



Digitalization of Retailing with Machine Learning

A master thesis by
Nien-Hua Gu

A Service-Product Design for Digital Merchandisers
to Implement Machine Learning



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Faculty of Industrial Design Engineering
MSc Thesis "Strategic Product Design"
Delft University of Technology

Author

Nien-Hua Gu, 4755405

Chair of the Graduation

Dr. Gerd Kortuem

Professor

Internet of Things

Mentor of the Graduation

Niya Stoimenova

PhD candidate

Product Innovation Management

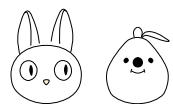
Bloomreach Company Mentor

Albert Wang

Director of Product & User Experience

致思懿，
我生命的靈犀。

還有
他們。



This research has been sponsored by Minister of Education,
R.O.C (Taiwan). I am honored to represent Taiwanese design
researchers to find the future of A.I. design.

Table of contents

Executive summary	vi
1 — Introduction —	1
1.1 Company: Bloomreach	2
1.2 Context: Retailers and Machine Learning	5
1.3 Purpose	7
1.4 Approach	8
2 — Literature review —	13
2.1 Digitalization of Retailing	14
2.2 Implementing ML-powered products	20
3 — Product analysis —	33
3.1 Features and architecture	34
3.2 Interactive Machine Learning (iML)	38
3.3 Product strategy	41
4 — Service analysis —	47
4.1 Method	48
4.2 Stakeholders	51
4.3 Current-state Service blueprint	55
5 — Merchandiser analysis —	69
5.1 Visual merchandising practices (VMD)	70
5.2 Behavior analysis	76
5.3 Merchandiser interview	81

6 — Insights & design brief —	89
6.1 Insight synthesis	90
6.2 Design definition	94
6.3 Persona	105
7 — Experience design —	111
7.1 brXtrategy family	113
7.2 brXtrategy Card	127
7.3 brXtrategy Playbook	135
7.4 brXtrategy Merlin	157
7.5 brXtrategy Insight	163
7.6 Loading tip	169
8 — Service & Implementation —	173
8.1 Journey map	174
8.2 Future-state service blueprint	178
8.3 Roadmap	182
8.4 Transitional workflow	186
9 — Evaluation —	191
9.1 Methods	192
9.2 Desirability, Viability & Feasibility	196
10 — Conclusion —	201
11 — Appendix —	207
11.1 Current service blueprint	208
11.2 brXtrategy Card	212
11.3 Project brief	236

Executive summary

The thesis addresses the implementation challenges of Machine Learning (ML) for merchandisers in the scenario of digitalization of retailing, and proposes a product-service design as the solution. The digitalization of retailing is defined as an on-going process to integrate Internet-connected digital technologies into interfaces between retailers and consumers. The researcher collaborates with Bloomreach, who provides an ML-powered merchandising tool called Bloomreach Search & Merchandising (brSM), and uses the context as an example of digitalization of retailing with ML. brSM helps merchandisers to improve the search and category experiences by optimizing the ranking of products, improving search results and curating recommendations on e-commerce platforms.

The project presents a comprehensive analysis of the product, service, and merchandiser. In the product

analysis, it is suggested that brSM doesn't facilitate the interaction between the merchandisers and algorithms. Due to the knowledge gap, merchandisers have difficulties to align the expectation of the product at the beginning. Furthermore, the product doesn't provide proactive feedback that improves the supervision of the user. In the service analysis, the misalignment of the internal feature communication leads to the confusing implementation service for the merchandisers. Specifically, the internal workflow and communication during the new feature introduction are confusing internally and externally. In the merchandiser analysis, it identifies two personas of merchandisers during the implementation of ML due to different business contexts and product characteristics. It thus is suggested to provide customized implementation supports according to their different needs.

To address these challenges, the design solution aims to improve the (new) feature communication by adopting a use-case oriented approach for merchandisers and internal stakeholders with supportive tools. Based on the implementation framework of service design, the solution will be addressed on three levels, experience, service and strategy.

At the experience level, brXstrategy family, supportive tools that provide merchandising inspirations, is introduced. It provides customized implementation information according to merchandisers' business context. Also, it simplifies the product information by the adopting use-case oriented approach, which provides example-based explanations. Moreover, it improves the interaction between the merchandisers and algorithms by an interactive education tool and proactive notification of algorithmic performance.

The front-stage and back-stage services are illustrated by the user journey map and service blueprint, which specify methods to improve the intra-company collaboration and the customer services in the critical moments like new feature introduction, onboard, and re-training.

On the strategy front, a roadmap and a transitional workflow are introduced to facilitate the product strategy and the solution implementation. The workflow, called Use-case oriented development workflow, bridges the gaps of product/merchandiser understandings between the field teams and the R&D teams during feature developments.

With comprehensive research and three aspects of the design solution, the thesis contributes to the company and academic domain. It contributes to a better understanding of merchandisers in the process of digitalization of retailing. Also, the

solution improves brSM's services and facilitates the implementation of ML. Last but not least, it demonstrates a design approach that designers can perform that improves ML-powered products.



01

Project background

Chapter 1

This thesis is executed in collaboration with Bloomreach. It focuses on the digitalization challenges with Machine Learning for retailers. Our introduction tells the background story behind the thesis.

First, since the research context is based on

Bloomreach's products and its business clients, we will give a brief introduction to the company. Then, we shall set out the scope of the project, including research questions and research purposes. Finally, we shall conclude the chapter with an explanation of our approach and an outline of the thesis.

1.1 Company: Bloomreach

Bloomreach is a technological solution provider specialized in marketing and merchandising with 10-years' experience of Machine Learning technologies.

[1] CBInsight. (2017). AI 100: The Artificial Intelligence Startups Redefining Industries. Retrieved from <https://www.cbinsights.com/research/artificial-intelligence-top-startups>.

Bloomreach is a technological solution provider founded in Mountain View, California in 2009 which is focused on providing products and services that help clients to build and optimize digital business. Bloomreach's products rely on Machine Learning technologies, and the company was selected as one of the top 100 AI companies in the world [1]. After celebrating its 10th anniversary, it has become a medium-scale international company with offices in the USA, the UK, the Netherlands and India with 250 employees in total (Figure 1).

Bloomreach devotes itself to helping companies with their digital transformation. It believes personalizing experience is the key to good customer service which drives conversion rates

and boosts revenue. Its products enable marketers and merchandisers to curate digital content, provide consistent digital services across different channels and optimize the service touch points by a data-driven approach. From a technical perspective, Bloomreach's products have a flexible software architecture, which helps developers to integrate them more easily.

The company provides two software products, Bloomreach Search and Merchandising (brSM) and Bloomreach Experience Manager (brXM). brSM is a digital retailing solution that improves search quality and provides personalized experiences for e-commerce websites, while brXM is a Content Management System (CMS) which enables marketers



Figure 1. Locations of Bloomreach offices

to manage complex multi-language websites, offering multi-language support, without the need for extra technical staff.. Furthermore, Bloomreach provides professional services to help with technical integration and business implementation. Technical services help clients' developers to re-platform and integrate command, data and file pipelines. Business services assist non-technical users to understand the mechanism of the software, learn good practice, and by planning their own roadmaps, take an active role in product development.

DNA of Machine Learning

Bloomreach takes pride in its deep understanding of Machine Learning (ML) technologies. Back in 2009, Bloomreach

released its first product BloomSearch (Later brOrganic), an ML-powered search engine optimization (SEO) tool. By definition, SEO is a set of techniques that improve the presence and importance of a website in search results of search engines like Google and Bing [2], and SEO involves an iterative process from data analysis to content creation. Bloomreach built its ML-powered Web Relevancy Engine to decrease labor efforts and significantly improve SEO performance with 80% more search traffic [3]. The understanding of Machine Learning and search engine optimization was later applied in their Bloomreach Search & Merchandising (brSM), which became the most important product in the company. This successful pattern fed into their practice and became embedded in the company's DNA.

[2] Yalçın, N., & Köse, U. (2010). What is search engine optimization: SEO?. Procedia-Social and Behavioral Sciences, 9, 487-493.

[3] Constine, J. (2012). Bloomreach Crunches Big Data To Deliver The Future Of SEO and SEM. Techcrunch. Retrieved from <https://techcrunch.com/2012/02/22/bloomreach/>

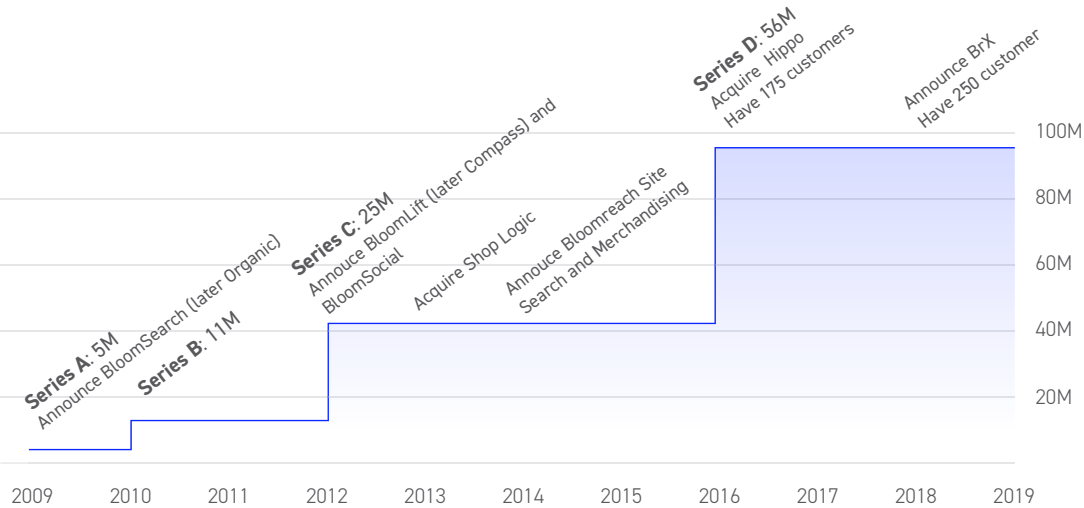


Figure 2. Funding history and important events of Bloomreach

A route to IPO

Figure 2 shows the timeline of funding and important developments in the history of Bloomreach. Bloomreach finished the Series D funding in 2016, having funded almost 100 million USD in total. Currently, it has 250 business clients across the U.S.A and European area. Its yearly

revenue is gradually increasing, reaching 75 million USD [4]. With this positive financing projection, the company aims to launch an Initial Public Offering (IPO) in these years.

In order to reach its goal, the company is implementing two strategies to expand its business. Firstly, the company

[4] Latka, N. (2018). Bloomreach CEO: We've turned down acquisition offers in \$400m range. Get Latka. Retrieved from <https://getlatka.com/companies/bloomreach>

[5] Statista. (2019). E-commerce share of total global retail sales from 2015 to 2021.

[6] Econsultancy. (2018). Digital Intelligence Briefing, 1–27.

[7] Oka, T., Ghai, S., Venkatesan, P., & Bagri, A. (2017). Disruptions in Retail through Digital Transformation, 1–64.

[8] Google. (2019). UX Playbook for Retail: Collection of best practices to delight your users.

[9] Häubl, G., Dellaert, B. G. C., Murray, K. B., & Trifts, V. (2004). Buyer Behavior in Personalized Shopping Environments, 207–229.

[10] Accenture. (2017). What Is The Difference Between Artificial Intelligence And Machine Learning?, 1–17.

[11] Kalaignanam, K., Kushwaha, T., & Rajavi, K. (2018). How Does Web Personalization Create Value for Online Retailers? Lower Cash Flow Volatility or Enhanced Cash Flows. Journal of Retailing, 94(3), 265–279.

places emphasis on post-sale services and upselling. Bloomreach provides a series of products for marketing and merchandising purposes. The first product that customers purchase provides penetration for other products. When a customer is satisfied with one product, the Customer Success Management team can “upsell” the other products. Further to this, the company is going to

introduce an all-in-one product called Bloomreach Experience (brX). In the business-to-business digital industry, a total-solution product more likely applies to a high-price strategy. Thus, brX will provide a comprehensive marketing and merchandising solution. The company expects the new product to be a revenue driver in the coming years.

1.2 Context: Retailers and Machine Learning

Implementing ML-powered technologies in digital retailing

Digital transformation of retailing is an ongoing trend. The contribution of digital channels to retail markets is gradually increasing from 7.4% in 2015 to 11.9% in 2019 [5]. 43% of new generations prefer to research brands and products online before purchasing in-store [6]. Thus, conventional retailers are digitalizing their businesses in order to keep market presence, especially when directed towards millennials.

Digitalization of retailing revolves around online customer experience with technologies enriching the experience [7]. Machine-Learning(ML)-powered applications including Search and Recommendation particularly play an important role in the digital customer experience. According to Google [8], 85% of search results don’t return what the user is looking for, and 80% of users will abandon the website because of unsuccessful searches. Recommendation is considered to be beneficial for both users and companies, providing a better quality of service to customers making purchase decisions [9] and improving the revenue of companies [10] [11] .

However, the retail industry has a slow speed of technological adoption and is not ready for Machine Learning, although e-commerce has been in operation since 1994 [12]. Retailers have difficulties to understand and utilize Machine Learning. For example, people without a data science background have difficulties

[12] Kalakota, R., & Robinson, M. (2001). e-Business 2.0: road-map for success (pp. 1–361). Boston, MA, USA: Addison-Wesley Longman Publishing Co., Inc.

[13] Dove, G., Halskov, K., Forlizzi, J., & Zimmerman, J. (2017). Challenges for Working with Machine Learning as a Design Material (pp. 278–288). Presented at the the 2017 CHI Conference, New York, New York, USA: ACM Press.

[14] Mulhern, F. (2009). Integrated marketing communications: From media channels to digital connectivity. Journal of Marketing Communications, 15(2–3), 85–101.

[15] Yang, Q. (2017). The Role of Design in Creating Machine-Learning-Enhanced User Experience.

[16] Girardin, F., & Lathia, N. (2017). When User Experience Designers Partner with Data Scientists, 1–6.

learning and working on ML-based services due to the knowledge gap [13], lack of required skills [14] [15] and scientific work method [16].

Services from Bloomreach

In recent years, Bloomreach has established a Professional Service division to facilitate the transition for customers. The division is comprised of two teams, the Technical Service team and the Business Service team.

On the technical front, Machine Learning takes time and effort to be implemented. It requires extensive collaboration with a client’s engineers to prepare the data pipeline for the algorithm. The Technical Service team cleans up the dataset for algorithms, creates user signal receivers, and optimizes results based on the signals.

On the other hand, it is important to train non-technical business users to interact with the ML-powered system. For example, merchandisers, who are responsible for stimulating consumers to purchase [69], have traditionally used product grids to promote products based on market trends or the business preferences of the company. ML can assist with these tasks. The Business Service team assists merchandisers to learn best practice in managing ML-powered services, and helps managers to build the

technological roadmap to unleash the full potential of Bloomreach's product.

In this project we will assess the usefulness of the current service provided by Bloomreach, and identify the implementation challenges that Bloomreach's clients have. A product-service design will be developed and presented to illustrate the better implementation experience for Bloomreach's clients.

1.3 Purpose

Facilitating merchandisers to implement brSM by a product-service design.

The project aims to facilitate merchandisers to implement Bloomreach Search & Merchandising (brSM), a Machine-Learning-powered digital retailing tool by a product-service design based on the existing brSM's services & product.

The major purpose can be breakdown into three perspectives.

Perspective of merchandisers

This thesis contributes to a better understanding of merchandisers in the process of digitalization of retailing. Digitalization of retailing is changing the role of merchandisers. When technology is implemented and thus changes the interfaces between retailers and customers, it influences how merchandisers perform merchandising strategies [56]. Addressing the role of merchandisers during digitalization of retailing, including their business goals, merchandising strategies and activities, allow us to provide a more complete

view of the merchandising activities with Machine Learning.

Perspective of Bloomreach

For Bloomreach, this thesis proposes a solution to improve brSM's service that facilitates the implementation. Since merchandisers are the frequent users that interact with the system, an improved implementation experience supports merchandisers to get the most out of brSM. It improves the satisfaction of the products & services, and thus reduces the brSM's client churn and improve Bloomreach's revenue.

Perspective of designers

Moreover, this thesis identifies the potential roles that designers can play in the era of smart technology. Although ML is considered as the new User Experience [17], designers are not ready for it in terms of knowledge, methodologies and tools [18]. Designers are acting reactively when designing with the technology, and simply "putting lipstick on the pig" [13]. This thesis provides an example of how designers can facilitate the implementation of ML for non-technical users with a service-product design. It therefore improves the performance of ML-powered products due to better collaboration between human and algorithm.

[17] Brownlee, J. (2015). Apple Finally Learns AI Is The New UI.

[18] Yang, Q., Scuito, A., Zimmerman, J., Forlizzi, J., & Steinfeld, A. (2018). Investigating How Experienced UX Designers Effectively Work with Machine Learning (pp. 585–596). Presented at the the 2018, New York, New York, USA: ACM Press.

1.4 Approach

Applying the service design approach, this thesis structures the content according to the four major phases of the methodology, Discovery (Ch 1-5), Problem Framing (Ch 6), Ideation (Ch 6-8), Implementing & Validation (Ch9)

[19] Stickdorn, M., Schneider, J., Andrews, K., & Lawrence, A. (2011). This is service design thinking: Basics, tools, cases (pp. 1–367). Wiley. Retrieved from http://lib1.org/_ads/8615CE06FB-F00070E2C-29B418984870A

This thesis applies service design methodologies as the approach. Service design is a field focusing on the creation of well thought through experiences using a combination of intangible and tangible mediums. As a practice, it generally results in the design of systems and processes aimed at providing a holistic service to the user (The Copenhagen Institute of Interaction Design, 2008).

Given the complex the context of

brSM and various touchpoints between Bloomreach and its clients, we apply the service design methodology defined by Stickdorn et al [19] as the approach for this project. It consists of four phases, which are explained along with their research questions as below (Figure 4).

Discovery

Service design aims to understand the context of the products and services, gain a clear understanding of the situation from the perspective of customers, and visualize these findings in the beginning. Consequently, there are four parts in the first phase (Figure 3). In Chapter 2, a literature review presents the theoretical background of the project. Then we analyze the product aspect of brSM in Chapter 3, while the service is investigated in Chapter 4. Last but not least, the perspective of customers is introduced in Chapter 5. We present the visualization respectively in each chapter.

The thesis starts with a literature review that builds a theoretical foundation in Chapter 2. It provides frameworks to conceptualize the context. The first research question is formulated: 'What is the context of Digitalization of retailing around retailers?' This question is investigated by a framework that addresses four components of

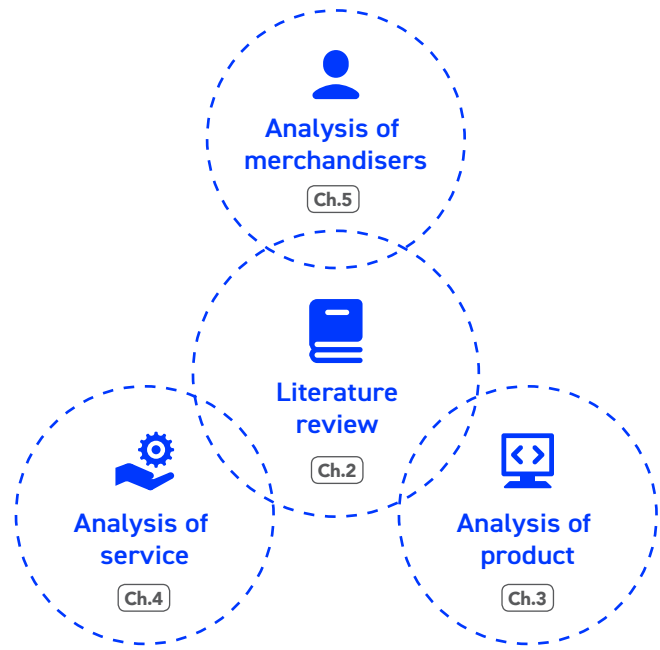


Figure 3. The four parts in the Discovery phase.

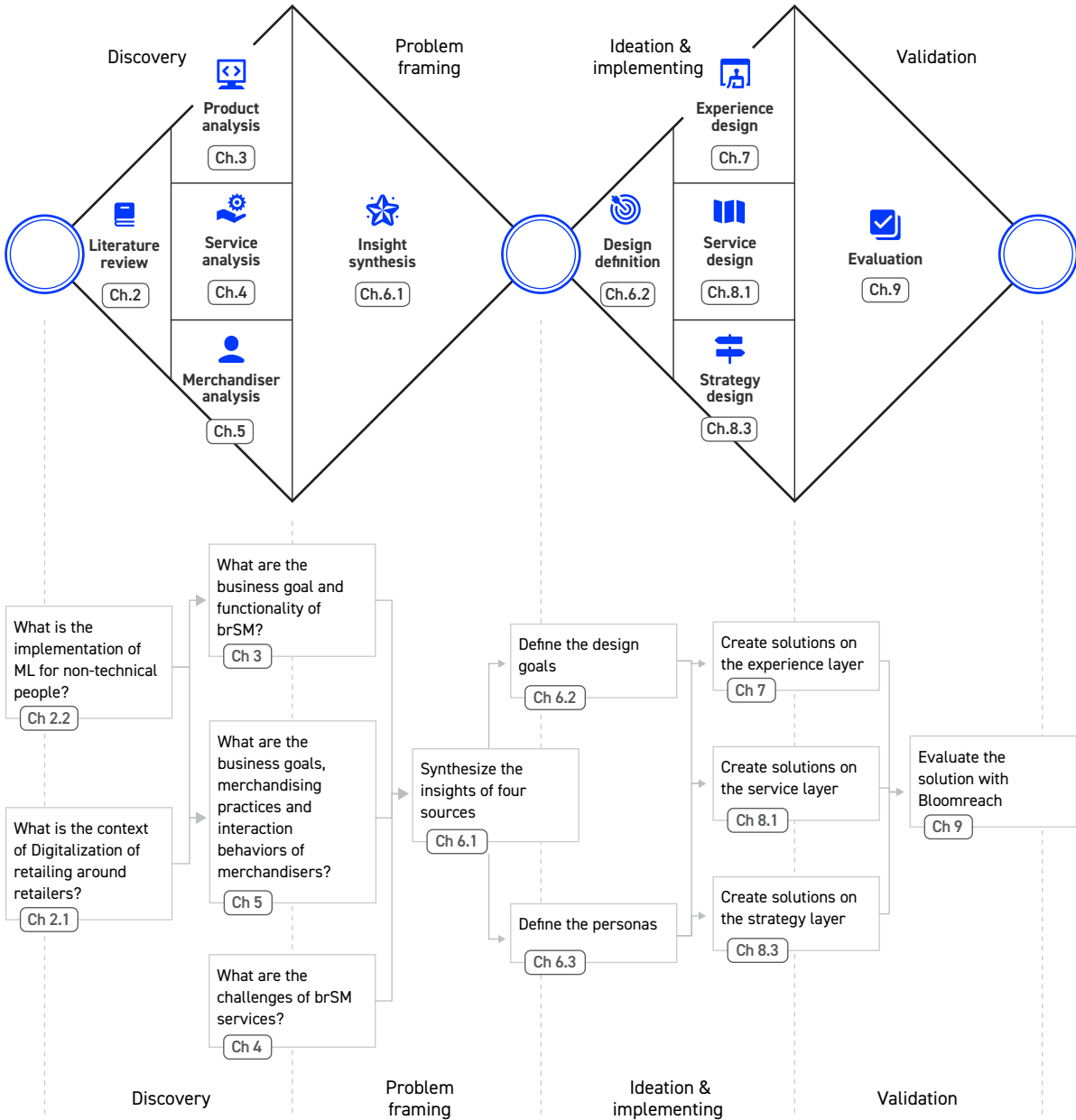


Figure 4. The overall approach of the thesis

[20] Arico, M. (2018). Implementing service design in the organisation. Retrieved August 17, 2019, from <https://www.slideshare.net/Livework/implementing-service-design-in-the-organisation>

[21] Junginger, Sabine & Sangiorgi, Daniela. (2009). Service Design and Organisational Change. Bridging the gap between rigour and relevance.

digitalization of retailing. Besides, this chapter also addresses: ‘What is the implementation of ML for non-technical people?’. We investigate the question by reviewing literature relevant to the implementation and interaction of ML-powered products. Another framework with four components that conceptualized this kind of products is introduced in this part.

Chapter 3 introduces the product brSM, which is addressed the research question: ‘What are the business goal and functionality of brSM?’ The technology architecture is illustrated that specifies how ML is working in brSM. Then, the interaction model of brSM, Interactive Machine Learning (iML) is introduced to explain the interaction process between ML and users. Moreover, the competition of brSM is discussed and the product strategy is explained.

Chapter 4 dives into the service of brSM, including how Bloomreach prepares the services and what are the touchpoints in the customer journey. In particular, the following research question is addressed, ‘What are the challenges of brSM services?’ A series of interview with internal

stakeholders is conducted, regarding the intra-company collaboration and their tasks. We summarize and visualize it by service blueprint, along with the bottlenecks in each service phase.

Chapter 5 aims to provide a better understanding of merchandisers’ situation, that addresses the following research question: ‘What are the business goals, merchandising practices and interaction behaviors of merchandisers?’ The merchandising practices are analyzed, and the insights are then mapped to their online behaviors. As results, the behavior patterns are identified, along with their business context from interviews.

Problem Framing

In the problem framing phase, service designers simplify complex situations and synthesize the insight. Chapter 6.1 summarizes the insights from the previous chapters, and illustrates the relationship between insights from different chapters.

Ideation & implementation

The concepts are then developed and the final solution, brXtrategy, is proposed.

The design directions are illustrated. The design brief is defined in Chapter 6.2, while Chapter 6.3 introduces two personas that embody users in different business contexts.

According to the implementation model of service design (Figure 5, [20] [21]), a service design plan covers three levels of design aspects. Experience level introduces the tangible part of the plan, including service interfaces and interactions. Also, the implementation plan is introduced at the service level. Moreover, it also addresses the strategic plan that fosters change and innovation on the strategy level.

Three levels of design are created to address brXtrategy in the different aspects. Chapter 7 introduce the design on experience level. The brXtrategy family is introduced, including the card set (brXtrategy Card), new documentation (brXtrategy playbook), and email notification (brXtrategy Intelligence). Chapter 8.1 illustrates the journey that merchandisers interact with brSM products and services. Then in Chapter 8.2 a new service blueprint is illustrated five projects that deliver the solution with collaboration across teams. Furthermore, Chapter 8.3 introduce a roadmap of brXtrategy that illustrates how Bloomreach can implement the solution within a two-year timeframe. Last but not least, to facilitate the transition, an assistive tool is introduced in Chapter 8.4.

Validation

To validate the solution, several stakeholders are invited to join the validation session to verify the feasibility, viability and desirability. Chapter 9 illustrates the methods to perform the validation and the results of the session.

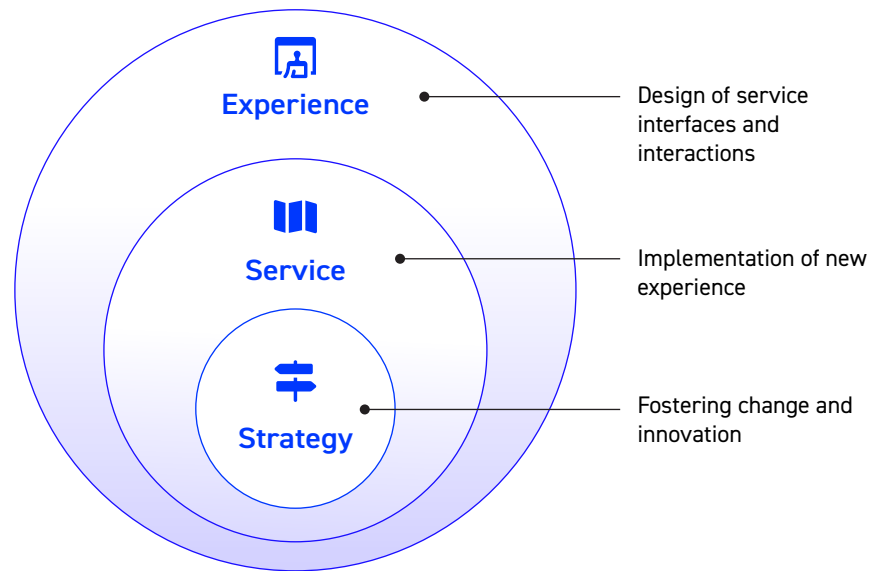


Figure 5. Implementation model of service design [20] [21]

02

Literature review

Chapter 2

In this literature review, we provide a theoretical background to the project. The purpose of the chapter is to work with existing theories and frameworks in presenting a comprehensive view of the digitalization of retailing with Machine Learning. Based on our findings, we can understand and conceptualize the context of Bloomreach's clients, services and products.

This chapter is structured in the following order. First, we introduce the four components of the

digitalization of retailing created by Hagberg, Sundstrom & Egels-Zandén (2016). In each section, we introduce related academic and practical findings that illustrate some of the challenges and tasks faced by retailers. Next, we present literature regarding the implementation of ML-powered products. Another framework with four components, created by Girardin & Lathia (2017), is introduced to provide a perspective to further understand strategies and practices used in implementing technologies.

2.1 Digitalization of Retailing

The digitalization of retailing is an on-going process to integrate Internet-connected digital technologies into interfaces between retailers and consumers.

[22] Yoo, Y., Boland, R. J., Jr, Lyytinen, K., & Majchrzak, A. (2012). Organizing for Innovation in the Digitized World. Organization Science, 23(5), 1–12.

[23] Hagberg, J., Jons-son, A., & Egels-Zandén, N. (2017). Retail digitalization_ Implications for physical stores. Journal of Retailing and Consumer Services, 39, 264–269. [http://doi.org/10.1016/j.jretconser.2017.08.005](https://doi.org/10.1016/j.jretconser.2017.08.005)

[24] Statista. (2019) E-commerce share of total global retail sales from 2015 to 2021. Retrieved from <https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide>.

Digitalization refers to the replacement of existing processes with new processes enabled by digitized artifacts and technology [22]. Specifically, the digitalization of retailing is an on-going process to integrate Internet-connected digital technologies into interfaces between retailers and consumers [23]. Although this is a broad concept, we focus on the integration of e-commerce in particular. This transition of digitalization is not only changing mediums of retailing, but methods of exchange, roles of key actors, settings of retailing and offerings

of goods.

Digitalization of retailing is a developing event. E-commerce was estimated to have a share of 8.6% of total global retail sales in 2016, which is expected to increase to 17.5% in 2021 [24] (Figure 6). This implies retailers use mostly physical channels, while digital channels are gradually increasing. Therefore, achieving the paradigm shift from physical to digital channels is one of retailers' major challenges.

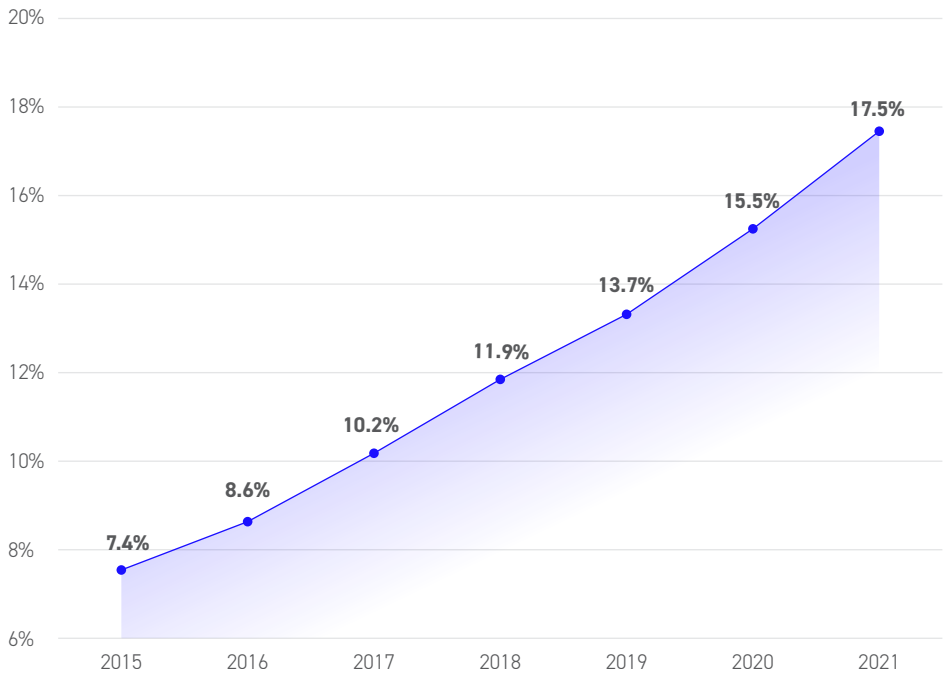


Figure 6. E-commerce share of total global retail sales from 2015 to 2021 [24]

To capture the developments of the Digitalization of Retailing, Yoo, Boland, Lyytinen & Majchrzak [22] developed a conceptual framework with four components: exchanges; actors; settings and offerings. The concept of exchange refers to various activities that take place during a customer journey. They use the concept of actors to encompass the interactions between customers and

retailers. And the concept of setting refers to different situations where the interaction happens. Last but not least, the concept of offering refers to the assortment and pricing. These four components have different degrees of dependencies with each other. When one of them changes, it influences others at the same time.

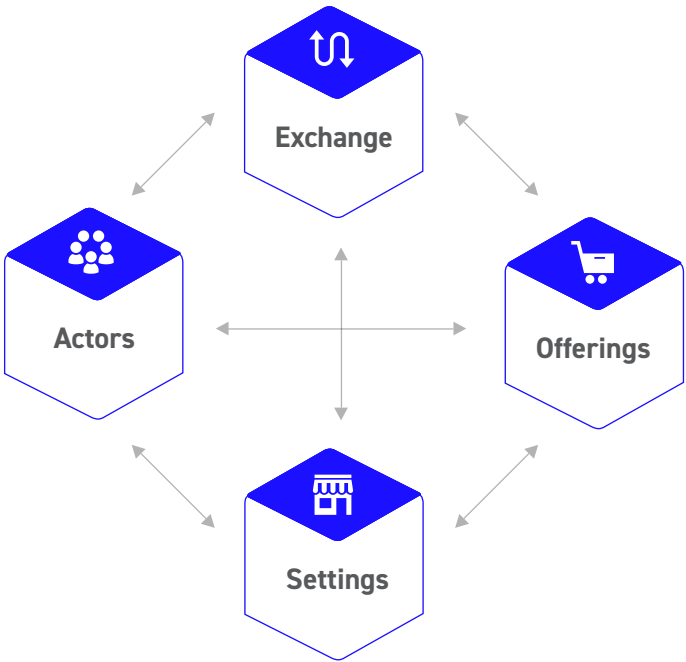


Figure 7. Modified conceptual framework of the digitalization of retailing [22]

[25] Kalaignanam, K., Kushwaha, T., & Rajavi, K. (2018). How Does Web Personalization Create Value for On-line Retailers? Lower Cash Flow Volatility or Enhanced Cash Flows. *Journal of Retailing*, 94(3), 265–279.

[26] Häubl, G., Dellaert, B. G. C., Murray, K. B., & Trifts, V. (2004). Buyer Behavior in Personalized Shopping Environments, 207–229.

[27] Bizibl. (2015). 7 Steps to Becoming a Digital Merchandising Hero. Retrieved from <https://bizibl.com/marketing/download/7-steps-becoming-digital-merchandising-hero>

[28] Verhoef, P. C., Kannan, P. K., & Inman, J. J. (2015). From Multi-Channel Retailing to Omni-Channel Retailing: Introduction to the Special Issue on Multi-Channel Retailing. *Journal of Retailing*, 91(2), 174–181.

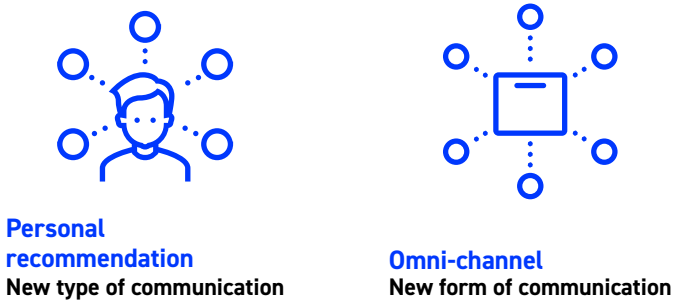


Figure 8. New type of exchange & new form of exchange

Exchange

In retailing, there are several exchanges such as delivery, communication, and transaction. With digitalization, new types and forms of exchange are created (Figure 8). For example, in the analog age, all communication was one-fits-all, and personalized communication on a large scale was difficult. In the current situation digital technologies are making greater personalization possible, and retailers can provide new types of customized information based on customers' preferences. Also, digital and physical channels are mixed in a customer journey, and thus omni-channel, a new form of exchange, is created.

New type of exchange: personal recommendation

Thanks to the Customer Relationship Management system and user identification tracking methods, retailers can record user behaviors, purchase histories and other user signals to provide personalized recommendations. It has proven to be useful for both retailers and customers. For retailers, research has shown that personalization reduces customer churn and thus

improves cashflow [25]. For customers, personalization reduces the effort involved in decision making and improves the quality of the process [26].

The goal of recommendation is to provide the most relevant results possible, whether to new or returning customers. If a recommendation is well managed, it enables product discovery by providing product information that customers may not have been aware of, and thus improves sales performance. Retailers can achieve their goals by leveraging ranking, sorting and positioning strategies in how browsing and search results are displayed, which produce direct impacts on conversion rates [27].

New form of exchange: omni-channel

The definition of omni-channel is to provide customers with the ability to move between 'channels' seamlessly during one integrated purchasing process [28]. The research has shown that retailers use e-commerce websites as a method to discover new customers and generate new visitors into physical stores. [29]

Technically speaking, to create omni-channel experiences, retailers need to build a product feed pipeline that synchronizes the information between the Point of Sale (POS) system, assortment management system, and product feed that is consumed by the ML-powered system. The product availability information is important for customers to check whether there are the same products in the physical stores nearby. Also, it is crucial to show products which have sufficient inventory to satisfy customer's preferences and requirements. Otherwise, it may damage the customer experience if the e-commerce website doesn't hide unavailable products [27].

Actor

Digitalization creates impacts on the relationship between actors in retailing. And also, technology becomes an important "actor" in the scenario. There are two major actors in retailing scenarios, customers and retailers. Besides, integrating technologies as a part of business activities, creates new types of relationships between retailer and technologies. Therefore, these two relationships will be introduced.

Cutomser-retailer relationships

Where retailing interfaces have become computerized, the emotional impact on customers changes dramatically [30]. An e-commerce experience is less friendly and co-operative compared to a physical one. Since inter-human interactions are mostly indirect in digital channels, relationships between customers and retailers deteriorate. Furthermore, the experiences are more formal and task-orientated than physical ones. In order to improve business performances, e-commerce websites are designed to provide just enough information and clear actions in order to maximize the conversion rate. And that leads to task-orientated experiences in online shopping.

On the retailer side, digitalization changes the way retailers understand customers [27]. A merchandiser's goal is to serve up products that will inspire shoppers to purchase. Understanding shoppers by data and usage of the preferred language for products is the key to delivering relevant products in exploration and search experiences. Therefore, the signals received from social media and website analytic tools are essential to capture preferences and trends on a macro scale.

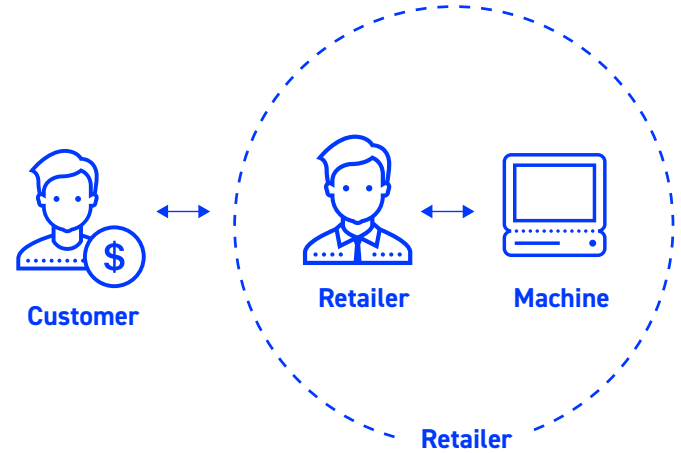


Figure 9. Two types of relationships between key actors

Retailer-technologies relationships

However, the tension between technologies and employees escalates during the transition of digitalization. One study has shown that relationships between technologies and employees are negative [31]. Employees To improve the sense of control, opportunities to learn the system and capacities to intervene in the computational process are valid methods. It makes users feel they are the principal judges of the new system.

Settings

Digitalization replaces traditional retail settings like fixed, physical stores.

[29] Rotem-Mindali, O., & Weltevreden, J. W. J. (2013). Transport effects of e-commerce: what can be learned after years of research? *Transportation*, 40(5), 867–885.

[30] Keeling, K., Keeling, D., & McGoldrick, P. (2013). Retail relationships in a digital age. *Journal of Business Research*, 66(7), 847–855.

[31] Baronas, A.-M. K., & Louis, M. R. (1988). Restoring a Sense of Control during Implementation: How User Involvement Leads to System Acceptance. *MIS Quarterly*, 12(1), 111–15.

[32] Leibowitz, J., & Rettaliata, A. (2012). How retailers can win the mobile shopper turf war. McKinsey & Company.

[33] Bhatnagar, A., & Syam, S. S. (2014). Allocating a hybrid retailer's assortment across retail stores: Bricks-and-mortar vs online. Journal of Business Research, 67(6), 1293-1302.

[34] Grewal, D., Roggeveen, A., & Runyan, R. C. (2013). Retailing in a connected world. Journal of Marketing Management, 29(3-4), 263-270.

[35] Kalaignanam, K., Kushwaha, T., & Rajavi, K. (2018). How Does Web Personalization Create Value for Online Retailers? Lower Cash Flow Volatility or Enhanced Cash Flows. Journal of Retailing, 94(3), 265-279.

Retailers can curate a customized experience based on the geographical information of on-the-go customers [32]. The proliferation of mobile devices creates new settings for retailing. For example, customers can purchase products during commuting. For the on-the-go consumer, consumer data and real-time geographic information enable retailers to interact with them at key decision points.

In practice, it is suggested to respond relevantly to contextual nuances and preferences to assist customers to make decisions [27].

Offering

Digitalization contributes to possible extensions of offering and how these

offerings are priced.

Extension of offerings

The combination of physical and online stores has provided a new opportunity to increase profitability in assortment allocation [33]. Merchandisers can prepare different selections of products in different channels. In this way, they can even extend the lifecycle of a product by selling it in physical channels first and then digital channels.

Personalized pricing

Customized promotions or dynamic pricing becomes possible in the era of digitalization [34]. However, the degree of trust from customers may also diminish. And thus only trustworthy retailers or business-to-business companies can more likely apply the strategy [35].



Figure 10. New settings and offerings in the digitalization of retailing

[36] Microsoft. (2018). Machine Learning Pro-Research ProResearch, 1–9.

[37] Gualtieri, M., Giudice, Lo, D., Sridharan, B. P. W. S., Miller, E., & Yunus, A. (2018). Deep Learning: An AI Revolution Started For Courageous Enterprises.

[38] Gulli, A., & Pal, S. (2017). Deep Learning with Keras (pp. 1–302). Birmingham: Packt Publishing.

[39] Rumelhart, D. E., Hinton, G. E., & Williams, R. J. (1988). Learning representations by back-propagating errors. Cognitive modeling, 5(3), 1.

[40] Rosenblatt, F. (1958). The perceptron: a probabilistic model for information storage and organization in the brain. Psychological review, 65(6), 386.

[41] Amershi, S., Weld, D., Vorvoreanu, M., Fournay, A., Nushi, B., Collisson, P., et al. (2019). Guidelines for Human-AI Interaction. the 2019 CHI Conference (pp. 3–19). New York, New York, USA: ACM.

2.2 Implementing ML-powered products

ML-powered products is characterized as a feedback loop, which is an iterative mechanism that personalizes, optimizes, improves and automates data based tasks.

Machine Learning is a type of artificial intelligence (AI) providing computers with the ability to learn without being explicitly programmed [36]. Machine learning mimics the way humans learn by identifying patterns and predicting outcomes [37].

The common Machine Learning algorithms include Decision Trees, Linear Regression, Support Vector Machines (SVM), and Neural Networks. As one of the most common algorithms, Artificial Neural Networks is inspired by studies about the central nervous system of mammals. These networks consist of several interconnected neurons, organized in layers, which exchange messages when certain conditions happen [38]. The concept was first introduced in 1958, when Rosenblatt introduced a double-layer network for a simple operation. This model requires huge amounts of data to process and thus needs huge computational power. Therefore, this novel concept only became feasible for business application after the introduction of a concept of a high-performance algorithm [39] and improvement of GPU computational capacity around 2011. A milestone had been reached, with Machine Learning becoming a buzz-word for business and

an important domain for research.

Application

Table 1. The list of ML applications on business-to-consumer and business-to-business sides.

Customer-facing applications ^[41]	Business-to-business applications ^[42]
Ecommerce	Agriculture
Navigation	Auto
Music recommendation	Healthcare
Activity tracker	Government
Autocomplete	Semiconductor
Social network	Telcom
Email	Finance/Insurance
Voice assistants	Industrials
Photo organizer	Retail
Web search	Media
	Real Estate
	Legal, compliance & HR
	Training data
	Software development
	Data management
	Cyber security
	Ads, sales & marketing
	Others

After decades of development, Machine Learning is now regarded as an established technology and has potential for innovation [13]. Machine Learning is widely integrated into applications and industries from both consumer-facing and business-to-business concerns (shown in Table 1). As ML becomes more common in various contexts and businesses, the implementation of ML inevitably becomes an urgent topic to discuss.

Challenges

However, unlike with other technologies, when a company integrates ML into their value chain, there are unique challenges to overcome. In the research done by Sapp [43], five challenges are identified: data availability; data quality; data integration; ethical concerns and talent acquisition.

Data availability

Since ML relies on a large amount of data to train and validate its algorithms, it requires computing powers and data management capacities. Therefore, companies need to either invest in infrastructure or find external service providers to build the capacity to collect data and utilize ML technologies.

Data quality

Timeliness of data is important for data quality, especially when realtime applications like those handling financial information are involved . Data becomes less relevant due to changes in external factors that have occurred simultaneously. Also, data is extremely context-specific and there are significant limitations to its reuse. Migrating data from one context to another will diminish its accuracy or

[42] CBInsight. (2019). The AI 100: Artificial Intelligence Startups That You Better Know. Retrieved from <https://www.cbinsights.com/research/artificial-intelligence-top-startups/>

[43] Sapp, C. E. (2017). Preparing and Architecting for Machine Learning, 1–37.

[44] Chou, J., Murillo, O., & Ibars, R. (2017). How to Recognize Exclusion in AI – Microsoft Design – Medium. Retrieved from <https://medium.com/microsoft-design/how-to-recognize-exclusion-in-ai-ec2d6d89f850>

[45] Simchi-Levi, D., & Wu, M. X. (2017). Powering retailers' digitization through analytics and automation. *International Journal of Production Research*, 56(1-2), 809–816.

[46] MacKenzie, I., Meyer, C., & Noble, S. (2013). How retailers can keep up with consumers. McKinsey & Company.

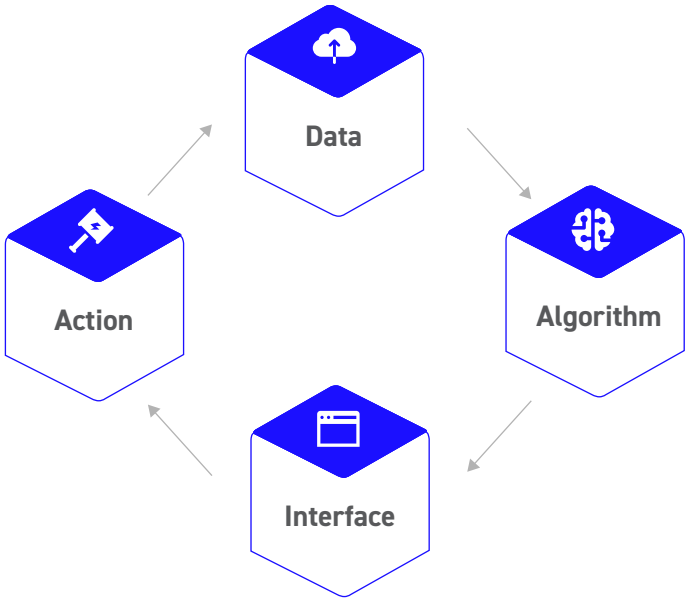


Figure 11. A conceptualization framework of ML-powered product [16]

Talent acquisition

Companies need to have talented staff who are knowledgeable in ML at both management and executive levels. Managers who understand ML can make the right decisions for ML implementation. Companies that work successfully with ML employ data specialists and engineers internally or externally.

Implementation

To gain a better understanding of the implementation of products with ML, a framework introduced by Girardin & Lathia [16] is used to conceptualize them.

They describe a product with ML as characterized by a feedback loop, which is an iterative mechanism that personalizes, optimizes, improves and automates data based tasks. It starts from the input of data. The algorithm uses a statistical approach to understand the data, identify patterns, generate knowledge, and make decisions (or suggestions) on behalf of

users. Then, the interface where users can interact provides the results of the algorithm. Once an interaction is made by a user, it becomes a signal for the algorithm to improve its accuracy and a new feedback loop is spawned.

Based on this framework, we can categorize the implementational needs or challenges using these components (Figure 11).

Data

Even though ML-powered products can operate automatically, manual interventions are necessary to help the algorithms to learn and optimize. People at both management and operation levels need to apply a data-informed approach to make decisions and actions that facilitate ML technologies to reach their business goals.

Management level

Implementation of ML-powered technologies should be complemented by appropriate change management, where data analytics integrate into the day-to-day management process [45]. For example, companies can translate it into strategic suggestions concerning revenue improvement, cost reduction and capital efficiency [46].

Operational level

At the operational level, employees perform data analysis and interpretation, where they gather and analyze data to understand customer preferences [46]. During the process, they generate knowledge that can modify ML and improve algorithms [16]. For example, they can identify the trend of a specific customer segmentation on a macro-level and make business decisions based

on it. Moreover, on a micro scale, they can understand the needs of individual consumers and personalize the offers on a one-on-one basis.

In addition to new activities that employees perform, the data-driven approach also influences their workflow. Girardin & Lathia [16] (Figure 12) present a data-driven workflow with five phases: hypothesis; prototype; validation; deployment and evaluation. The workflow follows a scientific method with strict and iterative processes. It depends on well-formulated research questions, that formulate the hypothesis and metrics for the context of the project. Then a prototype is created to validate the assumption. Then the new model is deployed once the improvement has been confirmed. In the long term, employees should constantly monitor and evaluate the results. Once the context changes, the model may not meet expectations and needs. Accordingly, employees formulate another research question and start a new cycle.

Algorithm

Algorithms are distinct components in the business value chain. To facilitate the implementation of ML, Ng [47] proposes algorithm-related activities for management and at operational levels.

Management level

It is suggested to enable managers to understand what algorithms can do for the company, to begin developing strategy, and to allocate appropriate resources.

First, managers need to understand the mechanisms and capacity of algorithms. Explaining what they can and cannot do is useful for non-technical users. Then,

the business strategy should be reviewed based on the impact of ML, and a potential new workflow proposed after algorithms are integrated into the value chain. For example, when an algorithm can automate some tasks, a new collaboration method between multidisciplinary teams and the technology should be prepared. Last but not least, companies should allocate resources accordingly, to improve talent, knowledge and infrastructure for the transition.

Operational level

In-house engineers should have technical understanding of machine learning and ML tools.

They should be familiar with open-source and 3rd party tools for building ML systems and keep up-to-date with

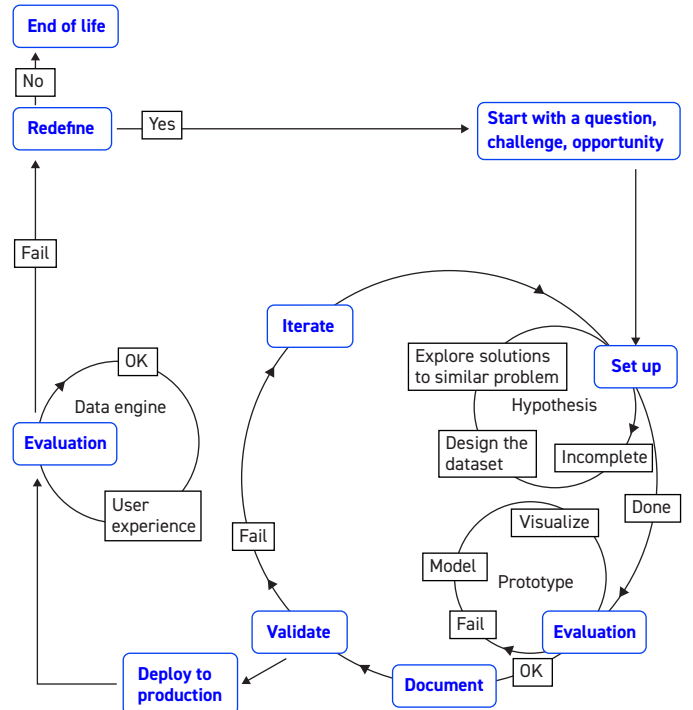


Figure 12. A data-driven process from the hypothesis, prototype, validation, deployment and evaluation [16]

[47] Ng, A. (2018). AI Transformation playbook.

[48] Holbrook, J. (2017). Human-Centered Machine Learning.

[49] Norman, D. A. (1994). How might people interact with agents. *Communications of the ACM*, 37(7), 68–71.

[50] Horvitz, E. (1999). *Principles of Mixed-Initiative User Interfaces*. *Acm*, 159–166.

[51] Höök, K. (2000). Steps to take before intelligent user interfaces become real, 1–18.

[52] Noessel, C. (2017). *Designing Agentive Technology*. Rosenfeld Media.

[53] Google. (2019). *People + AI guidebook*. Retrieved June 16, 2019, from <https://pair.withgoogle.com/about/>

[54] Winograd, T. (2006). Shifting viewpoints: Artificial intelligence and human-computer interaction. *Artificial Intelligence*, 170(18), 1256–1258.

evolving ML technology. Also, they need to execute the workflow proposal and develop systems to work with ML.

Interface & Action

Interface & action are where end-users interact with an ML-powered product. The initial concept of interaction between user and intelligent technologies was proposed by Human-Computer Interaction pioneers such as Norman [49], Horvitz [50] and Höök [51]. Where more ML-powered products have been introduced in recent years, practitioners and researchers create design guidelines for ML. am [52] proposes a new term, “agentive technology” to describe the products that make decisions on behalf of users, and introduces an interaction framework. Amershi et al [41] use a systematic approach including 150 pieces of literature to establish ML-powered product design guidelines, and have conducted several rounds of validations to confirm the usefulness of the results. The results emphasize the design challenges from the perspectives of user experience (UX) and user interface (UI). Google Design has introduced a preliminary design guideline called Human-Centered Machine Learning by Holbrook [48],

which extends the research from People + AI Guidebook [53]. The new guidelines focus not only on UX and UI design, but also on product management. They emphasize finding a problem-solution fit, and help product teams to identify the right problem, collect appropriate data, and solve UX/UI design challenges.

Since this research project focuses on how merchandisers implement ML, there are extensive interactions between the technology and non-technical users. We will introduce interaction patterns, design challenges, and design guidelines in the following sections.

Two AI-human interaction

patterns

There are two perspectives regarding relationships between humans and smart technologies: artificial intelligence (AI) and intelligence amplification (IA). Both perspectives embody different attitudes towards smart technologies and imply different practices when implementing ML.

The debates between AI and IA have lasted decades. Winograd [54] describes the evolution of the two contradicting perspectives in the AI and HCI domains. The conflicts were initially introduced by McCarthy and Engelbart in the 1960s. AI, which is described as “Superbrain” by McCarthy, aims to mimic human brains, and potentially computerize human activities [55]. IA, which is called ‘augmentation’ by Engelbart, is used to assist and enhance human intelligence in performing tasks [56].

Zhang et al [55] further investigate the impacts of the two perspectives in companies. Although IA has significant effects on the collaboration between IT

and highly educated workers currently, it is believed that AI will have the greater influence on the high-education labor market in the near future. Therefore, they suggest companies should provide continuous training to update employees’ skills. Thus companies will be able to fully take advantage of smart technologies and enhance the productivity of the labor force.

These two perspectives also influence how users interact with technologies. Based on Abowd and Beale’s model [57], Noessel [52] builds two interaction models to describe relationships and actions in the two scenarios. In conventional Human-Computer interactions, the human’s activities and the computer’s ones are two separate parts (Figure 14). Computers receive input from humans, process data (the step is further split into performance, core, presentation in another model.), and display the output. Then, humans see the input, make decisions based upon that, and send further demands to computers. Compared to Abowd and Beale’s model, Nossel’s model specifies the starting point where humans set up computers, and the stopping point where the systems don’t fit users’ intention and are disengaged.

We will introduce the interaction models of the two perspectives based on Nossels’ findings. To clarify and avoid confusions about the naming, we will use human-led to refer to IA, and AI-led to refer to AI in this specific part of our thesis.

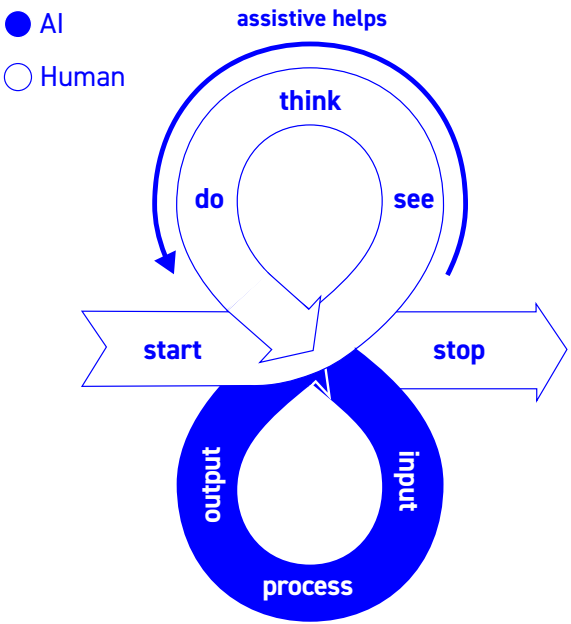


Figure 14. Human-led interaction pattern (intelligence amplification)

Human-led interaction (intelligence amplification)

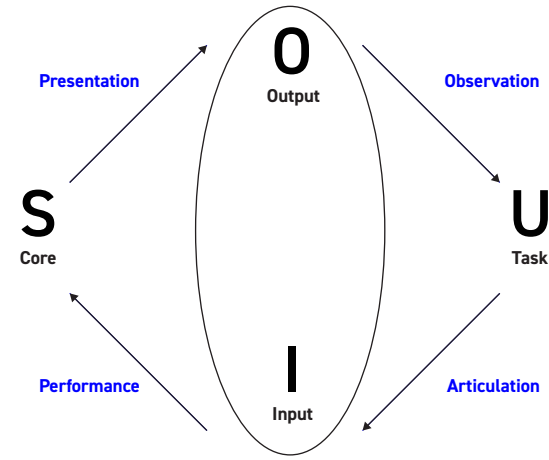
From the perspective of human-led interaction, smart technologies are assistants for users to achieve their tasks. In the new interaction model, computers and humans are not on opposite sides. A new interaction, where computers participate as assistants in the human’s activities, is created. At the same time as humans see, think and do, computers can help to organize and prioritize the information (see), simulate the results and provide recommended actions (think), manage how commands sent by users are contributed across a network of recipients and coordinate how the commands are executed by a network of actuators (do).

[55] Zhang, D., Peng, G., & Yao, Y. (2019). Artificial Intelligence or Intelligence Augmentation? Unravelling the Debate through an Industry-Level Analysis, 1–39.

[56] Licklider, J. C. R. (1960). Man-computer symbiosis. *IRE transactions on human factors in electronics*, (1), 4-11

[57] Dix, A., Finlay, J., Abowd, G. D., and Beale, R., (1992), *Human Computer Interaction*, 2nd ed., Prentice Hall, ISBN 0-13- 239864-8.

Figure 13. Abowd and Beale’s model [57]



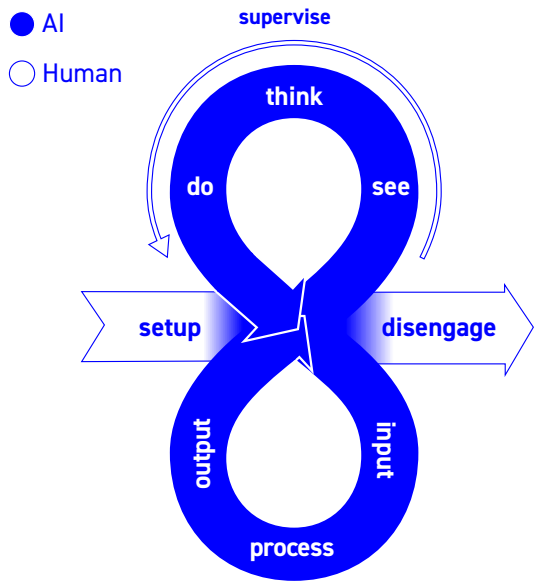


Figure 15. AI-led interaction pattern (artificial intelligence)

[58] Nielsen, J., & Molich, R. (1990). Heuristic evaluation of user interfaces. *Acm*, 249–256.

AI-led interaction (artificial intelligence)

From another perspective, smart technologies should reduce human interventions by computerizing their activities. In the model, computers perform what human used to do, while humans take on a supervisory role, monitoring operations and occasionally modifying decisions. Computers may also interact with users proactively during the process, especially when errors and multiple choices occur.

Another difference compared to the previous model is the transition points between human and computer. There are more intensive interactions in the starting and ending points. Before the pipeline of activities starts, humans may need to understand the mechanism, capacity, possible results and give certain commands in the setup stage. Since smart technologies may not have a specific

ending time, humans also decide when the system stops.

Intelligence amplification and artificial intelligence are not just different perspectives to develop smart technologies. They are in the real world, influencing how companies are using technology in the workforce [55], changing the interactive behaviors between humans and computers [52]. We assume these two perspectives are not distinct and exclusive to each other. They may exist in the same product when users with different preferences and background knowledge interact with smart technologies, and thus influence how companies implement smart technologies.

Interaction Challenges

Since ML applies probabilistic models, the results of services are unpredictable. These results may be disruptive, confusing and offensive. Consequently, it may confuse users, erode their confidence, and potentially lead to abandonment of the service. It therefore poses great challenges for interactive design.

Amershi et al [52] compare characteristics of ML with HCI design principles and identify the following three major challenges.

Inconsistency

The information provided by ML components is not consistent due to the learning mechanism of the technology over time. It violates the UI principles “be consistent” [58] and makes it harder for users to understand and use ML-powered products.

Unpredictability

The results from ML algorithms are easily influenced by nuanced changes of the context, such as differing lighting or noise conditions around users. Systems may respond differently to the same input over time.

Errors made by the algorithm

Errors are common in ML-powered products, and thus the principle of error prevention is hard to be achieved [58]. This fact contributes to the efforts of AI explanations and interpretability to help users to verify the proposed actions and its potential outcomes.

Interaction Guideline

Since the conventional HCI design guidelines can’t apply to ML-powered products, Amershi et al [52] have established design guidelines for this specific technology based on an extensive literature review process and several rounds of validation with practitioners. Researchers use sequential categories to group these guidelines including Initially, During Interaction, When wrong, and Overtime.

Initially

Compared to the conventional products, when users initially interact with ML-powered products, it is suggested to explain the mechanism, clarify the limitation, and thus align the expectations of results.

a. Mechanism explanation

Explaining the mechanism and conveying capacity are two important deliverables at the beginning [52].

Explaining the mechanism of an ML-

powered product is a straight-forward solution to align expectations. However, since reasons behind a particular ML prediction are sometimes unknown or too complex to be explained briefly, the best practice is not to attempt to explain everything but only the aspects that impact users’ trust and decision-making [53].

General explanations, specific output explanations, and example-based explanations could help users understand the system in a brief format. A general explanation can explain how a system behaves, regardless of specific inputs. It can also introduce the metrics that it tracks [41], what a system is optimizing for and how a system is trained. As for specific output explanations, explanations are displayed in the context of user tasks, and provide the actions that resolve confusions. Besides, example-based explanations are useful when the reason behind an algorithm’s prediction is hard to explain. An example is given from the algorithm’s training set that is relevant to the decision being made [53]. These examples help users to understand the mechanism in an easier and familiar way.

b. Limitation explanation

To help users to align expectations, it is useful to clarify how well the system can perform and what the system can’t do.

When a user has high expectations and the results turn out to be worse than those expectations, they feel disappointed with the service. Therefore, it is important to convey any limitations at the beginning [52]. When explaining ML-powered features, we can give warnings about inaccuracy and tell users that errors might occur and that you can ‘teach’ to improve performance [41].

Also, when the system provides a

prediction, confidence level and potential alternative choices can explain how certain the results are [53].

During interaction

After an ML-powered service has been deployed, the system will make decisions and execute them independently. However, if the system is “out of sight” for most of the time, it leads to an “out-of-mind” problem for the service providers [52]. Therefore, proactive interaction from ML in an appropriate way is necessary.

a. Moment of engagement

The system should use appropriate events to interrupt or remind users. For example, when new contents or choices appear, the system can send notification to communicate the updates. Moreover, the practitioner suggests the system deserves credit when everything processes smoothly [52]. It provides an opportunity to remind the user of the

value they receive from the service.

b. Appropriate information

Since proactive interaction may annoy users, the information should be relevant to the user’s current task and environment. The information and behavior should also fit in with social norms, avoiding undesirable and unfair stereotypes and biases.

When wrong

The system will notify users when a problem occurs with suggested actions depending on the type of error. Holbrook [48] uses a confusion matrix (Figure 16) to describe different types of errors in ML-powered products, including false positive and false negative. The system should provide different actions, taking into account the contexts of the two scenarios.

a. Notification of errors

A system should send notifications and request precautions when uncertain situations happen. Along with the notification, it should also provide descriptions and reasons for the system’s previous actions.

b. Activation / Disengagement

When errors occur, it could be that users choose to disengage from the ML service. It is important to ensure a smooth process of the transition. For example, a global-level modification can make sure a system responds to users’ intentions without any exception.

c. Paths forward from failure

Creating paths for users to take action

when errors occur encourages patience with the system, keeps the relationship going, and supports a better overall experience [53].

These actions can be categorized as false positive and false negative [52]. False positive errors are the activated events that users don’t expect to appear, while false negative errors are the expected events that don’t happen.

False positive errors are for the most part considered as minor, and the system can provide a simple action like ‘skip this case for now’, with duration or location to ignore. If the cost of false positive errors is high, advanced actions including trigger reviews and rule modification can help users to improve the algorithm. As for false negative errors, they diminish the value of the product dramatically and can have a huge impact on user satisfaction. ‘Add to whitelist’ could be a solution for specific cases. In addition, rule modification is an advanced method to help users to improve the algorithm with problem inspection.

Overtime

In the long run, systems learn and adapt to users’ preferences by signals they provide.

a. Long-term personalization

Maintaining short-term history records allows the user to make efficient references to their previous activity. The system can use this data to learn from actions all the time.

Except for behavioral data, Using a granular feedback approach more inputs indicating user’s preferences can be received during regular interactions with the system. However, the system should avoid disruptive changes to preferences when it identifies new preferences.

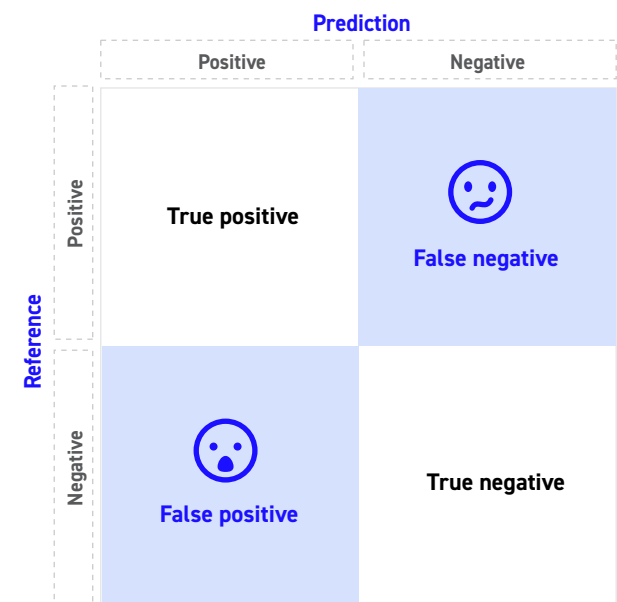


Figure 16. Confusion matrix [48]

Conclusion

Chapter 2

In this chapter, we review the literature related to the two themes, Digitalization of retailing, and implementation of ML. In each theme, we identify models, facts, challenges, and practices that illustrate the business and technology context of the thesis. We represent the insights below.



i 2-2

Providing a sense of control

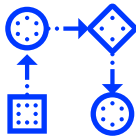
However, the implementation of technology endangers employees’ sense of control. This effect can be mitigated by improving interactions between users and systems, [31] two of the potential solutions.



i 2-1

Activities of the digitalization of retailing

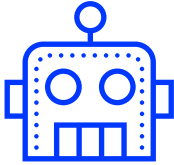
In the new era, technologies enable merchandisers to perform new or existing activities. They interpret customer behavioral data and arrange product positions to improve personalized exploring and searching experiences [27]. Personalization strategies can be further extended to location-specific campaigns [32], pricing [34], and assortment strategy [33]. Once data from physical stores is integrated, digital channels can become part of the customer journey and merchandisers can apply omni-channel strategies [29].



i 2-3

Unique workflow for ML-powered products

Since ML uses a statistical approach to operate, users need to learn a data-driven approach to interact with the system. The new workflow is characterized as an iterative and scientific process with five phases: hypothesis; prototype; validation; deployment and evaluation [16].



i 2-4

Interaction models between users and ML

There are two perspectives regarding the future role of smart technology, which are artificial intelligence and intelligence amplification. The impacts of the two strategies will depend on the way smart technologies are developed [54], how companies implement the technology [55], and how users interact with it [52].



i 2-5

Communicating ML’s limitation

Due to ML’s unpredictability, non-technical people may have wrong expectations of the technology. Providing a clear explanation to managers is important to making business decisions and allocating resources before implementation [47]. Also, specifying limitations at the beginning helps users to align the expectation of results coming from an ML-powered system [52].



i 2-6

Explaining the mechanism of ML

An explanation of the mechanism of ML is important at the beginning of the journey [52]. It is suggested to use different formats to communicate it such as general explanations [41], specific output explanations, and example-based explanations [53].



i 2-7

Providing proactive interaction with users

ML systems should interact with users proactively in order to remind users of the contribution made by the system [52], though the format of communication should be appropriate to the cultural context of users [41].

03

Product analysis

Chapter 3

Bloomreach Search and Merchandising (brSM) is the product at the core of this project. To illustrate brSM better, this chapter provides introductions from technical, operational, and strategic perspectives. The approach taken was to leverage public information from Bloomreach, and compare it with information from external sources.

Firstly, brSM's features and software architecture are addressed. We explain what features it provides and how the algorithms work. Then, we further explain the interactions between users and machine. Following that, we introduce the business strategy of brSM. The market position of brSM is introduced, which impacts its long-term product strategy.

3.1 Features and architecture

We shall dive deeply into brSM's features and software architecture to understand how Bloomreach has constructed a digital retailing solution with ML.

Overall, brSM is an ML-powered product helping merchandisers to improve searching and exploring experiences by optimizing the ranking of products, improving search results and curating recommendations on e-commerce platforms (Figure 17). The service is based on digital software in the Platform-as-a-Service (PaaS) model. Taking advantage of cloud servers and data exchange

protocol, Bloomreach's business clients don't need to build infrastructure. Instead, they prepare data pipelines where they can provide product and user data to the system from their side, and build the interfaces to represent the data from brSM. When the system is deployed, users can access the system by web-based interfaces (Dashboard) to maintain and modify the system.

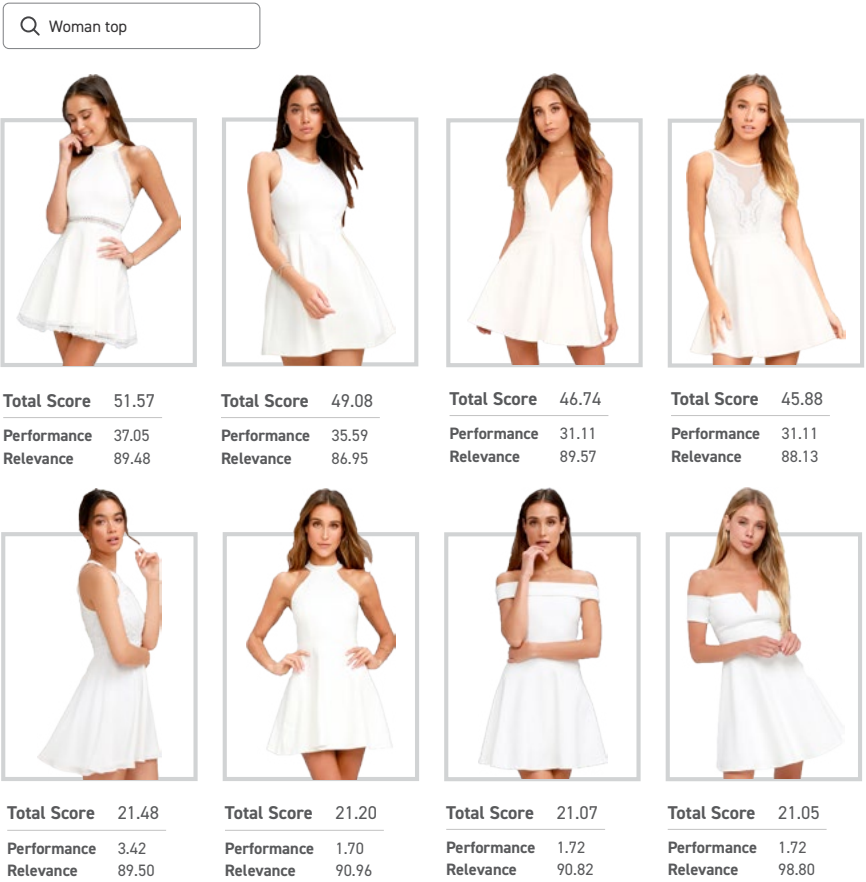


Figure 17. The metrics that brSM's algorithms use and how products are ranked by the algorithms in search results

[59] Kraft, R., Chang, C. C., Maghoul, F., & Kumar, R. (2006). Searching with context. In Proceedings of the 15th international conference on World Wide Web (pp. 477-486). ACM.

[60] Widyantoro, D. H., & Yen, J. (2001). A fuzzy ontology-based abstract search engine and its user studies. In 10th IEEE International Conference on Fuzzy Systems.(Cat. No. 01CH37297) (Vol. 3, pp. 1291-1294). IEEE.

[61] Nadeau, D., & Sekine, S. (2007). A survey of named entity recognition and classification. Lingvisticae Investigationes, 30(1), 3-26.

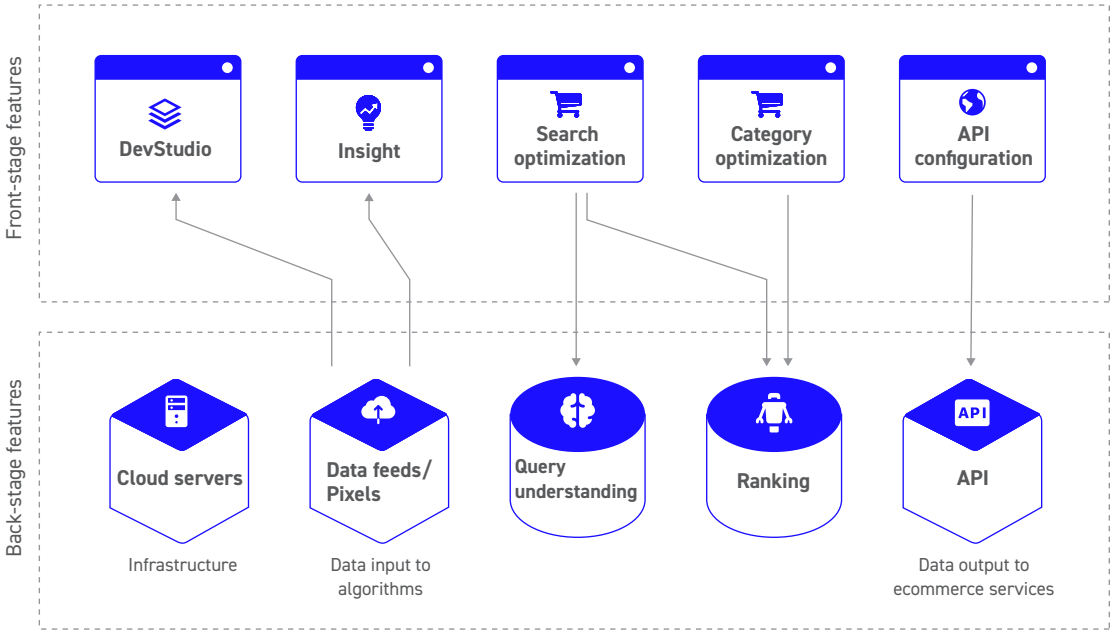


Figure 18. The relationships between front-stage features and back-stage features of brSM.

The features of brSM can be categorized into front-stage features, where users interact with the system by means of the Dashboard, and back-stage features, where the system operates automatically (Figure 18).

Back-stage features

Cloud servers

Bloomreach hosts brSM services with cloud servers. The advantage of using cloud servers is its great scalability. E-commerce services have higher fluctuation of computing needs due to influx during seasonal sales. Also, customers may have e-commerce business worldwide, which makes cloud-based services useful for brSM.

Data feeds/Pixels

Data feed & pixel are two different methods of receiving various data from external sources.

Feed is a scheduled method that upload datasets to a designated SFTP address, and performs data ingestion for brSM's

[62] Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2012). Foundations of Machine Learning.

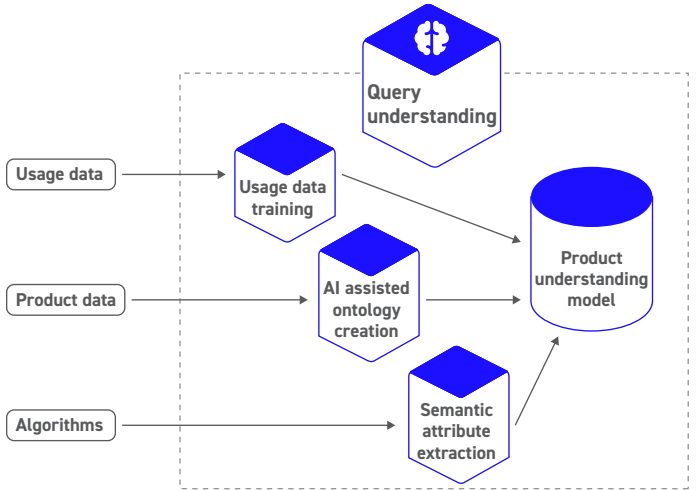


Figure 19. The high-level architecture of query understanding

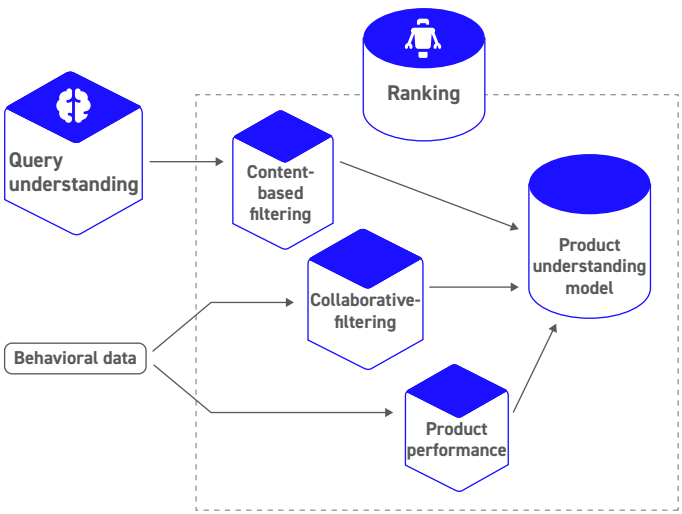


Figure 20. The high-level architecture of ranking

[63] Ricci, F., Rokach, L., & Shapira, B. (2011). Introduction to recommender systems handbook. In Rec-ommender systems handbook (pp. 1-35). Springer, Boston, MA.

algorithms. Three kinds of data are delivered via the feed method which are product data, user information data and user behavior history data. Product data provides contents (e.g. description) and attributes (e.g. color & assortment status) of products that are used to build content relevance. User information data provides contextual data (e.g. gender) of a specific user. User behavior history data includes lists of end users' actions (e.g. view the content & add to cart). Algorithms identify patterns from the behavioral data, understand user preferences from the user information, and thus provide recommendations and optimize algorithms.

Pixel is a method which collects realtime user signals to measure the performance of products. When end users add products to the cart and purchase them, signals (e.g. product names, prices & action types) are transferred from the user's browser by APIs in Json formats. User signals are aggregated and become metrics of product performances (e.g. Add-to-cart rate). It is also used to

send the requests (e.g. search requests) from end users to initiate the search and recommendation process.

Query understanding

Query understanding is Bloomreach's comprehensive approach to refine search queries and understand users' intentions. It is comprised of the following three algorithmic techniques powered by Natural Language Process (NLP) (Figure 19).

Usage data training refers to a query rewriting, a process to reformulate a search query to capture user intents accurately [59] by the user signal data and generating synonyms and auto-correct suggestions. Ontology creation is a process to identify a fuzzy ontology of term associations to refine the query effectively [60] by the product data. Semantic attribute extraction is so-called entity recognition, referring to a process to recognize information units (e.g. product types & colors) and numeric expressions (e.g. sizes & quantities) [61] by a pre-trained and customized algorithm.

Ranking

Ranking is a process to identify keyword relevances, user signals, and product performance. It leverages an application of machine learning called Machine-Learned Ranking (MLR) to construct ranking models for information retrieval process [62]. Bloomreach applies a hybrid approach for ranking with the three algorithmic techniques explained below (Figure 20).

Content-based filtering is a technique using semantic relevance to prioritize results. It is based on query understanding described in the previous section. Collaborative-filtering, also known as "People who bought this also bought...",

is a technique to prioritize results based on behavioral patterns. By definition, if a user fits a behavioral pattern similar to a group of previous users, the algorithm will show recommendations from similar users [63]. Last but not least, product performance collected by pixel is also used as a metric for ranking due to the ecommerce context.

API

Bloomreach uses API to deliver data, which provides the flexibility to present data in different platforms, such as e-commerce websites, mobile applications and Kiosk machines. It also enables developers to integrate the results from brSM easily to their existing platform without re-platforming client's digital services.

Front-stage features

The front-stage features are based on Dashboard, a web-based interface that users can modify and optimize back-stage features.

DevStudio

This feature enables users to modify the pipeline of data ingestion. Technical users can define dataset relationships, design dataset structures, and change their attributes.

Insight

Insight is a business intelligence system, displaying performances of category pages, queries and products. Based on aggregated data from Pixel, it helps business users to identify overall performances and opportunities to optimize.

Search optimization

Search optimization is a series of tools specialized to improve search quality. Business users can manage the synonyms created by algorithms, control facets and product rankings on the basis of each search term. This feature enables users to optimize query understanding and improve the search ranking for better search accuracy.

Category optimization

Category optimization is a feature which helps merchandisers to organize the pre-defined product category pages (e.g. New arrival or shirts). Similar to search optimization, it can control facets and product ranking for each page. This feature enables users to optimize product orders on the grid for better content relevancy.

API configuration

API configuration enables technical users to control the format of data sent via APIs. Developers can define names of objects and format of keys to fit in a front-end app.

3.2 Interactive Machine Learning (iML)

Dashboard is a user interface of brSM that enables merchandisers to interact with Machine Learning. It creates a collaborative dynamic between users and machines to achieve business goals.

[64] Boukhelifa, N., Bezerianos, A., & Lutton, E. (2018, January 24). Evaluation of Interactive Machine Learning Systems. arXiv.org.

Previously, we mentioned brSM has Dashboard, a web-based interface through which users can optimize the back-stage features like query understanding and ranking. It enables non-technical users to intervene in how algorithms work. In this section we shall explain the specific interactions between algorithms and users.

Bloomreach introduced Dashboard to build trust between algorithms and clients. Before Dashboard was introduced, business clients complained about the results coming from algorithms since they

couldn't understand how results were being generated and how to change results. Therefore, Dashboard was created to provide an interface through which users could remove undesirable results and inspect the metrics that influence results. Moreover, since Dashboard provides a sense of control over technologies, it reduces employee resistance during implementation [31]. Dashboard has been further developed to provide more advanced and dedicated control over algorithms.

Interactive Machine Learning (iML)

Dashboard stands as an example of Interactive Machine Learning (iML) where merchandisers and machines collaborate to improve service revenue. Boukhelifa, Bezerianos & Lutton [64] define iML as an interactive machine learning system comprising an automated service, a user interface, and a learning component (Figure 21). Users interact with automated components through a user interface, where the user provides iterative feedback to a learning algorithm. Put another way around, the algorithm also provides feedback to express the knowledge it has gained.

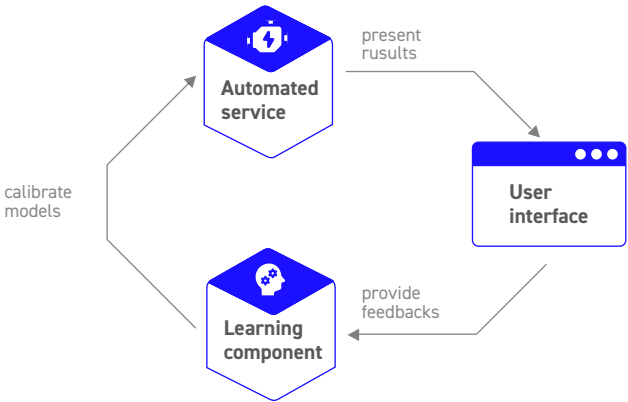


Figure 21. The model of Interactive Machine Learning [64]

iML model of brSM

Applying the iML model to brSM and Dashboard, user interfaces refer to Dashboard and clients' e-commerce websites (Figure 22). Dashboard is a place where merchandisers create rules to boost or bury certain items (e.g. emphasizing new products. We will introduce these techniques in Ch.5-1). These decisions influence how results are presented in clients' e-commerce websites (e.g. showing new products on the top pages), and thus change the behavior of customers (e.g. increasing page views) and item performance (e.g. increasing purchase numbers). Relevance (semantic relationships and collaborative-filtering associations) and performance are metrics that provide feedback to a learning algorithm. When customers "vote" by their clicks and purchases of these promoted products, it helps the algorithm to identify the new trend. The learning algorithm calibrates its model, and the automated service can boost and bury items according to the updated metrics (Figure 23). The algorithm calibration

becomes a signal sent back to Dashboard that merchandisers can further modify or remove.

The iML mechanism is applied to query understanding and ranking. In query understanding, it is used to manage "synonyms". Management of synonyms is an important feature to improve searches. The feature provides keyword suggestions and improves product relevance with a specific keyword. For example, when there are a certain amount of users searching for "8 inch lamp" and looking at "20 cm lamps", the system can identify the relationship between inches and centimeters, and create a synonym for the specific term. Moreover, it becomes more sensitive when handling other inch-cm relationships. Continuing the previous example, when the algorithm identifies another term like "40 inch clock", it can build a synonym for "100 cm clock" with fewer data compared to the previous case. If a synonym is mistakenly created, merchandisers can remove it from the Dashboard.

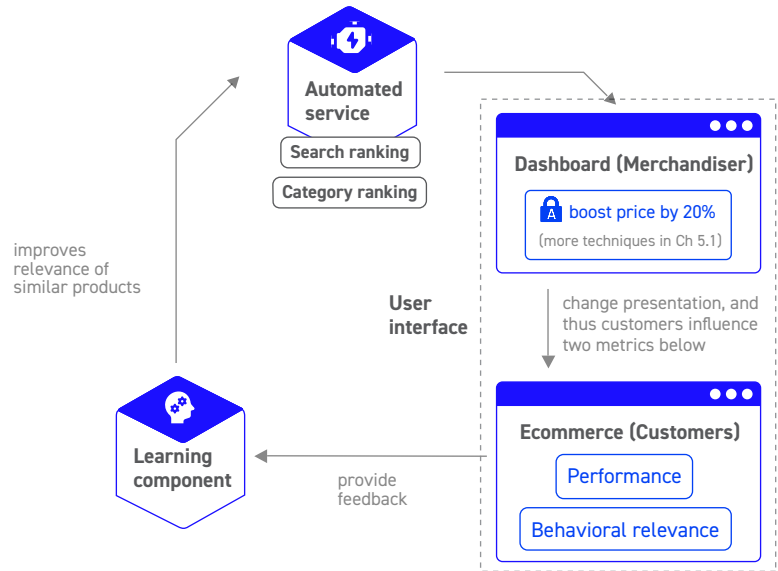


Figure 22. iML model in brSM

iML also has border applications in ranking. It helps to improve search results, category pages and their filters. Merchandisers can create soft rules to boost desirable items (e.g. increase the weight or price by 20%), and help algorithms to learn the importance of high-price products gradually. They can also create hard rules to promote specific items immediately (e.g. put A, B, C products to the top). However, this may create noise and diminish the quality of patterns that the algorithm identifies.

Value of iML in brSM

The iML mechanism enables merchandisers to train algorithms to fit their business case even better. It integrates valuable expert knowledge that may be hard to encode directly into

computational models [64]. For example, there could be thousands of important queries on an e-commerce website. But the applicable boost conditions are different in each query. If a merchandiser wants to modify product rankings for a seasonal trend, iML decreases the merchandiser’s operations by means of its learning capacity and simple user inputs like attribute rules.

Furthermore, IML can resolve existing uncertainties such as biased results and errors that may arise from automatic machine learning [64]. Many noises can be created by various and unstable user behaviors. If merchandisers monitor the developments and make interventions, it not only improves the algorithm’s accuracy but also avoids false negative errors

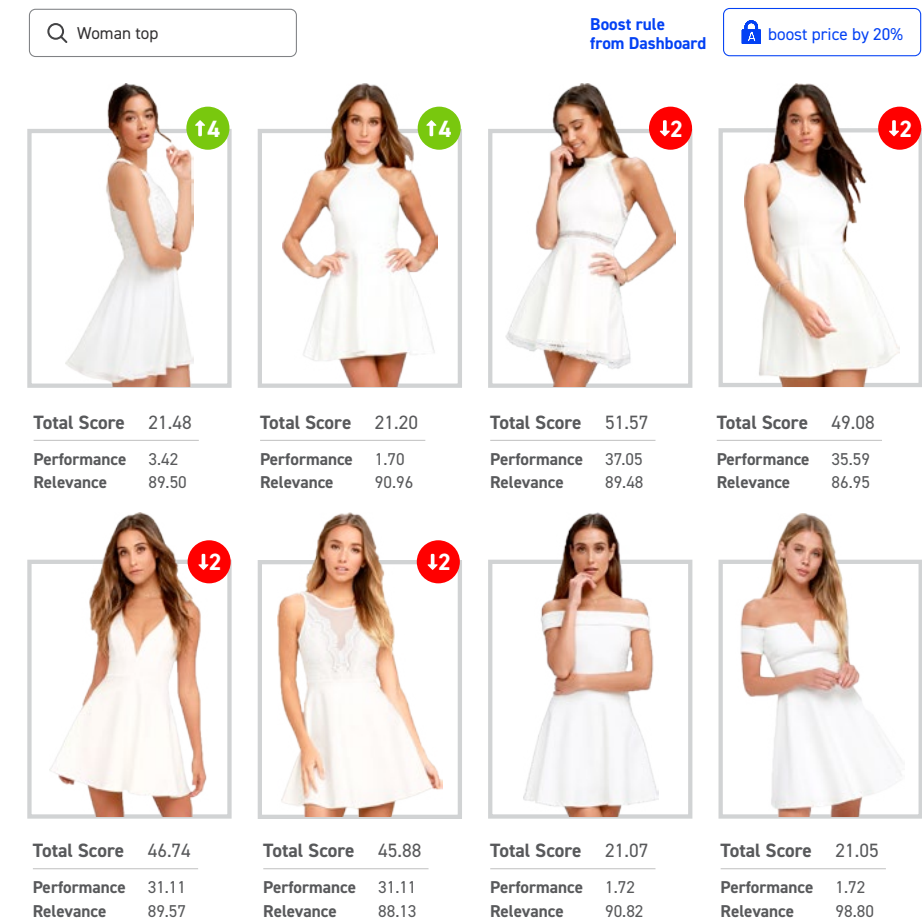


Figure 23. How a soft rule can inflence search results

3.3 Product strategy

In late 2019, brSM will integrate with Bloomreach Experience Manager (brXM) and become Bloomreach Experience (brX). brX is a Digital Experience Platform that comprises both marketing and merchandising features and will be the strategic product of Bloomreach for the next few years.

Currently, the company has a niche market-product fit, providing medium-scale customers with a highly flexible solution. However, since brSM only provides limited solutions to the digitalization of retailing, it becomes harder for the company to approach large-scale enterprises seeking a total solution with not only merchandising features, but also marketing capacity, which is commonly known as a digital experience platform (DXP).

What is DXP?

DXP is defined as a platform to develop personalized user experiences across all channels, devices, and touchpoints throughout a user journey [65]. It helps businesses to manage, deliver and optimize digital experiences [66]. Figure 13 shows 10 key components that characterize DXP. It enables companies to integrate experience into various user touchpoints, curate visual elements and contents, create micro marketing pages, launch marketing campaigns, connect internal data, provide accurate searches, sell products and services online, and perform internal collaboration.

After mapping the components of DXP with brSM’s capacity, it is obvious that the product is lacking marketing features and content creating capacity. In order to complete the puzzle Bloomreach acquired an Amsterdam-based company Hippo CMS in 2016, providing a content management system (CMS) that allows marketers to curate contents and launch marketing campaigns. Hippo CMS became Bloomreach Experience Manager (brXM) and joined the product portfolio of the company. However, the integration between brSM and brXM was not happening due to technical challenges until 2019. The integration between brSM and brXM will finish soon. Bloomreach aims to use it as a flagship product called Bloomreach Experience (BRX) at the end of 2019.

On the business front, an all-in-one solution helps Bloomreach to expand the scope of target clients, especially large-scale ones. Also, this kind of product is more likely to fit with a high-price strategy. The introduction of brX is a milestone for the company to drive revenues higher and thus launch an IPO in the near future. On the other hand, the increasing complexity of brX,

[65] Shivakumar, S. K. (2018). Digital Experience Platforms: An Overview (pp. 1–12). Infosys.

[66] Guseva, I., Phifer, G., & Tay, G. (2019). Magic Quadrant for Digital Experience Platforms (pp. 1–27). Gartner.

inevitably makes it become more difficult to learn and be used and implemented by business users. There is therefore reasonable cause for Bloomreach to evaluate current experience and improve it for the coming brX.

Competition in the DXP market

Garner has released yearly reports on the DXP market since 2017 (renamed from Horizontal Portals). In the latest report made by Guseva et al [66] (Figure 25), it introduces the market overview with the strength and weakness of brXM and brSM.

The DXP market has high-velocity dynamics. It is estimated that 90% of

global organizations will rely on solution providers to design, build and implement their digital experience strategy by 2021. With the increasing market size, more and more companies join and provide DXP solutions including Adobe’s Target, Salesforce’s Einstein AI, and IBM Watson’s Content Hub. Although growing rapidly, the market is still emerging and immature. Different solution providers have various definitions of DXP, and there is no established archetype available. Besides, ML applications are not common in the market category. Many companies are struggling to provide simpler, rule-based systems.

Bloomreach is considered as visionary, forward-thinking and demonstrating a firm focus on emerging Business-to-

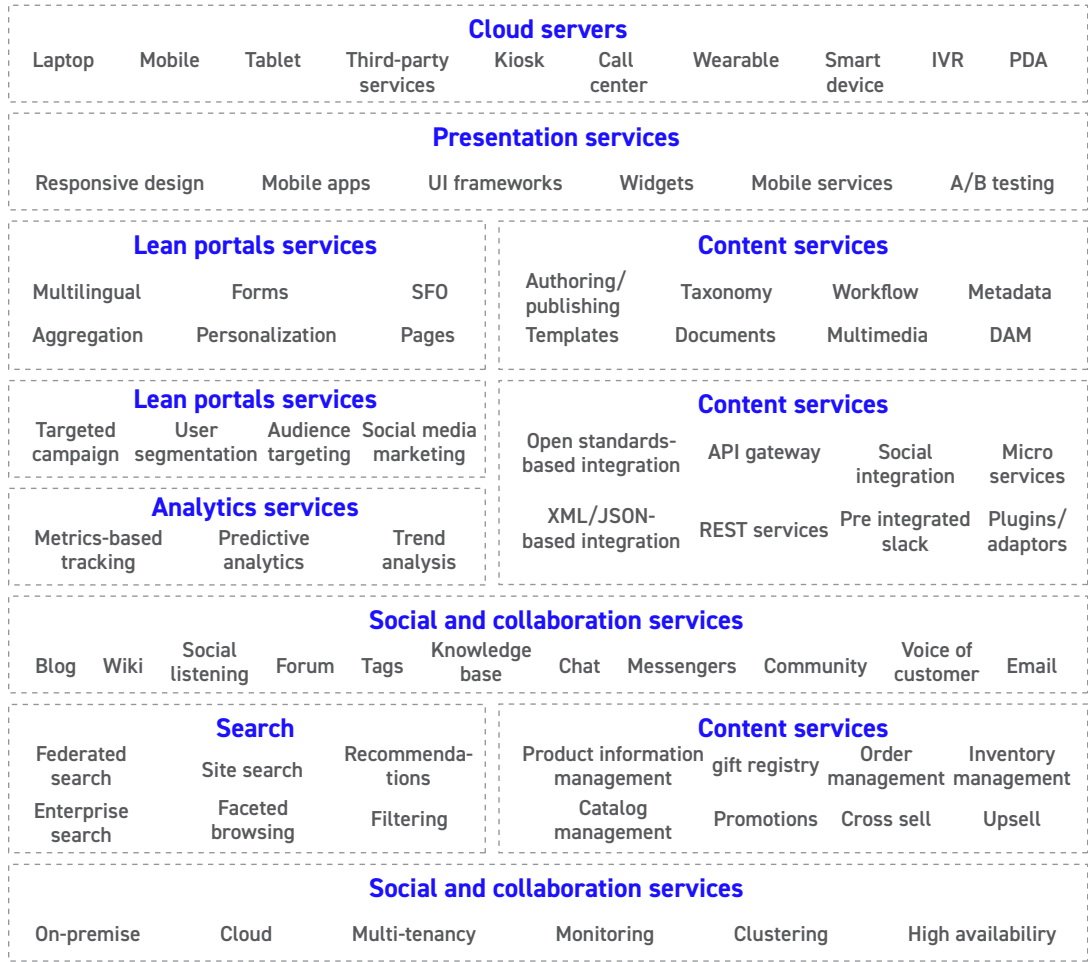


Figure 24. Key components of a DXP [65]

Customer needs and the potential impact of ML technology. Also, thanks to its API-based architecture, it enables Bloomreach to respond quicker to market demands. However, Bloomreach is still lacking in the integration of brSM and brXM. Also, the immature business partner ecosystem affects the ability of execution.

Combining with the introduction of brX and the analysis made by Garnet, Bloomreach would expect to nudge its position towards the leaders quadrant in Figure X and compete with others with its advanced ML capacity by its product strategy. However, the successful case of implementation is still to be seen.

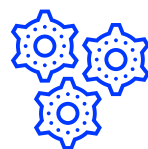


Figure 25. DXP market analysis [66]

Conclusion

Chapter 3

This chapter provides an introduction to the features of brSM, and technical explanations regarding the algorithmic techniques used by the system.



i 3-1

Mechanism of brSM

brSM improves search and exploring experiences on ecommerce platforms by leveraging two ML-powered components. Query understanding uses Natural Language Process (NPL) techniques for keyword interpretation and thus improves search quality, while ranking applies Machine-Learned Ranking (MLR) techniques to perform recommendations and curate product grids based on product performance and user preferences.



i 3-2

iML model

To capture insights from merchandisers' expertise and build trust, Bloomreach has introduced Dashboard which has led to brSM becoming an example of interactive Machine Learning (iML). Dashboard provides interfaces to control query understand and ranking in various ways. It enables machines to learn from merchandisers' decisions and adapt to their business preferences.



i 3-3

Product strategy of brX

In competition analysis, brSM is recognized as a powerful product in a niche market. Bloomreach aims to integrate brSM with Bloomreach Experience Manager (brXM), and introduce Bloomreach Experience (brX). Leveraging brSM's ML capacity, brX will become an important player in a Digital Experience Platform (DXP) that provides marketing and merchandising solutions.

04

Service analysis Chapter 4

This thesis is executed in collaboration with Bloomreach. It focuses on the digitalization challenges with Machine Learning for retailers. Our introduction tells the background story behind the thesis.

First, since the research context is based on

Bloomreach's products and its business clients, we will give a brief introduction to the company. Then, we shall set out the scope of the project, including research questions and research purposes. Finally, we shall conclude the chapter with an explanation of our approach and an outline of the thesis.

4.1 Method

To investigate brSM’s service, a series of interviews are conducted with eight interviewees from four teams.

Subject

Bloomreach has a sophisticated structure to support its international business, with 10 different divisions in four countries. Limited by time and location, we have selected the most relevant teams for our research in terms of their influence on customer services. These teams are the Technical Service team (TS), the Business Service team (BS), the Customer Success Management team (CSM) and the Product team (PT), which are referred to as internal stakeholders. There are two representatives from each team in the research. To better describe the eight interviewees, an alias with the abbreviation of the team name and an interviewee number is used for each person. For example, the second interviewee from the Product team is called PT2.

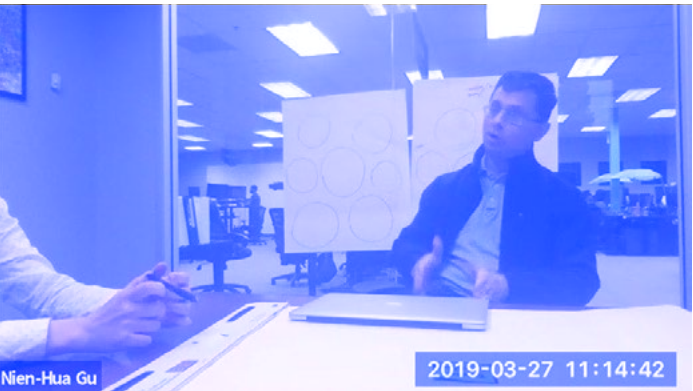


Figure 26. Interviewee answered questions in part 1.

Format

The interviews are in a semi-structured format with two mapping exercises. The goal of the interviews was to identify the bottlenecks of current services. Therefore, the interview scope was to understand each person’s responsibility, their functionality in each service phase, and their interactions with the others.

Each interview lasted 30 minutes and consisted of three parts described in the following paragraphs. The entire interview was filmed for further analysis.

Part 1. General self introduction

After a brief introduction, the interviewees were asked to answer the following open-

- What is the function of your position?
- What is your daily routine?
- What is the most challenging part of your job?

ended questions (Figure 26).

Part 2. Team collaboration

In this part, we try to understand the function and responsibility of the teams. In average, each team has ten people with different positions. Since every

position has a different function, we ask the collaboration between the team members and summarize the overall function of a team.

An empty poster was provided to interviewees, and they were asked to visualize the major functions of their team, and collaboration between their team members (Figure 27). The following leading questions were used to encourage each participant to put more information on the poster.

- Could you write down the important roles in the team?
- What are the tasks you would have in the different phase of the service process in the team?
- How do you collaborate with your team member?

Part 3. Intra-company collaboration

Then, the post-its with the names of all major divisions of the company were provided. The participants were asked to map them around the box of their team (Figure x), and describe the relationships and collaborations with each member of the team.



Figure 27. An interviewee illustrated the team collaboration on a poster in part 2

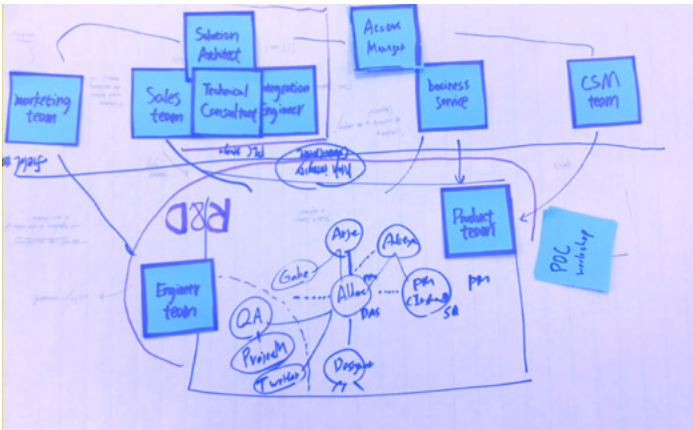


Figure 28. A poster illustrate both team collaboration (inside the blocks), and intra-company collaboration (outside the blocks)

- Can you cluster these functions by the way you interact with?
- Can you describe what kind of interaction you had with them?
- What is the most challenging part in the collaboration with them?

Data analysis

The data analysis was split into two phases.

In the first phase, all interviews were transcribed. And researchers reviewed the transcriptions along with the videos. Then, more relevant statements were captured and collected (Figure 29).

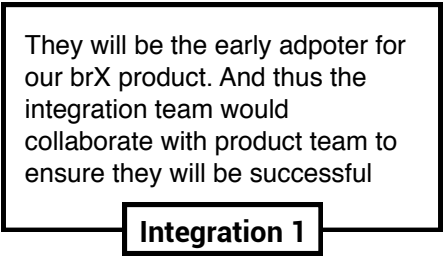


Figure 29. A captured statement

A service process synthesizing all drawings from the exercises was created. And all statements were mapped in the process and further clustered to illustrate the service in each phase (Figure 30).

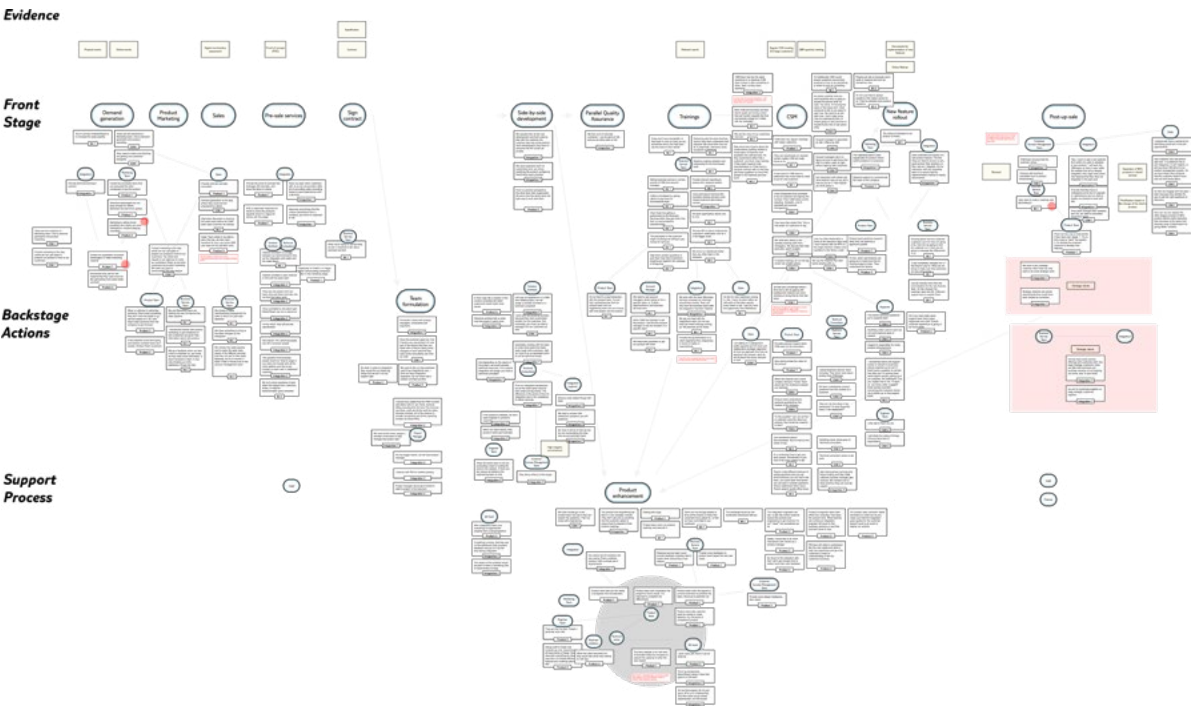


Figure 30. The cluster of the service process with statements.

4.2 Stakeholders

Four focused internal stakeholders from field teams and R&D teams are introduced.

Figure 31 shows the teams involved in product development and customer interactions. The strength of their relationships is illustrated by the width of the lines. These teams can be further categorized into two groups, field teams and R&D teams

Field teams are business-driven since they have direct interactions and are the representatives of Bloomreach in different channels and phases. Because they are customer-facing, they focus

more on the short-term benefits and features that satisfy the current needs of clients. On the other hand, R&D teams are responsible for planning the roadmap of Bloomreach's future products, and executing these plans. It makes these teams more future-oriented. Although these teams interact with clients directly in minor cases, like explaining the product roadmap or answering technical questions, they perform indirect, back-stage activities more.



Figure 31. Teams involved in Bloomreach's Product and Service, and their relationships.

We have chosen to illustrate the roles and functions of four internal stakeholders.

Product team (PT)

The product team is responsible for product planning and development management. They develop plans based on the long-term visions of executive officers and the short-term requests of clients. Considering the limited human resources for development, a strategic perspective has to be applied to find the balance between these two. Once the plan is formulated, the team delivers the features and monitors it in collaboration with the Engineer Team.

The Product team influences the clients’ implementation in an indirect manner because it envisions product direction, and delivers developer tools, documentation, and a Dashboard.

Responsibility

The goal of the Product team is to deliver product plans based on the company’s long-term visions and customers’ short-term needs. Long-term projects keep the company innovative, while short-term projects deliver immediate customer values (PT2). The biggest challenges for the team are in making decisions that sacrifice short-term values, while making sure this is compensated for in the long-term project.(PT2).

At a strategic level, the Product team decides the priority of features based on competitor analysis, prospects’ opinions, high-value customer requests, and user research (PT1). Then, the team arranges and releases a product roadmap on a quarterly basis. This roadmap is important for clients to understand future features and allocate developer resources to integrate the features they need (BS

1). Also, as the team which translates practical needs to technical architectures in the first place, they become the internal consultants regarding the mechanisms and limitations of products when customers have technical problems (PT2).

Technical service (TS)

The Technical team provides integration services and training, mainly during the product integration phase. They help clients’ developers successfully implement and integrate Bloomreach’s product into their own services. The team also provides on-demand services when new features roll out.

Responsibility

The goal of the Technical Services team is to ensure a smooth integration. They take on a proactive role to understand clients’ needs (TS2), explain the technical aspects of products (TS2), discuss service packages with customers, and confirm on the deal (TS1).

The Technical Service team uses Software Development Kits (SDKs) that are created by the Engineer team and, in collaboration with clients’ developers, makes sure the data displayed in the Dashboard is correct .(TS2)

The team also engages with clients after integration. When a new feature is introduced, they notify the clients’ developers and provide necessary information (TS2).

Customer Success

Management Team (CSM)

The Customer Success team is responsible for relationship maintenance

after the integration is done. As the interface between Bloomreach and clients, they regularly interact with them, receive feedback, organize responses from all internal teams, and then report to customers.

Responsibility

The goal of the Customer Success Management team is to ensure that customers can use Bloomreach products successfully(CSM1). For Bloomreach, future renewals could depend on CSM activities. Where possible, they will try to upsell other products and services if clients need them. These are the reasons why they regard themselves as a “funnel” between two parties (CSM1).

Challenges

However, discussing technical information seems to be hard for CSM team members due to both their own lack of knowledge and customer capacity.

We are not technical person, and the day to day contact that I have and myself are communicating and discussing technical things that we understand maybe 30% of and trying to communicate those to our respective technical counterparts. (CSM2)

You don’t really know the technical expertise to the customer and how much they actually understand it. (CSM2)

Sometimes employees from the client side need to report responses from Bloomreach to their managers. It, therefore, makes technical communication difficult and inconsistent.

That there’s something misinformation and just because I only understand, to a

certain degree. What have you been trying to explain depends on how much the next person gets what I’m saying (CSM2)

Business Service Team (BS)

The Business service team provides training to business users in various formats including training programs and optimization assistance. Since they sometimes operate the system on clients’ behalf, they are also some of the most frequent users of Bloomreach’s products. And thus, they become the translators between Bloomreach’s products and client’s business needs.

Responsibility

Their goal is to provide services that help clients get best value from their purchase (BS1). They sell a bucket of hours to a customer to provide training or support.

This team is newly established. They describe themselves as an extension of the CSM Team (BS2). Since the services provided by the CSM Team are free of charge, questions and requests from clients sometimes overwhelm the team. To make the services more scalable, the Business Service Team provides dedicated on-demand services (BS1).

They try to iterate and improve their new services. As they describe, a lot of these services that they are delivering are new to the team. So there are some trials and errors. (BS2)

In addition to the regular training programs they provide, they also helps client to understand the business value of Bloomreach’s products and build their technological roadmap (BS2). Also, they reply to the questions of clients. They find members of other teams to help with solving their problems.

We need to go to an engineer, and they have to debug internal tools that we don't give access to our customers (BS2)

Challenges

There are several challenges mentioned in their daily routine. They mention that the decision makers for service purchasing are not frequent users of Bloomreach's products. And therefore the service they purchase may not fit their needs:

We found out that while one of the executives at their company thought it would be a good idea that they would be engaged for basically a bucket of hours to do additional training. They weren't the users interacting with products. So it was a little bit hard to figure out how to use that time and be really creative about projects that they might not have been interested in (BS2)

They sometimes can't find the answer to clients' questions because the products may be customized for clients' business case (BS1).

Furthermore, they find the unclear delivery time of a requested feature to be problematic. In the past, they could find the expected delivery time on Bloomreach's product roadmap, but this information has been recently removed (BS1) because the Product team has been postponing this kind of request and focusing on the development of brX.

4.3 Service blueprints

Four service phases influence the product implementation, including product enhancement, onboarding, new feature rollout, and post-sale services along with their bottlenecks.

Process overview

The whole service journey is illustrated in an eight-phase model (Figure 32). Bloomreach promotes its products and services to prospects through physical and digital channels in the marketing phases and collects their contact information. After that, the Sales team engages with these prospects in the demand generation phase, and demonstrates products and

prototypes (proof-of-concept) in the sale phase. If the Sales team successfully makes the deal, product integration starts with the Technical Service team in the integration phase. Some clients may request some features due to different business cases, and the Product team prioritizes and executes them accordingly in the product enhancement phase. Once the integration is completed, the CSM and Business Service teams step in and

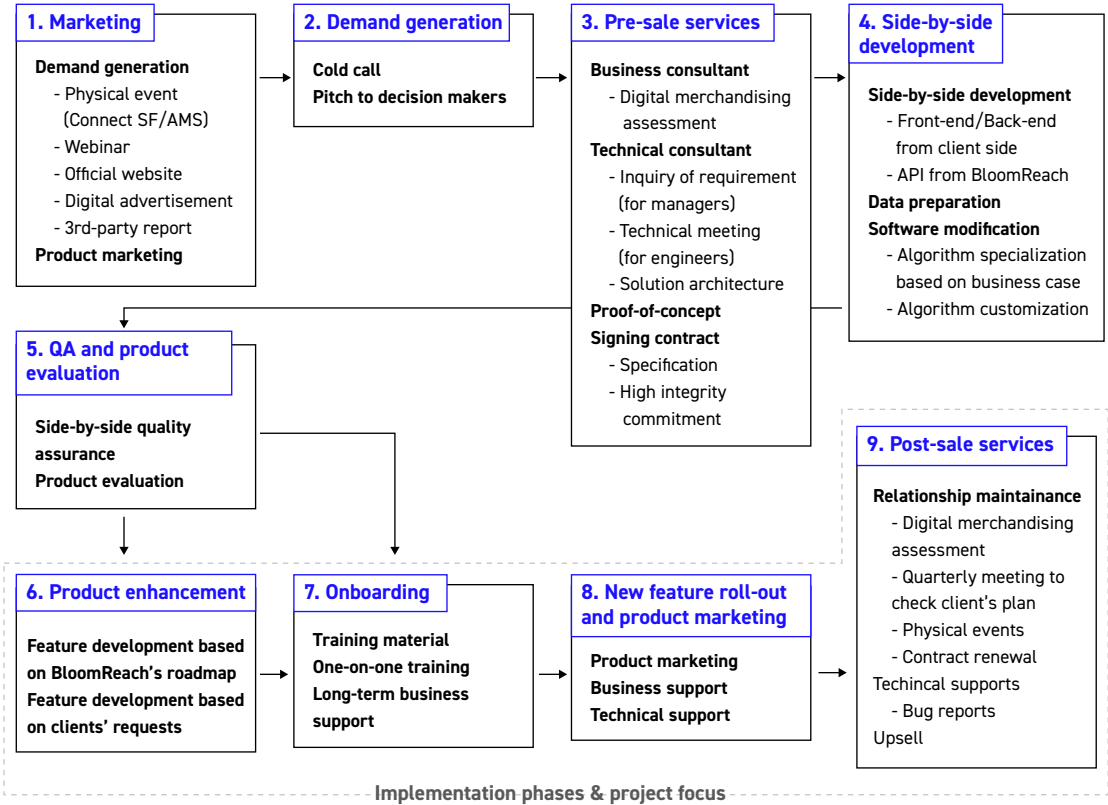


Figure 32. Overview of the service process of brSM

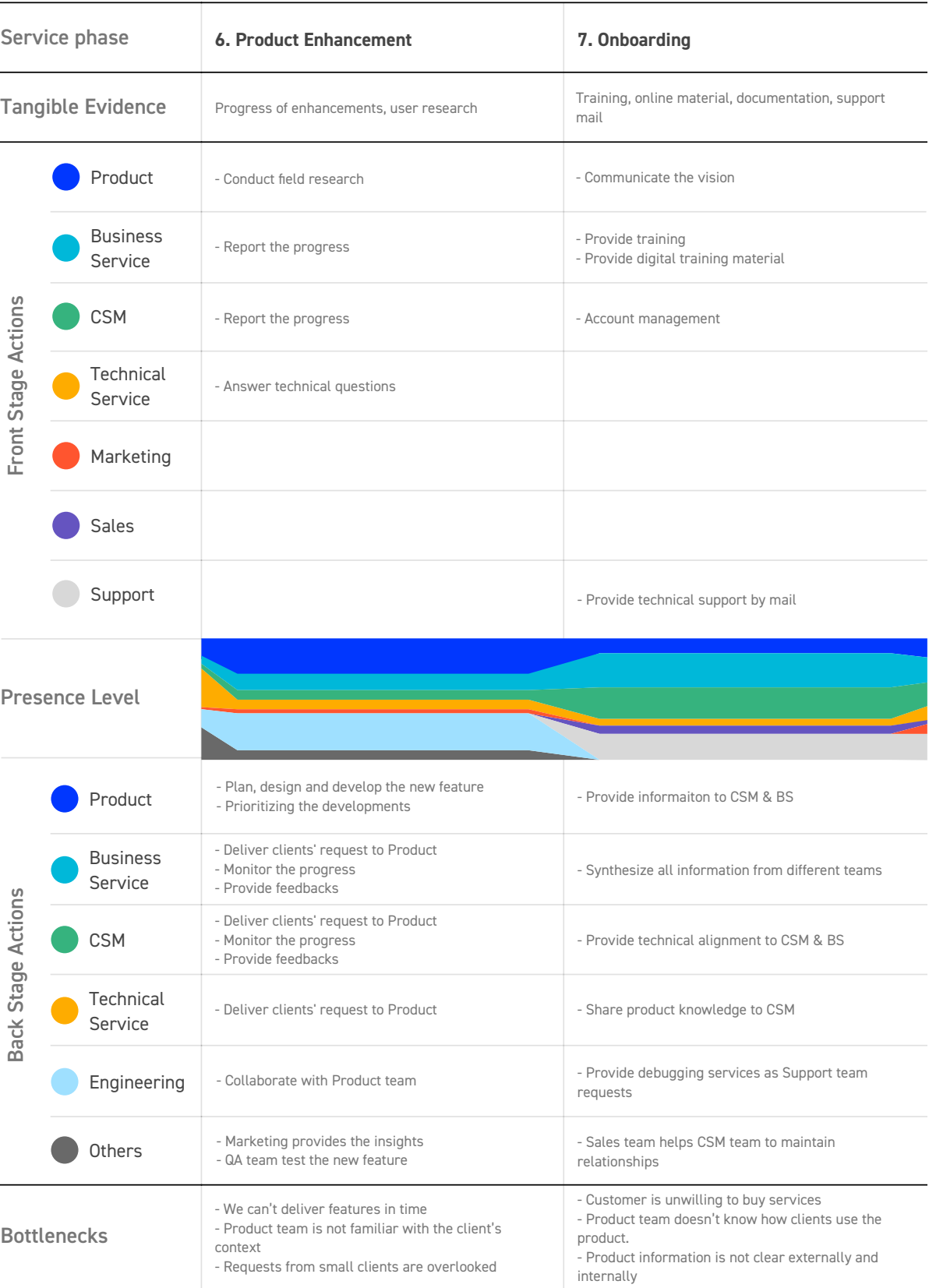


Figure 33. Service blueprints of Product enhancement and Onboarding

provide support and training for non-technical users in the onboard phase. When a new feature is going to be introduced, the company communicates the information and helps customers to integrate it in the new feature rollout phase. In the long term, the company will track the outcomes of clients and seek opportunities to upsell more products and services in the post-sale phase.

Since the project focuses on implementation issues, we will zoom in on four later phases: product enhancement; onboard; new feature rollout and post-sale, and discuss their repective challenges.

Product enhancement

There are two kinds of initiatives in the product enhancement phase. Some projects are based on the product roadmap that the Product team owns (BS1), while the others come from clients' requests (PT2). Interestingly, the Product team thinks the latter ones are not ideal. This may suggest that the Product team has blind spots and doesn't fulfill clients' expectations (PT2).

External research and client feedback are two sources from which the Product team can receive inputs for planning.

External research

The capacity of receiving external signals is important for product managers in the Product team (PT2). When the Product team is planning roadmaps for important products, they perform user research, trying to understand clients' business context and potential needs (PT1). Another common approach is to do a competitor analysis since clients evaluate vendors' offers and make decisions based upon that (PT1).

Client feedback

The Product team has office hours every day to answer client questions via field teams, and respond to their needs. Integration engineers, Business Service and CSM team members come to the sessions to ask product questions (PT2).

Feature Prioritizing

The prioritization of these projects is a challenge for the Product team. They do it in a strategic manner by balancing the two kinds of projects mentioned earlier. The Product team has roadmap meetings on a quarterly basis with board members to prioritize the requests.

There are five metrics to evaluate the priority (PT1). The potential impact on future use-cases is important to establish where there are differences with competitors. The contributions from clients making requests shows how new features deliver value to high-profile clients. Competitor analysis specifies the advantages and disadvantages of Bloomreach's products. Requests from prospective users illustrate the features that can contribute to short-term or immediate revenue. Last but not least, requests from strategic partners are important to expanding the capacity of the company to enter new markets.

Considering the five metrics above, the Product team publishes a roadmap for the next three quarters for clients on a quarterly basis.

Development

In accordance with the roadmap, the Product team comes up with concepts for a feature, uses prototypes as a boundary object to discuss with the engineering and field teams (BS1), and concludes the discussion by providing product

requirement documents (PRDs) (PT2). Then the Engineer team develops these features according to the document.

QA

When the development is nearly finished, the QA team collaborates with the Product team to review and debug the features (PT 2). If the QA has not been properly carried out, the defects will become bugs during technical implementation, and be returned to the Product and Engineer teams (TS2).

Bottlenecks (Figure 34)

a. We can't deliver requested features on time

Feature delivery is one of the top problems in the services. There are not enough people to deliver all the features that customers have asked for, or that we have committed to our customers (BS 1). The situation becomes worse when the PM team has failed to properly scope the project boundary, which is frustrating for customers and other teams (PT2).

When the delivery time is unstable and unpredictable, field teams sometimes explain the situation to the clients, and introduce additional features as a way to mitigate the problems (CSM1).

b. Product team is not familiar with the client's context

The Product team is too busy with feature developments, and faces challenges in collecting feedback appropriately.

Ideally, I would like to do more interactions with clients as a product manager. But my focus is on the execution side that I don't get enough time to collect more than user feedback. (PT2)

It seems to worry the field teams when the Product team makes decisions based on feature priority. The Field teams think some features don't reflect customers' needs.

Product team developed products from the context of Bloomreach. But it sometimes doesn't fit in the context of clients. (CSM2)

Onboarding

When the Technical Service team has finished product integration and the product goes online, it moves to the onboard phase (TS1 & 2). The CSM team takes control of the account. If clients are seeking training to become more productive using the products, the Business Service team will also provide training in this phase.

Training

The Business Service team customizes training according to the client's requirements (BS1). Although the content introducing the system and features are the same, they use clients' data to better

explain the features. Moreover, since they also notice the pattern of questions from different kinds of clients, they have slides addressing these questions (BS2).

They also help the company to brainstorm features that clients can integrate and implement in the future, and then organize them in the roadmap (BS1). It helps clients' product managers to clarify future steps and improve intra-company communication on the client side.

Account management

To manage the account, account managers from the CSM team will try to understand the client's context and identify opportunities to sell other services or products (BS1).

There are many intra company information exchanges happening in this phase. For example, when the CSM team has product problems, they will approach the Business Service team first.

I asked Business Service Team every day. They know more about product than CSM team. BS team understands product questions from the context of a customer, while Product team understands it from the context of the company. (CSM2)

Also, in order to understand the nuances of the client's context, the CSM team approaches the Sales team to understand the practices to interact with them.

I am talking to a salesperson pretty regularly and it's more about collaborative strategic alignment on how we approach this, how we approach the renewal, what do we do about this issue. (CSM2)

Bottleneck (Figure 35)

a. Customer is unwilling to buy services

Clients have a low awareness of training. And thus they are not necessarily willing to pay for services (BS1).

Bottlenecks of Onboarding



Figure 35. Bottlenecks of Onboarding

b. There are scalability issues for the services

The Business Service team was established to improve the service. The CSM team was overwhelmed by customer requests, and could not provide appropriate timely support. Therefore, the Business Service team provides on-demand services when clients want to buy more time from Bloomreach. For both teams, how to provide service efficiently and improve scalability is still a major challenge. (BS1)

c. Product team doesn't know how clients use the product.

Field teams expect the Product team to understand how clients use the products and improve them accordingly. Since there are many questions being raised by clients especially during this phase, improved products could have helped

Bottlenecks of Product enhancement

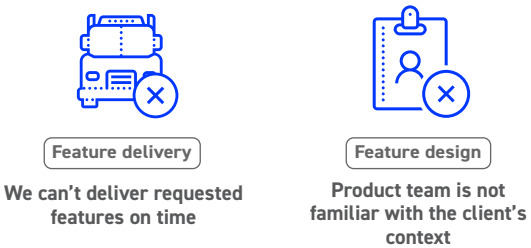


Figure 34. Bottlenecks of Product enhancement

them to reduce the problems and efforts.

It's just that I sometimes feel that our product team and our engineering team are out of touch with how people use the product. (BS1)

d. Product information is not clear internally and externally.

The internal channels of product information are complex. Sometimes field teams don't know where to find answers to certain questions.

There are a few different avenues of asking questions and you can email someone, you could slack that person, you can post in product questions. There are dashboard office hours. There are search quality office hours (BS2)

For customers, the information is hard to find as well, and the Product team has improved on this recently. Since the introduction of some documentation, the situation has been improving.

So that was a challenge before I think we're still struggling with building that material, but we're working on doing that so that that helps (CSM1).

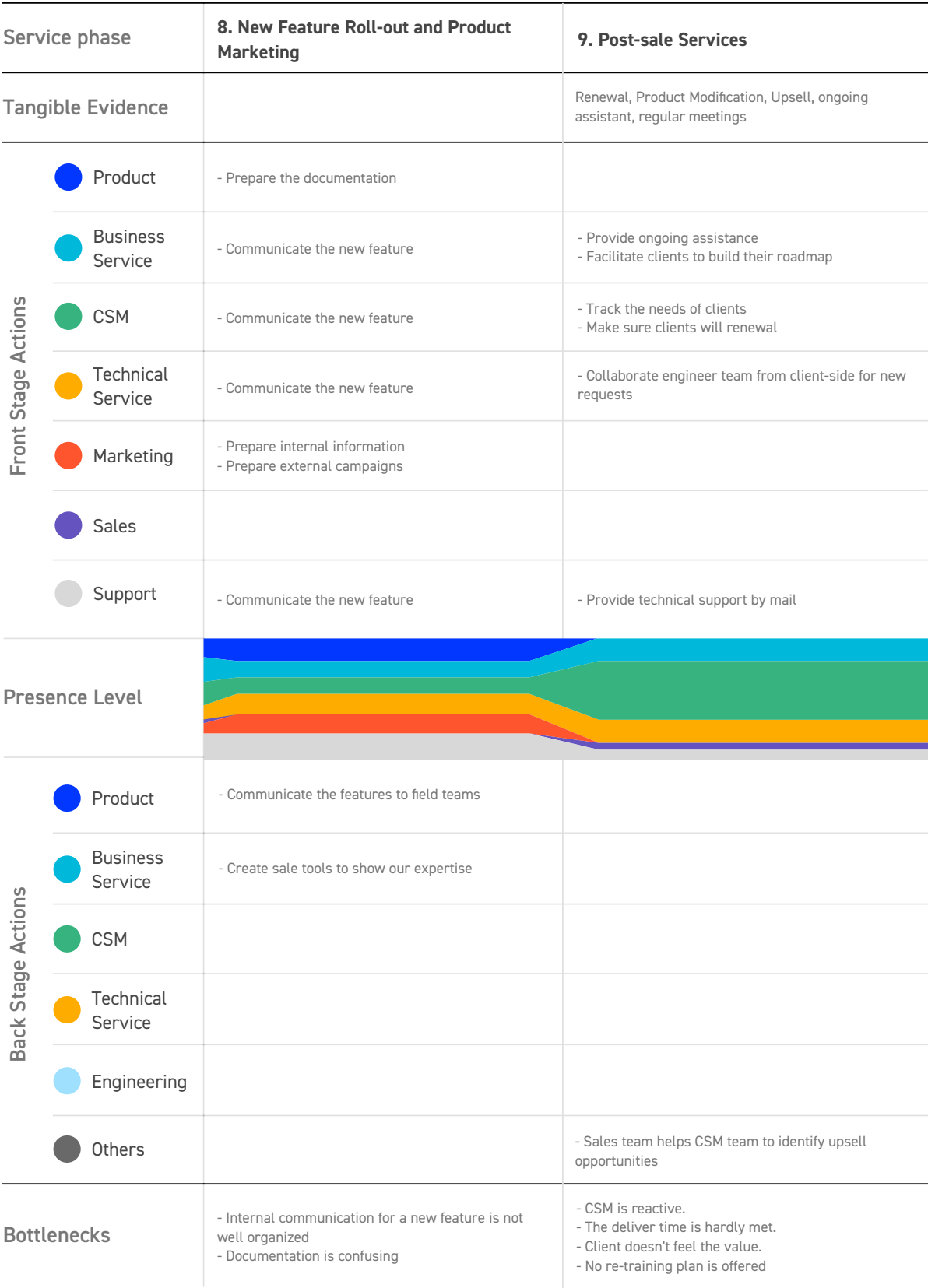


Figure 36. Service blueprints of New feature rollout and Post-sale services

New feature rollout

brSM has new updates on a monthly basis, and is being continuously improved. It therefore becomes an important mission for Bloomreach to deliver the information and ensure clients are integrating and implementing the new features.

Documentation

There are two types of documentation. The documentation for business users explains with case studies and tutorials, while documentation for technical users provides information regarding technical integration. The technical documentation is created by the Marketing team as a part of product marketing activities.

Documentation for business users is relatively new. Field teams frequently answer questions about best practice and explain product features to business users (CSM2), which are things that the documentation should help with. So the Product team provides documentation which helps the field team give better explanations. Moreover, Q&A is considered as helpful content for users (CSM1).

Internal communication

Once a feature is released, the Product team organizes rollout meetings with the BS and CSM teams to explain features and example cases (BS1 & PT1).

Since the Marketing team is responsible for product marketing, it is also responsible for a part of internal communications, especially with the Sales team (TS1).

External support

There is much direct communication happening during a feature rollout, with both technical and non-technical discussions.

Once customers are aware of a new product feature. The first thing we need to ensure is very good answer their question on. Hey, how do I integrate? So my interaction with the marketing team is to ensure that the implementation method is clearly documented. (TS1)

Thinking about how the customer is going to use it or how it is going to be, how are we going to train the customer on it. What we are doing is to make sure that customers are educated on this. (BS1)

Bottleneck (Figure 37)

a. Internal communication for a new feature is not well organized

This phase is described as a “rocky experience” (BS1). Internal communication is disorganized and nobody owns the task (BS1). Due to the confusion, the Product team inevitably has repeated and frustrating discussion with other teams (PT2).

b. Documentation is confusing

The documentation for business users is

problematic. Even for internal employees, it seems to be pretty hard to understand and use.

I don't know if it's well documented. I don't know how things are connected (BS1).

Post-sale services

After the onboard phase, the Business Service and CSM teams provide post-sale services to help clients to successfully implement the products and achieve their business goals.

Ongoing assistant

The Business service team provides ongoing assistance when clients don't have the bandwidth to use the Dashboard, and use the tool on their behalf. This dedicated approach is effective in enabling clients to understand the best practices through the demonstrations of the BS team. (BS1)

Regular meetings

For the CSM team, regular weekly and quarterly meetings are effective in maintaining relationships.

Weekly meeting

The CSM team has weekly meetings with high-contribution clients (PT1). The sessions are Q&A sessions with system operators (CSM2), where they cut a big chunk into smaller pieces to explain features (CSM1).

When the customers have more complex demands, the Product Team might join the discussion. (CSM1 & PT1)

Quarterly meeting

In the quarterly meeting, the CSM team meets clients' managers and discusses yearly budgets and high-level goals. These meetings facilitate renewal, which is the current focus of the team (CSM1).

Phone / mail support

Whenever clients have questions, they can find support from Bloomreach via phone or mail services. Clients want a partner who can always answer the phone (CSM2), and provide a timely response to their questions (BS2). Clients send more technical questions to the Support team via emails. But the major questions are common problems like how to debug a certain situation (PT2).

Upsell

Demand from clients side

When customers redesign, re-platform or upgrade their services, they will need help from the TS team (CSM2). Moreover, they may also want to integrate some new feature they have not integrated before (TS1).

It is possible that the features that clients ask for don't exist. If there is no easier way to “hack the system” to achieve it, the Product team will schedule the request into the queue according to its priority (PT1).

Demand generation by field teams

The CSM team will also try to discover the potential needs of clients to sell more services and products using discovery questions.

Bottlenecks of
New feature rollouts

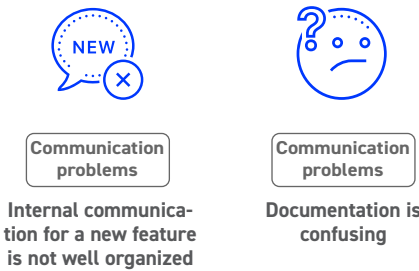


Figure 37. Bottlenecks of New feature rollout

How can we replace their legacy product with Bloomreach's products without really impacting their business at the same time? (CSM1)

The Sales team also provide tips to the CSM team regarding demand generation.

We engage with the sales team because they identify the way to ask the right questions of discovery (CSM1)

Bottlenecks of Post-sale services

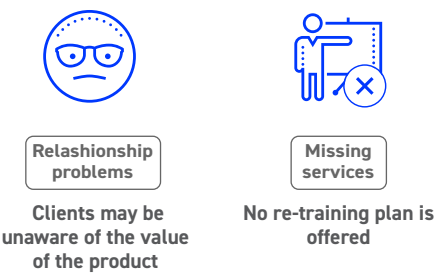


Figure 38. Bottlenecks of Post-sale services

Bottleneck (Figure 38)

a. Clients may be unaware of the value of the product

Some clients are not aware of the value of the products. They may not even notice how the technology will influence their workflow since they have become used to conventional merchandising techniques (e.g. marketing catalogs) during the past 20 years (CSM2). Furthermore, users simply don't feel the benefit of Bloomreach's product since it is working in the background (BS1)

b. No re-training plan is offered

Re-training is required when experienced employees from the client's side leaves, or when clients expand their digital

merchandising team (CSM2). But Bloomreach doesn't yet provide for this need.

Conclusion

Chapter 4

We interview eight internal stakeholders, analyze brSM services, identify the bottleneck, and visualize the services by the service blueprints. Considering the scope of the project, we summarize the chapter with the following insights.



Compared with the other phases, new feature rollout phase is obviously the weakness of brSM service. Currently, internal communication is unorganized between CSM, Business Service, and Product team. It may lead to bad communication with clients, making product integration more challenging, and causing unsuccessful product implementation.

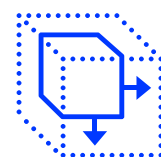
Currently, Product team provides documentation that explains mechanism and workflow of brSM features. However, it isn't useful for internal stakeholders and clients. On one hand, the documentation doesn't illustrate how to use the product in real cases. The situation-specific information (e.g. Q&A) seems to be more useful. Business Service team also use real cases to explain a feature. Also, the organization of the documentation is also confusing since it is structured by features instead of the use-case oriented method. When a user tries to find the information to achieve their business needs, it is not easy to find the right features immediately.



i 4-3

Underestimated value of brSM

In competition analysis, brSM is recognized as a powerful product in a niche market. Bloomreach aims to integrate brSM with Bloomreach Experience Manager (brXM), and introduce Bloomreach Experience (brX). Leveraging brSM's ML capacity, brX will become an important player in a Digital Experience Platform (DXP) that provides marketing and merchandising solutions.



i 4-4

Service scalability

Both CSM team and Business Service team struggles to provide satisfying services and supports for the growing number of clients. Hence, scalability of the service is important for the new future improvements.



i 4-5

No re-training program

To support customer in the longer term, Bloomreach needs to facilitate the learning and implementation of clients when the new employees get onboard along the way. The re-training is not offered in Bloomreach services yet.

05

Merchandiser analysis

Chapter 5

During the digitalization of retailing, merchandisers are the key players who make the implementation roadmap for technologies and interact with the systems. They are a key factor in a successful implementation.

In this chapter, we analyze these merchandisers' activities, behaviors and challenges in three ways.

First of all, we summarize three digital merchandising guidelines that explain practices that brSM users might perform. Then, we analyze the behavioral data of 10 Bloomreach clients, and identify which practices they perform frequently. Last but not least, we conduct interviews with two selected Bloomreach clients.

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5.1 Visual merchandising practices (VMD)

VMD is an activity which coordinates effective merchandise selection with effective merchandise display, which merchandisers perform in brSM.

Visual stimulation and communication are considered as important aspects of retailing [67]. The practices regarding these aspects are named as visual merchandising (VMD), which is defined as the ‘activity which coordinates effective merchandise selection with effective merchandise display’ [68]. In physical retail, VMD means merchandisers apply practices that stimulate consumers to purchase, such as discounting, physical presentation for products and displays, and the decisions about which products should be presented to a specific customer [69].

Physical VMD also applies to digital environments. Then and DeLong [70] suggest an analogy between the interface design of e-commerce websites and the layout of retail stores. Both of them have the goal of encouraging customers to come into the store, enjoy the environment, and purchase products. On an experiential level, the path between product departments in shops should be clear to avoid confusing the customers [69]. This physical VMD discipline can be analogous to using category pages and smoothing journeys to find a product with navigation aids or search engines [71].

To illustrate the possible VMD practices that merchandisers perform on ML-powered e-commerce websites, we reference three merchandising practice guidelines. Bizibl [27] describes a seven-step guideline to perform digital merchandising in a comprehensive manner. Bustos [72] introduces the possible practices to optimize e-commerce websites, categorizing them in three levels of difficulties to implement. SearchSpring [73] summarizes the practices that users can perform based on its solution. Since these three materials are not created or affiliated by Bloomreach, the summary of them could reflect the VMD practices from merchandisers’ perspective.

We structure this chapter based on the two types of e-commerce experiences, category & search. First, we introduce practices that can be performed in both scenarios. Then the practices for the two experiences will be introduced respectively.

General VMD practices

Product presentation

For online VMD, merchandisers are able to provide customized shopping experiences that adapt to different customers’ contexts. Product presentation should reflect how customers interact with the e-commerce website, and their goals during the interaction journeys.

Specifically, the top positions of category pages or search results garner the most attention. Since online shoppers easily get distracted and have short attention spans, it is therefore important to manage the top positions by displaying the most relevant product strategically with both manual control and algorithmic ranking.

Merchandisers can curate the product presentation by ordering the products in terms of relevancy based on business’ and customers’ preferences.

Hard control

Hard control refers to manually pinning selected products to the top of the category pages or results (Figure 39). Though it is a timely approach, it is labor intensive, and the relevancy of pinned products can gradually decay. To mitigate the negative influences on the algorithm results, the method should be accompanied by a data-informed manner or A/B testing.

Following discounting campaigns, merchandisers can promote on-sale products only while the campaign is active. Also, when new customers enter the website without any user signals, the system can show most-purchased products at the top to engage these specific viewers.

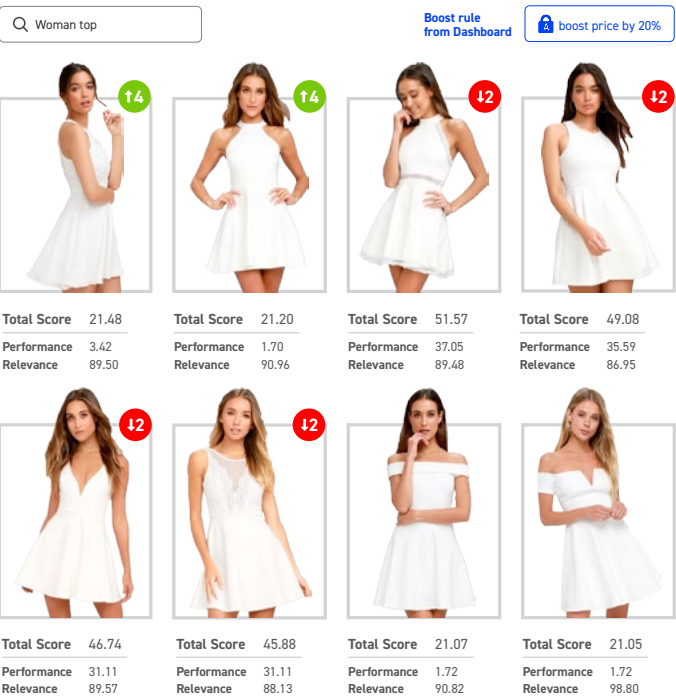


Figure 39. Promoting products manually to top of the page by hard control.

Moreover, products without images should be pinned to the bottom for better presentation since their performance will definitely be worse than the others.

Soft control

On the other hand, soft control boosts or buries products by weighting product results based on specific attributes that could improve product relevancy or conversion rates. For example, it is common to boost products with high margins or high-inventory. Also, merchandisers can promote seasonal products by burying spring and summer apparel during winter. Furthermore, some merchandisers define customized attributes (e.g. theme, campaign, new-arrival) for products. Rather than manually arranging products on a day-to-day basis,

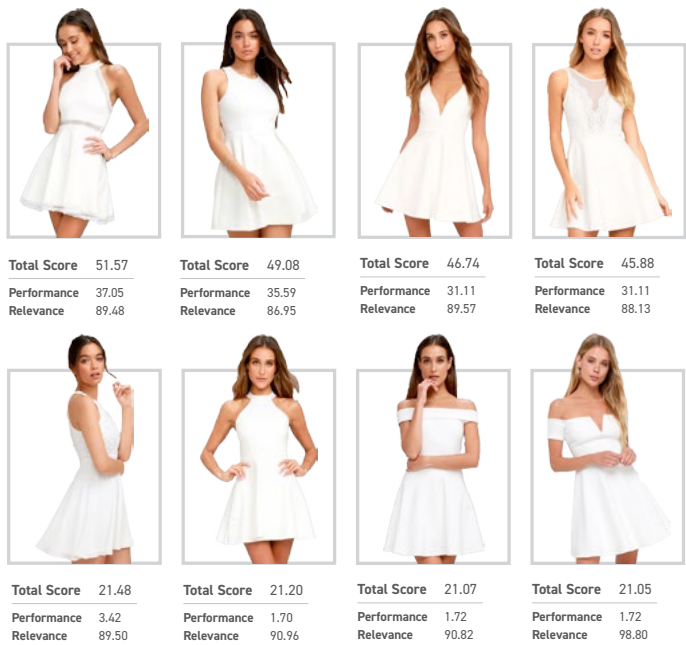


Figure 40. Promoting product according to important metrics by soft control

merchandisers can promote trendy or important products with automated rules.

Contextual customization

According to an understanding of the unique preferences of customers from a different culture and geographic, merchandisers can create rules to promote relevant results. Based on the two controls, contextual customization allows merchandisers to control the rules that can be factored dynamically to an individual customer or a customer segmentation.

The system can enable particular rules when real-time user signals satisfy the rule's condition. For example, if a customer is located close to a physical store, in-stock items or geographical campaigns that run in the store might be interesting to the customer. Also, for international users, the system can bury products which can't be delivered

internationally. At an individual level, if a customer filters the results by brand in a dress category page, products from the same brand, such as a handbag, can be promoted on a related page.

Contextual customization also enables merchandisers to perform personalization for specific individuals. Their behavioral signals (e.g. sorting by price, engaging with facets with certain styles, visiting the Sale category page, and engaging with certain products) can provide further cues for personalization. Furthermore, a user's history data is a strong signal to perform customization. For instance, a retailer selling pet products can optimize product priority by matching apparel and food to the dog's breed of a returning customer.

Presentation control

Presentation control of facets is analogous to the path to find products in physical stores [71]. It therefore becomes another

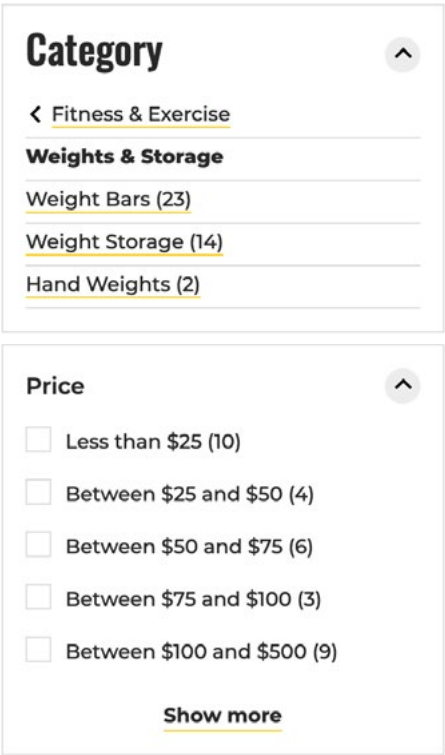


Figure 41. Organizing filters to improve product finding

focus of online VMD. Merchandisers promote the most appropriate filter and facet options for each category page and search results (Figure 41). It requires the investigation of customer behavior engaging with different kinds of products with qualitative interviews or behavioral data.

Missing facets

Providing relevant facets helps customers to find products. When users fail to find a product in the category pages, they use search instead to find the product matching their preferences. Merchandisers can conduct search quality analysis to uncover the missing filters and facets for a page.

Filter popularity

Merchandisers can prioritize facets and options by popularity to improve engagement from shoppers. However, the items in brand facets should be sorted alphabetically to fit in with user behaviors.

Normalizing Options

Facet options should be intuitive. However, since the system generates facets according to the attributes provided in product feeds, the options could be confusing. For example, the system may generate color filters for both "grey" and "stone" or "pink", "coral" and "salmon". It is therefore important to normalize the options to keep facets clean and easy to use.

VMD for category

In category experiences, merchandisers need to display the most interesting and appealing products. They perform conventional VMD techniques that create visual orderliness by grouping products

according to their colors, brands, and types. Also, merchandisers apply a data-informed approach to curate the positions, including external signals (e.g. Facebook like, Pinterest pins), internal signals (e.g. inventory level, product performance),



Figure 42. Organizing products with similar colors

and user signals (e.g. purchase behavior). By optimizing to prioritize the display of products appealing to customers, merchandisers can positively influence conversions and experiences.

Color groups

Similar to physical VMD, grouping products with similar colors makes the page visually appealing. Though this technique doesn't ensure displayed products are the most desirable ones for customers, this style of presentation can help to introduce products when there are a variety of options available within a category (Figure 42).

Brand groups

In physical VMD, it is common to place items from the same brand next to each other on the shelf. This practice is still useful for some special scenarios in e-commerce. For instance, in digital accessory pages, there are official

products and third-party items displayed on one page. Grouping official hardware on the top provides better credibility of the results to customers (Figure 43).



Figure 43. Organizing products from the same brand together

Place rotation

Freshness is a key metric for customers to measure the quality of the offerings from an e-commerce website. For an e-commerce site with many returning customers, rotating the place of products regularly can provide a sense of freshness even in the absence of new products.

VMD for search

Search behavior is unique compared to physical channels. In conventional VMD, merchandisers provide information in a proactive manner, trying to lead a purchasing path for customers. However, customers’ search behaviors are unexpected. It therefore becomes harder for merchandisers to curate the results. Therefore, VMD for search requires a data-driven manner. Merchandisers perform actions based on popular & trendy search reports and failed search reports.

Two types of search behaviors are identified, and merchandisers can perform different actions to improve research results.

Synonyms for fuzzy-defined search

When customers are in the discovery phase and looking for inspiration, they use fuzzy-defined queries such as a brand name, category, or theme. These kinds of searches contribute to a large volume of search activities. In this phase, customers are more receptive to a wider range of products as they browse through the product catalog. In order to help the system to understand the fuzzy-defined intents, creating synonyms reflecting failed search reports will improve accuracy.

Redirect for defined intents

As their purchase intent rises, customers search for products using more accurate queries, such as a brand name plus a product type.

In this scenario, merchandisers offer more specific promotions in relation to the query. For example, if a search term is directly related to Valentine’s day, the system can redirect customers to a dedicated holiday campaign page. However, since the customer is primed for purchase, merchandisers should focus on delivering accurate results, instead of distracting the shopper with unnecessary merchandizing practices.

Short search results

When the search query is fuzzy-defined or there are not many related results, it leads to short search results, which impact the purchase journey negatively. Based on failed search reports, merchandisers should provide product suggestions to the system. Thus the system can “relax” the search scope with less relevant products.

5.2 Behavior analysis

By analyzing the activities that merchandisers perform in brSM, it presents their preferred VMD techniques and the interaction with the ML.

To evaluate the effectiveness of its features, Bloomreach collects user behavior data from the Dashboard. It enables Bloomreach to understand clients better. The Product team uses the data to evaluate specific features and plan new features. Field teams, including the CSM and Business Service teams, use it to understand the level of engagements, and include it as one of the metrics evaluating clients' satisfaction.

We used the behavioral data of 10 brSM clients to understand how they implement brSM in terms of engagement level and frequency of different features. There are limitations in data collection methods. First, since the environments around users are not controlled, there are potentially noises in behavioral data. Also, the data only represents the user interaction on Dashboard. In fact, some clients use third-party software during the process. The behavioral data may not reflect the real workflow.

Methods

Subjects

From among all brSM clients, we selected 10 companies for further analysis. There are three metrics to filter the subjects. (1) The samples should represent three levels of revenue contribution. (2) The samples should represent five major business

types (3) The samples should represent two business scales (international & American market).

Conceptualization of brSM

As mentioned in Ch3.1, the Dashboard provides comprehensive features for both technical and business users. Since the topic focuses more on interactions with merchandisers, we created a framework to illustrate the interaction between non-technical users and Dashboard features.

Based on a data-driven workflow created by Girardin & Lathia [16], we created a four-step model to conceptualize the features. Evaluation refers to features providing current performance and insights, which are used to define a hypothesis. Setup refers to features that enable users to modify rules and perform VMD techniques. Setup features can be further categorized into soft control and hard control as mentioned in Ch 5.1. A/B test represents features comparing performances of two variants in a given time. Validation consists of features inspecting and verifying the setup results. Moreover, since brSM supports features for both search and category experiences, setup can be further split into two sub-feature groups.

Consequently, there are seven feature groups that reflect the major features in brSM (Figure 44).

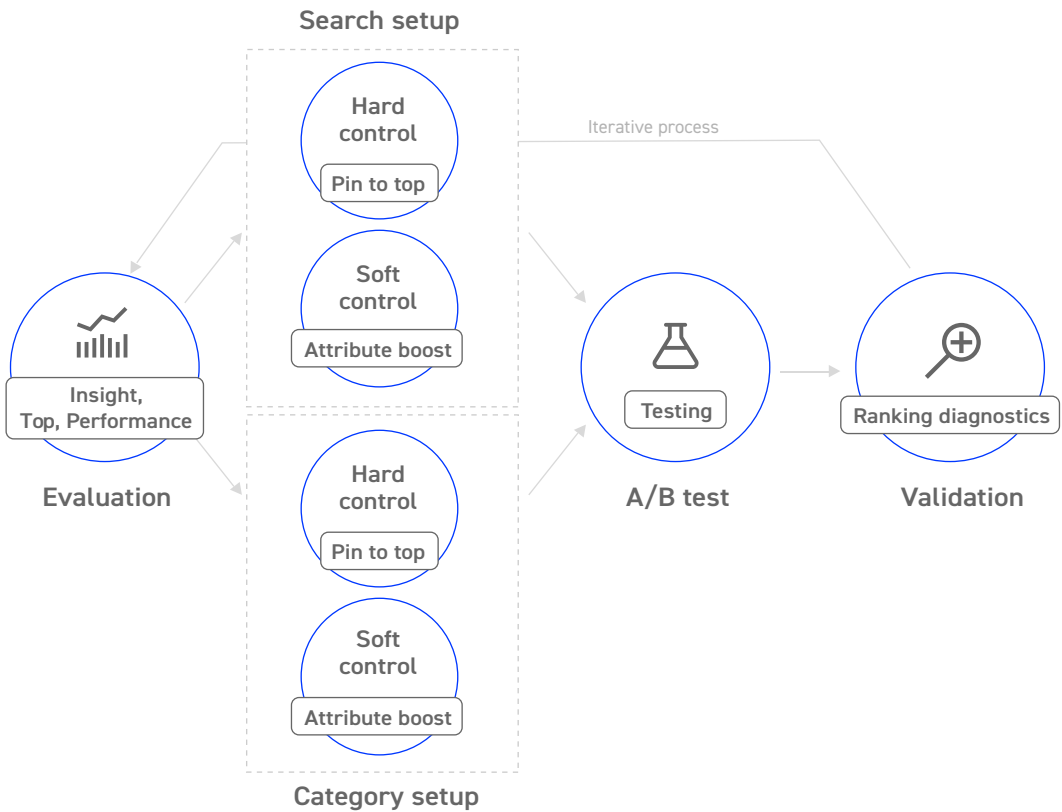


Figure 44. Conceptualized model of brSM

Metrics

To evaluate the implementation status of each feature group, we applied two metrics, engagement and frequency.

Engagement is defined as the user's level of involvement with a product, representing depth of interaction. We measured the percentage of activities that users interact with features belonging to a feature group in three months.

Frequency tracks how frequent the interactions are. In our analysis, we measured the percentage of the active weeks of a client during three months for a feature group.

Analyze

All behavioral data from the same company was aggregated as one entity since intra-company users collaborate to reach their shared goal. When the data had been collected and mapped with 10 feature groups, we compared the results and identified two patterns. The following metrics show the average of feature groups.

Results

After comparing the data, we identified two interaction patterns: a human-led group and a hybrid group. Seven clients were considered to be applying the human-led strategy, while three clients were applying the hybrid strategy. There were three major differences between the groups. The human-led group had higher total activity records (avg. 3295) than the other group (avg. 1079). Also, when creating rules, The human-led group relied heavily on hard controls (avg. 71%), while the hybrid group used hard controls (avg. 25%) and soft controls (avg. 21%) evenly. Last but not least, the hybrid group used validation features more (avg. 47%) than the human-led group (avg. 24%).

The patterns reflect the discussion regarding the two AI-human interaction

patterns proposed by Noessel [52]. Intelligence Amplification (IA) fits the behavioral patterns in the human-led group. Merchandisers make the leading decisions, and use ML as an assistive tool to fill the gaps in services. On the other hand, Artificial Intelligence (AI) fits the behavior in the hybrid group. Merchandisers monitor and review what ML has done, and provide guidance to improve it when necessary.

Human-led group (n=7, Figure 45)

Clients from the human-led group have strong preferences to control category experiences by hard rules (60%). Since hard controls are labor intensive (Bustos, 2016), the average number of activities (3295) in the group are significantly higher. Moreover, A/B test usage is rare (1%). It may suggest that clients are unaware of the importance of verifying

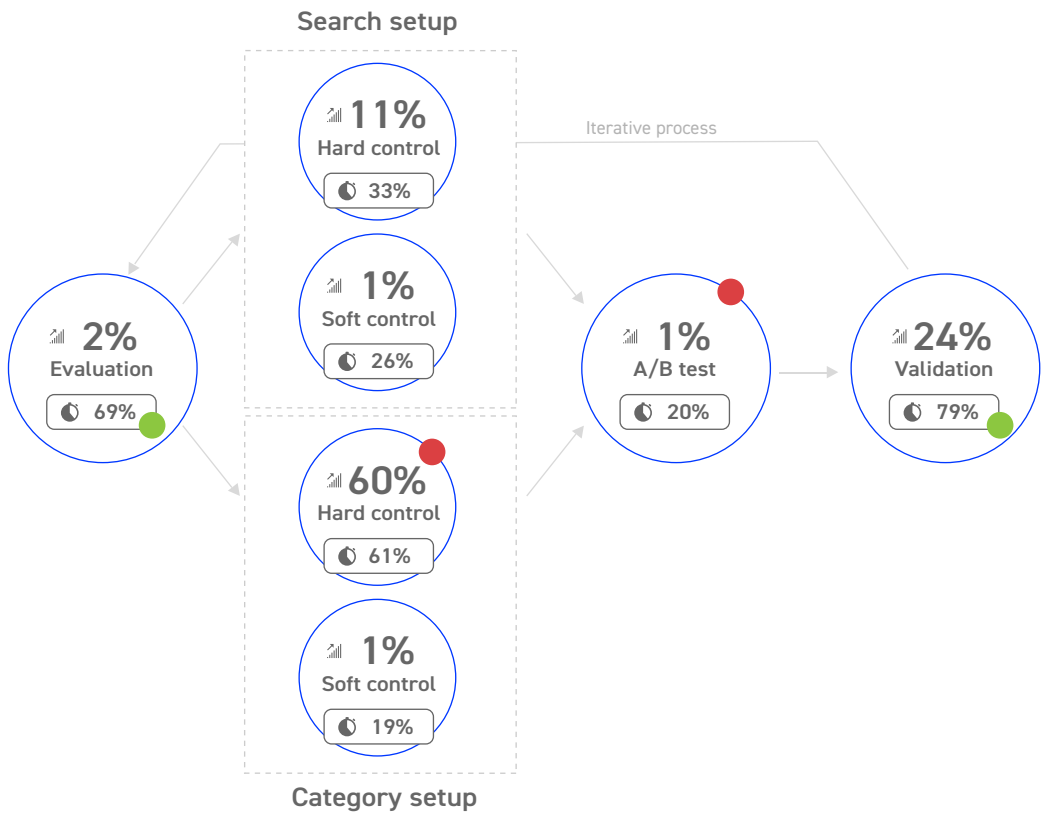


Figure 45. Behavior data of the Human-led group.

the configurations by testing, and thus they don't use the features, or integrate the features into their platform.

Interestingly, users from this group use data to evaluate and inspect performance regularly. Evaluation and Validation features have relatively high usage frequencies (69% and 79%), although their engagement levels are low (2% and 24%).

From the findings of Ch 5.1, it is identified that merchandisers can perform conventional VMD, especially in category experiences. It implies that they want to keep overall control, reflecting what a merchandiser expresses as "don't trust a black box engine to achieve the goal [73]". Since the behavioral patterns of the group fit the description of IA [52], we can further conclude that merchandisers regard algorithms as an

assistive component, although they are knowledgeable, understanding how to use the system and using data as an important reference.

Hybrid group (n=3, Figure 46)

On the other hand, users from the hybrid group demonstrate a different approach when interacting with algorithms. They use both hard controls and soft controls evenly in both category and search environments. This group of users do not perform conventional VMD that often compared to the previous group.

To understand what the algorithms have done, the merchandisers engage with Validation features (47%) and use the features very frequently (88%). This group is also data-informed with a high usage frequency (67%) for Evaluation features. However, as with the previous group, the

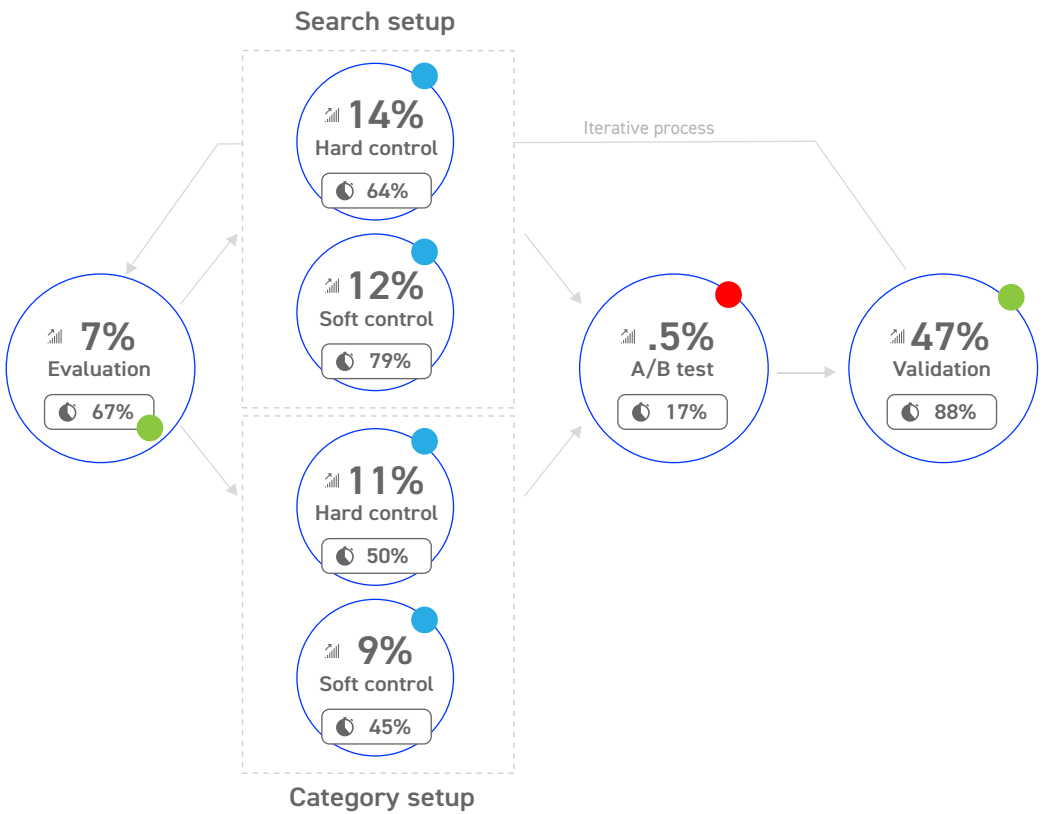


Figure 46. Behavior data of the Hybrid group.

A/B test is not commonly used.

The behavioral patterns fit with the AI definition from Nosse [52], and we can conclude that ML is more autonomous in these relationships. It embodies a different collaboration model, where users govern the algorithms more by understanding them, than controlling them.

5.3 Merchandiser interview

The business context of two types (human-led & hybrid) of merchandisers is investigated by interviews.

To evaluate the effectiveness of its features, Bloomreach collects user behavior data from the Dashboard. It enables Bloomreach to understand clients better. The Product team uses the data to evaluate specific features and plan new features. Field teams, including the CSM and Business Service teams, use it to understand the level of engagements, and include it as one of the metrics evaluating clients' satisfaction.

We used the behavioral data of 10 brSM clients to understand how they implement brSM in terms of engagement level and frequency of different features. There are limitations in data collection methods. First, since the environments around users are not controlled, there are potentially noises in behavioral data. Also, the data only represents the user interaction on Dashboard. In fact, some clients use third-party software during the process. The behavioral data may not reflect the real workflow.

Methods

Subjects

From among all brSM clients, we selected 10 companies for further analysis. There are three metrics to filter the subjects. (1) The samples should represent three levels of revenue contribution. (2) The samples

should represent five major business

Format

The interviews are in a semi-structured format with two parts and a card sorting exercise. The goal of the interview is to identify the context around the merchandising activities they perform. Therefore, the interview scope is to understand their merchandising goals and the selection of VMD techniques.

Each interview lasted 30 minutes and consisted of two parts described in the following paragraphs. The audio of the interviews was recorded for further analysis.

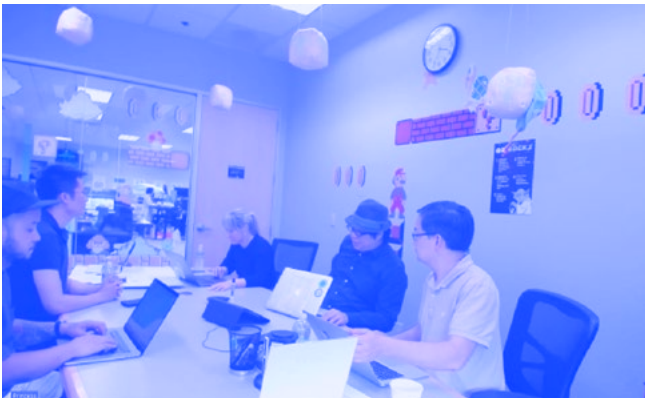


Figure 47. Due to the company's policy, the interview will be conjoined with sales and CSM members.

Part 1. Merchandising goals

After a brief introduction, the interviewees were asked to answer the following open-ended questions.

What is a good digital experience as a digital product manager?

Can you describe the activity or task you did in your work?

Part 2. Merchandising activities

A set of merchandising activities cards were prepared to facilitate the discussion (Figure 48). This card set is the prototype of the design solution called merchandiser's practice cards, which will be introduced in Ch7.2. The interviewee firstly scans through these cards, and selects the activities they performed. The interviewer then asked the following questions.



Figure 48. A card set is used as a discussion tool to understand merchandiser's activity.

Which merchandising activities did you do recently? Why?

In the group you didn't do, is there anything important card? Why didn't you do that?

Analysis

The approach of the analysis was similar to that in Ch 4.1. The interviews were transcribed, and researchers selected the relevant statements and clustered them into several groups

Discussion

Responsibility

Due to the differences in business types and scales, the responsibilities of the two managers are different.

With a bigger team, interviewee 1 focuses more on coordination with other merchandisers and marketers. Their website serves customers from different nations. Therefore, each merchandiser has a specific regional market focus. Also, the merchandising team places more emphasis on seasonal marketing campaigns, around which all merchandising activities revolve. Before a campaign starts, the interviewee has extensive meetings with merchandisers and marketers to align product information and optimize the customer journey. They also perform presell testing, by which they improve the marketing plan before the official campaign.

Interviewee 2, however, places more emphasis on collaboration with IT teams. They develop product roadmaps of features that improve their business goals. The interviewee takes initiatives regarding new features, and discusses them with a business analyst to assess the potential impact on the metrics. Then she writes the user story, collaborates with developers and delivers the features. Collaboration with sales and marketing teams is a minor part of her responsibilities. Since the company is business-facing, marketing campaigns are not a major revenue driver. Thus the team doesn't pay as much attention to them as in the case of the first interviewee.

Goals

For merchandisers, the most important goal is to improve add-to-cart rate, and thus increase the revenue. To reach the

goal, interestingly, these two companies apply different approaches.

Interviewee 1 believes providing a fresh and appealing product selection is the key. With the merchandisers' domain knowledge concerning trends, assortment strategies, and margins, they curate the best product selection across channels using news letters, marketing campaigns, category pages and search results. It therefore becomes important to plan all possible information funnels for customers, and make sure that, no matter how customers search and where they find the product information, they can always get this selection.

On the other hand, interviewee 2 believes the key is providing the best digital experiences with relevant results. They should provide meaningful search results at the right time to a variety of customers in terms of their needs and industries. When customers are searching products with specific attributes and qualities, merchandisers should make sure all searching and filtering mechanisms are helpful for customers along a purchasing journey. All noises during it are undesirable and should be eliminated.

Activities

According to their respective approaches to the goal, the two interviewees apply different practices in their activities.

Interviewee 1



Figure 49. Interviewee 1 selects Improvement of search accuracy (S6), New product launch (S1), Low-priced & high-volume products focused (S3), High-margin product promotion (S2)

Interviewee 1’s activities revolve around a marketing campaign created by the marketing team. When the new season is coming, merchandising team members will confirm new product selection for different themes (Card S1). The themes could refer to sales events (e.g. Black Friday), purposes (e.g. boys’ birthday), and target audiences. They will make sure these selections are coherent across channels, and more appealing, high-margin (Card S2), low-priced (Card S3), and high-assortment products stand out.

To make sure that customers can find the same selection through their search, they brainstorm all possible queries that customers may have and create hard rules that promote selected products for these keywords (Card S6). Also, synonyms are created accordingly in the search engine, so that related queries can lead to the right page. Occasionally, they

review failed search reports. If there is any missing opportunity and keyword, they will react and fill the blind spots.

Before a campaign rolls out, interviewee 1 performs an A/B test to test the water. Since not all product information in different mediums is modifiable such as e-letters, the testing is to verify the desirability of the product selection. Product positioning will be revised if the testing doesn’t go well.

The merchandising team becomes reactive to problems after the introduction of the campaign. For example, if revenue performance has dropped during the past week, they will swap the product priority because “the promoted products sell terribly, and any other products might be better”.

Interviewee 2

On the other hand, interviewee 2’s activities are mostly improving search experiences. The company is a wholesale business with a wide range of products, providing more technical and feature-orientated products. Therefore, it is easier for shoppers to find a product by searching for its specification. Given the product characteristics, the search contributes major revenue on the digital platform.

Interviewee2’s main tasks are supporting better search results (Card S6). For example, since customers rely on filters to scope down the search range, they pay attention to all important queries. Even though brSM is capable of prioritizing facets automatically based on the frequency of interactions, Interviewee 2 finds there is room to improve the facet priority even better manually. Besides, the facets are sometimes confusing due to duplicated or similar items. It requires interviewee 2 to collaborate with

developers to clean up the product feed files, so that the system can generate clear facet items. Furthermore, they have complex search queries from descriptions to keywords with different specifications. To improve searches in these cases, they review popular keywords and failed search reports frequently, and create synonyms to train algorithms to understand the complex queries better.

They have minor scenarios to boost new products(Card S1). Interviewee 2 carefully performs and minimizes external interventions in the search results, which sometimes influences the search relevancy negatively without gaining a clear understanding of customers’ intentions.

Interviewee 2 collaborates with her marketing team on (physical) campaigns where customers are asked to search using a specific keyword on the e-commerce website (Card S6). In such cases, they will try to eliminate all noises from related search terms before the campaign.

They receive feedback on search noise from their customers or partners. Sometimes the merchandising team receives complaints from the sales team regarding inaccurate searches. The team then inspects the back-end statistics and performs some modifications to remove the noises.



Figure 50. Interviewee 2 selects New product launch (S1), Sale campaign on the way (S5) & Improvement of search accuracy (S6)

Conclusion

Chapter 5

his chapter illustrates the context of clients by three approaches. We introduce visual merchandising (VMD) techniques, and how merchandisers translate physical VMD to digital environments. By behavioral data, the actions that merchandisers perform in brSM is introduced. Two behavior patterns, human-led group and hybrid group, are identified. Comprising the VMD practices and behavior analysis, we interview the two merchandisers from the groups, illustrate their business goals, explain the rationale behind VMD practices they performed.

We conclude the chapter with following insights.



i 5-1

Visual Merchandising (VMD) techniques

Merchandisers apply VMD techniques on digital platforms. On the basic level, they select high-profile products, and organize the visual presentation manually by the hard control. Then merchandisers can even weight different attributes and influence how algorithms work by the soft control. To personalize experiences, contextual customization can be used as additional conditions for the hard and soft controls. The search optimization is also mentioned in online VMD techniques. Merchandisers improve the keyword interpretation and facet priority to optimize customer's search journey.



i 5-2

Influence of product characteristics upon which VMD techniques merchandisers apply

Depending on the characteristics of products, they apply different VMD techniques to engage customers. For visual-oriented products like apparel, they apply conventional VMD techniques to present product categories in a visually appealing way, while for feature-oriented products, they emphasize more on smooth search experience.



i 5-3

Influence of VMD techniques upon how merchandisers perform in brSM and relationships between merchandisers and ML

The merchandisers behave differently according to the VMD techniques they apply. Furthermore, their behaviors imply the different interactions and relationships between them and ML. When merchandisers perform conventional VMD, they tend to use ML as an assistive component to complete the experiences they didn't curate. On the other hand, when merchandisers optimize search, they tend to use ML as an autonomous component, monitor the progress and modify the results when necessary.

06

Insight & design definition

Chapter 6

In the course of our analysis, many possible ways to improve the brSM product or service have come to our attention. In order to propose useful design solutions, we will provide an overview of the insights and summarize them with an actionable design brief.

In this chapter, we will first synthesize the insights from the previous chapters. After that, we shall present a design brief representing how these insights reflect design directions. Moreover, we shall show at the end how two target users illustrate the design solution.

6.1 Insight synthesization

There are 17 insights presented at the end of chapters 2,3,4 and 5. Theses insights are categorized into informative insights, which provide useful information for design or conceptualize the context of the product, and situational insights, which illustrate some of the challenges facing brSM (Figure 51).



Figure 51. The list of insights from chapter 2 to chapter 5

Figure 52 shows the relationships of findings, which are mapped into the three research subjects, product, service and, merchandisers.

Product

Bloomreach Search and Merchandising (brSM) is an ML-powered product helping merchandisers to improve search and category experiences by optimizing the ranking of products, improving search results and curating recommendations on e-commerce platforms.

Bloomreach is planning to integrate brSM with another marketing product, and release a new product, Bloomreach Experience (brX, i3-3). Considering the strategic importance and its release date, the design solution should be applied to brX as well.

brSM improves search and category experiences on e-commerce platforms by leveraging ML-powered components, which are query understanding and keyword interpretation (i3-1). The algorithms are designed to improve revenue by promoting the best performing and relevant products on pages. To facilitate the process and optimize results, merchandisers can use the Dashboard to interact with algorithms which fits the definition of interactive Machine Learning (iML, i3-2).

To ensure fluent interactions between users and algorithms, several approaches have been proposed. The implementation of new technologies can lead to employees feeling a loss of control. Involving them through training, and improving interactions between users and systems are potential solutions (i2-2). Also, due to ML's unpredictability, non-technical people may have wrong expectations of the technology. Therefore, clarification of

its limitations beforehand is important (i2-5). Furthermore, it is suggested to explain the mechanisms in flexible ways, such as with general explanations, specific output explanations, or with example-based explanations (i2-6).

Service

Bloomreach has field teams to provide direct assistance and support to clients. However, the services have the following challenges.

Internally, the services have scalability issues. Field teams struggle to provide satisfactory service and support for the growing number of clients (i4-4). In addition, brSM has frequent feature rollout. There is no specific team coordinating internal communication concerning brSM. This potentially leads to bad communication with clients, makes integration of new features more challenging, and causes unsuccessful product implementation (i4-1).

For clients, documentation is useful when they get onboard, or train their new employees (i4-5). The organization of the documentation is confusing since it is structured by features. It requires users to be familiar to the product before they can find the right feature that solves their problems. Thus, the documentation should also provide more use-cases to explain the features better (i4-2).

When the product is deployed, clients underestimate brSM's value because the system works behind the scenes (i4-3). It is therefore suggested that the ML-powered product should have proactive interactions with users, and remind them of the contribution that the system has made (i2-7).

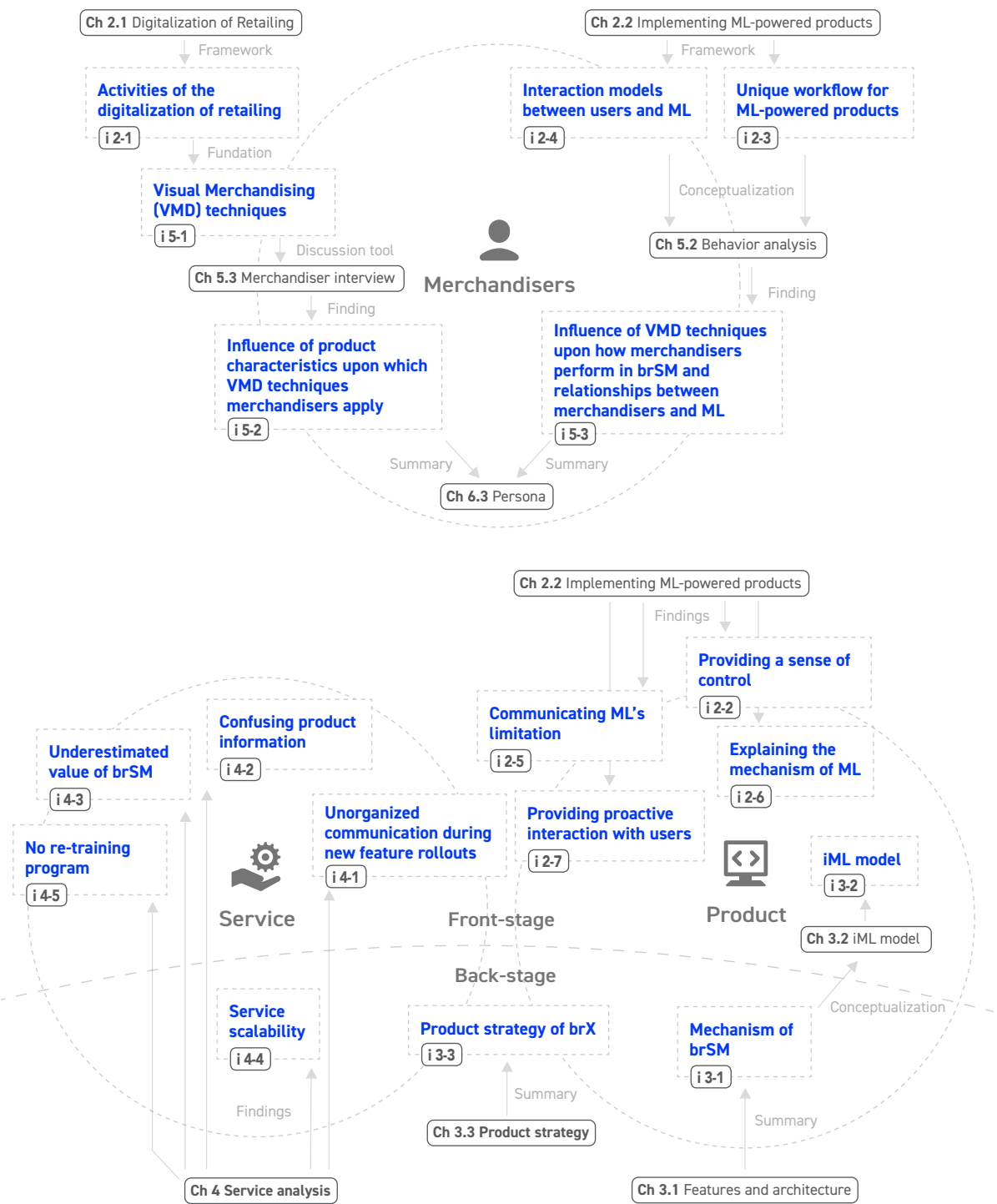


Figure 52. The relationship of insights which are mapped to three research subjects

search experiences (i5-2).

Merchandiser

The goal of merchandisers is to promote the sale of products. Through the digitalization of retailing, merchandisers are able to perform new activities to understand customers' needs, personalize their experience, and provide consistent experience across different channels (i2-1). Specifically, they perform visual merchandising (VMD) techniques on digital platforms like e-commerce websites. They create a visual presentation of products employing manual hard controls and algorithmic soft controls, customize the experience for groups of customers or for individual shoppers and improve searches by employing keyword interpretation and facet priority (i5-1).

Depending on the characteristics of products, merchandisers apply different VMD techniques to engage customers. For visual-oriented products, they perform granular modifications on visual presentation. Whereas for feature-oriented products, they focus more on

Merchandisers behave in different ways according to the VMD techniques they apply. Two human-AI interaction patterns have been identified, which are intelligence amplification (IA) and artificial intelligence (AI) (i2-4). Merchandisers emphasizing visual presentation take more actions to modify results, demonstrating the IA pattern, while merchandisers focusing on search, represent the AI pattern, doing more to inspect and understand what algorithms have done, and minimizing actions that influence algorithmic results.

These tendencies further influence the relationships between merchandisers and ML. Merchandisers emphasizing visual presentation tend to use ML as an assistive component to complete the experiences that they didn't curate. While merchandisers focusing on search tend to use ML as an autonomous component, monitoring progress and modifying results when necessary (i5-3).

6.2 Design goals

The translation from insights to design plan is addressed in the chapter. It introduces the design goals and structure of design solutions in the following chapters.

New Machine Learning technologies allows merchandisers to create better shopping experiences on digital platforms [10] and thus increase business performance [35]. The promise is that algorithms can optimize product and category experiences automatically for clients and decrease their labor.

However, interaction and collaboration between ML and merchandisers are key to a successful implementation. Merchandisers need to adapt to the new work methods during the integration of the new system (i5-3). According to the characteristics of products that merchandisers promote, different merchandising practices should be applied (i5-2). It thus influences the workflow [16] and interactions with ML [52].

Currently, Bloomreach has field teams to help merchandisers to accomplish the transition. We suggest the Product team should also participate and facilitate this process by improving the product documentation and interaction. The advantage of this approach is better scalability compared to the services that field teams can provide (i4-4). It will also improve Bloomreach's service weakness around new feature introduction (i4-1), once the Product team plays a more proactive role in this phase.

The Product team needs to apply the communication approach applied by field teams. Field teams apply the use-case oriented approach that provides examples that help merchandisers to understand actual cases and technical limitations (i4-2). The Product team, on the other hand, currently uses a more feature-oriented approach to explain the products due to its extensive collaboration with the Engineer team. We suggest that the Product team is encouraged to adopt a use-case oriented approach when designing and explaining the features. It will ensure that information and features can be more useful and understood more easily, not only by the field teams but also by merchandisers.

To sum up, the design solution should improve the feature communication, especially for new feature rollout, by adopting a use-case oriented approach for merchandisers and internal stakeholders with supportive tools.

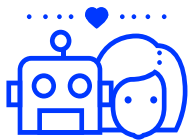


Design goal

To improve the (new) feature communication by adopting a use-case oriented approach for merchandisers and internal stakeholders with supportive tools.

We breakdown the design goal into seven sub-goals that reflect research findings on experience, service and strategy levels.

Experience level



DG 1

Customizing experiences for two types of merchandisers

Two types of merchandisers with different merchandising techniques and interaction behavior are identified (the personas will be explained in the next sub-chapter). The Product team needs to customize the information and interactions according to their respective needs and preferences.



DG 3

Communicating merchandising practices

Provide a straightforward index of feature information. The documentation can be organized in accordance with a use-case oriented approach, referencing problems that users may have, or the business goals that users want to achieve. It helps them to find the right information more easily.

Furthermore, features can be introduced using example-based explanations [53] with limited technical input [41]. It helps merchandisers understand the features, and avoid a wrong expectation of algorithmic results.



DG 2

Providing a sense of control

Help merchandisers to have a sense of control over the algorithms during implementation. Better interaction between systems and users can mitigate the negative feelings of users [31].

For example, the system can tell users what algorithms have done regularly, and what the next actions are that users can perform [52].



DG 4

Providing re-training & onboarding content

Provide training tools and content for merchandisers when Bloomreach experts are not present. Clients sometimes have employee replacement during the implementation, and the training content enables them to re-train, even without the participation of CSM and Business Service team.



Service level



DG 5

Facilitating new feature introduction

New brSM features are introduced frequently every month. However, both internal and external communication in this phase are not well organized.

Therefore, a new service process coordinating new products in this specific phase is crucial to improving the implementation of new features.



DG 6

Intra-company collaboration

With the new design solution, a new intra-company collaboration should be established. It includes how the content of the communication tools can be created along with the evolvement of brSM, how the tools can be introduced to merchandisers, and how this product can improve the services provided by the field teams.

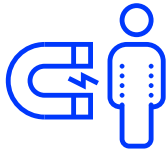
Strategic level



DG 7

Preparing for brX

brX, the new product comprising brSM and brXM, is coming soon. The solution should address the roadmap to transit from brSM to brX. It will ensure the design solution can be extended to the flagship product in the coming years.



DG 8

Product team's transition

The barrier between R&D and field teams is noticeable in the service analysis. R&D teams are more technical-focused and future-oriented, while field teams are customer-facing and focus on short-term benefits. Our findings suggest nudging Product team toward the business side. And thus Product team becomes a translator between two parts. To achieve the goal, a transition plan of Product team should be introduced.

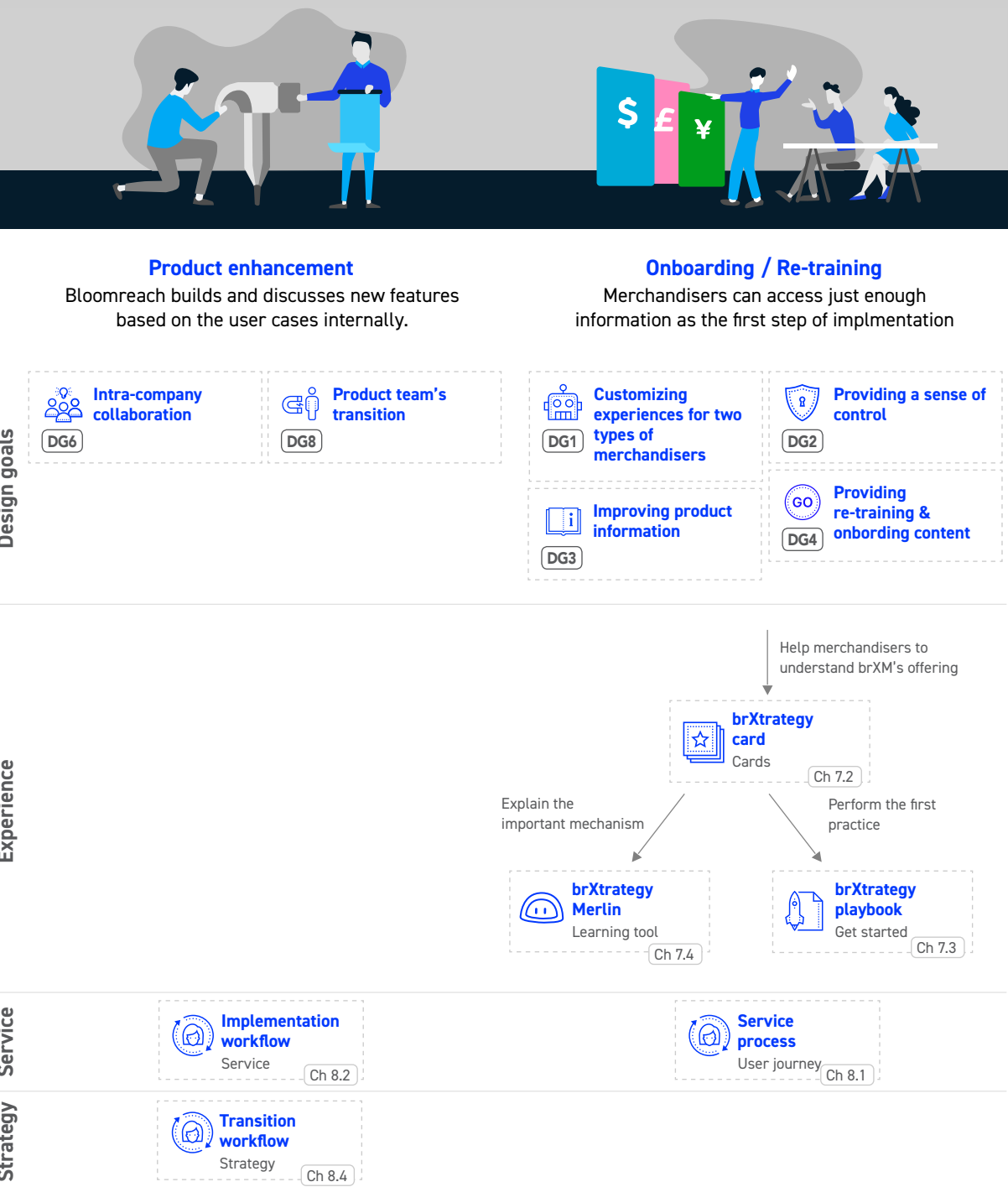


Figure 53. Structure of the design solution in the product enhancement and onboarding / re-training phase

Service phases

To support merchandisers in the different service phases and enable Bloomreach to deliver the solutions, the design deliverables are mapped into the service process chart to specify the purpose (Figure 53, Figure 54).

Product enhancement

Product enhancement is where R&D teams develop new features. A use-case oriented approach that improves internal alignment (DG6) is applied. It is further influence how Product team response to the feedback. Therefore, the transition of Product team should be introduced (DG8). We also address these goals with a service design plan and transitional workflow.

Onboarding / Re-training

Merchandisers start to learn brSM in the Onboarding or Re-training phase (DG4). We address the need of clear introduction (DG3) that is customized according to merchandisers' needs (DG1) in the chapter. Explanation of the system in an interactive approach also helps them to gain a sense of control (DG2). The experience designs including brXstrategy Card (merchandisers' practice cards), brXstrategy Merlin (a learning tool) and brXstrategy Playbook are introduced to help merchandisers to learn the product better. These solutions are incorporated with intracompany collaboration plan (DG5) to clarify how to integrate the information with existing services.

New feature rollout

During the introduction of a new feature, Bloomreach should communicate the benefit of it, and convince clients to allocate resources and implement the feature (DG4). We aim to improve the

communication strategy of new features (DG3) for two types of clients (DG1). On experience level, we use brXstrategy Insight, a weekly email service, as a touch point to notify users of new brSM updates. It leads users to brXstrategy Playbook that provides further introduction and integration information. Furthermore, in the long-term plan, we incorporate the brX product plan, and thus make the design solution future-proof (DG7).

Continuous learning

In the long-term, Bloomreach should ensure continuous interaction and adaption between merchandisers and the system. Providing customized feedback and suggestions (DG1) that improve the sense of control from merchandisers (DG2) can facilitate the process. We use the brXstrategy Insight and Loading tip to take the initiative to interact with merchandisers.

Design deliverables

Considering the complex context, a comprehensive design package is introduced. According to the implementation framework of service design [20] [21], the design deliverables can be categorized into three levels, experience, service and strategic level (Figure 55).

Experience design

At the experience level, we aim to deliver solutions that improve ML-merchandise interaction and feature information. Four designs are introduced.

brXstrategy Card (Ch7.2)

The card set introduces a wide range of merchandising practices that improve

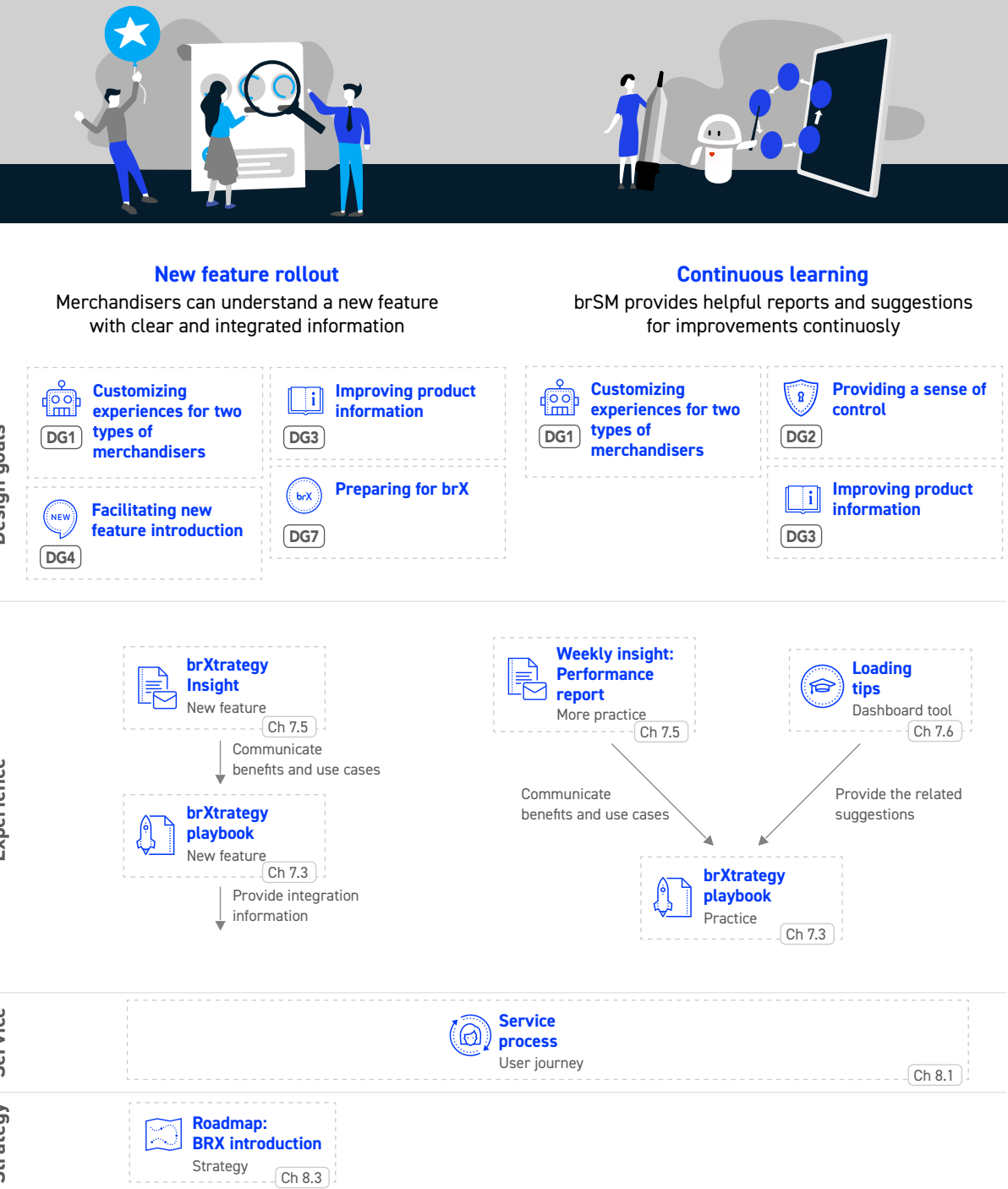


Figure 54. Structure of the design solution in the new feature rollout and continuous learning

relevancy and revenue. The card specifies the action types (evaluation, setup, A/B test, and validation) and merchandiser types (curator & optimizer, addressed in Ch6.3) with simple tutorials. It enables merchandisers to find useful practices that fit their context easier along with actionable suggestions that they can apply right away.

brXstrategy Playbook (Ch7.3)

Organizing the documentation in line with business needs and challenges, the merchandising playbook provides feature explanations in a use-case oriented way.

brXstrategy Merlin (Ch7.4)

The interactive learning tool helps merchandisers to understand the important algorithms that perform in the system, the key metrics that are consumed by the algorithms, and their influences in merchandising experiences.

brXstrategy Insight (Ch7.5)

Since the merchandisers might not engage to Dashboard frequently, routine newsletters that display algorithms feedback and suggestions are used to provide proactive interaction from brSM.

Loading tip (Ch7.6)

During the data loading in Dashboard, the system provides the random tips that related to a merchandiser's current activity on the system.

Service design

Feature communication is an ongoing activity. A service design is introduced to explain what experiences are provided in the key moments, and how to collaborate internally to deliver experiences.

Journey map (Ch8.1)

The journey map explains how two personas experience the implementation services with different information and how the new tools facilitate the existing

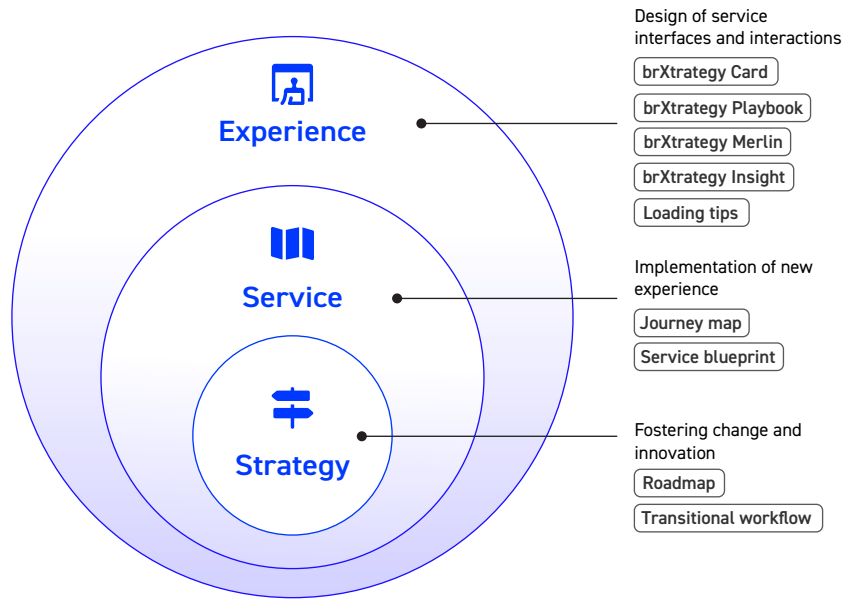


Figure 55. Mapping the solution in the implementation framework of service design

Service blueprint (Ch8.2)

A future-state service blueprint explains how multidisciplinary teams collaborate in six stages where merchandisers interact with brSM and BloomReach’s representatives.

Strategic design

At the strategic level, we address the strategic plan that fosters change and innovation, including the roadmap that considers the future product plan of brSM, and the transitional workflow for Product team that facilitates the solution implementation.

Roadmap of brSM (Ch8.3)

The roadmap introduces four horizons to execute the project: the Minimal Viable Product (MVP), Initial support, Introduction of brX, and Advanced support.

Transitional workflow (Ch8.4)

The workflow design helps Product team to transit from technical-focused culture to a more business-driven one. It introduces several tools for the team to become a translator between R&D and field teams.

6.3 Persona

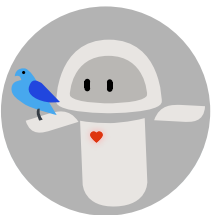
Two types of merchandisers have been identified, Curator and Optimizer, with different contexts, tasks and preferences.

We have conducted comprehensive research to understand merchandiser’s high-level business goal (Ch2.1), business context (Ch5.3), operational tasks (Ch5.1), and interaction between ML (Ch5.2). We will use this part to summarize the findings regarding merchandisers in the previous analysis.

Due to the characteristics of the products which these merchandisers promote, it leads to different merchandising strategies, including digital experiences that they create, different VMD techniques and different collaboration models with the algorithms.



Curator



Optimizer



Curator

Fresh and appealing product selection is the key to success

Goal

Curators believe that providing the best digital shopping experiences by fresh and appealing product selection is the best strategy. They understand the market trends, predict the products that customers love, and present them in the most visually appealing way.

their digital stores. No matter where they come, merchandisers always customize sophisticated product selection for customers to choose from.

Characteristics



Visual-oriented products



Brand image



Market campaigns

Visual-oriented products

The products that curators promote are visual-oriented like apparel, furniture and decorative items. It makes conventional VMD techniques important in the digital setting since the visual attraction is more important in the case.

Brands

Curators may work for brands that selling the exclusive and unique product selection. They prepare product selections that align with the brand image.

Market campaigns

The core of the curator's tasks is marketing campaigns. They have scheduled campaigns to follow. According to the timeline, they will select products, decide copywrites, choose imageries, and curate the visual presentation on the website.

Experience analogy

Curators want to create online experiences which are similar to physical shops. They have curated several paths with information that facilitate purchases. Customers walk through their selections, pick up products they are interested, and head to the counter. The sophisticated experience is rich in-depth yet easy to access.

VMD techniques

Marketing campaigns are the main thing surrounded by all merchandising activities. Firstly, curators perform pre-sale campaigns to validate their selection with A/B testing. Then, they curate offerings for all possible channels including different mediums (external search engines or campaign information)

and onsite search queries. When the campaign rolls out, they monitor the results and deals with problems when the performance drops.

Interaction model with ML

Curators apply a human-led collaboration model where they make the major decisions based on internal signals that the system provides, or external signals based on their domain knowledge. Thus ML is used as an assistive component that fills in "gaps" that curators miss.

Figure 56 shows curators apply a data-driven approach, and therefore they use Evaluation (69%) and Validation (79%) frequently. Category experiences are more important, while search experiences are a supportive feature helping customers find the right purchase path. To make sure the customers can always find the selected products, they rely on hard controls heavily.

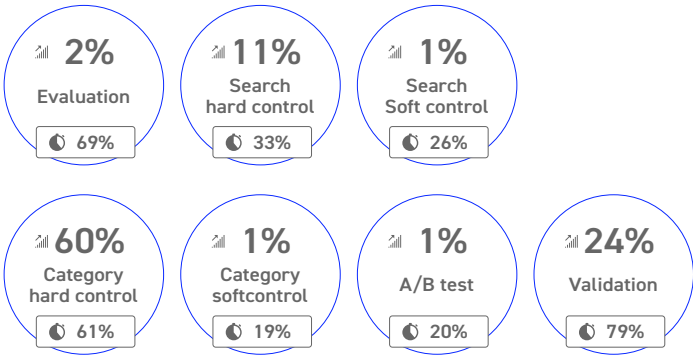
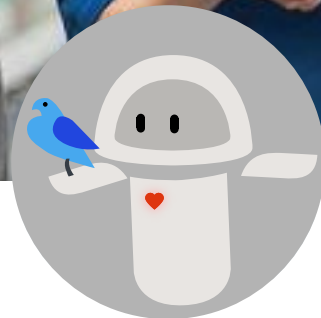


Figure 56. Interaction records of Curator



Optimizer

Provide best experiences with the most relevant results

Goal

Optimizers believe providing the most relevant result will not only help their customer to find products faster, but also drive the revenue of their digital shops. Due to the complexity of their product portfolio, they collaborate with ML in a data-driven approach to identify blindspots in the customer journey and

discover customers' needs.

Customers may have difficulties to find products, and therefore use the onsite search engine with fuzzy-defined queries. Curators help customer to find products by understanding their intents, and train the algorithm to interpret them better.

Characteristics



Function-oriented products



Wholesale with a large product portfolio

Function-oriented products

The products that optimizer promotes are functional products with complex attributes such as sizes, specifications, or purposes. When customers don't know the exact product they are looking for, they will try to search.

Wholesale with a large product portfolio

Optimizer's company may be a wholesale business that has a variety of products categories. In the case, customers could use search to find the products. Also, by using filters in category pages, they can find the products easier.

Experience analogy

Optimizer aims to create smooth search experiences as if customer were asking staffs for product information in physical shops. When staffs understand the needs of customers, they can suggest the most useful products on the shelf in a short time. The supportive services let customers trust the shop and the staffs' expertise.

VMD techniques

Optimizers care about the quality of algorithmic results. They pay attention to how algorithms perform, improve ML's capacity to interpret queries, and avoid to create actions that cause noises.

Optimizers evaluate the current search results, identify the failures, and improve them by creating synonyms that help algorithms to interpret the query or expand the search scope in case of short results. Besides, since customers use filters to scope down the search range, optimizers ensure the facet items are

clear and useful.

Interaction model with ML

Optimizers apply machine-led approach where algorithms will take the lead to make decisions, while optimizers monitor these algorithms and modify them when necessary.

Figure 57 shows they inspect the algorithmic results frequently (with 89% of frequency and 47% of engagement level) Both search and category pages are equally important to optimizers (26% for search and 20% for category). They perform modifications by soft controls (25%) and hard control (21%) evenly when the problems occur.

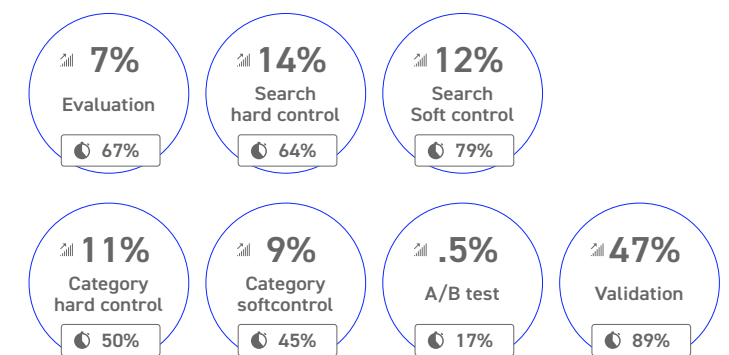


Figure 57. Interaction records of Optimizer



Expereince design

Chapter 7

brSM is a powerful merchandising tool with an advanced ML capacity that differentiates per se from the competitors. However, the interfaces and information of brSM has a functional focus, and don't facilitate merchandisers to get the most out of the product. It leads to the barrier between R&D teams (who build and plan the products) and field teams (who communicate the product to clients). For merchandisers, the product is complex and the information is hard to understand. And they thus have difficulties to implement the products.

Based on the design goals, we will introduce four experience design solutions in the chapter. We firstly

explain **brXtrategy family** and its use cases. Then **brXtrategy Cards** are introduced as the first service touchpoint. From the link provided by the cards, merchandisers visit **brXtrategy Playbook** that explains further information. Besides, **brXtrategy Merlin** explains the mechanism of brSM algorithms in an interactive approach. To ensure these merchandisers can receive the **brXtrategy Insight** from the system, a newsletter design is used to raise the awareness of the design. Furthermore, **Loading tip** provides the merchandising suggestions when the data is loading in Dashboard, making the brXtrategy contents more discoverable.

7.1 brXstrategy family

brXstrategy is a tool that provides merchandising inspirations to brSM users.

There are five designs in brXstrategy family that present merchandising inspiration in different mediums (content presentation) or deliver the information to users (content delivery).

On the content presentation front, in order to help merchandisers to understand ML's capacity, we apply three kinds of explanations (see more in Chapter 2.2) in the design. brXstrategy Cards and brXstrategy Playbook provides extensive example-based explanations [53], along with general explanations

[41] that illustrate the mechanism behind the system briefly. On the other hand, brXstrategy Merlin applies specific output explanations [53] to explain the metrics and algorithms that construct brSM system. With these explanatory approaches, they reduce the knowledge gap for merchandisers.

On the content delivery front, we use brXstrategy Insight and Loading Tip that deliver the content links to the touchpoints where merchandisers more likely engage with. It also helps to raise the awareness of the merchandisers when Bloomreach introduces the new service.



brXstrategy
card



brXstrategy
Merlin



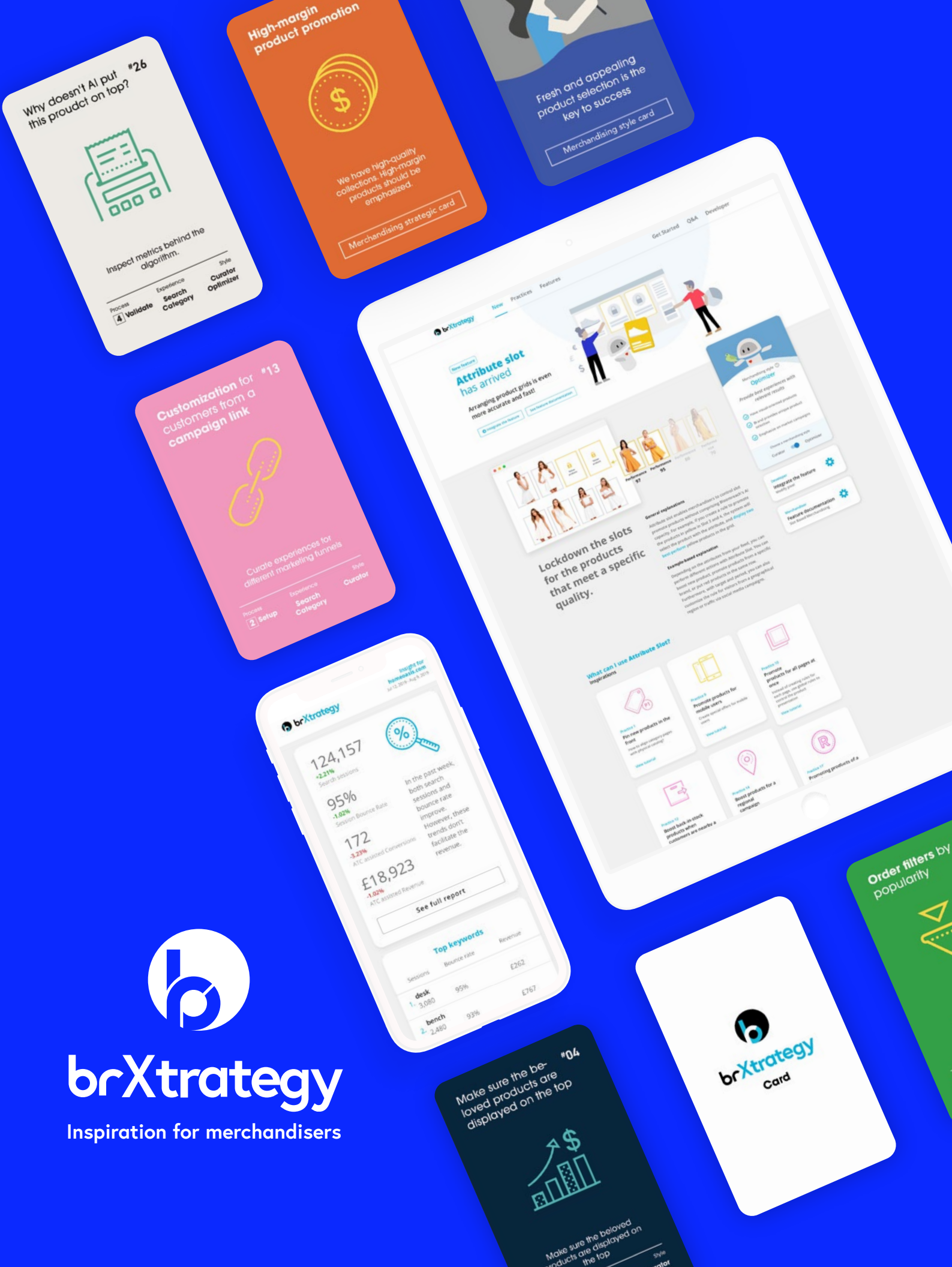
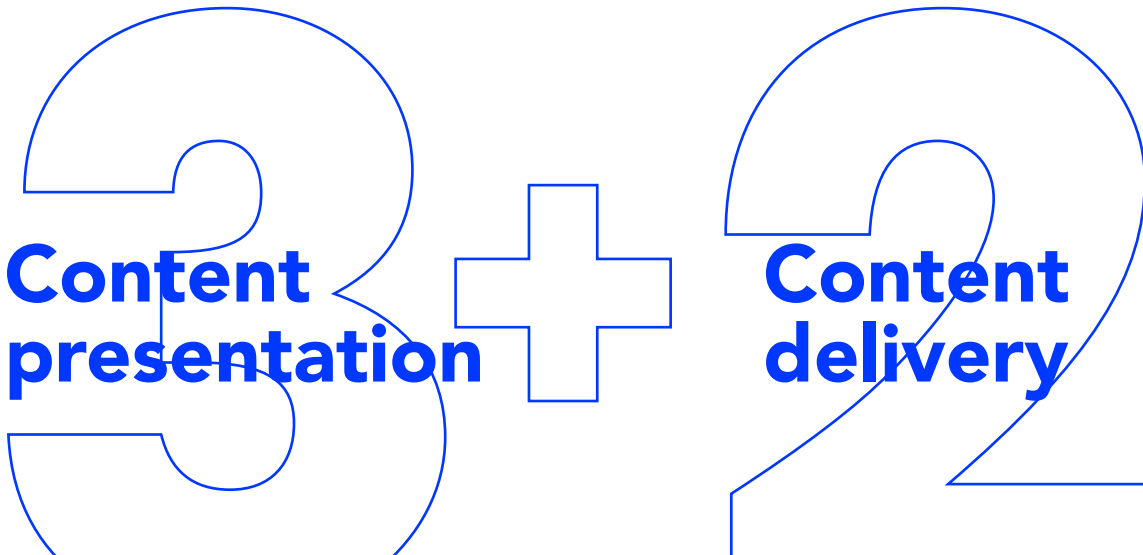
brXstrategy
playbook



brXstrategy
Insight



Loading
tips



Scenario

In Ch4.3, we investigate the service of brSM and identify nine phases in the service. Specifically, there are three phases that merchandisers interact with the system for different purposes. In the onboarding, merchandisers aim to learn the product effectively and efficiently. When a new feature of brSM is introduced, merchandisers want to be informed about the function and business benefits. And thus they can allocate resources to integrate it. In the continuous learning,

merchandisers engage the system to improve the results or solve the problems.

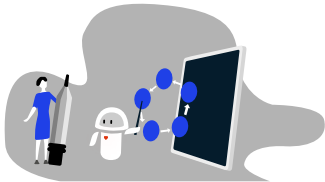
The design solutions are mapped in the three scenarios and we will explain how the solutions can improve feature communication along the way.



Onboarding &
Re-training



New feature rollout

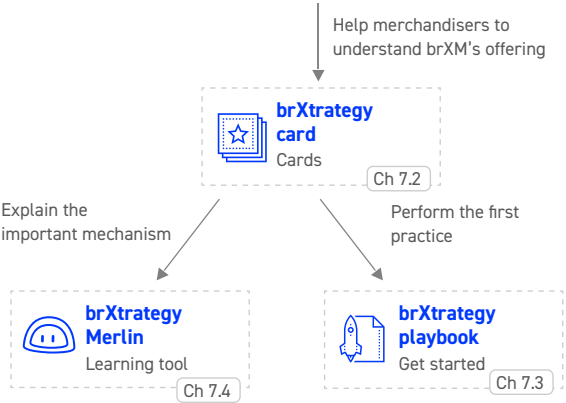


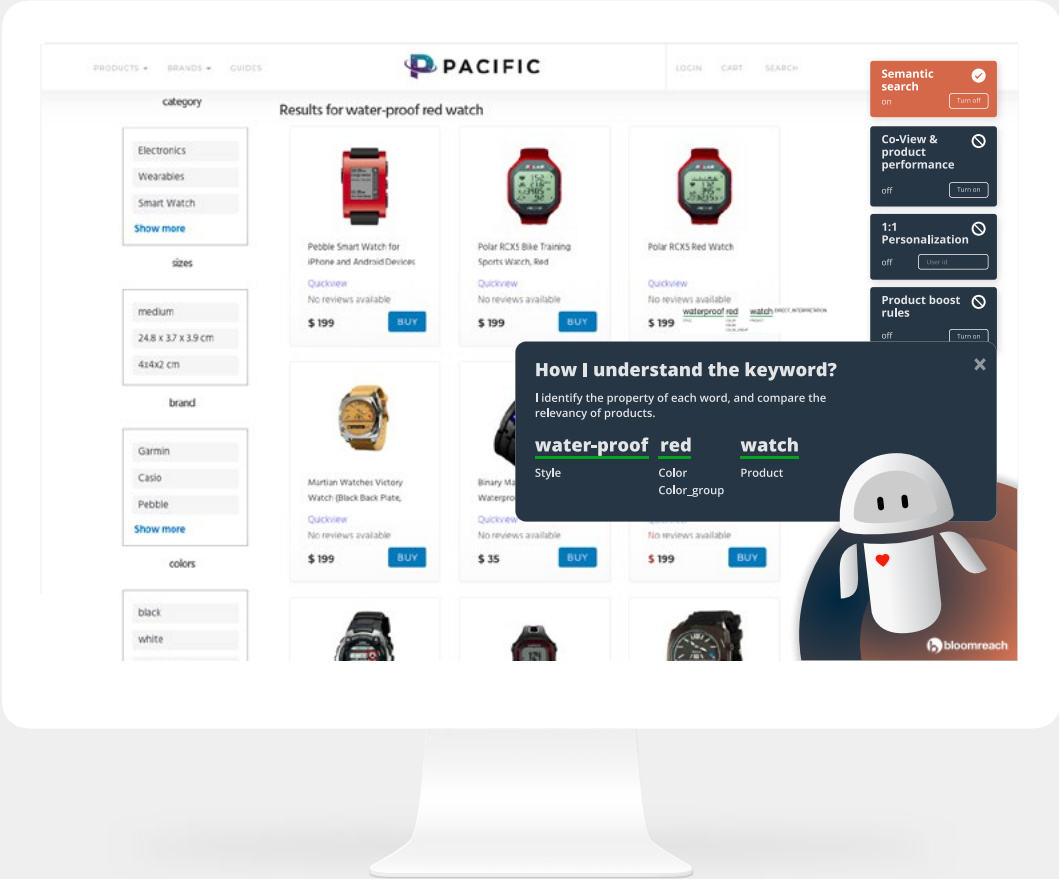
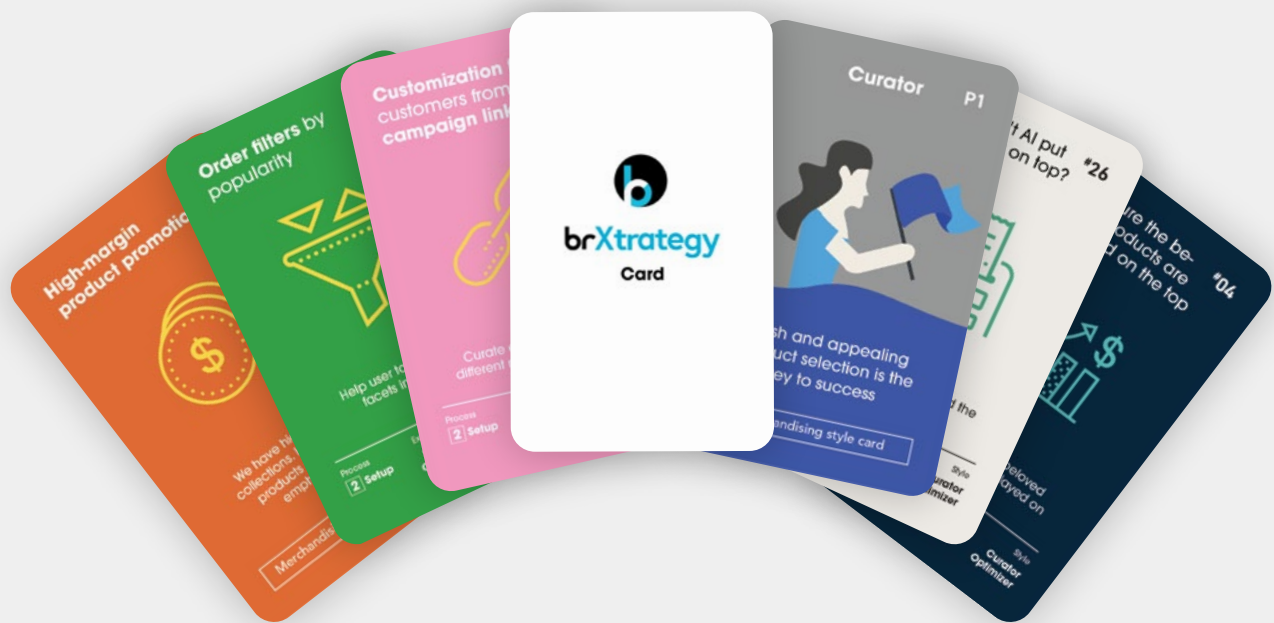
Continuous learning



Onboarding & Re-training

After a long technical preparation and series of tests, brSM is finally available for the merchandisers. These merchandisers may have prior knowledge in using other merchandising tools. They might be told that brSM is better than the other product due to its advanced AI. However, how it can deliver business values is still to be seen.



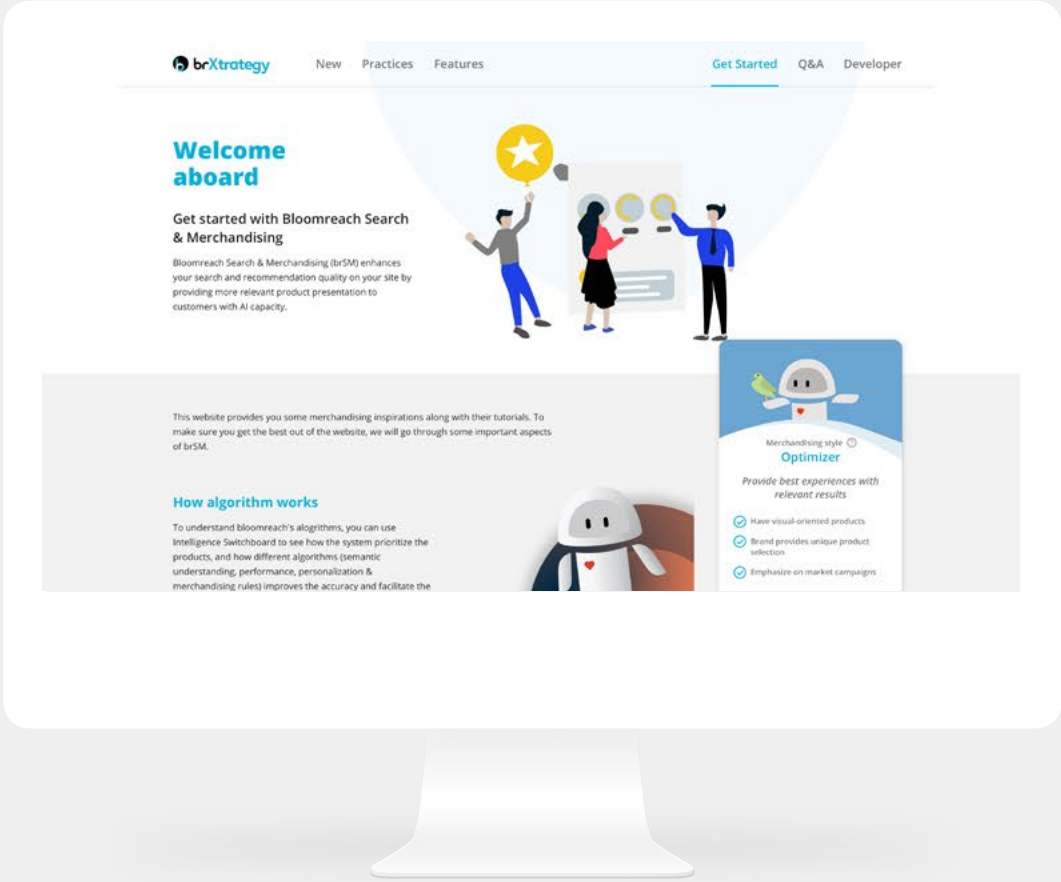


When the training start

When they participate in the training provided by field teams, they will receive the **brXstrategy Card**. The cards explain the merchandising practices that helps their work. In the back of each card, a simple instruction is provided. It shows how brSM features used to achieve a business goal. Even though not all features are integrated and not all practices are possible to perform at the moment, it can provide an overview of brSM's capacity. Merchandisers can create an integration plan to get the most from the system gradually.

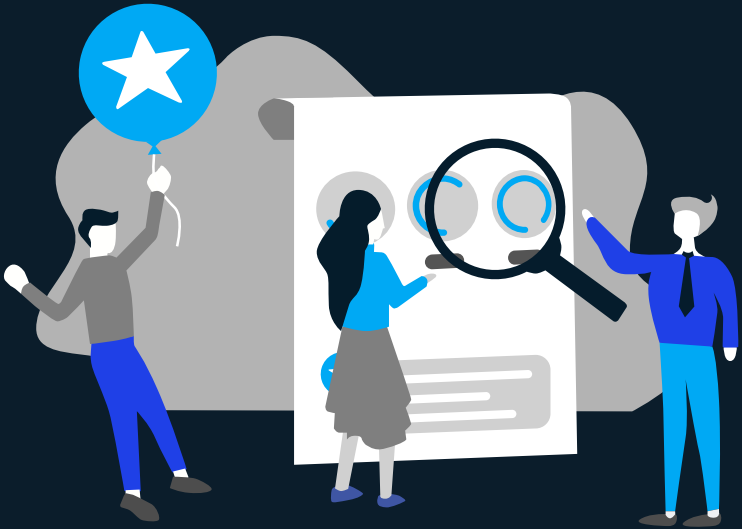
How does algorithm work?

At the beginning of the training, the mechanism of brSM's algorithms is explained by **brXstrategy Merlin**. Two important metrics, performance and relevant, are explained. They influence how algorithms provide the search results and prioritize the products in category pages. It also provides a brief explanation regarding several important algorithms like query understanding and personalization.



Get started

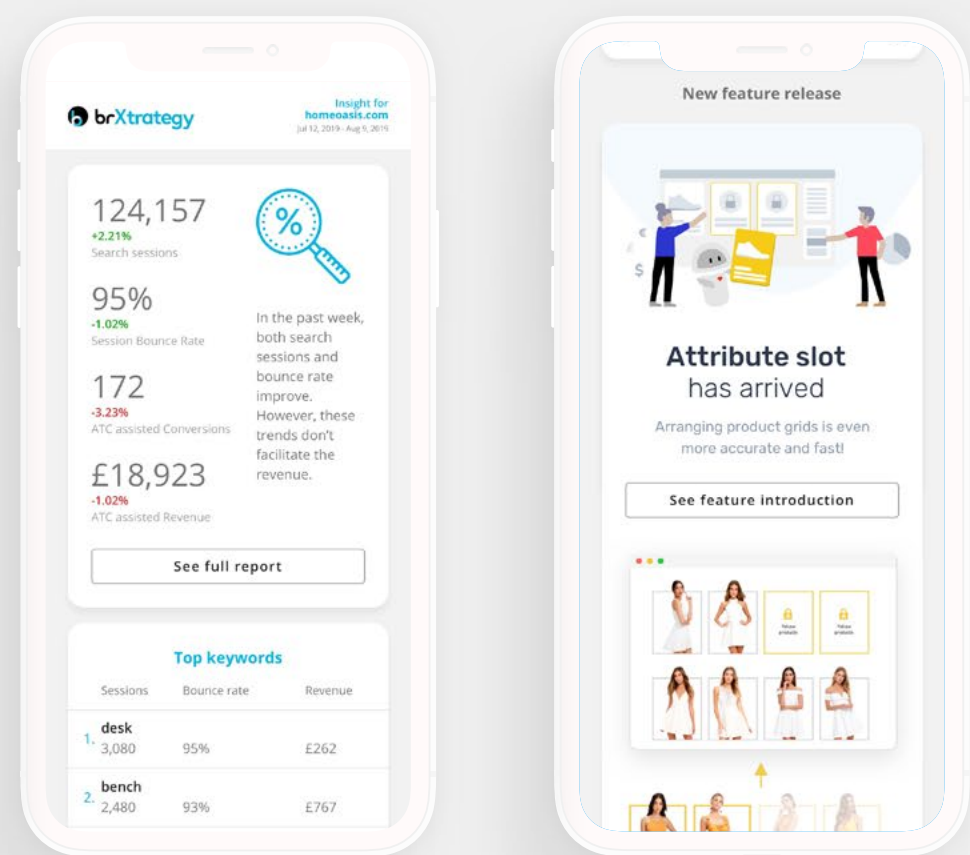
“What is the first action we can do?”, a merchandiser asks. **brXstrategy Playbook** is presented to explain the most useful techniques they can perform according to their strategy. Since merchandisers are busy all the time, these just enough information is the key to successful implementation.



New feature rollout

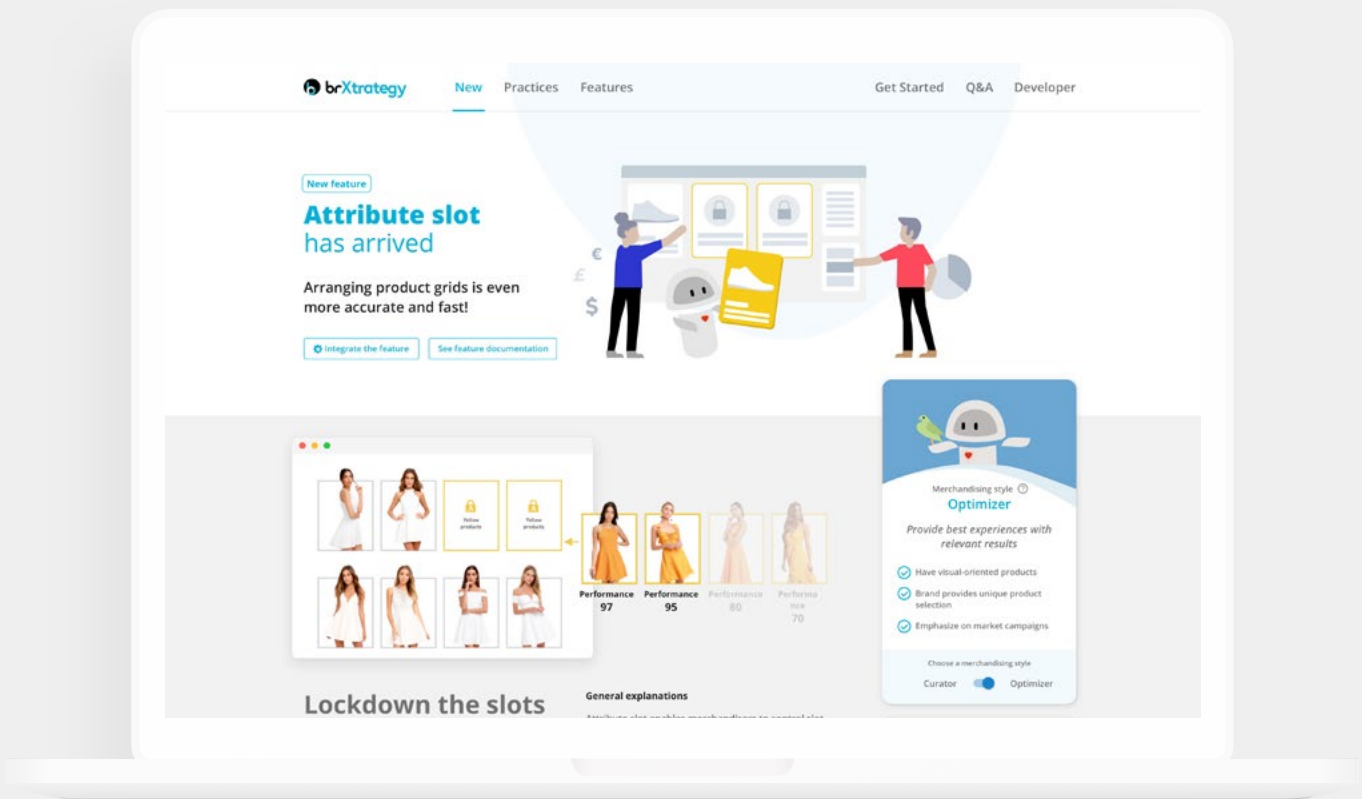
Every month, Bloomreach introduces a new feature of brSM. Merchandisers receive the information which facilitates them to integrate the feature.





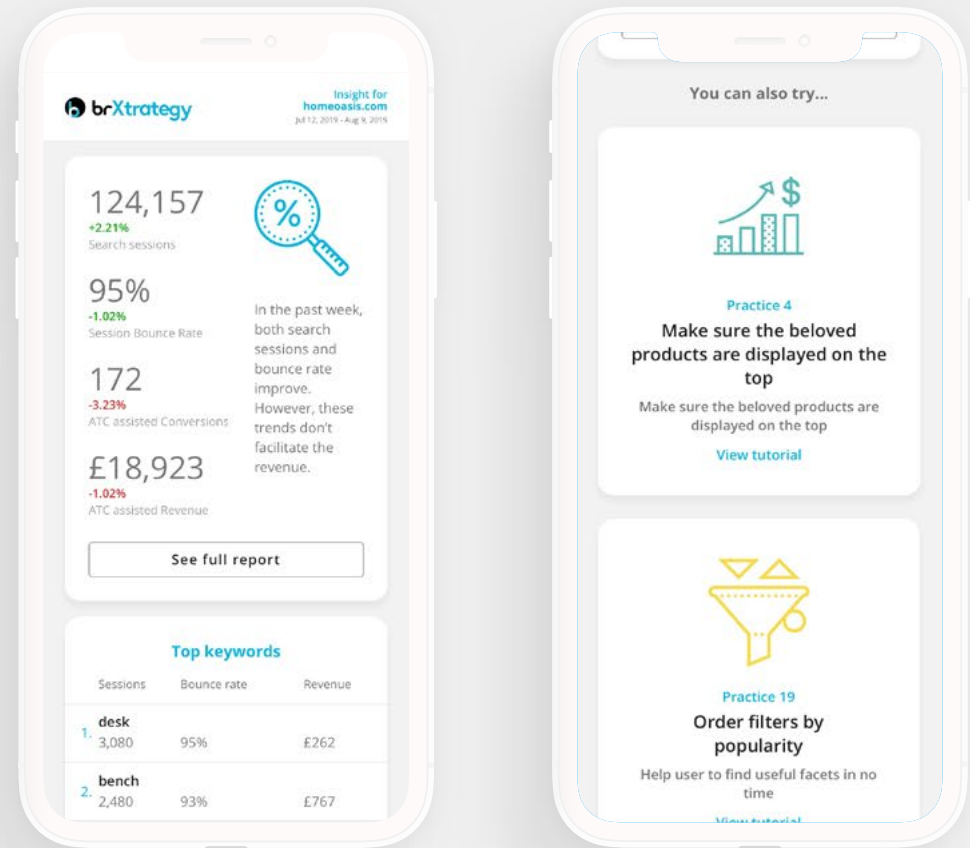
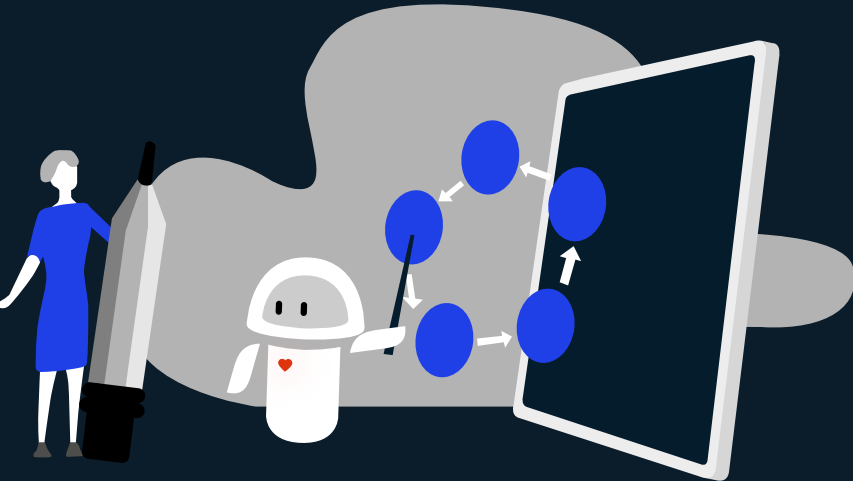
Hey, new feature!

In the morning, the merchandiser arrives at his desk, clicking the inbox, and scanning the new mails. Bloomreach sends **brXstrategy Insights** along with the new feature information. “Is it the one I have asked last month?” Merchandiser opens the mail and, unfortunately, it is not the feature he requested. “Hey, why should I bother to integrate then?” The email describes the benefits of the feature, that is customized for his preferences.



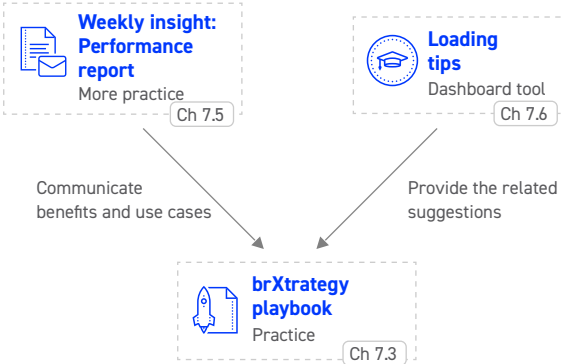
Integrate me maybe

After clicking the link to **brXstrategy Playbook**, it explains the potential practices that he can do with the feature. “Hmm... That looks interesting... Maybe I can ask engineers to check how much efforts is required?” Along with the integration information, merchandiser forwards the mail to the engineering team to see the feasibility to integrate the feature in the next month.



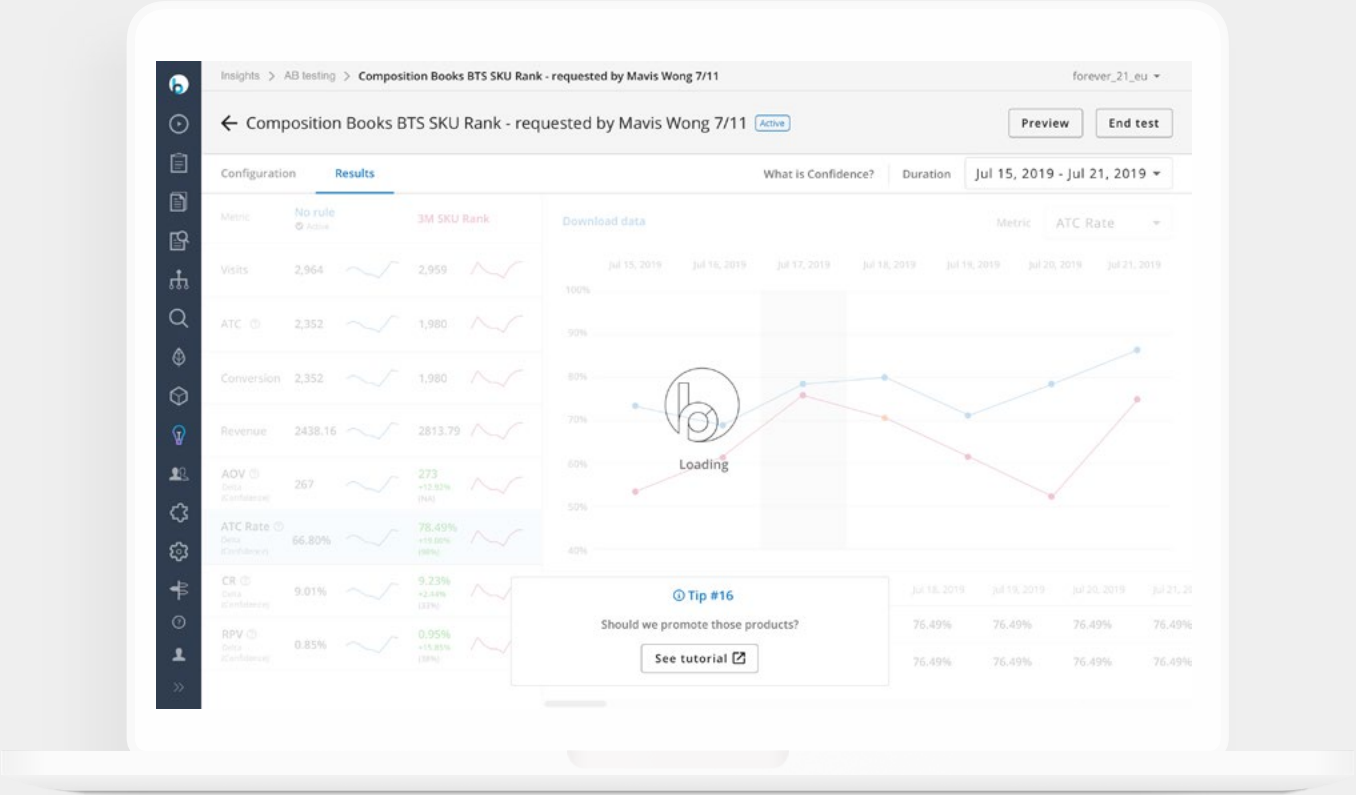
Continuous learning

With weekly Insight mails and loading tip, brSM provides feedback to merchandisers proactively. Merchandisers can understand what the system has achieved, and how to modify it if necessary.



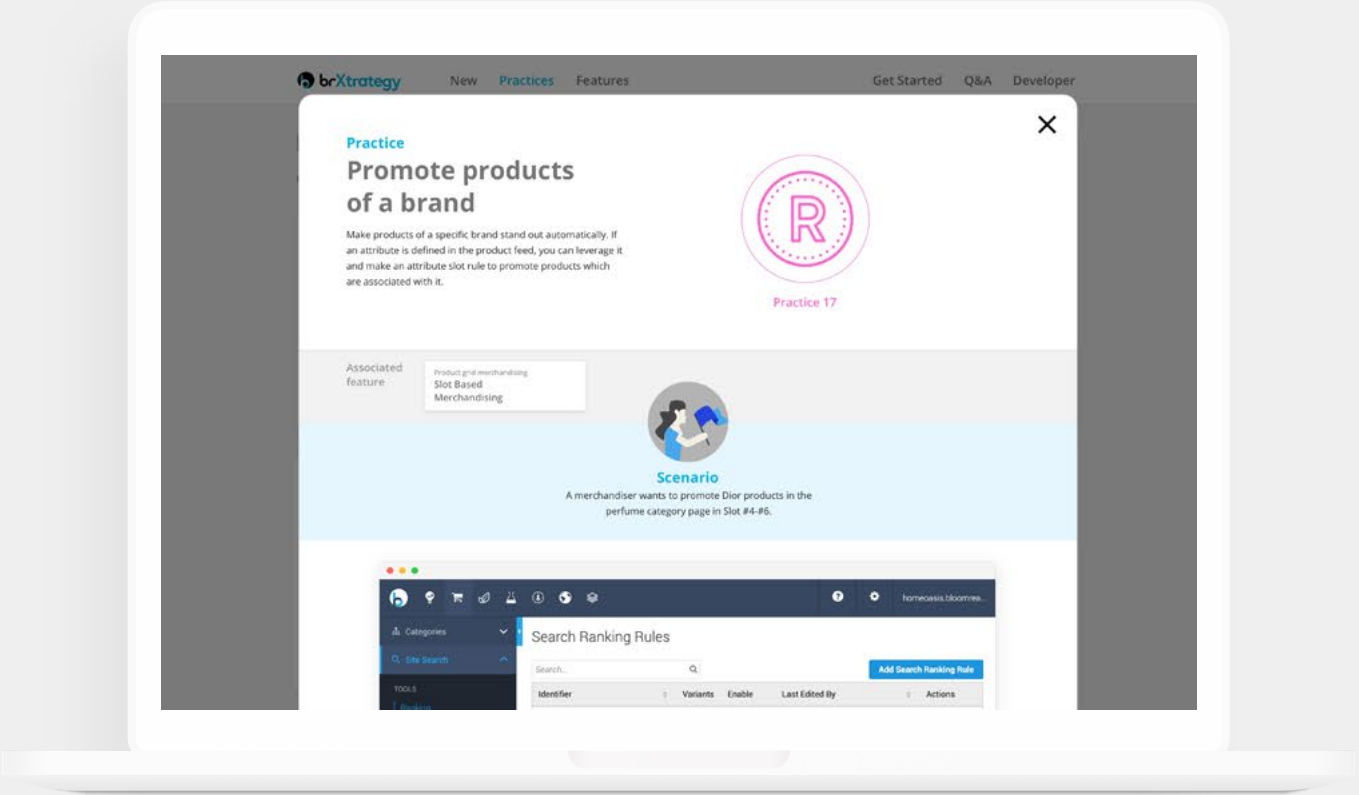
People like you also do this....

In another morning, the merchandiser receives **brXstrategy Insight**, the weekly brSM performance report. Since he is going to have a weekly team meeting to discuss the performance, he opens the mail and takes some numbers to his presentation. Along with the mail, it tells further actions he can do this week.



Maybe you can do...

Actually, whenever the merchandiser uses Dashboard, it gives suggestions regarding new practices or suggestions to avoid some problems that he tried to solve.



Repeat after me

No matter in the notification mail or message Merlin send, a brXstrategy link is provided to supplement the further information.

7.2 brXstrategy Card

The card set translates business goals to merchandising actions in brSM. Merchandisers can find the preferred merchandising practices and get technical, operational instructions.

brXstrategy cards are the core of the design solutions. The design purpose is to translate business goals to merchandising actions in brSM. Merchandisers can find the preferred merchandising practices and get technical, operational instructions. The card is prepared for two personas (curators and optimizers) to help merchandisers with different needs.

These cards provide a comprehensive set of merchandising practices to decrease labor efforts, to validate the marketing strategy, and to increase revenue. There are five types of practices introduced including evaluation, category action, search action, A/B test, and validation. Furthermore, it provides brief instructions that specify actionable suggestions on each card. Merchandisers can perform actions according to the information if they are familiar with brSM, or visit the link on the card for detailed tutorials.

Goals

Customizing experiences for two types of merchandisers (DG1)

Practices for curators and optimizers are introduced. Merchandisers can find the practice that they need according to

‘persona’ information on the cards.

Improving product information (DG3)

This card provides feature information in a use-case oriented approach that is easier for merchandisers to be understood.

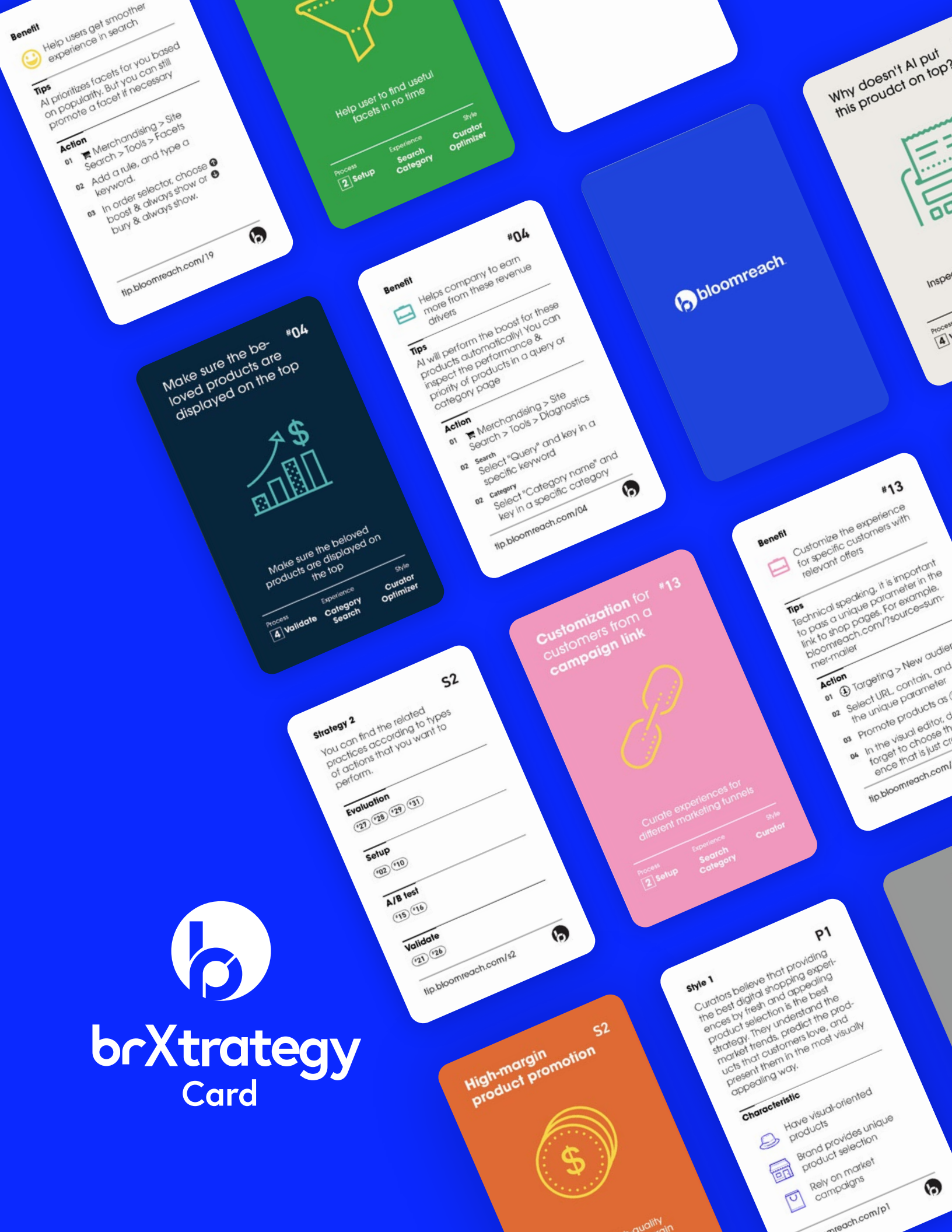
Design

Information collection

In order to organize the most useful information to create the card set, several methods are used to collect the information. Literature review (Ch2-1) provides activities of digitalization of retailing that specify merchandising strategies. VMD techniques (Ch5-1) provide merchandising insights that can be translated into actions. Moreover, by looking at the customers’ behavior (Ch5-2), the popular techniques used by current Bloomreach customers are included in the cards.

Card design

brXstrategy Cards have 42 cards (All cards are presented in Ch11.2). There are merchandising style cards, strategic cards and practice cards. Persona cards illustrate



the two merchandising styles. Strategy cards introduce high-level strategies that consist of several practices, while practice cards explain a technique along with features that associate with it.

Merchandising style cards

The cards illustrate the two merchandising styles that are introduced in Ch 6.3 (Figure 59). It specifies the style that merchandisers want to perform, and they can find the style meta on practice cards.

Merchandising strategic cards

Strategic cards introduce business needs that require several techniques to achieve (Figure 60). And seven strategies are introduced. The front side illustrates the

strategies, while the rear side explains practice cards that associate with it by reference number (#18).

Practice cards

Practice cards introduce merchandising techniques along with instructions (Figure 61, Figure 62 & Figure 63). On the front side, it specifies the meta information like process, experience and style (Figure 58). According to the workflow type, the background color changes accordingly to increase the visual separation and help merchandisers to find the similar practices.

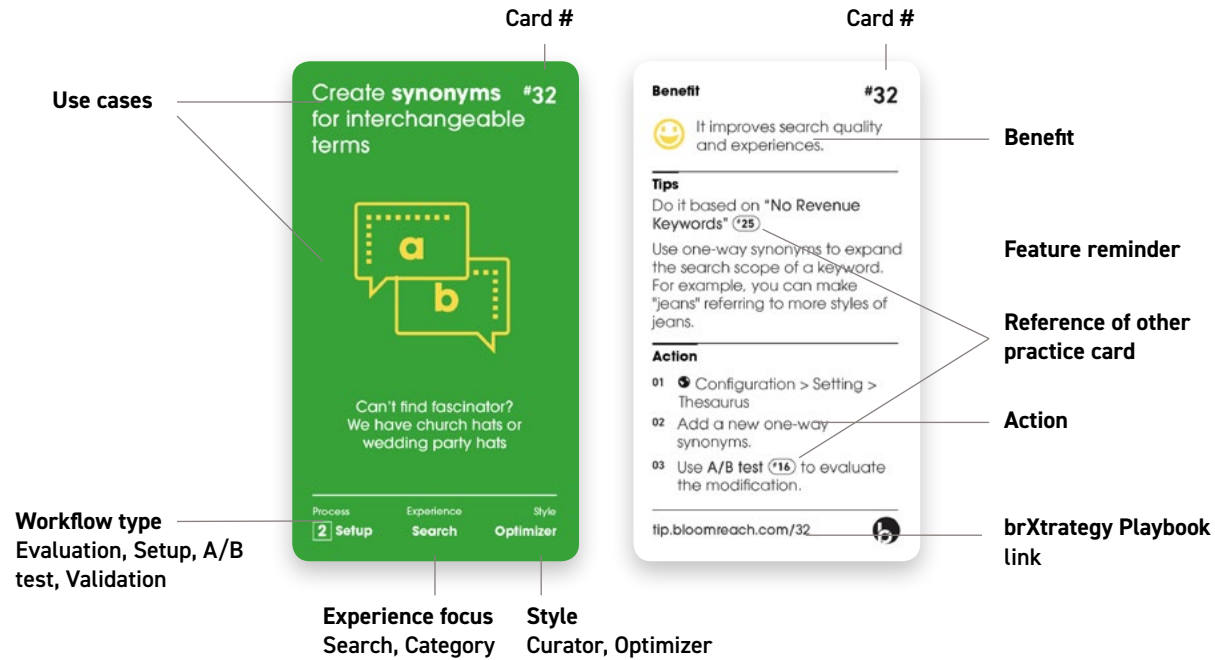


Figure 58. Content structure of practice card

Use case: Onboard

In the training session organized by Business Service team, brXtrategy cards are used to introduce the features that brSM offers in the way that clients can understand. It can facilitate clients to plan a roadmap to integrate all brSM features gradually.

Choose a merchandising card

The trainer chooses a Merchandising Style Card for clients (Figure 59). But he still explains the business context of the other style. It makes merchandisers aware of the different way to implement brSM.



Figure 59. Merchandising style cards

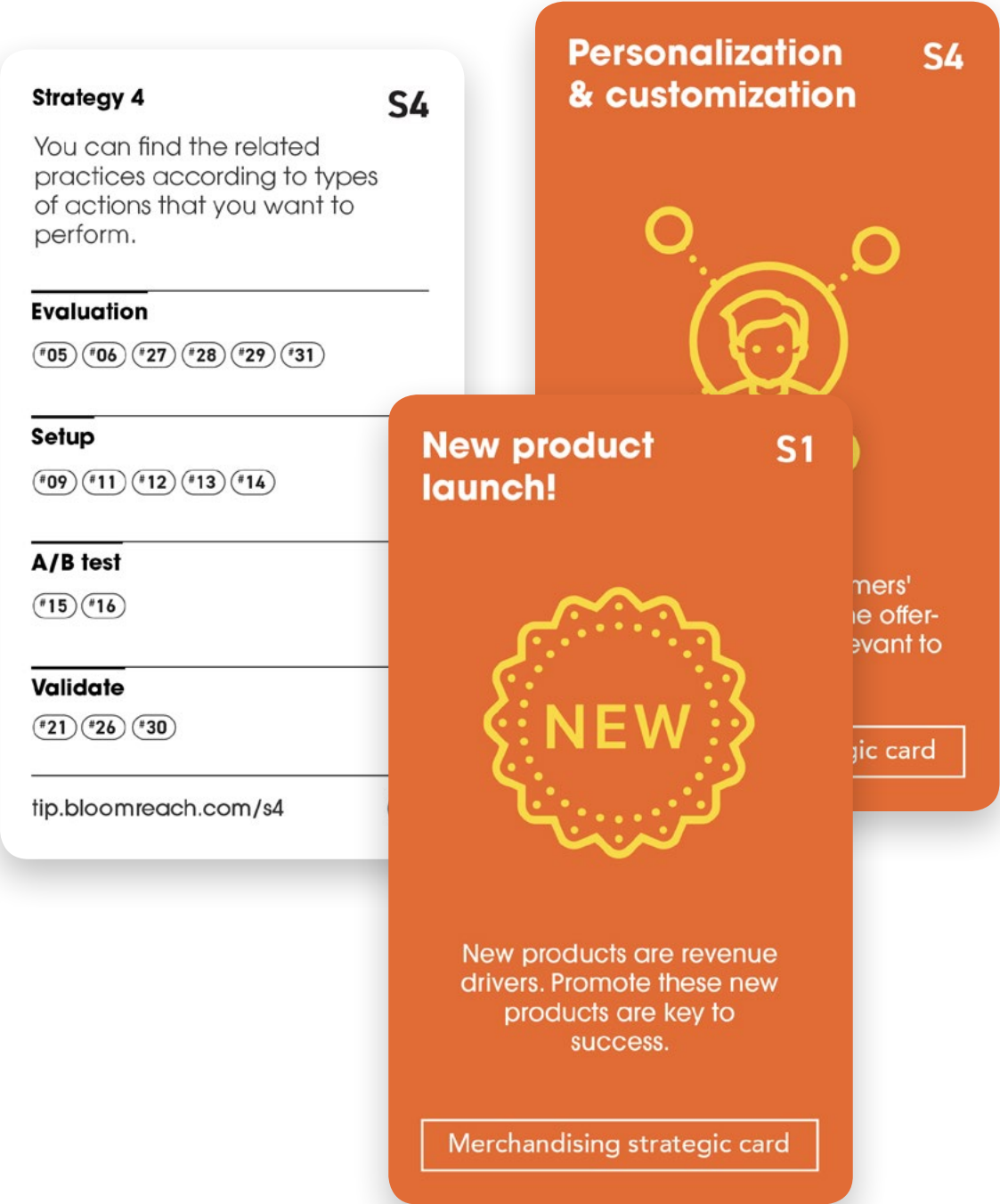
Choose merchandising strategies

Every company has its own workflow and business preferences, which influence preferred merchandising practices.

Therefore, the merchandisers can choose merchandising strategies that they want to apply, including New product launch, High-margin product promotion, Low-

priced & high-volume products focus, Personalization & customization, Sale campaign on the way, Improvement of search accuracy, and Noises & problems identified (Figure 60).

By reference numbers in the back of cards, they can find relevant merchandising practices.



130 Figure 60. Merchandising strategic cards

Choose practices

The trainer split all practice cards into five groups according to the card color. The color specifies the practices in the different workflow process, including Evaluation, Setup (Category/Search), A/B test, Validation.

According to the reference numbers

in the back of selected strategic cards, the relevant practices are selected. The trainer can explain the associated features of these cards. If there are the features that are not integrated into the client's system. They can use the cards to build the integration roadmap considering the integration complexity, engineering bandwidth, and business impact.

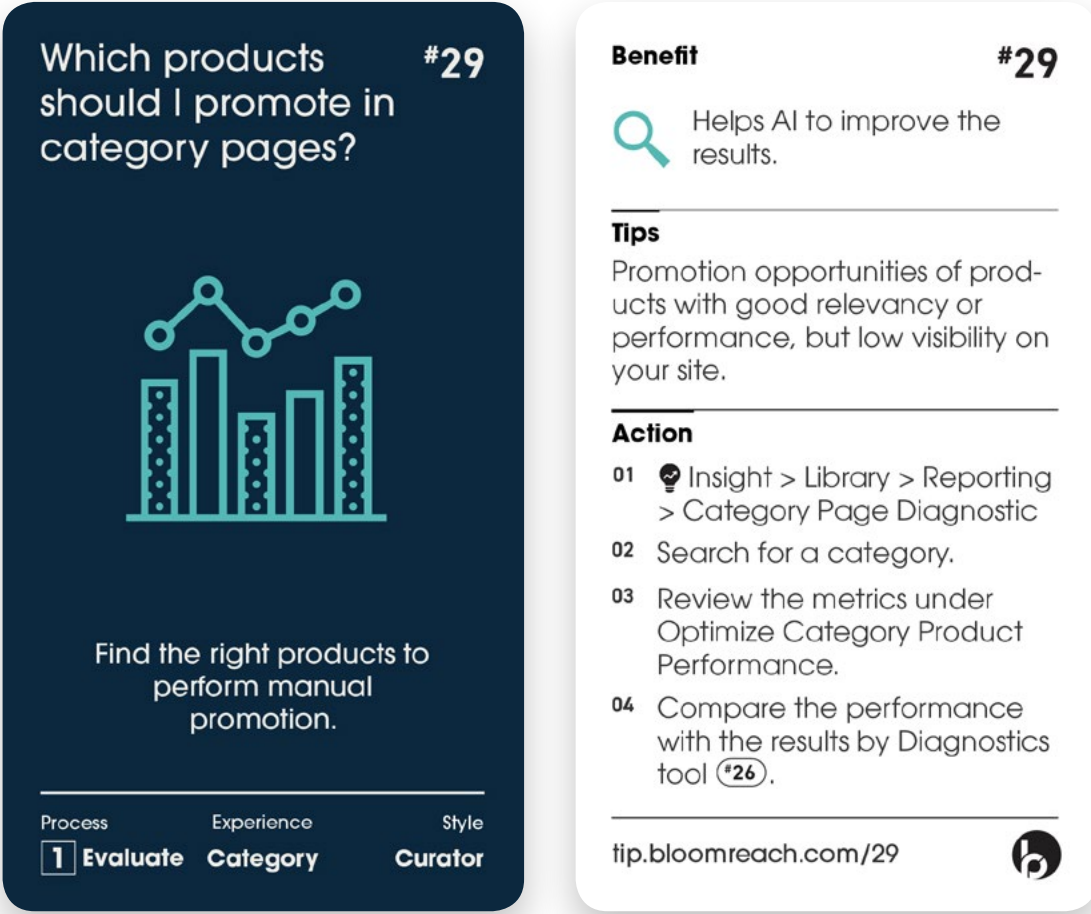
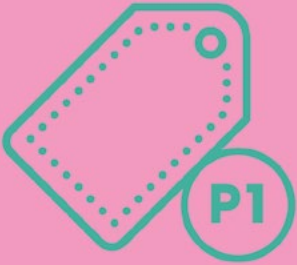


Figure 61. Practice cards (Process 1: Evaluation)

Pin new products in the front

#01



How to align category pages with physical catalog?

Process

Experience

Style


2 Setup

Category

Curator Optimizer

Benefit


#01

 Accurately curate the product order.

Tips

Use **1 boost to top** for position 1, and **lock position** for the other cases.


Action

01  Merchandising > Category Ranking > Add rules

02 In product tab, select products to pin.


03 Use **A/B test** **(#16)** to evaluate the modification.

tip.bloomreach.com/01



Should we show baby cloth in t-shirt category page?

#15



Validate whether products from a sub-category create noises for search & category pages

Process

Experience

Style


3 A/B test

Category

Curator

Benefit


#15

 Improve product selection with solid proofs

Tips

We will make an A/B test between a new rule and algo results. This technique can apply to both search and category.

Action


01  Merchandising > Category Ranking > Add rules

02 Bury product as **(#11)** and save it

03 Select a search/catalog rule and compare it with "No Manual Change"


04 Check the result when sufficient data is collected

tip.bloomreach.com/15



Order filters by popularity

#19



Help user to find useful facets in no time

Process

Experience

Style


2 Setup

Search Category

Curator Optimizer

Benefit


#19

 Help users get smoother experience in search

Tips

AI prioritizes facets for you based on popularity. But you can still promote a facet if necessary


Action

01  Merchandising > Site Search > Tools > Facets

02 Add a rule, and type a keyword.

03 In order selector, choose **1 boost** & always show or **2 bury** & always show.

tip.bloomreach.com/19



Why doesn't AI put this product on top?

#26



Inspect metrics behind the algorithm.

Process

Experience

Style


4 Validate

Search Category

Curator Optimizer

Benefit

#26

 Understand the mechanism of the AI system


Tips

Performance is based on user behavior signals such as revenue, conversions, add-to-car, views...

Relevance is based on Semantic Engine and Term Match

Total score is contributed by the two metrics and used by AI

Action

01  Merchandising > Site Search > Tools > Diagnostics

02 Find a specific category or keyword

tip.bloomreach.com/26




Figure 62. Practice cards (Process 2: Setup)

Figure 63. Practice cards (Process 3: A/B test, Process 4: Validation)

7.3 brXstrategy: Playbook

The website improves the existing documentation by a merchandiser-friendly content structure.

brXstrategy Playbook is a website that provides feature documentation in a use-case oriented approach. The purpose is to improve the existing documentation by a merchandiser-friendly content structure. It digitalizes the merchandiser's practice cards, enabling merchandisers to find suitable practices and features. Except for the feature explanation, it also provides new feature information and integration documentation.

When a merchandiser visits brXstrategy Playbook for the first time, the system asks him to choose between two personas

and memorize the decision (Figure 64). According to the selection, the different strategies and practices that fit the user's business needs will be presented. Furthermore, it deeply dives into features with their purposes, limitations, metrics, and tutorials with examples. With the improved content structure, it provides a clearer explanation, facilitates brSM's clients to integrate the (new) feature, helps merchandisers to solve system problems.

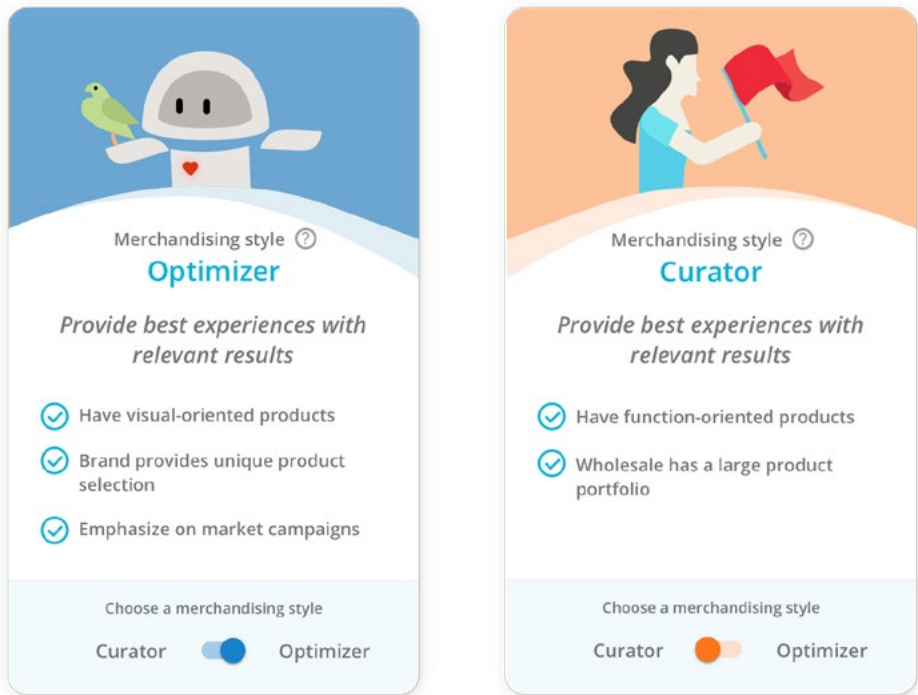


Figure 64. Merchandiser style controller



Goals

Customizing experiences for two types of merchandisers (DG1)

Merchandisers can select their type and read customized strategies & practices.

Improving product information (DG3)

Except for the content from merchandiser's practice card, brXtrategy explains the limitation of features [52] and use a different approach to explain the mechanism with general explanations [41] and example-based explanations [53].

Providing re-training & onboarding content (DG4)

It has a Get started landing page that introduces important knowledge such as algorithm mechanism, workflow, and the starters' practices.

Facilitating new feature introduction

(DG5)

brXtrategy Playbook provides an overview of a new feature, explains its value, and provide relevant technical information.

Design

There are two kinds of pages in brXtrategy. Landing pages are information for specific needs, while content pages are generic information that merchandisers can learn.

There are three landing pages that provide context-specific information, including Get started for onboarding/re-training, New feature for new feature rollout, and Q&A for error solving.

The content pages are categorized into three layers, strategy category, practice tutorial, and feature documentation, navigating merchandisers to the relevant information.

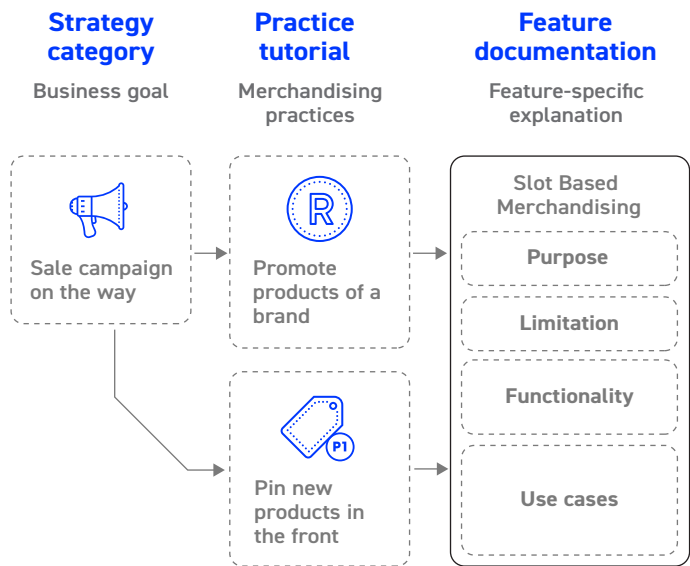


Figure 65. Structure of content pages

Some of the pages provide customized information for two merchandising styles. Merchandisers can make the decision in the selection by Merchandiser style controller.

Merchandiser style controller (Figure 64)

In pages provided practices information, a persona controller is presented that merchandisers can switch between curator and optimizer.

Website structure

Landing page: Get started (Figure 66)

In the page, it provides the basic knowledge and practices that merchandisers can perform, such as A/B test ideas or data interpretation techniques.

Landing page: New feature (Figure 73)

It introduces the benefit of the feature in the banner, illustrates the related strategies and practices, and provides links to the feature explanation and technical documentation.

Lading page: Q&A (Figure 79)

This page presents common questions that Support team receives. They can search their questions and find guidance to inspect the errors and solve the problem.

Content: strategy, practice & feature (Figure 65)

The content pages are the digital version of brXtrategy Cards, categorized into three layers, strategy category, practice tutorial, and feature documentation (Figure 65).

Strategy category is similar to the Merchandising Strategic Cards that introduce 7 common strategies and the relevant practices. Practice tutorial is similar to the Practice cards, that explain the benefit, limitation and process of a merchandising practice. Feature documentation is pages that integrate the current documentation website, allowing frequent users to find the content they need in the current format and structure.

Merchandisers select a strategy first, and the screen displays the practices belongs to it. Then when the merchandiser clicks a practice card, a modal shows a tutorial with several steps. For further explanation, a feature mentioned during the process, a merchandiser can click the link to the feature page. The feature page explains the feature in detail. It includes a list of purposes, the description of limitations to align the expectation, algorithmic metrics that influence results, and examples and practices.

Use case 1: Onboard / Re-
training

Get started

brXstrategy Playbook provides a landing page for new users to learn brSM without help from Bloomreach expert. The page introduces the mechanism with

brXstrategy Merlin (see Ch7.4), explains two merchandising styles, displays potential merchandising strategies, and workflow when using brSM.

Then the user can click ‘Go to practice’ button and see the practices.

Figure 66. brXstrategy Playbook: Get started (Part 1 of 3)

Go to brXstrategy Merlin

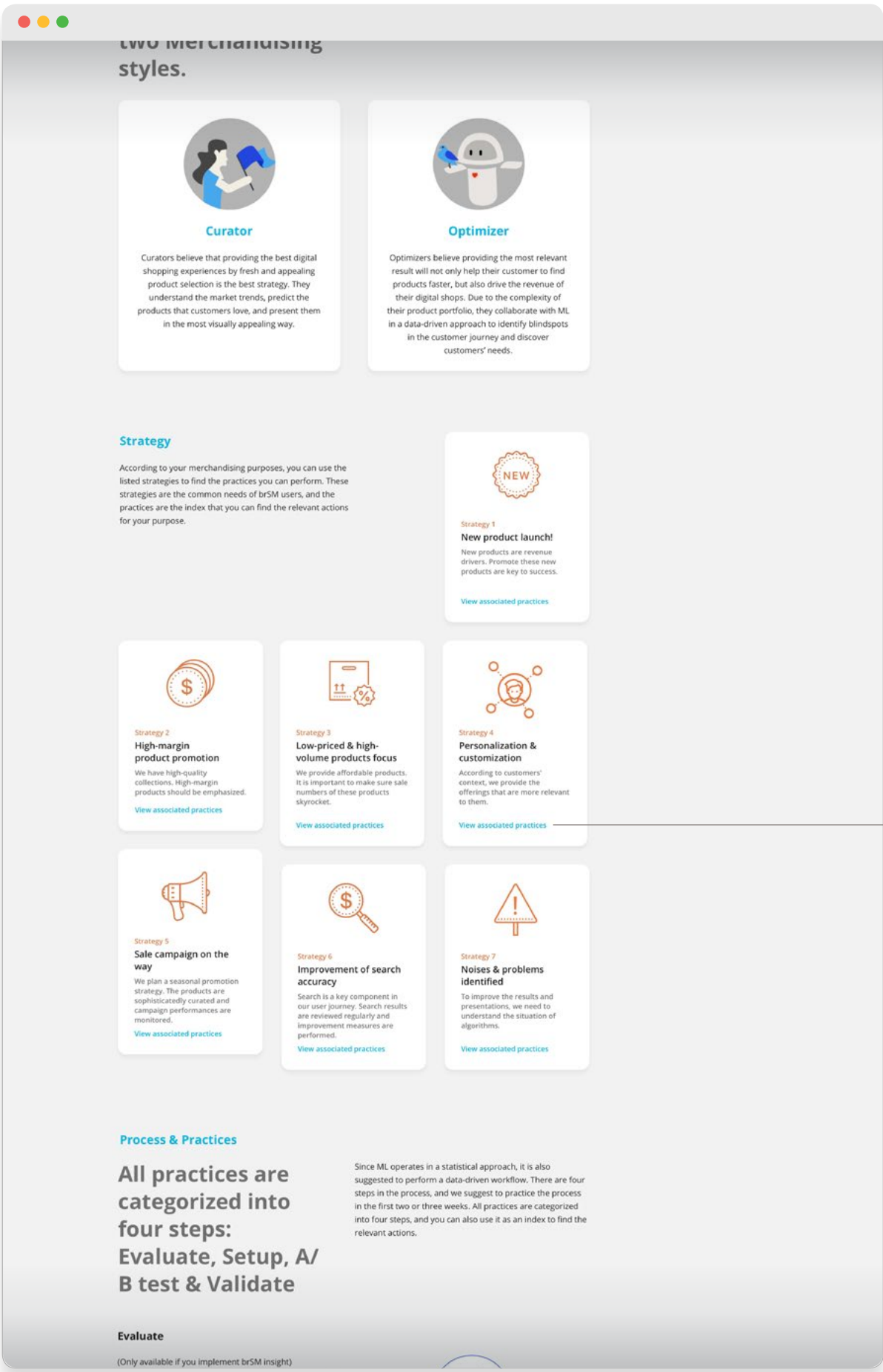


Figure 67. brXstrategy Playbook: Get started (Part 2 of 3)

Go to Figure 70

Figure 68. brXstrategy Playbook: Get started (Part 3 of 3)

Strategy 5

Sale campaign on the way

We plan a seasonal promotion strategy. The products are sophisticatedly curated and campaign performances are monitored.

View associated practices

Strategy 6

Improvement of search accuracy

Search is a key component in our user journey. Search results are reviewed regularly and improvement measures are performed.

View associated practices

Strategy 7

Noises & problems identified

To improve the results and presentations, we need to understand the situation of algorithms.

View associated practices

Process & Practices

All practices are categorized into four steps:
Evaluate, Setup, A/B test & Validate

Since ML operates in a statistical approach, it is also suggested to perform a data-driven workflow. There are four steps in the process, and we suggest to practice the process in the first two or three weeks. All practices are categorized into four steps, and you can also use it as an index to find the relevant actions.

Evaluate

(Only available if you implement brSM insight)

In the phase, you can use the reports that Insight provides to identify the opportunities to improve. These include the trends happening on your site and potential queries and pages you can review.

Setup

You can modify algorithmic results in search and categories pages in the phase. With Bloomreach Dashboard's functionality, you have various way to promote and bury product. Furthermore, you can also customize the experience for different customer according to their context or visiting time.

A/B test

We strongly recommend you to perform A/B test whenever you create a modification. It will not only help you to validate a business decision, but also enable you to understand customer's preference better.

Validation

Customer preferences drift along the way. Therefore, you can monitor the results, such as the best performance query/ category. It helps you to verify the modifications you made are still valid.

Insight, Top, Performance

Evaluation

Category & Search

Setup

Testing

A/B test

Ranking diagnostics

Validation

Start to explore your first practice

Go to practice

bloomreach

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Go to Figure 70

Practice

All merchandising practices are presented on the page. Due to their quantity, on the top of the page, it has filters for users to find the relevant practice (Figure 69). They can choose the merchandising category (strategy), merchandising style, and process (workflow phase).

The practices are categorized based on four phases in brSM workflow (Evaluation, Setup: Category, Setup: Search, A/B test and Validation). And user can click the card and see the detail in a Practice tutorial page.

Chapter 7
Expereince design

brXstrategy

New Practices Features

Get Started Q&A Developer

Category

Noises & problem identified

New product launch

High-margin product promotion

Low-priced & high-volume products focus

Personalization & customization

Sale campaign on the way

Improvement of search accuracy

Noises & problems identified

Style

Curator

Optimizer

Curator

Process

Evaluation

Setup: Category

Setup: Search

A/B test

Validation

Merchandising style

Curator

Provide best experiences with relevant results

Have function-oriented products

Wholesale has a large product portfolio

Choose a merchandising style

Curator Optimizer

Practice 25

Identify keywords with bad performance.

Which keyword does not satisfy customers?

View tutorial

Practice 31

What types of products drive interaction with my site?

Identify themes or concepts, such as low cost, hip, eco, color, pattern, and style.

View tutorial

Practice 7

What are the important keywords?

Popular keywords are sometimes the focus of merchandisers

View tutorial

Practice 21

What are the important category pages?

Popular category pages are sometimes the focus of merchandisers.

View tutorial

Practice 26

Why doesn't AI put this product on top?

Inspect metrics behind the algorithm

View tutorial

Practice 30

Can my customers find what they're looking for?

Review the performance of important keywords.

View tutorial

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Figure 69. brXstrategy Playbook: filters in Practice

Figure 70. brXstrategy Playbook: Feature (Part 1 of 3)

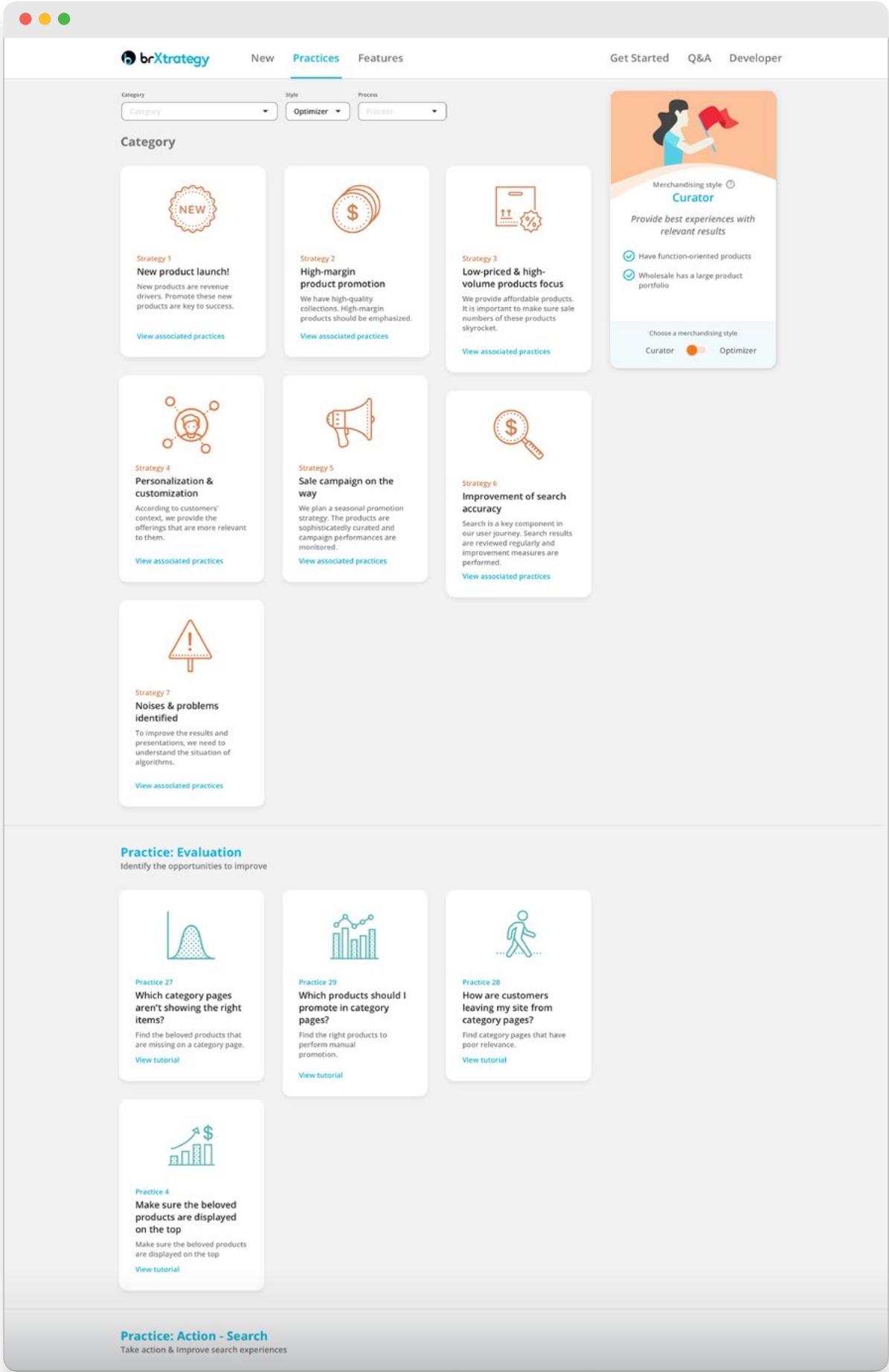


Figure 71. brXstrategy Playbook: Feature (Part 2 of 3)

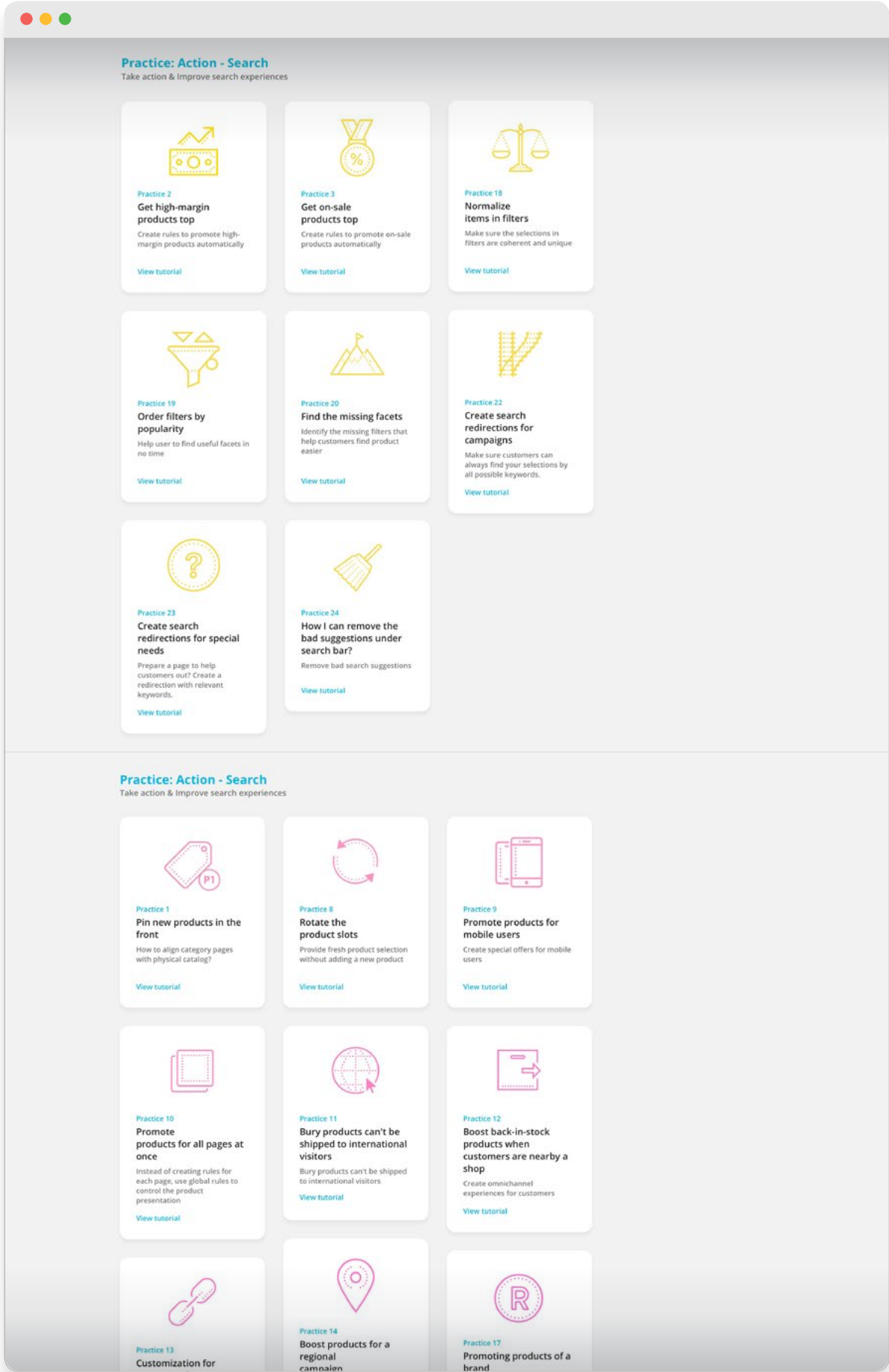
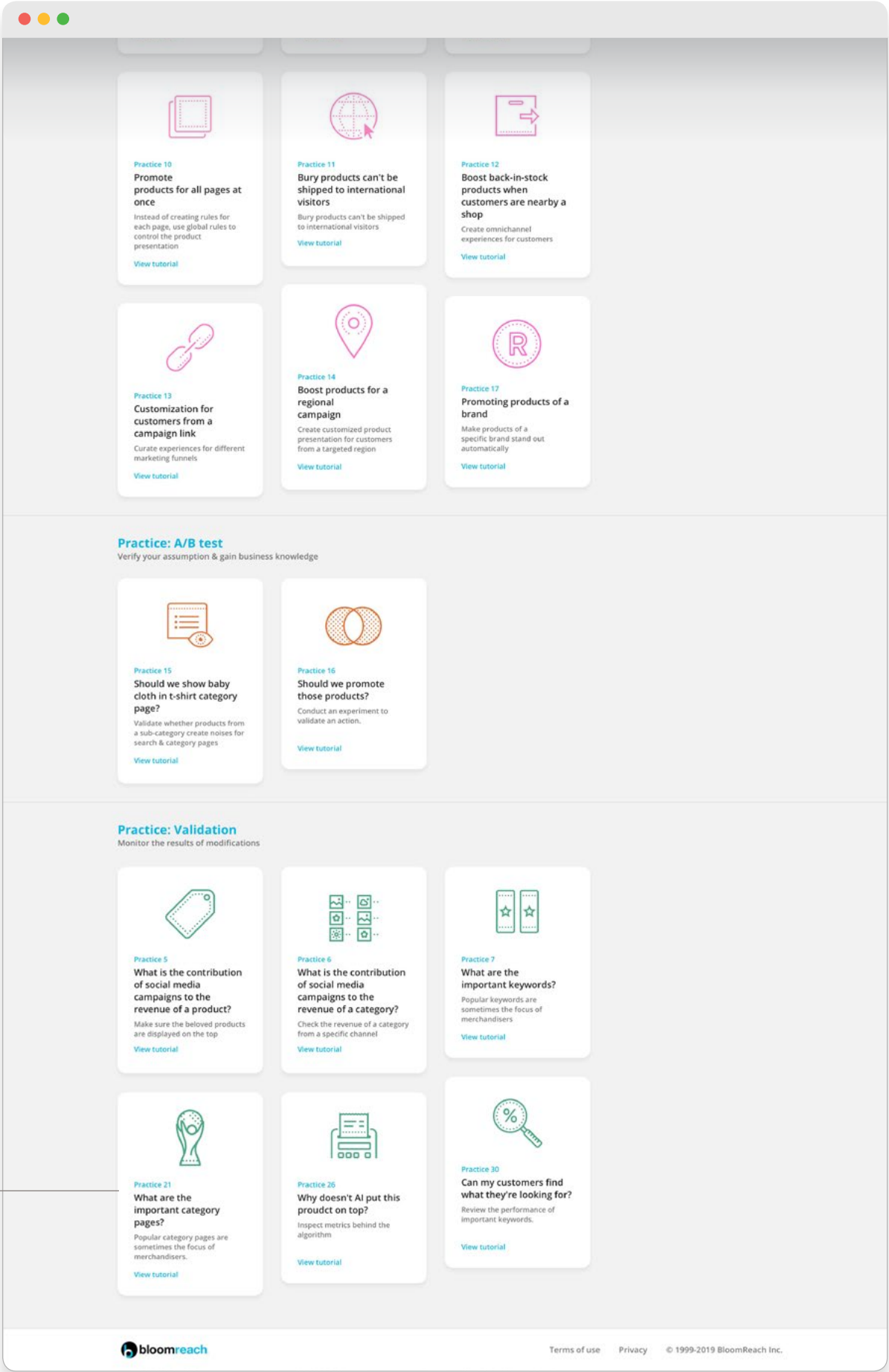


Figure 72. brXstrategy Playbook: Feature (Part 3 of 3)



Go to Figure 73

Practice tutorial

In a Practice tutorial page, it provides an example along with tips for merchandisers. It provides the link to pages of associated features, gives tips such as generic mechanism explanation or system limitation, and demonstrates a step-by-step tutorial in a merchandising example.

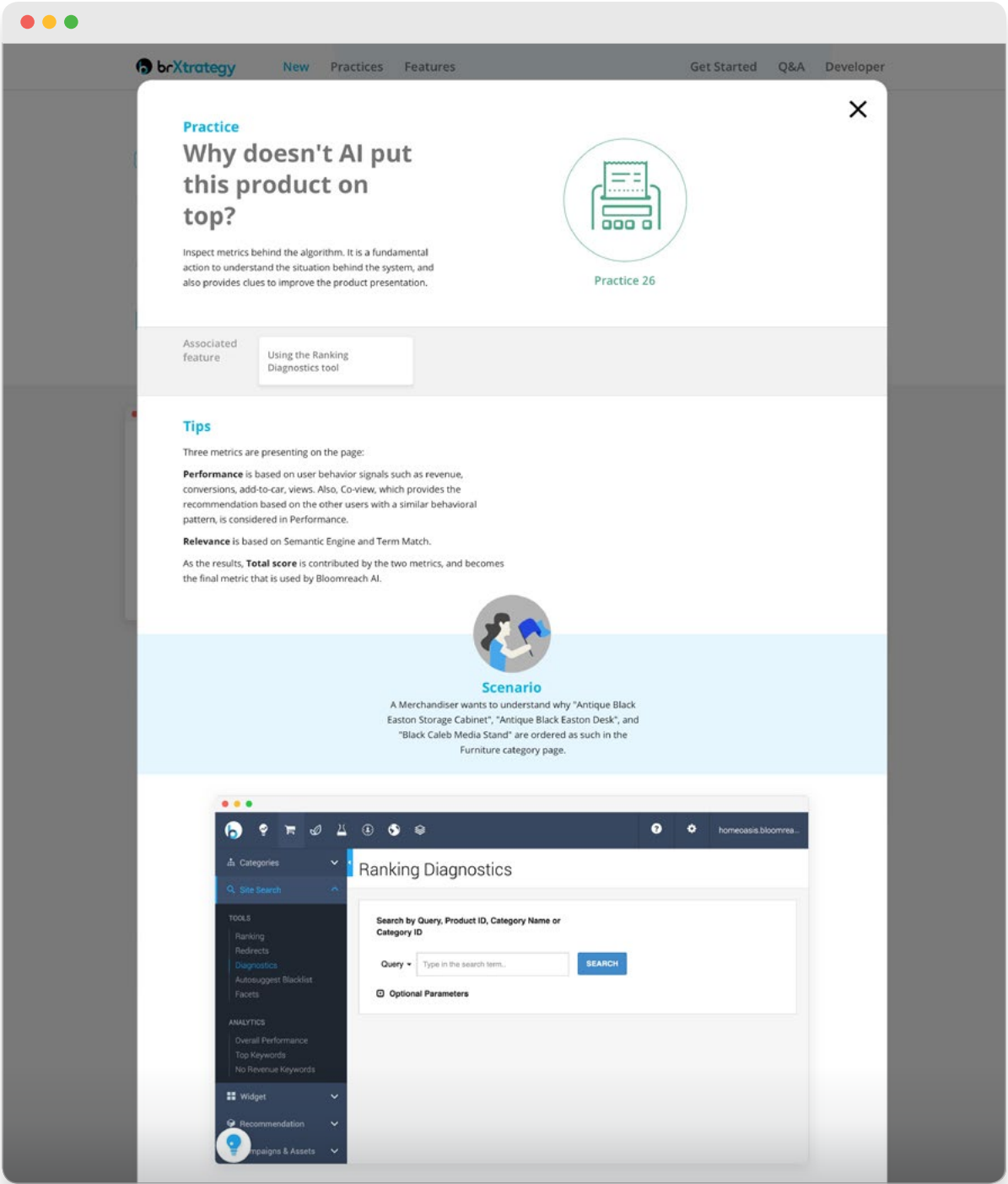
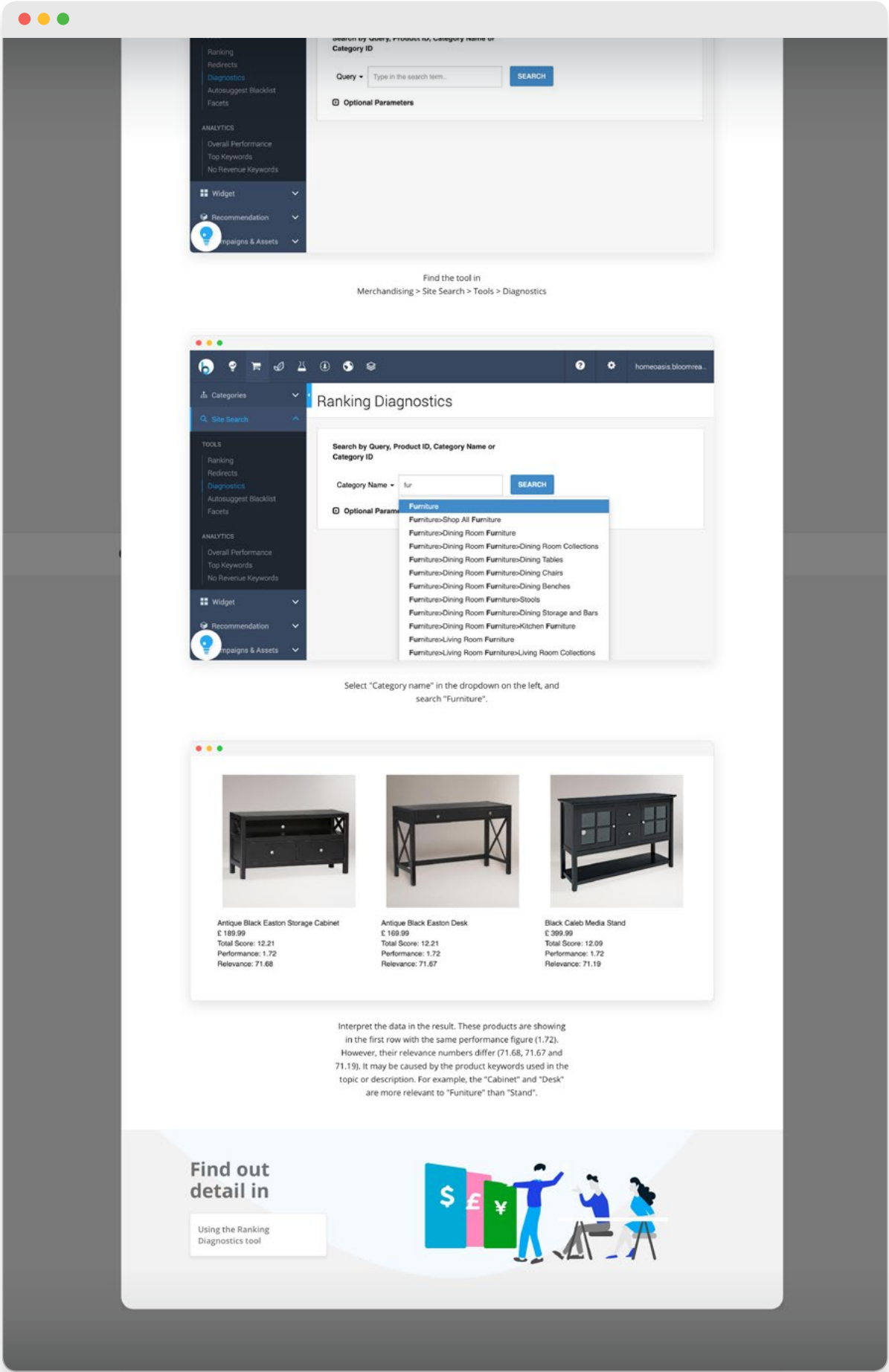


Figure 73. brXstrategy Playbook: Tutorial (Part 1 of 2)

Figure 74. brXstrategy Playbook: Tutorial (Part 2 of 2)



Use case 2: Feature introduction

New feature

brXstrategy Playbook has a dedicated page to explain the most recent update. The page is a landing page for the merchandisers from product marketing email sent by Marketing team, or brXstrategy insight mail (see Chapter 7.5).

The page explains the high-level business value of a feature, convincing the client to allocate resource to integrate it (if it is required). Also, the new merchandising practices associated with the feature are introduced in the bottom, helping merchandisers to understand the feature with these examples.

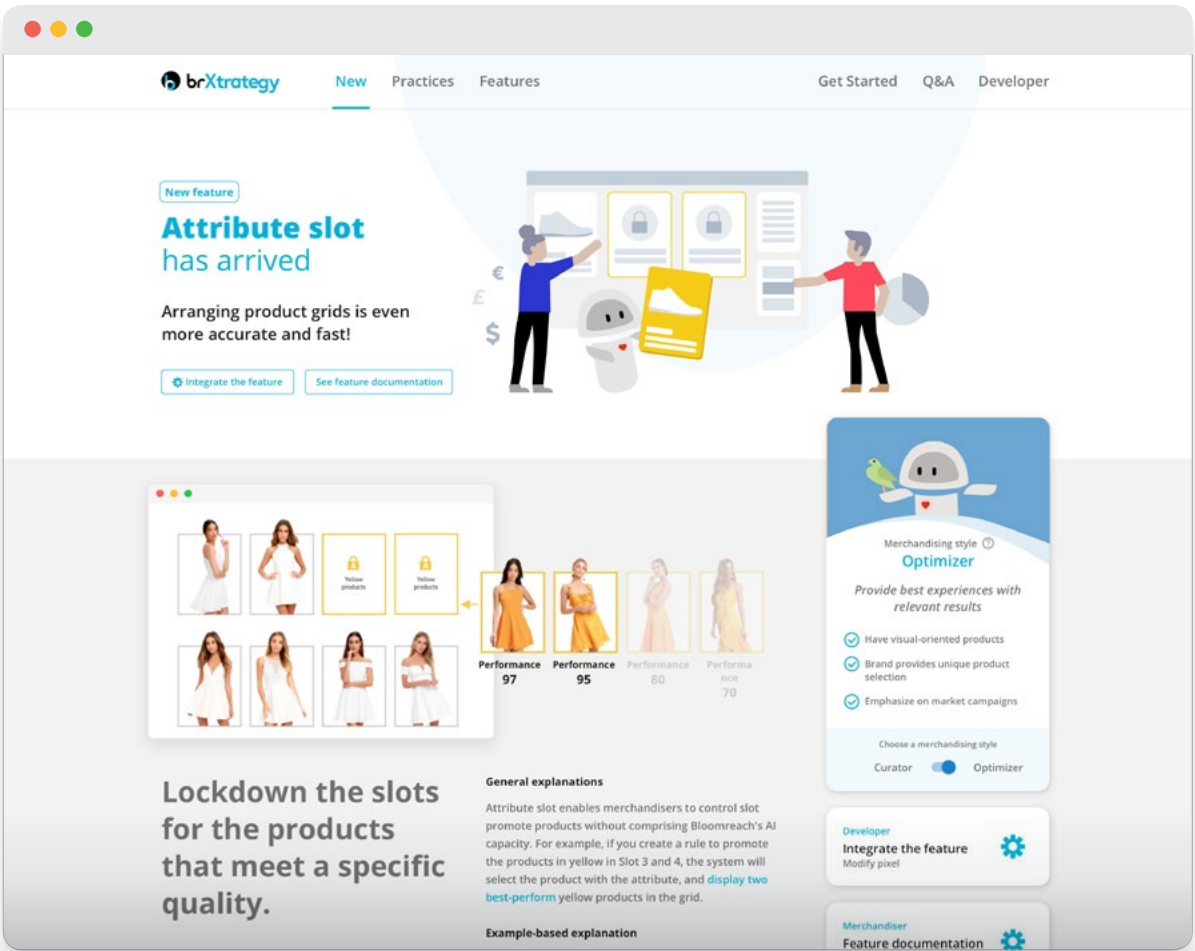
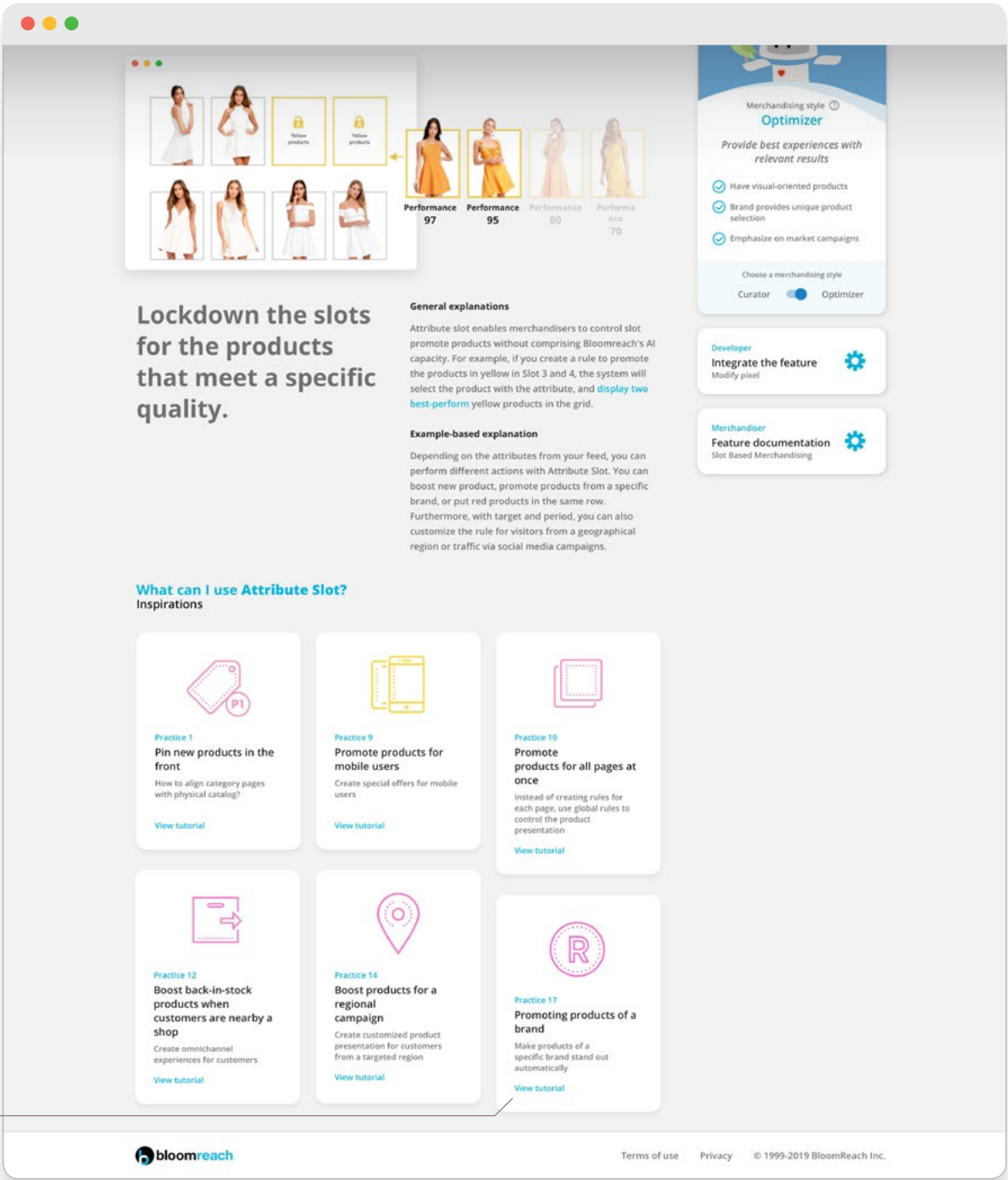


Figure 75. brXstrategy Playbook: New feature (Part 1 of 2)

Figure 76. brXstrategy Playbook: New feature (Part 2 of 2)



Go to Figure 77

Practice tutorial

They can choose the desired practices that merchandisers want to implement right away. With the example-based explanation, they can also estimate the difficulties and values of a new feature easily.

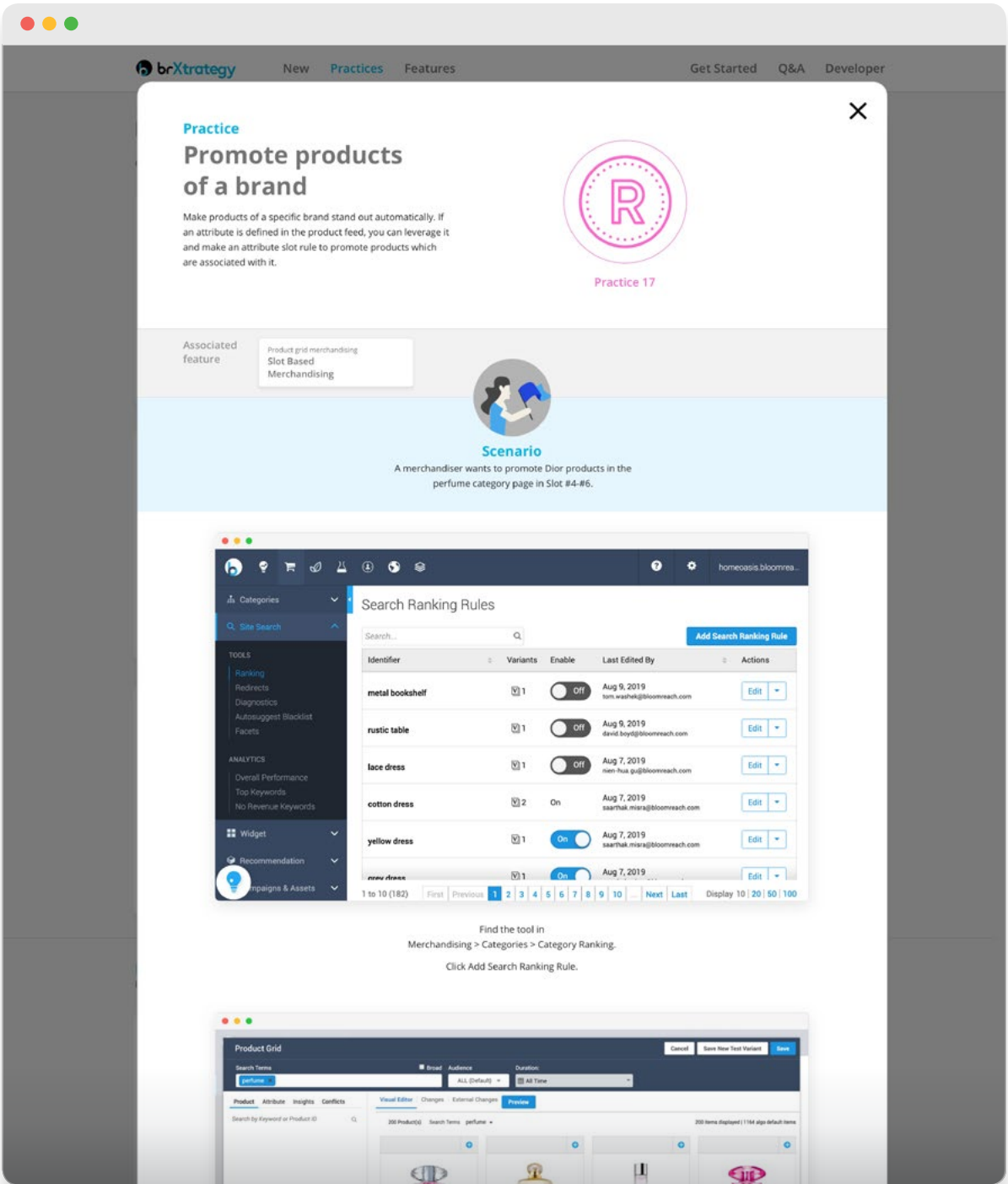
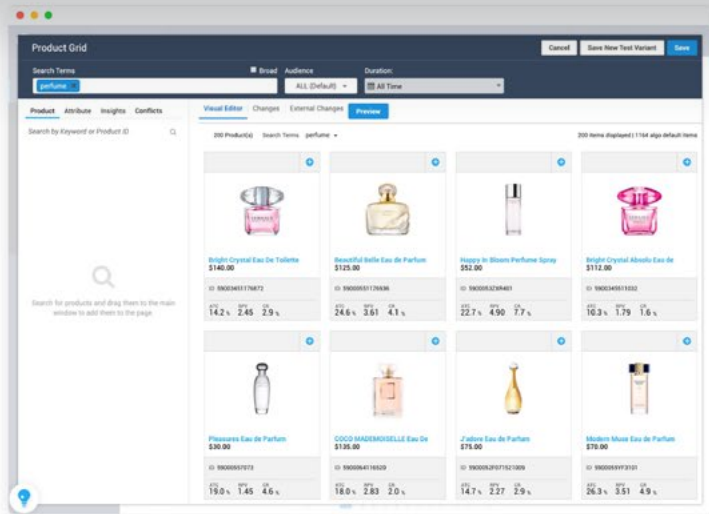
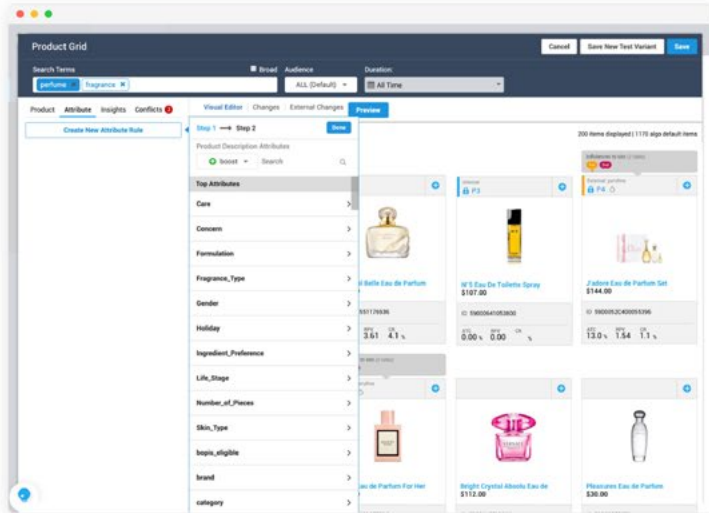


Figure 77. brXstrategy Playbook: Tutorial (Part 1 of 3)

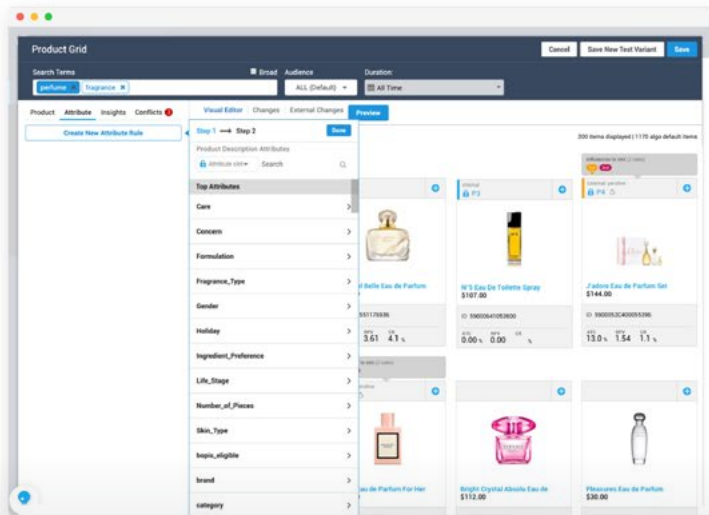
Figure 78. brXstrategy Playbook: Tutorial (Part 2 of 3)



Fill in "Perfume" in Search Terms



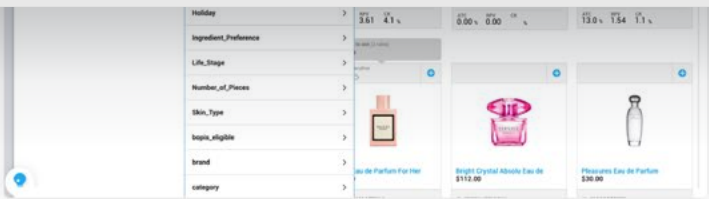
Then, click Attribute tab and click "Create New Attribute Rule"



Choose Attribute Slot in Product Description Attributes

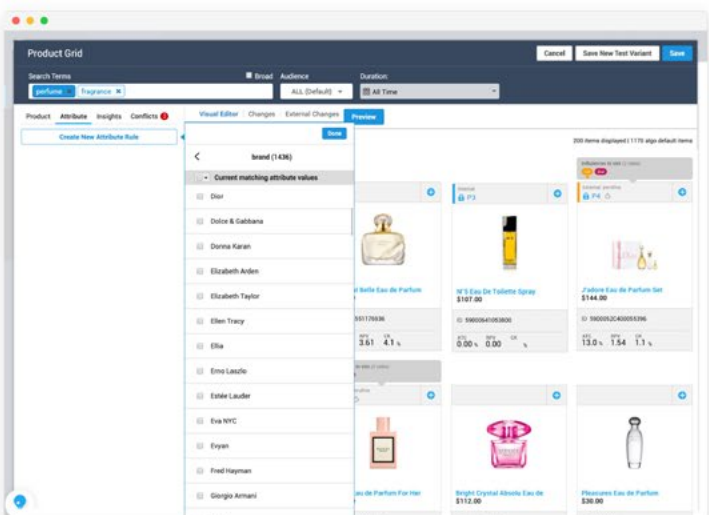
Find the brand attribute in the list

Figure 79. brXstrategy Playbook: Tutorial (Part 3 of 3)

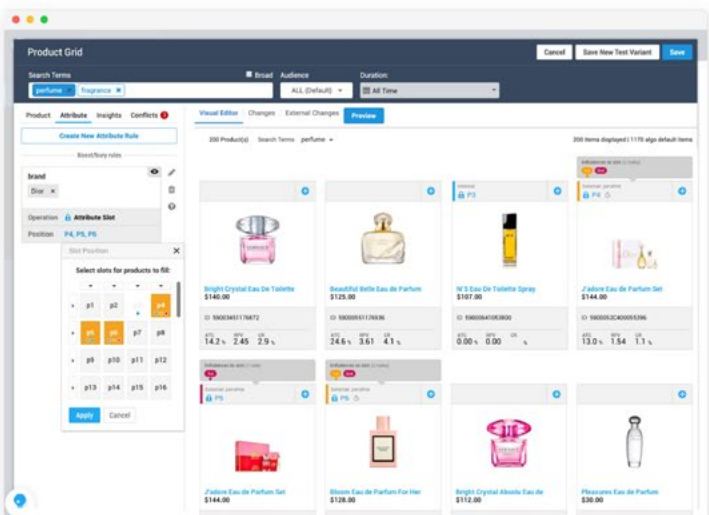


Choose Attribute Slot in Product Description Attributes

Find the brand attribute in the list



Select Dior, and click Save



Click "Set Grid Position" and select P4, P5, and P6, and click Save.

Find out detail in

Product grid merchandising
Slot Based
Merchandising

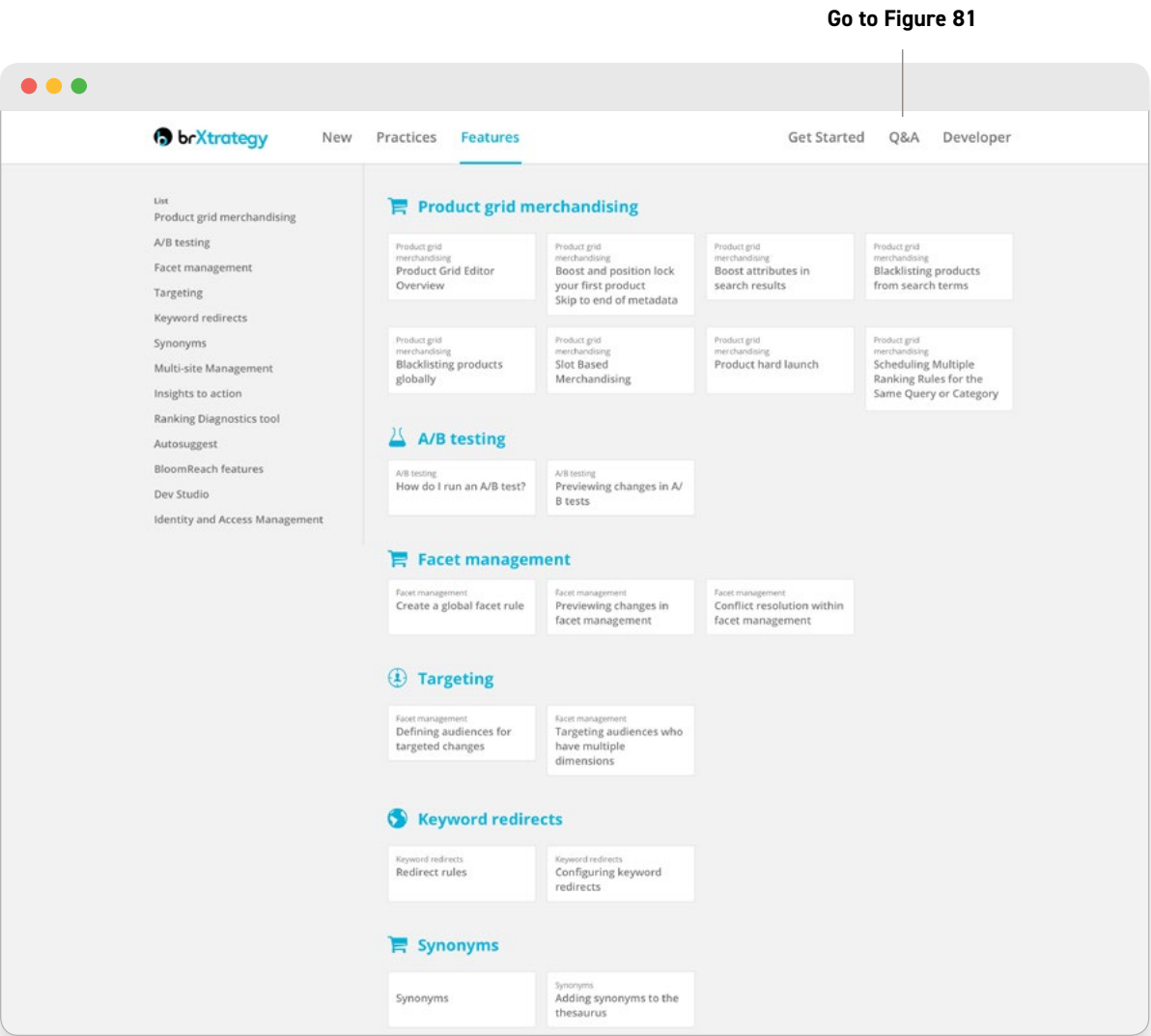


Figure 80. brXstrategy Playbook: feature

Use case 3: Error solving

Feature

It is common that merchandisers encounter an unexpected results from the algorithms. To inspect the error, merchandisers sometimes need to know the deeper mechanism of a feature. And thus the source of the errors can be found. The pages also provide guidance to solve them in detail.



Q&A

If the merchandiser doesn't even know which type of error they are encountering, Q&A pages organize all common questions that Support team receive in one place. They can find relevant content by the search.

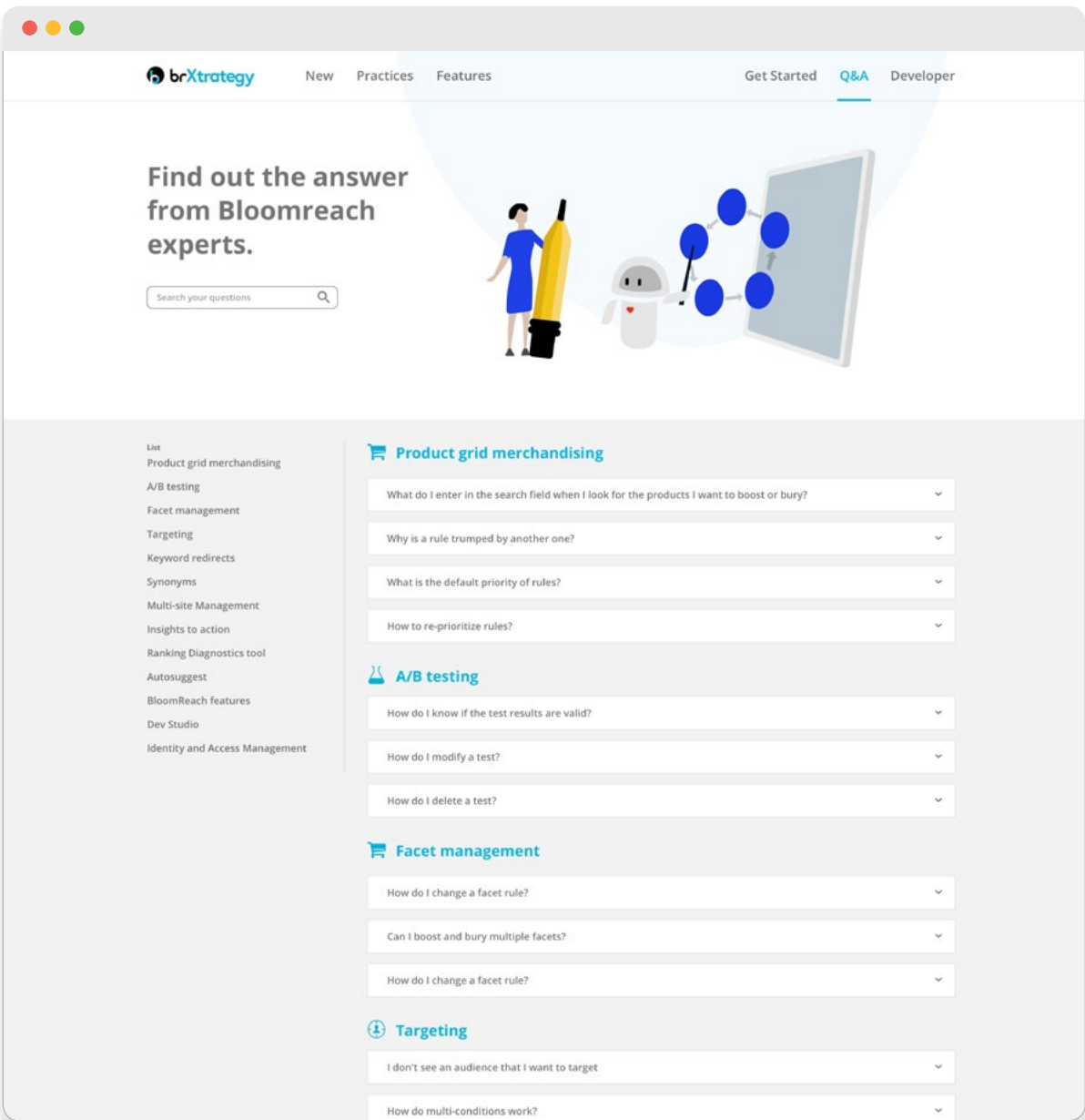
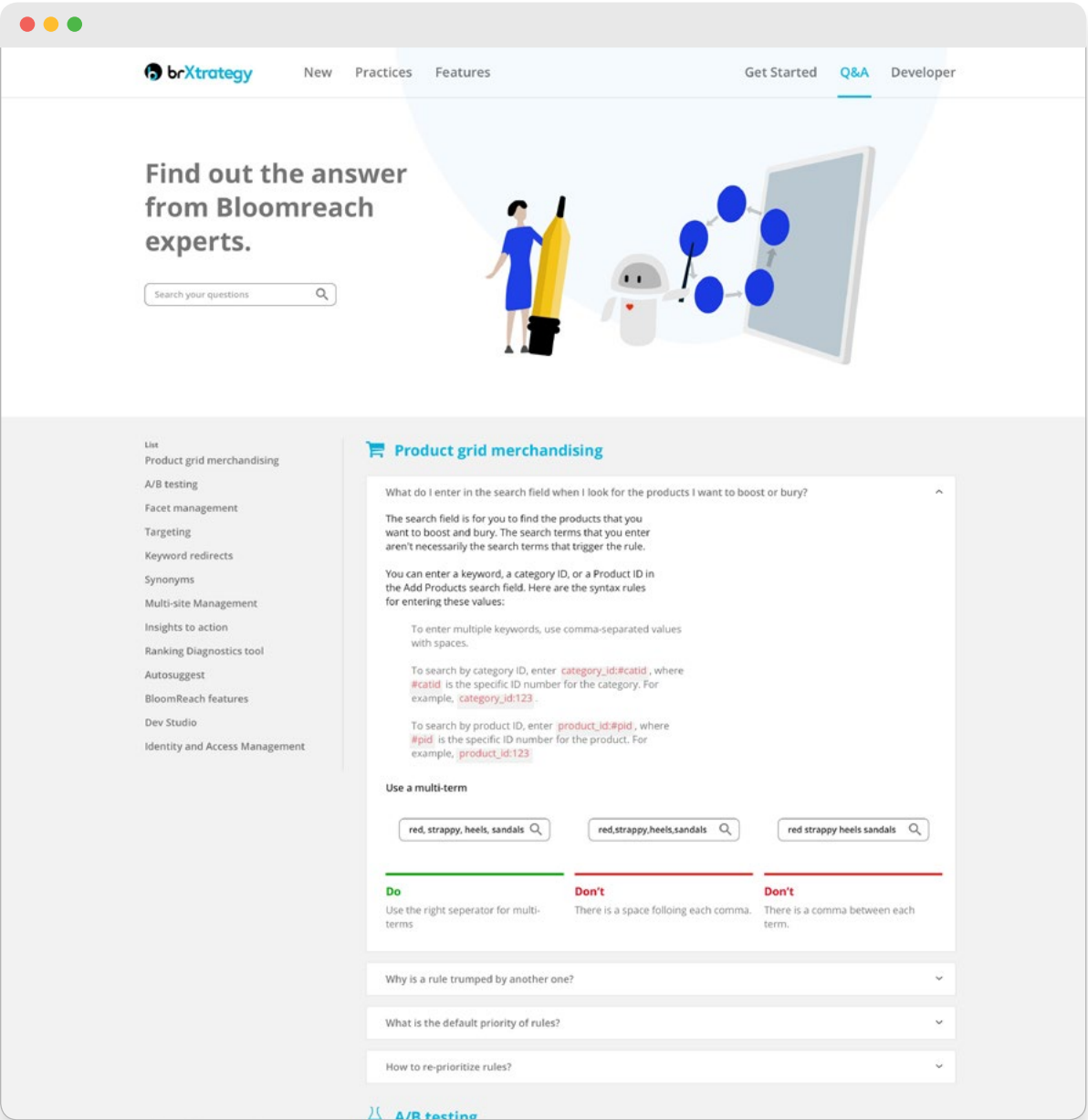


Figure 81. brXstrategy Playbook: Q&A

Q&A pages explain the possible sources of the a problem, and provide the right (Do) and wrong ways (Don't) to explain the generic practice to use a feature.

Figure 82. brXstrategy Playbook: Q&A



7.4 brXtrategy Merlin

This interactive learning tool helps merchandisers to understand how brSM algorithms work and improves a sense of control.

brXtrategy Merlin is an interactive educational tool that introduces the algorithmic mechanism of brSM. This is the improvement from an existing product called Intelligence Switchboard, that is used as a sales tool. This proposal transforms it into an educational tool by adding generic and context-specific explanations in the tool.

Learning tool

brXtrategy Merlin is a browser plugin that adds additional information and controllers on the top of the client's website. It displays two metrics (relevance & performance) that consumed by the system.

Furthermore, merchandisers can turn on/off the algorithms that influence the results, including semantic understanding, collaborative filtering, personalization, and merchandising rules. Merchandisers can understand these algorithms easier by comparing the results. During the interaction, Merlin provides related information for merchandisers that explains the mechanism better.

Goals

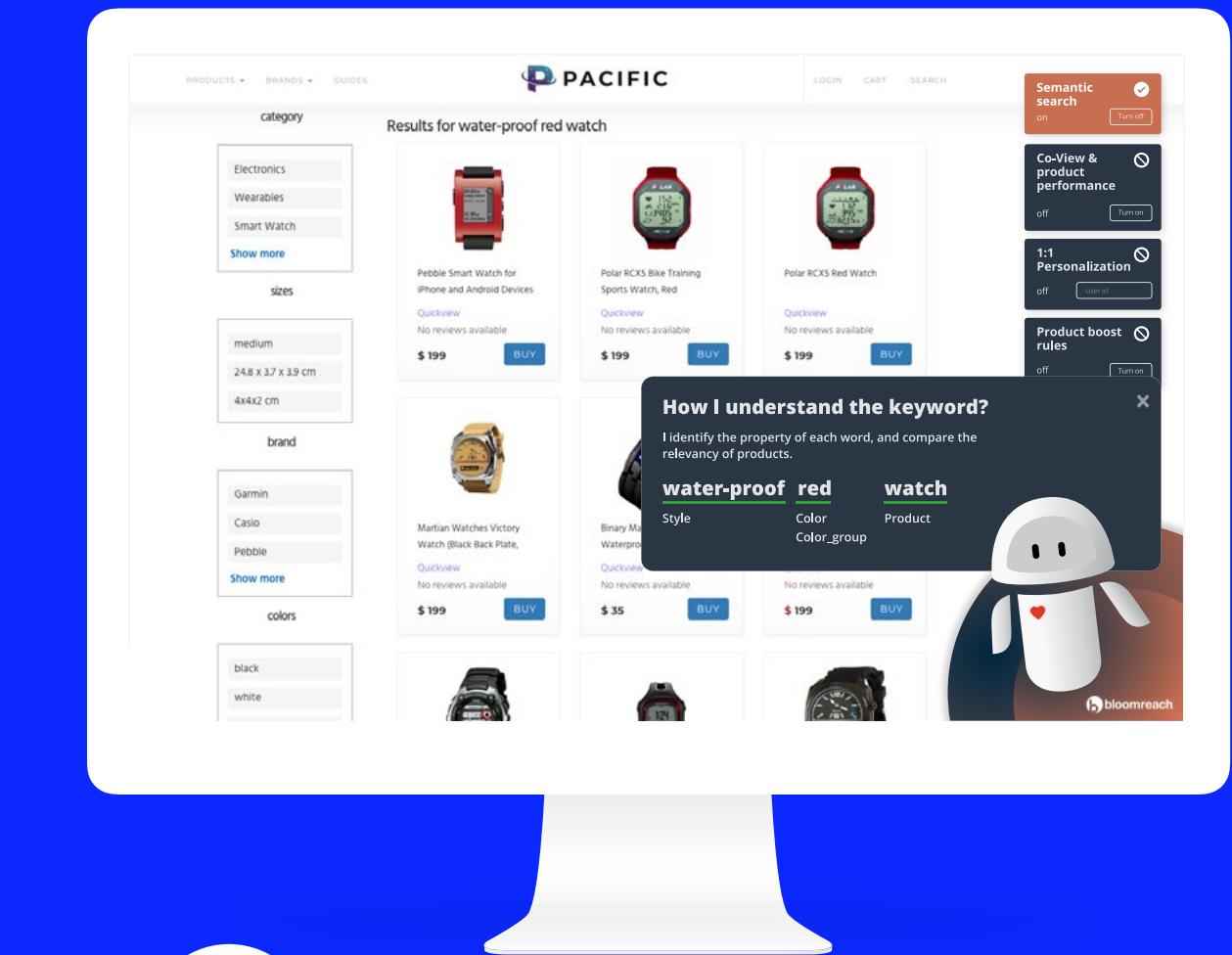
Providing a sense of control (DG2)

Improving interaction between user and merchandisers is useful to build a sense of control. It explains the results by the statistic data that is consumed by algorithm, facilitating merchandisers to understand the results of the algorithms.

Design

Character

Merlin characterizes the algorithms. We give Merlin an image of a cute robot with a heart to make the algorithm more humane.



Use case

Welcome

As a part of the onboarding session, the tool educates the merchandisers in an interactive approach. Merlin shows up when they enter the page, providing a welcome message.

Go to Figure 84

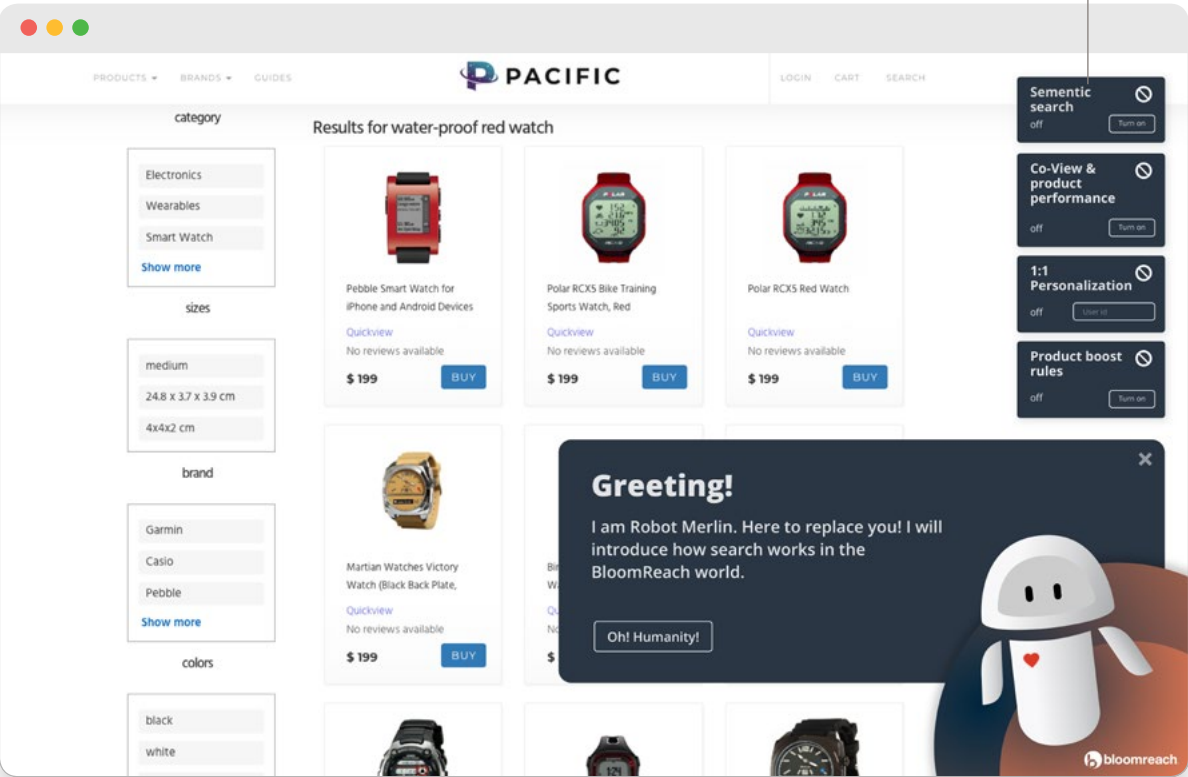


Figure 83. brXstrategy Merlin: Welcome

Generic explanation

When the user interacts with the switcher, Merlin provides the generic explanation to introduce the mechanism. It also provides the link to the associated feature pages from brXstrategy Playbook (See Ch7.3).

Go to Figure 85

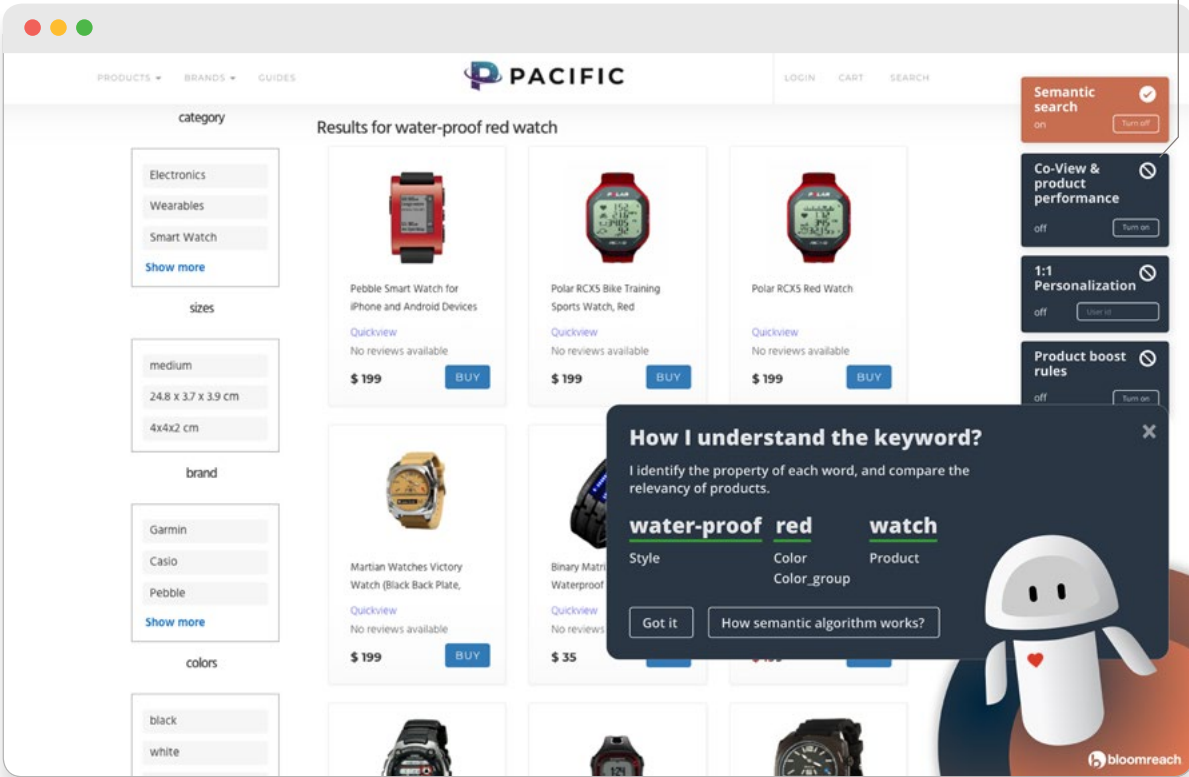


Figure 84. brXstrategy Merlin: Generic explanation

Metrics

The system also displays three key metrics that consumed by the system. It enables merchandisers to understand how the algorithm evaluates the performance or relevance of products.

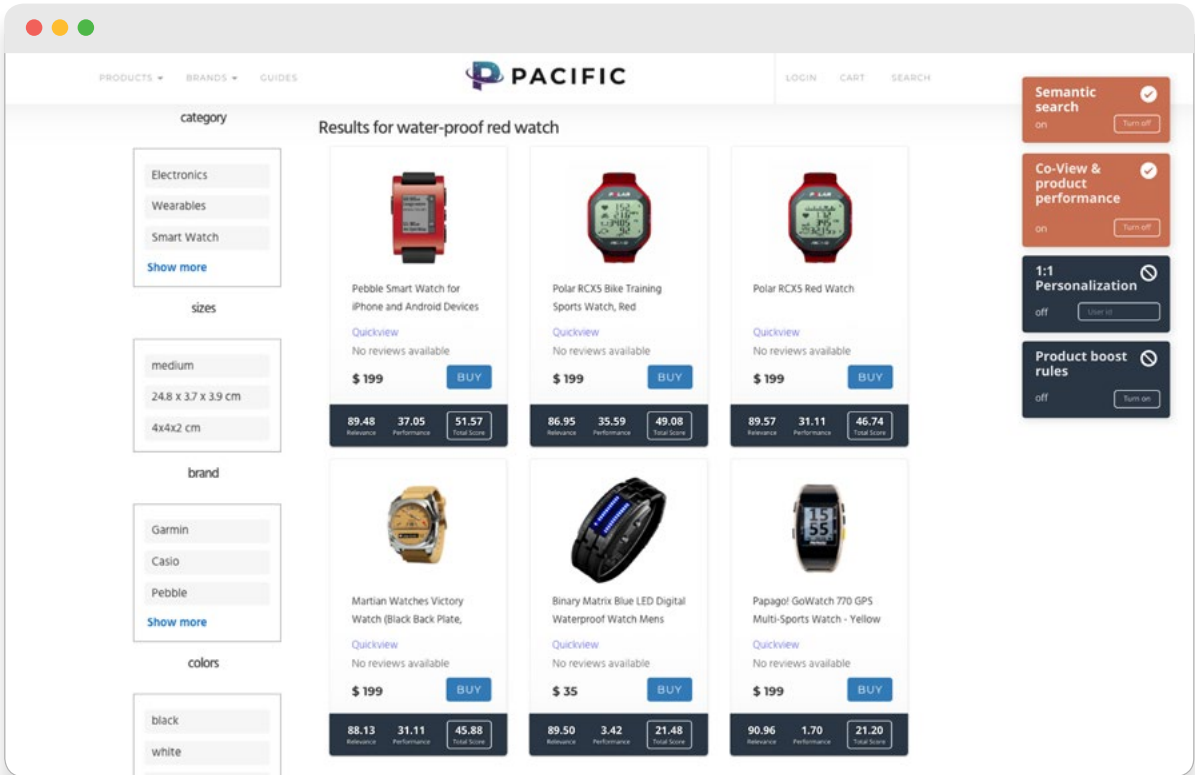


Figure 85. brXtrategy Merlin: Metrics

Specific output explanation

By the specific output explanation, Merlin explains the system by the real case that happens on the website. It makes learning even more effective since the example is directly related to the merchandisers.

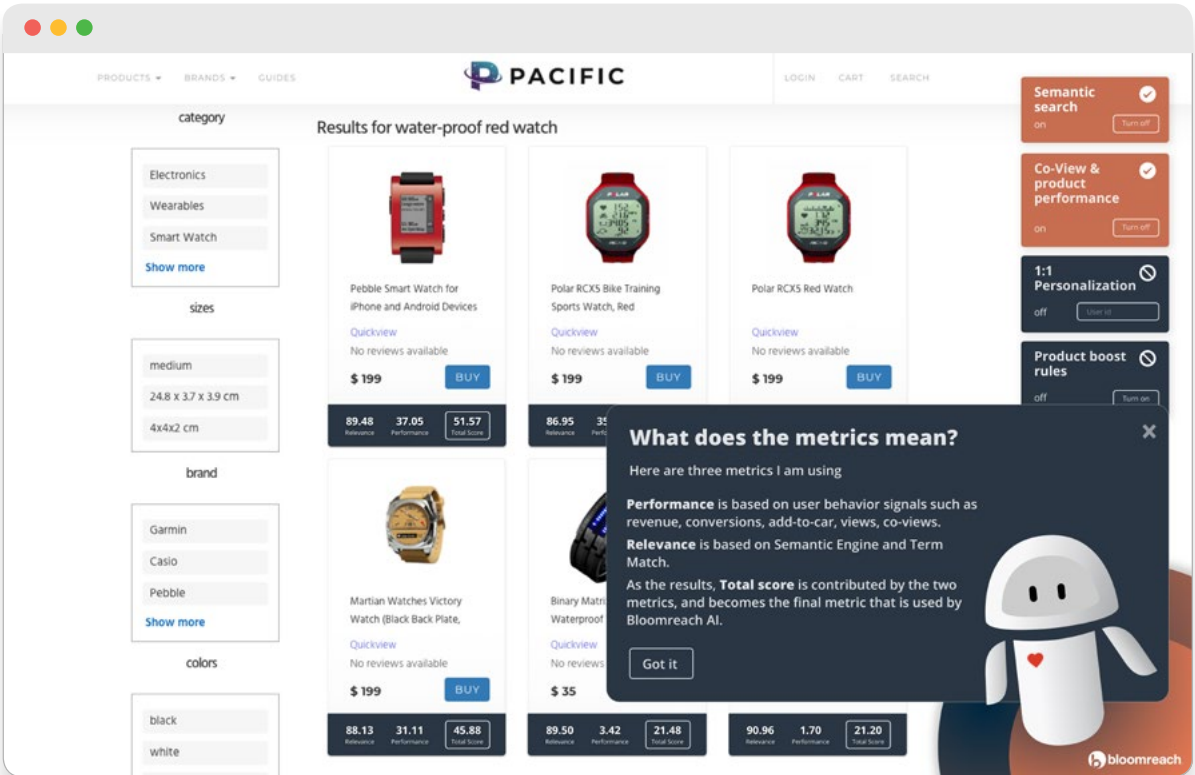


Figure 86. brXtrategy Merlin: Metric explanation

7.5 brXstrategy Insight

This mail provides the performance information that is useful for merchandisers since they need to evaluate the result routinely.

brXstrategy Insight is an email service that organizes the relevant and useful information from Dashboard and brXstrategy. Since merchandisers may not use Dashboard and visit brXstrategy Playbook routinely, the email notification is used to raise the awareness of the service.

This mail provides the performance information that is useful for merchandisers since they need to evaluate the result routinely. Also, the practice suggestion is attached at the end of the mail. Furthermore, when there is a new feature update, brXstrategy Insight also mentions it in the mail.

Goals

Customizing experiences for two types of merchandisers (DG1)

The mail has two variants that are customized for two different personas.

Providing a sense of control (DG2)

To improve the interaction between merchandisers and the algorithms, it is especially important to tell users the results of systems, and inform them about the consequences caused by their modifications.

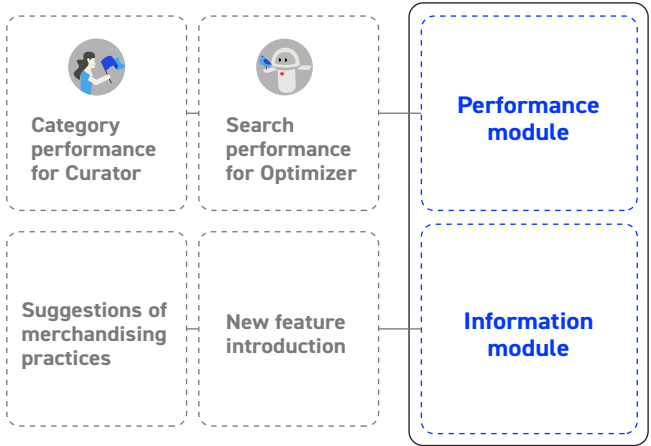


Figure 87. Content modules of brXstrategy Insight

Facilitating new feature introduction (DG4)

The new feature will be mentioned briefly, and the user can visit the related pages in brXstrategy Playbook.

Design

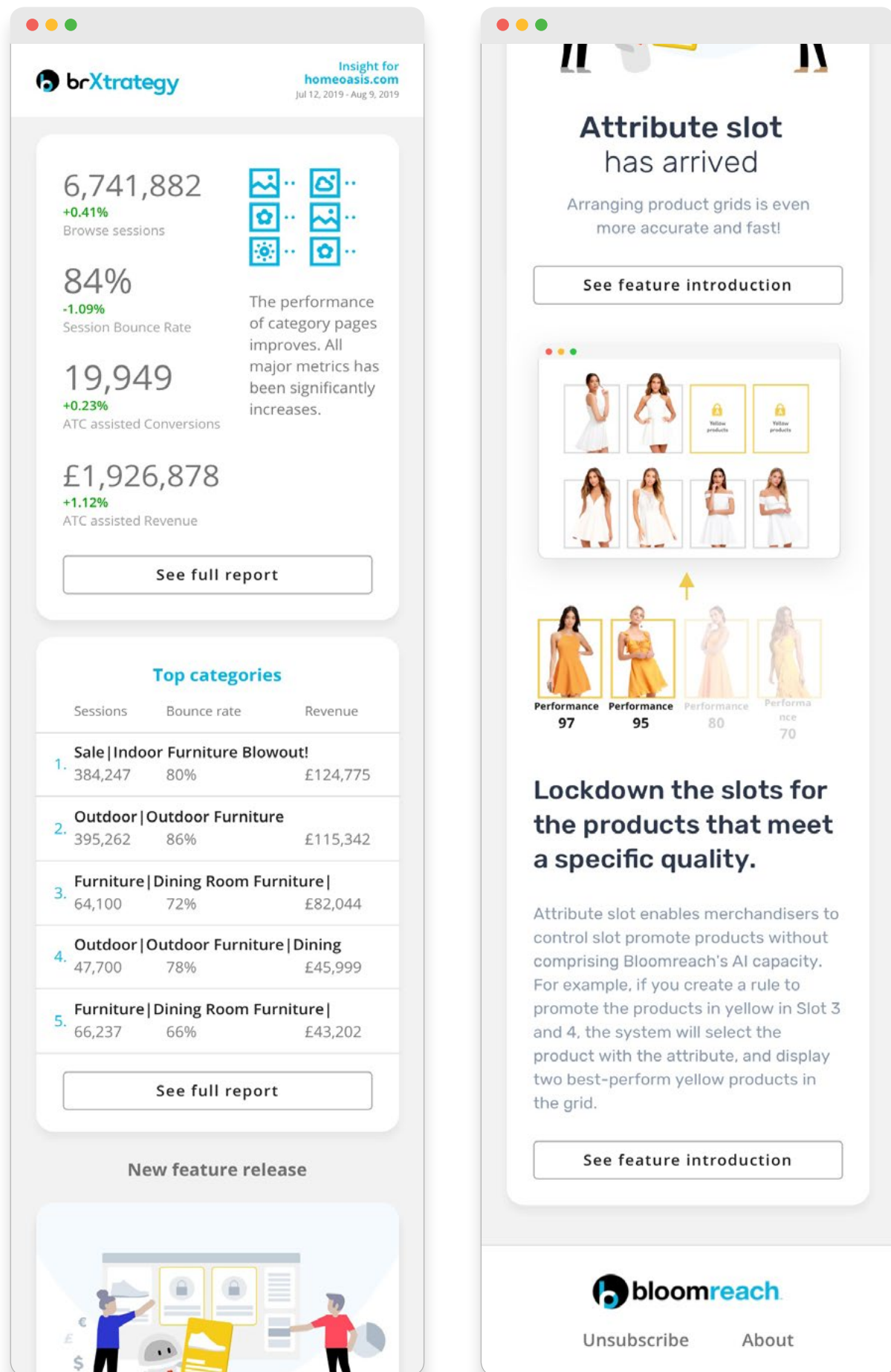
There are two modules in the email, performance module and information module (Figure 87).

Performance module

Performance module displays the performance data in the past week, and compares it with the data in the week before. It facilitates merchandisers to



Figure 88. brXstrategy Insight (curator, new feature)



review the performance data regularly, which is a decisive action for the successful implementation of ML.

The metrics changes when the persona of the merchandisers are identified according to their behaviors on Dashbaord.

Information module

brXstrategy Insight presents a potential practice that the similar merchandisers do with instruction links of brXstrategy Playbook. When there is a new feature introduced, this content is replaced with its introduction.

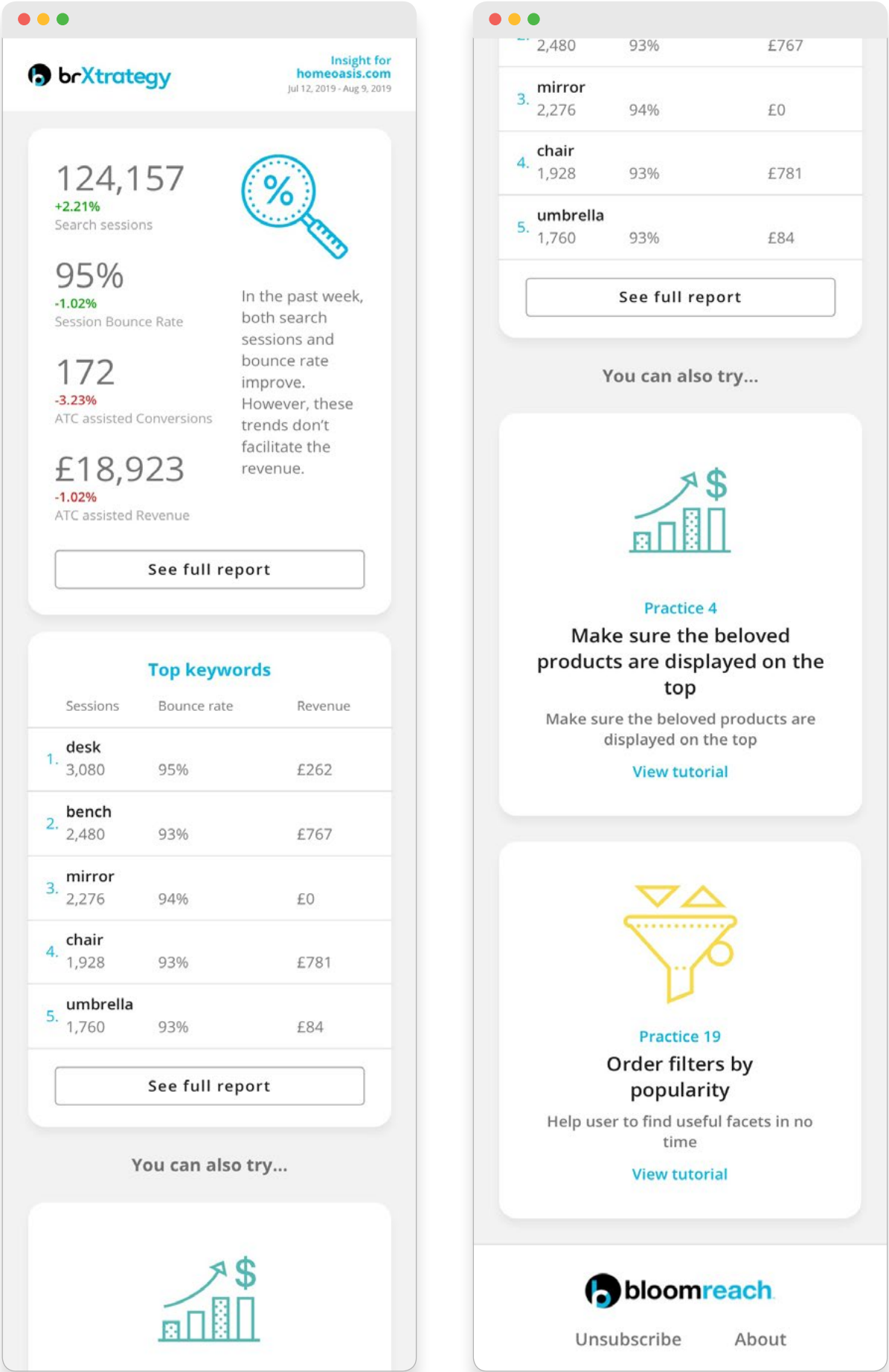
Use case 1: Curator

Curator creates algorithmic modifications for category pages frequently. Therefore brXstrategy Insight provides performance information from category pages.

The data includes all categories' session number, bounce rate, conversions, and revenue. Furthermore, the top five categories are listed in terms of their revenue contribution to the client. The link to the reports in Dashboard is provided in each session.

Also when new feature introduction, the email attaches the information at the end, along with a link to the New feature page from brXstrategy Playbook.

Figure 89. brXstrategy Insight (optimizer, new practice)



Use case 2: Optimizer:

Optimizer has a focus on search experiences. brXstrategy Insight, therefore, provides the search performance in the mails.

The data includes all search' session number, bounce rate, conversions, and revenue. Also, the top five search terms are listed in terms of their bounce rate, which implies the quality of the search results from customers' perspective. The link to the reports in Dashboard is provided in each session.

Moreover, the practice suggestions are provided at the end of the mail. Based on two behavior patterns we identified in Ch5.3, we can train the algorithm to recommend practices based on a user's recent actions. When the persona of the user is identified, it suggests the actions made by the other users who have the same pattern. It would help merchandisers to identify the room to improve, and thus implement the system better.

7.6 Loading tip

It displays the merchandising tips that are delivered from Playbook.

Loading tip displays a tip (Figure 90) whenever the loading screen of Dashboard is triggered. It is a minor update for Dashboard, but potentially provides major improvements for continuous learning. It provides tip suggestions according to merchandisers' current action, and makes the loading time more meaningful.

Since loading screen is considered as a secondary component in the engineering architecture, it should not require complex APIs and conditional statements to operate. To reduce the resources required, all tips (including description, link address and action type) are loaded to the cache of the user's browser. Then when the loading screen is triggered, according to the type of loading task (e.g. loading the statistic of an A/B test), the system filters out the relevant tips and randomly displays one of them.

Design goal

Raise the awareness of brXstrategy

it may raise the awareness of brXstrategy service for Dashboard users. The content in brXstrategy Playbook becomes even more discoverable.

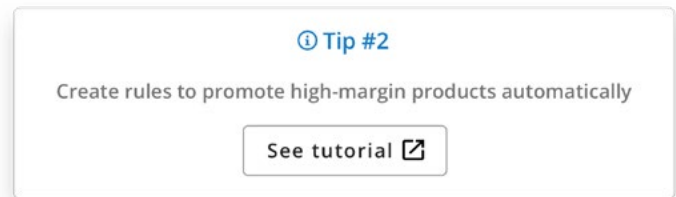
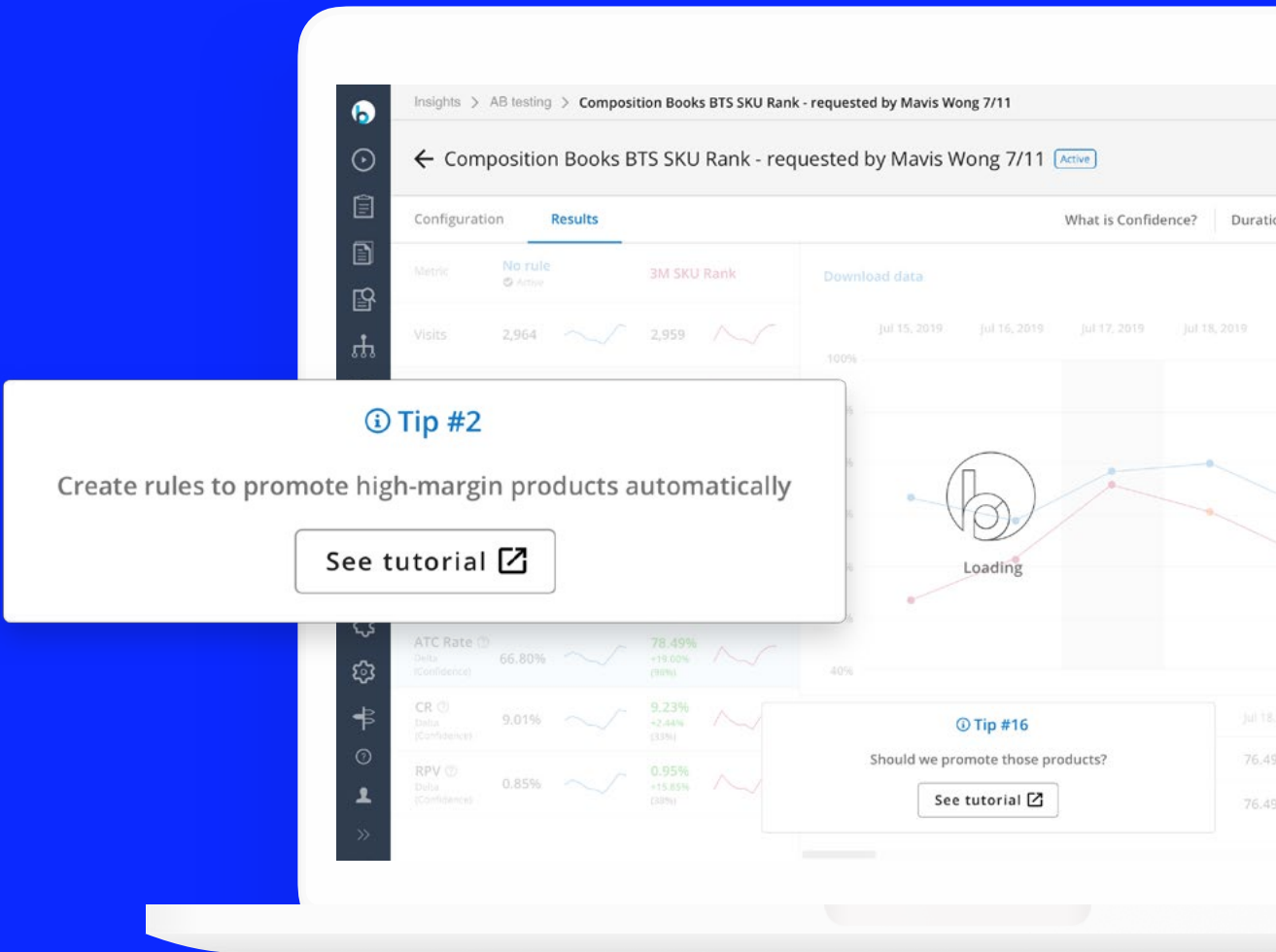


Figure 90. Dialogue of Loading tip

Use case: Visual editor

The visual editor is a place that user create merchandising rules to a category page or search result. When the product data is loaded from the product feed, it sometimes spends from five to ten seconds. In the period, the tips related to VMD might be introduced.

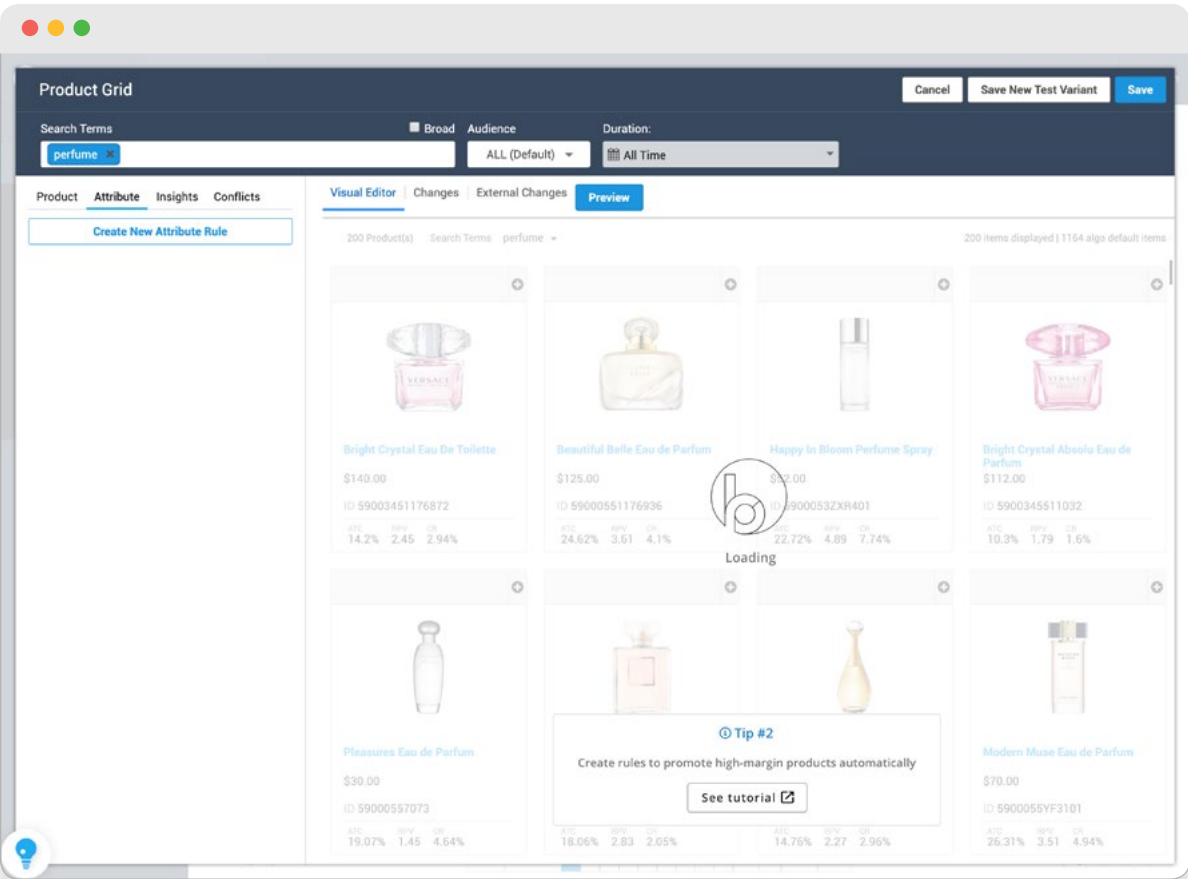


Figure 91. Loading tip in a ranking editor on Dashboard

Use case: A/B test

Another situation with a long loading time is the result page of A/B test, which uses 20 to 30 seconds to collect and aggregate the behavioral data. The system can display A/B test tips when the system is loading the data, helping merchandisers to perform better A/B test experiments.

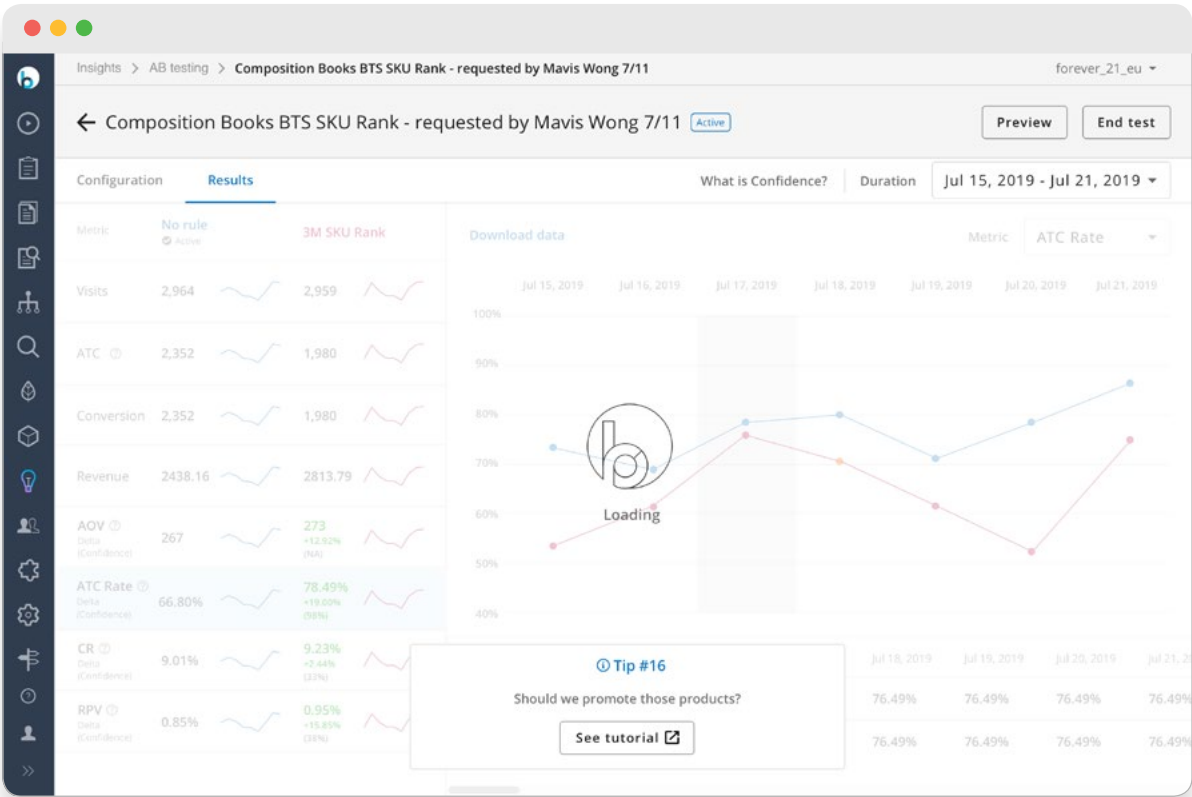


Figure 92. Loading tip in the A/B test tool on Dashboard

08

Service & Implementation

Chapter 8

Following the introduction of brXtrategy family in the previous chapter, the implementation plan of brXtrategy is introduced. First, we present the front-stage services by a user journey map. It explains experiences and service in three phases, onboarding/retraining, new feature rollout, and continuous learning. Also, we illustrate the back-stage service by a service blueprint. It explains the collaboration process that builds brXtrategy in the

early stage and updates the content when a new feature is introduced. Moreover, the project applies a lean approach to deliver the product-service design with a four-horizon roadmap. Last but not least, to foster the internal transition, we present the Use-case oriented development workflow, that fills the knowledge and communication gaps between the field teams and R&D teams.

8.1 User journey map

The map explains the experiences of two personas in the service process, and relationships between the existing services and new tools (brXstrategy family).

The map introduces a detail user journey with six stages (Figure 93 & Figure 94). In Ch 8-1, we address how brXstrategy family can facilitate merchandisers in the three phases (Onboarding, New feature rollout & Continuous learning). We further split these phases into six stages including Training, Initial engagement of Dashboard, When wrong, New feature rollout, Improvement of workflow. The user's thoughts, need, actions and information provided by the system are illustrated.

Since brXstrategy family is enhancing the existing services, the map illustrates how these tools can improve the services, and how the field teams can use them to empower merchandisers.

Besides, we introduce two personas (Curator & Optimize) in Ch6.3. Due to their respective business contexts, they perform merchandising techniques differently. Thus, the journey map illustrates the customized experiences that brXstrategy family provides.

Design goals

Customizing experiences for two types of merchandisers (DG1)

The map illustrates information customization during the implementation.

Facilitating new feature introduction (DG5)

The map includes new feature rollout phase in the service plan.

Onboarding / Re-training

Training

The stage happens when CSM or BS team provides the training.

Firstly, they will introduce the important mechanism of the system (1), for example, the metrics that the system uses and the operations that influence these metrics. Following that, the Bloomreach expert can introduce the overall features of brSM by brXstrategy cards. According to the different personas, more relevant features can be introduced to facilitate merchandisers to learn the system better. In addition, the algorithmic mechanism can be explained by brXstrategy Merlin interactively.

Then, Bloomreach experts demonstrate how to use Dashboard (2) in the production environments to help merchandisers to understand the product better.

Initial engagement of Dashboard

To prepare for the system, curators focus on marketing campaigns (3) and plan

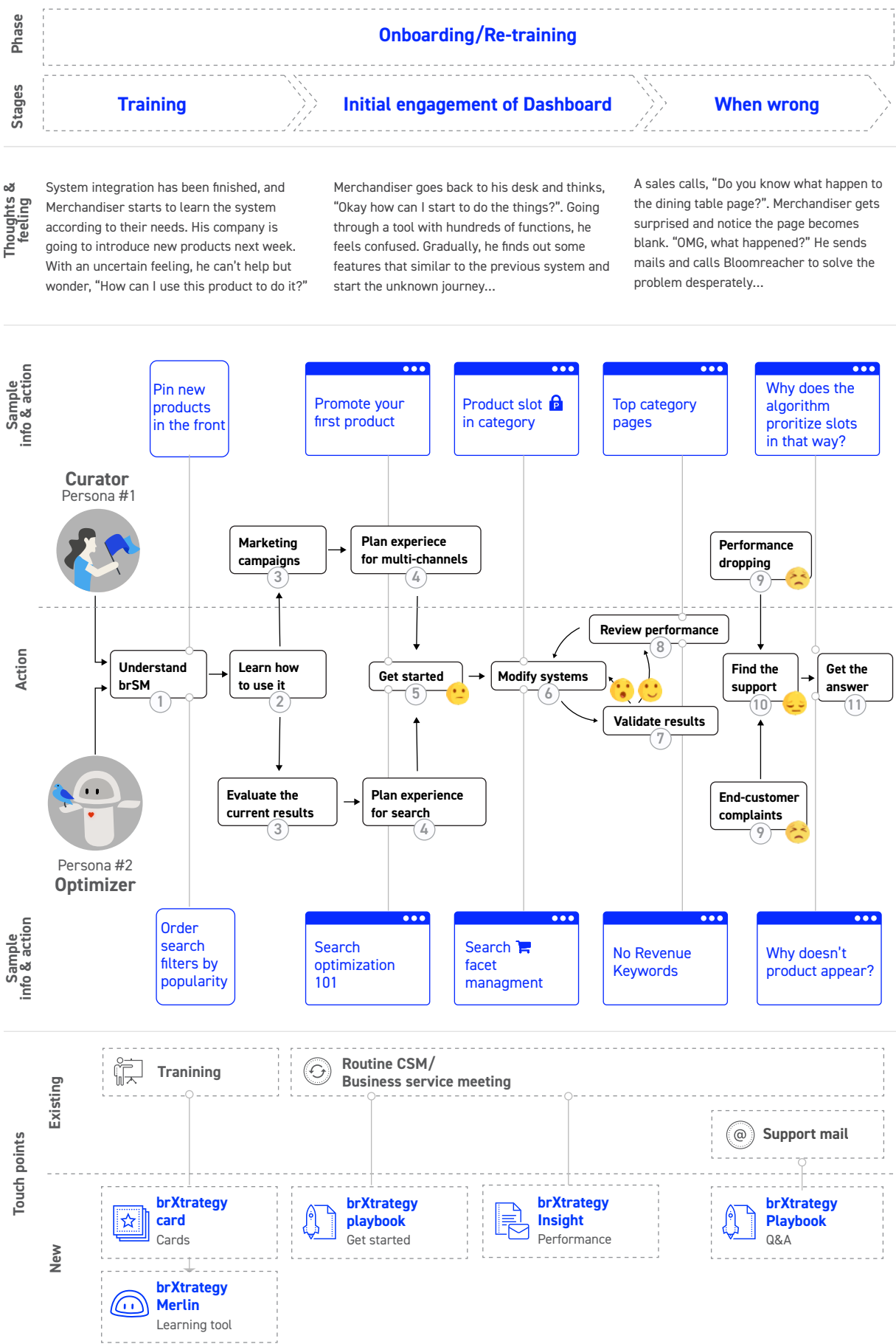


Figure 93. User journey map (1 of 2)

how to arrange product presentation for different marketing funnels (4), while Optimizers emphasize the accuracy of search results, evaluate the current search performance first (3), and plan the search experience (4).

When merchandisers engage to Dashboard for the first time, they can visit “Get started” of brXstrategy Playbook to see the relevant practices for starters (5). Then they learn the iterative workflow of brSM with the help from routine CSM & Business Service meetings, and the tutorials from the Playbook. They perform the modification in the system (6), validate the algorithmic results (7) with the brXstrategy Insight, monitor the long-term performance (8). When the unexpected results appear, they go back to Dashboard and revise the modification.

When wrong

The errors happen frequently in the ML-powered system. Merchandisers might receive the complaints internally or externally (9), find the decrease of performance (9), and then take actions. It is a frustrating moment, they can choose to find Bloomreach experts by regular meetings or support emails (10). Also, brXstrategy Playbook provides common Q&A content that they can get answers without helps from the Bloomreach side (11).

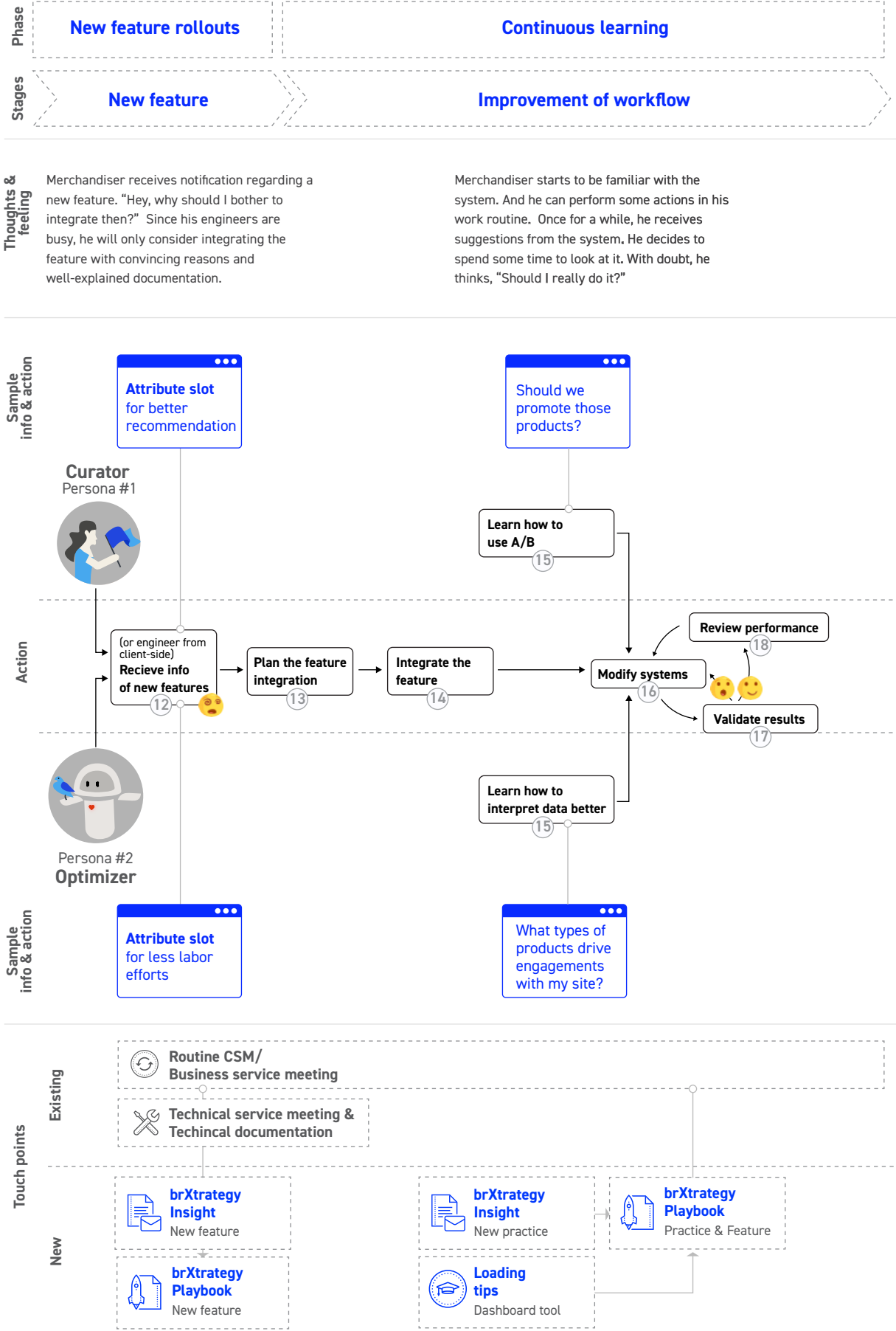
New feature rollout

When Bloomreach introduces a new feature, merchandisers and developers from the client-side receive the information from regular meetings with Bloomreach experts or emails sent by brXstrategy Insight (12). The newsletter has different variants of benefits for two merchandising personas to convince them to integrate it. If they recognize the values, clients might

put the project in their development roadmap (13), and integrate it when they have the bandwidth (14). Thanks to the new content organization, the integrators can find technical information easily from brXstrategy Playbook. When the integration is done, merchandisers can learn the feature by the tutorials, and improve their workflow (16-18).

Continuous learning

Furthermore, in the long run, Bloomreach facilitates merchandisers to improve their merchandising practices in order to adapt to their changing business. Except for the regular meetings with Bloomreach experts, brXstrategy Insight and Loading tip provide suggestions that fit their needs (15). Then, The tutorials from Playbook provides further information to them to improve their practices (16-18).



8.2 Future-state service blueprint

The future-state service blueprint introduces the back-stage services that Bloomreach performs in order to deliver the product-service solution.

Service blueprint illustrates the intra-company collaboration that creates brXstrategy content and builds the solution. The collaboration can be categorized into two groups, solution building, and content updating. Solution building refers to a process that creates the initial content and the technical infrastructure of brXstrategy products, while content building addresses the better workflow to create new features and the content for brXstrategy services.

Design goals

Facilitating new feature introduction (DG5)

The blueprint introduces a new workflow that helps internal teams to align the expectation of a new feature.

Intra-company collaboration (DG6)

Both the field teams and R&D teams are included in the back-stage services, expected to improve the intra-company collaboration.

Solution building

Content preparation

This part introduces a process to create the initial content of brXstrategy services. It is initiated by a Project manager and Technical writer who create the templates for Q&A, feature documentation and high-level merchandising strategy (1). Then the templates are reviewed and discussed in two approaches. With the field teams that work with business users (Marketing, CSM and Business Service team), they evaluate whether the templates explain the features and deliver the values to clients. On another hand, Technical Service team evaluates the templates from the technical perspective, ensuring the templates can facilitate clients to understand features in the technical correct way. As results, the templates is confirmed (2).

Based on the templates, Product team starts to create the content. With the help from Marketing and Business team, they create tutorials of merchandising practices (3). It is later used to create brXstrategy Cards (5). As for Q&A contents, they require the collaboration between Support team and Product team to identify the common questions from clients and provide the correct guidance to solve them (4).

Development of brXstrategy Playbook, Insight, Merlin and Loading tip

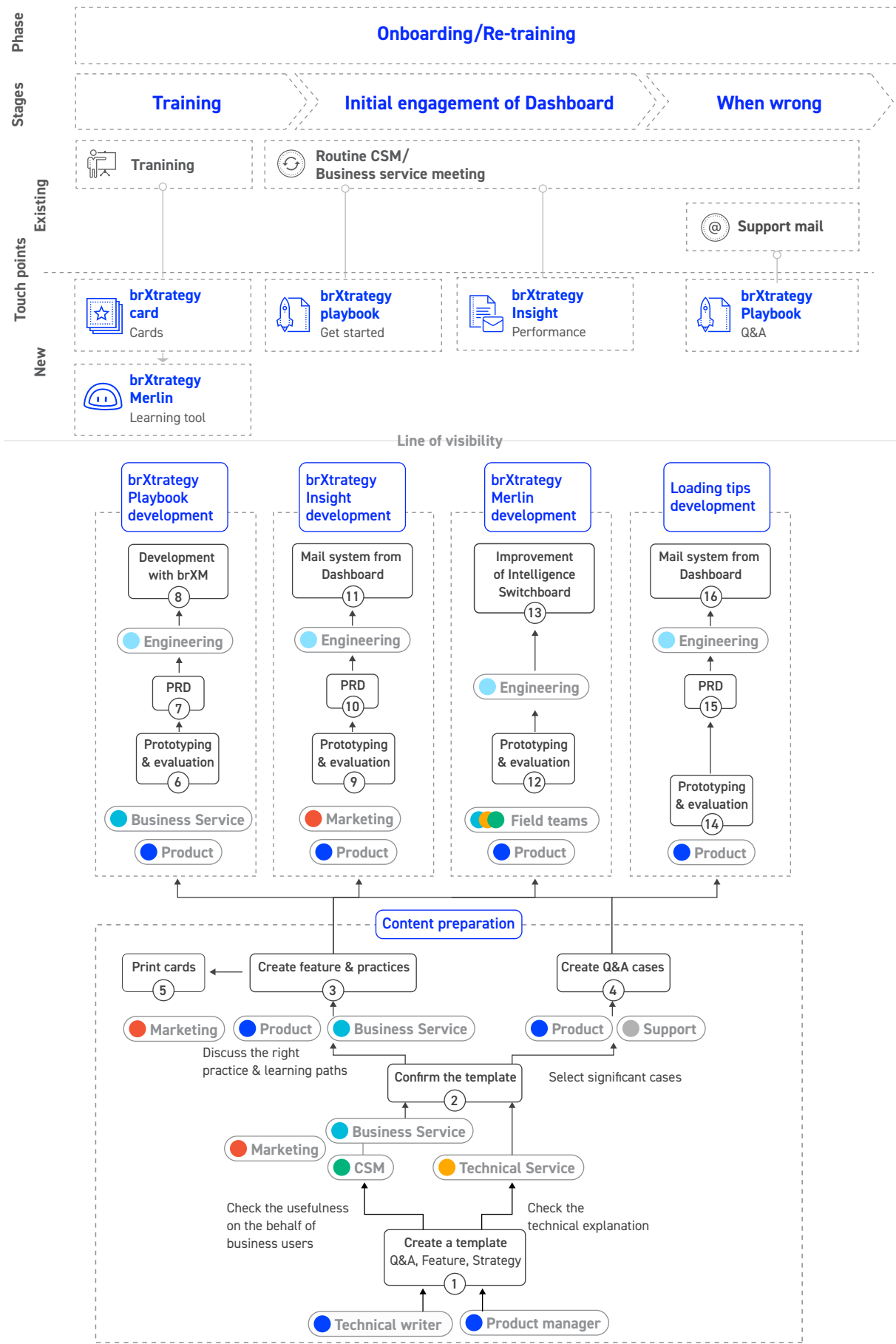


Figure 95. Future-state service blueprint (1 of 2)

There are four new products introduced in the project, brXstrategy Playbook, brXstrategy Insight, brXstrategy Merlin and Loading tip. The ordinary product development process is applied to the development projects of these products, which includes prototyping & evaluation (6, 9, 12, 14), Product Requirements Document (PRD) review (7, 10, 12, 14), and developments. (8, 11, 13, 16) In the early stage, different teams are evolved in the project according to the relevances of the product. For example, Playbook provides merchandising practices, which is the tasks that Business Service team is doing. Thus they will participate in the evaluation session of the product.

Feature enhancement

Bloomreach release a new brSM update every month. And a new process is introduced to align the feature communication between the field teams and R&D teams, and update feature information of brXstrategy.

It starts from an OKR (Objectives and Key Results) method to collect feature requests via field teams (17), prioritize the projects of feature development (18), and kickoff the selected project every quarter (19). Then, a new working method, called Use-case oriented development workflow, will apply to the developments (see Ch 8.4). Product team creates use cases by discussing with field teams (20), and summarizes it with a design one-pager (21). According to the documents, design team starts the UX/UI design process (22) and conducts the internal tests (23). Once the design has been confirmed, the design results are distributed to Engineering teams for development (24), and Technical writer to update the brXstrategy contents (25).

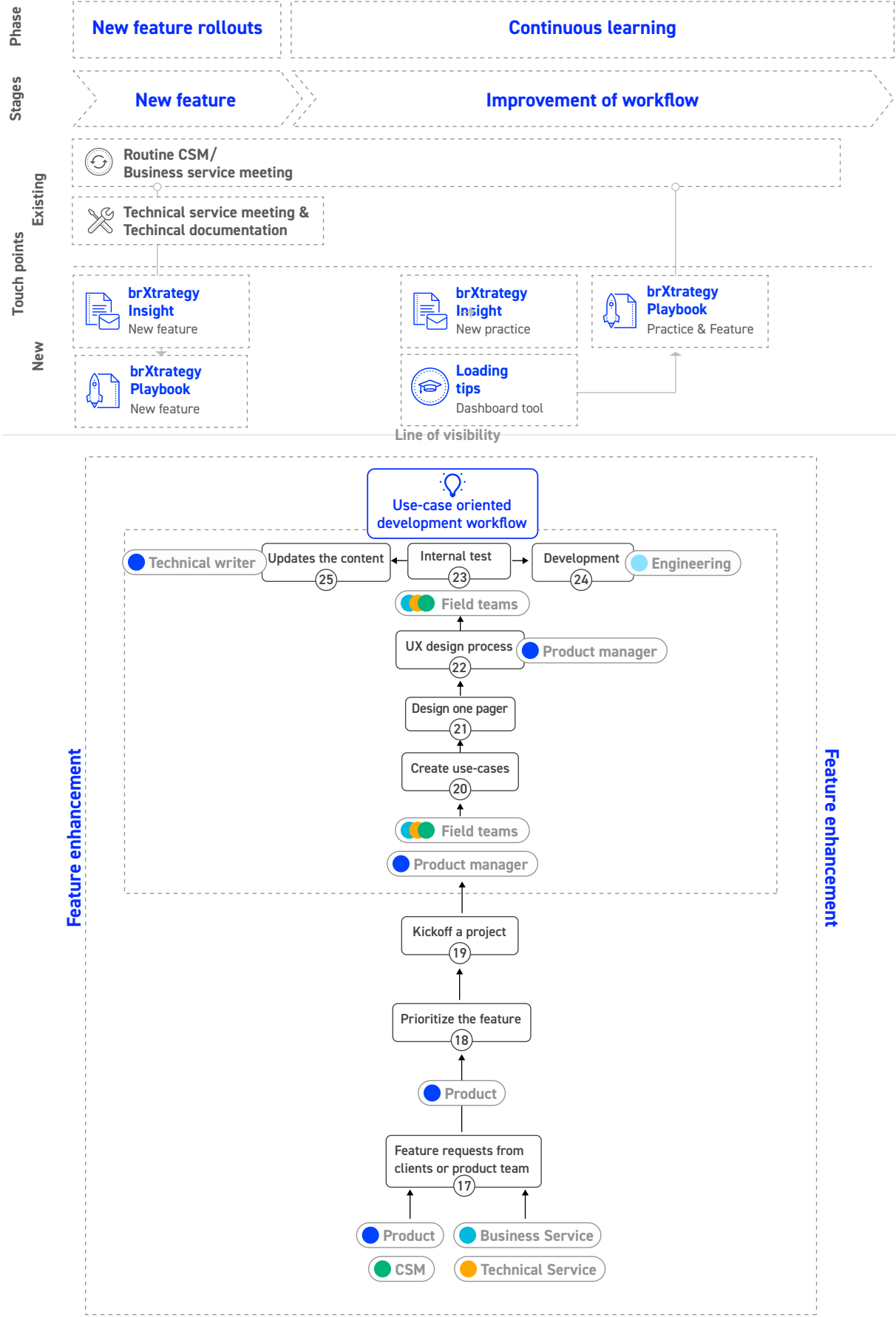


Figure 96. Future-state service blueprint (2 of 2)

8.3 Roadmap

The roadmap explains the implementation process of the product-service solution with four major phases.

This roadmap introduces the implementation strategy in a lean approach. The deliverables of the project are separated into four phases (Figure 97), which ensure the company can evaluate the usefulness along the way without full commitment at the beginning of the project. The required resources of each phase are allocated to a similar amount.

The first phase is Creation of MVP, where the team creates the minimal viable product, aligns the information structure with field teams, and evaluates the effectiveness internally. Then, if the project gets a green light, it proceeds to the second phase, Initial support, which provides supports and contents of brSM. Following that, it moves to the third phase, Road to brX, where the

solution extends to brXM teams, and the company creates content for both brXM and brX. Last but not least, in the phase of Advanced support, the email service, that requires more engineering efforts, is developed.

Moreover, the roadmap suggests a process to align the back-stage services between brSM and brXM's teams. Currently, the back-stage services of the two products are different, which will become confusing when they merge to brX. With the solution, two parties will have a consistent feature development workflow and aligned product understanding.

Design goals

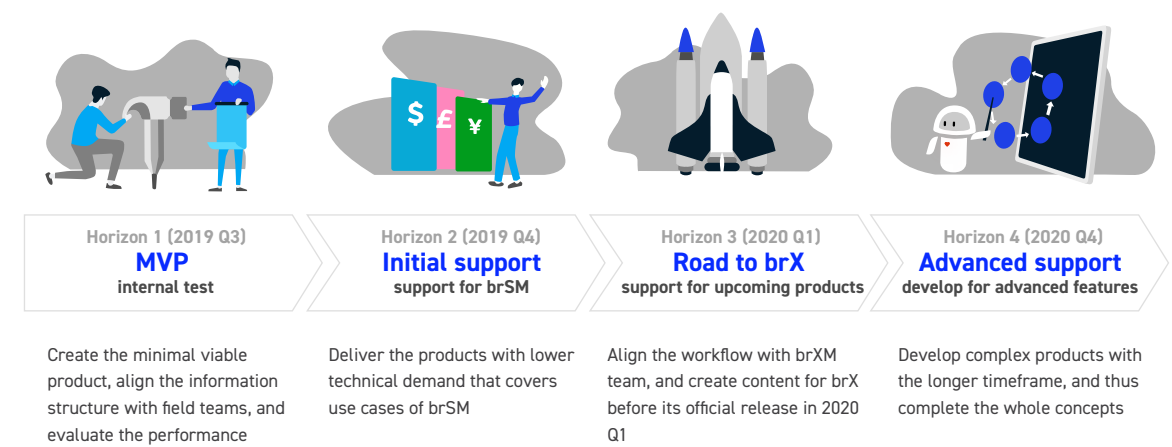


Figure 97. Four horizons of the Roadmap



Figure 98. Roadmap

Preparing for brX (DG7)

This roadmap reflects the product strategy that is mentioned in Chapter 3.3. Currently, the company is going to introduce, brX, the flagship product that comprises of current brXM and brSM in Q4 2019. The integration of these two products is the top-priority project in the company. However, the integration is focusing on functional aspects, ignoring the supportive information and services. Given the complexity of new product and characteristics of ML, we urge that the integration of supportive information is equally important and be overlooked right now.

Horizon 1: MVP (Q3 2019)

The aim of the phase is to create tangible results within a quarter to get trusts from the leadership, and convince them to allocate resources for the following phases. Therefore, the required technology is limited to the minimum level, and we focus on improving the existing products (such as documentation and Intelligence Switchboard).

There are three key activities in the phase. Led by Product team, the templates of brXtrategy family is created with collaboration with the field teams. It ensures that stakeholders have agreements on the content formats. Also, we create the prototype for Playbook. Product team will take responsibility to develop the front-end appearance, while Engineering team will use brXM to develop the back-end functionality. brXM is a content management system (CMS) that enables editors to update the content in the interface without technical supports. Moreover, brXtrategy Merlin 2.0 is created in the phase. Since it is an existing product (Intelligence Switchboard), it will be just a two-week

project that requires a designer to create contents and interfaces, and an engineer to implement them.

Among these projects, Use-case oriented development workflow (see Ch8.4) will be implemented, which improves the development process and align the product understanding between field teams and R&D teams.

Horizon 2: Initial support (Q4 2019)

Based on the templates and prototypes created in the first horizon, the contents and supportive tool of brSM are fully created in the phase.

There are three key activities in the phase. First, brXtrategy Card will be printed. It is considered as a tool for product marketing, and thus it requires around 3,000 USD of the marketing budget for 100 pieces of card sets. Business Service will brainstorm the use cases of the card set in the training session. Furthermore, the full content of Playbook is delivered to the website. Engineers integrate the authorization system (Single Site Oath, SSO) to Playbook. It ensures that only brSM clients can access the content. In addition, Loading tip is developed in brSM Dashboard. It is not a technical-challenging project, but still requires the efforts to design a framework that loads the tip data in a JSON format, selects one object from the list with simple conditional statements, and presents it to the screen.

Horizon 3: Road to brX (Q1 2019)

When the value of brXtrategy is

recognized, Bloomreach can extend its workflow and content format to brXM. brXM is a product that is developed and marketed in the Amsterdam office. And it requires efforts to migrant the solution to the context. In the current plan, brX 1.0 will be released in Q1 2019, and the brXM-supported brXtrategy aims to go live around the same time.

There are three key activities. First, with collaboration with teams from brSM and brXM, the content of brXtrategy will expand to both products. Following that, the content will be delivered to Playbook. Last but not least, it provides the loading tip in brXM dashboard. Since the product uses a different environment (Angular) from brSM (Node.js), another loading framework requires brXM's engineers to implement.

Horizon 4: Advanced support (Q4 2020)

In the last phase, the technical-challenging product, brXtrategy Insight will be delivered. This project requires higher engineering efforts and may not be considered as a high-priority item during Q2-Q3 2020, therefore it is only expected to be finished in Q4 2020.

The content format of the email service will be created with the collaboration between Marketing team and the field teams. Once the content and design have been confirmed, the engineering team will start the development.

Since the product requires a mail service that Bloomreach doesn't have, it requires more resource to be implemented. Technically speaking, the mail service has two components, automated data pipeline and automated mail delivery service. To present the performance data

in the previous weeks, the data pipeline will collect the relevant data from brSM and send it to the delivery service. Then, the delivery service generates the email content and send it to brSM user according to the user credential data from the SSO system.

Both of the components are new to the company. It thus concludes the technical demand of the product.

8.4 Transitional workflow

To foster the internal transition, we introduce a new workflow for new feature development that aligns the feature expectation and improves internal communication.

In Ch4, we identified the internal problems of feature expectation and communication. Due to different functions and levels of engagement to clients, the field teams and R&D teams have misalignments of the product, which lead to bad external feature communication between Bloomreach and clients.

For example, the R&D teams are future-value driven, that prioritizes the projects helping Bloomreach's future growth, while the field teams are business-driven, that aims to deliver the short-term value to clients. They also have different

communication approaches. The R&D teams apply feature-oriented approach to communicate the product, while the field teams use use-case oriented approach.

Design goals

Product team's transition (DG8)

We urge Product team should take responsibility to fill the gap by adopting the use-case communication approach, and involving field teams in the feature development process more (Figure 99).

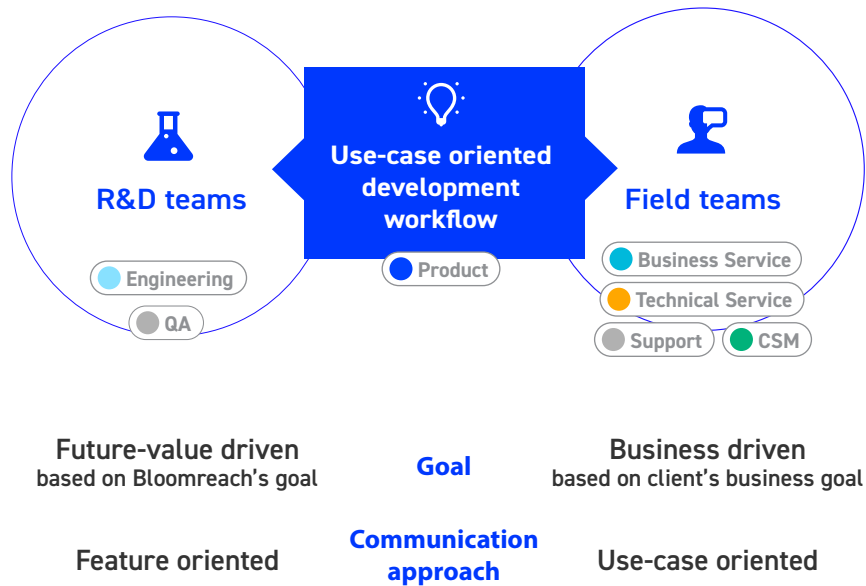


Figure 99. The new workflow bridges the communication and knowledge gaps between the field teams and R&D teams.

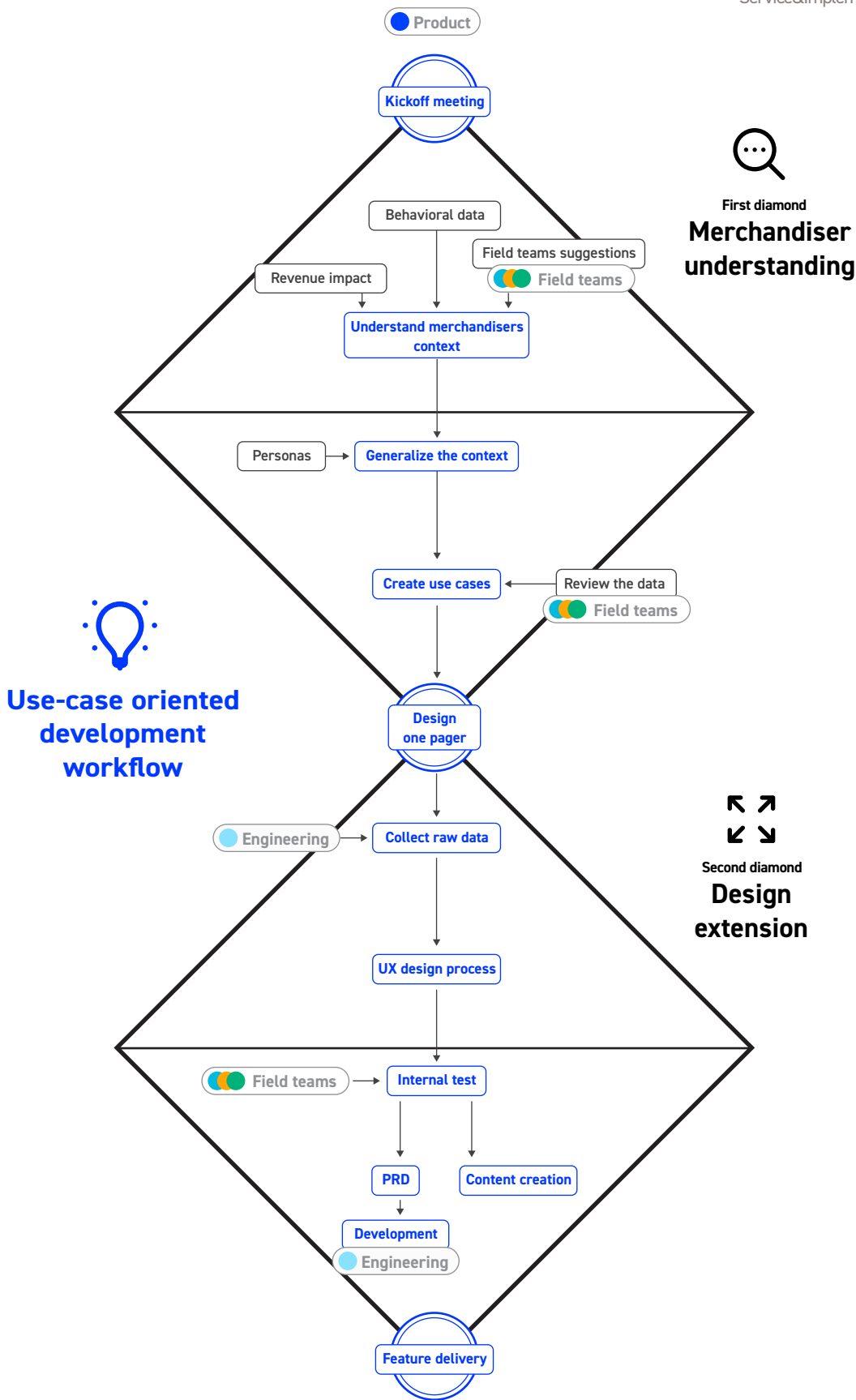


Figure 100. The process of Use-case oriented development workflow

We propose Use-case oriented development workflow (Figure 100), a new workflow of feature developments that fills the gaps, aligns the expectation, and generates contents for brXtrategy. The workflow consists of two phases, merchandiser understanding, and design extension.

Merchandiser understanding

Bloomreach starts a new feature development due to either the request from clients via the filed teams, or the company's product plan. In the first phase, Product team will gather the external signals of merchandisers and summarize it as a vehicle to align the feature expectation.

After the kickoff meeting of a project, Product team will research on the context of the potential users for the feature. There are three possible signals, potential users' revenue impact, their behavioral data on Dashboard and the suggestions from the field teams. Revenue impact specifies the importance of the users to Bloomreach. It also implies the resources that the company can allocate to the project, which decide the scope of the project. Behavioral data explains what are the current action that the potential users are performing on Dashboard. It suggests the problems or their preferences. Field teams can also provide useful insights from their experiences with clients.

Next, Product team will generalize the context by several personas if the different patterns are identified. The generalized personas represent the groups of potential users without showing sensitive information. Then, the field teams review the personas and provide contextual information that complete the personas. Also, the teams brainstorm the possible use cases of the feature.

As results, comprehensive research regarding potential users of a feature is created. A design one-pager is created to summarize the visualize the results.

Design extension

According to the design one-pager, the design team defines the user flows. To simulate the future user flow, the related data that is displayed on the screens is requested from Engineering teams. The data could be product feed data or performance data. Then, the conventional UI/UX design process starts.

Once the prototype is created, the field teams will participate in the internal tests. After the design is revised and finalized, on one hand, Product manager will create a PRD document for Engineering team. On another hand, all design, which is created in the phase, will be passed to Technical writer as a resource to create brXtrategy content.

09

Evaluation Chapter 9

In the previous chapters, we have proposed a comprehensive design solution on experience, service and strategy aspects. It enables us to perform an extensive evaluation.

We apply the Three IDEO Circle model, desirability, feasibility and viability as metrics to evaluate the solution. It ensures the solution is possible to be implemented by Bloomreach.

9.1 Methods

(74) IDEO. (2017). How to Prototype a New Business. Retrieved August 22, 2019, from <https://www.ideo.com/blogs/inspiration/how-to-prototype-a-new-business>.

(75) Orton, K. (2017). Desirability, Feasibility, Viability: The Sweet Spot for Innovation. Retrieved August 22, 2019,

The internal and external feedback is gathered to evaluate the desirability, viability, and feasibility of the solution.

Metrics

In order to evaluate the product-service solution, we apply Three IDEO Circles [75] (Figure 101), desirability, viability, and feasibility, as the metrics. It illustrates three characteristics of a successful innovation. The tests of three characteristics provide the feedback of potential adjustments during future implementation. According to the definition made by Orton [75], these characteristics are described below.

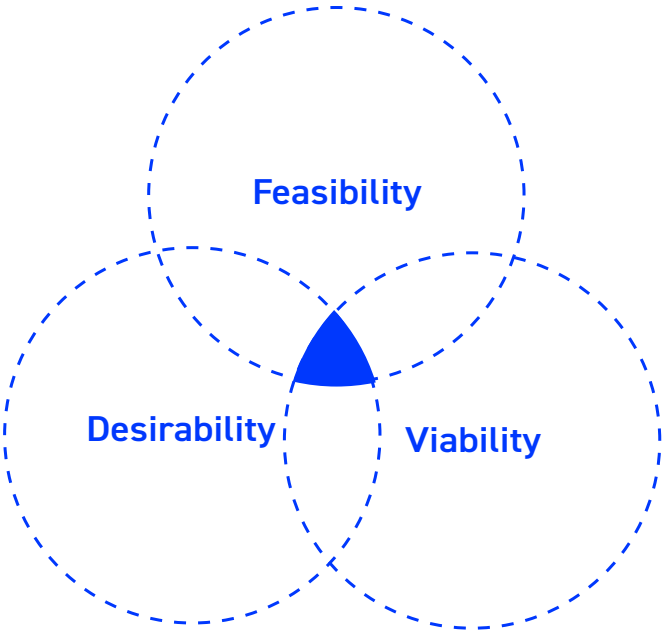


Figure 101. Three IDEO Circles

Desirability

Test of desirability evaluates whether the innovation is solving clients’ pain points. It measures the necessity of the solution to the subjects. If the innovation solves the key pain points that the subjects face in the current services, it is considered to meet the test of desirability.

Viability

Test of Viability evaluates the value chain of the solution to ensure that it is viable for now and in the future. It measures the business value of the solution, as well as the efficiency of the solution building.

Feasibility

Test of feasibility measures the operational capacities to deliver the new solution. It assesses the strengths of technology, finance, branding, customer service, and partnership. If the solution can leverage 80% of current operational capacity, it is considered as a feasible solution.



Figure 102. Design evaluation with merchandisers

Methods

Several methods are applied to conduct these tests with internal stakeholders and merchandisers.

Desirability

Since both the new front-stage and back-stage services are proposed. The desirability tests include the ‘users’ of these services, internal stakeholders and merchandisers.

Desirability of internal stakeholders

There are two experiments are performed with internal stakeholders. First, we perform a showcase to the leadership of Bloomreach, including CEO, CPO (Chief Product Officer), and CRO (Chief Revenue Officer). brXstrategy Card is used to validate the concept of feature communication in the use-case oriented approach. Also, the internal presentation is used to validate the research findings and product-service solution with Director of Product team, Business Service team, Technical Service team, Marketing team, People Management team and 15 multidisciplinary Bloomreach employees (Figure 103). They are asked to write comments on post-its during the presentation.

Desirability of merchandisers

In the same experiments where we invites two types of merchandisers to provide their business context (see Ch 5.3, Figure 102). We use brXstrategy Card as a discussion tool to understand their goals, tasks, and challenges. At the end of the interviews, they are asked the opinion of the tool.

Viability

Since solution proposes supportive tools

which don’t contribute to the revenue directly. We majorly evaluate the efficiency of solution building for the metric.

We organize a review meeting with a Product Manager, who decides Bloomreach’s product roadmap. The service blueprint and roadmap are used to evaluate the viability of the solution.

Feasibility

Feasibility of Customer Service and Technology are more relevant aspects of the feasibility test. We, therefore, conduct experiments to assess these feasibility.

Feasibility of Customer Service

A review session with the director of Business Service team is organized. We present the whole solution and discuss the implementation issues of the team.

Feasibility of Technology

We organize a review meeting with a Product Manager and a Product Designer. We review the implementation plan and discuss the technological feasibility.



Figure 103. Design evaluation in the company

9.2 Disirability, Viability & Feasibility

In the tests of desirability and feasibility, the solution receives overwhelming positive feedback, though there are some concerns regarding its viability.

Desirability

The product-service solution receives great feedback from the company leadership, internal stakeholders, and merchandisers. The pain points we identify are valid, and the solution is

useful for merchandisers.

Desirability of internal stakeholders

Both tests with the internal stakeholders and leadership are positive.

The pain points of the feature communication are valid, and the solution is considered to mitigate the problem. Business Service team considers brXstrategy embodies use-case oriented communication. Marketing team regards the design as 'the clear way to communicate our products to prospects'. Technical service team finds the potential value of the solution to explain the complex brX solutions to clients (Figure 106).

The company leadership feels excited about the solution. CRO finds the solution is useful to communicate the value internally, especially between Product team and Sales team. And both CEO and CRO comment the solution and share it to internal Slack channels (Figure 104). Furthermore, CPO even suggests the solution can 'educate our people in the Amsterdam office (brXM teams) on brSM', which prove the strategic value of the product that aligns the workflow and knowledge between teams of brSM and brXM (See Ch8.3).

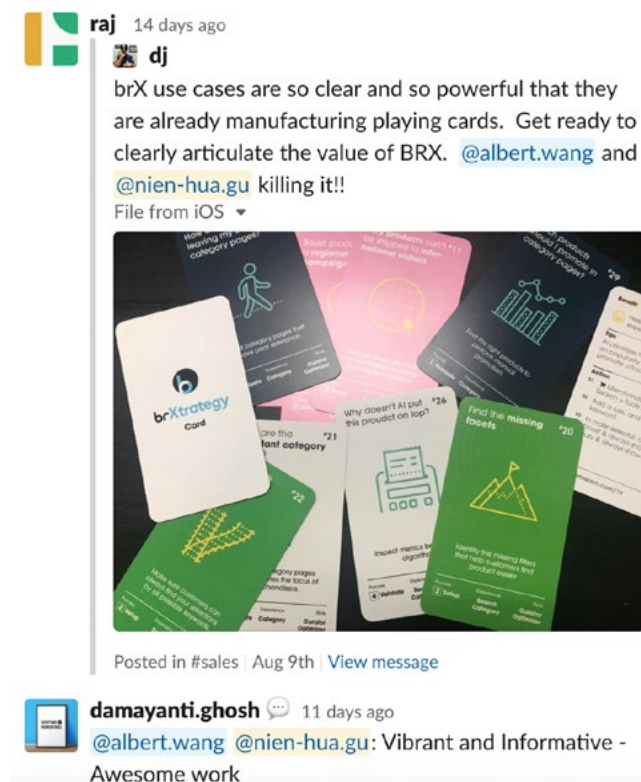


Figure 104. CEO and CRO share the design results to the sales channel in Slack

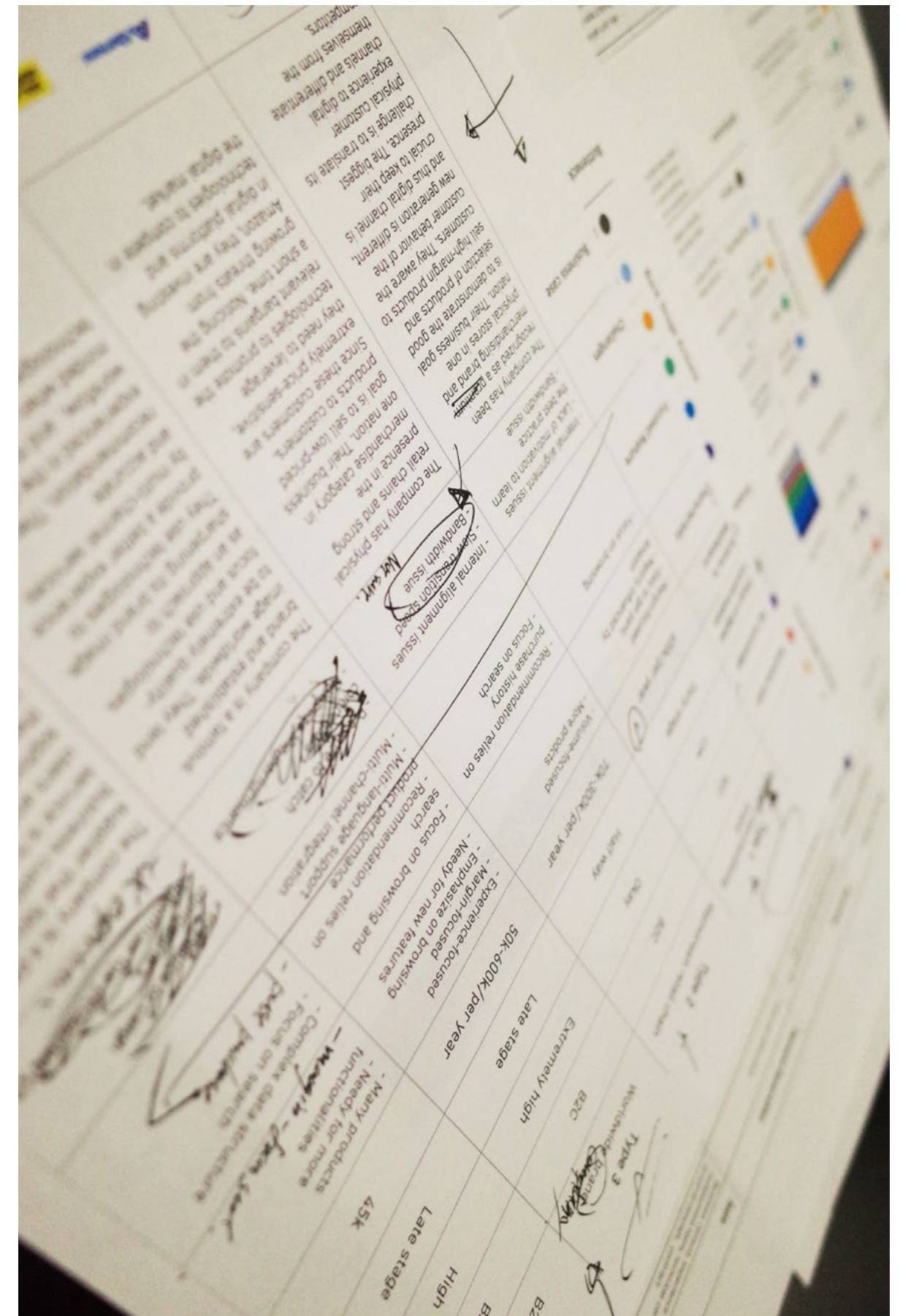


Figure 105. Feasibility test of Customer Service with the director of Business Service

Desirability of merchandisers

In the experiments, both two types of merchandisers can utilize the brXstrategy Card during discussion. They can use them without many explanations, which implies the practices on the cards are authentic in the business context.

Merchandiser 1 mentions, the card set helps her to understand brSM better, for example, she finds a practice that was considered impossible to perform on brSM. Merchandisers 2 considers the solution is helpful for re-training. She wants to use the card set to educate her new team member.

Viability

In the test of viability, the solution is considered as a viable solution that can be built with limited sources. After the internal presentation, the first three horizons are included in the BloomReach's product roadmap, and they are expected to be delivered in Q1 2020.

However, the PM suggests, the business value should be articulated better with key metrics or competitor cases if it proceeds to the forth horizon. Since the mail system requires more engineering resources, improving the priority of the project during resource allocation becomes important.

Feasibility

In feasibility tests of Customer Service and Technology, the solution receives positive feedback since the solution adoption is not hard, and the required technology is not complex.

Feasibility of Customer Service

Customer Service team welcomes the solution, considering the solution facilitates their training. They only need to spend some time to discuss the how they can utilize the solution in the training session.

Feasibility of Technology

The PM describes 'there is no technical-challenging part in the project'. brXstrategy Insight is an improvement of an existing product. brXstrategy Playbook can be built with another company's product. Loading tip is just an additional improvement of Dashboard.

brXstrategy Insight is a new mail system, which requires more engineering efforts, though it is not technical-challenging. But it may be a lower priority project compared to the other strategic ones and get postponed given the limited development resources.

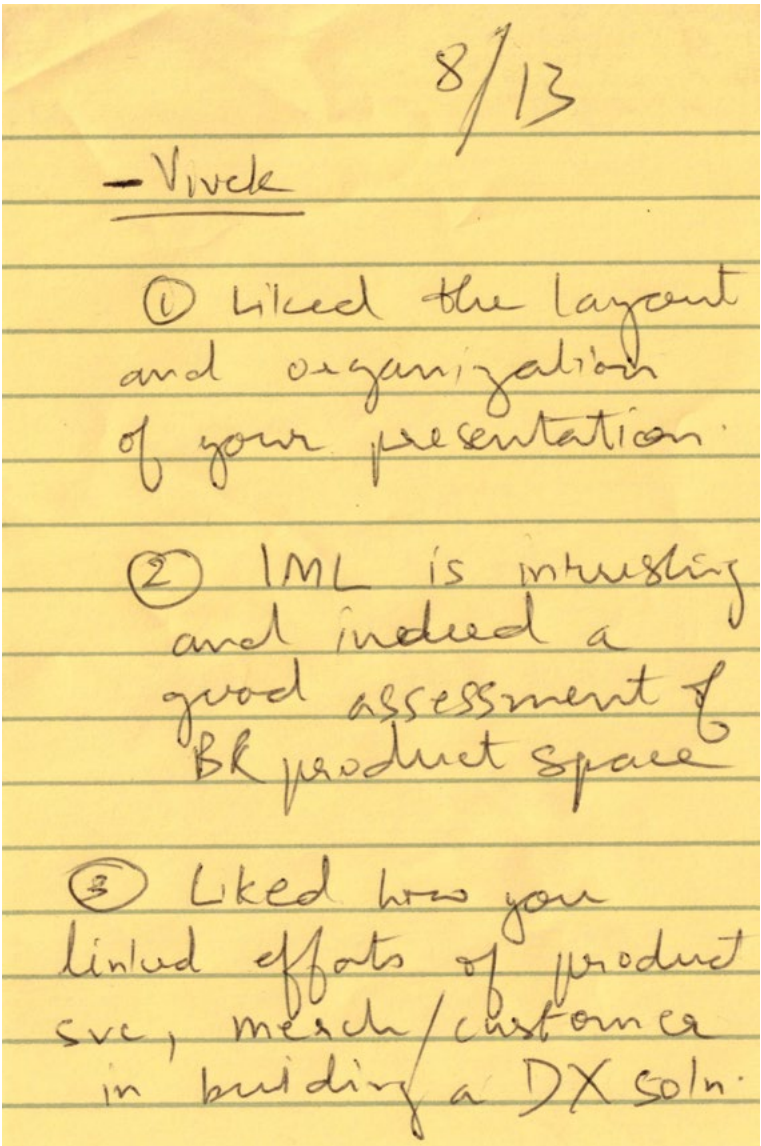


Figure 106. A feedback post-it received in the internal desirability test

10

Conclusion

Chapter 10

10 Conclusion

The thesis addresses the implementation challenges of Machine Learning (ML) for merchandisers in the scenario of digitalization of retailing, and proposes a product-service design as the solution. The researcher collaborates with Bloomreach who provides a merchandising tool called Bloomreach Search & Merchandising (brSM). brSM is an ML-powered product helping merchandisers to improve search and category experiences by optimizing the ranking of products, improving search results and curating recommendations on e-commerce platforms. By facilitating retailers to implement brSM, Bloomreach devotes itself to helping the companies with their digital transformation with ML. It thus becomes the motivation of the project, that defines the research scope, digitalization of retailing with Machine Learning.

Digitalization of retailing with Machine Learning

Retailers are digitalizing their sale channels gradually [5] due to the change the customer preferences of the new generation [6]. The transformation reveals new opportunities for retailers. It enables retailers to create omni-channel experiences, the seamless shopping experiences across physical and digital channels [28] [29]. Also, retailers are able to target specific customer segmentation and customize experiences in scale, which potentially increase revenue [10], extend product lifecycle [33], and decrease customer churn [11]. It also benefits customers with better quality of purchasing decisions [9].

However, the implementation of new

technology also poses challenges to retailers. It diminishes the relationships between the system and users. Users perceive that digitalization represents a threat to the sense of control of their work due to the transition from old work methods. As results, they lose the feeling of control in the process [31]. For ML-powered products, specifically, due to the inconsistency [52], uncertainty, and errors of algorithmic results [58], it requires users to have statistical knowledge to understand it [14] [15] and the scientific work method to interact with it [16].

Based on the academic foundation, we further investigate brSM in three aspects, product, service and merchandisers.

brSM: the product

brSM improves search and category experiences on e-commerce platforms by leveraging algorithms such as query understanding and ranking. The algorithms are designed to improve revenue by promoting the best-performing and relevant products or keywords. To facilitate the learning process and optimize results, merchandisers can use Dashboard to interact with algorithms which fits the definition of interactive Machine Learning (iML) [64].

The AI-human interaction guidelines suggest to align the expectation of results [47], explain the mechanism in the different approaches [41] [52] [53], and guide users in the case of errors [52] [53]. Firstly, non-technical people may have wrong expectations of the technology. Therefore, clarification of its limitations beforehand is important [52]. Furthermore, it is suggested to explain

the mechanisms in several ways, such as with general explanations [41], specific output explanations, or with example-based explanations [52]. Moreover, since errors happen frequently, it is useful to prepare guidance, that helps users to inspect the errors, and instructions to solve the issue [52] [53].

Besides, Bloomreach is planning to integrate brSM with another marketing product, and release a new product, Bloomreach Experience (brX). Considering the strategic importance and its release date, the solution should be future-proof and applied to the new product.

brSM : the service

Bloomreach has field teams to provide direct assists to clients. However, the services have the following challenges.

Internally, the services have scalability issues. Field teams struggle to provide satisfying service to the growing number of clients. In addition, brSM has frequent feature rollouts. There is no specific team coordinating internal communication concerning brSM. This potentially leads to bad communication with clients, makes integration of new features more challenging, and causes unsuccessful product implementation.

For clients, documentation is useful when they get on board, or train their new employees. However, the organization of the documentation is confusing since it is structured by features. It requires users to be familiar with the product before they can find the right content that solves their problems. Thus, the documentation should apply the use-cases oriented approach to explain the features better.

When the product is deployed, clients

underestimate brSM's value because the system works behind the scenes. It is therefore suggested that the ML-powered product should have proactive interactions with users, and remind them of the contribution that the system has made [52].

Merchandiser: the user

The goal of merchandisers is to promote the sale of products. In practice, merchandisers perform visual merchandising (VMD) techniques on e-commerce websites [68]. According to Bizbl [27], Bustos [72] and SearchSping [73], merchandisers modify the visual presentation of products, customize the experience for customers and improve search results by improving keyword interpretation and facet priority.

By the behavioral data analysis and interviews with merchandisers, the association between business context, merchandising goal and merchandising practice are identified. Two merchandising personas are identified, curator and optimizer.

Curators are working with visual-oriented products in brand companies. In the website, its shopping experiences are more similar to the physical shops, where merchandisers curate all experiences for all marketing funnels. Merchandisers perform conventional visual merchandising practices and translate the practices into the actions in category pages with hard controls.

Optimizers have function-oriented products in wholesale companies. Due to the large product portfolio and complex product attributes, they optimize search and filter tools to help their customers to find product faster. In practice, they tend to understand the algorithmic

results, and avoid unnecessary intervene. Thus, optimizers use soft controls and inspection tools frequently.

These two personas are two paradigms with equal importance. Therefore when Bloomreach introduces the new support service, it should provide customized information for two personas to accommodate their business contexts.

Design definition

Given the broad internal and external challenges, a comprehensive service-product solution is introduced. The design goal is defined as, improving the (new) feature communication by adopting a use-case oriented approach for merchandisers and internal stakeholders with supportive tools. According to implementation framework of service design [20] [21], the solution will be addressed on three level, experience, service and strategy.

Experience design

At experience level, brXstrategy family, supportive tools that provide merchandising inspirations, is introduced. There are two types of products in the family, content presentation and content delivery.

On the content presentation front, in order to help merchandisers to understand ML's capacity according to their context. brXstrategy Cards and brXstrategy Playbook provides extensive example-based and general explanations that illustrate the mechanism and limitation in a simple format. On the other hand, brXstrategy Merlin applies specific output explanations [53] to explain the metrics and algorithms that construct brSM system. With these

explanatory approaches, they reduce the knowledge gap of merchandisers. Besides, brXstrategy Playbook improves the QA content structure that helps merchandisers to find the guidance of error inspection and problem-solving.

On the content delivery front, we use brXstrategy Insight and Loadingt tip that deliver the content links to the channels where merchandisers more likely engage with. It also helps to raise the awareness of the merchandisers when Bloomreach introduces the new service. brXstrategy Insights provides weekly performance review, along with supplementary information including new feature or suggested practices. It is expected to provide more feedback from the system and provide the senses of control to merchandisers. Loading tip provides related tips that merchandisers can learn according to their current actions during data loading in Dashboard. It encourages merchandisers to visit brXstrategy Playbook for merchandisers practices.

Service design

At the service design level, both the front-stage and back-stage services are introduced by the user journey map and service blueprint.

The user journey map illustrates the process of the front-stage service in three phases, onboarding/retraining, new feature rollout, and continuous learning. Particularly, in the new service process, it enhances critical moments that are considered as the bottleneck of the current brSM services. For example, in the phase of onboarding, it provides more interactive materials that can facilitate merchandisers to learn and understand brSM in training session or routine CSM meetings. Also, with the new solution, re-training service becomes

possible even when Bloomreach experts are not available. Moreover, in new feature introduction, the feature communication becomes more efficient and merchandiser-friendly with the use-case oriented approach.

In the service blueprint, it illustrates the intra-company collaboration that creates the content, and builds the solution. There are two major parts in the blueprint, solution building and content updating. Solution building refers to the process to create the initial content and technical construction of brXstrategy products, while content building illustrates the better workflow to create new features and their content for brXstrategy services.

Strategic design

At the strategic level, the solution facilitates the product strategy and improves the intra-company collaboration that fosters the implementation of the solution in Bloomreach.

In the roadmap, it explains the implementation process with four steps, creation of MVP, Initial support, Road to brX, and Advanced support. The strategic value of the roadmap is to integrate brSM and brXM, including supportive information and workflows. Also, it can become a strategic project to align the service provided by brSM and brXM's teams.

The transitional workflow proposes a development process, called Use-case oriented development workflow, that bridges the gaps of product/merchandiser understandings between the field teams and the R&D teams during feature developments. It consists of two phases, Merchandiser understanding, and Design extension. In the first phase, the Product team collects the relevant

contextual data, and generate personas and potential merchandising practices with the field teams. Then in the second phase, Design team performs UI/UX design tasks, tests the prototypes with the field teams, and passes the results to PMs for developments and technical writers for the content generation of brXstrategy.

Contribution

With the comprehensive research and three aspects of the design solution, the project contributes to the company and academic domain in three ways.

This thesis contributes to a better understanding of merchandisers in the process of digitalization of retailing. It identifies the two personas of merchandisers during the implementation of an ML-powered product due to different business contexts and product characteristics. As results, it provides a series of supportive tools that customize the contents and experiences.

For Bloomreach, this thesis proposes a solution that improves brSM's services and facilitates the implementation. It improves the front-stage user journey, and back-stage workflows. Furthermore, the implementation plan can facilitate the collaboration and product alignments between the field teams and R&D teams, and between brSM teams and brXM teams.

Moreover, this thesis identifies the potential design approach that designer can perform. It demonstrates an example of how designers can facilitate the implementation of ML for non-technical users with a service-product design. It therefore improves the performance of ML-powered products due to a better interaction between human and algorithms.

11

Appendix

Chapter 11

11.1 Current service blueprint

Service phase	1. Marketing	2. Demand Generation	3. Sale
Tangible Evidence	Official website, SEO, social media ADs, Connect events (Physical events)	Discovery call, pitch	Business consult, experience assessment tools, technical consultant, proof-of-concept, contract
Front Stage Actions	Product	- Provide training in events	
	Business Service	- Provide training in events	- Help sale services - Use experience assessment tools
	CSM	- Invite clients to events	
	Technical Service	- Provide training in events	- Provide the proof-of-concept - Consult engineer divisions of prospects
	Marketing	- Create successful stories - Organize marketing campaigns	- Pass the prospects' information to Sales - Provide sales content
	Sales		- Engage to prospects - Close the contract
	Support		
Presence Level			
Back Stage Actions	Product	- Predict the user values of products for marketing material.	
	Business Service		
	CSM		
	Technical Service		
	Engineering		
	Others		
Bottlenecks	- It is hard to explain the products and predict product value	- Field teams do not understand products enough.	- Sales sometimes promise too much

Service phase	4. Side-by-side Development	5. QA and Product Evaluation
Tangible Evidence	Side-by-side development, Data preparation	Side-by-side QA
Front Stage Actions	Product	
	Business Service	- Conduct the product evaluation
	CSM	
	Technical Service	- Integrate products with the client-side - Modify the algorithm - Prepare the data
	Marketing	
	Sales	
	Support	
Presence Level		
Back Stage Actions	Product	- Explain how the product works to TS team - Solve the problem caused from the evaluation
	Business Service	
	CSM	- Take the account ownership from sales team
	Technical Service	- Formulate an integration team - Govern the progress and expense - Govern the progress and expense
	Engineering	- Facilitate the customization
	Others	- QA team tests the products
Bottlenecks	- Product is not properly designed - Integration was hard and expensive	- QA is not perfect

Service phase	6. Product Enhancement	7. Onboarding
Tangible Evidence	Progress of enhancements, user research	Training, online material, documentation, support mail
Front Stage Actions	<div></div> <div>Product</div> <div>- Conduct field research</div>	<div></div> <div>- Communicate the vision</div>
	<div></div> <div>Business Service</div> <div>- Report the progress</div>	<div></div> <div>- Provide training</div> <div>- Provide digital training material</div>
	<div></div> <div>CSM</div> <div>- Report the progress</div>	<div></div> <div>- Account management</div>
	<div></div> <div>Technical Service</div> <div>- Answer technical questions</div>	
	<div></div> <div>Marketing</div>	
	<div></div> <div>Sales</div>	
Back Stage Actions	<div></div> <div>Support</div>	<div></div> <div>- Provide technical support by mail</div>
	<div></div> <div>Product</div> <div>- Plan, design and develop the new feature</div> <div>- Prioritizing the developments</div>	<div></div> <div>- Provide informaiton to CSM & BS</div>
	<div></div> <div>Business Service</div> <div>- Deliver clients' request to Product</div> <div>- Monitor the progress</div> <div>- Provide feedbacks</div>	<div></div> <div>- Synthesize all information from different teams</div>
	<div></div> <div>CSM</div> <div>- Deliver clients' request to Product</div> <div>- Monitor the progress</div> <div>- Provide feedbacks</div>	<div></div> <div>- Provide technical alignment to CSM & BS</div>
	<div></div> <div>Technical Service</div> <div>- Deliver clients' request to Product</div>	<div></div> <div>- Share product knowledge to CSM</div>
Bottlenecks	<div></div> <div>Engineering</div> <div>- Collaborate with Product team</div>	<div></div> <div>- Provide debugging services as Support team requests</div>
	<div></div> <div>Others</div> <div>- Marketing provides the insights</div> <div>- QA team test the new feature</div>	<div></div> <div>- Sales team helps CSM team to maintain relationships</div>
Bottlenecks		<div></div> <div>- We can't deliver features in time</div> <div>- Product team is not familiar with the client's context</div> <div>- Requests from small clients are overlooked</div>
		<div></div> <div>- Customer is unwilling to buy services</div> <div>- Product team doesn't know how clients use the product.</div> <div>- Product information is not clear externally and internally</div>

Service phase	8. New Feature Roll-out and Product Marketing	9. Post-sale Services
Tangible Evidence		Renewal, Product Modification, Upsell, ongoing assistant, regular meetings
Front Stage Actions	<div></div> <div>Product</div> <div>- Prepare the documentation</div>	
	<div></div> <div>Business Service</div> <div>- Communicate the new feature</div>	<div></div> <div>- Provide ongoing assistance</div> <div>- Facilitate clients to build their roadmap</div>
	<div></div> <div>CSM</div> <div>- Communicate the new feature</div>	<div></div> <div>- Track the needs of clients</div> <div>- Make sure clients will renewal</div>
	<div></div> <div>Technical Service</div> <div>- Communicate the new feature</div>	<div></div> <div>- Collaborate engineer team from client-side for new requests</div>
	<div></div> <div>Marketing</div> <div>- Prepare internal information</div> <div>- Prepare external campaigns</div>	
	<div></div> <div>Sales</div>	
Back Stage Actions	<div></div> <div>Support</div> <div>- Communicate the new feature</div>	<div></div> <div>- Provide technical support by mail</div>
	<div></div> <div>Product</div> <div>- Communicate the features to field teams</div>	
	<div></div> <div>Business Service</div> <div>- Create sale tools to show our expertise</div>	
	<div></div> <div>CSM</div>	
	<div></div> <div>Technical Service</div>	
Bottlenecks	<div></div> <div>Engineering</div>	
	<div></div> <div>Others</div>	<div></div> <div>- Sales team helps CSM team to identify upsell opportunities</div>
Bottlenecks		<div></div> <div>- Internal communication for a new feature is not well organized</div> <div>- Documentation is confusing</div>
		<div></div> <div>- CSM is reactive.</div> <div>- The deliver time is hardly met.</div> <div>- Client doesn't feel the value.</div> <div>- No re-training plan is offered</div>

11.2 brXstrategy Card



Curator

P1

An illustration of a woman with long dark hair, wearing a blue top, holding a blue flag on a black pole. She is standing on a blue wavy line that represents water or a horizon.

Fresh and appealing product selection is the key to success

Merchandising style card

Style 1

P1

Curators believe that providing the best digital shopping experiences by fresh and appealing product selection is the best strategy. They understand the market trends, predict the products that customers love, and present them in the most visually appealing way.

Characteristic

Have visual-oriented products

Brand provides unique product selection

Rely on market campaigns

tip.bloomreach.com/p1

b

Optimizer

P2

An illustration of a white robot with a red heart on its chest, holding a blue bird on its outstretched arm. The robot is standing on a blue wavy line that represents water or a horizon.

Provide best experiences with the most relevant results

Merchandising style card

Style 2

P2

Optimizers believe providing the most relevant result will not only help their customer to find products faster, but also drive the revenue of their digital shops. Due to the complexity of their product portfolio, they collaborate with ML in a data-driven approach to identify blindspots in the customer journey and discover customers' needs.

Characteristic

Have function-oriented products

Wholesale has a large product portfolio

tip.bloomreach.com/p2

b

New product launch!

S1



New products are revenue drivers. Promote these new products are key to success.

Merchandising strategic card

Strategy 1

S1

You can find the related practices according to types of actions that you want to perform.

Evaluation

#27 #28 #29 #31

Setup

#01 #08 #17 #24

A/B test

#15

Validate

#21 #26

tip.bloomreach.com/s1



Low-priced & high-volume products focus

S3



We provide affordable products. It is important to make sure sale numbers of these products skyrocket.

Merchandising strategic card

Strategy 3

S3

You can find the related practices according to types of actions that you want to perform.

Evaluation

#27 #28 #29 #31

Setup

#03 #10

A/B test

#15 #16

Validate

#21 #26

tip.bloomreach.com/s3



High-margin product promotion

S2



We have high-quality collections. High-margin products should be emphasized.

Merchandising strategic card

Strategy 2

S2

You can find the related practices according to types of actions that you want to perform.

Evaluation

#27 #28 #29 #31

Setup

#02 #10

A/B test

#15 #16

Validate

#21 #26

tip.bloomreach.com/s2



Personalization & customization

S4



According to customers' context, we provide the offerings that are more relevant to them.

Merchandising strategic card

Strategy 4

S4

You can find the related practices according to types of actions that you want to perform.

Evaluation

#05 #06 #27 #28 #29 #31

Setup

#09 #11 #12 #13 #14

A/B test

#15 #16

Validate

#21 #26 #30

tip.bloomreach.com/s4



Sale campaign on the way S5



We plan a seasonal promotion strategy. The products are sophisticatedly curated and campaign performances are monitored.

Merchandising strategic card

Strategy 5 S5

You can find the related practices according to types of actions that you want to perform.

Evaluation

#05 #06 #25 #27 #28 #29 #31

Setup

#08 #09 #13 #14 #17 #22 #24 #32

A/B test

#15 #16

Validate

#21 #30

tip.bloomreach.com/s5



Noises & problems identified S7



To improve the results and presentations, we need to understand the situation of algorithms.

Merchandising strategic card

Strategy 7 S7

You can find the related practices according to types of actions that you want to perform.

Evaluation

#25 #31

Validate

#04 #26 #27 #28

tip.bloomreach.com/s7



Improvement of search accuracy S6



Search is a key component in our user journey. Search results are reviewed regularly and improvement measures are performed.

Merchandising strategic card

Strategy 6 S6

You can find the related practices according to types of actions that you want to perform.

Evaluation

#07 #25 #31

Setup

#18 #19 #20 #22 #23 #24 #32

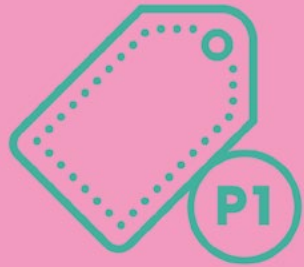
Validate

#30

tip.bloomreach.com/s6




Pin new products #01 in the front



How to align category pages with physical catalog?

Process Experience Style
2 Setup Category Curator Optimizer



Benefit #01

 Accurately curate the product order.

Tips

Use  boost to top for position 1, and  lock position for the other cases.

Action

- 01  Merchandising > Category Ranking > Add rules
- 02 In product tab, select products to pin.
- 03 Use A/B test  to evaluate the modification.

tip.bloomreach.com/01




Get on-sale products top #03



Create rules to promote on-sale products automatically

Process Experience Style
2 Setup Search Curator


Benefit #03

 Reduce the efforts that we promote products one by one

Tips

It is necessary to have an on-sale attribute in the product feed file to perform it

Action

- 01  Merchandising > Category Ranking > Add rules
- 02 Fill in a search term or category on top
- 03 In Attribute tab, click Create New Attribute Rule
- 04 Choose attribute slot or attribute boost
- 05 Use the on-sale attribute to boost matching products

tip.bloomreach.com/03




Get high-margin products top #02



Create rules to promote high-margin products automatically

Process Experience Style
2 Setup Search Curator


Benefit #02

 Reduce the efforts that we promote products one by one

Tips

It may introduce the product that not relevant to customers. It may be better to use Attribute boost with a lower rule strength

Action

- 01  Merchandising > Site Search > Add rules
- 02 Fill in a search term or category on top
- 03 In Attribute tab, click Create New Attribute Rule.
- 04 Choose attribute boost
- 05 Use the high-margin attribute to boost matching products
- 06 Choose the rule strength

tip.bloomreach.com/02



Make sure the beloved products are displayed on the top #04



Make sure the beloved products are displayed on the top

Process Experience Style
4 Validate Category Search Curator Optimizer


Benefit #04

 Helps company to earn more from these revenue drivers

Tips

AI will perform the boost for these products automatically! You can inspect the performance & priority of products in a query or category page

Action

- 01  Merchandising > Site Search > Tools > Diagnostics
- 02 Search
Select "Query" and key in a specific keyword
- 02 Category
Select "Category name" and key in a specific category

tip.bloomreach.com/04




What is the contribution #05
of social media cam-
paigns to the revenue of
a product?



Check the revenue of a
product from a specific
channel

Process Experience Style
1 Evaluate Category Curator

Benefit #05

 Evaluate the performance
of experiences across
marketing channels

Tips

There are more metrics such as
Conversion, ATC and Entrance

Action

- 01  Insights > Library > Report-
ing > Product dashboard
- 02 Choose a product
- 03 Find highest Traffic Channel
- 04 Choose group by revenue
- 05 Click Social revenue and it
shows the data

tip.bloomreach.com/05 


What are the #07
important **key-
words**?



Popular keywords are some-
times the focus of
merchandisers

Process Experience Style
**1 Evaluate Search Curator
Optimizer**


Benefit #07

 Identify the hotspots and
high-priority goals to work
on

Tips

It is a basic step that leads to
further actions such as (#22) (#23)
(#24)

Action

- 01  Merchandising > Site
Search > Analytics > Top
Keywords
- 02 Check the different periods
by using time selection on the
top

tip.bloomreach.com/07 


What is the contribution #06
of social media cam-
paigns to the revenue of
a category?



Check the revenue of a
category from a specific
channel

Process Experience Style
1 Evaluate Category Curator

Benefit #06

 Evaluate the performance
of experiences across
marketing channels

Tips

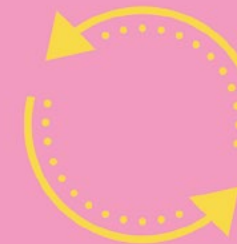
There are more metrics such as
ATC next, ATC after and bounces

Action

- 01  Insights > Library > Report-
ing > Product dashboard
- 02 Choose a category page
- 03 Highest Traffic Channel
- 04 Choose group by revenue
- 05 Click Social revenue and it
shows the data

tip.bloomreach.com/06 

Rotate the #08
product slots




Provide fresh product
selection without adding a
new product

Process Experience Style
2 Setup Category Curator

Benefit #08

 It's a countermeasure
when critical moments
happen

Action

- 01  Merchandising > Category
Ranking > Add rules
- 02 Cancel the existing product
promotions and promote a
new set of products
- 03 Use A/B test (#16) to evaluate
the modification

tip.bloomreach.com/08 


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of social media cam-
paigns to the revenue of
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tip.bloomreach.com/05 


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tip.bloomreach.com/07 


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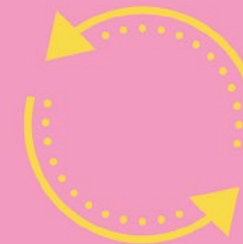
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tip.bloomreach.com/06 

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tip.bloomreach.com/08 


Promote products for mobile users #09



Create special offers for mobile users

Process Experience Style
2 Setup Search Category Curator


Benefit #09

 Curate experiences for different marketing funnels

Tips

Considering using global rules (#10) to reduce time creating repetitive rules

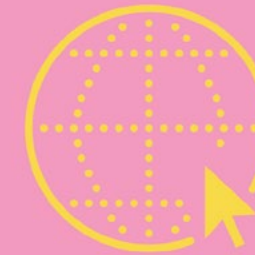
Action

- 01  Targeting > New audience
- 02 Select device, IS, and choose desirable choices like Mobile
- 03 Promote products as (#03)
- 04 In the visual editor, don't forget to choose the audience that is just created.

tip.bloomreach.com/09




Bury products can't be shipped to international visitors #11



Remove products which are not possible to deliver to customer's location

Process Experience Style
2 Setup Search Category Curator Optimizer


Benefit #11

 Display relevant product to customers according to their location

Tips

It is necessary to have delivery info in the product feed to perform it. Consider creating global rules (#10) to reduce the efforts that we create the duplicated rule for different pages

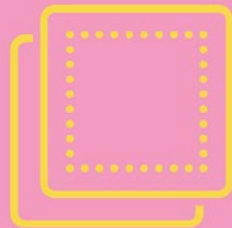
Action

- 01 As (#14), define a audience that not possible to receive certain products by region.
- 02  Merchandising > Category Ranking > Add rules
- 03 In Attribute tab, click Create New Attribute Rule
- 04 Choose attribute slot or attribute boost
- 05 Use the delivery attribute to bury matching products

tip.bloomreach.com/11




Promote products for all pages at once #10



Instead of creating rules for each page, use global rules to control the product presentation

Process Experience Style
2 Setup Category Browsing Curator Optimizer

Benefit #10

 Reduce the efforts where we create the duplicated rule for different pages.

Tips

Global rules are powerful and trump the other rules (that work for categories & keywords). Therefore, be aware of its impact on the results & algorithms

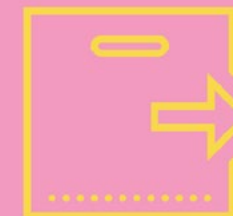
Action

- 01  Configuration > Setting > Global Ranking Rules > Add Rules
- 02 Modify product presentation as (#01) (#03) (#11)

tip.bloomreach.com/10




Boost back-in-stock products when customers are nearby a shop #12



Create omnichannel experiences for customers

Process Experience Style
2 Setup Category Curator Optimizer



Benefit #12

 Customize the experience for specific customers with relevant offers

Tips

Customers look at the ecommerce website before they visit the physical stores. It is necessary to include physical assortment information in the data feed

Action

- 01 As (#14), define a regional audience nearby a shop
- 02 In Attribute tab, click Create New Attribute Rule
- 03 Choose  attribute slot or  attribute boost
- 04 Use the assortment attribute to promote matching products

tip.bloomreach.com/12




Customization for customers from a campaign link #13



Curate experiences for different marketing funnels

Process **2** Setup Experience Search Category Style Curator


Benefit #13

 Customize the experience for specific customers with relevant offers

Tips

Technical speaking, it is important to pass a unique parameter in the link to shop pages. For example, bloomreach.com/?source=summer-mailer

Action

- 01  Targeting > New audience
- 02 Select URL, contain, and fill in the unique parameter
- 03 Promote products as **'03'**
- 04 In the visual editor, don't forget to choose the audience that is just created.

tip.bloomreach.com/13




Should we show baby cloth in t-shirt category page? #15



Validate whether products from a sub-category create noises for search & category pages

Process **3** A/B test Experience Category Style Curator


Benefit #15

 Improve product selection with solid proofs

Tips

We will make an A/B test between a new rule and algo results. This technique can apply to both search and category.

Action

- 01  Merchandising > Category Ranking > Add rules
- 02 Bury product as **'11'** and save it
- 03 Select a search/catalog rule and compare it with "No Manual Change"
- 04 Check the result when sufficient data is collected

tip.bloomreach.com/15




Boost products for a regional campaign #14




Create customized product presentation for customers from a targeted region

Process **2** Setup Experience Search Category Style Curator Optimizer

Benefit #14

 Customize the experience for specific customers with relevant offers

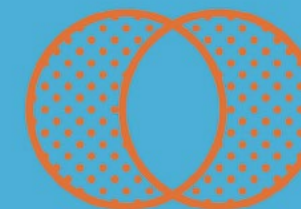
Action

- 01  Targeting > New audience
- 02 Select location, IS, and fill in the name of a target area
- 03 Promote products as **'03'**
- 04 In the visual editor, don't forget to choose the audience that is just created.

tip.bloomreach.com/14



Should we promote those products? #16



Conduct an experiment to validate an action.

Process **3** A/B test Experience Search Category Style Curator


Benefit #16

 Test the water and improve merchandising strategy

Tips

Not all manual promotions are effective. A/B test can provide insights that reduces these efforts

Action

- 01  Testing > Start a new test
- 02 Select a search/catalog rule and compare it with "No Manual Change"
- 03 Check the result when sufficient data is collected.

tip.bloomreach.com/16




Promote products of a brand #17





Make products of a specific brand stand out automatically

Process Experience Style
2 Setup Category Curator Optimizer


Benefit #17

 Reduce efforts to promote products by creating a rule

Tips

Use  attribute boost to prioritize specific products and  attribute slot to lock them in specific slots

Action

- 01  Merchandising > Categories > Category Ranking
- 02 Add Search Ranking Rule.
- 03 In Attribute tab, click Create an attribute rule.
- 04 Select Product Description Attributes and find brand attribute.
- 05 Select brand name and click ok.
- 06 Select either attribute boost or attribute slot.

tip.bloomreach.com/17



Order filters by popularity #19



Help user to find useful facets in no time

Process Experience Style
2 Setup Search Category Curator Optimizer



Benefit #19

 Help users get smoother experience in search

Tips

AI prioritizes facets for you based on popularity. But you can still promote a facet if necessary

Action

- 01  Merchandising > Site Search > Tools > Facets
- 02 Add a rule, and type a keyword.
- 03 In order selector, choose  boost & always show or  bury & always show.

tip.bloomreach.com/19



Normalize items in filters #18



Make sure the selections in filters are coherent and unique

Process Experience Style
2 Setup Search Curator Optimizer

Benefit #18

 Help customers find products faster

Tips

Some retailers have color filters for both "grey" and "stone" or "pink", "coral" and "salmon". Normalize these options to keep your filters light, clean, and easy to use

Action

- 01 Check the facets in important search queries and category pages.
- 02 Modify the product feed data when the bad facet items are identified

tip.bloomreach.com/18



Find the missing facets #20



Identify the missing filters that help customers find product easier

Process Experience Style
2 Setup Search Category Curator Optimizer

Benefit #20

 Customers can find their product faster

Tips

Perform the facets improvement for popular category pages ⁽²¹⁾ or keywords ⁽⁰⁷⁾.

Action

- 01 Compare the facets that are provided by competitors and see whether any important one is missing.
- 02 Since facets are generated by the product feed, include the new product attributes in the file.
- 03 Change the facet priority ⁽¹⁹⁾ when necessary

tip.bloomreach.com/20




What are the **important category** pages? #21



Popular category pages are sometimes the focus of merchandisers.

Process Experience Style
4 Validate **Category** **Curator Optimizer**

Benefit #21

 Identify the hotspots and high-priority goals to work on

Tips

It is a basic step that leads to further actions such as (#13) (#20)

Action

- 01  Merchandising > Category > Analytics > Top Categories
- 02 Check the different periods by using time selection on the top.

tip.bloomreach.com/21




Create **search redirections** for special needs #23



Prepare a page to help customers out? Create a redirection with relevant keywords.

Process Experience Style
2 Setup **Search** **Curator Optimizer**


Benefit #23

 Navigate customers to pages provide assistive information.

Tips

Check out important keywords. If there are special needs such as a category or contact, create a redirection for that.

Action

- 01 Check the keyword report to identify potential needs (#07).
- 02 Create pages to provide assistive information.
- 03  Merchandising > Site Search > Redirect
- 04 Fill in the link and click Add New

tip.bloomreach.com/23




Create **search redirections** for campaigns #22



Make sure customers can always find your selections by all possible keywords.

Process Experience Style
2 Setup **Search** **Curator**

Benefit #22

 Navigate customers to category pages or landing pages for campaigns. They will not miss special offers!

Tips

Create redirect terms one by one to avoid false-positive errors.

Action

- 01 Brainstorm possible keywords with the data (#07)
- 02  Merchandising > Site Search > Redirect
- 03 Fill in the keyword and designated link for visitors coming from campaign links (#33)

tip.bloomreach.com/22



How I can remove the bad suggestions under search bar? #24



Remove bad search suggestions

Process Experience Style
2 Setup **Search** **Curator Optimizer**


Benefit #24

 Help users get smoother experience in search

Tips

AI generates suggestions based on term relevancy. Sometimes it doesn't make sense for human. Consider hiding them.

Action

- 01  Merchandising > Site Search > Tools > Autosuggest Blacklist
- 02 Key in a keyword in Live Preview and find undesired suggestions
- 03 Add a new rule and select these suggestions.

tip.bloomreach.com/24



Identify keywords with bad performance. #25



Which keyword does not satisfy customers?

Process Experience Style
1 Evaluate Search Optimizer


Benefit #25

 Learn from failed results and realize users' intents.

Tips

Review the results routinely. It provides the data that implies underlying needs of customers.

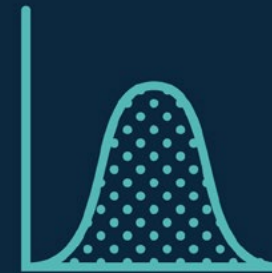
Action

- 01  Merchandising > Site Search > Analytics > No revenue Keywords
- 02 Find the keywords with high impacts
- 03 Find the reason in "Site Search Diagnostic" (08) for keywords.

tip.bloomreach.com/25




Which category pages aren't showing the right items? #27



Find the beloved products that are missing on a category page.

Process Experience Style
1 Evaluate Category Curator

Benefit #27

 Help user find interesting products faster

Tips

AI maps behaviors of users having connections to the category page and finds potential products. Consider to promote them.

Action

- 01  Insights > Opportunity > Improve Category Navigation
- 02 In Categories With Missing Products, review the list.
- 03 Click the dropdown button and see the Products missing in this category.
- 04 Select the products on the list and promote them (01).

tip.bloomreach.com/27



Why doesn't AI put this product on top? #26



Inspect metrics behind the algorithm.

Process Experience Style
4 Validate Search Curator
Category Optimizer

Benefit #26

 Understand the mechanism of the AI system


Tips

Performance is based on user behavior signals such as revenue, conversions, add-to-cart, views...

Relevance is based on Semantic Engine and Term Match

Total score is contributed by the two metrics and used by AI

Action

- 01  Merchandising > Site Search > Tools > Diagnostics
- 02 Find a specific category or keyword

tip.bloomreach.com/26




How are customers leaving my site from category pages? #28



Find category pages that have poor relevance.

Process Experience Style
1 Evaluate Category Curator
Optimizer

Benefit #28

 Learn from bad results and revise the customer journey on the site.

Tips

Review the results routinely. We can also use proactive techniques (e.g. (32)) to improve it.

Action

- 01  Insights > Opportunity > Improve Category Navigation
- 02 In High Exit Rate Category Pages section, review the list.
- 03 Click the dropdown button and see Assess Performance.
- 04 Consider to change the collection and navigation structure.

tip.bloomreach.com/28




Which products should I promote in category pages? #29



Find the right products to perform manual promotion.

Process Experience Style
1 Evaluate **Category** **Curator**


Benefit #29

 Helps AI to improve the results.

Tips

Promotion opportunities of products with good relevancy or performance, but low visibility on your site.

Action

- 01  Insight > Library > Reporting > Category Page Diagnostic
- 02 Search for a category.
- 03 Review the metrics under Optimize Category Product Performance.
- 04 Compare the performance with the results by Diagnostics tool ⁽²⁶⁾.

tip.bloomreach.com/29




What types of products drive interaction with my site? #31



Identify themes or concepts, such as low cost, hip, eco, color, pattern, and style.

Process Experience Style
1 Evaluate **Category Search** **Optimizer**

Benefit #31

 It provides insights to improve site navigation and category pages.

Action

- 01  Insight > Playbook > Find Seasonal Trends > Trending Products.
- 02 Note down the characteristics (e.g. low cost, hip, eco) of these products.
- 03 Identify the similarity of the characteristics.
- 04 Create category pages or make create synonyms to cover them ⁽³²⁾.

tip.bloomreach.com/31



Can my customers find what they're looking for? #30



Review the performance of important keywords.

Process Experience Style
4 Validate **Search** **Curator Optimizer**

Benefit #30

 Drive more revenue with these important keywords.

Tips

Review the results routinely.

Action

- 01  Merchandising > Site Search > Analytics > Top Keywords
- 02 Inspect the keyword by Diagnostics tool ⁽²⁶⁾
- 03 Promote the potential products ⁽⁰¹⁾ or create rules to promote them ⁽⁰⁸⁾

tip.bloomreach.com/30




Create synonyms for interchangeable terms #32



Can't find fascinator?
We have church hats or wedding party hats

Process Experience Style
2 Setup **Search** **Optimizer**

Benefit #32


 It improves search quality and experiences.

Tips

Do it based on "No Revenue Keywords" ⁽²⁵⁾

Use one-way synonyms to expand the search scope of a keyword. For example, you can make "jeans" referring to more styles of jeans.

Action

- 01  Configuration > Setting > Thesaurus
- 02 Add a new one-way synonyms.
- 03 Use A/B test ⁽¹⁶⁾ to evaluate the modification.

tip.bloomreach.com/32





We are weaving
on the sea of data

Digitalization of Retailing

A Service-Product Design for Digital Merchandisers
to Implement Machine Learning

