

Information System for Data Collection on Building Tools and Materials Using the Rational Unified Process (RUP) Method

Sahnas Wulandari Siregar ^{1,*}, Raissa Amanda Putri ¹

* Correspondence Author: e-mail: Sahnaswulandari17@gmail.com

¹ Information Systems Study Program; Universitas Islam Negeri Sumatera Utara; Address; Jl. Lapangan Golf, Desa Durian Jangak, Kec. Pancur Batu Kab. Deli Serdang, Sumatera Utara, Indonesia
e-mail: Sahnaswulandari17@gmail.com
e-mail: raissa.ap@uinsu.ac.id

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Abstract

UD. FLORA records the re-inventory of building equipment that has been sold by reading the transactions one by one in the ledger. A proper way is needed to overcome the problems that occur. This research aims to create an information system software. In making information system software, a method is needed that can carry out the stages from initial design to implementation of the software. This research uses the Rational Unified Process (RUP) method, namely a software development approach that is carried out repeatedly (iterative), focuses on architecture (architecture-centered), is more directed based on use cases (use case driven). This research produces a tool data collection application at UD. FLORA using the RUP method. The existence of an information system for data collection on building equipment using the Rational Unified Process method means that UD. FLORA can be helped in managing building equipment data collection. The system enables real-time transaction recording, providing better insight into inventory status, and supporting more accurate decision-making.

Keywords: Data Collection, RUP, Information System, UD.FLORA

1. Introduction

A system is a regularly related element that forms a relationship (Renaldy & Rustam, 2022 & Gede Endra Bratha, 2022). An information system is an organized combination of people, hardware, software, communications networks and resources that collects, transforms and disseminates information within an organization. Information technology is a very supportive factor in implementing information systems and is an agency and management solution for solving management and accounting problems that arise in practice (Seto et al., 2022 & Susilo & Ermatita, 2022).

Information technology is an organization consisting of hardware, software, telecommunications equipment, database management, and other technologies used to store data and make data available in the form of information to decision makers. Information is data or documents that have been processed in such a way that they change their form into information (Fathurrahman et al., 2022). Based on the definition above, it can be concluded that an information system is a device of elements or components consisting of hardware and software that is used to collect, manage, store, change and disseminate information. Trading business is a business activity that buys goods and resells them without changing the condition of the goods.

Trading businesses aim to seek profit or gain from calculating operational and distribution costs. Trading businesses can be in the form of a business entity or not a legal entity. Trading businesses require a trading business permit which has certain

conditions and advantages. UD. FLORA provides tools and building materials for sale including cement spoons, sand filters, hoes, shovels, hammers, nails and so on. Consumers can buy various tools and building materials that are available. Every buying and selling transaction carried out is always recorded in the ledger. Building tools and materials are all the necessities that humans use to make buildings.

Based on "research conducted by (Mulyani et al., 2022)" regarding the Design and Development of a Service Complaint Information System Using the Rational Unified Process Method, it was concluded that the website-based Bina Insan Qur'ani Integrated Islamic Elementary School (SDIT) complaint information system has been completed. . So the school feels helped by the existing system and features and parents can make complaints regarding the school easily because it can be done anywhere as long as they are connected to the internet network.

Based on "research conducted by (Yahya & Mulyati, 2022)" regarding the Design and Development of an Information System Using the Rational Unified Process (RUP) Method in the Scuto Car Salon, it was concluded that the existence of a car salon information system can make it easier for managers to find out turnover history, know stock of goods interior and exterior, car medicines, and history of salon machines that need to be repaired, and can calculate and record transactions accurately.

The main problem faced by UD. FLORA is inaccuracy and inefficiency in inventory management of building tools and materials. The manual system currently used often causes delays in decision making and errors in data recording.

The researcher chose the Rational Unified Process method because several previous studies had succeeded in using the Rational Unified Process method in various cases so that the researcher obtained a clear reference regarding the method stages. Rational Unified Process (RUP) is a software application development technique with many tools to assist in coding the final product and tasks related to the objectives.

The RUP method is a method that uses object-oriented concepts and focuses on developing models using Unified Modeling Language (UML). Application design using the Rational Unified Process (RUP) development method consists of four development stages: inception, elaboration, construction, and transition. In each phase, this method supports an iteration or repetition process in software development based on changes or additions of features as needed (Hidayatullah et al., 2018).

UD. FLORA collects data on the inventory of tools and building materials that have been sold by reading the transactions one by one in the ledger. Goods data collection is an activity of recording inventory stock in warehouses which is generally done manually (Sutejo & Tanaamah, 2022 & Hanny & Ari Sulistiyawati, 2023). A proper way is needed to overcome the problems that occur. This research builds an information system software. Building is the depiction, planning and sketching or arrangement of various separate elements into a unified and functioning whole.

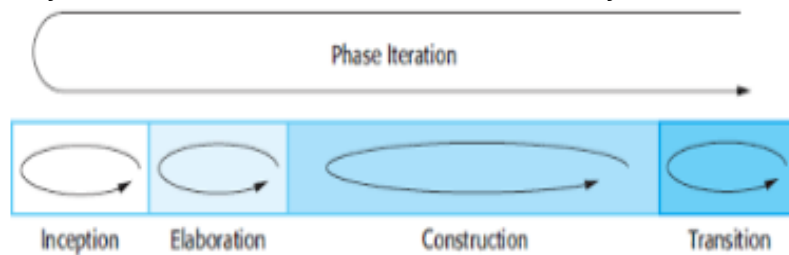
The innovation of this research lies in the application of the RUP method in the context of inventory management of building tools and materials. By using RUP, it is hoped that the resulting system will be more structured, easy to adapt, and have high quality. Apart from that, this system is expected to provide more efficient and accurate solutions compared to the current manual system.

In making this information system software, researchers used HTML, PHP, CSS, Javascript and MySQL database. Hypertext markup language (HTML) is a programming language commonly used to create components on web pages (Sari et al., 2022). PHP is a script that is integrated with HTML and is located on the server (server side HTML embedded scripting). The CSS used in creating this website is to collaborate with HTML in order to produce an attractive website appearance (Utami, 2022). JavaScript is a scripting language that animates HTML pages HTML (Mulyani et al., 2022). MySQL is software that is classified as a DBMS (Database Management System) which is Open Source (Zaman, 2021).

This development uses Visual Studio Code. Visual Studio Code is a very useful development tool for software developers of any skill level. With advanced features and support for various programming languages, VS Code is one of the most popular code editors today, ideal for web and cloud application development.

2. Research Method

The Rational Unified Process (RUP) method was chosen because it is a structured and iterative framework for software development. RUP helps ensure that all critical aspects of information system development are addressed, from requirements analysis to implementation and maintenance. By using RUP, it is expected that the developed information system can meet user needs more effectively and efficiently.



Source: (Hakimin et al., 2021)

Figure 1. Stages or Phases in RUP

RUP has 4 stages or phases which can also be implemented iteratively. The following is an explanation for each RUP phase.

1. Inception Stage (Beginning)
At this inception stage there is a process carried out, namely Needs Analysis. The needs analysis includes:
 - A. Analysis of process requirements, namely data on tools and building materials
 - B. Analysis of input needs, namely taking data on tools and building materials, carrying out the stages of the rational unified process method, applying the rational unified process method.
 - C. Analysis of output needs, namely data collection reports on tools and building materials.
2. Elaboration Stage (Expansion or Planning)
At this elaboration stage, a design process is carried out which includes Usecase Diagrams, Activity Diagrams and Sequence Diagrams.
3. Tahap Construction
At this stage, the implementation process is carried out, namely the appearance of the system.
4. Transition Stage
At this transition stage, a testing process is carried out which includes black box testing.

During this process, iteration is carried out in each phase to ensure that the system being developed meets user needs and can adapt to changing needs or market conditions (Nurgoho et al., 2018).

Previous research has applied the RUP method in various contexts, such as the development of information systems for monitoring the procurement of goods or services, population administration systems (Fitria & Widowati, 2017), and building rental information systems (Hutahaeen et al., 2019). In each case, RUP helps produce a system that is valid, accessible across browsers and well received by users.

The RUP (Rational Unified Process) and Waterfall methods are two approaches to software development that differ in terms of process, freezing, and project management. Here is an explanation of the main differences between the two:

1. **Process Approach:** Waterfall is a software development method that follows a linear and sequential process. The project begins with a requirements analysis stage, followed by design, implementation, testing, and maintenance. The process is one-way, meaning that after passing one stage, you do not return to the previous stage without starting over from the beginning. Meanwhile, RUP is a software development process that is iterative and incremental. This means the project is developed in multiple iterations, with each iteration covering the analysis, design, implementation, and testing stages, allowing for changes throughout the development cycle. Feedback from previous iterations can be used to improve and change requirements and designs.
2. **Development Phase:** Waterfall has separate phases and must be completed sequentially. For example, you have to complete the design before starting coding. It is difficult to adapt to changes after a certain phase is completed, due to the linear nature of the process. Meanwhile, RUP consists of four main phases, Inception, Elaboration, Construction, and Transition, each of which can be repeated in iterations and allows adaptation and change during the iteration phase, accommodating feedback and changing needs that may arise.
3. **Risk Management:** Waterfalls are often only discovered after the testing phase, as all previous phases must be completed first, helping to handle major changes once the project is far along. Meanwhile, RUP risks are managed early and continuously through iteration, allowing time to identify and address problems more quickly and enabling better risk adjustments and management due to the incremental nature of the process.
4. **Usage and Implementation:** Waterfall Suitable for projects with stable requirements that don't change much, such as software projects that are very well defined from the start, Not ideal for projects that require changes or adjustments midway.

Meanwhile, RUP is ideal for projects that are complex and have the possibility of changing requirements, such as software projects that evolve with user feedback and provide communication and allow for easier adjustments.

3. Results and Analysis

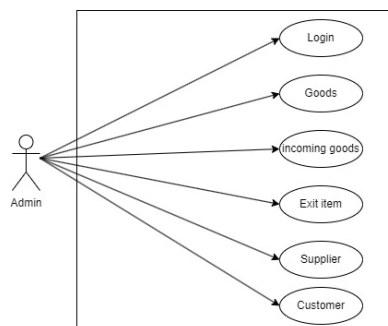
3.1 Inception

Before proceeding to the design stage, the thing to do is analyze needs. The needs analysis is: Analysis Method and Analysis Results

1. Analysis of process requirements, namely building equipment data
2. Analysis of input requirements, namely taking building equipment data, carrying out the RUP method stages and applying the RUP method.

3.2 Elaboration

Application system design at UD. FLORA Using Method *Rational Unified Process* namely through several stages as below:

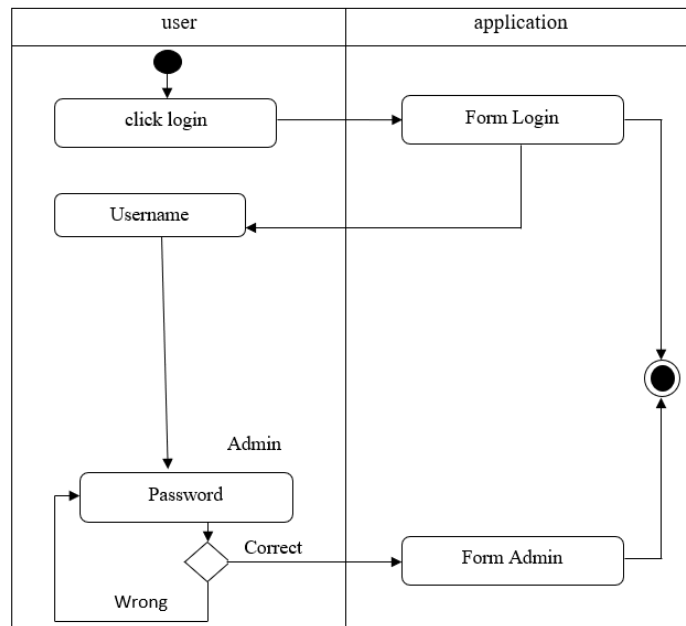


Source: Research Result (2024)

Figure 2. Use Case Diagram

Use case diagrams are used to describe who will use the system and what they do. Use cases can provide a brief overview of the relationship between use cases, actors and systems.

Activity diagrams are activities carried out by users on the system.

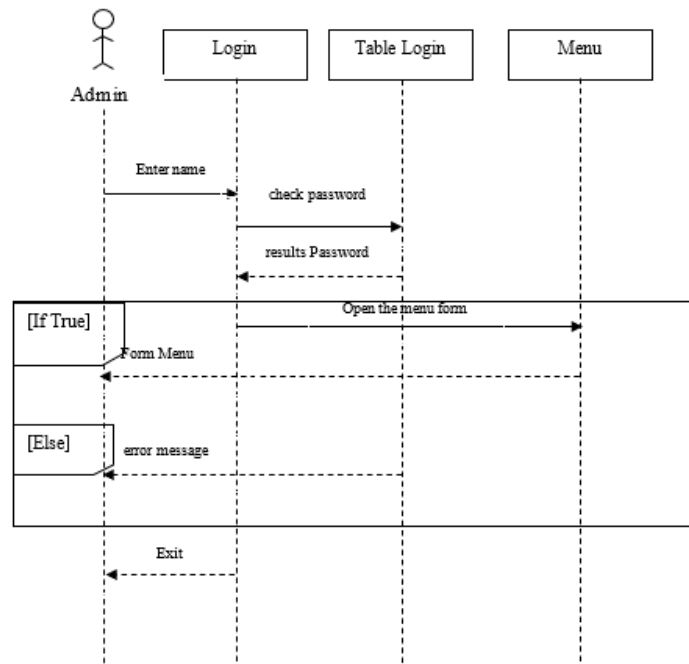


Source: Research Result (2024)

Figure 3. Activity Diagram Login

The login activity diagram illustrates the flow of activities that occur when a user attempts to log into the system. This diagram helps visualize the entire login process, from the user entering their credentials to the system verifying and granting access.

Sequence Diagrams are used to describe interactions between objects in and around the system in the form of messages depicted over time.



Source: Research Result (2024)

Figure 4. Sequence Diagram Login

A sequence diagram illustrates how objects interact in a particular scenario of a use case. It shows the sequence of messages exchanged between objects to carry out the functionality.

3.3 Contruction

The results of this research are in the form of a system interface that has been developed. The interface for the Admin can be seen in the following image. The implementation at this stage involves creating the application (project) and the resulting system (User Interface).

3.3.1 Login Form Display

Pendataan
merupakan suatu kegiatan mendata stok persediaan barang di gudang yang pada umumnya dilakukan secara manual. Dengan pendataan secara manual, seringkali terjadi ketidaksesuaian antara jumlah barang masuk dan keluar.

Silahkan Login :

Username: Admin

Password: *****

proses

Universitas Islam Negeri Sumatera Utara
Jl. XXX, Kota Medan, Sumatera Utara

Source: Research Result (2024)

Figure 3. Login Form Display

This login page is the starting point for entering the system. Admin needs to enter the registered username and password to access this system.

3.3.2 Display Supplier Form

Pendataan Alat Bangunan.

HOME PEMASOK ALAT BANGUNAN BARANG MASUK PERSEDIAAN BARANG KELUAR EXIT

Perubahan
Merupakan salah satu aksi atau kegiatan yang menggantikan sesuatu yang lama menjadi sesuatu yang baru.

PEMASOK

ID PEMASOK	NAMA	ALAMAT	NO. TELP	EMAIL
1				

tambah hapus ubah

Universitas Islam Negeri Sumatera

Source: Research Result (2024)

Figure 4. Supplier Form Display

Displays a list of all suppliers who have registered in the system. Includes Supplier ID, supplier name, address, telephone number and email. This form also provides add, edit and delete menus.

3.3.3 Customer Form Display

Pendataan Alat Bangunan.

HOME PEMASOK BARANG BARANG MASUK PELANGGAN BARANG KELUAR EXIT

Perubahan
Merupakan salah satu aksi atau kegiatan yang menggantikan sesuatu yang lama menjadi sesuatu yang baru.

Tgl/Bln/Thn: mm/dd/yyyy set

Pelanggan

tambah

ID PELANGGAN	NAMA	ALAMAT	NO TELP	EMAIL
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Customize

Source: Research Result (2024)

Figure 5. Customer Form Display

Displays detailed information about customers, such as customer id, name, address, and contact. In this form there is an add menu.

3.3.4 Display of the Incoming Goods Report Form

Print
Total: 1 sheet of paper

Printer
Microsoft Print to PDF

Copies
1

Layout
☒ Portrait
☐ Landscape

Pages
☒ All
☐ e.g. 1-5, 8, 11-13

Color
Print Cancel

7/1/24, 6:04 AM LAPORAN

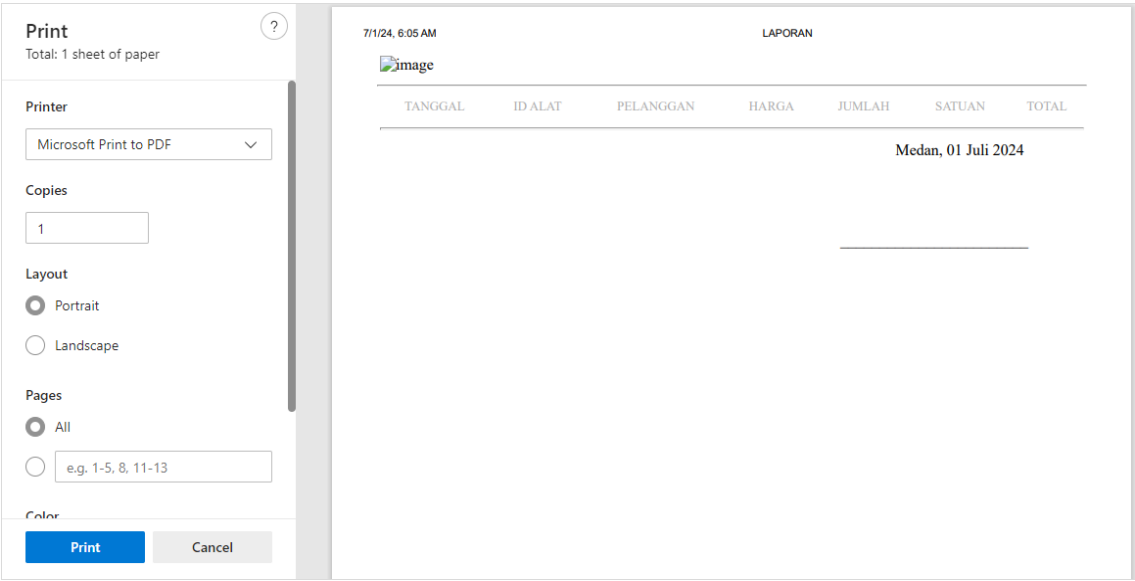
TANGGAL	ID ALAT	ID PEMASOK	HARGA	JUMLAH	SATUAN	TOTAL
Medan, 01 Juli 2024						

Source: Research Result (2024)

Figure 6. Display of the Incoming Goods Report Form

Incoming reports in information systems usually refer to documentation that records all items or data received by a system. This can be in the form of goods receipt reports, incoming mail reports, or incoming transaction data. This form also has a print menu.

3.3.5 Display of Outgoing Goods Report Form



Source: Research Result (2024)
Figure 7. Display of Outgoing Goods Report Form

Outgoing reports in information systems usually refer to documentation that records all items or data sent to or released from a system. This can be in the form of goods delivery reports, outgoing mail reports, or outgoing transaction data. This Outgoing Goods Report Form also provides a print menu.

3.4 Transistion

Transition is the final phase of the RUP methodology, which involves testing. In this phase, testing is conducted using black-box testing. The results of each test will be recorded in a table and visualized as a whole.

Functional testing is used to verify whether the implemented system can meet the operational function requirements that were designed and planned beforehand. In the Information System for Data Collection on Building Tools and Materials, functional testing is conducted on several components. Once the functional testing is completed, overall system testing is performed to determine the accuracy and reliability of the developed system.

Table 1. Transition Login

No	Component	Information	Results
1	Process Button	If the user enters the username and password correctly and clicks the process button then the application displays a menu form	Valid

Source: Research Result (2024)

This component is used to process the use of user names and passwords. If the user enters the user name and password correctly and clicks the process button, the application will display the Valid menu form and the results will show that this process was successful.

Table 2. Transition Menu

No	Component	Information	Results
1	Menu Button	The application displays a menu form	Valid
2	Supplier Button	The application displays a supplier form	Valid

3	Item Button	The application displays the goods form	Valid
4	Incoming Items Button	The application displays the incoming goods form	Valid
5	Inventory Button	The application displays an inventory form	Valid
6	Exit Item Button	The application displays the outgoing goods form	Valid
7	Tombol Exit	The application displays the login form and closes the menu form	Valid

Source: Research Result (2024)

This menu button is used to display the application's main menu form. Supplier Button, Goods Button, Incoming Goods Button, Customer Button and Outgoing Goods Button. These components are used to display forms related to suppliers, goods, incoming goods, customers, and outgoing goods. The Exit button is used to close the menu form and return to the login form and will display the results. All components have "Valid" results, indicating that the process of displaying the form was successful.

Table 3. Supplier Transitions

No	Component	Information	Results
1	Save button	The application saves the text typed in all textboxes into the database	Valid
2	Change Button	The application changes the contents of the database according to the data entered in the textbox	Valid
3.	Delete button	The application deletes the contents of the database according to the selected data	Valid

Source: Research Result (2024)

The function of the save button is to save the data that the user has entered into the textbox into the database. This is an important step in the data management process, as it ensures that the typed information will be stored safely and can be accessed at a later date. The edit button is used to change data that already exists in the database. When the user enters new data in the textbox and presses this button, the application will update the corresponding information in the database based on the user input. The delete button functions to delete the data selected by the user from the database. Users can select specific data they want to delete, and by pressing this button, the application will delete that data permanently. If successful, the status will display "Valid" indicating that the saving process was successful, and the data has been stored correctly in the database.

Table 4. Customer Transition

No	Component	Information	Results
1	Save button	The application saves the text typed in all textboxes into the database	Valid
2	Change Button	The application changes the contents of the database according to the data entered in the textbox	Valid
3	Delete button	The application deletes the contents of the database according to the selected data	Valid

Source: Research Result (2024)

The Save button is used to save data typed in the textbox into the database. The Change button is used to change the contents of the database according to the data entered in the textbox. Delete button used to delete database contents according to the selected data and has a "Valid" result which indicates that the process of saving, modifying and deleting the data was successful.

Table 5. Incoming Goods Transition

No	Component	Information	Results
1	Save button	The application saves the text typed in all textboxes into the database	Valid
2	Change Button	The application changes the contents of the database according to the data entered in the textbox	Valid
3	Delete button	The application deletes the contents of the database according to the selected data	Valid
4	Report Button	The application displays reports based on periods	Valid

Source: Research Result (2024)

The Save button is used to save data typed in the textbox into the database. The Change button is used to change the contents of the database according to the data entered in the textbox. The Delete button is used to delete the contents of the database according to the selected data. The Report button displays reports based on period and will display "Valid" results indicating that the process of saving, modifying, deleting data, and displaying the report was successful.

Table 6. Transition of Outgoing Goods

No	Component	Information	Results
1	Save button	The application saves the text typed in all textboxes into the database	Valid
2	Change Button	The application changes the contents of the database according to the data entered in the textbox	Valid
3	Delete button	The application deletes the contents of the database according to the selected data	Valid
4	Report Button	The application displays reports based on periods	Valid

Source: Research Result (2024)

The Save button is used to save data typed in the textbox into the database. The Change button is used to change the contents of the database according to the data entered in the textbox. The Delete button is used to delete the contents of the database according to the selected data. The Report button is used to display reports based on periods and will display "Valid" results, indicating that the process of saving, modifying, deleting data, and displaying the report was successful.

4. Conclusion

UD. FLORA experienced inaccuracies and inefficiencies in managing inventory of tools and building materials because it used a manual system which often caused delays and errors in recording data. This research uses the Rational Unified Process (RUP) method to develop an information system for data collection on building tools and materials. RUP is an iterative software development approach, focused on architecture, and more directed by use cases (use case driven). This research went through four stages of RUP, namely inception, elaboration, construction, transition.

The information system developed has several main features, such as: login form, goods form, supplier form, customer form, incoming goods form and outgoing goods form. The information system developed using RUP has succeeded in developing an information system for data collection on building tools and materials at UD. FLORA is more structured, easy to adapt, and has high quality using the RUP method.

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Author Contributions

Sahnas Wulandari Siregar proposed the topic Information System for Data Collection on Building Tools and Materials Using the Rational Unified Process (RUP) Method.

Conflicts of Interest

The author declare no conflict of interest.

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