

Big Data Analytics as an elementary Customer Loyalty Instrument for German banks – an empirical approach from a banker's perspective

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Abstract

The German banking sector is undergoing a massive transformation phase due to increasing digitalization. This challenge is enormously influenced by demographic change, the low-interest phase, technological progress as well as supervision and regulation. As a result, banks in Germany are forced to deal with strategies for customer centricity. In this context, Big Data analytics can be seen as a useful tool to better understand customers, e.g. by predicting product affinities, purchase probabilities or distribution channel preferences. The consolidated view of Big Data Analytics and Customer Centricity is already considered in the scientific literature. The studies on the combination of Big Data Analytics and the German banking sector, on the other hand, are rudimentary so far. The main purpose of this research is to answer the following research questions: [I: "Does Big Data Analytics improve the quality of advice (measured by the principles of client advisory services) from an advisor's perspective and does it have an influence on customer loyalty?"] and [II: To what extent can Big Data Analytics make a positive contribution to the situation of banks in the age of digitalization?]. To answer the research questions, the results of a survey of banking experts (N = 43) form the backbone of this empirical research. The findings of this paper can be of benefit to researchers and practitioners alike, in order to make the potential of big data analytics recognizable and usable for banks in the context of customer centricity.

Keywords: Bank Advisor, Big Data Analytics, Customer Loyalty Instrument, German Banking Sector, Principles of client advisory services.

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Introduction

The German banking system traditionally consists of three pillars, private sector banks, public savings banks and cooperative banks (see Figure 1). This structure makes the German banking system unique, only the

Austrian banking system has a similar structure in Europe (Behr & Schmidt, 2015; Frank et al., 2014; Komorowski, 2020). For ease of reading, this article refers to German banks.

The German banking sector is undergoing a massive transformation phase due to increasing digitalization. This challenge is enormously influenced by demographic change, the low-interest phase and technological progress, supervision and regulation (Giebe & Schulz 2021a; Giebe & Schulz 2021b; Giebe & Schulz 2021c).

According to Hammerström et. al (2019), Big Data Analytics (BDA) investment decisions are often influenced by the desire to optimise existing business. Big Data & Analytics is used in many industries to be more competitive (Hammerström et al., 2019). With modern analytical methods, the use of BDA is also finding its first examples of application in the German banking industry. Advances in information technology are rapidly increasing the collection, storage and processing of all forms of data. These can be systematically used by further developing existing methods for data analysis and data forecasting. From a customer centricity perspective, it is worthwhile for banks to further develop the introduction of BDA and align existing processes accordingly (Au & Hiese, 2021; Brühl, 2019; Hock & Giebe, 2022).

The three pillar model of German Banks



Figure 1. The Three Pillar Model of German Banks

Source: Hock & Giebe, 2022.

In order for Customer Centricity to be lived in the banks, prerequisites for implementation must be created. This concerns aspects such as organization, customer processes, management behaviour, communication, customer processes, customer information as well as controlling. Even more important is the willingness of the entire company to make customer reactions the basis for decision-making and to immediately remedy any identified deficiencies and consistently use their potential for process optimization (Große-Holtforth et al., 2020; Krämer & Burgartz, 2022).

Aim of Research

From an academic perspective, the majority of BDA research to date has been conducted in the healthcare, tourism, automotive, smart city and marketing sectors. Unfortunately, research in the banking sector has mostly focused on the benefits of BDA by presenting best practices from the perspective of banks in a limited way (Hung et al., 2020; Shakya & Smys, 2021; Srivastava & Gopalkrishnan, 2015; Sun et al., 2014). Currently, a conceptual framework of BDA in the banking sector has been published (Phan & Tran, 2022), which, however, refers exclusively to the banking centre Hungary. Accordingly, there are only a few studies on the use of BDA in the German banking market. These are Trelewicz (2017) for Deutsche Bank, Au & Hiese (2021) for Commerzbank, Damaschke & Giebe (2020), Lünemann & Müller-Hammerstein (2021) and Giebe (2022) for the savings banks.

The influence of BDA on the model „Principles of client advisory services" (see Figure 2), which are taught as part of the three-year training to become a bank clerk in Germany is given special consideration here. For example, the article "Sparkassen-DataAnalytics: Den Datenschatz der Sparkassen-Finanzgruppe heben" (Savings Banks Data Analytics: Lifting the Data Treasure of the Savings Banks Finance Group) points out that BDA ensures more objective, comprehensive, individualised and active advice (Damaschke & Giebe, 2020). However, there is a lack of quantitative research to prove this. Against this background, this article focuses equally on the academic discussion and a practical orientation on BDA and its benefits in the German banking sector under aspects of customer centricity.



Figure 2. Model: Principles of client advisory services

Source: Damaschke & Giebe, 2020.

When advising clients, there are different perspectives (see Figure 3), that of the bank client (01), that of the bank advisor (02) and the perspective of the bank (03). The bank is interested in a lifelong relationship with the bank client. The bank advisor is employed by the bank and sells its products to bank clients. The bank client is a customer of the bank and has usually made a conscious decision to enter this partnership. In 2019, Giebe et al. conducted research on the principles of client advisory services in relation to BDA. In the authors' study, the customer perspective was considered (Giebe et al., 2019). This article is about the perspective of bank advisors in Germany. The following research questions are to be answered:

- I: Does BDA improve the quality of counselling from the counsellor's perspective (measured against the principles of client advisory services) and has an influence on client loyalty?*
- II: To what extent can BDA make a positive contribution to the situation of banks in Germany in the age of digitalization?*

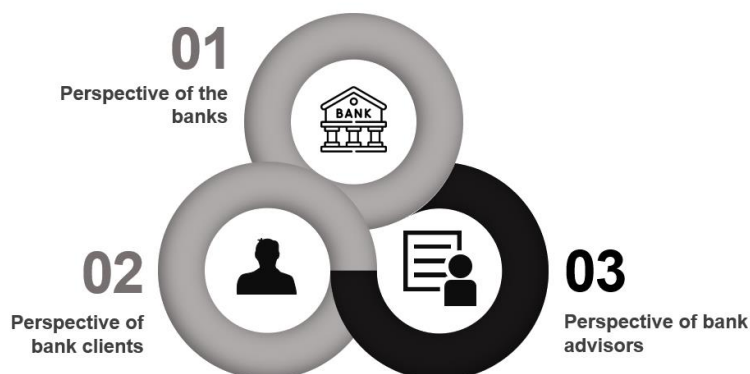


Figure 3. Perspective of Bank Advisors in Germany

Source: Compiled by the authors.

Material and Methods

In order to answer the two research questions, a standardised series of interviews was arranged and successfully implemented in the period from 01.08.2021 to 31.10.2021. The occupational profile of the bank clerk is the relevant training occupation in the banking sector. The majority of employees in the banking sector complete this vocational training (Frank et al., 2014). For this reason, participants were randomly selected from the authors' network for the survey who had successfully completed vocational training as a bank clerk (or a dual course of study) in a credit institution in Germany. In the end, personal interviews were conducted with a total of 43 trained bank clerks. In addition to this aspect, another premise was that the subjects were currently employed in the financial services industry. With these attributes, the interview partners can be ascribed the status of "banking expert" from the authors' point of view. The standardised interviews were conducted in person, by telephone or by video conference, and the interviews were evaluated anonymously.

To answer the first research question, the following statements are analysed:

1. From the perspective of the banking experts, big data analytics ensures higher customer loyalty.
2. Big data analytics provides more objective advice from the perspective of banking experts.
3. Big data analytics provides more comprehensive advice from the perspective of banking experts.
4. Big data analytics ensures more individualised advice from the point of view of banking experts.
5. Big data analytics ensures more active advice from the point of view of banking experts.
6. The age of the bank experts does not play a role in the evaluation of customer loyalty.

For statements 2-5, a four-point Likert scale was used for scaling because no "abstentions" and no "tendency towards the middle" were to be allowed. In order to examine the following six statements, statistical hypotheses were formulated, the significance of which was subsequently tested.

Answering the second research question

In order to be able to answer the strategic necessity of BDA as a customer loyalty instrument for banks from the point of view of banking experts in Germany, the 43 respondents were asked to answer the following question with "Yes" or "No" within the framework of the standardised interviews:

Do you agree with the statement that investments in big data analytics projects are strategically necessary and advisable for banks in Germany in the age of digitalization (only one answer possible)?

Results of the research

Demographic attributes of the respondents

The average age of all banking experts is 38.4 years. A division has been made into four age clusters (see Figure 4).

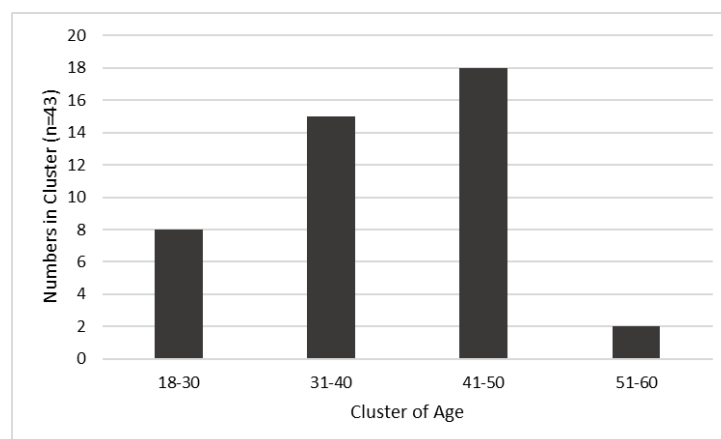


Figure 4. Distribution of the age of the bank experts

Source: Compiled by the authors.

Another question that was answered was the period of time since completing the training. The average work experience can be divided into three groups: (1) 7% 1-5 years, (2) 42% 6-15 years and (3) 51% more than 15 years. It is noticeable that the respondents with an average age of 38.4 years are younger than the bank average of 44.3 years (Employers’ Association of the Private Banking Industry, 2021). It can be assumed that the subjects of this study thus have both the experience and innovativeness as well as an eye for visionary future and digitalization topics in general.

Answers from the banking experts

There were two possible answers to the question "Do you agree with the statement that big data analytics increases customer loyalty? [1] Yes and [2] No (see Figure 5). As the graph shows, 90.70% of the interview participants chose the answer "Yes" and 9.30% of the interview participants chose the answer "No".

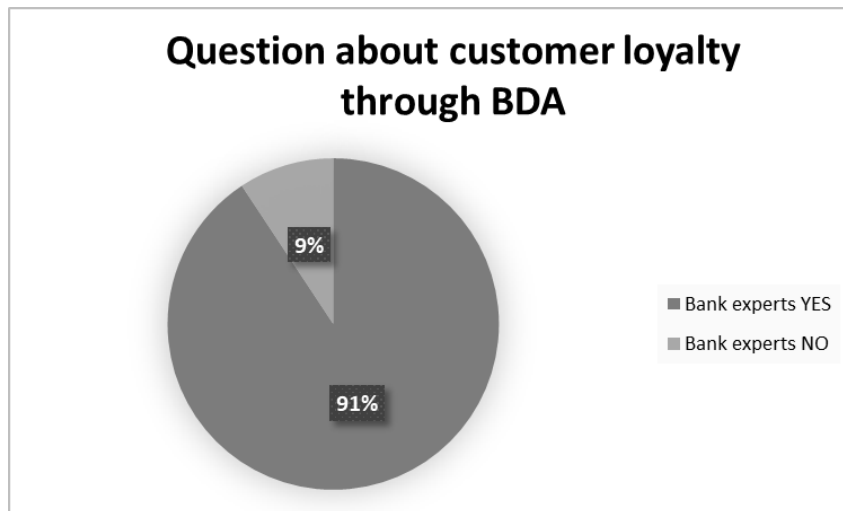


Figure 5. Question about Customer Loyalty through BDA

Source: Compiled by the authors.

The answers to statements 2-5 (BDA provides more objective advice from the point of view of the banking experts, BDA provides more comprehensive advice from the point of view of the banking experts, BDA provides more individualised advice from the point of view of the banking experts and BDA provides more active advice from the point of view of the banking experts) are consolidated and explained below (see Figure 6).

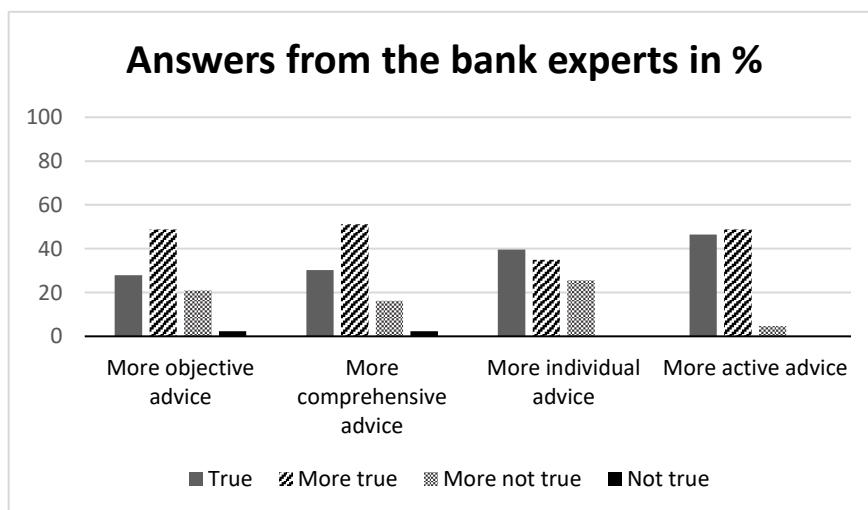


Figure 6. Answer of the bank experts

Source: Compiled by the authors.

Big Data Analytics ensures more objective advice

There were four possible answers to the question "Big Data Analytics provides more objective advice": [1] Applicable, [2] Somewhat applicable, [3] Somewhat not applicable and [4] Not applicable (see Figure 25). As the diagram shows, 27.91% of the interview participants chose the answer "Applies", 48.84% of the interview participants chose the answer "Rather applies", 20.93% of the interview participants chose the answer "Rather does not apply" and 2.33% of the interview participants chose the answer "Does not apply".

Big Data Analytics ensures more comprehensive advice

There were four possible answers to the question "Big Data Analytics provides more comprehensive advice": [1] Applicable, [2] Somewhat applicable, [3] Somewhat not applicable and [4] Not applicable (see Figure 26). As the graph shows, 30.23% of the interview participants chose the answer "Applies", 51.16% of the interview participants chose the answer "Somewhat applies", 16.28% of the interview participants chose the answer "Somewhat does not apply" and 2.33% of the interview participants chose the answer "Does not apply".

Big Data Analytics ensures more individualised advice

There were four possible answers to the question "Big Data Analytics provides more individualised advice": [1] Applicable, [2] Somewhat applicable, [3] Somewhat not applicable and [4] Not applicable (see Figure 27). As the graph shows, 39.53% of the interview participants chose the answer "Applies", 34.88% of the interview participants chose the answer "Somewhat applies", 25.58% of the interview participants chose the answer "Somewhat does not apply" and 0% of the interview participants chose the answer "Does not apply".

Big Data Analytics ensures more active consultation

There were four possible answers to the question "Big Data Analytics ensures more active counselling": [1] Applicable, [2] Somewhat applicable, [3] Somewhat not applicable and [4] Not applicable (see Figure 28). As the graph shows, 46.51% of the interview participants chose the answer "Applies", 48.84% of the interview participants chose the answer "Somewhat applies", 4.65% of the interview participants chose the answer "Somewhat does not apply" and 0% of the interview participants chose the answer "Does not apply".

Information on the strategic necessity of big data analytics

In response to the question "Do you agree with the statement that investments in big data analytics - projects for banks in Germany in the age of digitalization, are strategically necessary and recommendable?", the survey participants were asked to vote [1] yes or [2] no. Among the 43 interview participants, all 43 subjects answered "Yes" and no one answered "No" (see Figure 7).

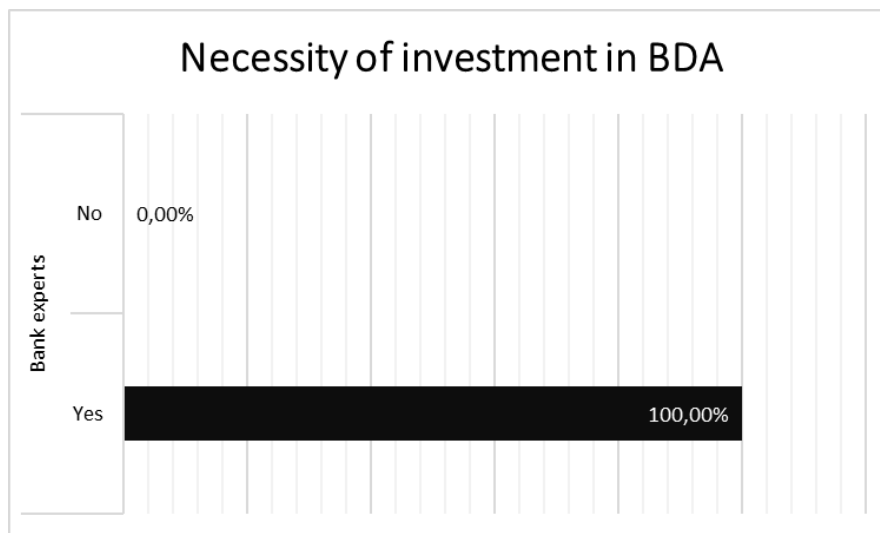


Figure 7. Necessity of investments in BDA

Source: Compiled by the authors.

Hypotheses and Methodology

Within the framework of inductive statistics, the statistical software "R" was used to be able to disprove or prove hypotheses with statistical tests. These statistical tests were carried out with a significance level $\alpha =$

0.05. For the data preparation, the data of the answers from the interviews were documented in an Excel file and the values of the Likert scale were coded numerically (e.g. "agree" value 1 and "disagree" value 4). The expressions of the questions with answer options "yes" and "no" were coded in binary. In the context of this research section, various statistical tests were applied and selected according to the respective scale level.

Statement 1:

From the perspective of the banking experts, big data analytics ensures higher customer loyalty.

The interview participants answered the questions independently of each other. Therefore, the answers to the questions can be modelled as a "Bernoulli" distributed random variable. The probability that a banking expert answers positively to this question is referred to as p_{pos} .

Hypothesis: $H_0 : p_{\text{pos}} \leq 0.5$

The probability of a randomly selected banking expert answering positively to the question about customer loyalty is ≤ 0.5 (less than 50% of participants).

Alternative hypothesis: $H_1 : p_{\text{pos}} > 0.5$

The probability of a randomly selected banking expert answering positively to the question about customer loyalty is > 0.5 (more than 50% of participants).

To answer the hypothesis, an (exact) binomial test is performed. The test variable is the number of positive responses and binomially distributed under the hypothesis (with $p = p_{\text{pos}}$ and $n=43$).

Exact binomial test

```
data: Kundenbindung_Bankberater and Anzahl_Bankberater
number of successes = 39, number of trials = 43, p-value
= 1.554e-08
alternative hypothesis: true probability of success is greater than 0.5
95 percent confidence interval:
 0.7996407 1.0000000
sample estimates:
probability of success
 0.9069767
```

Result:

The hypothesis was statistically refuted as the p-value is < 0.05 .

Big Data Analytics ensures higher customer loyalty from the perspective of banking experts.

Statement 2:

From the perspective of the banking experts, big data analytics ensures more objective advice.

What is being investigated: "How big is the influence of more objective advice on the question of higher customer loyalty?"

Procedure for statements 2, 3, 4 and 5:

There is a statement for each of the 43 bank experts regarding more objective, more comprehensive, more individual and more active advice. It is known which of the bank experts have come to the assessment that BDA ensures higher customer loyalty and which have not. According to this assessment, the bank experts can be dichotomised. The aim is to test whether there is a significant difference in the answers to the question (more objective, more comprehensive, more individual and more active advice).

Background: 43 bank experts answered "yes" or "no" to the question whether BDA ensures higher customer loyalty. So, there are two groups, on the one hand the "yes" and on the other the "no" respondents. Now it can be compared whether both groups would have answered the question about more objective, more

comprehensive, more individual and more active advice in roughly the same way. It would be plausible if the "yes" answerers would also argue for more objective, comprehensive, individualised and active counselling.

What is now being tested is the question of a difference between the two groups. Since the Wilcoxon rank-sum test is a non-parametric test, no formulae can be used as hypotheses. The test checks whether the two same groups are from the population.

Hypothesis: Both groups are from the same population. This means that means that the two groups formed would, on average, answer the question similarly. would answer the question similarly.

Alternative hypothesis: Both groups do not come from the same population.

To answer the hypothesis, a Wilcoxon rank-sum test is chosen because there is an ordinal scale level (Likert scale) with ranking.

```
wilcoxon rank sum test with continuity correction
```

```
data: objektivere_pro_Kundenbindung and objektivere_contra_Kundenbindung
W = 64, p-value = 0.5411
alternative hypothesis: true location shift is not equal to 0
```

Result:

The p-value is > 0.05 . The test shows that the hypothesis cannot be rejected.

More objective advice has no impact on customer loyalty.

Statement 3:

From the point of view of the banking experts, Big Data Analytics ensures more comprehensive advice.

What is being investigated: "How big is the influence of more comprehensive advice on the question of higher customer loyalty?"

Hypothesis: Both groups are from the same population. This means that means that the two groups formed would, on average, answer the question similarly. would answer the question similarly.

Alternative hypothesis: Both groups do not come from the same population.

To answer the hypothesis, a Wilcoxon rank-sum test is chosen because there is an ordinal scale level (Likert scale) with ranking.

```
wilcoxon rank sum test with continuity correction
```

```
data: umfassendere_pro_Kundenbindung and umfassendere_contra_Kundenbindung
W = 117, p-value = 0.07805
alternative hypothesis: true location shift is not equal to 0
```

Result:

The p-value is > 0.05 . The test shows that the hypothesis cannot be rejected.

More comprehensive advice has no impact on customer loyalty.

Statement 4:

From the point of view of the banking experts, big data analytics ensures more individualised advice.

What is being investigated: "How big is the influence of more individualised advice on the question of higher customer loyalty?"

Hypothesis: Both groups are from the same population. This means that means that the two groups formed would, on average, answer the question similarly. would answer the question similarly.

Alternative hypothesis: Both groups do not come from the same population.

To answer the hypothesis, a Wilcoxon rank-sum test is chosen because there is an ordinal scale level (Likert scale) with ranking.

wilcoxon rank sum test with continuity correction

```
data: individuellere_pro_Kundenbindung and individuellere_contra_Kundenbindung
W = 253, p-value = 0.5591
alternative hypothesis: true location shift is not equal to 0
```

Result:

The p-value is > 0.05 . The test shows that the hypothesis cannot be rejected.

More individualised advice has no impact on customer loyalty.

Statement 5:

From the point of view of the banking experts, big data analytics ensures a more active advisory service.

What is being investigated: "How big is the influence of more active counselling on the question of higher customer loyalty?"

Hypothesis: Both groups are from the same population. This means that means that the two groups formed would, on average, answer the question similarly. would answer the question similarly.

Alternative hypothesis: Both groups do not come from the same population.

To answer the hypothesis, a Wilcoxon rank-sum test is chosen because there is an ordinal scale level (Likert scale) with ranking.

Result:

wilcoxon rank sum test with continuity correction

```
data: aktivere_pro_Kundenbindung and aktivere_contra_Kundenbindung
W = 73, p-value = 0.8316
alternative hypothesis: true location shift is not equal to 0
```

The p-value is > 0.05 . The test shows that the hypothesis cannot be rejected.

More active counselling has no influence on customer loyalty from the point of view of the banking experts.

Statement 6:

The age of the bank experts does not play a role in the evaluation of customer loyalty.

The interview participants answered the question about age independently of each other.

The mean age of the banking experts who answered positively to the question about higher customer loyalty through BDA is referred to as μ_{pos} . Analogously, the mean age of the banking experts who answered negatively is defined as μ_{neg} .

Now we want to test whether the interview participants who answered positively and those who answered negatively are the same age on average.

Hypothesis: $H_0 : \mu_{\text{neg}} = \mu_{\text{pos}}$

Alternative hypothesis: $H_1 : \mu_{\text{neg}} \neq \mu_{\text{pos}}$

To answer the hypothesis, a (two-sided) t-test is conducted. The test variable is the standardised difference of the means. Under the hypothesis, the test variable is "Student-t-distributed".

It is assumed that there is no significant age difference between banking experts who answered positively and negatively on the question of customer loyalty. Therefore, the Welch approximation of the degrees of freedom is used.

welch Two sample t-test

```

data: Alter_Kundenbindung and Alter_keine_Kundenbindung
t = -0.39381, df = 3.7284, p-value = 0.7152
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -12.333104  9.345925
sample estimates:
mean of x mean of y
 38.25641  39.75000
    
```

Result:

The hypothesis was statistically confirmed as the p-value is > 0.05 .

The age of the bank experts does not play a role in the evaluation of customer loyalty.

Discussion on Research

Research question I: *Does big data analytics improve the quality of advice from an advisor's perspective (measured against the principles of client advisory services) and has an impact on client retention?* can be answered as follows.

The majority of the bank experts agreed with the statement whether big data analytics provides more objective, comprehensive, individualised and active advice. It was proven that Big Data Analytics increases customer loyalty from the point of view of the bank advisors (91% of the test persons answered the question about higher customer loyalty through BDA in the affirmative). And it can be stated that the age of the subjects did not play a significant role in answering the questions about customer retention. The authors would have assumed that older test persons would be able to answer the question in the negative to a greater extent, which was not the case.

What was subsequently investigated was whether the "yes" and "no" respondents to the question about higher customer loyalty answered differently to the questions about more objective, more comprehensive, more individual and more active counselling. This is to assume whether the counselling aspects have an influence on customer loyalty or not. Since the "Yes" and "No" respondents answered the questions about better advice similarly on average, it can be assumed that the principles of customer advisory services (more objective, more comprehensive, more individual and more active advice) do not have a direct influence on customer loyalty.

It can be assumed that the banking experts consider the use of big data analytics alone as a success driver for customer retention under aspects of customer centricity. From the authors' point of view, it would be advisable to understand the confirmed better customer advice through BDA also with the goal of higher customer retention. Here, personnel development measures for bank advisors would be advisable in order to internalise the importance of the principles of customer advisory services in the BDA and Customer Centricity context in order to strive for higher customer retention.

Research question II: *To what extent can big data analytics make a positive contribution to the situation of banks in Germany in the age of digitalization?* can be answered unanimously with "yes". The interview participants confirmed that they consider investments in big data analytics projects to be strategically necessary and recommendable for German banks in the age of digitalization. The authors had not expected this unanimity and had reckoned with more conservative responses.

Conclusions

From the perspective of banking experts, big data analytics can be considered an elementary customer loyalty instrument for German banks (see Figure 8). Investments in Big Data Analytics projects are strategically necessary and recommendable for banks in Germany in the age of digitalization. The relevance of the findings on this scientific problem is that the effectiveness of customer retention could be answered from the advisor perspective. This quantitative study proved that the use of BDA can provide for increased advisory quality and customer retention from the perspective of bank advisors in Germany. The age of the test persons did not play a role in answering the question about customer retention.

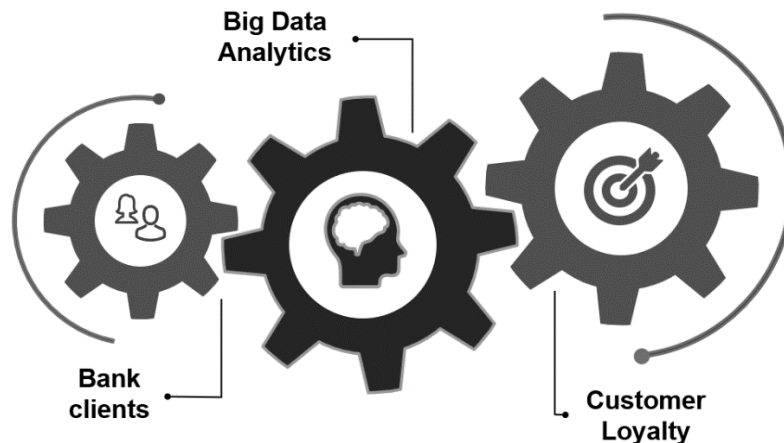


Figure 8. BDA as an elementary customer loyalty instrument

Source: Compiled by the authors.

In the digital age, the demands on the social skills of the workforce are increasing once again. On the other hand, many years of professional experience with its positive advantages, such as increased soft and communication skills, are being called into question, as even successful start-ups are predominantly founded by young people without extensive professional experience (Hammermann & Stettes, 2016). When using BDA as an elementary customer loyalty instrument, it is therefore important to make the strategy tangible and to involve all employees. From the intern to the managing director, every employee should be able to demonstrate digital competences and be willing to develop them further (Giebe, 2019; Mavlutova & Volkova, 2019; Nenninger & Seidel, 2021). It could be of further scientific interest to investigate which strategic aspects and which digital competences are essential for the successful use of BDA as a customer loyalty instrument in order to ensure the concrete reference to the principles of the customer relationship from the perspective of the advisors.

Limitations of research

According to Wetzker & Strüven (2016), questionnaires are often not structured in a targeted way. Furthermore, they are sometimes only filled out superficially. They rarely contain control questions that check the consistency of the statements. The results are descriptive and not explanatory. In sum, results are noisily derived and communicated from an unfinished procedure (Wetzker & Strüven, 2016). This research has to face this methodological critique, as no deeper analysis is possible. However, the quantitative methods used offer exact results in the form of statistically evaluable figures. Therefore, a high degree of objectivity and comparability of the results can be achieved.

With N=43, a sufficiently large sample was selected within the framework of the standardised interviews. However, the survey is not fully representative. The reason is that the banking experts come from the authors' personal network and may be of similar age and regionally distributed. Here the realization has matured that in follow-up studies, for example, a differentiation according to bank groups, federal state, age distribution in the Federal Republic would make sense. However, due to the expert status of the interview partners, this study can be considered a well-founded thesis in the view of the authors. In the context of further research, this thesis could be investigated with a representative survey.

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Conceptualization: Giebe, C., Zwerenz, D. & Hammerström, L., methodology: Giebe, C., Zwerenz, D. & Hammerström, L., validation: Giebe, C., Zwerenz, D. & Hammerström, L., formal analysis: Giebe, C., Zwerenz, D. & Hammerström, L., investigation: Giebe, C., Zwerenz, D. & Hammerström, L., resources: Giebe, C., Zwerenz, D. & Hammerström, L., data curation: Giebe, C., Zwerenz, D. & Hammerström, L., writing – original draft preparation: Giebe, C., Zwerenz, D. & Hammerström, L., writing – review & editing:

Giebe, C., Zwerenz, D. & Hammerström, L., visualization: Giebe, C., Zwerenz, D. & Hammerström, L., supervision: Giebe, C., Zwerenz, D. & Hammerström, L., project administration: Giebe, C., Zwerenz, D. & Hammerström, L.

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