



It's about Inclusion! Mining Online Reviews to Understand the Needs of Adaptive Clothing Consumers

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Clothing is a basic need for human beings. Adaptive clothing is defined as clothing, garments, and footwear specially designed for people with physical disabilities, the elderly, the infirm, and post-surgery patients (Disabled-World, 2020). They play an important role in reducing the negative consequences of disability limitation problems and benefit those people's life. Nowadays, more and more adaptive clothing consumers choose online (Annett-Hitchcock & Xu, 2015). Although substantial research efforts have been taken to utilize customers' opinions to improve the adaptive clothing design process (Wang et al., 2013), there is few studies analyzed online customer reviews (OCR) to understand their online shopping experience. Therefore, it is important to understand the various challenges that disabled individuals face while shopping online, and identify opportunities to make a meaningful or impactful change. This research aims to 1). identify the customer needs of adaptive clothing through online reviews, 2). reveal the differences and similarities of consumers' needs and evaluations about their shopping experience between regular online retailers (Amazon) and retailers that are specialized in adaptive clothing (Silverts', IZ adaptive).

The theory of customer value and the Functional, Expressive, and Aesthetic (FEA) Consumer Needs model were used in this research. Value is considered as a trade-off between customer benefits and costs of acquiring or using a product (Boksberger & Melsen, 2011). When shopping online, customer value is associated with the product price, quality, e-retailer reputation, privacy risk, and the valence of online experience, such as ease-of-use website, relevant information, and customer service (Chen & Dubinsky, 2003). When the product/service meets customers' needs, they gain the benefit. Otherwise, they undertake the cost which customer satisfaction will decrease in the whole experience. In this paper, customer value theory was utilized to extract the latent customer needs in the online shopping experience from customer reviews. Considering the unique characteristics of adaptive clothing, the FEA model proposed by Lamb and Kallal (1992), was also brought in. This model has been widely utilized to connect the design research and evaluation stages of the design process. The three FEA criteria, functional considerations, expressive considerations, and aesthetic considerations, have been used to assess consumers' needs and wants toward specific garment types. Besides the design research, the usage of the FEA model has been extended to consumer behavior research. Hwang et. al (2016) has confirmed that external stimuli of FEA dimensions significantly influence consumer attitude toward purchasing smart clothing. In this study, the FEA model would help to evaluate customers' reviews toward product quality and identify their needs toward adaptive clothing sold online.

To achieve research goals, OCR was collected as a reliable data source. These reviews posted online imply customers' praise and complaints after actual purchase and could reflect their latent needs. Three websites selling adaptive clothing, Silverts', IZ adaptive, and Amazon were chosen to understand customers' adaptive clothing shopping experience between adaptive clothing retailers and regular e-commerce retailers. While adaptive clothing retailers might provide more accessible communications online, Amazon has become a popular destination for consumers to search for adaptive products as well. These three websites all provide a wide variety of products with a large number of online product reviews as the ideal data source. Considering the data availability and balance, customer reviews posted before Jan 2021 were crawled on Silverts' and IZ adaptive. In Amazon, search "adaptive clothing", and the reviews of the products on the first page were all crawled. In total, we extracted 1,120 reviews from Silverts, 468 reviews from IZ adaptive, and 1,776 reviews from Amazon for analysis. Upon pre-processing, we employed Latent Dirichlet Allocation (LDA) algorithm (Blei et al., 2003), a topic modeling algorithm in text-mining, to extract the key aspects discussed in the OCR.

To ensure brevity, in Table 1 we only provide example topics identified from the customer reviews of Amazon and IZ-adaptive along with the 5 most important keywords. The reviews of Amazon show that most products are shirts and pants, and Amazon customers mainly mention the needs toward products, not services. Most of the topics are related to functional considerations, such as fit size and soft fabric. Customers are impressed by the adaptive design. For example, the zipper, snaps, and magnetic closure make dressing much easier. Amazon customers also mention the aesthetic consideration. They love to see more choices with different colors and styles. Besides the needs toward the product, customers in IZ-Adaptive and Silverts' also mention that they need good customer service and quick delivery speed. Unlike Amazon, which has a comprehensive customer service system and fast delivery for prime members, IZ-adaptive and Silverts' have a growing service system in which improvements are needed. It is interesting to see that IZ-adaptive has a large number of reviews related to masks. During the pandemic, many adaptive clothing customers are also at increased risk of developing illness from COVID-19. Therefore, it is reasonable for adaptive clothing retailers to provide this personal protection equipment to meet the customer's needs. Compared with IZ-adaptive, Silverts' has a wider selection of products online, but the product search function has to be updated since customers mention the needs of easy navigation in reviews.

Table 1. example topics extracted from reviews of Amazon and IZ-Adaptive

Online Retailers	Topics	Top 5 key words
Amazon	fit shirt	shirt, fit, snaps, larger, skin, soft
	easy access	shirt, dad, access, easy, nurse
	magnetic closure	shirt, button, magnetic, closure, easy
	easy snaps	gown, pleased, use, easier, snaps
	elastic waist	pants, waist, pockets, elastic, drawstring
	easy zipper	pants, quality, zipper, leg, easily
	open snaps	surgery, shoulder, snaps, open, dressing
	size/style	size, easy, recommend, stylish, highly
	soft fabric	fabric, soft, quality, washes, nice
	perfect look	look, fit, color, different, perfect
IZ-Adaptive	fit mask	mask, fit, face, comfortable, family
	material quality	mask, washed, quality, easy, material
	fashionable style	mask, stylish, fashionable, looking, recommend
	mask received	mask, received, weeks, order, arrived
	durable pants	pants, comfortable, wheelchair, durable, waist
	long enough	pants, fabric, long, enough, able
	fit waist	jeans, fit, happy, waist, button,
	order received	received, order, hope, ago, hard
	customer service	service, excellent, customer, Canada, wear
	order delivery	delivery, product, order, new, sweatpants

This study utilized OCR from three different websites selling adaptive clothing, to explore

customers' needs regarding adaptive clothing shopping experience. Guided by the theory of customer value and FEA, the findings suggest that customers place more emphasis on functional considerations and fashionable products. The valence of the online experience is also an important component of customer value during online adaptive clothing shopping. The findings also provide managerial recommendations to online retailers of adaptive clothing, such as the need for easy-to-navigate website and quick delivery/return service. Also, when compared to large e-commerce retailers, adaptive clothing retailers have more targeted customer segments. As a result, it will be easier for the latter group to build brand loyalty by providing products/services in urgent needs under exceptional circumstances. In future studies, more data sources, such as virtual community and social media data would be included to have a deeper understanding of adaptive clothing customers' needs and develop more efficient online marketing strategies.

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