

Declaration

We, Adishi, Anirudh, Sreekar, Eeshaan and Navneet students of 5th Semester B.E, Computer Science and Engineering at JSS Science and Technology University, Mysuru hereby declare that this group activity was carried out by our group and this report was prepared by us as a part of the course work CS530- Software Engineering under the guidance of Prof. Dr. Trisila Devi Nagavi.

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Abstract

This document serves as a requirement engineering study for our academic project JCE Foodie. Each project requires research into the features, functions and design that the developers must implement to ensure user satisfaction. This document contains the direct responses from potential users, the analysis of their requirements and a comprehensive list of all features and models that must be designed from aforementioned analysis. User interactions, system interfaces and system specifications are all recorded in this document along with validation and requirement management. The goal of this report is to provide the designers of the product with clear specifications and a clear concept of the implementation of the system.

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Part I

Requirements Engineering

Requirements Engineering is the process of defining, documenting and maintaining the requirements. It is a process of gathering and defining service provided by the system.

This is critically important for creating accurate results in software engineering. Requirements Engineering is also known as Requirements Analysis.

Objectives :

- i. To describe the principal requirements engineering activities and their relationships.
- ii. To introduce techniques for requirements elicitation and analysis.
- iii. To describe requirements validation and the role of requirements reviews.
- iv. To discuss the role of requirements management in support of other requirements engineering processes.

Requirements Engineering is divided into seven phases :

- i.** Inception
- ii.** Elicitation
- iii.** Elaboration
- iv.** Negotiation
- v.** Specification
- vi.** Validation
- vii.** Requirements Management

1 Inception

As a fresher, it can be overwhelming to find so many dining options in the college, whether it tastes good, if it's delicious, if it's expensive etc. Therefore, in this digital era we need a software solution to this problem. This solution must make it easier for students, and people in general to find different dishes and cuisines with appropriate ranking and other information such as the quality, quantity, cost etc.

1.1 Understanding the problem

Our college has students coming in from various parts of the country who have a variety of tastes, right from the saffron of Kashmir to the banana chips of Kanyakumari. As a fresher who is just getting used to the hostile environment of the hostel, not being able to enjoy the tastes of their hometown can seriously suppress their spirits. Therefore, it would be very useful to them if there was an easy way for them to know what foods are being served, where and for how much so that they can try them out and feel at home, at least in terms of food. We also have many other students, faculties and the general public who could use some help with the dining options in the form of a food guide.

1.2 People that want a solution

The target users for this software will be freshers who have little to no idea on the food options available across the campus and also around the campus. However, considering the large number of students studying in the college, there are many who could use a food guide to know where to find what food, the quality and quantity available, and also know about the rush/peak hours when it takes longer than normal to get the food. Moreover, we have many faculties who have their lunch/snacks in one of the college restaurants, and we also have people from outside living near the college who would be interested in exploring the food options available in the region.

1.3 Nature of the solution

The solution to the mentioned problem can be realized in the form of an android based application (which can then be extended to the iOS Platform) that the users would have to install on their phones, which will provide them with all the details regarding the food options in and around JSS Science and Technology University. The rankings of the food will be based on the collective opinions by the user group which includes students, faculty members (teaching and non teaching) and also other outsiders who want to try out the delicacies of JSS S&TU. At any given time, the user can open the app, look at the recommendations or the rankings for any particular dish, and then decide if it's a good time to visit based on the rush hour information that will be provided.

1.4 Communication and collaboration

Due to the extensive nature of the problem that this system overcomes, anyone with a plan to dine in and around the campus is a potential client or stakeholder. To obtain a more specific and realistic approach towards obtaining requirements we reduced our target audience to three specific groups:

- i. Students: The main inspiration to start with the project was the problems faced by freshers, especially the ones who reside in the hostel where good food is scarce. Students in their second, third and fourth years, are the people that do have a good idea about the various food options available in and around the campus. They form the backbone of the rating system as they can provide valuable insights to the feedback system.
- ii. Faculties: They don't get time to try all food items available in the restaurants. They can try various food once the ratings are available.
- iii. Others: With the college canteens open to everyone, and also with the inclusion of restaurants outside the campus, the general public that's interested in trying out any of these food chains make for stakeholders.

Our team was in communication with all three clients and prepared a set of general questions for each of these groups along with some specific questions for each set. These questions were structured in order to obtain the maximum possible information from the users. The elicitation (section 2) contains more detailed interviews with clients.

2 Elicitation

The following questions were structured to obtain all the required information from the target audience. It is to be noted that this set of questions are standard and were answered and verified by each customer. The following section contains the questions along with the paraphrased responses of the user.

2.1 Questionnaires

2.1.1 Students

This set of questions was answered by Vaibhav (EEE, 1st semester), a student of JSSSTU. The interview was conducted in the lawn in front of Admin block. He lives in Shivarathri hostel because seniors told him food isn't good in the college hostel. He travels 4km just for the sake of food. His requirements can be taken as the standard for all the students who are new to college.

Did you face any issue while choosing what to eat?

I was clueless about what to eat when I joined the college. I ate samosa in Yampa and burger in Cafe Frappe. I don't have an idea about the best food items in the college. It takes me around 15 minutes to ask people around.

Are you satisfied with the recommendations?

No, I am not satisfied with the recommendations. My friends are new to college and they don't know much about food served in various canteens. I don't go out often but whenever I go, I try new food item every time. If I don't make a correct choice, time and money gets wasted.

If our application was available to you right now, how would you use its features? Does the application help in simplifying tasks?

If it is possible to get honest reviews on your application, I would use the system to decide which food item to choose. Reviews about quantity and quality of food will help all freshers in investing their money in the right food item. Mentioning waiting time will help us plan our day easily. Currently, I don't go anywhere in 10:30- 11:00 break because I may be late for my class.

Can you think of any reason why our product would fail to deliver on performance or otherwise?

I have no specific idea about this. One issue can be that people may not have tried enough food items from all the canteens. Another issue would be people may not be honest with their reviews.

We also met another student, Preetham (MECH, 1st semester) and asked him the same set of questions. He gave similar answers. He lives in the campus hostel. He also told us that dinner isn't served on Sundays and he would like recommendations regarding the same. This interview was conducted in the second floor of Admin Block.

2.1.2 Faculties

This set of questions were answered by our teachers in JSS S&TU. Interview was conducted in the Staff room of Golden Jubilee Block. Their requirements can be taken as the standard for all the teachers in our college who have time constraints.

Did you face any food related issue?

We have a hectic day because of meetings and classes. We can't try new food items because waiting time for food isn't fixed. We really don't have extra time to decide among various food items. Therefore, we eat the same food every time.

Do you ask other people for recommendations?

We have a busy schedule, therefore none of us gets time to try different food items. Hence, we can't get suggestions.

If our application was available to you right now, how would you use its features? Does the application help in simplifying tasks?

If it is possible to get honest reviews on your application, I would use the system to decide which food item to choose. I can try new food items. Since, waiting time is specified I can make wise decisions.

Is there any other feature that we can add to our product?

In this establishment there is nothing. If you are considering going to all restaurants in Mysore, then you might have to add more features that include mode of payment, distance, ambience and other details about the food.

2.1.3 Restaurant Owners

This set of questions were answered by the owner and manager of Cafe Frappe. This Cafe specializes in fast food and North Indian Cuisine. The interview was conducted in the same restaurant. Her requirements can be taken as the standard for all the restaurants.

What are the peak hours in your restaurant?

This place is usually crowded in the afternoon, 1pm- 3pm. We have additional staff during that time so that everyone gets food on time. We cater to everyone's need.

If our application was available to you right now, how would you use its features? Does the application help in simplifying tasks?

It will help me improve the food items served in my canteen. I can prepare the bestseller food items in advance to save time. In addition to that, I can change the ingredients of the food items not liked by the students. I can get feedback from both students and teachers. This product will help me provide good food items to everyone.

How many people can you accommodate at one time and at what time food is available?

I can accommodate around 50 people. Food is served from 10am- 8pm. We are trying to expand our place to accommodate more people.

We asked the same set of questions to the owner of Yampa, and we got a similar response. He also told us that lately he has been seeing decline in the sales of shakes, and would like to improve upon it if the application would help him. This interview was conducted in his canteen.

2.2 Association of requirements

From the above questionnaire we have collected all the necessary requirements and created a list to attribute all the features to their source.

- i. Students: Honest reviews about food items, quality, quantity, waiting time, price, regular updates, food delivering rate
- ii. Faculties: Honest reviews about food items, quality, quantity, waiting time, regular updates, food delivering rate
- iii. Restaurant owners: Feedback from customers, regular updates

3 Elaboration

From the information collected via the questions in the previous sections, we were able to create a refined model containing the basic functions that the system will implement, the interactions between the users and the task management system as well as the overall association between each module. We also came up with the list of features to implement.

3.1 Database System

The system is itself vertexed on students of the college (who will act as the major recipients) consequently making them an important entity. As the service can be extended to people beyond the college, we consider these people in the student category as well.

As we will be profiling the different customers in categories like teachers, students and shops we have an attribute signifying their categories. We also have an entity called 'FOOD' which will have all the details of the different food items along with a relation which will connect it to the entity called 'SHOP' defining the places that particular item may be found.

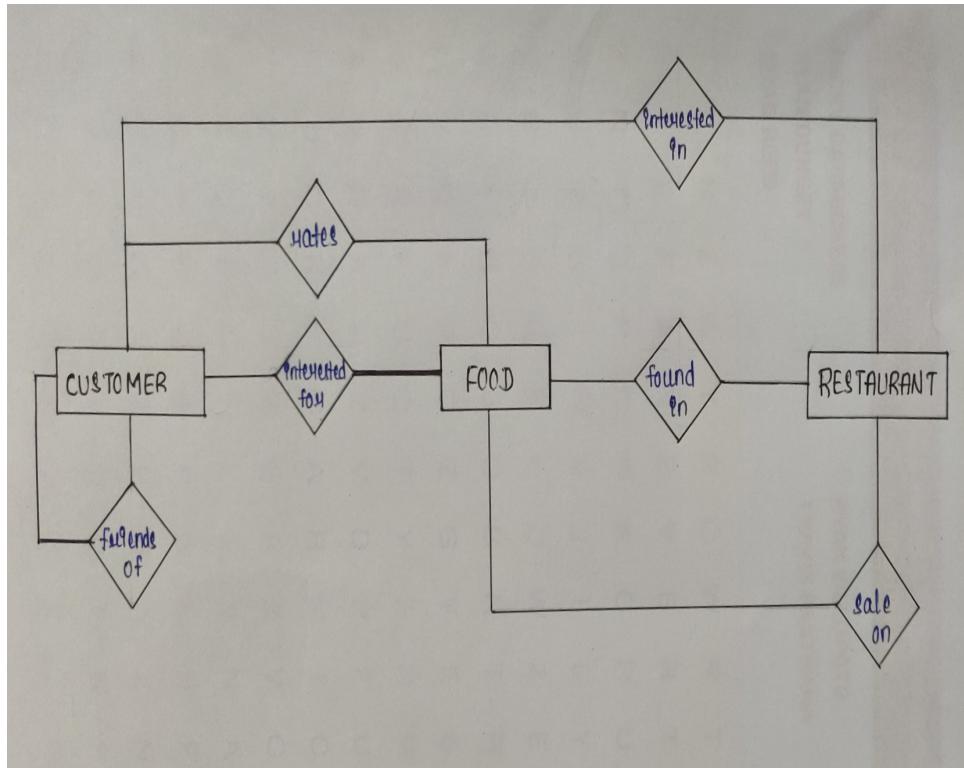


Figure 1: Entity-Relationship diagram

The **Entities** are:

Customer: This entity includes all personal information of the different customers including their category (freshers, veterens, PeopleNearby). Freshers would have a more diverse recommendation encouraging them to try different places and try out new things. Veterens will have a more stronger profiling with recommendations rendering only to their taste. PeopleNearby will include people opting for the service situated outside the college in the nearby areas.

Food: This entity would have all information about the food items including it's ratings, vicinity (calculated dynamically with the customer's location), price, discount (calculated dynamically from saleOn relationship), picture(blob), and the number of friends who like that item.

Shop: This entity will contain all the information regarding the shop, it's contact, delivery options, it's location and the general popularity. This entity is related to the entity food with two relations 'foundIn' and 'SaleOn' where the latter lets the shop provide different discounts on food items.

The **Relationships** are:

InterestedIn: This is a many to many relationship existing between Customers and Shops.

InterestedFor: This is another many to many relationship connecting the customers and the food items.

FoundIn: This relation links the different food items to the shops they are found in.

SaleOn: This relation lets shops to provide different kinds of discounts on food items.

FriendsOf: This is a self relationship on customers keeping a track of their friend circles.

Rate: This relation allows customers to rate.

3.2 Features to implement

- Light weight Android based Application.
- Compare any two restaurants in terms of a common dish.
- Provide ranking for the common dishes based on the feedback.
- Provide information such as menu, preparation time, price, quality and quantity.
- Provide information about timings and peak hours.

- Have separate profiles based on the type of user using Machine learning.
- Integrate Google Maps to provide navigation facility.
- Simple, clean and neat User Interface.

4 Negotiation

Our team had in mind the deadline of the requirement sheet submission and thus had to cut down a few requirements that were out of scope of the project and that were out of scope of the available skill set that our team possessed. Our development team had to keep in mind that we were developing a Food ranking system that was not specific to a single type of client but to general users who wanted to enjoy the delicacies of JSS S&TU.

4.1 Scalability Issues

We will be making the app for cafes and restaurants in the campus, including Frappe, Nescafe, etc, but not places like Aroma the Bakers, Kannan Bakery, Lassi Shop. This is because of a couple of reasons:

- i. The main stakeholders of the app are students of JSS S&TU. The college gives breaks of about 30 minutes to 1 hour. Hence to be on time to class, students have to eat inside the campus rather than outside.
- ii. The other issue is distance to the outside places. Aroma the Bakers is 1km, while Lassi Shop is 2.5km from college, which is a major problem because most of the 1st year students do not have motor vehicles. So, they won't be visiting them most of the time.

4.2 Food delivery applications integration issues

Residents who live in hostels or Paying Guest establishments, where cooking is either not available or gets tiring, often order food using online apps like Zomato, Uber Eats and Swiggy. We could implement our idea into these platforms. If one was to decide where to order a particular dish available in two or more places, then the platform will tell them which one would be better. However, due to time limit for the submission, we have to delay the said integration.

4.3 Machine Learning implementation issues

- i. Lack of quality data: Comparing two or more food items has a lot more than just the calories, quantity, price and distance to the cafe. There are factors like the ambiance of the cafe and taste, which both depend on the customer. Converting these factors into data will be a time consuming process and also very hard to implement.
- ii. Inadequate infrastructure: Machine learning requires a vast amounts of data processing power. Our system won't be able to handle the workload and will crash under pressure. Considering the computers in our college labs, only the newly installed PARAM supercomputer will be able to handle it (but the large number of machine learning and data science projects taken up by students will make it time consuming, waiting for our chance).

- iii. Implementation issues: To implement, we will need Analytic engines. Implementing newer Machine Learning methodologies into existing methodologies is a complicated task.
- iv. Lack of skilled resources: Deep analytics and machine learning in their current forms are still new technologies. Thus, there is a shortage of skilled developers available to manage such analytical content for Machine Learning. Data scientists often need a combination of domain experience as well as in-depth knowledge. We teammates being 3rd students, don't have enough knowledge.

4.4 Result

Our team decided to negotiate such requirements with the stakeholders so that we could strive for a win-win result. In this win-win situation, what we intended for was that the stakeholders would win by getting all the functional requirements which were absolutely necessary and those which would satisfy their needs, and also we would win by working to realistic and achievable deadlines. Thus, during the negotiation phase, our team successfully identified the key stakeholders and determined the win conditions of the stakeholders. Then we approached the stakeholders and negotiated the stakeholders win conditions in order to have them satisfied with those requirements and also to make us complete the task within the specified deadline. This was a key step for our team to carry out the further plans which include the actual design and implementation of the project.

5 Specifications

The following subsections of the Software Requirements Specications (SRS) document provide an overview of the entire SRS. This document provides details on how the developers will design the system, however this document is not for designing.

5.1 Introduction

5.1.1 Purpose

- i. To come up with efficient real time application that will provide users with a better option among a couple of restaurants.
- ii. To give feedbacks to the restaurant managers, to better their service and hence to improve sales.

5.1.2 Document Conventions

LaTex is used to document the Requirements gathering phase.

5.1.3 Intended Audience and Reading Suggestions

- i. Front end developers - They will have to know about the customer and Restaurant manager side of the app, i.e. XML and Web Development.
- ii. Back end developers - They will have to know Java or Kotlin development.
- iii. Testers and Debuggers - They will have to know about the assumptions and dependencies made, software quality attributes and overall description of the application.
- iv. Customers and Restaurant Owners - They will have to know the features of the apps to be using it to the full potential.

5.1.4 Product Scope

- i. The app will be working for the restaurants in the campus of JSS S&TU, however, we will be increasing the scale expanding to restaurants and cafes outside the campus.

5.1.5 References

- i. <https://ieeexplore.ieee.org/document/7991732>
- ii. <https://ieeexplore.ieee.org/document/6785539>

5.2 Overall Description

5.2.1 Product Perspective

- i. This is a new self contained product, which is independent of any other applications.
- ii. The idea was born when we experienced dilemma in which restaurant to visit, so we wanted to make it easy for the freshers, importantly not exclusively, in the college.
- iii. The application will play an important role in aiding the restaurant managers to introduce changes in their menu or service to improve sales.

5.2.2 Product Functions

- i. The product should identify the best restaurant for a particular dish.
- ii. It should then identify the reason why one restaurant is rated over another, so the lower rated restaurants can improve.
- iii. It should give the customers opening and closing timings for each restaurant.
- iv. Details about each food item is given, so that food choices can be made easily.

5.2.3 User Classes and Characteristics

Product functions used by :

- i. Product maintenance people : for modification and updation of the product
- ii. End Users : for finding the best rated food items of the college

5.2.4 Operating Environment

- i. The product is Android Based Application. Any mobile phone hosting versions of Android 6.0 or higher can be used.
- ii. There should also be reliable internet connection.

5.2.5 Design and Implementation Constraints

- i. Languages used: Java and Kotlin
- ii. Front end development: XML

5.2.6 User Documentation

- i. User manual will be provided for the product.
- ii. Tutorials given for beginners.
- iii. Email id's of the product creators and designers provided for any user support or issue.
- iv. Additional reading references also provided for efficient usage.

5.2.7 Assumptions and Dependencies

Assumptions:

- i. It is assumed that the user ratings are honest.
- ii. It is also assumed users have tried enough food items.

Dependencies:

- i. Interfaces should work properly and values should be updated regularly.

5.3 External Interface Requirements

5.3.1 User Interfaces

- i. Login page for authentication of the user.
- ii. If no reliable internet connection, then display error message: Internet not found/ network connection is slow, depending on the state.
- iii. Interactive buttons to get current status of food ranking.

5.3.2 Hardware Interfaces

Minimum requirements of the hardware components for the system :

- i. Mobile phone connected to WiFi or mobile data connection or any other kind of internet connection.
- ii. 5 MBPS connection speed, which is ideal.

5.3.3 Software Interfaces

- i. Android Marshmallow(6.0) or higher.

5.3.4 Communication Interfaces

- i. Any Android device to use Internet facilities.

5.4 System Features

- i. Ranking for food.
- ii. Menu of the restaurants, along with other information like quality, quantity, price etc.
- iii. Timings, ambience, hygiene etc of the restaurant.

5.5 Other Nonfunctional Requirements

5.5.1 Safety Requirements

- i. Only secure connections to be used while browsing or Internet usage.

5.5.2 Security Requirements

- i. Only users authorised to modify and change the characteristics of the application can use the tool.

5.5.3 Software Quality Attributes

Portability Application must work on different machines, irrespective of their hardware components, provided the hardware requirements mentioned in section 3.4 are satisfied. It also must be platform independent.

Reliability The software must be reliable and function desirably on all Android platforms, and at all times.

Usability Software must be user friendly, that is, it should be easy to understand and use by all of its users. Instructions for use must be provided on the form, to help the user understand the procedure to use the network monitoring system. The different buttons must also be named appropriately, to avoid confusion.

Modifiability Software must be easy to understand and modify, in order to cater to future needs. It should be possible for the system to accept inputs of other forms like static dataset, if the necessary changes are made to the respective modules. Modification of one module or subcomponent, should have minimum effect on the other modules or subcomponents.

5.5.4 Business Rules

- i. The software requires someone with a good knowledge of network.
- ii. The software provides information which the administrator must understand in order to commit his/her changes.

5.6 Other Requirements

No other requirements identified as of now.

6 Validation

Validation of the collected requirements plays an important role in the overall process of requirements gathering. The process of validation of requirements involves activities like checking for any ambiguities in the requirements collected, omissions of any requirements and finding out if any inconsistent requirements are present or not. Once the requirement model is shown to the stakeholders, the stakeholders prioritize the requirements based on their needs and we, as requirement engineers, group the requirements into packages so that they can implemented easily as software increments. During this step, the requirement engineer must ask questions that are shown in the following subsection.

6.1 Validation Checklist

i. *Is each requirement bounded and unambiguous?*

We went through the requirements which were mentioned previously and found out that there were a few ambiguous ones, like the stakeholder category of Students gave us a lot of ambiguous requirements eg. some of them were willing to pay a lot while others weren't. We eliminated such requirements by introducing price as a feature which helps in making things clear. Our team provided abstract details to the stakeholders which hid the implementation part of the project. This made easy for the team to gather requirements without confusing the stakeholders of the implementation part. A few requirements which were out of scope of the project were realized in this stage, and were eliminated. The students category of stakeholders requested to get food ratings for all the restaurants in Mysore. This requirement was out of scope of our project and was not feasible in terms of implementation, so our team eliminated this specific requirement. Apart from this, the lecturers category of stakeholders wanted recommendations based on their order history. This requirement was out of scope of our project, because it is about ranking food and not using machine learning to learn from the order history.

ii. *Is the requirement really necessary or does it represent an add-on feature that may not be essential to the objective of the system?*

While answering to this question, we thought that the requirement of having a feature to show the billing details was not necessary and hence we eliminated it. Our main objective with this application is to find the best food items by collecting several reviews. This feature is general to all people.

iii. *Is each requirement achievable in the technical environment that will house the system or product?*

The team decided to remove the feature of recommendations based on order history during this phase of requirement collection as it is difficult to achieve in the technical environment that will house the application. The feature would definitely be useful in our application however due to our strict deadline and lack of required skills we discarded this feature.

iv. ***Do any requirements conflict with other requirements?***

We surely did come across a few ambiguous and a few out of scope requirements, but our team found out that there were no requirements that conflicted the other. Validation of requirements through this question was done easily.

v. ***Does each requirement have attribution? That is, is a source (generally, a specific individual) noted for each requirement?***

During the process of requirement collection, our team carefully noticed and made a note of the source of each requirement. This has been successfully reflected in the elicitation phase of the requirement collection. Each client has been attributed to a specific set of requirements.

vi. ***Is the specification structured in a way that leads to easy understanding, easy reference, and easy translation into more technical work products?***

A Software Requirements Specification(SRS) document has been created to allow easy understanding of the models and functions of the project, along with formal diagrams, descriptions and other graphical models. The SRS is a part of this report and has been included in previous sections.

These were the questions asked and answered to ensure that the requirements model was an accurate reflection of stakeholder needs and that it provided a solid foundation for design.

7 Requirement Management

Requirement Management can be defined as a process of eliciting, documenting, organizing, and controlling changes to the requirements.

We started this process of management of requirements as soon as the elicitation phase began. Our team had a closer look at the requirements collected and had a clear understanding of what the requirements were, and also got an abstract idea of how these requirements can be implemented into actual software, which is just a mobile application in this case.

During this phase, we had a better control on our project. We followed a particular pattern for managing the requirements. What we did first was, identified each of the requirements clearly. This was possible because our team maintained a note of all requirements collected. Then we went through the list and reassembled the requirements based on a priority given by the stakeholder. During this process of reassembling, we also made sure that the requirements were reassembled taking into consideration, the various problems we might face during the implementation of the project.

Part II

Process

8 Discussion with the Students



Figure 2: Interview with a Fresher



Figure 3: Interview with another Fresher

9 Discussion with the Faculties



Figure 4: Interview with a Faculty



Figure 5: Interview with more Faculties

10 Discussion with the Restaurant Owners



Figure 6: Interview with Cafe Frappe's Owner



Figure 7: Interview with Yampa's owner

11 The Team



Figure 8: Group Discussions



Figure 9: Team Members

Part III

References and Remarks

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13 Professor's Remarks