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# Elementary School Communication Transformation: Developing a Parent-Teacher Communication and Information System with the Spiral Method

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Keywords

Comunication Transformation, Spiral Method, Application Development

**Abstract.** Parental involvement is essential in supporting their children's education at the primary school level. Effective collaboration between parents and schools is essential to improve students' motivation, academic achievement, and behavior. In the digital era, communication between parents and teachers has evolved significantly. However, there are still challenges in maintaining effective and regular communication between both parties. This research uses the Spiral development method to address the complexity and dynamics of developing a parent communication and information system in primary schools. The Spiral method was chosen for its flexibility in accommodating unforeseen changes in software development projects. The planning phase involves identifying project objectives, determining the scope of the application, allocating required resources, and planning the development schedule and budget. Risk analysis identifies potential risks such as schedule delays, changing user requirements, and resource limitations. Strategies to address these risks are devised. In the engineering phase, application design, programming, and core testing ensure an intuitive user interface, module implementation, and extensive testing using dummy data. The evaluation phase involved testing the app with 20 teachers and 80 parents, which showed improved communication and user satisfaction. The implementation phase marks the app's official launch, which allows for continuous improvement based on user feedback and evolving communication needs. This research contributes to developing an app that facilitates communication and access to information for all parties involved in primary school education. The app increases parental involvement, addresses communication issues between teachers and students, and facilitates better collaboration. As a result, this research has the potential to positively contribute to improving education and student development in primary schools.

## 1. INTRODUCTION

Parents play a crucial role in supporting their children's education at the primary school level. Parents' active involvement in education can help improve students' motivation, academic achievement, and behavior. Collaboration between schools and parents is critical in achieving better educational outcomes. Communication between parents and teachers has changed in the increasingly advanced digital era. Today, much communication is done through text messages, emails, and web-based platforms. However, there are still challenges in maintaining effective and regular communication between the two parties[1]–[4].

Communication tools that allow teachers, parents, and students to interact efficiently positively impact students' academic and social development. Parents and teachers need easy access to relevant information, such as schedules, grades, attendance, and student progress. In some schools, there are barriers to communication between teachers and students. Some students may be reluctant or uncomfortable to talk to teachers about their academic or personal problems. Therefore, means are needed to encourage students to be more open and actively participate in the educational process. With the rapid changes in technology and the evolving needs of education, there is a need for a system that can provide integrated and efficient communication between schools, teachers, parents, and students. The system should facilitate collaboration and easy access to relevant information[5]–[9].

Software development is a complex process involving various methods and approaches. Several methods in software development have existed for years, such as Waterfall, Agile, and Iterative

methods. Each method has its advantages and limitations, and the selection of a development method primarily depends on the project's needs and nature[10]–[16].

One development method that is increasingly recognized in the software development community is the Spiral method. The Spiral method combines elements from various software development approaches and offers a more adaptive and iterative approach. The main advantage of the Spiral method is its ability to cope with unexpected changes in a software development project. By allowing continuous evaluation, improvement, and planning during development, the Spiral method is suitable for complex and rapidly changing projects[17]–[19].

However, in developing a parent communication and information system application at a primary school, the advantages of the Spiral method become even more critical. The project involves many parties, such as teachers, parents, students, and school staff, which can result in unexpected changes and changing needs. Therefore, the adaptive and flexible Spiral method can help overcome these challenges by allowing changes and adjustments during development[20]–[22].

In this research, the Spiral method was chosen as the primary development approach to address the complexity and dynamics of the project to develop a communication and parent information system application in elementary schools. The use of the Spiral method is expected to provide the flexibility needed to meet the needs of parents, teachers, and students and contribute to the successful development of this application. This research aims to design, develop, and implement a parent communication and information system application at elementary schools using the Spiral method. This research aims to provide an effective solution to improve communication between schools, teachers, parents, and students[23]–[26].

The contribution of this research is expected to involve the development of an application that eases communication and access to information for all parties involved in the education of students in primary schools. The app is expected to increase parents' involvement in their children's education, address communication issues between teachers and students, and facilitate better collaboration. Thus, this research has the potential to positively contribute to improving education and student development in primary schools.

## 2. METHOD

The stages in the spiral method are designed to be iterative so that the project can continuously evolve and adapt to the changing needs and requirements of the project. Each iteration helps improve the functionality and quality of the application. This makes the project more responsive to the changing environment and user needs. This research generally consists of the stages: Planning, Risk Analysis, Engineering, Evaluation, and Deployment, as shown in Figure 1.

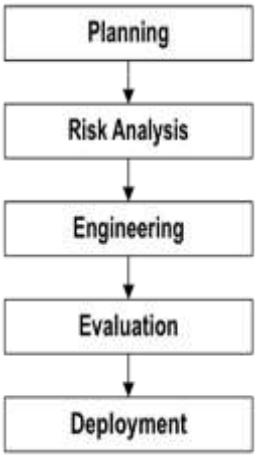


**Figure 1.** Research Stages

**Planning**

Identify the purpose of developing a communication information system between teachers and parents. This stage determines the scope of the application and the resources required. This stage also plans the development schedule and initial budget.

**Risk Analysis**

This stage identifies potential risks that may affect the system development project. Evaluate the impact and probability of these risks. This stage also plans mitigation strategies to overcome these risks.

**Engineering**

This stage consists of design, programming, and testing activities of the core of the teacher and parent communication information system.

**Evaluation**

Evaluate the results of system development to ensure that the system fulfills the predetermined requirements, such as the ability to communicate effectively between teachers and parents.

**Deployment**

The final stage is where the communication information system is introduced and launched to teachers and parents. After the launch, consider conducting continuous iterations with the spiral method to improve the system as needed. This can involve improvements, changes, upgrades, and adjustments based on user feedback and changes in the communication needs of teachers and parents.

## 3. RESULTS AND DISCUSION

**Planning**

The results of this stage are shown in Table 1. At this stage, the project objective is identified.In the example above, the project objective is to improve communication and collaboration between teachers and parents in primary schools. This objective is highly relevant, given the importance of parental involvement in their children's education. Furthermore, the scope of the app is well-defined. The app includes several essential features, including an online portal, calendar, notice board, messaging, student progress reports, and integration with the school's academic system. With the comprehensive scope of the app, it will be a powerful means of communication between teachers and parents.

The necessary resources have also been identified, including a team of software developers, computer infrastructure, financial resources, and dummy data for initial testing. This demonstrates careful planning and readiness to proceed to the development phase. The planned development schedule is realistic and considers the time required for each stage. In addition, the initial budget estimated was appropriate for the complexity and scope of the project.

At the risk analysis stage, identifying potential risks that may affect the project is prudent. These risks should be monitored, and mitigation strategies should be planned to reduce their impact.

Overall, this initial planning formed a solid foundation for the development of the application. All the essential elements, from objectives, scope, resources, and schedule to budget, are well identified. With these initial steps in place, the project can move on to the next stage with solid confidence in achieving its goals.

**Table 1.** Result of Planning

| Stages | Desc. |
|---|---|
| Goal Setting | This system aims to improve communication and collaboration between teachers and parents in primary schools. The system will enable teachers to share information, assessments, and student progress effectively with parents. The goal is to increase parental involvement in their children's education and support students' academic development. |
| Scope of Application | • An online portal that allows teachers to share student progress.<br>• Calendar with information about school activities and assignments.<br>• Notice board for important information from the school. |

| Stages | Desc. |
|---|---|
| | • Messaging feature for direct communication between teachers and parents.<br>• Student progress reports.<br>• Integration with the school's academic system. |
| Resources | Software development team (analysis, design, programming).<br>Computer and server infrastructure for hosting the application.<br>Financial resources for development and maintenance costs.<br>Dummy data for testing and initial development. |
| Development Schedule | Needs analysis and initial planning: 1 month.<br>Core design and programming: 4 months.<br>Testing and evaluation: 2 months.<br>Launch: 1 month. |

**Risk Analysis**

The Risk Analysis stage is essential in developing communication information systems between teachers and parents. Identifying and assessing risks that may arise during the project provides a better understanding of potential threats that may affect the project's success. The following is a discussion based on the results of the Risk Analysis stage:

**Risk of Changing User Requirements**

The risk of changing user requirements is common in software development. The impact is moderate because changing user requirements can increase development time and costs. The risk probability is high because user requirements can change over time. To reduce this risk, mitigation strategies include defining a strict change submission process and prioritizing urgent changes. This helps ensure that essential changes are accommodated, and the schedule and budget are maintained.

**Risk of Resource Constraints**

Resource limitation risk is another risk identified. The impact is high because budget limitations can affect the quality of the project. The risk probability is medium as the resources have been well identified. Mitigation strategies include ensuring efficient use of the budget and seeking additional resources if needed. By managing resources well, the risk of resource limitations can be managed effectively.

The Risk Analysis stage is essential in identifying, evaluating, and planning mitigation against potential risks. This helps the project to be better prepared for changes and challenges that may occur during development. With the right mitigation strategies, these risks can be managed well, and the project has a greater chance of achieving its goals and success in improving communication between teachers and parents.

**Engineering**

The Engineering stage in developing teacher and parent communication information systems is critical in the application development process. The following is a discussion based on the results of the Engineering stage:

**Application Design**

Application design is the initial stage in the Engineering stage. The development team has designed the user interface well, an essential element for a good user experience. An intuitive and easy-to-use user interface is an essential aspect of this app, as teachers and parents will use it. The database design has also been well-established to store student, teacher, and parent information.

**Application Programming**

At this stage, the programming of the main modules of the application has been done well. The main modules include the online portal, calendar, notice board, messaging feature, and student progress report. Implementing these functionalities is essential in ensuring that the app delivers the expected benefits to the end users.

**Application Testing**

Application testing is a crucial step to ensure that the application functions properly. Module testing, integration, and overall testing have been conducted to check the extent to which the application conforms to the predefined requirements and design. Dummy data is used in the testing to ensure that the application responds correctly to the data.

In the context of application development, the results of the Engineering stage show that the application has reached a stage that is ready for the launch stage. Design, programming, and testing have been completed correctly. The app has undergone a series of trials to ensure the functionality is as expected and the user interface works well.

The Engineering stage helps in turning the initial concept into a ready-to-use application. It is an essential milestone in this app development journey and brings us closer to the ultimate goal, which is to improve communication between teachers and parents. With this stage well completed, the app will be ready for the next stage, the evaluation stage, before launch.

**Evaluation**

20 teachers and 80 parents have evaluated the system to ensure that the features that support effective communication between teachers and parents function correctly. This evaluation includes testing messages, notifications, and other features that enable smooth communication. The test results are shown in Table 3.

**Table 3.** Testing Results

| Testing | Results |
|---|---|
| Functional Testing | Teachers conducted testing to check that all the key features and functionality of the app were working correctly. Data is used in the testing to ensure the app responds well to predefined test scenarios. |
| Integration Testing | Final integration testing was conducted to ensure all app components interact well and share data correctly. |
| Overall Testing | Overall testing of the application with dummy data of students, teachers, and parents of students to ensure that the application runs well in a production environment |

Of the 20 teachers who participated in the survey, 80% felt that the app improved communication with parents. Of the 80 parents who participated in the survey, 85% felt that the app made it easier to follow their children's progress. Several interviews with teachers and parents were conducted to obtain more detailed feedback on using the app. This feedback included user experience in using the app, strengths, and recommendations for improvement. Evaluations conducted with this data helped ensure that the app met the requirements and positively impacted users. With the successful results of the Evaluation stage, the app will be ready for the next stage.

**Deployment**

The Deployment stage is the final stage in developing the teacher and parent communication information system, where the application is officially introduced and launched to users. This stage marks the endpoint in the development cycle but is also the beginning of the actual use of the app within the school environment. Launching the app is an important step that allows teachers and parents to utilize its features to improve communication. The app will be an essential tool to help teachers and parents collaborate in supporting student development.

The spiral method in app development allows for continuous refinement, customization, and improvement after launch. Developers will continue to monitor feedback from users and respond to changes in the communication needs of teachers and parents. This will ensure that the app continues to evolve and meet user expectations. In all, the Deployment stage marks an essential stage in the development of this app, but it is also the beginning of an ongoing journey. With the app launched, users now have a powerful tool to improve communication and collaboration in student education. Through continuous monitoring, user support, and iteration, the app will continue to evolve according to the school community's needs and become a more effective tool in supporting student development.

## 4. CONCLUSION

This research concludes that developing parent communication and information system applications in elementary schools using the Spiral method is practical. With its flexibility, the Spiral method allows developers to cope with complexity and changes that may occur during development. Several key findings can be identified based on this research: The developed application successfully improved communication between teachers and parents. Evaluations involving teachers and parents showed that the app has provided an effective solution to increase parental involvement in their children's education. The Spiral method effectively dealt with changing needs and potential risks during development. Its ability to perform continuous iteration allows the app to evolve continuously and fulfill user needs. This app provides benefits in improving communication between teachers and parents and addressing communication issues between teachers and students. It creates a more open environment and supports students' academic and social development. This research contributes to developing an application that facilitates communication and access to information for all parties involved in education in primary schools. This application is expected to provide tangible benefits in improving the quality of education and student development at the primary school level. Thus, this research shows that using the Spiral method in developing parent communication and information applications in primary schools is a successful approach and has the potential to positively contribute to the education of children at the primary school level. In the context of developing parent communication and information system applications in primary schools, several areas of research or future work can be explored to improve and expand the applications and their benefits, one of which is applying artificial intelligence technology to provide more precise recommendations, predict student needs, or support better assessment. AI can be used to personalize the educational experience.

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