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Cognitive Aspects of UX in Information Search: Evidence from Young Users of Regional Financial Institutions

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Abstract:

Purpose: *The study takes a cognitive perspective to analyze how interface design affects young users' information processing, navigation strategies, and decisions in digital environments.*
Design/Methodology/Approach: *Eye-tracking and interviews reveal that intuitive navigation and clear cFocusing on cooperative bank websites, it investigates how UX elements influence the efficiency of information retrieval and user behavior. ontent structure reduce cognitive effort and improve browsing performance.*
Findings: *However, young users often navigate in a fragmented, non-linear way, preferring simple, visually engaging interfaces over traditional layouts. The findings suggest that standard UX approaches may not fit youth expectations.*
Practical implications: *The study highlights the need for design solutions aligned with users' cognitive strategies to support more effective marketing communication by regional financial institutions in particular cooperative banks.*
Originality/Value: *Cognitive science is fundamental to User Experience (UX) design as it provides insights into how humans perceive, process, and respond to information, enabling designers to create intuitive, engaging, and user-friendly websites, interfaces, and other digital products.*

Keywords: *Cognitive strategies, User Experience (UX), eye tracking, consumer behaviour, regional financial institutions, cooperative banks.*

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1. Introduction

User experience (UX) in digital financial services is increasingly viewed not only as a matter of design aesthetics or technical functionality, but as a process deeply intertwined with cognitive mechanisms of information processing. As Cordeschi (2002) noted, understanding human interaction with artificial systems requires insight into how cognitive processes can be modeled and supported by technology.

In this perspective, Cañas (2008) emphasized that effective interface design must consider the interplay between human cognition and technological solutions – a key concept of cognitive ergonomics. An interface does not operate independently of the user's cognitive strategies; rather, it can facilitate or hinder information search and decision-making.

Furthermore, according to Marchitto and Cañas (2011), UX research should precede product development and guide innovation by analyzing user behavior and cognitive patterns in specific contexts. This aligns with cognitive load theory (Sweller, 2011) and dual-process theory (Krämer and Kahneman, 2011), which explain how information overload or poor design can negatively impact user performance and decision-making.

For young users often referred to as digital natives (Prensky, 2001), information-seeking behavior is characterized by intuitive, fragmented navigation strategies and a preference for interactive, visually engaging content. As Norman (2013) suggests, understanding and designing with these cognitive patterns in mind is crucial to improving usability and communication effectiveness. Therefore, aligning UX design with cognitive principles contributes not only to improving service accessibility but also to strengthening the role of regional financial institutions in engaging younger audiences in the digital environment.

Regional financial institutions are seen as tools for implementing regional policy. These include banks that are well-rooted in the region, such as cooperative banks (Korenik and Ignor, 2024). From a global perspective, a regional financial institution operates within a specific geographic area, often within a group of countries or a region, promoting economic development, financial stability, and international cooperation in that region (Rana and Pacheco Pardo, 2018). At the national level, a regional bank is an institution that typically operates in a single region (province) or several neighboring regions (Maingi, 2024), acquiring customer information through formal and informal channels (Carnevali, 1996).

Unlike large national or international banks, regional banks focus their operations on the needs of local communities and businesses, complementing national, global institutions and promoting financial inclusion in the region (Machinea, 2007). Therefore, from the perspective of external customers, the main customers are companies and local residents, largely older individuals who know the bank and have trusted it for a long time. However, the institution does not exclusively target this group, as young people also constitute a valuable segment for them.

Therefore, we decided to assess the extent to which the online information messages they create are appropriate for this target group, for whom the digital world is largely associated with social media. It's important to remember that the way young people browse and consume information through these channels is significantly different from how financial institutions currently design it (Miluniec and Miciuła, 2024). This is why the conducted analysis plays such an important role in the in-depth understanding of cognitive processes.

2. Research Methodology

Modern younger generations predominantly acquire information through digital sources, particularly those with simplified and intuitive user interfaces, such as social media platforms or mobile applications.

Therefore, it can be assumed that their expectations regarding User Experience focus on delivering a high level of aesthetics, clarity, and interface functionality, which directly influences the speed and effectiveness of the information-seeking process. Here are the results of using eye-tracking technology in a user experience study focused on the information-seeking behaviour of young customers of a regional bank.

A total research sample counted 48 participants (25 males and 21 females), including high school students and university students aged 18 to 24. The study was approved by the local bioethics committee - Approval of the Bioethics Committee at the Regional Medical Chamber (OIL) in Szczecin for a period of 5 years - Resolution No. 14/2022 of 8 December 2022.

It was conducted in two phases: the first part was an eye-tracking study (the Tobii Pro Fusion 60 Hz eye tracker was used to record eye movements), and the second part was based on direct interviews with the participants.

The aim of the study was to determine how User Experience elements affect the effectiveness and speed of action of young bank customers while seeking information on a website. The main hypothesis tested in this study is that a properly designed UX increases the efficiency and speed of users' information retrieval. Auxiliary hypotheses:

Users of banking websites with intuitive navigation are more effective in finding the information they are looking for. A well-structured design of a banking website positively influences the speed of user interaction. Techniques that enhance text readability and scannability affect how the message is received and how the content is read.

Eye tracking is a method of study allowing for the verification of how humans perceive objects in front of them (e.g., Internet websites on the computer screen) (Duchowski, 2007). This method consists of tracking the movement of eyeballs with the help of a specially designed video camera, which is capable of registering even the most minute eye movements.

Thanks to this method, we can learn what people look at, which elements are perceived by them, and which are omitted. It allows to check whether a particular graphic design, e.g., for an Internet website or an advertisement, meets its marketing objectives – i.e., whether recipients see those elements of the message which are crucial to the seller.

This method proves especially valuable in the process of website design and analysis of cognitive processes. This technology is particularly beneficial when analyzing the behavior of online store customers. Eye tracking enables website creators to gain insights into how users view and interpret the pages they design (Nielsen and Pernice, 2010).

It allows for measuring how users' gaze moves across the site while attempting to complete specific tasks, which areas of the page attract their attention for longer periods, how they respond to advertisements (and whether they notice them at all), whether the navigation menu is intuitive for first-time visitors, and how they engage with various types of content – including text, images, videos, and interactive elements such as flash animations.

Most eye-tracking data is interpreted in relation to the execution of specific tasks, such as reading or searching for information. The analysis is based on recorded elements such as:

- fixations - the duration for which the eye remains focused on a single point or object,
- saccades - rapid eye movements between two fixation points,
- residence time - the amount of time spent in a designated area of interest, measured from the moment the decision is made to shift gaze there,
- average and total viewing time - indicating how long participants look at specific parts of the tested material,
- individual image components - depending on the nature and format of the material being studied.

In the subject literature, various models can be found that describe how people seek information. Each model emphasizes different aspects of the information-seeking process, ranging from psychological motivations and cognitive theories (Wilson, 1997; Belkin, 1990; Miluniec and Miciuła, 2019) to efficiency analyses such as Information Foraging Theory (Pirolli, 2007) and even specific steps in the search process (Ellis, 1989; Kuhlthau, 2004). In practice, a hybrid approach is often observed. Users adopt different strategies depending on the context.

When it comes to analyzing models used in UX eye-tracking research, authors also identify com-monalities. Among the models related to analyzing web content are the F-Shaped Pattern, Z-Shaped Pattern, and Golden Triangle. These models describe common webpage scanning patterns and reveal user behaviors in processing information. All three models address how people process content on websites, with the primary difference being the usage context and the layout of the content that best suits each scanning pattern. Table 1 briefly outlines how each model relates to how people view content, make decisions, and seek information.

***Table 1**. Eye-tracking models describing how users scan web pages and make decisions.*

Criterion	**F-Shaped Pattern (F-Pattern)**	**Z-Shaped Pattern (Z-Pattern)**	**Golden Triangle**
Type of website	Text-heavy pages, articles, blogs, search results	Simple visual pages (landing pages, company pages, advertisements)	Search results pages (e.g., Google,e-commerce)
Scanning direction	Left to right, mainly in an "F" shape – headings and beginnings of paragraphs	Z-shaped scanning – users move gaze between key areas	Focus on top-left corner – users check top results, rarely look further
User behavior	Scans headlines, scrolls quickly, skips long paragraphs	Follows logical flow – key points placed along the "Z" path	Primarily views top results – higher and more to the left = greater attention
The most important area on the page	Top-left corner, first lines of text	Top bar and points where the "Z" trajectory crosses the CTA	Top-left corner – first search results positions

***Source:** Own elaboration based on Nielsen and Pernice, (2010), Garrett, (2010.*

Financial institutions, public offices, universities, and government organizations often have websites rich in informational content, yet they must remain intuitive and accessible. In such cases, the F-Shaped (F-Pattern) layout tends to work best. This model assumes that users primarily scan headings and the first paragraphs in search of key information.

3. Results of Eye Tracking Study and Individual in-Depth Interviews (IDI)

3.1 Results of Eye Tracking Study

In the context of the conducted research, an analysis was carried out to verify how participants behaved when they first interacted with the tested website, with one of their tasks being to find an offer suitable for themselves. As part of the usability study of the website of the Cooperative Bank, high school and university students participating in the research were asked to complete three tasks (48 individuals out of 50 participants, 2 people did not pass the calibration process correctly). Before this, they were allowed to freely explore the bank's website (starting from the homepage).

Participants were encouraged to click on any options that interested them and to visit subpages of their choice. This stage of the eye-tracking experiment, lasting one and a half minute, had three main objectives: (1) to help participants get comfortable with the unusual situation (taking part in a study conducted by individuals from outside their school) and adapt to the specific conditions of the experiment; (2) to familiarize them with the content of the website (reflecting the nature of a financial institution); and (3) to identify which subpages sparked interest among potential bank customers.

During the free exploration of the site, no clear navigation pattern was observed on the homepage. Participants viewed the elements on the page in highly varied ways – from methodically scanning them left to right, top to bottom, to chaotic eye movements in all directions (Figure 1). For those who browsed in a less structured way, a common behavior was returning to elements they had previously looked at. However, when assigned a specific, clearly defined task, their navigation became more systematic (as discussed later in the article).

The dominant element on the bank's homepage was a promotional banner consisting of thirteen different advertising messages, rotating every five seconds (with an additional option to click and view the next image). All participants noticed and looked at the banner, but only at the beginning of their visit and only at the currently displayed content. Only one-fourth of the high school teenagers and university students (seven individuals) actively clicked on the banner to view more slides. Later, as they explored other sections of the website and performed further tasks, they no longer paid attention to it.

***Figure 1**. Sample scan paths on the homepage*

***Source:** Own research.*

Starting from the homepage, the high school and university students visited a total of 50 different subpages of the website of the Cooperative Bank. The highest number of visits was recorded on subpages containing information about various payment cards (Table 2).

Participants were interested in both debit and credit cards. In all cases, these were short visits. The students browsed these pages quickly and did not spend much time reading the content. This suggests that information intended for young users must be brief and easy to remember.

The students did not analyze the text in detail – if a page did not catch their interest within the first few seconds, they left it. Within the one-and-a-half-minute timeframe, they were able to visit several subpages, spending only a few to several seconds on each (number of visited subpages ranged from 0, for participants who did not leave the homepage, to 8, with a mode of 5).

***Table 2**. Most frequently visited subpages of the bank's website by study participants.*

No.	Website name	Website address	Number of visitors	Avg. visit duration	Min visit duration	Max visit duration
1	Cards for individuals	https://.../category/karty-dla-osob-fizycznych/	5	0:11:00	0:06:00	0:13:00
2	Debit Cards	https://.../category/karty-dla-osob-fizycznych/karty-debetowe/	4	0:07:45	0:06:00	0:12:00
3	Credit Cards	https://.../category/karty-dla-osob-fizycznych/karty-kredytowe/	4	0:05:00	0:02:00	0:12:00
4	Mastercard or Visa credit card	https://.../karta-kredytowa-mastercard-lub-visa/	3	0:18:00	0:10:00	0:25:00
5	VisaYouth Card	https://.../karta-visa-electron-paywave-mlodziezowa/	3	0:13:00	0:10:00	0:18:00
6	Cards	https://.../category/karty/	3	0:12:00	0:04:00	0:28:00
7	Loans	https://.../category/kredyty/	3	0:07:20	0:03:00	0:13:00
8	Deposits	https://.../category/lokaty/	3	0:10:40	0:08:00	0:12:00
9	Deposits in PLN	https://.../category/lokaty/lo lokaty/	3	0:12:40	0:08:00	0:15:00

***Source:** Own elaboration.*

Task 1 involved exploring the offer related to a selected bank account (instruction: Find a suitable account offer for yourself and read its description). The number of accounts viewed by participants varied. Among the 25 teenagers, 12 chose one account and read its description, 7 explored two account offers, and 4 reviewed three different accounts.

Out of several types of personal accounts offered by the Cooperative Bank, participants selected four different accounts, including one specifically dedicated to young people aged 18-30 (Youth Account "IMPULS"). In addition to browsing offers related to personal bank accounts, some teenagers also visited subpages with information about accounts for farmers, business accounts, payment cards, savings accounts, and term deposits.

This was likely due to a lack of familiarity with banking terminology, which may have caused difficulties in correctly understanding the task. In the case of university students (n=23), 6 participants limited themselves to choosing one account and reading the information about it, 10 people familiarized themselves with the offers of two accounts, and 7 people – with three accounts. Among several types of accounts for individuals offered by the Cooperative Bank, they most often chose also account dedicated specifically to young people (IMPULS Youth Account, 12 indications).

Analyzing the way participants navigated the website to find information about bank account offers revealed that, in most cases, the top menu was used for navigation (the top menu items were clicked 28 times). Only a few participants accessed these subpages using links located elsewhere on the bank's main page (the "Offers for You" section placed below the advertisement banner or the menu on the right side of certain subpages, which accounted for 4 and 5 visits, respectively).

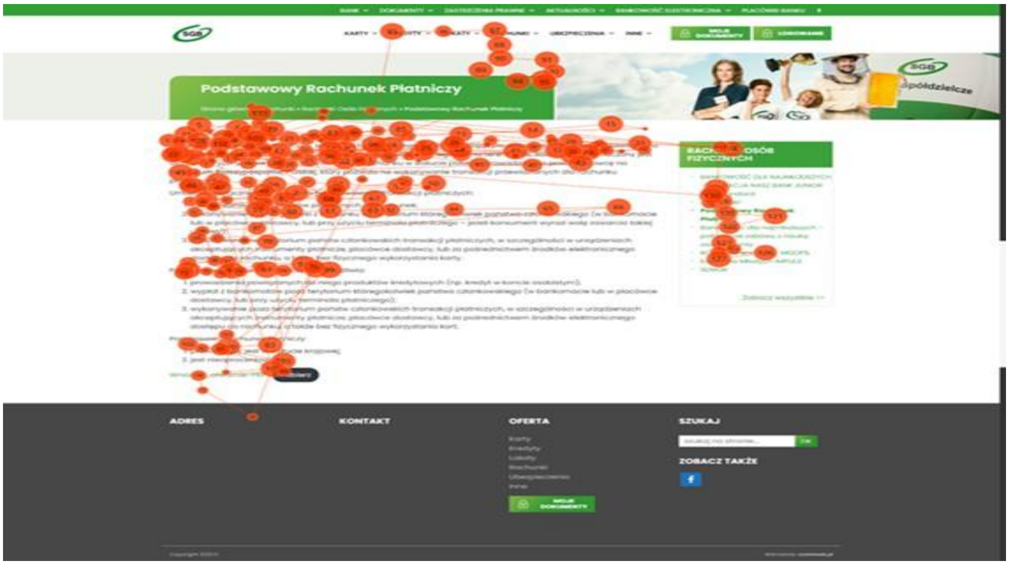
When analyzing the ways in which participants processed information on the Cooperative Bank account offer pages, the F-Shaped Pattern model (F-Pattern) was taken into account. Previous eye tracking studies by J. Nielsen have shown that users tend to read web content in a manner resembling the shape of the letter F (Kang *et al.,* 2024).

The F-shaped reading pattern refers to the viewing order in which users begin by reading across the top line, then look slightly further down the page and read across again, and finally continue scanning down the left-hand side. In reference to Figure 2, scan paths show an F-shaped eye movement pattern for a selected study participant.

It can be observed that most fixations are concentrated in the upper-left corner of the page (each red dot represents a fixation; lines between the dots show saccadic movements, during which the user's eyes move rapidly and they are practically blind; these lines help to more easily track fixations; larger dots represent longer fixations, and the numbers indicate the sequence). This gaze plot in the shape of the letter F was observed in a study participant scanning a page that featured a lot of text with very little formatting.

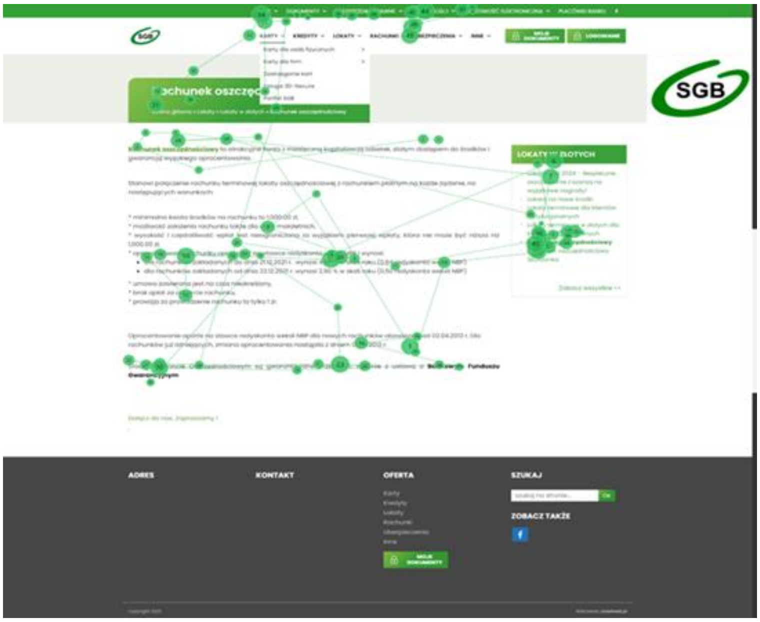
The implications of the F-shaped tendency confirm that users don't read all the content on a webpage. It's worth noting that not all participants exhibited the F-shape pattern. Moreover, this study questions the tendency to form an F-shaped pattern when content includes a mix of images and text arranged in different relative positions on the screen (Figure 3).

***Figure 2**. Scan paths of a participant reading a page with a lot of text*



***Source:** Own research.*

***Figure 3**. Gaze plot without specific shape*



***Source:** Own research.*

This is also supported by recent findings from Nielsen and Pernice (2010). Scanning online doesn't always take on the F-shape. Other common scanning patterns exist. The F pattern can be detrimental for both users and businesses, as important information may be overlooked.

A well-designed layout can help prevent F-shaped scanning. The most important information should appear in the first two paragraphs, and both paragraphs and bullet points should begin with high-information words that catch the user's eye as they scan down the left-hand side.

After the time allocated for completing Task 1 expired, participants were shown three questions designed to assess their retention of the information they had just read. In most cases, participants provided correct answers (question 1: 95%, question 2: 91%, question 3: 100%).

This suggests that participants made an effort to focus on the task and remember the information presented on the pages visited.

The second task involved logging into the specified account and making a transfer according to the details provided on the note (instruction: "Log in to the account – the login details are written on the note in front of you. Next, make a transfer to the specified person – the necessary information is provided on the note").

The goal of this task was to check how long it would take high school and university students to complete both activities (to obtain the answer to this question, an analysis of the recordings was carried out using Tobi Pro Lab software, Version 24.21). The results achieved by the participants are presented in Table 3.

The shortest time taken to complete task 2 was 2.19 minutes, while the longest time was 5 minutes. The average time to complete this task was 3.13 minutes.

The third task involved logging into the account again, checking the euro exchange rate for February 7, 2025, and then logging out (instruction: "Log back into the account and find the Currency option. Check what the Euro exchange rate was on February 7th. Log out of the account").

The purpose of this task was to examine: (1) how much time it took to log into the account again (and whether this time improved compared to the first login), (2) how much time the participant needs to complete the task (i.e., finding the euro exchange rate for February 7) and (3) how much time the participant needed to locate the "Log out" option on the website.

Table 4 presents sample results obtained for selected participants.

Table 3. *Time taken for each activity of task 2.*

Participant	**Name of the event**	**Start timefrom TOI start (ms)**	**Start timefrom TOI stop (ms)**	**Duration (ms)**	**Total time(min**
P1	Banking login	316 949	367 801	50 852	3.25
P1 P1	Transfer execution	367 801	508 373	140 572	
	Transfer approval	508 373	512 157	3 784	
P2	Banking login	358 954	444 774	85 820	3.64
	Transfer execution	444 774	573 229	128 455	
	Transfer approval	573 229	577 479	4 250	
P3	Banking login	302 617	361 652	59 035	3.36
	Transfer execution	361 652	499 349	137 697	
	Transfer approval	499 349	504 050	4 701	
.	.	.	.	.	.
P48	Banking login	296 864	352 991	56 127	2.80
	Transfer execution	352 991	463 454	110 463	
	Transfer approval	463 454	464 854	1 400	

Source: *Own elaboration.*

Table 4. *Time taken for each activity of task 3. Source: Own elaboration*

Participant	Name of the event	Start time from TOI start (ms)	Start time from TOI stop (ms)	Duration (ms)	Total time (min)
P1	Re-login	524 907	574 051	49 144	1.20
P1	Checking The euro exchange rate	574 051	592 585	18 534	
P1	Log out	592 585	596 635	4 050	
P2	Re-login	589 030	629 431	40 401	1.22
P2	Checking The euro exchange rate	629 431	653 741	24 310	
P2	Log out	653 741	662 424	8 683	

P3	Re-login	515 900	575 136	59 236	1.25
P3	Checking The euro exchange rate	575 136	587 353	12 217	
P3	Log out	587 353	591 053	3 700	
P48	Re-login	476 729	516 247	39 518	0.97
P48	Checking The euro exchange rate	516 247	531 898	15 651	
P48	Log out	531 898	535 198	3 300	

Source: *Own elaboration.*

The shortest time taken to complete task 3 was 0.97 minutes, while the longest time was 2.5 minutes. The average time to complete this task was 1.20 minutes. Thus, an improvement in the result was noted on the second attempt to log into the account – participants completed this task faster than the previous one.

As indicated by the analysis of the conducted experiment, eye tracking provides insight into the cognitive processes involved in the reception of visual stimuli. This technology makes it possible to record the direction of gaze, fixation duration, and the sequence of visual scanning, allowing for the analysis of attention mechanisms, information selection, as well as the recognition and interpretation of stimuli in real time.

Thus, eye tracking allows us to get closer to real, often unconscious perceptual, and cognitive processes. Eye tracking delivers objective data on how users interact with an interface. It allows for the identification of elements that attract attention, as well as those that are overlooked despite their functional importance. The analysis of heat maps and gaze paths can help web designers assess whether the visual hierarchy of content aligns with the intended direction of perception.

This, in turn, can enable the optimization of the graphical layout, information structure, and placement of key functions, potentially leading to an improved user experience. The eye-tracking study also made it possible to examine how young people read information presented both on websites and in traditional informational materials, as well as to analyze their viewing of a video (advertising spot). The data obtained was then compared with insights gathered during individual interviews.

3.2 In-Depth Individual Interviews (IDI)

The analysis of in-depth interviews was structured around key thematic categories reflecting partici-pants' information-seeking behavior and perception patterns. The following table 5 summarizes the main findings, illustrating how young respondents interpreted, searched for, and processed information within the tested context.

Particular attention was paid to semantic associations, visual scanning strategies, and the role of familiar cues in navigating content. The selected verbatim quotes exemplify typical reactions and recurring user insights.

Table 5. *Analysis of In-Depth Interviews*

Theme	Findings	Selected Participant Quotes
Familiar Keywords and Slogans	Young users search for information based on familiar keywords or general slogans that capture their attention.	"It's better if there's a slogan in bigger letters. . . " "Maybe it's better. . . as there are slogans or such tiles. . . "
Searching for a Personalized Offer	Participants looked for intuitive cues like "account," "offer," or "in-dividual customer," often seeking hints related to age.	"account and age indicated" "individual customer account" "there was an offer. . . on the bar at the top"
Associations with the Word 'Account'	The term "account" was rarely associated with a suitable offer and often provoked misunderstanding or distancing reactions.	"an account too, no, better an offer"
Visual Attention and Page Scanning	Participants naturally directed their gaze to the top section of the website, considering it the key area for locating relevant of-fers.	"up, yes up" "found from the top"
Perception of Offer Texts	Long texts discouraged careful reading; participants preferred to skim or scan content. How-ever, they accepted detailed information if genuinely interested.	"I would narrow it down" "Shorten the information..." "If I were interested. . . this form is ok."
Graphic Highlights (Bold, Color, Bullet Points)	Bold text, color emphasis, and bullet points improved information retrieval, but overuse of highlights reduced their effectiveness.	"What is free is still bolded. . . " "These boldings are enough. I pay attention. . . free account opening"
Preferences for Layout and Visual Presentation	Respondents preferred slogans, tile-based layouts, and eye-catching graphics over dense text blocks.	"Some kind of bigger picture. . . " "I like the slogans just thrown together. . . "
Colors and Readability	Red color attracted attention but was often associated with warnings or errors. Small fonts and dense text reduced readability and user engagement.	"The red colour is ok. . . " "It looked like such a mistake. . . "
Page Layout and Login Section	Clear placement of the login section — preferably centralized — was suggested to improve navigation and focus.	"More in the middle, maybe bigger" "Login would be in the middle. . . "

Clarity and Transparency as Key Expectations	Clarity and transparency of information and website design were repeatedly emphasized as essential usability features.	"The website was so clear" "I like the website, it is readable, clear"

Source: *Own elaboration.*

The way young users search for, and process information is deeply rooted in cognitive mechanisms shaped by habitual media usage and prior knowledge. From a cognitive science perspective, information retrieval is not a neutral, purely rational process - it reflects mental shortcuts, selective attention patterns, and semantic associations.

The findings from the in-depth interviews conducted with young respondents confirm that their information-seeking behavior heavily relies on familiar keywords, visual prompts, and perceptual cues rather than analytical reading or deliberate exploration.

4. Conclusions

The findings of the study confirm the main hypothesis that a high level of User Experience (UX) significantly enhances the effectiveness and speed of information retrieval by young users of banking websites.

The auxiliary hypotheses were also positively verified. Properly designed for a specific group of recipients, consumers UX increases the efficiency and speed of users' information retrieval. Simplicity and the use of visual elements emerged as key factors facilitating cognitive processes, which are based primarily on identifying keywords.

The study also revealed that young users browse websites in a manner similar to their behavior on social media – scanning content quickly and non-linearly, even in contexts requiring focus. These findings highlight the need to design digital content in line with evolving patterns of perception, emphasizing clarity, minimalism, and visual accessibility.

The research and conclusions presented in the article offer valuable insights for practitioners, particularly in the design of information messages and websites tailored to young customers. These findings can be valuable for a wide range of businesses, including banks and cooperative banks, as well as companies that target young consumers.

This study contributes to the cognitive-oriented discourse in human–computer interaction and user experience research by emphasizing how cognitive patterns, such as attention span, visual scanning, and semantic familiarity, influence the perception and retrieval of information. Furthermore, it underlines the significance of transparency, simplicity, and visual structuring in designing information for young users accustomed to fast-paced, visually driven digital environments.

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