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Fingerprint Based ATM Machine

1. Introduction / Project Defining

1.1 Project Summary:

Automatic self-banking has become very popular in recent years. The use of ATMs can provide users with proper banknote handling. However, the crime rate has risen frequently (A study indicates that more than 90% of the ATM security issues are robbery). When a person's card is lost, the criminal extracts and takes advantage of it resulting in significant financial losses for the victim.

Since, in the conventional method of using ATM, criminal cases are increasing making financial losses to customers. We are introducing Fingerprint-based security which enables a safe login to the ATM and provides enhanced security. Fingerprint technology is a well-known and well-developed biometric technology that is simple to design and provides an advanced degree of security. A fingerprint sensor is installed in the ATMs for authentication purposes instead of inserting the plastic card. Fingerprint sensors are already familiar to the majorly of people.

The minute details of each human's fingerprint are unique, allowing the user to have distinct identification. To complete any banking transaction, the user needs to verify with a fingerprint to access the account. By using fingerprint recognition customers will be more comfortable with the idea of saving their money with the bank because no one can replicate their fingerprint and take their money.

1.2 Project Scope:

The aim is to ensure utmost security to the ATM’s by using fingerprint authentication

Most of the financial transactions are done by using ATM machines in the current period, therefore securing them will help in reduce huge financial attacks both for the banks and the customers.

1.3 Advantages:

* It is simple to use and requires little time and effort to register one's fingerprint with a fingerprint identification device.
* Even if the credit card is lost, the money cannot be withdrawn.
* Fingerprint-based ATMs are more secure and safe.
* People with a low level of education have easy access.
* Hackers can easily guess the pin code but not the fingerprint.

1.4 List of Features and Modules:

* Database – To store the fingerprint for authentication.
* Sensor Design & Production – Appropriate model of sensor is designed and produced to install in the current ATMs without many alterations
* Software Development – Implementation of image processing to analyze fingerprints and match with the images of the database.
* Integration – Integrating the separate modules to create a full flow.
* Installation – Installation of the sensors for use.

2. Project Planning:

2.1 Project Development Approach:

For our project we could have implemented the traditional waterfall method, but we opted for the agile methodology for its flexibility. The project goes through 2-week sprints and has about 6 sprints to go live.

Diagram, shape

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Fig. 1. The Project Development Approach

The project goes through all the regular phases, such as project Initiation, planning, execution, testing, installation, and closure. The project kickoff started at January and each of the module are given sufficient time as the project is security sensitive.

2.2 Project Schedule:

The tasks completed for each sprint is given:

Timeline

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Fig. 2. Project Timeline Detail

The High-level goal of each of the sprint is given as follows:

* Sprint 1 – Database related activities, Design of Sensors
* Sprint 2 – Image Processing
* Sprint 3 – Production of Sensors
* Sprint 4 – Integration
* Sprint 5 – Unit Testing and prototype testing.
* Sprint 6 – Field Testing

2.3 Project Network:

Drawing the project network places the activities in the right sequence for computing the start and finish times of activities. Activity time estimates are taken from the task times in the work package and added to the network. The critical path method (CPM) has long been considered the “Holy Grail” of project management.

2.3.1 Critical Path

We have listed the network information based on each activity and have found our critical path and lag timings We have strictly followed our estimated duration, so we can complete the project on time. We can see that the tasks Image processing, Production of sensors and Integration takes more time. This is because the project is divided and into major modules and those major modules have huge activity time.

Table 1

Project Network Information

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Fingerprint Based ATM upgrade network information | | | |
| Activity | **Description** | **Preceding Activity** | **Activity Time** |
| A | Define Requirements & Project Initiation | None | 15 |
| B | Sensor Modelling / Design | A | 10 |
| C | Database Creation, Storage and load test | A | 20 |
| D | Image Processing | A | 25 |
| E | Production of Sensors | B | 25 |
| F | Integration Sensor, Image Processing and DB | C,D,E | 20 |
| G | Testing Single integrated Unit | F | 5 |
| H | Field Testing & Security Testing | G | 15 |
| I | Installation on ATM machines | H | 10 |

A screenshot of a computer

Description automatically generated with medium confidence

Fig. 3. Project Network Diagram with Slack Time

We have 9 tasks form A – I. After project defining, each module is worked separately and are integrated at last to complete the feature. This can be seen in our flow. The critical Path is A – B – E – F – G – H – I

2.4 Roles and Responsibilities:

One tool that is widely used by project managers and task force leaders of small projects is the responsibility matrix (RM). The RM (sometimes called a linear responsibility chart) summarizes the tasks to be accomplished and who is responsible for what on a project. In its simplest form an RM consists of a chart listing all the project activities and the participants responsible for each activity.

Our Responsibility Matrix lists out our tasks in high level and indicates the person responsible for it which means the ownership and the one who assists or supports the task along with the person with ownership.

Table 2

Responsibility Matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Task | Kiruthiga | Akshaya | Naveen | Sri Krishna |
| Sensor production | R |  | S |  |
| Integrate sensor and image |  | R |  | S |
| Database Connection to integrated system |  |  | R | S |
| Storage and retrieval of Fingerprints using integrated system | S | R |  |  |
| Overall Flow Testing |  | S |  | R |
| Field Testing & security Testing | R |  |  | S |
| Installation of Sensors to ATM machine | S |  | R |  |

2.5 Budget:

During the project proposal, the cost of different modules, development costs and the production costs of sensors are estimated very carefully and got approval for the same.

The bank has about 12K branches and the development cost is estimated to be about $100K. Whereas, the fingerprint sensor production and installation consists of huge budget of the project for abut $24M. With this single feature $550B worth of money is protected for the bank.

The figure shows our budget breakdown, with respect to each task and subtasks. Our project has used only the estimated amount and didn’t go over bound in terms of cost even though the production of sensors became a little late than expected.

Diagram

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Fig. 4. Budget Estimation

2.6 Variance Calculation:

The variance is calculated in the field-testing phase, which takes into account the major sprints and their respective variances.

Table 3

Cost and Schedule Variance

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| Sprint | **% Complete** | **EV** | **AC** | **PV** | **CV** | **SV** |
| 1(Database & Sensor) | Finished | 4 | 4 | 4 | 0 | 0 |
| 2 (Image Processing) | Finished | 2 | 1.5 | 2 | 0.5 | 0 |
| 3 (Sensors Production) | Finished | 12 | 13.5 | 14 | -1.5 | -2 |
| 4 (Integration) | Finished | 2 | 1 | 1 | 1 | 1 |
| 5 (Testing) | Finished | 1 | 1 | 1 | 0 | 0 |
| 6 (Field Testing) | 30% | 3 | 2 | 3 | 1 | 0 |
| Cumulative Totals |  | 24 | 23 | 25 | 1 | -1 |

As we can infer from the table that there is not much discrepancy. But a minor delay in scheduled happened because of the production of sensors and the tasks that follows it. But the team managed to compensate the loss by kicking off the testing phase earlier than scheduled.

2.7 WBS

Once the scope and deliverables have been identified, the work of the project can be successively subdivided into smaller and smaller work elements. The outcome of this hierarchical process is called the work breakdown structure. Use of a WBS helps to assure project managers that all products and work elements are identified, to integrate the project with the current organization, and to establish a basis for control. Basically, the WBS is an outline of the project with different levels of detail.

The below flowchart gives the idea of different elements of the project broken down to the sub task level:

A screenshot of a computer

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Fig. 5. Work Breakdown Structure

The Work Breakdown Structure defines five major divisions. After all the approvals and scheduling of resources and planning, the divisions have few sub tasks. Few of the modules can be completed parallelly as they don’t have any dependency.

The Design of Sensor has two tasks – Design and Finalizing the sensor type. The Image processing has its implementation and testing phases. The Database has creation, uploading fingerprints available locally, retrieving and storage of fingerprints along with load testing to handle multiple concurrent hits. The testing & integration phase has integration of each module and field testing with finally installation of sensor and enabling this feature to all the 12K ATM machines.

3. Risk Management:

3.1 Risk Severity Matrix

Risk Assessment Form:

Table, calendar

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Fig. 6. Risk Assessment Form

Chart

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Fig. 7. Risk Severity Matrix

This matrx is developed based on above from – describe about the risks.The Risk Assessment Form takes into consideration of various risks that could happen while in development and after the installation of the feature. It details about which stage this could happen and what are the remedial measures that can be taken in order to fix it.

One major risk involving in this project is security issue, if the private data such as fingerprints gets leaked / hacked it would be dangerous. So, Firewalls are put for the network and encryption layer and techniques are used to securely store and authenticate fingerprints. Therefore, even if the person has the data they would not. Be able to do anything with it. We have used our proprietary encryption algorithm for security.

4. Execution:

The execution of the project took place as per the schedule. Although there was a minor delay in production of the sensors, since other tasks had some lag time, those resources are efficiently used for the testing purposes concurrently. Because of this fix, the project came back on track and the team was able to complete the feature on time.

Overall, the implementation and integration was smooth, there were no roadblocks and the stories created as part of this epic in the sprint backlog are completed. The remaining story in this epic is support for the feature, which can be opened when the feature goes live.

5. Testing:

The prototype testing has been completed after the integration of the modules. The Sensor passes all the testcase and was cleared for field testing. After which , 1200 ATM branches are chosen in terms of their area and these sensors are installed for use. After the initial few days, a customer satisfaction survey is taken to learn about the customer’s view about this feature.

The Survey included various criteria such as ease of ease, how secured the customer feel beacause of this feature, any changes that can be done to improve. So far, the results shows the expected performance and is likely to increase when istalled fully and are used full fledged.

6. Project Closure:

  The major wrap-up task is to ensure the project is approved and accepted by the customer. Other wrap-up activities include closing accounts, paying bills, reassigning equipment, and personnel, finding new opportunities for project staff, closing facilities, and issuing the final report. Checklists are used extensively to ensure tasks are not overlooked.

6.1 Wrap-up checklist:

Table 4

Wrap-up Closure Checklist

|  |  |  |
| --- | --- | --- |
| S.NO | Task | Status |
| 1 | Has the customer/clients given sign-off on delivery acceptance? | Yes |
| 2 | Has the customer received knowledge Transfer on the Application? | Yes |
| 3 | Have the project deliverables been given to the clients? | No |
| 4 | Have the project resources transferred to other projects? | Yes |
| 5 | Have the team members been notified of new tasks? | No |
| 6 | Has the performance review been conducted for every individual working on the project? | Yes |
| 7 | Has the marketing team started advertising? | Yes |
| 8 | Has the testing team given the defect report? | Yes |
| 9 | Has the release note contained all the required documents? | Yes |
| 10 | Has the project documentation been prepared and stored? | Yes |
| 11 | Has the lesson learned documentation been prepared and stored? | Yes |
| 12 | Has the developed application had all the modules mentioned in the requirement? | Yes |

6.2 Project deliverables

* Support Team is set up to handle future minor issues that arises.
* Final Report and User guide is created.
* Each ATM will have a pamphlet showing the steps sticked in the room.
* Resources are released after the project and are assigned for new project kick offs.
* Retrospective meeting is conducted: Documentation of valid changes needed and ideas to improve productivity is sent to upper management for consideration and implementation in relevant projects.
* Team Evaluation and Feedback Survey is conducted for the purpose of self-evaluation of strengths and weakness

7. Future Enhancements

No major future enhancements might be required. However, the customer satisfaction survey has various things listed for improvement. They are taken into consideration and further discussions will be made about the feasibility and the cost factors and as long as the additional feature adds value to this project, they will surely be extended and implemented on top of the fingerprint authentication.

8. Conclusion:

A few things learned as part of the project are -There are various encryption techniques and algorithms that are learned as part of the process, how to effectively mitigate production delays, usage of various tools and scripts, research about different sensors available and the design and kinds of sensors applicable to fingerprint authentication of ATMs. The performance of the project members is high with pristine production code. The integration was flawless securing all the sensitive information. Overall, the project implementation is a huge success, and the feature will satisfy the intended things.

Works Cited:

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