



Visualizing Critical Objectives in Omnichannel Management Through Mental Models: The Application of an Assortment Integration Context

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Abstract. Channel Integration is a crucial task for retailers in order to generate a seamless customer experience. This is particularly the case for assortments. Customers expect an identical assortment along all channels or customer confusion can occur, potentially leading to purchase abandonment or postponement and thus to losses in sales. Mental models can help to simplify complex systems and behaviour and can support managers in decision-making processes. This paper builds on a mental model approach to visualize the dynamics and trade-offs of the three critical objectives in omnichannel assortment management: assortment integration, customer confusion reduction, and purchase postponement/abandonment reduction, to assist retailers in decision-making through the depiction of different scenarios and objective achievements. Recommendations for actions are provided for each scenario eventually helping retail managers in improving understanding and decision-making for omnichannel assortment decisions.

Keywords: Omnichannel management · Mental models · Assortment integration · Channel integration · Customer experience

1 Introduction

The retail industry is experiencing tremendous development from different directions and is undergoing a major transformation towards “digital retail”, a combination of traditional retail and digital technologies with the aim to integrate all channels in a seamless manner [1–3]. Within this transformation process towards omnichannel retailing which is additionally accelerated by the impact of the COVID-19 pandemic [4, 5], the generation of a seamless customer experience represents the major leading objective for retailers [6, 7]. Channel integration activities can facilitate a seamless transition across channels for the customers and is therefore regarded as key to realize for an omnichannel approach [8]. As studies show, channel integration is positively related to retail performance [9, 10].

However, while attempting to implement channel integration, decision-makers in retailing are faced with balancing trade-offs in realizing customer- and shareholder-related objectives [11, 12]. Especially, the integration of the assortment across channels reflects a difficult and complex task in these activities [8, 13]. So far, there is still a lack of supporting tools for retail managers addressing these challenges. The aim of this study is to conceptualize a heuristic method assisting retail managers in reflecting the dynamics and trade-offs between selected assortment integration objectives along with recommendations for actions.

To do so, a mental model approach is applied. The concept of mental models supports the understanding of complex system behavior and can help decision-makers in making appropriate judgements and conclusions, particularly for trade-off scenarios [14]. This article builds on the conceptual propositions from the paper published in the Proceedings of the 4th International Conference on Computer-Human Interaction Research and Applications - Volume 1: WUDESHE-DR [15] that demonstrates a visual mental model approach assisting in understanding the dynamic relationships and trade-offs between the omnichannel objectives “Channel Integration”, “Customer Experience Generation” and “Economic Value Creation”, understood as high-level critical objectives in achieving transition into omnichannel retailing [15]. We adapt the conceptual basis and apply scenarios of omnichannel assortment integration objectives with corresponding recommendations for actions. The scenarios can help decision-makers to visualize dynamics and retrieve actionable directions in the realization of omnichannel assortment integration.

The article is organized as follows. The next section outlines the relevant theoretical background and provides definitions of the different concepts addressed in this paper. Thereafter, a brief look into related work is discussed, followed by the overview of the methodology and the main part, the proposition of a conceptual mental model capturing different scenarios in the realization of omnichannel assortment integration. Finally, the last section concludes the paper and addresses the limitations and future research of this work.

2 Theoretical Background

2.1 Objectives in Omnichannel Retailing

Omnichannel retailing is understood as the seamless and simultaneous use of all existing channels by customers [16]. The realization of omnichannel is defined as “*the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized.*” [2, p. 176). Digital technologies represent hereby an integral part and support integration as well as customer experience improvement activities. Technologies such as VR/AR, IoT, fog/edge computing, smart mirrors, beacons [e.g., 17, 18, 19]; AI applications [20–22] as well as customer experience-oriented concepts such as personalization [23] are utilized to achieve these goals.

The ability to integrate all existing channels is the crucial task in realizing an omnichannel approach [8, 24, 25]. Channel integration is understood as the degree to which different channels interact successfully with each other [26, 27]. The integration is required to be achieved on different levels such as on an operational level [e.g., 8], on an organizational structure level [e.g., 28] and on a strategic level to begin with [e.g., 29, 30, 31, 32]. Channel integration represents therefore a crucial objective in omnichannel management.

Along with the need for channel integration, customer experience developed to be the most significant aspect in the current retail industry today [2, 3, 33–35] and can be understood as the leading management objective [36]. It is characterized by the fact that it is a strategic objective of non-financial nature unlike typical financial objectives such as profit margin [37]. From a definition point of view, it is described as “*a multidimensional construct focusing on a customer’s cognitive, emotional, behavioural, sensorial, and social responses to a firm’s offerings during the customer’s entire purchase journey ...*” [36, p. 71] and therefore represents a difficult construct to capture and generate.

Trade-off problems occur when goals have a conflicting relationship to each other. This happens when a decision-maker is confronted with trading off the realization of one objective against another [38, Fig. 1].

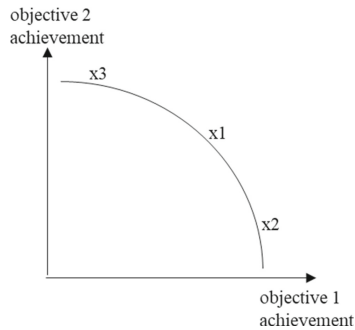


Fig. 1. Trade-off-relation between two objectives [38].

Figure 1 shows specific decisions (shown by three examples, x_1 , x_2 , and x_3 on the graph) each depicting a trade-off situation where the degree of the achievement of one objective is sacrificed against the achievement of the other objective. For example, decision x_3 reflects a high degree of the realization of objective 2 but a low achievement for objective 1.

It is clear that the realization of an omnichannel strategy entails dealing with conflicting objectives. Predominantly, the aspiration to generate a distinctive customer experience through seamless channel integration can conflict with shareholder-value-related business objectives [11] since a transformation towards omnichannel retailing can require significant realignment and reallocation of business resources, as well as high investments in digital technologies [e.g., 12]. Shareholder-value-related objectives are usually of financial nature and address the task in the creation of sustainable economic value (e.g., return on investment, profit, EVA).

The assumption is that superior customer experience can be achieved once channel integration is realized [e.g., 26], proposing a positive relationship between these two objectives. Ideally, as a result, economic value is created in the long term, eventually establishing the logical link of all three objectives.

2.2 Omnichannel Assortment Integration

Assortment can be described as the collection of goods or services a retailer offers to consumers [39, 40]. Consequently, in an omnichannel context, assortment represents all goods or services provided to consumers in all available channels the retailer utilizes. As a subtask in channel integration, the requirement for integration of assortment along channels is an ongoing and challenging issue discussed in current omnichannel literature [e.g., 8, 13], and an important but complex strategic decision for retailers [12, 41, 42]. The integration is usually measured by the “[*degree of*] overlap of assortments between a retailer’s different channels” [43, p. 438].

Next to the degree of overlap, assortment integration between on- and offline channels can appear in different configurations. These assortment coordination types can be divided into three approaches [44]. “No integration” implies an overlap of 0%, which means both the on- and offline assortment differ completely from each other. “Partial integration” or “asymmetrical integration” is characterized by a partial overlap of assortments. Empirical studies show that asymmetric integration is the most common type in retail practice [43, 45]. Finally, “full integration” means that assortment is identical along all channels and reflects the understanding of the seamlessness feature within omnichannel shopping – meaning I as a customer can buy all items in each channel.

2.3 Mental Models

Mental models are concepts of mental representations of external systems used by individuals to describe, explain, and predict certain behavior of those systems [46]. They support and facilitate a decision-maker’s judgements and decisions and are of subjective nature [47, 48] since they are created and adjusted through the interactions with real-life business systems they manage (e.g., marketing campaign management) [49].

This implies that there are assumptions and expectations based on experience and knowledge of systems behavior [14, 50]. According to Meadows et al. (1974), “*each person carries in his head a mental model, an abstraction of all his perceptions and experiences in the world, which he uses to guide his decisions...*” [51, pp. 4–5]. Similarly, Zhang-Kennedy et al. (2013) state that a mental model is a simplified internal version of a concept from reality [52].

To provide an example, Warren Buffet and Charlie Munger developed the well-known mental model of the “Circle of Competence” for decision-making in investment contexts (Fig. 2). Based on a Euler Diagram, the visualization of the mental model consists of an inner and outer circle. The inner-circle reflects one’s competence as “What you know” whereas the outer-circle represents “What you think you know” [53]. The utility is to show visually the boundaries of competence in decision-making with the principle “only invest in those things you know about”. Therefore, to respect your own

limitations and to make investment decisions based on your actual knowledge instead of relying on knowledge “what you think you know” [15].

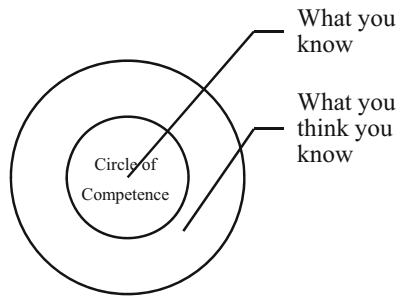


Fig. 2. “Circle of Competence” mental model [53].

2.4 Mental Model Visualization of Omnichannel Management Objectives

In the article “Visualising Trade-offs of Objectives in Omnichannel Management – A Mental Model Approach”, [15], the concept of Venn Diagrams [54] is used to visualize a mental model arranging different scenarios depicting different states of the relationship between omnichannel management objectives, along with shared and overlapping sections. Three circles represent the critical management objectives “Channel Integration” (CI), “Customer Experience Generation” (CX), and “Economic Value Creation” (EV) (Table 1).

Table 1. Descriptions of omnichannel objectives [15].

Objective	Description
Channel integration (CI)	This objective is realised when channels are integrated in such a way that alignment and interaction among these are ensured and operational. Realisation is driven through investments in e.g. digital technologies, restructuring efforts, or acquisition of relevant know-how
Customer experience generation (CX)	This objective is realised when a seamless transition along the customer journey across all available channels is ensured for the customer. Reflects customer-oriented objectives
Economic value creation (EV)	This objective is realised when the retailer is able to generate financial value (e.g. profitability). Reflects shareholder-value objectives

The relationship between the objectives is visible through the intersections of the circles. The larger the overlap the more complementary the two objectives are to each other, postulating a positive relationship (Fig. 3). For example, a high overlap of channel integration and customer experience would reflect a strong positive relationship.

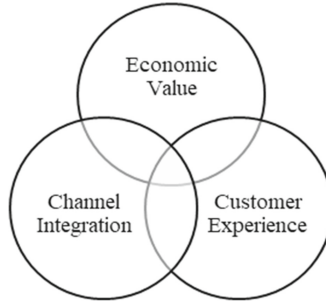


Fig. 3. Mental model visualized as a venn diagram [15].

The mental model can reflect five basic scenarios a decision-maker can be confronted with while pursuing a transition towards an omnichannel approach (Fig. 10, appendix). The following describes each of them briefly.

High CX Generation/Low EV Creation. High CX Generation/Low EV Creation. This scenario postulates a positive relationship between CI and CX. However, the achievement of EV is unsatisfactory and therefore reflects scenarios where a retailer is able to generate a distinct customer experience through effective channel integration but is unsuccessful in staying profitable at the same time. Typically, this scenario can represent retailers with a strong customer focus. The recommendation is to exploit and translate the value created through CX generation into financial outcomes and consider cost-effectiveness in CI activities at the same time to eventually improve EV.

High EV Creation/Low CX Generation. In this scenario, there is a positive relationship between CI and EV. However, there is a lack of substantial CX generation. This indicates that channel integration activities are cost-effective and do not affect profitability strongly negative but also lack distinctive CX generation as a trade-off. Retailers prioritizing profitability goals over CX generation can be associated with this scenario. It is recommended to improve and balance channel integration activities towards successful CX generation. At the same time, additional investments for these activities can be considered as well since this would ensure a sustainable approach towards CX generation.

Low CX Generation/Low EV Creation. This scenario can be regarded as the least optimal constellation since CI is not achieved, leading to no substantial CX generation nor to EV creation as a consequence. The recommendation is to initiate CI activities in order to generate distinctive CX and eventually address the industry narrative and the customers' needs. This scenario represents a pre-omnichannel setting and is not of sustainable nature.

High CX Generation/High EV Creation but no CI Achievement. In this scenario, the retailer is successful in the generation of high CX and stays profitable at the same time (high EV). However, this is not achieved through CI activities and indicates that the retailer provides high CX without relying on integrated channels. This might be the case with retailers having a strong imbalance between channels (e.g., 90% of revenue is generated offline, indicating a strong customer experience generation within a physical context, e.g. through atmospherics). It is recommended to identify and consider the potential positive impact of integrated channels on the CX generation and to improve the EV creation further.

Towards Omnichannel Approach. This constellation represents a balanced scenario between all three objectives and postulates a successful harmonization of all trade-offs. The rationale is that CI achievement leads to high CX generation evident through a high EV output as a consequence. CI activities are regarded as effective. This constellation serves as an ideal scenario and a mental aspiration towards a sustainable omnichannel approach. It is recommended to keep the balanced relationship and optimize further.

3 Related Work

There is scarce work addressing the tension between different objectives while undergoing omnichannel transformation, especially from a mental model view. However, some studies contribute to the discourse from different perspectives. The most relevant ones are discussed briefly below.

[40] propose a framework aiming at aligning strategies and actions from a market, firm, store, and customer perspective. They are linked to the overall objective “retailer profitability”. The objectives and their relationships are not discussed explicitly, but the study shows that “customer experience” is a crucial strategic concept influencing the overall objective “retailer profitability”. Additionally, a focus specifically on omnichannel is not intended but captured through a general industry lens. Following a qualitative grounded theory approach, [10] demonstrate that cross-channel integration is affecting sales growth positively. The work leaves out a customer experience perspective though. Similarly, [55] shows a relationship between channel integration, enabled by IT, to firm performance and considers human resources at the same time. Empirical findings underline a positive relationship and postulate efficient offering delivery and innovativeness in future offering creation. However, the context is positioned as a pre-omnichannel setting and “customer experience” is being left out in this work as well.

[56] utilize a Venn Diagram approach to decompose the business model concept into the three components value proposition (value offering), resources & competencies (value creation), and economic logic (value capturing). The visualization demonstrates the dynamics between the components with different scenarios with the overlap of all three circles reflecting a “workable business model”. The authors consider the same theoretical basis, the Attention-based-view of the firm [61], as [15] and this study. Despite having a very similar approach, the work concentrates on the concept of business models

and therefore does not focus on particular objectives in retailing or omnichannel context. Similarly, [57] develop a mental model approach on the premise of the conflicting relationship between usability and security in software design. The interesting approach aligns design features with user requirements and develops a meta-model relating security, usability, and the user mental model.

Overall, related work shows a gap in linking a mental model approach to the relationships of omnichannel retailing objectives in general and assortment integration objectives in particular.

4 Methodology

Assortment decisions represent a critical and complex task in channel integration activities [8, 12, 13] and are therefore selected as an appropriate context for the mental model development. The overarching goals “channel integration”, customer experience” and “economic value” [15] are mapped to the assortment objectives “assortment integration” (AI), “customer confusion reduction” (CCR), and “purchase postponement /abandonment reduction” (PPAR) (Fig. 4). Table 2 provides details and descriptions regarding the mapping. Assortment integration reflects the subset activity for channel integration [13], whereas customer confusion reduction represents a subset for customer experience [43]. An economic perspective is ensured through the concept of purchase postponement/abandonment as a behavioral consequence of customer confusion resulting in lost sales from a financial point of view [37].

The alignment of the assortment across channels represents a major challenge since customers can experience confusion when confronted with inconsistencies [12, 13, 58, 59]. For instance, a customer may identify an item of interest on the web-shop and decide to take a closer look and maybe purchase it at the physical store of the same retailer. The fact that the item may be not found in the physical store can lead to an undesired outcome/unmet expectation and thus to purchase abandonment or postponement in the short-term but also to potential image damage through bad word-of-mouth in the long-term [43, 60]. Consequently, the confusion effect should be reduced in case of identical assortments across channels [43], favoring the “full integration” type of overlap [e.g., 59].

Following [15], the intersections reflect the relationship between the objectives. The larger the overlap the more complementary the two objectives are to each other, postulating a positive relationship. For example, a high overlap of AI and CCR can represent a strong positive relationship. In this study, for simplification purposes, trade-off relationships are considered under certainty, as well as to eliminate uncertain consequences [38]. In this sense, and in line with the subjective nature of a mental model [47, 48], a non-formalized approach is followed [38].

The mental model scenarios attempt to capture the above-mentioned rationale for the relationship between the assortment objectives.

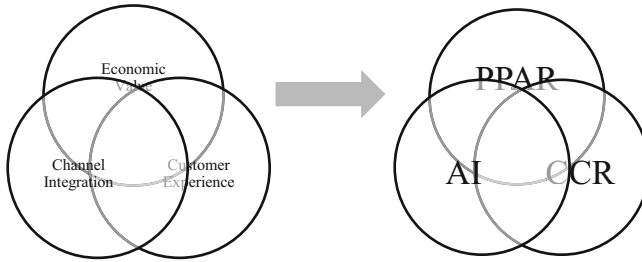


Fig. 4. Adapting high-level omnichannel management objectives into the omnichannel assortment context.

Table 2. Mapping and description of the assortment integration objectives.

Omnichannel objectives	Assortment context	Description	Literature
Channel integration	Assortment integration	The integration of different assortments across all channels. This can be reflected by full integration (assortments are identical throughout all channels), partial integration (there is partial overlap of the assortment between channels), and no integration (both the on- and offline assortments differ 100% from each other)	[8, 12, 13, 43]
Customer experience	Customer confusion reduction	Reflects a subset of customer experience. Cognitive overload can happen in case a large amount of information is needed to be processed within the shopping journey. Comparing assortments can lead to confusion the higher the dissimilarity across channels is evident. It can lead to purchase postponement and abandonment. Reducing the effect represents therefore a critical objective in assortment integration decisions	[43, 60, 62, 63]

(continued)

Table 2. (continued)

Omnichannel objectives	Assortment context	Description	Literature
Economic value	Purchase postponement /Abandonment reduction	Economic consequence of the customer confusion effect. The customer refrains from the purchase or postpones due to a dissatisfactory impact during the shopping journey. The aim should be therefore to mitigate the customer confusion effect in order to reduce purchase postponements/abandonments	[43, 64]

5 Mental Model Visualization of Omnichannel Assortment Integration Objectives

The developed mental model is able to reflect five basic scenarios representing different states of assortment integration objectives.

High CCR/Low PPAR. This scenario shows a positive relationship between realizing AI and achieving CCR (Fig. 5). However, PPAR is not achieved satisfactory and is still evident. This scenario can indicate the fact that despite achieving assortment integration and reducing the customer confusion effect, purchase postponements and abandonments are still occurring, potentially highlighting the fact that other factors might influence the postponement and abandonment behavior (e.g., inefficient searching/filtering process on the web-shop, bad layout and presentation of items in the physical store). The retailers should aim to identify and mitigate those factors and differentiate the effects accordingly compared to the assortment integration activities.

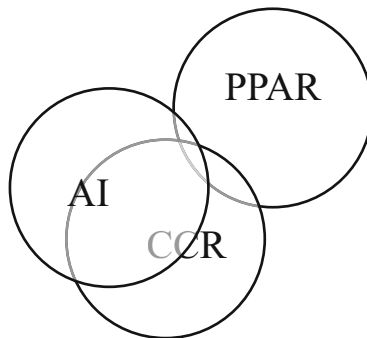


Fig. 5. High CCR/Low PPAR.

High PPAR/ Low CCR. Here, there is a positive relationship between AI and PPAR, meaning assortment integration has effectively reduced postponement/abandonment behavior (Fig. 6). However, CCR is still unsatisfactory and shows potentials for improvement. This scenario indicates that the assortment integration efforts do not mitigate the customer confusion effect but other factors leading to the reduction of postponements/abandonments. In this case, retailers should identify those factors which influence this independent from the customer confusion effect. A possible factor can be the case that not every confusion effect leads to postponement/abandonment).

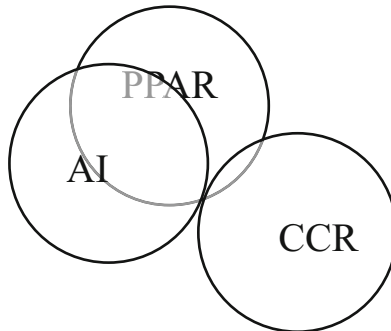


Fig. 6. High PPAR/Low CCR.

Low CCR/Low PPAR. This scenario reflects a pre-omnichannel constellation since AI is not achieved, resulting in the occurrence of the customer confusion effect and consequently purchase postponements and abandonments (Fig. 7). Here, the aim is to initiate AI in order to achieve CCR and therefore realize PPAR.

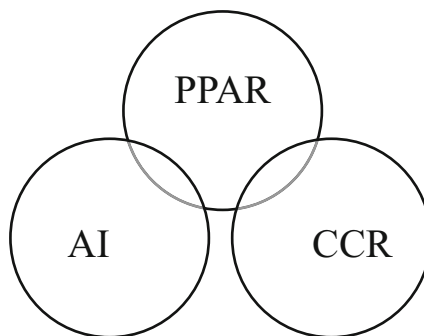


Fig. 7. Low CCR/Low PPAR.

High CCR/High PPAR. This scenario demonstrates a successful PPAR through CCR (Fig. 8). However, the CCR is not achieved through AI activities, indicating other factors mitigating the customer confusion effect. Since AI is not realized, meaning assortments across channels are different (no integration type), the customer confusion effect is not occurring. This might be the case when a retailer provides information for the customer on both channels, for example indicating the fact that “item not available on [channel]” or “item only available on [other channel]”, preempting the occurrence of unmet expectations.

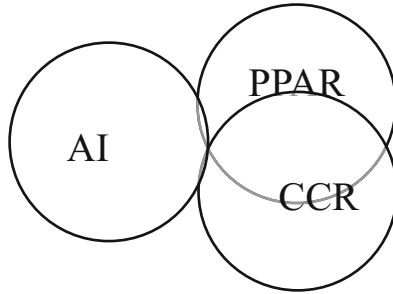


Fig. 8. High CCR/High PPAR.

Towards Omnichannel Assortment Integration. The high overlap between AI, CCR and PPAR shows a balanced and harmonized constellation between all three objectives (Fig. 9). AI leads to effective CCR and consequently to the realization of PPAR. This represents the ideal scenario and serves as an ideal mental representation of the relationships. The retailer should aim to keep the high degree of overlap and optimize further.

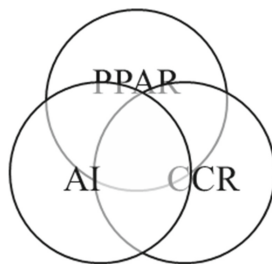


Fig. 9. Towards omnichannel assortment integration.

6 Conclusion

The challenge in realizing an omnichannel strategy is of major relevance for current retailers and demand an understanding of dynamics and trade-off relationships between critical objectives.

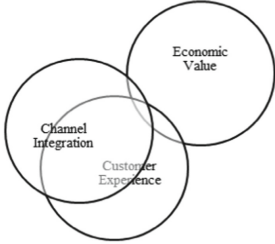
This article is motivated by the need for more decision-support in this regard and builds on the mental model visualization approach by [15]. The development of a heuristic method, visualizing the dynamics in omnichannel assortment integration demonstrates its utility in depicting five basic scenarios in the achievement of the assortment objectives “assortment integration”, “customer confusion reduction”, and “purchase postponement/abandonment reduction”. With this, retail managers are able to reflect, understand and predict those scenarios with the aim to act towards the realization of omnichannel retailing.

This paper involves the following limitations. It represents a conceptual idea subject to be further developed and supported by empirical validation, such as through case studies for example. Another limitation is evident through the fact that the proposed scenarios are not capturing all relevant constellations or situations. In addition, a time and evolution point of view can help to link the different scenarios to each other and determine certain paths for omnichannel assortment integration. It is planned to provide empirical validation and further develop the dynamics in future work. Finally, in view of future developments, the concept of personas development through mental model mapping has been successfully utilized to create decision support and user interfaces so far [e.g., 65]. However, with the accelerated application of AI solutions and their limitations (“black boxes”), new approaches need to be considered and developed to account for these requirements. Notable contributions such as Personas for AI [66] demonstrate practical solutions in the domain of mental models and AI and are expected to receive further attention in the future.

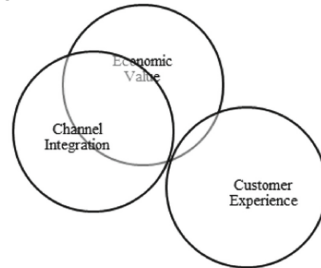
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Appendix

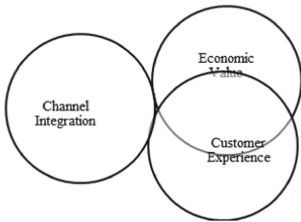
High CX Generation/ Low EV Creation



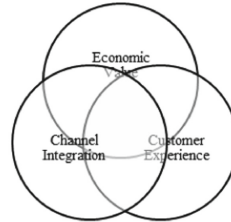
High EV Creation / Low CX Generation



High CX Generation/ High EV Creation but no CI achievement



Towards Omnichannel Approach



Low CX Generation/ Low EV Creation

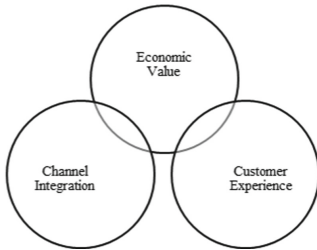


Fig. 10. Five basic scenarios arranging the objectives CI, CX and EV, [15].

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