Software Design Aimed at Proper Order Management in SMEs

Linett Velasquez Jimenez[1]*, Herbert Grados Espinoza[2],
Santiago Rubiños Jimenez[3], Juan Grados Gamarra[4], Claudia Marrujo-Ingunza[5]
Department of Engineering-Image Processing Research Laboratory (INTI-Lab),
Universidad de Ciencias y Humanidades (UCH), Los Olivos, Peru[1, 5]
Department of Engineering-Faculty of Industrial and Systems Engineering (FIIS),
Universidad Nacional del Callao (UNAC), Callao, Peru[2]
Department of Industrial Engineering-Faculty of Engineering and Architecture, Universidad Cesar Vallejo (UCV), Callao, Peru[3]
Department of Electrical Engineering-Faculty of Electrical and Electronic Engineering (FIEE),
Universidad Nacional del Callao (UNAC), Callao, Peru[4]

***Abstract*—The design and evaluation of an order management software oriented to SMEs in Lima is presented. Using Design Thinking, a prototype was developed focusing on Usability, Design and User Satisfaction. Through a Likert scale survey of 308 SME employees, perceptions on operational efficiency and user experience were measured. The results show high acceptance and highlight the intuitiveness of the system. However, areas such as loading speed and e-commerce functionalities require future improvements. This study establishes a framework for similar technological tools in commercial sectors.**

***Keywords*—Design thinking; SMEs; order management; software design; usability; user perception**

I. Introduction

The design of software for order management has become an essential component for the optimization of business processes of Micro and Small Enterprises (SMEs). In an environment marked by increasing competitiveness and high consumer expectations, the adoption of technological solutions becomes a fundamental part of the efficient and effective management of developing operations. The growth of e-commerce has transformed the way SMEs interact with their customers, and since the Internet has facilitated new sales opportunities for SMEs [1], a reach beyond traditional geographical boundaries is enabled. This highlights that the implementation of order management systems not only improves operational efficiency, but also contributes to greater customer satisfaction by providing real-time updates on the status of their orders [2].

In this context, efficient order management has become a key factor for the success of stores and businesses in various sectors. Small and medium-sized companies, in particular, face the challenge of managing a constant flow of orders while optimizing the user experience and maintaining customer satisfaction. To meet these challenges, the implementation of technology solutions such as order management systems offers a significant advantage, enabling stores to automate processes, improve accuracy, and reduce response times [3]. Order management systems are designed to handle a variety of tasks, from order receipt to final delivery. Some of the most important functionalities include centralized order processing that allows management from multiple channels with a reduction of errors and an improvement in processing speed; inventory control that facilitates stock tracking and prevents oversales or shortages; and real-time updates that provide constant information on order status, which contributes to an improved customer experience [4], [5].

In addition, it is proposed that future versions of the software could integrate emerging technologies such as Artificial Intelligence (IA) or Machine Learning (ML) to optimize decision making in areas such as inventory forecasting and purchase pattern analysis. Although these technologies were not included in this study, they represent an important opportunity to further improve the functionality of the system.

This article explores the features and benefits of order management software and the challenges faced by systems engineers in developing such solutions [1], and focuses on the development and evaluation of an order management software specifically designed for stores located in the busiest areas of Los Olivos, Lima. Through a sectorized approach, the software seeks to solve common management problems and facilitate the user experience, allowing businesses to improve their operational efficiency. However, the design and implementation of this type of software presents significant challenges. One of the main ones is integration with existing systems, which requires thorough analysis and careful planning by the systems engineer [1], [3].

Priority areas for improvement were also identified, such as the integration of e-commerce functionalities, which would allow SMEs to expand their digital reach and make sales effectively through online platforms. This aspect, together with the need for more intuitive interfaces and reduced loading times, is considered essential to ensure the acceptance and success of this type of technological tools.

To evaluate the effectiveness of the software, a survey has been designed based on three key dimensions: Design, Usability and User Perception. The results of this analysis will allow measuring user acceptance of the system and its impact on order management, providing valuable information for future improvements and technological adaptations [4].

This study hopes to provide not only a practical solution for local stores, but also to generate a reference framework for the development of technological tools that can be applied in other sectors with similar needs. In short, software design for ordering in SMEs is a critical area that not only improves operational efficiency, but also enhances competitiveness in a digitized market [5].

II. Literature Review

The development of order management software for SMEs has been widely researched due to its potential to improve operational efficiency and competitiveness in an increasingly digitized market. Several studies have addressed the challenges and benefits related to the implementation of these technological solutions.

The adoption of quality models in software-producing SMEs was investigated, highlighting that these companies represent 85% of the software industry. The research highlights the importance of implementing quality models to improve competitiveness and ensure high-quality products [6]. This approach is particularly relevant in the design of order management software, where accuracy and efficiency are crucial to ensure commercial success.

On the other hand, e-commerce in Peruvian SMEs was analyzed, revealing that many of these companies use digital platforms only as virtual catalogs, without taking advantage of their full potential to generate online sales. This study highlights the need to develop software that not only facilitates order management but also integrates e-commerce functionalities, allowing SMEs to make effective sales through digital channels [1].

In addition, a study on the design of software for the control of quotation processes in SMEs demonstrates how technological solutions can significantly improve operational efficiency. According to this analysis, both employees and managers recognize the importance of improving business processes through the use of software [7]. These solutions are easily adaptable to order management, optimizing business flow and minimizing operational errors.

In addition, order management systems offer multiple functionalities that are essential for SMEs. One analysis highlights that these systems not only enable centralized order processing and real-time inventory control, but also improve customer service by providing constant updates on order status [3]. This reduces processing errors, which is critical to maintaining customer satisfaction.

One of the relevant approaches in the early stages of the software development life cycle is represented in the application of Design Thinking. According to the study [8], this methodology is implemented especially in the analysis and design stages, for which it has shown high efficiency in eliciting requirements and creating architectures adapted to specific customer problems. It is also observed that its use fosters a deep understanding of the user's needs and an active collaboration within the development team, which contributes to generating innovative solutions, but with a certain degree of uncertainty.

On the other hand, [9] defines user interface design as a fundamental part of the creation of an attractive application. However, it is pointed out that the lack of attention to detail in planning and organization makes it deficient. The Design Thinking methodology is applied in this context to perform usability and user satisfaction tests using the System Usability Scale (SUS) to reduce these errors. As a result, an average value of 85.2 was obtained, which sustains that the value of the user interface design is included in the "Excellent" category.

Finally, automation is a key aspect of SME software design. A study on automation in SME software reveals that these tools enable companies to efficiently manage their day-to-day operations, such as quoting, invoicing, and inventory control. This automation not only reduces operating costs but also improves decision-making based on accurate data, which is vital for the sustainable growth of SMEs [10].

A. Theoretical Basis

1) Order management software: It is a tool that allows automation and optimization in the process of order entry, processing, and tracking. According to study [3], it contains inventory control, Customer Relationship Management (CRM), payment processing, and marketing integrations. It also improves operational efficiency, reduces response times, and minimizes errors, essential aspects to compete in an increasingly dynamic business environment. The study [7] indicates that specialized software helps SMEs in better workflow management, as it allows companies to adapt to new market demands.

2) User and customer experience: User experience is critical in the design of order management software, as an intuitive interface improves communication and streamlines transactions through automatic data storage, which increases efficiency and corporate image [7], [4]. A user-centered design benefits employees and has a positive impact on customer perception. Therefore, the design of ordering software in SMEs should consider operational functionalities with a good user experience, optimizing processes and improving customer satisfaction.

III. Methodology

Fig. 1 refers to the plan of the Design Thinking Methodology, which was used in this study to address the beginning and end of the design of a prototype aimed at improving proper order management in SMEs. It was segmented into five phases (Empathize, Define, Ideate, Prototype, and Test), in addition to detailing the tools used and the prototype design employed.

A. Design Thinking (DT)

This methodology is characterized by proposing innovative solutions through an iterative and people-centered approach. Its main objective is to generate concepts that not only solve specific problems, but also contribute to improving society. This approach has been widely recognized due to its ability to adjust creative ideas to practical needs [11], as well as to raise the expectations and level of commitment of those involved [12]. In

the business environment, Design Thinking has proven to be a key tool for identifying and solving user needs, optimizing processes and improving work environments [13]. Compared to traditional methodologies such as Agile or Waterfall, DT is particularly suitable for projects where user experience and iterative prototyping are critical, making it an ideal choice for this study.

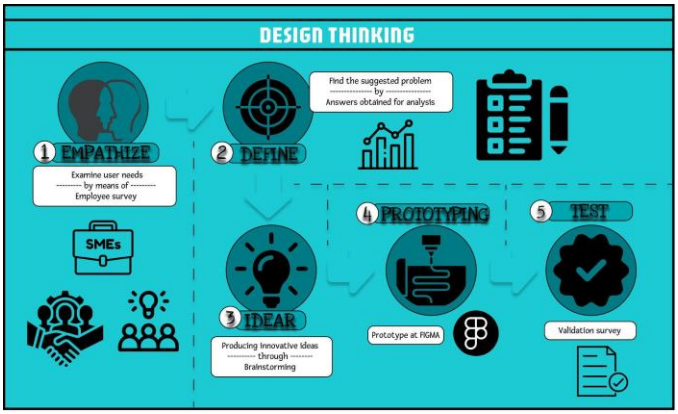

Fig. 1. Design thinking methodology.

1) Empathize: This initial stage focused on gaining a deep understanding of user needs and challenges through interviews and questionnaires with 308 SME employees. For example, the interviews revealed that simplicity in the interface was key to facilitating system adoption by less tech-savvy users. Also, the questionnaires indicated that many employees faced difficulties in managing large volumes of data, highlighting the need for specific functionalities such as advanced filters and optimized search [14].

2) Define: In this phase, the data collected were organized and analyzed using affinity maps, which allowed us to detect patterns and group the most relevant problems. For example, it was identified that unclear icons made navigation difficult in existing systems and that users required real-time information on order status. These findings guided the development of an initial software outline, prioritizing key modules such as customer, product and supplier management [15].

3) Ideate: Multiple innovative solutions were generated based on the problems detected, using techniques such as brainstorming and feasibility assessment. Among the ideas proposed, the creation of a modular system with specific functions that could be adapted to the individual needs of each business stood out. For example, an inventory module with real-time updates was included, since users highlighted the importance of avoiding oversales or shortages [16].

4) Prototype: The functional prototype was developed using the Figma tool, which allowed for the design of an intuitive interface and rapid iterations based on initial feedback. A key example was the incorporation of an interactive tutorial on the home page to help users become familiar with the main functions of the system. In addition, icons with descriptive labels and contrasting colors were implemented to improve visual clarity [17], [18].

5) Test: The prototype was evaluated by SMEs employees themselves through a structured survey that used a Likert scale to measure their perception of the Design, Usability and Overall Satisfaction. The results showed that 85% of respondents rated the intuitiveness of the design as “Strongly Agree”, while 88% rated the ease of completing tasks positively. In addition, qualitative analysis of the responses identified areas for improvement, such as the need to reduce loading times and optimize search functionality [19].

Each stage of Design Thinking not only contributed to the development of the software, but also ensured that it was aligned with the real needs and expectations of the users. Specific examples of decisions made in each phase demonstrate how this iterative, user-centered methodology enabled the development of a system that addresses critical management problems in SMEs, establishing an effective framework for future solutions. Although DT was highly effective in the ideation and prototyping stages, it is not designed for full software implementation. Future phases of the project could benefit from combining DT with other methodologies, such as Agile, to ensure smooth integration and implementation.

B. Software Evaluation Factors

1) Design: Factor that understands the requirements and develops the artifacts that define the creation of the product, also refers to the creation process that contains a reference to the requirements of the stakeholders [20].

2) Usability: Factor defined as the ability of users to understand, employ, and acquire knowledge of software in a simple way [21].

3) User perception: It is defined as the user interactions throughout the product life cycle, it is represented in values of Usability, Design, Loyalty, Quality, Interaction, Productivity, among others; which serve to improve the perception of value from a user's perspective [22].

IV. Results

This results section illustrates the stages of the Design Thinking methodology that will allow us to understand the users' problems and provide a short-term solution, as well as to understand their long-term perspectives in an already implemented software. The advantages, disadvantages and comparison of using the Design Thinking methodology are also presented.

A. Results of the Empathize Stage

During this stage, the main limitations in the use of software technologies were identified through interviews and questionnaires addressed to 308 SME employees. Table I presents the questions (Q1 to Q5) asked:

The results indicated that the priority aspects for users are the clarity and simplicity of the interface, the ease of handling large volumes of data, and the speed of tasks in the system. These findings underscore the importance of developing software that is intuitive, efficient, and accessible.

TABLE I. QUESTIONS

Questions	
ID	**Questions**
Q1	What improvements would you suggest to a software interface?
Q2	What do you look for in software when handling big data?
Q3	How do you define the speed of completion of your tasks in software?
Q4	What do you find important in software usability?
Q5	What do you consider fundamental in the functionalities of software?

B. Results of the Define Stage

Table II contains the most repeated answers in the questionnaire (R1 to R5) of the survey addressed to SME employees; there are a total of 308 answers for the analysis.

TABLE II. SME EMPLOYEE SURVEY

Responses	
ID	**Responses**
R1	Clarity and simplicity of interface
R2	Ease of handling large volumes of data
R3	Quick time to complete tasks
R4	Ease of use of software
R5	Easy access to functionalities

1) R1: The clarity and simplicity of the interface was mentioned as a key priority to ensure an efficient user experience.

2) R2: The ease of handling large volumes of data was highlighted as a necessary functionality to optimize workflow.

3) R3: Speed in completing tasks was identified as a determining factor in improving operational efficiency.

4) R4: Ease of use of the software was recognized as essential to promote acceptance among users.

5) R5: Easy access to specific functionalities was considered critical to ensure the effectiveness of the system.

C. Results of the Ideate Stage

Table III indicates the suggested solutions (S1 to S3) as a solution. An estimated score is provided for the choice of the best idea and its development is completed in the next phase.

TABLE III. SCORING IDEAS

Idea Scoring		
Solutions	**Ideas**	**Total**
S1	Creation of an order management software	60 points
S2	Create an order management application	26 points
S3	Applying Excel methods for order management	14 points

1) S1: The solution chosen was the creation of an order management software, given its high score and alignment with users' needs.

D. Results of the Prototyping Stage

For the results of the prototyping carried out with the Figma tool, the most salient functionalities that the order management software will offer in SMEs will be presented. The prototype functionalities are presented in Table IV.

TABLE IV. PROTOTYPE FUNCTIONS

Fig.	Function
2	Login, with access by credentials.
3	New Employee Module for ease of navigation.
4	New Customer Module to manage the organization's customers.
5	New Product Module to manage detailed product information.
6	New Category Module to classify products within the system.
7	New Distributor Module to manage the collaboration of distributors in the organization.
8	New Supplier Module to manage supplier transactions.
9	New Purchase Module to manage purchase orders within the organization.
10	Allows editing of purchase data in order to modify information to correct errors.

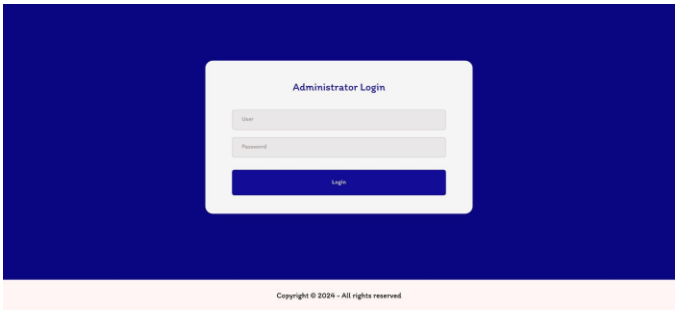

Fig. 2. Login.

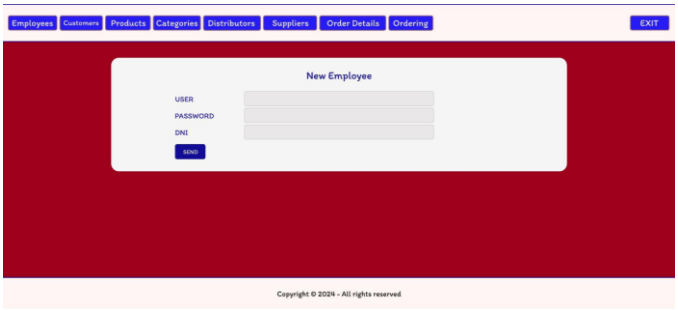

Fig. 3. New Employee.

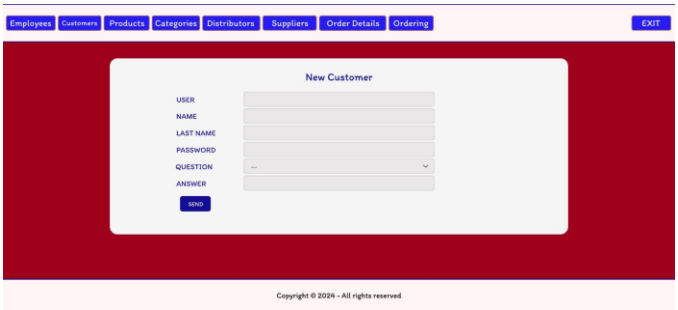

Fig. 4. New customer.

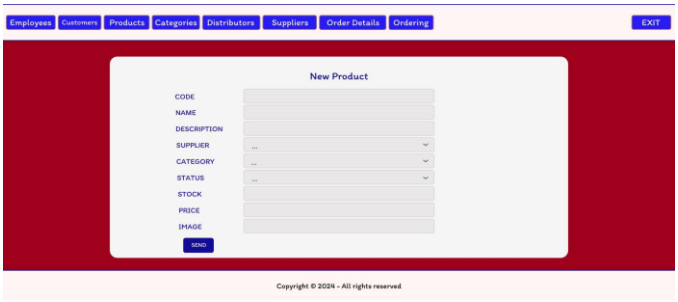

Fig. 5. New product.

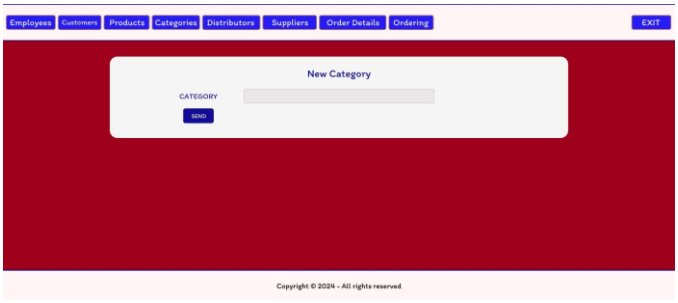

Fig. 6. New category.

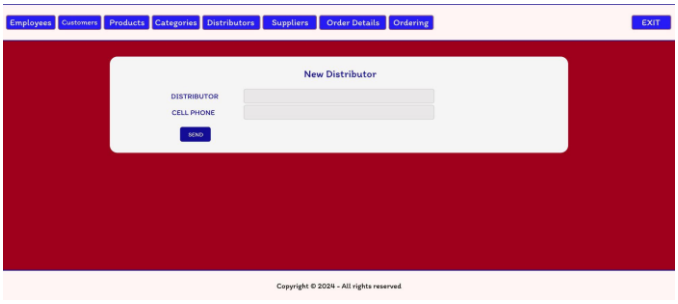

Fig. 7. New distributor.

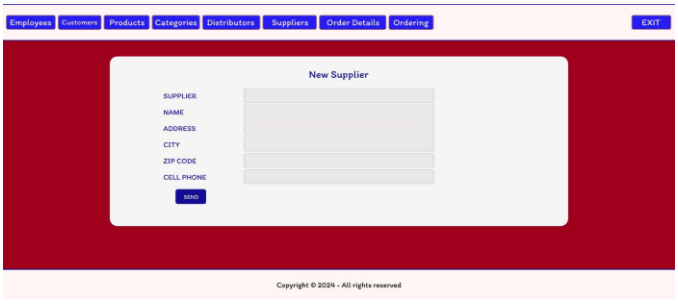

Fig. 8. New supplier.

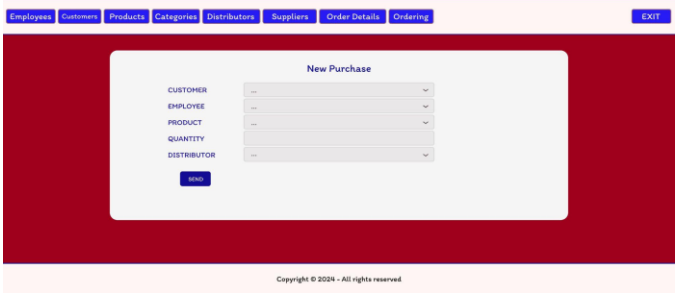

Fig. 9. New purchase.

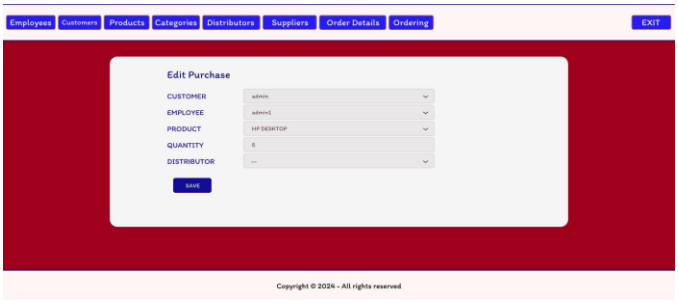

Fig. 10. Purchase edition.

E. Results of the Testing Stage

To develop this last phase of the Design Thinking methodology, it is required to validate that our order management prototype is suitable for the user and their needs. When surveying the 308 SME workers, three software evaluation factors were taken into account: Design, Usability, and User Perception. The Google Forms questionnaire tool was used, through 12 closed questions with a 4-point Likert scale (1= I Totally Agree and 4= I Totally Disagree), as well as an open question for possible improvements in an already implemented software. The questions used are presented in Table V.

TABLE V. INSTRUMENT

Q	Design
Q1	Do you find the login interface intuitive?
Q2	Do you consider that the design of the employee interface is clear and easy to understand?
Q3	Do you consider that the design of the customer management interface facilitates the handling of these data?
Q4	Is the organization of categories and sections consistent and easy to understand?
Usability	
Q5	Do you find it easy to perform tasks such as: creating or editing an order in the system?
Q6	Is the process of registering new employees, customers, or products easy?
Q7	Do you consider that the steps to edit information in the system are clear?
Q8	Do you consider that the average time to complete a task in the system is relatively short?
User Perception	
Q9	Do you perceive the overall ease of use of the order management system?
Q10	Would you rate the efficiency of the system in managing products and categories as adequate?
Q11	Does the system make it easy to create and edit distributors and suppliers?
Q12	Do you consider the different functionalities of the system accessible and understandable?

The design of the system was highly rated, with 85% of respondents rating the intuitiveness of the interface as “Strongly Agree”. In terms of usability, 88% highlighted the ease of performing tasks, highlighting its efficient functionality. In addition, user perception reflected a positive impact, with 82% indicating that the system significantly improves the overall experience.

On the other hand, Fig. 11, 12, 13, and 14 represent the results obtained according to the form applied in the SME sector to 308 people involved in sales management.

Fig. 11 presents the responses to the closed-ended questions asked of SME workers.

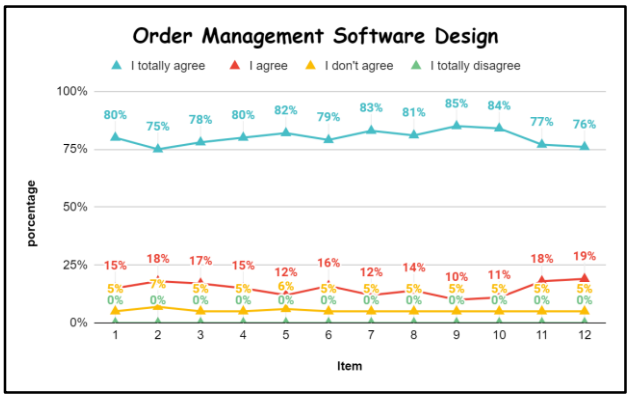

Fig. 11. Form results by ítem.

Fig. 11 shows the results of a survey on the design of order management software. The vertical axis shows the percentage of responses, while the horizontal axis shows the different items evaluated from 1 to 12. The response options are categorized into four levels: "I Agree" (represented in blue), where the majority of respondents are, maintaining a high trend in almost all items, with percentages ranging from 75% to 85%, indicating a strong overall approval towards the software design; 'I Agree' (represented in red), with a relatively low but constant percentage, between 12% and 19%, which, although not the dominant response, still reflects a considerable level of agreement in each item; "I Don't Agree" (represented in yellow), whose percentages remain between 5% and 7%, suggesting that a small portion of respondents do not agree with certain aspects of the design; and 'I Totally Disagree' (represented in green), which shows no significant presence, indicating that almost no respondents strongly disagree with the design of the software. Overall, the graph suggests a positive perception towards the design of the order management software, with high levels of acceptance and satisfaction among users. The levels of "I Totally Agree" and "I Agree" are predominant in almost all items, reflecting a favorable reception.

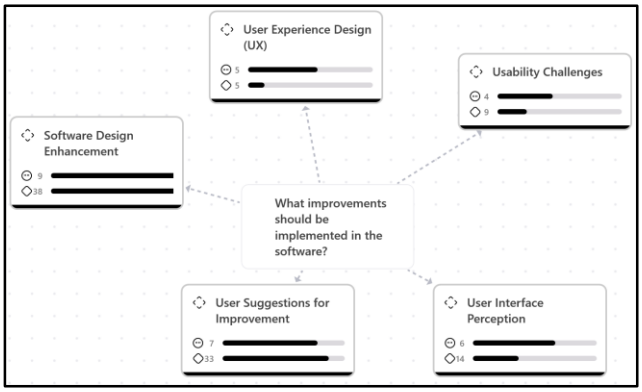

Fig. 12. Areas of software improvement.

Likewise, Fig. 12 presents the areas of improvement analyzed according to the open question asked in the survey, which was analyzed in the ATLAS.ti software to obtain the most repetitive nodes and points concerning possible improvements in an already implemented software.

Fig. 12 represents a concept map that highlights the key areas where users suggest improvements to an already implemented software. Themes include user experience (UX) design as a factor in improving efficiency and processes [23]; however, having a straight-line direction based on design is debatable due to a lack of concrete guidelines [24]. Usability challenges are also presented [25], considered strongly integral attributes [26], and it also points to interface perception as a decisive element for a consistent and sustainable experience [27], [28].

On the other hand, general suggestions for improvement are presented, such as better performance [29] with higher flexibility requirements [30]. Also, software design improvements from source code [31] are raised, this in order to increase software efficiency [32]. Each node shows the number of related comments and mentions, suggesting the priority areas to optimize the application.

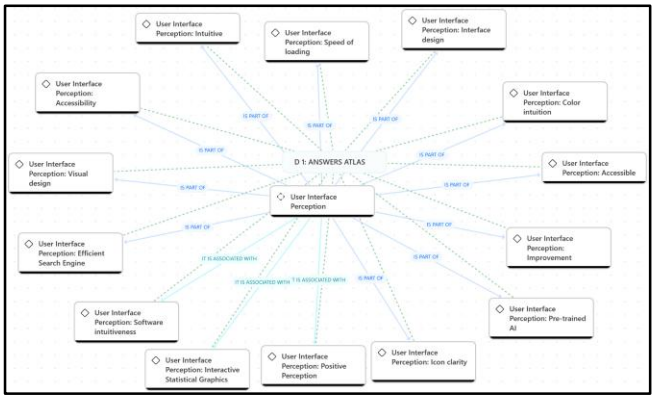

Fig. 13. Improvements in user interface perception.

Fig. 13 shows the different elements suggested by users about the perception of a software interface. Key elements in software use were highlighted, such as intuitiveness in user interaction [33], loading speed for a smooth experience [34], interface design for a visual representation of data [35], color intuitiveness to optimize task performance [36], accessibility to promote access inclusion and accessible product management [37], [38]. On the other hand, the overall positive perception of users is based on practical improvements [39], which are distributed in relevant elements such as the clarity of icons to capture users' attention [40], the search engine for data filtering [41], and in interactive statistical graphics for reporting [42]. Each of these elements is associated with the user experience and the diagram indicates how each factor is part of the user's overall perception of the interface.

Fig. 14 shows the main usability challenges that users have suggested in relation to an implemented software. Among them are noted suggestions related to accessibility [37], slow loading speed [34], lack of clarity in icons [40], and usability factors that improve system performance for the user [43], [44], [45]. In addition, they point to the lack of features as an indication of dissatisfaction [46], the challenge of adaptation with respect to

responsive design, which is a suggested element to increase visibility [47] and the importance of optimizing real-time analytics for effective prediction [48]. This indicates areas where an implemented software needs adjustments to improve the user experience.

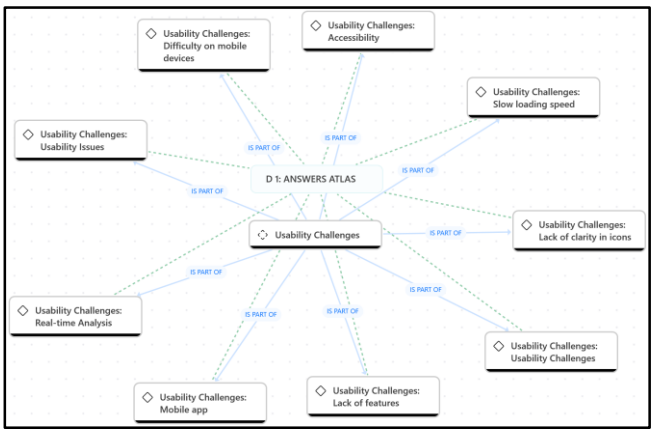

Fig. 14. Improvements in usability challenges.

F. About the Methodology

1) Advantages: The Design Thinking methodology was used to generate new ideas that respond to the needs and requirements of the users. This made it easier for the work to be active to provide new proposals to society and optimize the process of proper management.

2) Disadvantages: The disadvantages of this methodology is its focus on the prototyping of innovative ideas and not on the implementation of the software. In this context, it should be considered that this methodology can be complemented with another one for a future implementation phase.

3) Comparison: The DT methodology allowed the streamlining of the process of analysis and the generation of innovative ideas aimed at prototyping. In comparison with other methodologies focused on software development, this one includes the proposal of new plans that contribute to society.

V. Discussion

The findings of this study confirm and extend the existing knowledge on the positive impact of order management systems in SMEs, as highlighted by previous studies that emphasize the importance of accuracy and efficiency in software design to optimize operational processes and strengthen business competitiveness [6]. In this sense, the results obtained during the stages of the Design Thinking methodology reinforce the relevance of understanding users' needs in depth in order to design solutions that not only solve current problems, but also anticipate future needs.

First, the iterative and user-centered approach of the Design Thinking methodology was crucial to identify and solve SME needs. During the Empathize stage, priorities such as interface clarity and simplicity, speed of tasks and the ability to handle large volumes of data were identified. This underscores the importance of a design that combines efficiency and accessibility, aligning with research highlighting how intuitive design and high usability can minimize errors and increase technology adoption in sectors traditionally resistant to change [8].

In addition, the Ideate stage enabled the selection of the most appropriate solution through a detailed feasibility and impact analysis. Similarly, the Prototyping stage, carried out in Figma, facilitated the creation of a functional interface that was subsequently validated in the testing stage. It is worth noting that the use of surveys and Likert scales to evaluate Design, Usability and User Perception factors yielded favorable results, with high levels of approval reflected in Fig. 11, 12, 13 and 14. This evidences the effectiveness of the methodology to integrate relevant functionalities from the early stages of development, addressing a combined deficiency reported in previous studies [1].

However, it is important to recognize that, despite the high acceptance of the software, key areas for future improvements are identified. Among them, the integration of functionalities, the optimization of loading times and the improvement of responsive design are relevant challenges. In this context, user suggestions, analyzed in Fig. 12 and Fig. 14, revealed that aspects such as color intuitiveness, icon clarity and accessibility are critical elements to improve user experience.

On the other hand, the incorporation of emerging technologies such as Artificial Intelligence (IA) and Machine Learning (ML) emerge as a strategic opportunity to enhance the analytical capabilities of the system. These technologies could provide advanced functionalities, such as sales trend prediction or experience personalization, which are consistent with recent studies demonstrating their positive impact on business applications [12], [13].

Finally, this study reaffirms the value of a user-centered approach and the application of methodologies such as Design Thinking to develop technological solutions tailored to the specific needs of SMEs. The results obtained highlight the effectiveness of intuitive design and software functionality in improving operational efficiency and meeting user expectations. However, a limitation of Design Thinking is its focus on prototyping, which leaves the implementation of the software as a challenge for future stages. Given this, the importance of complementing with other methodologies to comprehensively address development and implementation is stressed.

In conclusion, this study not only validates the effectiveness of an iterative approach to software design, but also points the way for future iterations that include technological and functional improvements. Ultimately, these actions will contribute to optimizing the user experience and increasing the impact of software in the SME environment.

VI. Conclusions

The implementation of the Design Thinking approach allowed the development of an order management software tailored to the needs of SMEs in Los Olivos, Lima. This iterative and user-centered method was essential to address key issues such as simplicity in the interface and efficiency in data management, thus achieving a system that was highly accepted by users. Indicators such as design intuitiveness (85%) and ease of task completion (88%) reflect the effectiveness of the approach, while the overall improvement in user experience

(82%) underscores the software's positive impact on operational optimization and employee satisfaction.

Despite the progress made, key areas for future improvements were identified, such as the integration of functionalities and the optimization of loading times, which could strengthen the competitiveness of SMEs. In addition, the incorporation of emerging technologies such as IA and ML represent a strategic opportunity to enrich the system with analytical and predictive capabilities, making it possible to forecast sales trends and personalize experiences. These enhancements promise to consolidate the role of software as a transformative tool in the business context.

Although the study showed encouraging results, it also highlighted certain limitations, such as the challenge of implementing the system on a larger scale and the need to evaluate its long-term impact. It is recommended to combine Design Thinking with methodologies such as Agile to strengthen future development and integration phases, and to prioritize the inclusion of advanced technologies in future iterations. Ultimately, this work not only provides specific solutions for SMEs, but also lays the groundwork for the design of sustainable technological tools, highlighting the role of innovation as a driver of competitiveness in a constantly evolving digital marketplace.

REFERENCES

[1] L. H. Carbajal, Los factores a considerar para la venta en sitios web de Mypes del sector textil y Confecciones. Bachelor's Thesis, Faculty of Management and Senior Management, Pontificia Universidad Católica del Perú, 2023.

[2] Compara Software, “Software de Gestión de Pedidos en Perú,” 2024.

[3] Capterra, “Sistemas de gestión de pedidos,” 2024.

[4] HubSpot, “22 software gratis para pequeñas empresas en 2024,” 2024.

[5] Universidad Peruana de Ciencias Aplicadas (UPC), “Ingeniería de Sistemas de Información,” 2024.

[6] M. E. Amable-Ciudad and R. Millones-Rivalles, “Uso de modelos de calidad en las mypes productoras de software de Lima,” Ingeniería Industrial, vol. 37, no. 037, pp. 81-99, 2019. doi: 10.26439/ing.ind2019.n037.4543.

[7] L. O. Albarracín, L. J. Molina, E. J. Jalón, and C. M. Marín, “Diseño de software para control del proceso de cotizaciones en Pyme del cantón La Maná,” Revista Estudios del Desarrollo Social: Cuba y América Latina, vol. 10, no. 1, 2022.

[8] V. Cahui, D. Quispe, A. Condori, and J. Chapi, “Case Studies of Design Thinking in the Analysis and Design stages of Software Development,” Innovation and Software, vol. 3, no. 1, pp. 17-29, 2022. doi: 10.48168/innosoft.s8.a50.

[9] F. Fajri, F. Rizal, M. Yaqin, and Z. Purwanto, “Analysis And Design of Mobile Applications For Make-Up Artist Services (Halomua) With The Design Thinking Framework,” Sinkron: Jurnal Dan Penelitian Teknik Informatika, vol. 7, no. 3, pp. 1400-1408, 2023. doi: 10.33395/sinkron.v8i3.12483.

[10] SICO Pequeños Negocios, “Software para Pymes y Emprendedores,” 2024.

[11] B. Ku and E. Lupton, Health design thinking: creating products and services for better health. MIT Press, 2022.

[12] G. Wang, “Digital reframing: The design thinking of redesigning traditional products into innovative digital products,” Journal of Product Innovation Management, vol. 39, no. 1, pp. 95–118, 2022. doi: 10.1111/jpim.12605.

[13] S. Magistretti, C. Dell’Era, R. Verganti, and M. Bianchi, “The contribution of design thinking to the r of r&d in technological innovation,” R&D Management, vol. 52, no. 1, pp. 108–125, 2022. doi: 10.1111/radm.12478.

[14] J. McLaughlin, E. Chen, D. Lake, W. Guo, E. Skywark, A. Chernik, and T. Liu, “Design thinking teaching and learning in higher education: Experiences across four universities,” Plos One, vol. 17, no. 3, p. e0265902, 2022. doi: 10.1371/journal.pone.0265902.

[15] C. Pham, S. Magistretti, and C. Dell’Era, “The role of design thinking in big data innovations,” Innovation, vol. 24, no. 2, pp. 290–314, 2022.

[16] B. Matthews, S. Doherty, P. Worthy, and J. Reid, “Design thinking, wicked problems and institutioning change: a case study,” CoDesign, pp. 1–17, 2022. doi: 10.1080/15710882.2022.2034885.

[17] J. Vrana and R. Singh, “Nde 4.0—A Design Thinking Perspective,” Journal of Nondestructive Evaluation, vol. 40, no. 1, pp. 1–24, 2021. doi: 10.1007/s10921-020-00735-9.

[18] A. Mandani, A. Bakti, and A. Info, “UI/UX Design Of Sales Mobile Application On Up Store Using Figma,” JSAI (Journal Scientific and Applied Informatics), vol. 6, no. 3, pp. 462–468, 2023. doi: 10.36085/jsai.v6i3.5717.

[19] L. Vendraminelli, L. Macchion, A. Nosella, and A. Vinelli, “Design thinking: strategy for digital transformation,” Journal of Business Strategy, vol. 44, no. 4, pp. 200–210, 2022. doi: 10.1108/JBS-01-2022-0009.

[20] I. Ozkaya, “Building Blocks of Software Design,” IEEE Software, vol. 37, no. 2, pp. 3–5, Mar.-Apr. 2020. doi: 10.1109/MS.2019.2959049.

[21] A. Almazroi, “A Systematic Mapping Study of Software Usability Studies,” International Journal of Advanced Computer Science and Applications (IJACSA), vol. 12, no. 9, 2021. doi: 10.14569/IJACSA.2021.0120927.

[22] J. Idogawa, F. Bizarrias, C. Martnes, J. Contador, and W. Satyro, “User experience: the factors to improve the perception of value in software projects,” International Journal of Scientific Management and Tourism, vol. 9, no. 6, pp. 3247–3277, 2023. doi: 10.55905/ijsmtv9n6-002.

[23] J. Wang, Z. Xu, X. Wang, and J. Lu, “A Comparative Research on Usability and User Experience of User Interface Design Software,” International Journal of Advanced Computer Science and Applications (IJACSA), vol. 13, no. 8, 2022. doi: 10.14569/IJACSA.2022.0130804.

[24] A. Berni, Y. Borgianni, D. Basso, and C. Carbon, “Fundamentals and issues of user experience in the process of designing consumer products,” Design Science, vol. 9, 2023. doi: 10.1017/dsj.2023.8.

[25] A. Nemeth and A. Bekmukhambetova, “Achieving Usability: Looking for Connections between User-Centred Design Practices and Resultant Usability Metrics in Agile Software Development,” Periodica Polytechnica Social and Management Sciences, vol. 31, no. 2, pp. 135–143, 2023. doi: 10.3311/PPso.20512.

[26] Q. Ain, T. Rana, and Aamana, “A Study on Identifying, Categorizing and Reporting Usability Bugs and Challenges,” 2023 International Conference on Communication Technologies (ComTech), Rawalpindi, Pakistan, 2023, pp. 53–68. doi: 10.1109/ComTech57708.2023.10165169.

[27] W. Li, Y. Zhou, S. Luo, and Y. Dong, “Design Factors to Improve the Consistency and Sustainable User Experience of Responsive Interface Design,” Sustainability, vol. 14, no. 15, p. 9131, 2022. doi: 10.3390/su14159131.

[28] G. Li, “Visual Design of Human-Computer Interaction Software Interface Information Based on Human Factors Engineering,” 2023 4th International Conference for Emerging Technology (INCET), Belgaum, India, 2023, pp. 1–5. doi: 10.1109/INCET57972.2023.10170124.

[29] A. Blot and J. Petke, “MAGPIE: Machine Automated General Performance Improvement via Evolution of Software,” ArXiv, abs/2208.02811, 2022. doi: 10.48550/arXiv.2208.02811.

[30] V. Lakhai, O. Kuzmych, and M. Seniv, “An improved approach to the development of software with increased requirements for flexibility and reliability in terms of creating small and medium-sized projects,” 2022 IEEE 17th International Conference on Computer Sciences and Information Technologies (CSIT), Lviv, Ukraine, 2022, pp. 474–477. doi: 10.1109/CSIT56902.2022.10000787.

[31] Z. Tao, X. Sun, Z. Zheng, and G. Li, “Análisis inteligente de datos de software: investigación y aplicaciones,” Frontiers of Information Technology & Electronic Engineering, vol. 23, pp. 661–663, 2022. doi: 10.1631/FITEE.2230000.

[32] N. Luo and Y. Xiong, "Enhanced Software Design for Boosted Continuous Software Delivery," International Journal of Software Engineering & Applications, vol. 13, no. 2, pp. 23–31, 2022. doi: 10.5121/ijsea.2022.13202.

[33] J. P. Göpfert, U. Kuhl, L. Hindemith, H. Wersing, and B. Hammer, "Intuitiveness in Active Teaching," IEEE Transactions on Human-Machine Systems, vol. 52, no. 3, pp. 458–467, 2022. doi: 10.1109/THMS.2021.3121666.

[34] J. Pibernik, J. Dolić, L. Mandić, and V. Kovač, "Mobile-Application Loading-Animation Design and Implementation Optimization," Applied Sciences, vol. 13, no. 2, p. 865, 2023. doi: 10.3390/app13020865.

[35] B. Aslan and F. Aslan, "Examining the User Interface Development Stage in the Software Development Process," European Journal of Science and Technology, no. 35, pp. 408–416, 2022. doi: 10.31590/ejosat.1055996.

[36] S. Treneska, E. Zdravevski, I. M. Pires, P. Lameski, and S. Gievska, "GAN-Based Image Colorization for Self-Supervised Visual Feature Learning," Sensors, vol. 22, no. 4, p. 1599, 2022. doi: 10.3390/s22041599.

[37] W. Shi, H. Moses, Q. Yu, S. Malachowsky, and D. Krutz, "ALL: Supporting Experiential Accessibility Education and Inclusive Software Development," ACM Transactions on Software Engineering and Methodology, vol. 33, no. 2, pp. 1–30, 2023. doi: 10.1145/3625292.

[38] C. Furukawa, M. Soares, M. Cagnin, and D. Paiva, "Support for Accessible Software Coding: Results of a Rapid Literature Review," CLEI Electronic Journal, vol. 25, no. 3, pp. 1–13, 2023. doi: 10.19153/cleiej.25.3.1.

[39] E. Kühlmann, S. Hamer, and C. Quesada-López, "Software Visualization using the City Metaphor: Students' Perceptions and Experiences," 2023 XLIX Latin American Computer Conference (CLEI), La Paz, Bolivia, pp. 1–10, 2023. doi: 10.1109/CLEI60451.2023.10346099.

[40] T. Korpilahti and M. Massodian, "Guidelines for the Visual Design of Mobile Application Icons. An Experiential Case Study," IxD&A, vol. 54, pp. 241–276, 2022. doi: 10.55612/s-5002-054-010.

[41] C. Meng et al., "Quasi Real-Time Distributed Search Engine Based on Massive Operation and Maintenance Data," 2023 Asia-Europe Conference on Electronics, Data Processing and Informatics (ACEDPI), Prague, Czech Republic, pp. 300–304, 2023. doi: 10.1109/ACEDPI58926.2023.00065.

[42] D. D. Subramaniam and S. C. Johnson Lim, "An Interactive Visualization Web Application for Industrial-Focused Statistical Process Control Analysis," Journal of Science and Technology, vol. 14, no. 2, pp. 20–30, 2022. doi: 10.30880/jst.2022.14.02.003.

[43] J. M. Ferreira, F. D. Rodríguez, A. Santos, O. Dieste, S. T. Acuña, and N. Juristo, "Impact of Usability Mechanisms: A Family of Experiments on Efficiency, Effectiveness and User Satisfaction," IEEE Transactions on Software Engineering, vol. 49, no. 1, pp. 251–267, 1 Jan. 2023. doi: 10.1109/TSE.2022.3149586.

[44] H. Bayomi, N. A. Sayed, H. Hassan, and K. Wassif, "Application-based Usability Evaluation Metrics," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 13, no. 7, 2022. doi: 10.14569/IJACSA.2022.0130712.

[45] T. Issa and P. Isaias, "Usability and Human Computer Interaction (HCI)," in Sustainable Design, Springer, London, 2015. doi: 10.1007/978-1-4471-6753-2_2.

[46] A. Ali, I. Khalil, I. Ahmad, I. Parveen, and U. K. Uz Zaman, "Role of Non-functional Requirements in projects' success," 2022 2nd International Conference on Digital Futures and Transformative Technologies (ICoDT2), Rawalpindi, Pakistan, pp. 1–7, 2022. doi: 10.1109/ICoDT255437.2022.9787463.

[47] Y. Chen, S. Huang, Y. Chien, and I. Hsiao, "Quality Assessment of Web and APP Design Patterns," International Journal of Knowledge Engineering, vol. 9, no. 1, pp. 14–20, 2023. doi: 10.18178/ijke.2023.9.1.139.

[48] X. Hu, "Data Assimilation For Simulation-Based Real-Time Prediction/Analysis," 2022 Annual Modeling and Simulation Conference (ANNSIM), San Diego, CA, USA, pp. 404–415, 2022. doi: 10.23919/ANNSIM55834.2022.9859329.