E-Commerce in German Agriculture: A Case Study Investigating Farmer Satisfaction Applying the Thinking Aloud Method

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Abstract

E-commerce in agriculture is gaining increasing attention, but market penetration is currently low, and companies are barely exploiting its full potential. Identifying and satisfying farmers' expectations of e-commerce websites for farm inputs is crucial to reduce this opportunity loss. This paper presents a qualitative case study using the "thinking aloud" method, investigating the factors of an agricultural e-commerce site that need to be improved to increase customer satisfaction. The results reveal that farmers' dissatisfaction with and reluctance to engage in agricultural e-commerce are linked to deficiencies in the store design. These deficiencies are especially apparent in the incongruent design of off- and online stores. Congruity is needed not only in terms of price but, more importantly, in terms of design (e.g., navigation, product order) and services. However, this is often lacking. High channel congruence improves trust in the online provider and keeps perceived transaction costs low. The study emphasizes the importance of customer centricity and a channel integration strategy in agricultural trade and provides indications of which elements lead to higher customer satisfaction.

Keywords

online shopping; farm inputs; agricultural trade; cross-channel comparisons; channel integration

1 Introduction

The agricultural retail scene has changed considerably over the past few years. This is due to the lasting structural changes in agriculture, ongoing digitalization, and the associated growth of online retail. The latter has provided farmers with more products and purchasing options than ever before, simplifying price and product comparisons. While established agricultural trading companies offer online sales channels (in Germany, these include Agromais GmbH, Agravis Raiffeisen AG, ATR Landhandel), newly founded startup companies with independent online stores or marketplaces are also entering the online market (Agrando, agsupply, agrimand) (BICKERT, 2020). Between 2013 and 2017, around 20 startup-based marketplaces appeared in Germany, 40% of which explicitly market farm inputs or agricultural products (HUCHTEMANN and THEUVSEN, 2018). In 2020, BICKERT (2020) identified 11 marketplaces of this type. However, studies show a comparatively low rate of digital procurement transactions by farmers, in particular for the input categories of crop protection and seeds (ACKERMANN et al., 2018; ARDREY et al., 2020; GARTZKE, 2016). This reluctance to engage in e-commerce is evident across Europe, with only 13% of European farmers purchasing inputs online in 2019. However, around 30% of European farmers have stated they prefer to shop online. This discrepancy with the low online penetration could indicate poor customer experiences that have made online purchasing of agricultural inputs rather unattractive to farmers (ARDREY et al., 2020). In addition, farmers seem to be discouraged by transaction costs of shopping online (e.g., search, information, and order costs), which have an impact on retailer selection and customer satisfaction (ARDREY et al., 2020; CLASEN, 2005; KIM and LI, 2009). To capture the market potential of new online sales channels, companies must recognize and satisfy consumer needs (ARDREY et al., 2020; FECKE et al., 2018a).

Therefore, this article addresses the question of which aspects need to be improved to increase customer satisfaction and experience with agricultural e-commerce websites. The overall objectives of this research are to identify farmers' expectations and improve the understanding of farmers' satisfaction formation in e-commerce. The literature on agricultural purchasing behaviour has already highlighted individual factors influencing farmers' online buying behaviour, but no study has conducted a coherent analysis during actual use. Since there is a large gap between farmers' expressed willingness to buy online and their actions (ARDREY et al., 2020), it is important to examine farmers' behaviours during an active online shopping situation to understand their perceptions of and expectations for an agricultural e-commerce website.

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This study used semi-structured in-depth interviews to examine these behaviours and expectations. Participants were given two realistic tasks related to the online purchasing of crop protection products and corn seeds. The "thinking aloud" (KONRAD, 2020) method underpinned the methodological approach during the interviews. This method was used to determine how participants engaged with the given task, which of their expectations were met or not met, and whether they were persuaded by the respective e-commerce website. The results provide initial information for designing agricultural online stores with an improved customer experience and long-term customer value. Creating an effective design of digital channels is the basis for making the purchase of agricultural inputs more efficient and satisfactory for farmers. Additionally, the results also provide insights into a new research approach and provide an initial basis for developing large-scale qualitative and quantitative studies on agricultural e-commerce satisfaction.

The study first presents the drivers of and barriers to agricultural e-commerce. Then, it explains the conceptual background for the selection and adaptation of a satisfaction model. The fourth Chapter describes the data collection and evaluation methods, and the fifth Chapter presents and discusses the results.

2 Drivers of and Barriers to Agricultural E-Commerce

E-commerce in agriculture has attracted considerable scientific attention due to the emergence of agricultural e-commerce in the early-2000s, the subsequent consolidation process, and the recent increase in related startups. In many cases, the research has highlighted drivers and barriers that explain why farmers choose to adopt or not adopt a digital distribution channel.

The literature indicates that price and convenience – for example, the reduction of input and transaction costs – are the main reasons for purchasing agricultural inputs over the internet. Farmers associate e-commerce with lower purchasing prices compared to stationary retail (BATTE and ERNST, 2007; HENDERSON et al., 2006), which motivates them to buy online (SCHULZE SCHWERING and SPILLER, 2018). The amount of the expected discount depends on whether the product is time-sensitive (AKRIDGE, 2003; HENDERSON et al., 2004). Studies have found that farmers will switch from local retailers to e-commerce providers if the latter provide a price advantage of 9% for crop protection (FECKE et al., 2018a) and 10% for herbicides (BATTE and ERNST, 2007). Regarding convenience, the literature highlights the positive impact of time savings, which are often associated with online shopping (ACKERMANN et al., 2018; BATTE and ERNST, 2007). Studies have disagreed on whether price (CLASEN, 2005; FECKE et al., 2018a) or time advantages (ACKERMANN et al., 2018; BATTE and ERNST, 2007) are more influential for agricultural customers in choosing an online retail partner. Other e-commerce drivers include increased flexibility, mobility, accessibility, and spontaneity (ARDREY et al., 2020; GARTZKE, 2016; HOFFMANN and GRETHLER, 2013) as well as simplified information retrieval (HENDERSON et al., 2006; HENDERSON et al., 2004). Farmers appreciate that e-commerce provides them with increased choices and simplified product comparisons (HENDERSON et al., 2006; HENDERSON et al., 2004). A 2017 survey found that 45% of the questioned German farmers believed that the internet offered a better selection of choices than local shops (SCHULZE SCHWERING and SPILLER, 2018). However, the vast selection of products and suppliers on the internet can be overwhelming, with only around 40% citing ease of searching, comparing, and ordering as a reason for buying online (ARDREY et al., 2020). Positive e-commerce experiences and seals of approval can boost confidence in online shopping (ARDREY et al., 2020; FECKE et al., 2018a).

The main barrier to e-commerce in agriculture cited in the literature is the close personal and local business relationships typical for traditional (stationary) agricultural trade. These personal business relationships impact farmers' confidence levels and service expectations toward e-commerce. According to a study by the Kleffmann Group in 2016, the main reasons farmers do not buy online are their trust in local retailers (67%) and mistrust in online environments (43%) (GARTZKE, 2016). Farmers mainly prefer to buy online if they can use known and trusted retailers (BATTE and ERNST, 2007). As intimate farmer-trader relationships are salient (BATTE and ERNST, 2007; FECKE et al., 2018b; SCHULZE SCHWERING and SPILLER, 2018), the salesperson is fundamental in establishing trust within this buyer-supplier relationship (DONEY and CANNON, 1997). Therefore, the lack of personal contact in e-commerce decreases the confidence of farmers. Farmers prefer face-to-face meetings when communicating with retailers (88%) and will continue to prefer them in the future (64%) as they believe this is the most efficient approach for

purchasing (73%) (FECKE et al., 2018b). Farmers associate the growth of e-commerce with a decline in face-to-face meetings, the quality of communication, and the quality of customer relationships, and these are the elements they value the most (BRIGGEMAN and WHITACRE, 2010; FECKE et al., 2018b; GARTZKE, 2016; SCHULZE SCHWERING and SPILLER, 2018).

Furthermore, farmers fear service deficits. If an online store offered a 20% discount compared to stationary retail, 41% would switch if the service offers were identical. However, only 20% would switch to online offers if the service level were to decrease with the online discount (KALAITZANDONAKES et al., 2003). Service expectations also include after-sales aspects such as delivery and return policies. Delivery is the second-most important criterion for supplier selection after product quality (HO et al., 2010), both for stationary retail and e-commerce for agricultural inputs (FECKE et al., 2018a). Farmers will be more likely to use e-commerce if the delivery conditions result in better access to products (BATTE and ERNST, 2007), while delivery delays for time-sensitive products (e.g., crop protection) can lead them to reject online shopping (BRIGGEMAN and WHITACRE, 2010).

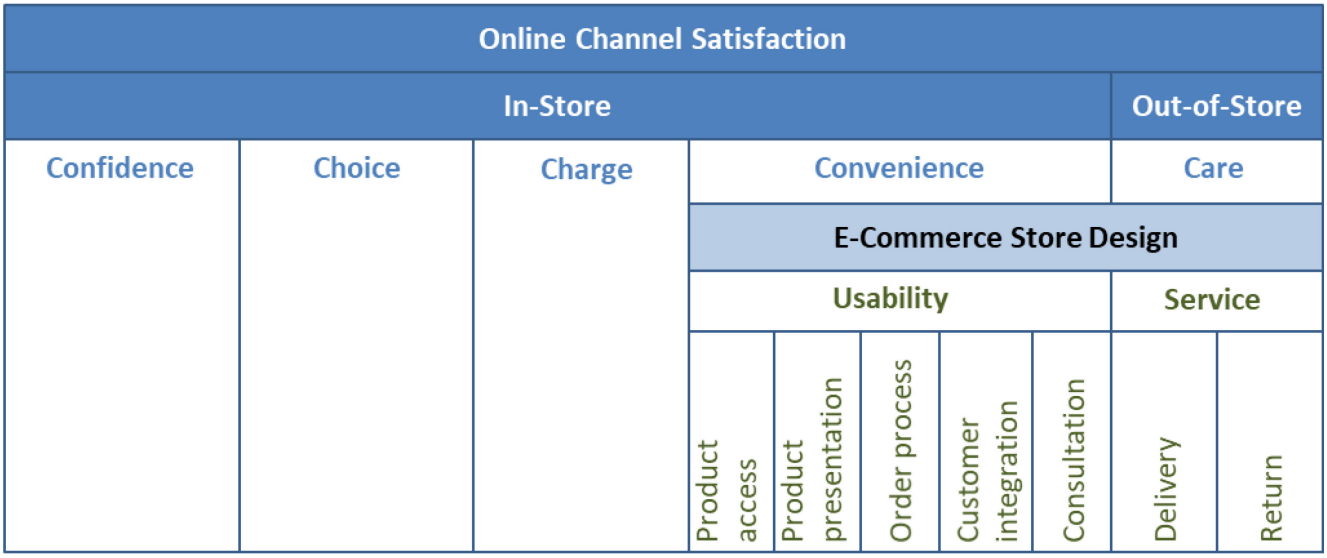
The above-mentioned factors have proven to be fundamental for farmers' decisions to use an e-commerce website. However, the discrepancy between the intention to use and the actual online purchasing penetration rate suggests that farmers could be dissatisfied with other aspects of online shopping. As of yet, no studies within the agricultural literature have analysed aspects of a suitable and satisfactory store design from the farmers' point of view. Accordingly, it remains unclear why many farmers do not complete an online purchase even though they show a basic willingness to visit the online store. Therefore, this study's basic hypothesis is that the gap between the expressed intention to use the store and the actual purchase behaviour may be related to deficiencies in the store design.

3 Conceptual Background

GRIGOROUDIS and POLITIS (2018) describe customer satisfaction as a multi-criteria evaluation problem, where the overall satisfaction with a provided service or product depends on several satisfaction criteria. The literature has used various approaches to measure customer satisfaction and the factors affecting it (TSAFARAKIS et al., 2018). We found that the alignable channel satisfaction model by HAMMERSCHMIDT et al. (2016) was the most appropriate for analysing farmer satisfaction using e-commerce websites for agricultural inputs. We chose the model because the analysis of the drivers and barriers aligns well with the model attributes, and the model is simple to apply. HAMMERSCHMIDT et al. (2016) observed that retail consumers focus on channel attributes that are equal in offline and online channels and that customer satisfaction can be determined based on five alignable channel facets (5C model): confidence, choice, charge, convenience, and care (Figure 1).

Confidence refers to the feeling that the interactions and transactions are safe and trustworthy. Choice

Figure 1. Online channel satisfaction model



Source: own figure adapted from HAMMERSCHMIDT et al. (2016) and GEHRCKENS and BOERSMA (2013)

implies a sufficient number and variety of products (HAMMERSCHMIDT et al., 2016). The choice dimension also includes the extent to which the available range of products and offers appeals to the customer and the ease with which all desired products can be found (FASSNACHT and KOESE, 2006). Charge covers the factors of affordable products and fair price levels (HAMMERSCHMIDT et al., 2016). Convenience is defined as 'The extent to which the purchasing process is efficient and effortless' (HAMMERSCHMIDT et al., 2016: 90). Care describes the extent to which a retailer ensures that all items perform as promised after purchase. FASSNACHT and KOESE (2006) define it as the degree to which the business partner keeps their service promise or fulfils the intended purpose or customer expectations.

We consider the 5C model to be a suitable starting point for a conceptual framework for our study because it has the advantage of showing comparable satisfaction dimensions for offline and online purchases. Farmers who are particularly loyal to stationary retail will draw relatively strong comparisons between the offline and online sales channels. HAMMERSCHMIDT et al.'s (2016) model has also proven its worth in the retail sector as well as other industries, such as the service sector (VAN DE SCHEUR, 2017). Although the model was developed for a B2C setting, it is possible to transfer it to B2B commerce, as B2B buyers usually have private e-commerce experience and similar requirements for a B2B online store (HEINEMANN, 2018).

The literature on farmer buying behaviour also suggests the usefulness of the 5C model approach. Studies have found that convenience and price (charge) are of particular importance to farmers (ARDREY et al., 2020; FECKE et al., 2018a; GARTZKE, 2016). Confidence in the supplier and service expectations (care) also influences agricultural e-commerce adoption (BRIGGEMAN and WHITACRE, 2010; FECKE et al., 2018a; GARTZKE, 2016). Choice, for example, the breadth and depth of the product assortment, is another fundamental dimension for farmers considering the attractiveness of a retail partner (HENDERSON et al., 2006; SCHULZE SCHWERING and SPILLER, 2018). The attractiveness and satisfaction towards a trading partner also increase with decreasing transaction costs, an aim which online traders try to achieve (CLASEN, 2005). Therefore, the 5C dimensions are important factors that mirror farmers' intentions to minimize their transaction costs when shopping at a retailer or their perceptions of high transaction costs. This allows researchers and companies to draw conclusions about the satisfaction status and purchasing behaviour of farmers. For this reason, we built on the 5C model (confidence, choice, charge, convenience, care) to examine the extent to which online retailers meet the five satisfaction dimensions and, if necessary, how these can be further specified by channel (online) and customer-specific (farmer) attributes.

This study focuses on farmers' satisfaction with existing e-commerce websites. Since online customer experience, which is largely determined by the shop layout, is linked to customer satisfaction (GEHRCKENS and BOERSMA, 2013; HASAN, 2016), we incorporated attributes of the store design into our underlying satisfaction model. Therefore, we extended HAMMERSCHMIDT et al.'s (2016) model with GEHRCKENS and BOERSMA's (2013) online customer experience model; our new model of online channel satisfaction is shown in Figure 1. We chose GEHRCKENS and BOERSMA's (2013) model because of its good fit with the respective 5C model dimensions. Their usability dimension largely corresponds to HAMMERSCHMIDT et al.'s (2016) convenience dimension: both dimensions relate to having an efficient, easily accessible, and effortless purchasing process. The service and care dimensions of the two models also match well, as they both address the post-purchasing process and therefore belong to the 'out-of-store' subsection.

An important distinction in online store design is between usability (user-friendliness) and service (Figure 1). The usability of an online store is characterized by five sub-aspects: product access, presentation, ordering process, customer integration, and consultation (GEHRCKENS and BOERSMA, 2013). In turn, each of these five aspects can be assigned to one of HASAN's (2016) three website design characteristics of visual, navigation, and information design. Product access means orientation in the webshop, including aspects such as navigation, product lists, product filters, and search options. FASSNACHT and KOESE (2006) describe this as clarity of the layout, which indicates the degree to which the design structure helps the user find their way. Presentation includes the preparation of the shop in terms of colours, images, additional features, or article texts and details. There is a distinction between graphic quality, which describes how well the user interface is visually presented, and information quality, which is the degree to which information is provided to the customer in a complete, accurate, and up-to-date manner (FASSNACHT and KOESE, 2006). The order process is composed of pa-

rameters regarding the shopping cart, checkout, payment options, or customer account, which are also discussed in SHARMA and AGGARWAL's (2019) e-commerce success model. According to GEHRCKENS and BOERSMA (2013), customer integration is determined by customer interaction, product ratings, social media/newsletters, and personalization. Personalization and interaction allow customers to rate the products and processes on which the service and recommendation policy of the website relies. Personalization can also be used to improve a customer's shopping cart (SHARMA and AGGARWAL, 2019). The consultation attribute covers product recommendations, advice functions, and product comparisons (GEHRCKENS and BOERSMA, 2013). The service sub-section consists of delivery and return attributes, which include aspects such as convenience, speed, costs, and transparency about deliveries and returns (GEHRCKENS and BOERSMA, 2013). FASSNACHT and KOESE (2006: 22) call this outcome quality and describe it as 'what the customer is left with after service delivery'. Understanding which elements lead to higher customer satisfaction and to what extent is important for academia when explaining adoption behaviour but also for companies when optimizing their investments.

4 Materials and Methods

4.1 The "Thinking Aloud" Method

Studies have largely left farmers' perceptions of e-commerce websites and reactions to different shop attributes unexplored. Qualitative research methods are particularly suitable for gaining insights into an area that has not yet been investigated. Of the qualitative methods available, the authors decided to use the "thinking aloud" method, in which the respondents are asked to verbalize their thoughts, perceptions, and feelings during the research process (KONRAD, 2020). The aim is to gain insights into the cognitive processes involved in learning, thinking, problem-solving, and decision-making (RIGBY et al., 2020). This methodology has been scientifically applied in different settings within marketing and consumer research. It is also the most frequently used method in user-based studies on the usability of internet offers (BUBER and HOLZMÜLLER, 2009). It is particularly often used to observe search behaviour on websites to optimize the effectiveness of the design of websites (GIDER and HAMM, 2019). This use of the "thinking aloud" method highlights the appropriateness of applying it for comparative analysis of different e-commerce websites in agricultural input trade. The method is typically applied in in-depth qualitative case studies, as "thinking aloud studies do not need a large number of subjects to be successful at identifying usability problems in a user interface" (NIELSEN, 1994: 392). The study has employed a sufficient number of respondents if additional interviews do not reveal new perspectives. In research, this is referred to as theoretical saturation (KÖHLER and FROMMER, 2011). It is recommended that the test be conducted with four to seven participants who express their thoughts on how they decide to interact with the applications. The value of any new participant added is expected to decrease significantly (DE. MORAES FRANÇA et al., 2018; NIELSEN, 1994). Comparable studies using the "thinking aloud" method to examine the usability of a nowcasting app or web browsing behaviour have similar sample sizes of six to eight participants (DE. MORAES FRANÇA et al., 2018; TAN and WEI, 2006). Eight people were interviewed in our study, and saturation of the results occurred after the seventh interview.

4.2 Interview Setup

In this study, eight semi-structured guided interviews averaging 60-90 minutes were conducted between January and March 2020. The interviews were held in German and took place on the respondents' farms. The selection of interviewees was primarily based on their location (Lower Saxony, North Rhine-Westphalia), but to achieve a certain heterogeneity, an attempt was also made to cover the following characteristics: age (</> 45 years), education (university/technical college degree), and farm type (livestock/crop farming). Respondents were identified through the authors' work and home contacts and recruited via telephone. The selection of participants was based on 'theoretical sampling', which means based on interest in knowledge (typical structures and conditions) rather than being completely representative (BUBER and HOLZMÜLLER, 2009).

For the data collection process, the eight participants were given realistic tasks and asked to speak aloud about the thoughts, feelings, and intentions that arose during task processing. They could speak either while they were executing an action or shortly thereafter (BUBER and HOLZMÜLLER, 2009; KONRAD, 2020; RIGBY et al., 2020). The interviewers' speech component was small and aimed to remind the respondent to verbalize all their thoughts aloud (RIGBY

et al., 2020). Each interview started with instructions and a simple warm-up exercise that trained the participant to think aloud (ERICSSON and SIMON, 1993). As a warm-up, respondents were first asked to check their e-mails on a device of their choice. In the first task, respondents were asked to purchase a pesticide and maize seeds online using a personal device of their choice. The aim was to determine their intuitive starting process when shopping online. Respondents were asked to go through the steps up to the product page selection. In the second task, respondents were again asked to purchase the above-mentioned products online, but now both the websites and the end device were specified. The task was completed up to the point where the farmer would have bought the product by pressing the "buy now" button.

The websites tested were selected based on their market relevance; they were the following: a) myfarmvis demo shop – founded in 2017 by AGRAVIS Raiffeisen AG, one of the leading agricultural cooperatives in Germany; b) myAGRAR – also founded in 2017 by ATR Landhandels-Gruppe, a leading agricultural trading company in Germany, Denmark, and Poland; c) ag.supply – founded in 2018 by a startup; d) Agromais web shop - opened by Agromais, which was founded in 2000 and is known for its seed distribution. The myfarmis demo shop was still under development, and the demo version was only accessible via AGRAVIS's own end devices; therefore, a laptop was provided. Where necessary, user accounts were created for all participants beforehand so that registration did not become part of the study.

4.3 Qualitative Content Analysis

To ensure comparability of the responses, all interviews were recorded, fully transcribed, and analysed according to the content analysis procedure described by MAYRING (2014). At the beginning of the analysis, the main deductive categories were identified by considering the developed model and the research questions. Further inductive sub-categories were formed so that a methodological mix of deductive-inductive category formation underpinned the analysis (KUCKARTZ and RÄDIKER, 2022). The aim was to condense the available material into essential content (MAYRING, 2014). Participants' statements were categorized into the created category system; they were then paraphrased, generalized, and reduced to filtered core statements. The qualitative data analysis was supported by MAXQDA software. Finally, the core results were compared to each other (KUCKARTZ and RÄDIKER, 2022; MAYRING, 2014). The quotes that best illustrated each model attribute were translated into English and presented in the tables. Sociodemographic and farm-related data were collected using a short, standardized questionnaire.

5 Results and Discussion

5.1 Sample Description

All respondents were farm managers whose main occupation was to run conventional farms.

The age distribution, presented in Table 1, shows that six participants are younger than 45 years, making the sample younger than the general German population of agricultural workers, where 39% are under 45 years old (PASCHER et al., 2021). All respondents were male, half of whom had a university degree in agriculture. The area farmed by the respondents ranged from 93 to 811 ha, with an average of 312 ha. Thus, the surveyed farms are larger in size than the average and run by farmers with above-average levels of education (PASCHER et al., 2021).

Table 1. Sociodemographic and farm-related data

	Age (years)		University/ Collage degree		Federal state		Livestock farming		Farm size (ha)	
Respondent	< 45	≥ 45	Yes	No	LS	NRW	Yes	No	Arable land	Grassland
R1	x		x		x		x		275	0
R2	x		x			x		x	160	30
R3		x		x		x	x		90	3
R4	x		x		x		x		163	3
R5	x			x		x		x	680	21
R6	x			x	x			x	143	13
R7	x		x		x			x	810	1
R8		x		x		x		x	75	25
Total	6	2	4	4	4	4	3	5		

LS = Lower Saxony; NRW = North Rhine-Westphalia
Source: own calculation

Table 2. Current procurement channels for crop protection and seeds

Respondent	Current procurement channel	Distance (km)	Agr. e-commerce experience
R1	Agricultural trade/Cooperative	3–20	No
R2	Cooperative/Marketer for special crops	3	No
R3	Cooperative/Marketer for special crops	5	No
R4	Agricultural trade/Cooperative	3	No
R5	Agricultural trade/Cooperative	10–25	No
R6	Cooperative	6	No
R7	3–4 trading partners, call for tender	200	Yes
R8	2 cooperatives	4	No

Source: own data

In addition to relying on arable farming, five farms also kept livestock. At the beginning of the study, farmers stated they preferred buying from the local retailer when procuring crop protection and seeds (Table 2). An exception was their purchase of seeds for special crops (e.g., vegetables, sugar beet), for which they preferred marketers. The two largest farms put their requirements out to tender but differed strongly in the chosen distance radius of the suppliers (25 km vs. 200 km). Only one respondent had experience with e-commerce in the context of agricultural input procurement. He chose e-commerce due to the earlier availability of prices during the season and the simplified possibility of procuring sugar beet seed. All interviewees, except for one, described their relationship with the stationary retailer as characterized by longevity and loyalty: "After all, this is our cooperative; they act for us" (R3); "in the region, for the region" (R5).

5.2 Intuitive Starting Process

Most respondents preferred to use a computer or laptop rather than a mobile device to shop online for business purposes. This could be because not all e-commerce websites are smartphone-responsive or because laptops and PCs offer larger screens and thus improved clarity. Across industries, less than 15% of companies make their online purchases via mobile devices (STATISTA, 2018).

All respondents started the intuitive online purchase process with an entry on Google. Individuals searched specifically in Google's "Shopping" section. Input terms on Google were "plant protection/maize seed" as generic terms or specific product names, supplemented by "purchase/shopping." Only one participant chose the name of his local retailer as a search term. None of the respondents considered searching on Amazon. This first step shows that no e-commerce provider seems to have established itself as a pioneer in online agricultural trade and that farmers prefer to place orders from stationary devices.

5.3 Factors influencing Farmers' Online Channel Satisfaction

The categories listed in Tables 3 to 5 represent the elements of the online channel satisfaction model shown in Figure 1. They were extracted from the protocols in the content analysis coding system outlined by MAYRING (2014). The tables contain verbatim quotations from the interviewees, translated and sorted by model elements. An abbreviation was assigned to each quotation listed in the tables to refer easily to the quotes in the text.

Confidence: respondents did not actively address confidence-related aspects, indicating that they did not harbour any general unease or distrust about online stores. However, rather than being concerned about security aspects, they were generally distrustful of the e-commerce providers. This study did not find significant security and privacy concerns as previous studies (BRIGGEMAN and WHITACRE, 2010; HENDERSON et al., 2006; HENDERSON et al., 2004). This could be attributed to the participants' experience with private online commerce as the level of trust increases once a person has more (positive) experiences with e-commerce (FECKE et al., 2018a; FELLNHOFER and HINTERHUBER, 2011). The results also confirm that DLG (German Agricultural Society) certificates and positive provider images (e.g., known and well-established providers) strengthen respondents' confidence.

The interviewees stated that they would be more likely to trust e-commerce offers from their current stationary retailer (Cf1) as interviewees feel loyal (Cf2) and would combine the benefits of e-commerce with those of local retailing (R6). Respondents also expressed that they would be cautious with unknown e-commerce providers by only including a limited

Table 3. Quotes underpinning the in-store satisfaction dimensions confidence, choice, and charge of e-commerce websites

Category		Quote	Respondent
Confidence	Cf1	When you know that there is a cooperative behind it, it is already trustworthy, I'd say [...] then you feel safe right away.	R6
	Cf2	I can't use the local retailer only for the things I spontaneously need, and bypass him for everything else by buying it somewhere else. I don't think that would be fair.	R2
	Cf3	If it's a shop that I don't know, then I wouldn't immediately make the wholesale purchase.	R4
Choice	Co1	I can dismiss that one right away because it does not have what I want.	R4
	Co2	If I have to open up five apps to get my order together, I don't think I would place it.	R1
Charge	Ca1	That's where I see the advantage of signing up right away: that you also get your specific price.	R1
	Ca2	Having the goods on-site and the advice cost money, and all of this has to be financed, and then you are willing to pay a little more for it.	R3
	Ca3	If you decide to use the agent on short notice [...]. Then, in most cases, if it must be done very quickly, and the price does not necessarily play a role; instead, availability is the more important factor.	R1

Source: own data

product quantity or shopping cart size in their initial orders (Cf3). They also expressed scepticism about the expertise of individual online shops due to incomplete, contradictory, or irritating information, particularly brought about by the unusual placement of the products (product categorization). The online product arrangement was compared with the product categorization of respondents' local and familiar shops. Too much deviation led to a loss of confidence, while a certain level of equality (structure in, e.g., product categories) led to the belief that "they have a little more experience" (R1).

Choice: as results from the early 2000s have shown (HENDERSON et al., 2006; HENDERSON et al., 2004), farmers expect e-commerce to provide larger product portfolios and simplified product comparisons than physical stores. To the respondents' surprise, the product choice of the e-commerce websites was smaller and not as convincing as that of local retailers, especially for corn seed. Furthermore, the availability of the desired product was critical to the respondents' choice of retailer (Co1, Co2). The respondents would have liked to see a larger or at least the same product portfolio online as in stationary agricultural retail or cooperatives. They also usually knew in advance what they wanted to buy and therefore searched for products in a targeted manner (see Table 4 A7). HAMMERSCHMIDT et al. (2016) showed that choice (number and variety of offers) has a moderate but slightly greater impact on online satisfaction than offline satisfaction. Their results also revealed that the mean value of choice is significantly lower online, suggesting an unused satisfaction potential, which was similar to this study's findings.

Charge: most respondents initially expected a price advantage online compared to offline retail, which can be an e-commerce driver. They expected leaner processes in online trade than offline, such as no warehousing or personal cash points compared to offline retailers (Ca2). Some respondents stated that knowing prices in advance would make online shopping more effective. Respondents also expected the indication of the non-negotiable, customer-specific final price, especially when a customer log-in was necessary to see product prices (Ca1). This binding nature of the price information was, according to the interviewees, imperative to ensure the advantages of e-commerce. Therefore, traders should aim for transparent, uniform prices across all channels, which could be made possible online via customer logins through which, for example, the system could automatically calculate prices for individual customers according to specific criteria. This is technically feasible with the help of enterprise resource planning systems (OKANGA and GROENEWALD, 2019) but requires defined pricing criteria and extensive customer data.

Respondents compared prices online with prices at physical retailers by considering both the product price and delivery costs. They had contrasting opinions on the availability of discount sales. On the one hand, they saw sales as an opportunity to optimize order quantities, but on the other hand, some respondents simply wanted to see the unit price with the discounts automatically applied. A lower price did not affect purchasing motive if the product was time-sensitive; in this case, the duration between purchase and product delivery was a decisive success factor (Ca3). This is in line with the findings of

ACKERMANN et al. (2018) and with the cross-industry literature, according to which the criterion of price/cost ranks third in the selection of suppliers after quality and delivery (HO et al., 2010). Stationary retail could use its competitive advantage in terms of product availability and willingness to pay for ad-hoc products to increase margins on time-critical products.

Convenience/Usability: Table 4 presents respondents' quotes on convenience attributes. The convenience/usability attributes are often linked to the design of the e-commerce platform, which should contribute to a measurable reduction of transaction costs (e.g., time/money) (HAMMERSCHMIDT et al., 2016; SCHULZE SCHWERING and SPILLER, 2018). This should include improvement in terms of ease of search, comparison, ordering, or contracting (ARDREY et al., 2020). Respondents in this study found it convenient that e-commerce allows orders to be placed directly regardless of time and place. They also found it advantageous that the "shopping list" can be sent immediately, and the order is not lost in the everyday stress (C3). Thus, participants would use e-commerce if it produced advantages in terms of time and/or cost savings compared to ordering by phone or on-site functions (C1; C2).

Regarding **product access**, respondents attached great importance to the clarity of the user interface or start page. They expected the store button to be positioned prominently on platforms that have many areas of activity. Sorting and filtering functions should be

Table 4. Quotes underpinning the in-store satisfaction dimensions convenience/usability of an e-commerce website

Category	Abbr.	Quote	Respondent
Convenience/ usability	C1	'Faster, cheaper' is always what you think first.	R4
	C2	[…] because then the online store is of no use to me, and then I can also just call directly.	R1
	C3	You can choose the products and order them immediately, and then it is done. You don't have to worry about it again. That is a very positive aspect.	R1
Sub-categories of in-store satisfaction dimension convenience/usability			
Product access	Pa1	It's sorted from A to Z [...], but if we have a letter somewhere in the middle, you have to scroll down all the way. […] Publication date: no idea – I would never know.	R1
	Pa2	If you have a program that you work with a lot, of course, it would be even faster with an app.	R2
	Pa3	Of course, if you are fixated on an app, you don't look anywhere else.	R4
Product presentation	Pp1	It would be nice if there was a photo, […] because with the photo I'm faster; otherwise, I have to read first.	R7
	Pp2	It is much easier with photos.	R3
	Pp3	Regarding pictures: Then you're a little more confident about what you're ordering.	R5
	Pp4	I want to order seed or crop protection. If the first thing I see is the spare part number, the first thing I think is that I'm in the wrong store.	R4
Order process	Op1	You know the process from other homepages, I'd say. If it continues like this, then you know "where" you stand.	R6
	Op2	[…] An invoice would be the only option.	R3
	Op3	An invoice is always more convenient.	R6
	Op4	Three, four pages – that has to suffice.	R5
Customer integration	Ci1	If I had to contact through email, I would have to open my e-mail program again and write an e-mail and, no, that would be too much effort right now.	R4
	Ci2	Then it would be quicker to pick up the phone and call. Because most of the time you are working, and you can quickly put a headset in your ear.	R1
Consultation/ advice	A1	It is faster when something is suggested.	R2
	A2	Regarding recommendations: This might be quite a good advertising tool for personal use, but in the plant protection area, it is rather superfluous.	R1
	A3	Now I already feel like I am on Amazon or Ebay [...] It makes you uncertain.	R6
	A4	I also think "similar articles" are nonsense now. [...] "Product of the day" I find – without looking at it – garbage.	R7
	A5	I have to be convinced that he will give me good advice. [...] Then, it is the foot in the door for me, also for the purchase.	R8
	A6	I would still say where the consultation would be. I would already combine it there. I think that's only fair.	R1
	A7	When shopping online, I no longer need any advice. I have bought it before, and then I know what I want to buy, and go to the online store and order it.	R4

Source: own data

well thought out and functional. The decisive factor was a meaningful filter criterion that depended on the product group or aligned with the sorting in the stationary retail shop (Pa1). Having such a filter increased respondents' confidence and simplified product access. Respondents believed that, for the examined product groups, it was not useful to have sorting by publication date or price; for seed products, respondents favoured filtering by maturation segment (medium-late) instead of exact maturation numbers (R1, R6). Attention should be paid to the limitation of the required data volume. All respondents agreed that long loading times were annoying and a reason for abandoning online shops. They associated the apps with more speed and convenience than the browser (Pa2; Pa3).

The respondents favoured a clear and accessible layout of product or article pages; that is, they wanted a clear **product presentation**. The required information ideally had to be recognizable at first glance, complete, correct, unambiguous, and reduced to the essentials. Photos were desired to speed up, simplify, and secure the selection process (Pp1–Pp3). DI et al. (2014) confirm that images can increase the attention, trust, and conversion rate of the buyer. HASAN (2016) also stated that the visual design (with images) of a website is crucial for assessing website quality, where good images can increase the quality perception of the product and website (DI et al., 2014). The colour selection, font size, and use of photos were also perceived as useful. If several product groups are offered, care should be taken so that they are presented and highlighted in the same way. Respondents were worried about making a wrong purchase if there were ambiguities in the presentation of the article/product page, which would trigger purchase abandonment (Pp4). Additional information should be available by making targeted requests for additional windows, PDF documents, or links but should not overload the product presentation.

All respondents had prior private e-commerce experience. Therefore, the experiences from the B2C sector serve as a benchmark to evaluate the **order process** (Op1). The timing of the customer log-in was controversial: Which benefit weighs more heavily – that of the non-binding price comparison or that of the immediate display of the individual product price? There was no general rejection of either variant. A watch list and the automatic buffering of the shopping cart, for example due to a loss of internet connection, were perceived as useful. For all respondents, invoices were the only attractive payment method (Op2, Op3). The "buy on account" option is highly relevant for B2B buyers, while for B2C buyers, payment services such as PayPal are of greater importance (RÜTER, 2022; WITTMANN et al., 2019). Credit limits and maximum order values on an invoice basis should be adapted to the specific customer to enable them to order greater amounts (R7). The online purchasing process also had to be fast, with a low click-to-completion rate (Op4). According to SÜSS (2016), websites should always be structured in such a way that customers can reach their goal (purchase) with as few clicks as possible in order to not annoy them, which was also the desire of the farmers in this study. Unlike B2C e-commerce, B2B e-commerce is less about performance indicators like website traffic or click-through rate and more about the number and quality of leads or the lead velocity (STINGL, 2020).

Respondents assessed satisfaction with **customer integration** based on the available customer interaction channels. Channel expectation depends on who initiates the contact and for what purpose. Information on delivery conditions is expected in writing by e-mail. Respondents preferred to submit information, such as the plant protection certificate or a request for a quote, using upload options or predefined input screens rather than by writing an e-mail (Ci1). However, if the respondents had specific queries, such as about product function, they would prefer the e-commerce provider to be available by phone, and the majority would not want to wait for answers by e-mail or chat (Ci2). Thus, respondents still perceive personal telephone calls as the fastest and most convenient way to clarify questions or other concerns. Other attributes, defined by GEHRCKENS and BOERSMA (2013) as customer integration (product ratings, social media/newsletters, personalization), played a minor role in this study, which is presumably because a concrete evaluation of these is only possible with more frequent use of the website.

Respondents value retailers that provide personalized customer service. Former studies have also confirmed the importance of personal conversations between farmers and retailers (FECKE et al., 2018a; FECKE et al., 2018b). Respondents' expectations of a **consultation** or **advisory** service depended on their typical advisory relationship with their retailer. If their local retailer provided consultation, the respondents also expected the online store provider to offer consultation services (A5). Where the respondents received the consulting services, they would also buy

Table 5. Quotes underpinning the out-of-store satisfaction dimensions care/service of e-commerce websites

Sub-Category	Abbr.	Quote	Respondent
Delivery	D1	Transparency (about availability/delivery duration) is, after all, absolutely critical.	R3
	D2	I think I would prefer to pick it up. Then you still have a bit of human contact. And you get to hear one or two other things, or you get another recommendation or a bit of advice in the process.	R4
	D3	Generally, you can't make the drive for €12 or €13.	R2
	D4	I would have to pay €14.99 for express delivery. Then I would also consider driving another three kilometres to my local dealer.	R4
Return	Rt1	I would probably go through the local retailer because they usually have to take it back.	R5
	Rt2	But it would be practical if it said: "returns possible on site."	R6

Source: own data

the products that are necessary to fulfil the consulting contents (A6). The interviewees recognized that consulting services incur costs, which are reflected proportionately in the product prices. In contrast, if the respondents obtained advice from a private independent consultant, they did not expect any advice from the e-commerce provider. In this case, the online store was merely another potential trading partner (A7) that should offer a price advantage. The respondents also attached importance to having a perfectly functioning search function that provides suggestions. They perceived suggestions as being able to speed up the process (A1). Nonetheless, the majority rejected algorithmic product recommendations typical in B2C e-commerce, such as “other customers also bought… similar articles” or the "product of the day" recommendation (A2–A4).

Care/Service: Table 5 gives an overview of care-related responses. Transparency was the decisive criterion for all delivery- and return-related issues. The main reasons for abandoning the purchase were lack of clarity about delivery costs or time (D1). Respondents who typically got orders delivered from stationary retailers did not want to accept on-site pick up when buying online. The remaining respondents considered a combination of online shopping and on-site pickup (click and collect) (D2). The quote (D2) also shows the importance of social networking. Even if respondents did not mention this as a direct criterion for making local purchases, it is clear they value exchanges with salespeople and professional colleagues. Thus, it is recommended that retailers do not underestimate the strategic importance of face-to-face contact as a social networking function. Even when providing or developing a multi- to omni-channel strategy, local retailers should cultivate existing customer relationships by maintaining personal conversations through, for example, consulting services or field days. However, it is becoming increasingly apparent that this exchange can also take place via messenger services such as WhatsApp (DEUTSCH, 2019).

The delivery costs were evaluated in terms of their reasonableness compared to the costs of using one’s own transport. However, the cost per kilometre of respondents’ vehicles varied (D3; D4). For most, 1-3 days delivery time from Monday to Friday was fine. Here, the stationary retail’s delivery times were again used as a benchmark. For crop protection products, the respondents would have liked to see an express option or overnight service. FECKE et al. (2018a) also recommended this option. Return conditions were only marginally addressed. The respondents did not expect pure online players to be able to return goods, but they did expect local retailers that operated an online store to be able to do so (R5). Only one respondent refused the online option because it lacked a return option (R8). If an online shop did not have a return option, respondents either preferred the retailer (Rt1) or the option "return on site" (Rt2).

5.4 Model Analysis and Managerial Implications

The results confirm our hypothesis that farmers' dissatisfaction with e-commerce websites is mainly due to the deficiencies in the store design, particularly the incongruent layout of offline and online sales channels. Farmers pay attention to channel attributes that are similar in offline and online channels, with the 5Cs moderating their channel satisfaction. To increase farmers' overall online channel satisfaction, all 5Cs of the e-commerce website must be designed in a similar manner as for stationary retail. Thus, local stationary retail represents the benchmark for all aspects and still plays a fundamental role in farmers’ information and purchasing processes. This seems trivial at first because stationary retail is the direct competitor to e-

commerce, but the comparability goes beyond availability and price. By incorporating GEHRCKENS and BOERSMA's (2013) online experience model, it was possible to determine that website structure and design (product presentation and categorization, search, range, and payment) should also be comparable with stationary retail. This systematic comparison of the online and offline channels supports the mental maps theory (GROEPPEL-KLEIN and BARTMANN, 2007; NIKLAS, 2014) and the idea of habitual buying behaviour (FOSCHT et al., 2017). LU et al. (2011) showed that users of offline channels are set in their habits, which means they are less likely to use new technology in the online context; this reluctance was also observed among the respondents in this study. According to the mental maps theory, buyers form unconscious ideas/expectations of the store layout before visiting a shop, which are depicted in so-called mental maps (NIKLAS, 2014). In B2C, customers have expectations of their local shop due to their digital experiences of that supplier's web presence (LOUPIAC and GOUDEY, 2019) or expectations of an e-commerce website from comparing different websites (KOLLMANN, 2019). Farmers, in contrast, form their e-commerce mental maps based on experiences in stationary retail shops. If the websites do not correspond to these mental maps, it can lead to dissatisfaction and even the abandonment of a purchase (NIKLAS, 2014). Following this logic, and since learning processes are the basis of habitual purchasing processes (FOSCHT et al., 2017), embedding spatial information (e.g., knowledge about the location of products) in the shopper's mind is a key factor for retail success (GROEPPEL-KLEIN and BARTMANN, 2007).

The fact that farmers expect a similar product offering and store layout offline and online and want non-negotiable end prices requires strategic channel integration among multi-channel companies. For this, all company departments – and especially offline sales management and online marketing – must work closely together to generate and maintain added customer value across channels. Factors such as transparent pricing and cross-channel store layout are decisive components of successful multi- or omni-channel management in agricultural e-commerce. In this context, mobile applications (apps) should also be integrated in retailers' offerings, as these provide leaner and simplified processes and show great future potential. SWOBODA and WINTERS (2021) investigated the impact of the most useful offline-online (Off-On) and online-offline (On-Off) channel integration services for customers of fashion companies. They found that retailers targeting consumers with low online shopping experience benefit most from Off-On services. These are services that help consumers in offline locations interact with an online channel, such as by viewing/ordering items that are not physically available. Thus, it is advisable that companies integrate online services into stationary retail to promote omnichannel processes. This could also increase customer satisfaction in agricultural retail because the benefits of both sales channels would be available to the farmer.

Since the link between consulting services and product purchases is currently based on the farmer's sense of loyalty, tensions arise as e-commerce increases market transparency. A performance-based pricing model linked with e-commerce might be one solution. The traded products would be categorized according to how much advice a farmer would need (e.g., intensive, low) based on a percentage gradation relying on customer relationship management data. A pricing example might be the following: the online price for consulting-intensive products would correspond to the price to be paid on-site, including consulting, whereas the price for products without consulting needs could be lower in the online shops (e.g., 5%-10% discount). Furthermore, stationary retailers could charge the additional return service or ad-hoc service as part of performance-based pricing. This performance-based pricing model would be analogous to the current practice in banks, where, for example, price advantages are granted for online banking compared to handwritten transfer slips (NEUHAUS, 2016).

Companies may currently mistake farmers with "regular" B2C costumers, which might explain the low online share in agricultural retail. However, farmers are more likely to be B2B buyers who purchase rationally and with a strong economic interest in keeping transaction costs low (SCHULZE SCHWERING et al., 2022). The study and a comparison of the KPIs of B2C and B2B commerce show that aimless clicking through the webstore rarely occurs in the B2B context and leads to displeasure. Ultimately, farmers expect the same user-friendliness when buying farm inputs online as they are used to from private online shopping, and they check the store design and the service for its comparability to stationary trade. Perhaps it is precisely these small but subtle differences in store design and service expectations that determine whether an online store will be successful in agricultural trade.

5.5 Limitations and Future Research

The chosen "thinking aloud" method is suitable to answering the research question as it provides in-depth insights into the decision-making processes and motivations of the farmers. However, it is possible that their articulation of thoughts influences the information processing and decision-making process (BUBER and HOLZMÜLLER, 2009; RIGBY et al., 2020). Thus, collected data might be incomplete due to the unconscious cognitions that are not verbalized or differences in respondents' verbalization ability (BUBER and HOLZMÜLLER, 2009). Furthermore, the methodologically conditioned small sample and the consideration of only two product groups limits the generalizability. Therefore, it is recommended to use the present findings as a basis for further quantitative research to be able to create attractive e-commerce offers that serve both farmers and retailers. For even more precise and detailed information on store design, future studies could use eye-tracking. Follow-up studies should also incorporate aspects of the mental maps theory to better understand decision-making and purchasing behaviour.

The present results once again indicate the importance of social networking in agricultural purchasing processes. Therefore, future studies should pay more attention to the social networking aspect. In our model, social networking cannot be assigned to a single dimension but forms an overlap of the in-store model dimension "convenience/usability" and the out-of-store dimension "care/service". Another limiting factor is the period in which the study was conducted, namely the beginning of the COVID-19 pandemic in spring 2020. This event is considered a driver for digitization in agriculture. This study cannot answer the question of whether the pandemic impacted how farmers choose between offline and online channels. Initial studies speak of a 36% increase in the desire to use digital channels to purchase farm inputs due to the COVID-19 pandemic (ARDREY et al., 2020). Currently, it is unknown to what extent this willingness has translated into actual and sustainable online purchases. Even if there is an initial openness to online trading, news such as the insolvency of the agricultural trading platform Agrando and the effects of the Ukraine war (uncertainties, problems with availability, and rising prices for agricultural inputs), which could affect farmers' purchasing behaviour and sense of security, are raising doubts about the market maturity of digital trading platforms. More recent studies are needed to validate these findings and account for the impact of the COVID-19 pandemic on agricultural purchasing behaviour.

6 Conclusion

This study aimed to determine the factors that affect farmers' satisfaction with agricultural e-commerce websites. In the 5C model assessment, stationary retail serves as a benchmark for e-commerce. Accordingly, it can be concluded that farmers' dissatisfaction with e-commerce websites is primarily due to deficiencies in store design, in particular the incongruent design of offline and online sales channels. Thus, to increase customer satisfaction and fully exploit the potential of this distribution channel, online stores must be comparable to offline stores not only in terms of price but above all in terms of store layout and service offerings. The most important attributes here are stocking the same or a more extensive product selection; having meaningful search and filter functions (inspired by stationary arrangement); presenting precise and short product information and photos; offering reasonable prices; eliminating algorithmic product recommendations; providing invoice payment; and offering personal customer service. Often, the telephone serves as a convenience benchmark, setting the bar high in terms of both the response time and personal interactions. As the results show, farmers do not have many privacy and security concerns when shopping online but have doubts about the trustworthiness of the respective provider. A congruent store design (product arrangement, filter etc.) to the offline store can positively influence the confidence in the e-commerce provider.

In summary, the results suggest that many farmers are not yet ready to switch from offline to online retail because their mental switching costs are too high. They simply see e-commerce as a nice add-on to their local retailer. This highlights the relevance of customer centricity and a channel integration strategy as key to facilitating input purchases and providing uninterrupted customer experiences across the channels. In many cases, respondents care about reducing transaction costs, which they do not believe e-commerce can achieve. Overall, the mixed results of this study reveal that the digital transformation process (RIMMA et al., 2020) has only just begun to reach agricultural trade.

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