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Web-Based Financial Ratio Application Program Design for Facilitating MSMEs in Managing Business Finances in the Digital Era

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abstract

This research aims to design a web-based Financial Ratio Application Program to facilitateSmall and Medium-sized Enterprises (UMKM) in managing their business finances in the digital era using Extreme Programming. In the context of existing research, traditional financial management methods are no longer sufficient for UMKM's needs in the digital age. Therefore, this study employs Extreme Programming as the research method, which ensures rapid development, flexibility, and customer-centricity. The main results of this research demonstrate a novel contribution by providing an innovative web application that empowers UMKM owners to efficiently calculate and analyze financial ratios, aiding them in making informed financial decisions. This application offers an intuitive user interface, real-time data updates, and customizable features tailored to UMKM requirements, ultimately enhancing their financial management capabilities.

Keywords: Financial Ratio Application, Web-based, UMKM, Digital Era, Extreme Programming.

1. INTRODUCTION

MSMEs have a very important role in the economy, because they employ a lot of labor and produce many products and services. It is important for MSMEs to know their financial condition and analyze financial ratios regularly to ensure success. Financial ratioanalysis also

helps identify financial problems and trends, MSMEs are suitable to use liquidity, solvency, activity, and profitability ratios because these ratios provide important information about the financial performance of MSMEs.

Based on the results of research and discussion of factors that affect business continuity, it can be concluded that solvency, profitability, and liquidity together have an effect (positive and significant) on the business continuity of Culinary MSMEs 212 BatamCity. In detail, Solvency has an effect (negative and significant) on business continuity, Profitability has an effect (positive and significant) on business continuity, Liquidity has an effect (positive and significant) on business continuity, and Profitability is the factor that most affects the business continuity of MSME actors Culinary 212 Batam City (Putri,2017).

Analysis of MSME financial ratios helps understand the performance and financial condition of a company, helps make the right business decisions, and ensures business success in the long run. In measuring the company's financial performance using financial ratios, it can be done with several financial ratios. Every financial ratio has a measured ratio interpreted so that it becomes meaningful to decision making (Karhab RS, 2022)

The condition of assets, debt, capital, cash flow, and fluctuations in MSME profits can be easily known, thus helping MSME players in making important business decisions, such as the purchase of new assets and business development plans. Good financial management will also improve aspects of business control, where MSME actors can find out whether their financial plans are achieved or not and help find out the cause. Likewisewith the capital aspect, having an orderly financial administration will facilitate MSMEs in applying for capital loans to banks or other financial institutions (Fauzi, 2020)

In this problem, extreme programming (XP) methods are used to develop software applications that help MSMEs in analyzing financial statements. XP is an agile approach that emphasizes intensive interaction between the development team and stakeholders,rapid change, responsiveness to changing user needs, and iterative testing. XP is considered the optimal method to overcome this problem because it provides flexibility in system development according to user needs and can be used well in the developmentof object-oriented systems. As a result, XP is considered a good choice for developing responsive and user-oriented software applications (Suryantara IGN, 2018)

Extreme programming (XP) simplifies software development, focuses on collaboration, iterates, and is responsive to customer needs. Unlike traditional methods that emphasize documentation, XP allows quick and flexible changes and improvements in software development (Novaliendry D, 2022). This research aims to create a special

application for MSMEs to design financial ratio web applications with the application of the Extreme Programming method to improve the effectiveness of MSME financial management, facilitate understanding of financial ratios, and improve the performance and competitiveness of MSMEs in the digital era. The Extreme Programming (XP) methodis one software development method that has proven effective in overcoming this challenge. XP emphasizes close collaboration between developers and stakeholders, rapid changes in development, and repeated testing. This method has been widely used in software development projects and can be the right solution in developing financial management applications for MSMEs in the digital era.

Therefore, this study aims to design and develop a web-based financial ratio application program that uses the Extreme Programming (XP) method with the aim of helping MSMEs manage their business finances more efficiently and effectively in the digital era. This research will consider the challenges faced by MSMEs in financial management and how the use of XP can overcome these challenges to provide solutions that are more adaptive and responsive to the changing needs of MSMEs in the dynamic digital era. Thus, this research will make a significant contribution to the understanding and ability of MSMEs in managing their business finances in the digital era, while incorporating innovative software development methods such as Extreme Programming.

2. LITERATURE REVIEW

2.1 MSME Financial Ratio Analysis

Financial ratio analysis is a technique used to assess the financial performance of a company by comparing various financial ratios calculated from financial data contained in the company's financial statements. Financial ratios describe the relationship betweentwo or more items in financial statements, such as balance sheets, income statements, orcash flow statements (Wardana LK, 2022) (Parwoto P, 2019). Here are some financial ratios that are often used in financial statement analysis: 1) Liquidity ratio: The liquidityratio measures a company's ability to pay short-term liabilities with its current assets. 2)Profitability ratio: The profitability ratio measures a company's ability to make a profit from sales. 3) Solvency ratio: The solvency ratio measures a company's ability to pay long-term liabilities with its long-term assets. 4) Activity ratio: The activity ratio measures the efficiency of a company in using its assets to generate sales. Financial ratio apps have become a useful tool in analyzing the financial health of a business. Study by Smith (2017) and Jones (2020) Describes how financial ratios are used in business practices to measure liquidity,

profitability, and financial stability. However, the implementation of web-based financial ratio applications in the context of MSMEs still needs to be further analyzed.

2.2 Web-Based Applications

(Patel, 2019) This reference discusses the impact of web-based applications on business efficiency, and can explore how web-based applications can help MSMEs improve the efficiency of their financial management by facilitating access and analysis of financial data. (Johnson, 2020) This research deals with how MSMEs can utilize web- based tools in their financial management. So that it is able to explore how web-based applications can change the way MSMEs manage their finances, especially in terms of reporting and monitoring.

(Anderson, 2021)This reference discusses web-based financial tools in the contextof comparative analysis, can examine the way web-based financial ratio applications are designed compared to similar tools in terms of functionality and benefits for MSMEs. (Lee, 2021) This research discusses the usability (ease of use) of web-based applications. So that it can explore how usability aspects can affect the adoption and effectiveness of web-based financial ratio applications among MSMEs.

Research by Beck (2000) and Martin (2003) explains the principles of XP and this approach in software development. The use of XP in developing web-based financial ratio applications for MSMEs can be an important innovation in this context. A large amount of literature emphasizes the importance of digital tools and applications in addressing the financial management needs of MSMEs. Researchers (Brown & Lee, 2018; Chen et al., 2021) has been exploring how web-based applications can empower MSMEs to make data-driven financial decisions, track performance, and ensure financial sustainability. The theme that appears in the literature is the impact of web-based financial ratio applications developed using Extreme Programming on MSMEs. Researchers (Wang & Liu, 2021; Kim & Park, 2022) has explored the results, including improved financial decision making, better financial performance, and increased competitiveness resulting from the implementation of such tools.

2.3 Extreme Programming (XP)

Extreme Programming (XP) is a software development methodology that emphasizes rapid, adaptive, and customer-oriented development. XP focuses on developing high- quality software and prioritizing customer needs by actively involving customers in the

development process (11–14). Recent research has recognized the value of agile development methodologies, especially Extreme Programming, in the context of developing software applications for MSMEs. Research by Prabowo dan Kuswanto (2019) and Gupta et al. (2020) has demonstrated that XP's iterative, collaborative, and responsive approach fits the rapidly changing requirements and needs of MSMEs.

In XP, the development team works collaboratively and organized, focusing on developing high-quality, fast, and adaptive software. XP also puts customer needs first, allowing software developers to produce products that better meet customer needs.

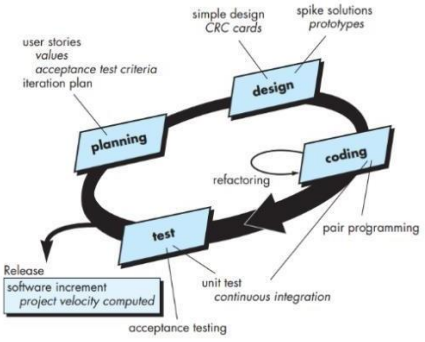

Figure 1 Stages Extreme Programming

In previous research by (Azdy and Rini, 2018), it was found that software development by applying extreme programming allows rapid development. They start by building the simplest components first, such as account verification, and then move on with the other components. The test was carried out using the black box method.

Other relevant research on the use of Extreme Programming by (Prabowo, *et al*, 2020) states that Extreme Programming is necessary due to rapid changes in application requirements during the development process. They perform the planning stages with problem identification and needs analysis, then proceed to design using UML diagrams, coding processes, and functionality and reusability testing. As a result, Extreme Programming helps make it easier for users to solve existing problems.

Gupta, R. (2017) Case studies covering the application of XP in the context of software development projects for small and medium-sized businesses. This reference can provide insight into the use of XP in application development that is appropriate to the scale of MSMEs. Smith, J. (2021) This research may include XP applications in software development

for small businesses. Can evaluate how XP affects the results of development projects and their application in the context of MSMEs.

3. RESEARCH METHOD

This research uses a type of qualitative research, which is a research that takes the design of a case study, which is research that describes a case that is studied in depth about humans or events whose data is obtained from interviews, observations, and documentation (Alakel, 2019). This research data can include qualitative data (such as interviews with MSME stakeholders) and technical data (such as application usage data).The sources of this research data include MSMEs that will use web-based financial ratio applications, as well as documentation related to application development. The datacollected by the author is about examples of financial data contained in the balance sheetand profit and loss, namely Current Assets, Current Liabilities, Inventory, Accounts Receivable, Cash and Banks, Net Income, Equity, Sales, Total Assets, Debt. Informants or respondents will be selected based on relevant criteria, such as MSME owners whoactively manage their business finances or application development team members. The research instrument involves the development of web-based financial ratio applications using the Extreme Programming (XP) method.

Data will be collected through observation of application usage, interviews with MSME owners, and monitoring the application development process using the XP method. The theoretical framework used may include concepts related to MSME financial management, software development with XP methods, and theories related to the use ofweb-based applications.

Data analysis will involve qualitative analysis to understand user views and experiences as well as technical analysis to evaluate application performance. Such as Document Content Analysis, Financial Ratio Analysis, Conclusion Drawing, Data analysis results will be used as a foundation for designing web-based financial ratio application designs. This design must reflect the needs and preferences of MSMEs, and provide solutions that are in accordance with the challenges faced in managing finances in the digital era. To ensure the credibility of the data, triangulation techniques will be used, bycombining data from various sources such as interviews, observations, and application testing results. In addition, audit trails and peer debriefings can be used to ensure data accuracy and reliability.

4. RESULT AND DISCUSSION

This research data was collected from the financial statements of MSMEs of True Rose Flower Shops which were the object of research. The sample data taken includes various important information contained in the financial statements. The data collected includes Current Assets, Current Liabilities, Inventory, Accounts Receivable, Cash and Banks, Net Income, Equity, Sales, Total Assets, Debt, Interest paid, and Cost of Goods Soldfor Reporting Year 2022.

All the data that has been collected is the main basis in the simulation process of making a financial statement ratio analysis application. By using valid and accurate data from the financial statements of MSMEs, as an effort to develop a reliable and useful financial ratio analysis application. This application is expected to help MSME owners or related parties to easily analyze the financial health of MSMEs and make better decisionsin managing their businesses.

In this study, various financial ratio methods were used to carefully analyze the financial health of MSMEs. The financial ratio methods applied include *Current Ratio, Quick Ratio, Return on Equity (ROE), Return on Assets (ROA), Gross Profit Margin, Debt to Equity Ratio,* and *Net Profit Margin*. The data obtained in this study includes informationon Current Assets, Current Liabilities, Inventory, Accounts Receivable, Cash and Banks, Net Profit, Equity, Sales, Total Assets, Debt, and Interest paid.

In addition, the results of this financial ratio analysis are expected to provide benefits for MSME owners, related parties, and interested parties in helping MSMEs achieve success and sustainability in running their businesses. Here is the financial information of MSMEs for the 2022 Report Year:

1. Current Assets : IDR 500,000,000
2. Current Liabilities :IDR200,000,000
3. Inventory : IDR 100,000,000
4. Accounts Receivable : IDR50,000,000
5. Cash and Bank : IDR 150,000,000
6. Net Profit : IDR 80,000,000
7. Equity : IDR 350,000,000
8. Sales : Rp 800.000.000
9. Total Assets : IDR 900,000,000
10. Debt : IDR 150,000,000
11. Interest paid : IDR 20,000,000

12. Cost of Goods Sold : Rp. 600.000.000

After calculating several important financial ratios that provide a more in-depth picture of the financial health of the True Rose Flower Shop in 2022 which will be included in the calculation of financial ratios, namely Current Ratio, Quick Ratio, Return on Equity (ROE), Return on Assets (ROA), Gross Profit Margin, Debt to Equity Ratio, Net Profit Margin. The following are the results of calculating important financial ratios fromthe data in the balance sheet and profit and loss:

1. Current Ratio:
   Current Ratio = Current Assets / Current Liabilities
   Current Ratio = Rp 500.000.000 / Rp 200.000.000
   Current Ratio = 2,5
2. Quick Ratio:
   Quick Ratio = (Current Assets - Inventory) / Current Liabilities
   Quick Ratio = (Rp 500.000.000 - Rp 100.000.000) / Rp 200.000.000
   Quick Ratio = 2
3. Return on Equity (ROE):
   ROE = (Net Income/Equity) x 100
   ROE = (IDR 80,000,000/IDR 350,000,000) x 100
   ROE = 22,86%
4. Return on Assets (ROA):
   ROA = (Net Profit/Total Assets) x 100
   ROA = (Rp 80.000.000 / Rp 900.000.000) x 100 x 100
   TWO = 8,89%
5. Gross Profit Margin:
   Gross Profit Margin = (Sales - Cost of Goods Sold)/Sales
   Gross Profit Margin = (Rp 800.000.000 – Rp. 600.000.000)/Rp 800.000.000
   Gross Profit Margin = 0,25
6. Debt to Equity Ratio:
   Debt to Equity Ratio = Utang/Ekuitas
   Debt to Equity Ratio = Rp 150.000.000/Rp 350.000.000Debt
   to Equity Ratio = 0,43
7. Net Profit Margin:
   NPM = (Net Profit/Sales)

NPM = (IDR 80,000,000/IDR 800,000,000) x 100
NPM = 0,1 x 100
NPM = 10%

Use case diagrams are a type of UML (Unified Modeling Language) diagrams used to illustrate interactions between actors (users or external systems) and systems in an application or software system. The elements contained in the diagram are Actors, Use Cases, Relationships and Systems. These actors are users of financial ratio applications, such as financial analysts, financial managers, or company executives. They will interact with the app to access financial ratio reports and analysis.

Use Cases such as Input Ratio Component Values, View Ratio Reports, and Generate Ratio Graphs. The ratio component value input is used to fill in the values of the components that make up the ratio value. View the ratio report to see the company's financial ratio. Produce ratio graphs to produce graphs or other visualizations of financialratios in a more understandable form. These diagrams help development teams and stakeholders understand key interactions between users and apps, financial ratios, and what functionality should be present in those apps to meet user needs. The use case diagram of financial ratio application is shown in figure 2.

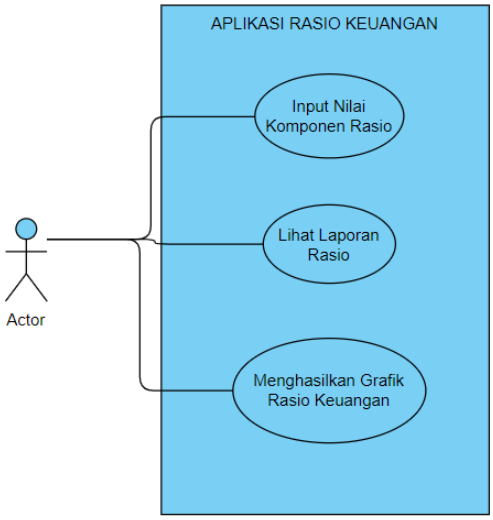

Figure 2 Use Case Financial Ratio Application Diagram

4.1 Database Design

Store admin data that has access and control over the system. The id_admin column is the primary key that serves as a unique identifier for each admin. The fields nama_admin, nama_lengkap_admin, username, password, and level_admin used to store admin-related information.

Table 1tb_admin

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
id_admin	int	11	AUTO_INCEREMENT	Primary Key
nama_admin	varchar	30		
nama_lengkap_admin	varchar	50		
username	varchar	30		
password	varchar	30		
level_admin	varchar	30		

Keep a list of accounts used in the accounting process. The kode_akun column is the primary key used to uniquely identify each account. The nama_akun field is used to storea clearer or descriptive account name.

Table2. tb_index

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
kode_akun	varchar	20		Primary Key
nama_akun	varchar	100		

Stores a list of indexes used in the accounting process. The id_index column is the primarykey used to uniquely identify each index. The caption field is used to store index-related information or descriptions.

Table 3tb_index

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
id_index	varchar	20		Primary Key

Keep a list of activities performed by a unit or department. The id_kegiatan column is the primary key used to uniquely identify each activity. The id_unit column connects

activities with specific units or departments. The nama_kegiatan column is used to storethe activity name.

Table 4tb_kegiatan

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
id_kegiatan	int	11	AUTO_INCREMENT	Primary Key
id_unit	int	11		
nama_kegiatan	varchar	50		

Store data on financial transactions that occur in the accounting system. The id_jurnal column is the primary key used to uniquely identify each journal. The id_transaksi field is used as a unique identifier for each transaction. The date field stores the date of the transaction. The id_kegiatan, kode_akun, id_index columns connect transactions with related activities, accounts, and indexes. Description, debit, and credit fields are used to store detailed information about transactions.

Table 5tb_transaksi

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
id_jurnal	int	11	AUTO_INCREMENT	Primary Key
id_transaksi	char	14		
tanggal	date			
id_kegiatan	int	11		
kode_akun	varchar	20		
id_index	varchar	20		
keterangan	varchar	255		
debet	int	11		
kredit	int	11		

Store unit or department data related to activities and transactions. The id_unit column is the primary key used to uniquely identify each unit. The nama_unit column stores the name of the unit or department. The jenis_usaha column is used to store information about the type of business or activity carried out by the unit.

Table 6 tb_Unit

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
id_unit	integer	11	AUTO_INCREMENT	Primary-key
nama_unit	varchar	30		
jenis_usaha	varchar	100		

Store user data or users who have access to the system. The id_user column is the primary key used to uniquely identify each user. The nama_user, nama_lengkap_user, username, password, id_unit, and level_user fields are used to store information related to a user, including the unit or department associated with that user.

4.2 System Implementation

A login page (Figure 2) is a web page or interface designed to allow users to accessa particular system or service using valid credentials, such as a username and password.Its function is to authenticate users and grant access permissions to restricted areas or

Table 7 tb_user

Nama	Tipe Data	Panjang Data	Keterangan	Nama Kunci
id_user	integer	11	AUTO_INCREMENT	Primary-key
nama_user	varchar	30		
nama_lengkap_user	varchar	50		
username	varchar	30		
password	varchar	30		
id_unit	integer	11		
level_user	varchar	30		

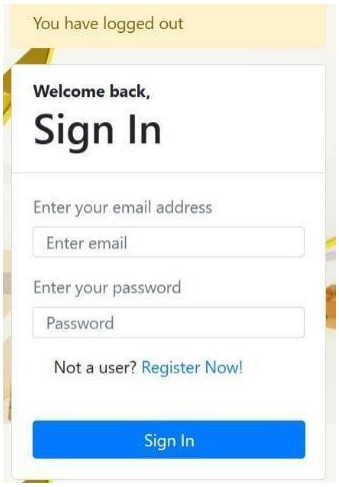

Figure 3 Halaman Login

The dashboard page (Figure 3) of a financial ratio application is a graphical or summarydisplay that presents data and information related to the financial performance of a company or business entity using various financial ratios. The purpose of this dashboard page is to helpusers, such as management, financial analysts, or shareholders, understand and analyze a company's financial health quickly and efficiently. Some common elements that may be present on the dashboard page of a financial ratio application are: (a) Financial Ratio Charts: Various graphs and data visualizations can be used to present relevant financial ratios.Examples of financial ratios that are often displayed include profitability ratios (such as Returnon Equity, Return on Assets), liquidity ratios (such as Current Ratio, Quick Ratio), debt ratios(such as Debt-to-Equity Ratio, Debt-to-Assets Ratio), and more. (b) Summary of Numbers: The dashboard may present key figures of important financial ratios in tabular form or prominent figures. This helps users get a quick picture of the company's financial performance. (c) Historical Trends: Historical trend charts can show changes in financial ratios over time.This helps users see the company's Long-term performance patterns. It is important to design a financial ratio dashboard with a clear layout, easy-to- understand information, and attractive visual appearance in order to provide valuable information for users. This helps them in making better business decisions based on thecompany's reliable financial performance.

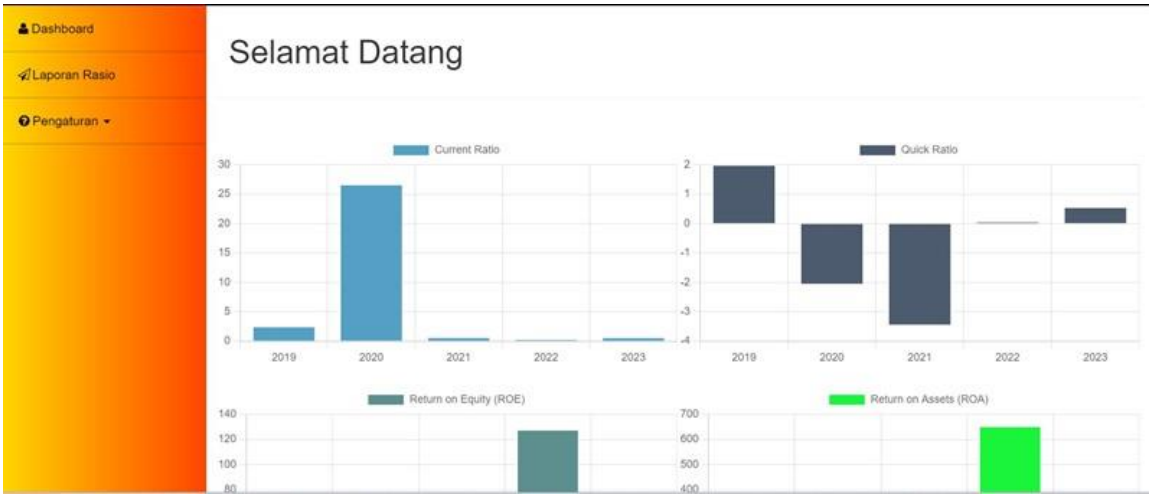

Figure 4 Halaman Dashboard

The financial ratio application input page (Figure 4) is a page in an application or software used to enter financial data of a company or organization to calculate and analyze financial ratios. Financial ratios are important indicators used to evaluate the financial health of an entity, including companies, banks, or other organizations. These inputs include the value of Current Assets, Current Liabilities, Inventory, Net Income, Equity, Total Assets, Sales, COGS, Debt, and Year.

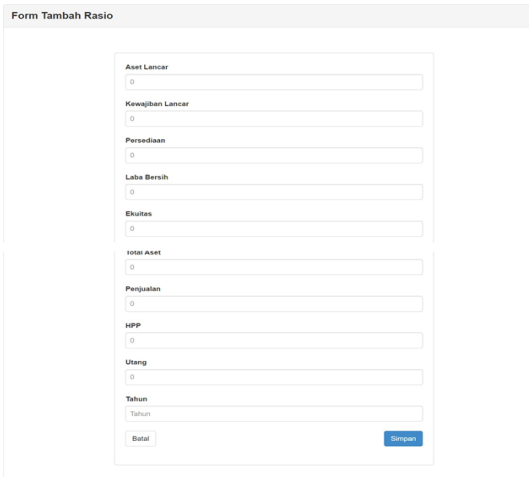

Figure 5 Input Rasio Keuangan

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The financial ratio application report page (Figure 5) is a web page or interface ina financial application that displays information about the various financial ratios of a company or entity. Financial ratios are an analytical tool used to evaluate the financial health of a company and provide insight into its financial performance and stability. Financial ratios displayed on this page include *Current Ratio, Quick Ratio, Return on Equity(ROE), Return on Assets (ROA), Gross Profit Margin, Debt to Equity Ratio, and Net Profit Margin*. On this page also added some graphs of financial ratios (Figures 6 and 7)mentioned earlier to give an idea of the trend of financial ratios per year.

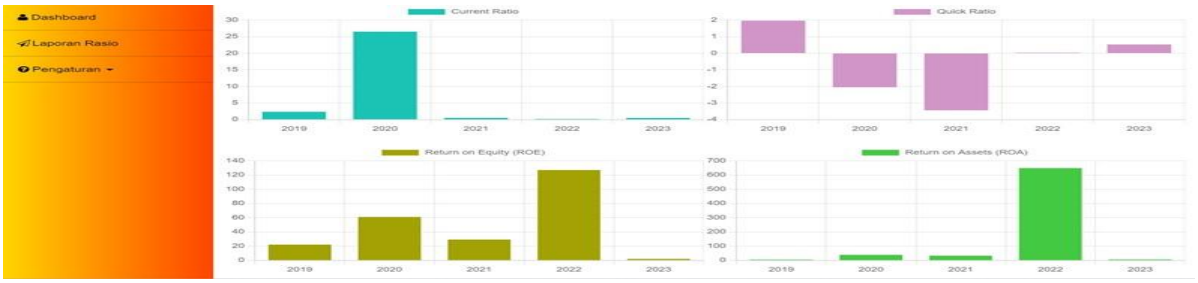
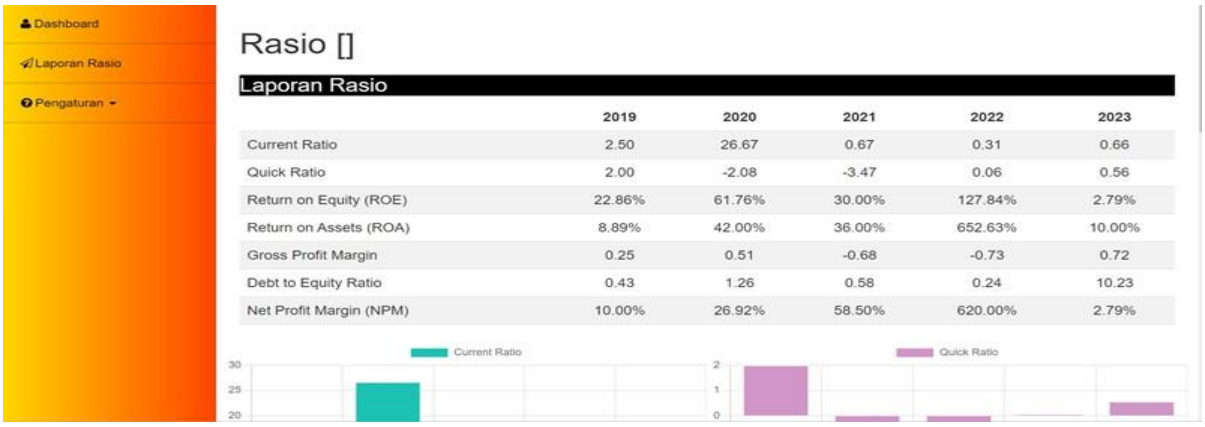


Figure 6 Laporan Rasio Keuangan



Laporan Rasio	2019	2020	2021	2022	2023
Current Ratio	2.50	26.67	0.67	0.31	0.66
Quick Ratio	2.00	-2.08	-3.47	0.06	0.56
Return on Equity (ROE)	22.86%	61.76%	30.00%	127.84%	2.79%
Return on Assets (ROA)	8.89%	42.00%	36.00%	652.63%	10.00%
Gross Profit Margin	0.25	0.51	-0.68	-0.73	0.72
Debt to Equity Ratio	0.43	1.26	0.58	0.24	10.23
Net Profit Margin (NPM)	10.00%	26.92%	58.50%	620.00%	2.79%

Figure 7 Grafik Rasio Keuangan Current Ratio, Quick Ratio, ROE, ROA

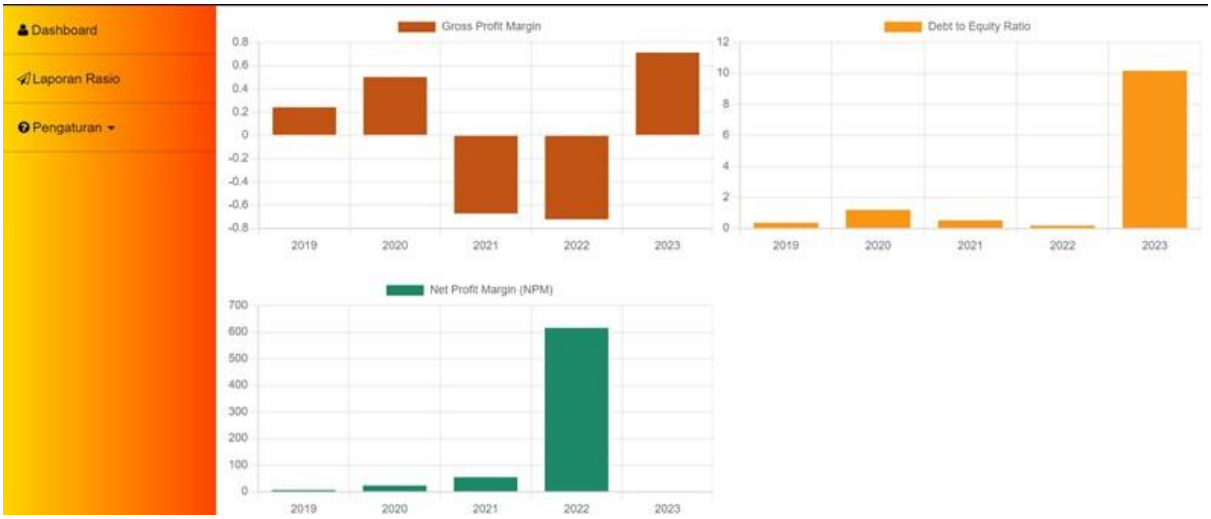


Figure 8 Grafik Rasio Keuangan Gross Profit Margin, Debit to Equity Ratio, dan Net Profit Margin

The next stage of this research is to refine the functionality of the financial ratio application that has been built. In addition, the application that is built needs to be tested for functionality using the Blacknox testing method. This test is to see the suitability of the system made according to needs. The format for system testing uses the following table:

Table 8 Pengujian Fungsionalitas

ID pengujian	Jenis Pengujian	Deskripsi Pengujian	Hasil yang diharapkan
TC01	Form Login	Deskripsi Pengujian	Proses login berhasil
....	....	....	....
TCxx	....	....	....

5. CONCLUSION

The conclusion from the results of this study is that the design of the Web-Based Financial Ratio Application Program using the Extreme Programming approach has succeeded in creating innovative solutions that can significantly facilitate Small and Medium-sized Enterprises (MSMEs) in managing their business finances in the digital era.Traditional methods of managing finances are no longer adequate to meet the demands of MSMEs in the fast-changing digital era. Through the Extreme Programming approach,the web applications developed in this study provide a number of key benefits.

First, the app allows MSME owners to efficiently calculate and analyze financial ratios, which is a key step in informed financial decision making. Secondly, the intuitive user interface makes it easy to use by users from different backgrounds. Third, ensure that financial information is always relevant. Fourth, this application can be tailored to the specific needs of MSMEs, allowing users to optimize their financial management according to their business situation.

Thus, the design of this application makes a significant new contribution to the ability of MSMEs to manage their business finances in an increasingly complex and competitive digital era. This is expected to help MSMEs to survive and thrive in an ever-changing business environment.

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