

Potentials of AR technology for the digitalization of consultancy intensive sales processes on the example of furniture sales

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Abstract. Selling highly configurable or complex products in online markets has been difficult as they often require intensive consultation time which currently takes place in a physical store. The consultation process has various facets that could possibly benefit from digital solutions. As a first step in our research process, we conducted an ethnographic observation in a furniture store to analyze current sales and consultation processes. Based on our findings, we derive several requirements which can guide the design of IT solutions to digitalize those processes. Additionally, we propose an augmented reality system offering various benefits to both consultants in stores as well as customers at home.

Keywords: digitalization, consultation, augmented reality, customer, consultant

1 Introduction

Striving for competitiveness, retailers constantly look for new opportunities and optimal strategies to keep customers interested in their wares. With the implementation of digital technology, eCommerce had a large impact on many industry branches in recent years. While some businesses solely arose because of a growing digital market, most retailers at least turned part of their businesses online, especially those looking to compete with mass scale online retailers using fully digitalized sales processes. However, industry branches that rely on or require one or more extensive sales consultation sessions, e.g. cars, real estate and furniture sales, have mostly kept their businesses offline due to the number of problems in digitalizing their complex consultation processes. In these areas, digitalization might still prove to offer an unseen opportunity in shortening consultation time and improving general consultation quality.

In this work, we focus on furniture sales. Nowadays, in-house furniture consultations face several problems: While customers can browse websites to generate ideas, they still visit the furniture store for more expensive and complex goods to receive a proper consultation. Guided by a consultant, they want to inspect and evaluate their possibilities in order to find a fitting configuration for their needs. Therefore, a consultant needs to know what the customers' needs and wishes are to

enable an optimal consultation. Customers on the other hand need to articulate these to a consultant in a precise manner. Schwabe et al. [1] describe this kind of advice giving as joint problem solving requiring an extensive knowledge exchange. Additionally, after closing in on a fitting configuration, a customer still needs to imagine the result. Unless the furniture store has the desired model in the selected configuration on display, parts of different exhibits need to be mentally merged by the customer to produce a complete picture. The customers cannot view or feel the furniture until it has been bought, built and shipped. This can dramatically increase customer's uncertainty before purchasing and may lead to longer consultation times or no sales at all.

As part of a joint project aimed at researching the possible improvements by digital sales processes in furniture retail, we worked together with a retailer specializing in highly customizable upholstery which usually needs intensive consultation times. The project aims to create a digital platform in which products which traditionally require in-store consultation can be offered together with remote, online consultations. With promising research about recommendation agents [2], remote consultations and the ability to see and interact with virtual objects in augmented reality (AR), we want to investigate possible digitalization solutions. In order to be able to create technical solutions helping consultants and customers alike, we need to better understand current practices and processes in the furniture sales industry. Therefore, we apply a design-based approach in order to guide our development. As a first step, we conducted an ethnographic study observing and interviewing furniture consultants to learn about the domain. Based on our findings, we derive requirements for digital solutions and, finally, provide a possible first, AR-based solution to these requirements.

In our proposed AR-based solution, customers use AR to receive advice from a consultant while simultaneously streaming their own living room to the consultant. The consultant then could, based on the video, place and (re-)configure virtual furniture for the customer. AR could also help customers articulate their wishes and ideas by highlighting certain parts or providing necessary vocabulary and explanations.



Figure 1. With the help of AR technology, a consultant is able to see a customer's home and offer remote consultation and support.

2 Related Work

The digitalization of labor in all areas and industries has been a topic discussed actively in recent years. The service industry might shift in their focus, as digital services in general are rising in popularity [3]. Even though there still are service sectors that have received little to no attention in previous digitalization efforts, we can already see huge potential implications technology has on current services. One of the most apparent ones may be the possibility to have remote interactions from anywhere at any time.

Sales consultations represent one of these barely touched areas, especially those consultations that are dealing with high-risk purchases, such as expensive or highly customizable and complex products. Because of the high level of perceived risk negatively impacting customer's purchase intentions [4], many customers still prefer to seek intensive offline consultations and purchase when physically visiting the store [5].

An important aspect of finding a satisfactory purchase option during a consultation is the collaborative effort between the consultant and the customer. Schwabe et al. [1] called this process consisting of two distinctly different roles "joint problem solving". Together, both parties need to communicate and discuss in order to find an optimal solution. Dolata and Schwabe [6] found that this form of collaboration can be digitally supported by different media channels allowing for a two-way communication ranging from simple emails to collaborative augmented environments. Greenhalgh et al. [7] showcased MASSIVE, an early collaborative system allowing for interpersonal communication using voice, text and graphics while enabling spatial awareness of surrounding users. This and similar systems are frequently utilized to support collaborative interactions between a novice and an expert, such as training or remote support scenarios. Gauglitz et al. [8] presented a system that allowed an expert to remotely augment the provided camera feed of the workplace of a novice with annotations and highlighting, effectively simulating a live support scenario. The "TeleAdvisor", developed by Gurevich et al. [9] uses an over the shoulder angle for augmenting the novice's field of view, instead. This augmentation is implemented using lasers so it can be seen by the novice without assistive devices.

Besides the main objective of finding a fitting solution for a customer, a consultation can also be seen as a form of building relationships with customers. Following this perspective, helping instead of simply advising a customer grows in significance. Edgar Schein [10] illuminates the helping aspect of a consultant-customer communication and points out different "Inequalities and Ambiguities of the helping relationship". Because of this, for some retailers the consultation may also be part of their "Customer Relationship Management" (CRM) intending to satisfy customer needs and build a lasting relationship with them to keep them interested in revisiting the store [11]. Digitally supporting this endeavor is known as "Electronic Customer Relationship Management" (eCRM) and can "reduce the costs involved in communicating to customers, optimize work flows as a result of integration with other enterprise systems, facilitate better market segmentation and enable enhanced customer interactions, relationship and personalization opportunities" [12].

In order to fully understand the connection between an expert-novice setting and the process of building a bidirectional customer-consultant relationship, it is crucial to examine the current consultation work processes and underlying reasons. As such, this study especially focuses on observing the workflows of consultants around building relationships towards customers during a standard furniture sales consultation. Based on these observations we try to pinpoint uncovered potentials through digitalization with AR technology.

3 Ethnographic Approach

In order to guide the development of possible solutions, we conducted an ethnographic study. In this study, we analyze the consultation process from the perspective of the consultant. This approach helps to guide our future ethnographic studies focusing on the customer's perspective. In this chapter, we provide a summary of our approach to data gathering and our analysis methodology. We highlight our results in chapter 4.

3.1 Data Gathering

Building support for remote consultancy requires an understanding of how furniture consultancy is conducted in practice, including options for supporting and innovating it. In order to develop this understanding, we conducted a field study in a furniture store located in Germany. We wanted to learn how current furniture consultation and sales processes work before using our observations as a baseline for further analysis and digitalization ideas. In particular, we observed the daily routine of consultants selling consultancy intensive and highly customizable couches in a medium to high price range. Our goal was to understand the workflow and their underlying decisions on selling mentioned products (couches in our case).

Three different researchers spent one workday each with one of three different furniture sales consultants employed by the furniture store. During this time, the researchers observed the consultation process within the store, and took notes based on a guiding sheet [13]. The guiding sheet contained details to look out for and to focus on during the whole observation. These details included: The structure of the consultation (phases, elements, start and end), communication (how is the talk guided, how does the customer articulate his wishes, how and when moments of silence occur, etc.), location of the consultation (desk of the consultant, in front of a piece of furniture, etc.), auxiliary means (photos brought by the customer, sketches drawn by the consultant, ruler, etc.), and other occurrences deemed to be unusual by the researchers.

To distract any customers as little as possible, the researchers took their notes under the guise of being a trainee of the furniture store that is being trained on the job and had been instructed to watch the sales and consultation process.

Additionally, the researchers conducted a semi-structured interview with the consultant they observed throughout the day. Besides the insights gained through

observations, those interviews aimed at getting a broader understanding on what had happened during the day and how this compared to regular days. This way the interviews were complementary and helped to classify our observations by adding additional context. The interview contained questions regarding what tools consultants use, what types of customers exist, how they deal with those types of customers, and what kind of knowledge they require to start the consultation, etc.

3.2 Analysis Approach

To analyze the data gathered during our observations and during the interviews, we reviewed it step-by-step, transcribed the recorded interviews, noted anything of interest on separate post-it notes and created an affinity diagram clustered along activities of consultants, support provided to them and information on clients. We then looked for similarities and differences between actions and utterances of each consultant observed. Items with strong similarities across all of the consultants or those that were different from each other were categorized and analyzed further for connections or strong contradictions, resulting in an affinity diagram of all observations [14].

Finally, the data was more deeply examined for underlying reasons of statements and brought into context with prior research. Based on these we identified issues that could either be digitalized directly to generate value or could be approached with a different solution to the original problem, which then could in turn be digitalized.

4 Analysis

This chapter presents our analysis based on the affinity diagrams we created. Each section encompasses a different theme we observed during our study. We use these findings to derive requirements in the following chapter.

High end furniture has many different options for customization. Selecting different options does not only consist of choosing between different cosmetic options like color, but also selecting options based on customers' requirements, e.g. for couches, selecting specific cushioning for heavy people, selecting different fabrics if pets are around, or selecting different backrests for people who are prone to backache. Customers do not know about these options and not all options are available in each piece of furniture. As such the process of buying higher end furniture is consultation intensive.

4.1 Knowledge asymmetry between consultants and customers

We observed a knowledge asymmetry between consultants and customers. While the former are knowledgeable about furniture and the latter are usually not, customers know more about their own environment. During our observations, consultants usually approached customers to ask questions relating to whatever they looked at, to provide additional information about an exhibit in the store or simply to engage into

chatter. This behavior enables them to engage in a professional and focused conversation, opens opportunities for questions and marks a known start of a consultation. If the customer also engages in this conversation and thereby accepts the offered consultation, consultants usually push on by asking for specific expectations, ideas or wishes about the ware they are looking for. By doing this, they hope to gain insight into the amount of information the customer already has and concrete preferences of the customer.

Jungermann et al. [15] called the consultant “experts on furniture” and the customers “experts on their home environment”. Prior to the consultation, each party only has generalized information about the others’ area of expertise, meaning e.g. that the consultant has generalized knowledge on what a client is looking for in a new piece of furniture based on trainings or market research, but no specific information what they are particularly looking for, since the consultant does not know anything about the customer’s home. At the same time, the customer might not know anything about furniture, since it is not their area of expertise, which is while they seek consultation. This difference in knowledge was also described by Schwabe et al. [6]. During the consultation both parties strive to minimize the knowledge asymmetry [15].

Consultants stated that they feel that customers are mostly unprepared when visiting the furniture store or are not able to communicate well what they are looking for. To balance out this seemingly missing information, consultants use a pattern matching approach trying to find comparable patterns from earlier cases [15]. In more extreme cases, consultants feel that they are forced to work in a time-consuming process of elimination by repeatedly asking for honest assessments of an exhibit. Consultants mentioned multiple times that they perceive many of the customers as unable to imagine configurations of furniture. To cope with this problem, consultants either produced a paper drawing or a digital representation of a configuration for customers. Customers can take home a printout of the configuration, in exchange for address data that is used for customer relationship building. The consultation itself does not rely on paper but rather on showing and demonstrating different pieces of furniture in the sales area. This domain relies less on paper than other domains, e.g. finance consulting [16].

In contrast to this observation and interpretation by consultants, a recent study conducted in Germany [5] found that when asking customers directly many of them (40%) feel like they are well prepared or at least have a rough idea of what to look for. This is in contrast to what the consultants we observed perceived and may point to a mismatch of perceptions between consultants and customers. While consultants perceive that customers are not able to articulate their wishes, customers, state that they are usually prepared and may already have a loose idea constructed in their mind.

The reason for this may be that the area of knowledge both sides talk about are different. While customers have a good idea of their own home such as the look of the designated location of the piece of furniture, consultants only have a generalized idea on what a customer wants to buy prior to the consultation [15]. On the other hand, they possess detailed knowledge about the furniture business, terminology in the context of furniture, available product options and their advantages [15]. Since a bi-

directional exchange of information is necessary to enable a productive consultation [15] this asymmetry in knowledge needs to be addressed.

Due to their experience, it is easier for consultants to make their knowledge explicit to the customer who is often less experienced [17]. The difficulty is to convey the information in such manner that the customer is able to understand it. Customers are typically not skilled in furniture consultancy and thereby have difficulties expressing their knowledge. One could argue that their local context, the room at home, is also to some extent tacit knowledge [18]. While the customer might find it easy to talk about it, the difficulty is not knowing which information the consultant requires. So, instead of assuming there is no or only a small amount of knowledge on the side of customers, the question should be how to activate this present but hidden knowledge of customers.

4.2 The unknown value of preparation vs. experience of consultants

As a possible explanation for the knowledge asymmetry as mentioned above, we observed a lack of preparation of both parties during our on-site visits. The consultants would gather all information they needed during the consultation itself and appointments are almost never made, even for returning customers. Customers very rarely call in advance to transmit information about their person and homes. During our observations, the only information about a specific customer available to the consultant prior to the consultation originated from their observations. They watch the customer while they stroll through the furniture exhibits the store has on display and take mental notes as to how the customers react to certain pieces of furniture or attached price tags.

From our observations, standard furniture shopping rarely offers individual customization of a piece of furniture, and customers might be unaware of the many choices they will have to make in a store that does offer these options. They might enter the store without preparation or a prior appointment, confident in their own ability to provide enough information to the consultant on the fly but are ultimately overwhelmed by the amount of choices presented to them. For example, modern couches in the high-end segment allow the configuration of cushioning, fabric, color, adjustable armrests and/or backrests, sleeping functions, lighting, which feet the couch is standing on, etc. This easily results in millions of different configuration options, expanded even further with non-cosmetical options like the stiffness of the cushioning or similar.

Because of this unpreparedness of the customer, consultants sometimes modify their workflows accordingly: They might not (actively) offer appointments, and they might not prepare themselves for consultations with returning customers. The latter might also be explained by a lack of return of investment in terms of time spent. If a customer might not return, e.g. because of the lack of an appointment, any time spent on preparing for said customer would be wasted time and money for the consultant.

Regardless of the reason, data from market research in Germany [5] supports the lack of need for or availability of appointments in furniture sales: Of over 3000 people asked, only 1.6% stated that they visited the furniture store because of an

appointment, mainly due to none being offered in the first place. 32% stated that they wished to receive a competent consultation. We also observed many customers returning for a subsequent consultation session. The interviews revealed that most customers need several sessions before they solidify their purchase decision. This behavior might indicate that customers remain uncertain after an initial visit. Often customers state that they want to go home and check their local environment again before making a final decision. Offering appointments might accommodate these individuals to help preparation. This, in turn, might already reduce some of the knowledge asymmetry introduced in chapter 4.1, or help reduce it during the actual consultation.

4.3 Developing consultant-customer relationships and overcoming insecurities as a means to appear professional

During our observations in the furniture store, we were told by consultants that customers seem to prefer interacting with the same consultants on consecutive visits. When recognizing customers, the consultant who had prior contact to the customers tries to engage them. Another reason for this behavior is the difficulty in splitting up the sales commission across multiple consultants fairly. Customers, despite their preparation and ideas, also seem to be insecure and uncertain of their decisions or feelings towards a selected configuration and need an external confirmation to ensure their considerations. They need to receive these affirmations from someone they feel is trustworthy who either represents a participant of their social network (family, friends, etc.) or a trustworthy acquaintance like a consultant. In order to build and develop this trust, we observed consultants investing large amounts of effort in showcasing their expertise and compatibility. They tried to not be influenced by a first impression and used most of their “free” consultation time with a customer (e.g. when walking to the next exhibition piece) to engage into chatter or add additional helpful information about a product. During these intentional interactions with a customer, they observe and study the customer’s body movements, as well as their verbal and facial expressions.

Research has shown that building relationships with customers is an important aspect of sales. As part of making this possible, sales consultants can emphasize different aspects during consultations. Ingram et al. [19] and Schein [10] both identify trust as an important aspect in relationships with customers. Ingram et al. further describe expertise and compatibility as the primary factor of consultants. Schein highlights behavioral traps consultants should avoid in order to not negatively influence the relationship (e.g. “Dispensing wisdom prematurely”).

Purchasing a highly customizable and expensive item is inherently risky, as the customer can only make sure the item fulfills their specifications after it has been custom-built and shipped. As such, the customers want to be as confident as possible that their purchase fulfills their standards for appearance, quality, feel and “social presentability”, as well as their needs before ordering. If possible, customers want to try out the item of interest, which is why conducting consultations directly at an exhibit allows for a “hands-on” experience. This should ease the customer’s mental

demand of imagining how the wanted item could look like and serve as an artifact for the conversation between both parties. Issues arise if the desired configuration or a similar one is not on display. These assumptions are supported by market research in Germany [5]: 60% of the people asked wanted to try out a piece of furniture before purchasing it (not important for the remaining 40%), and 56% stated that using material samples for haptic feedback would ease their decision process if purchasing online.

Prior research has shown that for building confidence in their own statements people tend to favor their own perceived levels of expertise when compared to other information sources [20], going as far as to overestimate their own ability [21]. At the furniture store, we observed behaviors shown by the consultants that can be explained by this prior research. As an example, many of the observed consultants regularly reconfirmed furniture dimensions, prices and sales using analog tools such as measuring tape or a calculator, but did not take any notes during the consultation, confident in their own ability to recall everything they need later.

Several of these aspects could be observed during our time at the furniture store, as well: The interviewed consultants revealed a recent increase in the number of customers who want a hands-on experience and to try out any special features a piece of furniture might have. As such, customers are taken to an exhibit right after initiating a consultation, and to different ones once more details about the customers' desires and needs emerge. The consultants demonstrated special features and provided material samples if a piece of furniture was not available in a certain configuration.

5 Towards a digital solution

In section 5.1, we first present requirements of a concept for a system aiming to bring the observed furniture sales processes into a digital world. Each aspect is linked to the corresponding section in chapter 4. Afterwards, we propose a possible AR solution based on the following requirements and briefly touch on additional questions regarding problems arising with the digitalization.

5.1 Deriving requirements for a possible technical solution

Since the analysis in chapter 4 might allow for multiple possible interpretations, we formulate requirements for all areas focusing on the most prioritized ones.



Figure 2. While being at home in their local context, customers can fully customize a configuration of a couch (e.g. adapting the cushion material or setting the color of the fabric; left side). At the same time a consultant can perform a consultation remotely via PC seeing all details the customer is seeing (right side).

First, the system should reduce the knowledge asymmetry between customer and consultant (see 4.1). The system should be capable of helping the customer to acquire knowledge and terminology about furniture as well as possible criteria which are important when deciding on a piece, and to introduce them into the possibilities for individualizing their piece of furniture. They need to be able to easily understand options and learn dependencies while trying out the system. Similarly, the consultant should be able to gain insight into what the customer wants, needs, and how their home is set up to enable a more streamlined consultation and to offer ideas which might be a better fit. They would need an ability to communicate with customers to further explain a context or even prepare more complex steps. Any information they would gather during the customer's visit to the store (either by watching the customer or talking to them) needs to be made available using alternative, digital means. These solutions, combined with the ability to make appointments prior to which both parties can submit information, should also serve to solve the lack of preparation mentioned in section 4.2.

Second, the system should support building consultant-customer relationships (see section 4.3). Since trust is an important factor, the system needs to resonate a feeling of being trustworthy. Raising the perceived level of expertise of a consultant or allowing for comparisons between consultants may do the trick. Simultaneously, the customer should also be provided with opportunities to collect additional opinions and thoughts on their choices from different sources (e.g. using social media to share configurations).

In this section we propose a digital solution to implement the requirements outlined before. We propose to use AR to implement most of the requirements. For the general setting, we envision a customer being at home and wearing an AR head mounted display (HMD) like the Microsoft HoloLens. This would enable a consultant to remotely connect to customers and see their local surroundings. Additionally, he then could aid them in finding and selecting a desired configuration of their furniture.

Digitally alleviate the knowledge asymmetry between customer and consultant. Using AR, customized configurations of a piece of furniture can be displayed during

every step of a consultation. Consultants would be able to view the local context of the customer and the spot the piece of furniture is supposed to be placed in (see Figure 2, right side). Similarly, customers can see their furniture configuration in their designated spaces at home before purchasing it. Seeing the furniture in its real size, the customer can check how well it fits spatially and aesthetically. They also could select parts of the furniture they want to customize directly and could be presented with a few options automatically chosen based on their interests or popular choices. In a similar fashion, the system could show information about various customization options like the fabric or cushioning and other properties (Figure 2, left). Presenting a pool of possible choices for a specific part of the furniture like this could alleviate the knowledge asymmetry between both parties as the customer can learn about furniture. This allows customers to explore offerings before actually visiting a furniture store, which fits the behavior of many customers to include online research into their shopping experience [5].

The usage of AR and HMDs additionally provides consultants with a clearer picture of the customers' local context and, as such, they do not need to rely as much on the customer's descriptions. The consultant would also be able to gain a sense of scale of the customer's surroundings, and information about the interior design theme of the room. This way, the consultant might be able to make suggestions that are more fitting to the customer's room and can express other ideas e.g. to sell additional products or to incorporate current trends in interior design. Although this feature is not specific to an AR HMD, it benefits from most AR HMDs featuring a built-in camera which is automatically directed at the area the customer is currently focusing on. Another benefit of having the customer wear an HMD is that consultants can direct the customer towards specific locations in the room to obtain a better overview of how the room looks like. Customers bringing photos of their rooms to the furniture store or simply describing them to the consultant might not be as informative. These abilities would bridge the current knowledge gap and thereby help the joint problem solving [1].

The ability to see and interact with fully configurable virtual objects in AR also allows customers to explore individual features of a piece of furniture (e.g. an extendable sleeping function, a compartment for bed sheets or adjustable arm- or backrests) and thereby creating an understanding of underlying dependencies. Here, a composite virtual object containing all possible configuration options can enable customers to visually compare different features from all sides. The functionalities of features could also be showcased by animations and explanations to help the customer learn about the product. When working on their own or while in a consultation session, the HMDs could also offer an automatic detection and warn about insufficient space, e.g. when an extendable drawer would not be able to be opened due to lack of space (see Figure 3). Additionally, the consultant could emphasize a functionality or selling point by highlighting various sections of the 3D model or starting certain animations. To support customers in understanding these more specific dependencies, the system could help "translate" it into more common terms.

Currently, certain information about a piece of furniture in the store is displayed on the exhibit itself, while other is only available digitally. In a digital AR solution, it

would be easier to group relevant information of delivery times, care instructions, prices, discounts or dimensions of the furniture delivery when the customer requires them. They could then be displayed directly next to the digital piece of furniture in question, making the information available where it is needed at all times. When customers access the configuration from home it is also possible to include location-based services. As an example, specific care instructions could be displayed if customers are living in an area in which the tap water contains a higher degree of lime. Another example is that initially displayed default furniture parts can be selected differently e.g. if the customer is known to live in an area with a high household income.

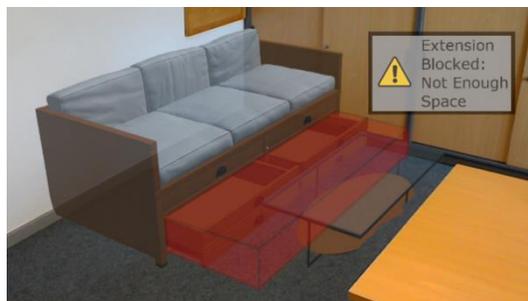


Figure 3. The system warns the user if movable parts of a piece of furniture, like a drawer, would be blocked by another object.

Provide a digital way of building customer relationships. Reducing customer uncertainties before buying is part of building a better relationship to the customer. From a customer perspective, AR adds to the furniture buying process as users gain ways of previewing configurations in their local context, which is not possible with current means. As furniture is manufactured to order, customers do not have good means of previewing *their* configuration before it is built as of yet. As already mentioned, AR offers a preview of the furniture in a realistic scale, an option that is not available when using printouts, only. The option of using the AR headset to confirm whether a piece of furniture mentioned prior fits their home aesthetically should alleviate customer uncertainty, as well. Additionally, sharing configurations with others through social media serves customers as a separate source of feedback before buying. As such, offering this option directly from the AR headset could prove to be beneficial. Finally, a detailed history of the customer’s needs and prior consultation sessions could be saved and made available to the consultant to support them when preparing for subsequent consultations with the same customer, directly improving the customer relationship.

To increase the customer’s perceived expertise of the consultant, the consultant could be displayed as a 3D avatar using the AR HMD inside of the customer’s local context, providing a “face-to-face” consultation although the consultant is not physically present. The avatar could be designed in a way that a majority of customers would perceive it as an attractive “expert” avatar, increasing their trust in, and perceived level of expertise of the consultant [22]. Alternatively, the customer could

be offered to pick from a set of different avatars or to customize one themselves. In addition, any actions the consultant would perform during the consultation, such as inputting data or measuring something, could be visualized using these avatars to bridge waiting times.

Finally, having access to the customer's local context visually through the AR HMD's camera and being able to view everything "through the customer's eyes" enables the consultant to provide recommendations directly tailored to customers' local context, further increasing the customer's perceived level of expertise of them.

Enable both parties to prepare themselves prior to consultations. In order to help customers to prepare for their initial visit, they could use an AR system to digitally explore different configurations. This could also help if customers do not have a clear idea of what they want to purchase yet. Otherwise, during rush hours, consultants might turn down unprepared customers as doing otherwise would be too time consuming.

A digital solution generally should be able to offer a structure for appointments and preparation, which we did not observe in our case. As mentioned in section 4.2, appointments are not offered, but could be easily implemented as a powerful eCRM solution. This would also offer possibilities for consultants to create specific notes for a consultation and to receive reminders to get back in touch with customers. A consultation history like this can aid consultants in their reflection of the case and with preparing for the next consultation. Furthermore, before the initial consultation, it would be possible for customers to send data to the consultant, which can include a 3D-scan of their room recorded with the AR HMD headset or even a picture, further aiding the consultant's preparation. By monitoring what customers are looking at, a digital system could replicate the consultant's strategy to observe customers in the sales area in order to get a feeling for their preferences and budget. The system can use this data to estimate interest and price range.

Finally, through using a digital solution it could also easily be managed to connect customer with consultants. This might be of benefit when building relationships, since consultants might remember earlier purchases and consultations.

Provide means for the customer to "try out" digital furniture. When digitalizing hands-on experiences, we differentiate between the customer trying out different features of the piece of furniture or furniture parts and the customer actually feeling the fabric. Here we discuss the former and the latter is discussed in the next section.

The aforementioned benefits of an AR solution can help the customer explore various functionalities of a piece of furniture: The virtual demonstration of movable parts of a piece of furniture enables the customer to learn about how a feature works, (e.g. adjustable armrests). In addition, the customer could swap between different configurations rapidly while not having to physically move around, enabling a direct comparison of different configurations. This is especially useful if the furniture store currently only has a small number of exhibits on site. The different configurations could simply be displayed and then examined from every side. Although a

digitalization does not provide a tactile experience, it can help while exploring functionalities.

Being able to view virtual furniture within one's own local surroundings represents a new way of "trying out" furniture that simply does not exist in physical stores, yet.

5.2 Open questions of digitalization

The solutions above show how different aspects of the consultation process could be digitalized. However, this is not possible for all observed facets.

In the interviews, the consultants mentioned that they actively look for facial expressions of the customer to gauge if the customer is satisfied with the consultation. They also observe other aspects e.g. to suggest pieces with better cushioning in cases customers are overweight. These possibilities do not exist when customers wear an AR HMD at home. As such, consultants would need to adapt their sales strategies. Shurgin et al. [23] offer insights on potential opportunities by showcasing a coherence between emotions and parts of the human face. It might be enough for the system to only observe a small area of the face and use this to deduce what a customer is feeling.

One issue is the difficulty in digitalizing hands-on experiences. Customers rely on having access to different fabric samples in the sales area of the furniture store to decide. Current online stores offer free fabric samples that are sent via mail, a process that takes time. Haptic experiences are difficult to incorporate into a digital solution. Recent studies show that 3D-printed hairs can simulate textures to a certain extent [24]. For solutions like these customer acceptance needs to be evaluated. Another possibility are special gloves (e.g. [25]) with which customers could manipulate or interact with the 3D objects, in case current interaction capabilities offered by state of the art HMDs like the Microsoft HoloLens are not sufficient enough in this domain.

Another issue might be scalability. A chatbot, as a form of a recommendation agent [2], might be able to offer scalable aid for customers in different situations: During rush hours, when all consultants are busy in the store, or during off hours, or if customers only need specific help with a configuration without wanting to bother talking to a consultant. The chatbot can assist with delivering information or help configure a piece of furniture. Having a chatbot is not meant to replace consultants, but rather offer a complementary means of acquiring information from a customer's perspective.

6 Conclusion

As part of a joint project, we conducted an observational study with interviews in order to understand consultation processes in furniture sales with the purpose of creating means for digitalizing those processes. In our analysis we describe current practices and challenges in the consultation processes. Based on this analysis we derive several requirements a digital solution must include in order to provide

benefits. Following that we propose a system based on augmented reality addressing these requirements.

In our analysis, we observed an asymmetry of knowledge between the customer and the consultant, which could be mitigated by digital solutions that raise the customer's level of knowledge about furniture, such as providing an AR solution allowing for configuring furniture themselves and previewing it in real-life size, virtually. A lack of preparation by both the customer as well as the consultant could be mitigated by providing digital means for making appointments and providing additional information before said appointments. To support the building of a customer relationship, digital means for always connecting to the same consultant and to allow the customer to share their experience with friends and family could be incorporated. The consultant could receive access to statistical data gathered about the customer, such as time spent in certain online shopping sections, to provide a more streamlined experience for the customer. We also observed a desire for the customer to try out furniture before buying it, which could be achieved by showcasing features using animations in an AR client.

Our work presents a suggestion on how augmented reality systems could possibly support furniture consultancy. We see our work as a first step towards this. Further studies are required to evaluate whether the proposed system would complement furniture consultancy. Nonetheless, our work is a helpful step towards a better understanding of this domain. As this study is especially focused on consultants, we are currently planning a study to incorporate the perspective of customers. Additional short and long-term studies will be conducted to evaluate the utility of the proposed system.

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