

Research and Analysis of User Experience of Shopping Websites by Intelligent Design System

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Abstracts: Shopping websites' continuous improvement and maturity (including mobile versions and APPs), but producing colossal content, widespread recommendations, precise advertisement, and repeated product recommendations lead to poor user experience(UX) in user shopping. Using an intelligent design system (IDS) to improve the UX of the whole shopping process has become an urgent problem to be solved. This paper takes shopping websites as the research object, studying and analyzing how the IDS can be applied to the current shopping websites and finding the best way to optimize the user experience. Through analysis of IDS, user experience, interaction design, user behaviour, and other related issues are discussed, which has practical research significance and specific judgment value and reference for the future development of the discipline to improve the UX of current shopping websites.

1. Introduction

With the rapid development of advanced information technologies such as artificial intelligence(AI), adversarial network algorithms, cloud computing, Internet of Things, and big data, human-computer interaction design and other related research appear in the field of user experience (Manogaran, Thota, & Lopez, 2022), especially the user experience of online shopping websites, which has gained significant development in recent years. Due to the integration into artificial intelligence, the research on the user experience of online shopping websites has received more attention. Research on the interaction between the IDS and user experience has also emerged. The continuous development and progress of technology have strengthened and extended the connection between intelligent design, interaction design, user experience and consumer behaviour, driving changes in interaction design, user experience and shopping online, opening up more boundaries and imagination for user experience and shopping scenarios, extending from traditional shopping websites to more scenarios of shopping. For example, the future of shopping in the space of smart cars, smart wear shopping, and the possibility of constantly developing new shopping scenarios, with the continuous progress of technology, especially AI technology, the Internet and the Internet of Things technology, so that the shopping experience, technology and scenario diversification brought.

2. Intelligent design system and user experience and development status

From the concept of intelligent design to the intelligent design system, due to the continuous development of AI technologies, especially interaction design, human-computer interaction, and user experience, and artificial intelligence mutual development(B.-h. Li et al., 2017). In recent years, the IDS has been invested in research in many areas, including shopping website experience. At the same time, these studies have ushered in new research enthusiasm, and the IDS and user experience have become the critical directions of current research.

2.1 The concept of the intelligent design system

The IDS is a design thinking and design methodology that integrates intelligent design and system thinking into the product design and development process to make products more intelligent

and have a good user experience. (X. R. Bin, Wu, & Yong, 2006) proposed an intelligent optimization design method. (Bo, Yulan, & Qigang, 2013) proposed a theoretical approach to intelligent design, and(X. X. Bin, 2011) summarized intelligent conceptual design, which provides the basis for intelligent design technology research and application. Therefore, intelligent design systems have become one of the design thinking for product development today, especially for Internet products carried out, and a design thinking approach to balance intelligent design and user experience to obtain the best solution.

In addition, entering the era of artificial intelligence and digitalization, user experience has also undergone significant changes(YunhePan, 2016). On the one hand, there is an interdisciplinary development toward digital technology, and the degree of integration between artificial intelligence and user experience design is getting closer. Interaction design, human-computer interaction, and user experience are also more linked in the intelligence era. On the other hand, design, survey, and manufacturing methods continue to iterate. In addition, being supported by intelligent design technology, intelligent design, interaction design, human-computer interaction, and user experience make the experience of shopping websites more intelligent and personalized. It dramatically accelerates and improves the quality of user experience and expands the boundaries of user experience, especially the imagination space and future practice space on using scenarios will become more. Finally, digital technology, human-computer interaction, and other information technology, combined with the evaluation methods of different dimensions such as user experience as the core and design expression, driven by the IDS, makes the online shopping website user experience developing toward the most excellent experience direction.

In conclusion, even though there are different understandings of the IDS, many Scholars, researchers and designers have widely paid attention to the positive impact of the AI system on UX.

2.2 User Experience

User-centred design (UCD) is a design philosophy, methodology, and series of design processes that enhance user experience (UX) as a result(Hassenzahl, Tractinsky, & technology, 2006; Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). UCD emphasizes user-centred product development and practice, and the product is being developed to meet the user's needs for the best user experience. Dr Norman proposed in design psychology that user-centred design is a human-centred design concept that puts user behaviour and needs at the forefront of design and makes a design approach to meet user needs after fully understanding what the user thinks and needs (Norman, 1986). In addition, Ilpo Koskinen, in his book "Empathic Design - User Experience in Product Design", also expressed the importance of user experience in product innovation(Battarbee & Koskinen, 2005). Taking user understanding and consumer experience as the core of product design, especially in the initial stage of product design, where the design concept and subject are relatively vague, and products are based on user experience, becomes more critical (Mattelmäki, Vaajakallio, & Koskinen, 2014). Jesse James Garrett, the founder of the user experience consultancy Adaptive Path, believed that achieving user trust and satisfaction is the goal of executing a product design, thus building the product's reputation and forming its unique brand value. In his book "User Experience Elements: User-Centered Web Design", he clarified that UX elements are five levels of transition from abstract to concrete, integrated UX design into the whole product development process, and divided UX elements into Strategy, Scope, Structure Skeleton and Surface layer (Garrett, 2010).

Although different scholars and experts have different understandings of UX, the overall basic core understanding seems to be similar, and they all agree that UX is a user-centred design concept.

2.3 Research on the intelligent design system and UX

In the context of the artificial intelligence era, the adoption of big data, cloud computing, and rich algorithms brings new changes to user experience research and gives a richer connotation to user experience(Dwivedi et al., 2021). User needs that could not be reached in the past due to technical reasons, but now the situation will be changed, and new technology can meet a better user experience and thus a user-centred design goal. The user experience under the artificial intelligent

design system focuses on efficient, easy-to-use, functional, fault-tolerant, immediate feedback, intelligent, and more pragmatic user-centred design concepts. The purpose of the IDS is also that there is no need to educate users, no very tedious prior operation instructions, and no customer service staff to guide users to learn operation-related behaviours (such as registering an account, placing a purchase order, or returning or exchanging productions). However, users can quickly understand how to use the website or APP and only spend less time becoming familiar with the website interaction behaviour logic, thus significantly reducing the user's cost of use. In addition, the design of the behaviour logic improves the user's viscosity and loyalty. This may be the requirement and understanding of the new concept of user experience in the context of artificial intelligence, that is, maximizing user experience design, introducing intelligent design system thinking to product design, development and application, and focusing more on user design-centred design result orientation.

3. Impact of the IDS on the user experience of shopping websites

The intelligent design system, Internet technology and AI technology are advancing simultaneously, and the shopping websites will be affected. From emotional experience, technical experience and application scenarios are affected differently (X. Zhang et al., 2019). Intelligent design system with its unique system integration ability, based on the design principles of the user-centred concept, integration of relevant technologies, making the user experience more intelligent and rich in function (Bond et al., 2019), primarily based on cloud computing, big data, Internet of Things and AI advanced algorithms, the user experience will be emotionally personalized, interaction design form diversification and application scenario diversification. At the same time, the functions of interaction design will be further refined to obtain the optimal user experience.

3.1 Personalized emotional experience

Compared with traditional design methods and user experience design, people often apply traditional design evaluation methods (WanyuHe et al., 2019). Such evaluation methods mainly rely on the experience and intuition of designers and product managers to complete. The experience design results are influenced by many developer factors and show a certain subjectivity. However, with the explosive growth of intelligent design, the experience results from a single unchanging design evaluation method have become unrealistic. The methodology may become difficult and unsupported users to obtain a good user experience in a timely and effective manner.

However, based on intelligent data analysis in different dimensions such as user data deposits, user tags, user usage behaviour, browsing habits, and AI algorithms (H. Li, 2019), users will have a better user experience in terms of personality and emotion after the intervention of the IDS. Artificial intelligence (e.g. based on machine learning and algorithms) can determine the user's preferences for the shopping process and decide what users like. An optimized interface presentation solution with personalized interaction design can be obtained to improve the overall experience. The continuous feedback of users' usage habits will also provide more data to the database, and the more data, the more accurate the machine judgment, the better experience users may get. Many well-known shopping sites such as Amazon, Alibaba, and Jingdong have already enabled big data-based system decisions to determine user preferences to provide users with a better personalized and emotional experience(Hänninen, Mitronen, Kwan, & Services, 2019).

In addition, the design decision-making method under the role of an artificial intelligence system can quantify and calculate multi-dimensional contents such as design knowledge, user behaviour and user perception, establish unified evaluation indexes, realize more refined design analysis and user experience evaluation, and improve the accuracy and objectivity of personalized emotional experience results. In addition, the IDS can effectively make up for the efficiency problem of traditional methods, allowing the intelligent system or designers to obtain objective user feedback results quickly and realize rapid iteration of user experience and interaction design.

3.2 Diversification of experience forms

Because interaction design develops toward multimodal forms (Amershi et al., 2019; Cpj, Sfd, Dpb, & Alk, 2019), such as touch interaction, voice interaction, gesture interaction, eye-movement interaction, and other forms of interaction design appear simultaneously, and new interaction methods continue to improve and emerge from the original traditional interaction design methods. User experience will become more New design processes, and new design methods will be produced due to involving AI (Kwong, Jiang, & Luo, 2016; Zhu, Liapis, Risi, Bidarra, & Youngblood, 2018), such as system design, design thinking, integral design, functional design, design aesthetics, interdisciplinary study, virtual reality technology, human-computer interaction, smart design and so on. Therefore, the user experience has more opportunities for technical support and different interaction designs to bring different experience outcomes. The embedding of intelligent design systems allows different technologies, algorithms, and interaction designs to produce different user experiences.

At the same time, professional AI terms such as multi-agent system, reinforcement learning, machine consciousness, swarm intelligence, artificial intelligence algorithm and organization of innovation network will also frequently appear in the interaction design and UX. UX and AI design systems are indeed developing toward the multi-experience direction (Dwivedi et al., 2019). Therefore, because of the powerful and diverse technologies and AI, it is no longer difficult for UX to form and obtain. Consequently, the UX, new technologies, and AI will be closer.

3.3 Diversification of application scenario experience

With the continuous improvement and enrichment of intelligent terminal devices, the shopping scenario becomes more diversified, and the options available for the shopping scenario become more. The application scenario of the shopping experience starts to extend from the original smartphone and computer to more user terminals and devices. For example, the home smart TV, community smart touch-pad, and smart refrigerator may soon happen in the smart car cab shopping behaviour. Especially after combining the Internet of Things, big data, cloud computing, intelligent manufacturing, smart wear and artificial intelligence, the range of interaction design application scenes will become more. The following user experience scenarios will follow richly, with the interaction and experience between human-human interaction and human-computer interaction going on all the time. In addition, instant mobile payments can happen in different application scenarios (Z. Zhang et al., 2019). These experience scenarios can not only be online shopping but also booking family doctors or remote video conferencing, etc. The interaction between interaction scenarios and people is not hindered by time and space, and users can complete various to-do lists through mobile terminal devices anytime and anywhere, which significantly facilitates people's daily work. Moreover, shopping scenarios will no longer be fixed or only specific scenarios (Liu, Bo, Zhuo, Yeh, & Zheng, 2018).

At the same time, by combining the IDS with AR and VR technologies, the online shopping experience will be further optimized, even reaching a physical touch experience comparable to that of offline brick-and-mortar stores. This technology breaks the tradition of needing to go to a physical store or shopping centre to see actual products, and the user experience will be significantly enhanced. In addition, driverless space (Detjen, Faltaous, Pflöging, Geisler, & Schneegass, 2021), 5D technology, and the upcoming explosion of the Metaverse concept of parallel worlds will allow the scenario of user experience to be continuously expanded, and the online shopping boundary has been further widened.

4. Future research highlights and trends of UX for shopping websites

The user experience driven by an intelligent design system aims to meet the personalized intelligence of users. Based on the current advanced algorithms, cloud computing, big data, Internet of Things and AI, and the interaction design of touch interaction, voice interaction, gesture interaction, eye interaction, and other forms, it will bring users a new user experience of online

shopping. In the future, in-depth research will be conducted on three aspects, including data-driven user experience, algorithm-driven user experience, and user-centred design of IDS.

4.1 Data-driven UX

With the rapid development of information technology, the information obtained by UX is increasingly diversified. UX design continuously incorporates new data types based on new expert experience knowledge and applies them to the UX design process. Through big data, e-commerce data of online shopping websites are obtained. Analyzed both kinds of data by crawling the review text information and the accompanying image information of e-commerce websites, using cluster analysis and machine learning algorithms, and made visualization studies to provide references for user experience improvement and innovation. For example, Jingdong and Taobao have developed their own big data cloud platforms, which can collect users' shopping behaviours, provide actual data for user experience design and upgrade, and then provide timely data feedback for user experience design improvement and conduct user experience analysis and iterative design.

At the same time, the data will record user behaviour and user preferences and track the user's shopping process can be analyzed for diverse user experience demands after drawing a user reading experience map and completing the visualization design of specific user needs. The IDS can both track and optimize user experience and behaviour through algorithms and also build new service scenarios based on the best experience of online shopping to improve the sense of user experience by collecting critical data such as content, time, location, interaction, and transaction of user experience, and use it as a basis for user experience data resource construction.

4.2 Algorithm-driven UX

The user experience framework of online shopping can be built by customizing user needs and drawing user experience data maps through algorithm design, combined with the finishing ability of an intelligent design system. On the one hand, user experience personality and emotion optimization, for user perception characteristics and shopping preferences, intelligent generation of user-preferred interfaces, colours, fonts, and product types, etc. The generated design results are based on analyzed user data precipitation and decision-making results. On the other hand, user shopping behaviour tracking. With the assistance of an intelligent design system, users' shopping interests and preferences are analyzed, and users' shopping experience is tracked in the time dimension, emphasizing the spatial dimension. At the same time, data links are made to users' experience behaviour to create accurate recommendations and personalized and emotional interaction design visual displays for users. Finally, user content is customized and the main for the user's preferred products and text content. Following the principles and processes of algorithmic design, the user content needs to generate the recommended area independently.

In addition, the intelligent design system achieves high-speed computing, deep analysis, and instant data transmission when users shop, thus changing the user's shopping experience and providing convenient and efficient shopping services for users. With the support of machine language processing and natural language understanding, as well as information extraction, knowledge mining, search engine, and speech recognition technologies, the intelligent design system reads to bring users a multi-sensory communication experience close to human language understanding and human brain processing, realizing a truly humanized and personalized intelligent user experience service. Specifically, combined with artificial intelligence algorithms can make the user experience more personalized emotional, experience form diversification, and application scenario experience diversification based on probing users' personalized needs.

4.3 User-centered design of intelligent design system

Up to now, AI has gone through three development. With AI algorithms and continuous improvement, especially the development gained in emotional computing, AI is gradually maturing technically, and one of the key issues to be solved now is to tap the application scenarios that meet the needs of society and users. The current UCD practice has entered the third stage, focusing on the UX and innovative design of the IDS. On the one hand, the third stage marks that the intelligent

UCD practice has entered a new stage of development. On the other hand, the UX design of intelligent systems requires the enhancement of UCD methods. Finally, the human factors discipline can support the enhancement of UCD methods, and UCD methods and intelligent design are mutually integrated and developed. The innovative design of the IDS is inseparable from UX-driven innovative design and human factors discipline methodology.

At the same time, using effective UCD methods to tap into more application scenarios, the UX design of the IDS needs to enhance UCD methods. For example, AI and big data technologies are applied to model and analyze data such as real-time online scenarios and user behaviours to predict user shopping scenarios. Finally, some effective user research methods in human factors disciplines are used to mine user needs, behaviours, experiences, and application scenario models in the general socio-technical environment.

In conclusion, the future intelligent design system is inseparable from the development of UCD while cross-developing with different disciplines (shown in Figure 1), such as human factors discipline, user experience, and interaction design.

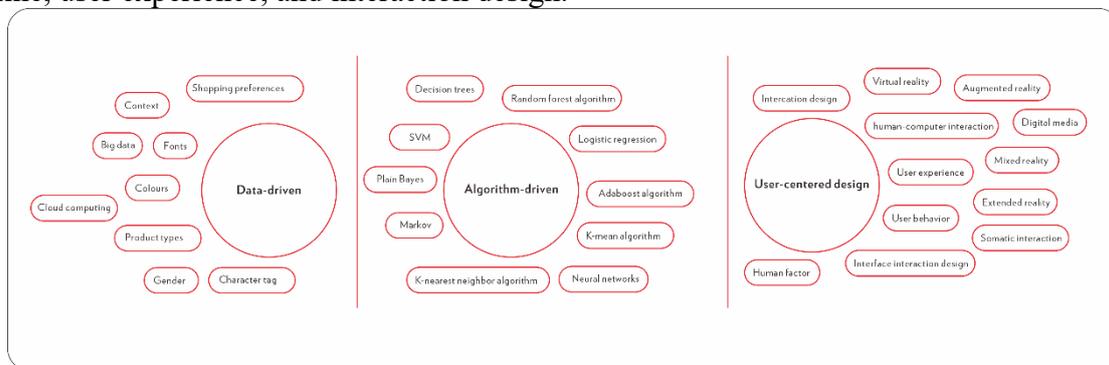


Figure 1 UX model of shopping website under the integration of the IDS (Liang 2022)

5. Conclusion

The IDS will change the user experience of shopping websites while gaining more meaningful development, especially in the level of cooperation between humans, things, and machines. Whether from emotion, technology, scenarios, and other aspects, AI's influence on integrating user experience, human-machine interaction, and interface interaction design has become a fact. Meanwhile, UX will be one of the main directions of application-level research of AI systems, and the core value of design should be to build a bridge between technology and human scenario. If the core of the AI revolution is technology, then the core value of an intelligent design system is to enable users to perceive that they need to get the desired service through a series of results that transform from technology to optimal user experience in a way that best meets expectations. This paper studies and analyzes the user experience of shopping websites from the perspective of the IDS and user experience. It summarizes the connection between the IDS and user experience, predicts the future development trend of the IDS and user experience, and points out the possible vital areas for future research.

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