Online Banking User Experience: A User Experience Questionnaire (UEQ) Assessment in South Africa

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Abstract. Online banking has seen tremendous growth driven by the emergence of the fourth industrial (4IR) and innovative technologies in every aspect of our daily activities. Hence, there is an emergence of areas of research around aspects of online banking, such as the need for user experience. This paper evaluates online banking user experience (UX) using the user experience questionnaire (UEQ). The study collected 725 survey responses from UEQ in South Africa, and the findings show a high quality of UX based on a comparison against the UEQ benchmark data set. More specifically, the hedonic quality scale aspect is at the highest level compared to the pragmatic quality aspects of UX. The findings provide practical contributions to online banking designers and developers in retail banks to optimize areas of strength and improve on those that need improvement.

Keywords: online banking, user experience, UEQ, hedonic quality, pragmatic quality

1. Introduction

Online banking is becoming part of our daily activities. It enables users to constantly monitor their financial situation, from checking balances to paying bills and sending money to family members and friends. The advent of digital-only banks has exacerbated the proliferation of online banking. As such, several research areas have emerged around the use of online banking; these include the security, usability, and user experience (UX) of online banking [1]. These aspects have been cited to influence the adoption of online banking negatively. Online banking has significant benefits that studies have identified; these include time-saving and the convenience of conducting banking anywhere and anytime [2]-[3]. One area regarding UX has been measuring the UX of information systems (IS) applications delivered through online platforms [4], such as online banking, e-health, and e-government, to mention a few.

South African banks have invested significantly in digital banking channels to leverage digital banking benefits [5]. Hence, getting more bankers to use these digital channels is essential to improve the return on investment by banks and allow users to optimize the benefits of online banking. UX plays a role in encouraging users to adopt online banking [6]. Additionally, high levels of UX are a dimension of competitive advantage in the service industry [7], where customers can easily switch from one provider to

another. Therefore, measuring UX assists in identifying areas of improvement to meet customer expectations and improve the use of digital channels.

This paper reports on the user experience (UX) evaluation of online banking services as delivered by retail banks in South Africa. The study uses a well-established User Experience Questionnaire (UEQ) assessment tool [8]. The UX of information systems applications has far-reaching contributions that include improving the security and usability of applications as users are less despondent when using them. Improved UX also has the potential to enhance the adoption of online banking. Hence, this paper attempts to answer the following research question: What is the level of user experience in online banking based on the User Experience Questionnaire assessment tool?

2. Literature review

2.1. Online banking

Online banking has become pervasive in our daily activities, allowing users to access and manage their finances conveniently 24/7 [9]-[10]. The banking activities offered through online banking vary from simple balance inquiries to more complex inter-account transfers. Online banking has crucial links to the electronic commerce (e-commerce) [11] as it offers an additional way to make e-commerce payments as an alternative to credit card payments, especially in developing economies [12]. Studies have investigated challenges to the successful adoption of online banking; these include poor internet infrastructure [13], [14], security risks [15], usability [16], and user experience Field[17], to mention a few. Akpan *et al.* [18] identified the lack of ICT infrastructure and socio-economic challenges such as poverty and lack of enabler infrastructure such as electricity as the primary adoption challenges. South African retail banks have since adopted digital banking channels, including the emergence of several digital-only banks. Socio-economic factors still hinder access to the Internet, and the rate of online banking adoption could be higher than in other emerging economies. Beyond the myriad of obstacles, there is still apprehension about adoption due to different user experience aspects like security, privacy, and usability associated with conducting sensitive activities such as online banking [19]. This study aims to investigate the level of online banking UX quality.

2.2. User Experience (UX)

The permeation of technology in our daily activities has brought about the need for more than technology functionality to complete activities. It also includes non-functional aspects such as UX formed during system interaction. ISO 9241-11: 1998 [20] defines UX as a user's perceptions and responses from using or anticipated use of an artifact. Essentially, UX takes a broader view beyond usability, which includes users' emotions throughout the interaction with the system [21], encompassing several aspects, such as ergonomics, human factors, accessibility, and usability, beyond system usability [22]. ISO 9241-210 [23] defined UX as a person's perceptions and responses resulting from using or anticipating a product, system, or service. Petrie and Bevan [24] allude that UX addresses aspects of users' interactions with systems beyond effectiveness, efficiency, and satisfaction. Hence, usability forms part of the broader realm of user experience as systems seek to captivate users during the interaction [21]. More objective metrics measure usability, while UX focuses on subjective aspects such as users' hedonic reactions [24].

Preece *et al.* [25] lists desirable and undesirable aspects of UX goals that cover items from emotions and felt experiences. Some desirable aspects include enjoyable, satisfying, rewarding, and exciting, while undesirable characteristics include frustrating, boring, unpleasant, and annoying [25].

UX assessment studies have been on the rise as researchers try to improve user satisfaction from using the ever-increasing reliance on technology in various sectors. Recent UX evaluations of the learning management systems (LMS) in education using UEQ identified the need for improved system dependability [26] and dependability and novelty [27], as these scales scored lowest among the six UEQ

scales compared to the benchmark data set. Meanwhile, [28] found that students have a positive UX with a mobile examination application using the UEQ+ assessment tool. Kuttikaden and Daniel [29] found a significant correlation between service perception and the overall UX of the Amazon Pay service. Another study, Field [30], identified a need for more dependability in the UX assessment of a food delivery service.

2.3. Hedonic/Pragmatic UX Model

According to [31], software possesses both pragmatic and hedonic qualities. However, the judgment on highly hedonic or pragmatic is appealing depending on the usage mode. The author contends for the existence of two modes of usage modes, namely, goal and activity. In activity mode, the appeal is determined by perceptions of hedonic quality, while in goal mode, both qualities are essential. The Hedonic/Pragmatic model of UX views UX as having two dimensions – hedonic and pragmatic [32]. Hedonic focus on a product or service's perceived ability to achieve the 'be-goals' (being competent, being unique, or being related to others) [32]. At the same time, pragmatic refers to the accomplishment of 'do-goals' (completing a specific task) [32].

2.4. UEQ

The UEQ is a UX measurement tool and has been applied with reliable results in many products and services. UEQ is mainly used to assess the UX of an interactive product. UEQ was first conceptualized by [8] and [33] using empirical data that resulted in constructing a 26-item survey grouped into six factors, as shown in Figure 1. The six factors are further categorized into clusters: attractiveness, pragmatic quality (perspicuity, efficiency, dependability), and hedonic quality (stimulation, originality) [34]. Practical quality groups technical aspects, while non-technical factors form the hedonic quality group. Which include efficiency, ease, and control of the system, are included in the group.

On the other hand, non-technical aspects such as user satisfaction and motivation, as well as innovative and creative designs, are included in the hedonic quality group. The structure of UEQ scales is shown in Figure 1 as conceptualized by [35], including regrouping the six scales into three clusters. Figure 1 lists the six scales and the grouping into three clusters.

Attractiveness refers to the overall effect of the service regarding whether users like or dislike it purely emotionally based on the acceptance/rejection dimension. The scale is measured by items such as enjoyment and attractiveness. *Efficiency, perspicuity,* and *dependability* are pragmatic quality aspects that describe interaction based on tasks and goals the system helps the user to achieve. For instance, how fast, efficient, easy to learn, or supportive is the system when completing tasks? Finally, *stimulation* and *novelty* are hedonic quality aspects unrelated to tasks and goals but concerned with the system's pleasure, motivation, or innovativeness [36]-[37].

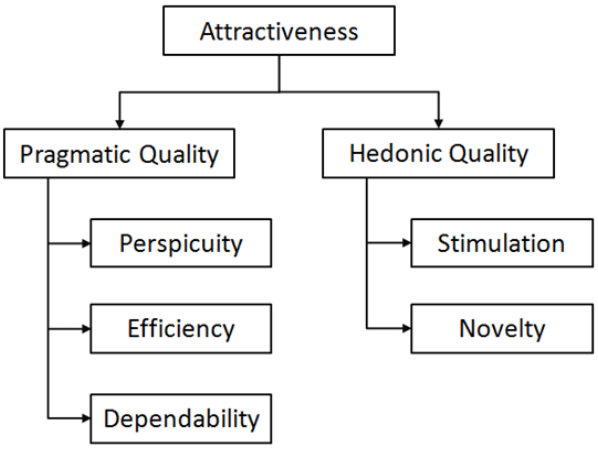

Figure 1. UEQ Items and scale structure

The UEQ analysis tool includes benchmarks that enable comparing UX assessment against a benchmark data set of previous studies. This allows for reliable conclusions and interpretation of the findings.

3. Method

The study used descriptive research to investigate the UX of online banking services using users' perceptions. A quantitative survey was used to gather perceptions of online banking users using the user experience questionnaire (UEQ) as a data collection instrument. The UEQ tool uses a 7-point Likert scale for the 26 scale items.

The respondents came from South Africa's five largest retail banks. The quantitative data from the UEQ tool was analyzed using the Microsoft Excel-based UEQ data analysis tool. The results are envisaged to provide insights into the level of UX quality local banks offer to online banking users.

Google Forms was used to collect questionnaire responses online. Different platforms were used to invite research respondents using the snowballing sampling technique, including email, social media (WhatsApp, Facebook, LinkedIn, etc.), and word of mouth. Apart from the UEQ scale items, the questionnaire asked respondents' biographical details to allow for group comparison during data analysis.

4. Results

4.1. Descriptive statistics

There were 725 complete and valid responses from online banking users in South Africa. The respondents were almost evenly split between females (48%) and males (52%). Table 1 presents the rest of the data frequencies. The majority (69%) of respondents were below 40 years old. Over half (57%) of the users sampled have been using online banking for five or more years. While 80% access online banking either daily or once a week. Mobile devices are the most used devices for accessing online banking, accounting for 72%, while 20% use mobile and desktop computers.

Table 1. Demographic Profile of Respondents

	Scale	**Frequency**	**Percent**	**Cumulative %**
Gender	Male	374	52	52
	Female	351	48	100
Age	Below 20 years	48	7	7
	20-29 years	186	26	32
	30-39 years	269	37	69
	40-49 years	167	23	92
	Above 50 years	55	8	100
Experience	Below 1 year	109	15	15
	1-4 years	204	28	43
	5 years and above	412	57	100
Use frequency	Every day	315	43	43
	Once a week	268	37	80
	Once a month	142	20	100
Device	Mobile	522	72	72
	PC	56	8	80
	Both	147	20	100

4.2. Scale reliability

The study received more than one thousand responses; however, suspicious data was removed based on the UEQ analysis tool heuristic that detects outlier responses.

Table 2. Scale reliability

	Scale	Cronbach's Alpha
1	Attractiveness	0.93
2	Perspicuity	0.86
3	Efficiency	0.88
4	Dependability	0.77
5	Stimulation	0.90
6	Novelty	0.75

This includes incomplete responses and those with a single extreme Likert scale value for all items, as the respondent is deemed to be answering without reading the questions. The data cleaning resulted in 725 complete and valid responses that were considered for further data analysis. The Cronbach's Alpha coefficient was used to determine the instrument's reliability for internal consistency. Table 2 gives the values for the reliability of each of the six UEQ scales. The reliability coefficients are above the acceptable threshold of 0.70, making the instrument reliable [38]-[39].

4.3. UEQ Analysis Tool

UEQ has an analysis tool that computes various statistical analysis techniques to interpret the questionnaire data. In addition to the scale reliability reported earlier, the tool gives different scale and item mean, variance, and standard deviation to communicate UEQ results, including benchmark tests.

4.3.1. Item analysis

Table 3 provides the mean, variance, and standard deviation (SD) for the 26 items. The interpretation of mean values is such that values > 0.8 represent a positive evaluation, and values < -0.8 describe a negative review. The 7-point Likert scale for items gives a range between -3 and +3. Across all 26 items, the mean values range from 1.2 to 2.0, representing a positive UX evaluation. The SD ranges from 1.2 to 1.7, which shows a slight deviation for each item means. The variance of mean values ranges between 1.4 and 2.8.

4.3.2. Benchmark

Schrepp *et al.* [40] provides a benchmark test of scale mean scores based on existing results in the benchmark data set. Values above zero represent a positive evaluation of the quality aspect for each scale with values above zero, while negative values represent a negative evaluation. The benchmark allows comparison of the findings relative to previous studies captured in the benchmark data set.

Figure 2 and Table 4 show benchmark results based on scale-level mean values. Table 4 depicts the mean values used for comparison with the benchmark results. Figure 2 displays the scale ranges using bar charts for visual presentation. The findings show that online banking in South Africa's stimulation and novelty scale qualities are within the best 10% range of the benchmark data set.

Table 3. UEQ items statistics.

Item	Mean	Variance	SD	Left	Right	Scale
1	1.9	1.6	1.2	annoying	enjoyable	Attractiveness
2	2.0	1.7	1.3	not understandable	understandable	Perspicuity
3	1.8	1.6	1.2	creative	dull	Novelty
4	1.6	2.3	1.5	easy to learn	difficult to learn	Perspicuity
5	1.8	1.7	1.3	valuable	inferior	Stimulation
6	1.7	1.7	1.3	boring	exciting	Stimulation
7	1.8	1.7	1.3	not interesting	interesting	Stimulation
8	1.2	2.8	1.7	unpredictable	predictable	Dependability
9	1.6	2.1	1.4	fast	slow	Efficiency
10	1.3	2.2	1.5	inventive	conventional	Novelty
11	1.8	1.6	1.3	obstructive	supportive	Dependability
12	1.8	1.7	1.3	good	bad	Attractiveness
13	1.8	2.0	1.4	complicated	easy	Perspicuity
14	1.9	1.4	1.2	unlikable	pleasing	Attractiveness
15	1.5	2.2	1.5	usual	leading edge	Novelty
16	1.8	1.8	1.3	unpleasant	pleasant	Attractiveness
17	1.5	2.3	1.5	secure	not secure	Dependability
18	1.5	1.8	1.4	motivating	demotivating	Stimulation
19	1.6	1.9	1.4	meets expectations	does not meet expectations	Dependability
20	1.9	1.9	1.4	inefficient	efficient	Efficiency
21	1.6	2.3	1.5	clear	confusing	Perspicuity
22	2.0	1.6	1.3	impractical	practical	Efficiency
23	1.8	1.8	1.4	organized	cluttered	Efficiency
24	1.6	1.9	1.4	attractive	unattractive	Attractiveness
25	1.7	1.8	1.3	friendly	unfriendly	Attractiveness
26	1.9	1.6	1.3	conservative	innovative	Novelty

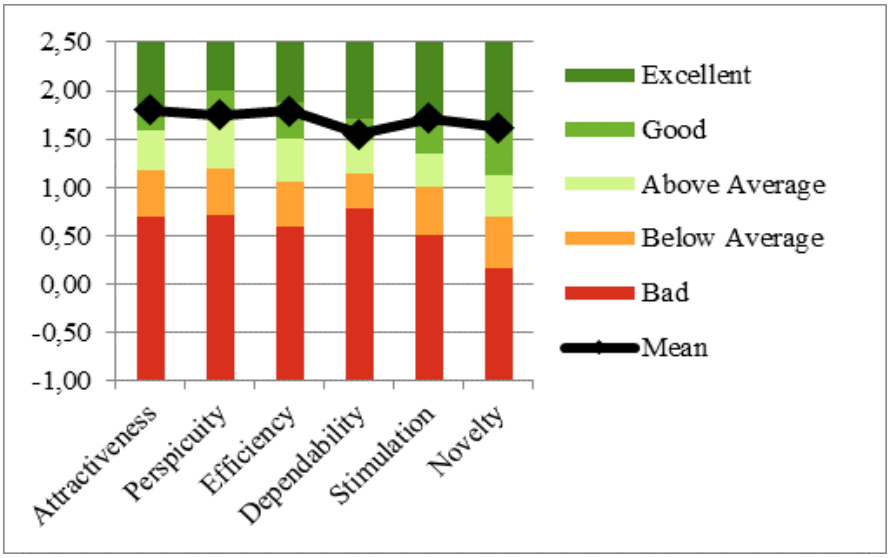

Figure 2. Scale interval scores

The benchmark intervals range from *bad* to *excellent*, as shown in Figure 2 [40]. The benchmark results of all the other four scales are in the 'good' interval range, meaning the 10% results of the benchmark are better than the current study, and 75% of the benchmark results are worse. These benchmark findings show that the UX qualities of online banking services are higher than those of comparative studies in the benchmark data set. However, there is a distinct difference between hedonic qualities and pragmatic qualities. While both are in the above-average interval, the two hedonic quality scales are in the *excellent* range compared to the suitable interval for practical quality scales.

Table 4. Benchmark interval ranges

Scale	Mean	Comparison to Benchmark	Interpretation
Attractiveness	1.79	Good	
Perspicuity	1.75	Good	10% of results better, 75% of results worse
Efficiency	1.79	Good	
Dependability	1.55	Good	
Stimulation	1.71	Excellent	In the range of the 10% best results
Novelty	1.62	Excellent	

This means there is still room for improvement in usability utility aspects of online banking to bring all scale mean values to the *excellent* interval range. In line with other studies reported earlier, dependability has the lowest score, albeit in the superb range compared to the five UEQ scales. This implies that IS applications need improvements to maintain their reliability. However, this might be a case of more visible aspects of applications, as downtime is more likely to be noticed by users than other aspects.

The confidence level, which measures the accuracy of the scale mean values prediction, ranged from a minimum of 0,075 to a maximum of 0.088. The confidence interval is a measure of the precision of the estimation of the scale mean. The small confidence figures indicate that the scale mean estimation is higher for the data set, making it more reliable. Hence, to achieve 0.05 confidence, more data is needed.

4.3.3. Correlation

The UEQ assessment tool measures the correlation between items to determine the relationship among them. Correlation (denoted by *r*), often called the Pearson correlation coefficient, measures the degree of association among variables. The correlation coefficient values range from -1 to +1, with -1 depicting a very strong, weak negative relationship and + showing a very strong positive relationship. Table 5 shows the degrees of relationship based on the range of *r* values.

Table 5. Degrees of relationship

Range of r values	Degree of relationship
±0.80 to 1.00	Very strong
±0.60 to 0.79	Strong
±0.40 to 0.59	Moderate
±0.20 to 0.39	Weak
±0.00 to 0.19	Very weak

The correlation between items in each scale showed a positive relationship between items in the six scales ranging from *moderate* to *strong*, as shown in Table 6. This indicates a positive association among the items that measure the same scale, making the findings reliable.

Table 6. Scale average correlation

Scale	Correlation average	Degree of relationship
Attractiveness	0.68	Strong
Perspicuity	0.61	Strong
Efficiency	0.65	Strong
Dependability	0.45	Moderate
Stimulation	0.69	Strong
Novelty	0.42	Moderate

5. Discussion

The study evaluated the UX of online banking, and the overall assessment indicates a favourable picture based on the benchmark data set. As indicated in Table 4, aspects of system reliability and efficiency still need to be addressed to move from *good* to *excellent*. However, when the study is drilled down based on different groups, unique areas of improvement are identified. The group comparisons are discussed next, highlighting significant differences in UX assessment based on groups.

5.1.1. Gender

Based on benchmark comparisons shown in Table 7, male users rate the quality of UX higher compared to their female counterparts. Male users scored higher on every scale than female users except novelty, which both groups scored and considered *excellent*. This shows that female users demand more from their respective online banking services, informing banks to consider their offerings where the majority of users are female.

Table 7. Gender interval ranges

Scale	Male	Female
Attractiveness	Excellent	Good
Perspicuity	Good	Above average
Efficiency	Excellent	Good
Dependability	Good	Above average
Stimulation	Excellent	Good
Novelty	Excellent	Excellent

5.1.2. Age

The benchmark scores for different age groups show that younger users need to be more impressed by the quality of UX. The youngest user group (< 20 years) scored dependability as bad, with *attractiveness, perspicuity*, and *efficiency* all considered *below average*. The scores improve as users age, with those 50 years and older considering UX quality *excellent* in four scales. This implies that the younger audience expects more from the online banking service, and banks need to recognise that aspect in service design and development.

5.1.3. Experience

Users using online banking for less than one year consider the UX very poor, with *attractiveness* and *pragmatic quality* scoring *below average* and only the *hedonic quality* scoring *above average*. The scores improve for those using online banking for up to four years. The more experienced group (+5 years) scored all six scales as *excellent*. This trend is expected as familiarity with the system tends to make users biased as they can easily navigate and complete tasks with little difficulty.

5.1.4. Use frequency

The same trend applies to the frequency of online banking service use, with daily users scoring all six scales with four *excellent* and two *good* scores. The scores drop gradually as the frequency of use decreases, with monthly users scoring the scales with a combination of *above average* and *good*.

5.1.5. Device

Comparing the scores of users who use mobile devices against those who use desktop computers shows no significant difference. This points to a service design that caters to both platforms equally, providing a holistic approach to UX system design.

The findings indicate that the older users, who are more likely to be the same, more experienced, and male users have a favourable assessment of the quality of UX banks provide. This is accompanied by higher scores by users who access the service more frequently than those who use it erratically. These findings might be due to the older, more experienced, and daily users having a better understanding of the service than new users. Additionally, younger users expect more quality as they access comparable online applications with better UX quality than digital banking channels.

6. Conclusion and future work

Online banking applications are information system applications that must be usable to attract users. However, given technology's pervasive nature, such applications require more than usability for a holistic user experience. Hence, UX aspects are needed to fulfil user expectations of quality applications. This

study used the UEQ tool to evaluate the UX of online banking. The findings show that the overall quality of UX provided by retail banking is well above average, with all six scales falling above the 'good' interval against the UEQ benchmark data set.

More specifically, the hedonic quality cluster of *stimulation* and *novelty* scales scored in the *excellent* range. This means banks excel in providing innovative online banking services that please users. However, there is a need to improve the 'good' range for a more fulfilling UX quality regarding pragmatic quality that deals with utility and usability aspects. This points to the need for improvements in usefulness, efficiency, and ease of use those users perceived as lacking compared to hedonic qualities based on the benchmark data set. These aspects point to a service that lacks functionalities and is considered cumbersome. Increasing services offered by online banking and designing user-friendly interfaces might improve *pragmatic quality*.

However, when results are analysed based on group comparisons, some significant differences exist in how demographic groups assess the UX. Generally, the more familiar users have a favourable view of the quality of UX compared to those with less exposure to the service. Hence, this helps banks identify improvement opportunities based on users' demographic details. These findings can help usability and UX designers and developers to probe and find ways to address users' concerns.

A possible avenue to further investigate the UX of online banking is to conduct a longitudinal study to compare UX quality at various points in time and compare the results using the UEQ tool. This can be extended to investigate UX for a single bank instead of the current collective investigation. An analysis of individual banks' UEQ assessments was not reported to avoid prejudice, as the number of responses is not large enough for an accurate evaluation.

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