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Question No. 01:-

Comparison of Multiple RE Strategies

Answer:-

(a) Activities Assigned to Different Frameworks:

Requirements Engineering comprises of multiple sub-processes. However, depending upon many factors, these sub-processes are ~~not~~ selected / dropped from the RE process. In other cases, the techniques in these sub-processes are opted as per the needs. Following is the demonstration of how the Requirement Engineering process (and the involved techniques) will vary across three different project types.

⇒ Short Term Project, Small Team

1- Identifying Stakeholders and Domain

The identification of stakeholders and domain understanding is the first step of RE. It helps to determine feasibility of system as well as to know where to elicit requirements from.

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Since the Software Organization is small, it'll most probably have clients who themselves are small organization so stakeholders' identification will be an easy step.

2- Understanding Existing System

If an improved version of an existing system is being made, it is important to understand that system first.

In a small organization, this can be done via going through previous system's documentation or by observation. ~~A small~~ In our case of small group, this step can be skipped as well.

3- Requirements Elicitation

A small team also has to elicit requirements even if the project is short termed. This step helps to identify the problem as well as to devise solution in further steps of SDLC.

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Requirements Elicitation in this framework gets a huge help from the experience of Requirements Engineering Team. If the client organization is unitary hard, a one-on-one interview also suffice. Otherwise, ~~TAD is the way to go~~ a group interview ~~brainstorming~~ session is the way to go.

4- Requirements Analysis

After eliciting requirements, it is mendatory to go through the requirements and identify any conflicting requirements. The conflicts should again be resolved in a group interview/ workshop to save time.

To get on the same page as the client, a scenerio for all requirements will also be documented and thus also validate requirement.

5- Requirement Prioritization

This step can be a part of the previous step, but here it is written separately as its techniques are

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different for each framework.
For a small team, prioritization will only be done before development. Since the no. of requirements will (most probably) be less, 'Ranking' or 'Kano' techniques will work best.

6- Verification and Validation

The requirements shall be validated from client in step 3 and 4 as a part of those subprocesses.

It'll be tried to develop solution product as per any existing standards. The validation matrix, at the end, will help to trace and verify the requirements as they're developed.

Requirements Management is not an explicit part of the process but all the 'use-cases, validation matrix, requirement prioritization matrix and updated of requirements shall be kept safely documented as an implicit Requirements Management.

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⇒ Medium-Term Project, Medium Team

A medium term project of 1-2 years and a team of 50 people means this framework can allow a relatively detailed Requirements Engineering process. I shall include the following activities in such framework:-

1- Identifying Stakeholders and Domain

Just as the previous framework, it is most important step to understand who are the stakeholders, in order to better elicit requirements. It is always beneficial to know/understand the domain of possible solutions so that the RE team is well prepared with experts.

2- Analysis of Existing System

In order to understand the problems being faced by client, a medium sized RE team (with sufficient time at hand) should observe the existing system. ~~Ethnography as well as interviews~~ Ethnographic observations followed

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by interviews will help in unbiased and better understanding.

3- Requirements Elicitation

For a Requirements Engineering, time is always a constraint. The best way to elicit requirements is via workshops / group interviews, followed by individual interviews with high-priority stakeholders.

The earlier interviews help to identify as many requirements as possible and the later will help RE team to understand the priority / urgency of problems.

If the resources allow, vertical and evolutive prototyping will also help the stakeholders about the type of solution they require. This is specially helpful if there is no existing system.

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4- Requirements Analysis

In ~~For~~ requirements analysis, first of all conflicts of requirements shall be resolved and documented.

For detailed analysis, usecase diagrams scenerios of requirements shall be made and discussed with clients.

5- Requirements Modeling

Assuming that the sytem being made is of mediocre complexity, sequence diagram shall be made to model the system behavior.

6- Requirements Prioritization

For this particular framework, requirements prioritization shall be done at Negotiation, Validation stp and before implementation.

Ranking or Wieger's techniques will suit this framework best (depending on complexity & no. of requirements)

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7- Validation and Verification

This sub-process of framework is almost identical to previous framework. Standards of the product being developed shall be followed. Validation matrix will provide the facility to trace or verify requirements.

The requirements ~~are~~ will also get validated (implicitly) during elicitation, analysis and modeling phase.

Requirements Management of this framework will also be embedded in previous phases. The requirement, conflict resolution, use cases, sequence diagrams, prioritization matrix, validation matrix shall act as necessary project documents.

ok. I will take this as documentation

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⟹ Long Term Project, Large Team

1- Identifying Stakeholders and Domain

The first step is identification and then classification of stakeholders. The project assigned to the team might be new to them, so it'll be better to do homework and understand the domain of possible solution.

2- Understanding Existing System

If there is any existing system in work, it has to be understood first. For a large working team, RE gets convenient here. It's easy to extract information. Observing the end users (followed by questions) shall be really helpful. This observation can be done as a one-way mirror so the user is unaware of being observed and doesn't get nervous. Or it can be done otherwise.

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3- Requirements Elicitation

For this framework, the most suitable elicitation techniques shall be Interviews (multiple groups / shuffled groups) and naturalistic observation. The reason is that there will be resources and time (hopefully) for these detailed activities.

4- Requirement Analysis

First of all conflicts, as identified, shall be resolved in meetings similar to elicitation. Use cases shall be developed. Use case diagrams shall be designed and then organized hierarchically for readability.

5- Requirements Modeling

Since the product is persumably complex, the most suitable modeling option will be colaboration diagram. They'll be more readable and can spread across any dimension.

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6- Requirement Prioritization

Requirements shall be prioritized at elicitation, Negotiation, Validation levels, as the no. of requirements will be higher.

Cost-Value and Wieger's techniques will be best suited for this framework.

7- Validation and Verification

This step will be same as in previous two frameworks. The addition will be of traceability matrix.

8- Requirements Management

Requirements management shall be continuously in place with each phase/activity. For this framework, management shall be explict and a standard SRS and other documents shall be produced.

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(b) Difference of Activities across Frameworks

The difference of activities is sub-divided into two types.

(bi) Presence and Absence of Activities

=> Present Activities

Requirement Elicitation, Analysis, Prioritization, Verification and Validation, Domain + Stakeholder knowledge are the activities exist in every framework.

The reason is that these are the most important ones and cannot / should not be missed at any condition. Absence of any of the above shall make the RE process lengthy and faulty.

=> Absent Activities

Requirements Modeling is absent from Framefork-1 since there are limited resources (humans + time) and the description of scenerios, more or less, compensates the absence of modeling.

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Requirements Management is not a separate activity in framework 1 and 2 but it is being done throughout the RE process.

(bii) Difference of Techniques in Activities across Frameworks

⇒ Elicitation

Framework 1 (FW-1) uses group interview or client's interview to save resources.

FW-2 uses observations as the time constraint is a little less but then used interviews to reserve resources. Prototyping helps in the same regard as well.

FW-3 can afford huge data and large time consumption, so, to be precise in elicitation; observations were suggested.

⇒ Analysis

Use of scenerios in FW-1 is because of the assumption that system is not so complex.

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FW-2 can be applied to mid-complexity systems, hence use cases will help in getting clear, complete and un-ambiguous requirements. Same is true for FW-3.

⇒ Modeling

FW-1 suggests no modeling as scenerios will suffice. FW-2 suggests sequence diagrams as they are easier to generate and maintain. FW-3's diagrams could be "complex so collaboration diagrams are opted there for modeling.

⇒ Prioritization

FW-1 deals with simpler systems and complexity grows towards FW-3. Hence for less no. of or less complex req of FW1, ranking or Kano will do well.

Complexity or number of requirements grow in FW-2 therefore Ranking of Weigers is suggested. For even complex/large req.s in FW3, Weigers and

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Cost-Value approach is suggested.

⇒ Analysis of Existing System

The techniques opted for existing system's analysis in all three frameworks is purely based on time and human resources available.

good work
minor issues
-1

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Question No. 02:-
Critique of Paper

Answer:

⟹ Introduction:

The paper 'An approach for Reviewing Security Related Aspects in Agile Requirements Specifications of Web Application' has been written by H. Villamizar, A. Anderlin, M. Kalinowski, A. Gracia and D. Méndez for 27th International Requirements Engineering Conference held in 2019.

The main idea of this paper is to highlight the negligence in Agile environment towards the security requirements (SRs). The paper emphasis that a lot of products are now web based i.e. more prone to security issues but security is still a Non-Functional Requirement that gets overlooked while delivering the 'working system'. Sometimes even the clients are unaware of

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the fact that any security requirements apply to their product. The other reason is the absence of a competent security engineer who can detect security requirements ~~and can~~ from the elicited requirements and also find any conflicting requirements. The paper under-discussion tries to solve the later problem via automated tools, specifically for Web Applications.

⟹ Summary:-

The authors in the paper propose a method that can help a naive security inspector to help find security requirements and any conflicts in them. The authors have made use of Natural Language Processing Techniques.

The Natural Language Processing Technique gets requirements in Natural Language and extracts security requirements out of it. Instead of waiting till Testing Phase, this is done in early stages of Software

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Development Lifecycle.

Open Web Application Security Project (OWASP) has a comprehensive list of high level Security Requirements and that is used in the study as well. Moreover, the security controls used, in accordance with the 3 properties of Software Requirements of OWASP, are 04. These 04 controls / properties are Confidentiality, Integrity, Availability and Identification Authorization. Any security Requirement, after being detected, is categorized ~~as~~ into the above stated 4 properties (or a combination of these properties).

The other important standard adopted in this study is the defect type. So the defects, after being detected, are classified as Omission, Ambiguity, Inconsistency and Incorrect Fact. A defect can also be a combination of stated types.

Some important assumptions for this study are as follows: 1) Requirement is given in user story format where first

block represents role, second block represents verb and third has the noun/reason.

2) OWASP has sufficient vocabulary for Security Requirements of Web Applications

The proposed approach works in two steps i.e. generating the reading technique and generating the defect form. First of all, in Phase 1, Requirements are input to the system. A Natural Language Processing technique decomposes the input and keywords are extracted. These keywords are then matched with OWASP word database and then each keyword is assigned one or more security property(ies). This is how a requirement is linked to any high level Security Requirements and at this point a 'Reading Technique' is generated. This document then enters the phase 2 of process where defects are detected, labeled and a 'defect report form' is generated as an output of this whole process. The 'Reading Technique' document, produced earlier, is claimed to be so easy that a naive can also

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detect any defects.

In order to prove the validity and correctness, an experiment has also been conducted. The data for the experiment i.e. the requirements were collected from OWASP. The participants of the experiments are graduate and undergraduate students with little to no knowledge of ~~Seq~~ Security Requirements. The participants are divided into Control and Experimental group in order to find answer to two questions.

1) How effectively (correct identification) a naive person can detect Defects from 'Reading Technique' and 2) How efficiently (fast/ in less time) can a naive person detect defects from 'Reading Technique' document.

The experiment took place in two iterations and according to the results, Undergraduates (iteration 1) and graduates (iteration 2) both were able to detect correct defects more easily from proposed techniques than otherwise. As far as efficiency is concerned, the first iteration i.e. undergraduate students were 20

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able to detect defects more quickly in proposed approch than the other technique. Same goes true for iteration 2 i.e. Graduate students who identified defects exponentially quicker than the control group.

These results evidently prove the validity of the proposed system.

⇒ Critique:

The proposed paper is a tremendous effort in the right direction. The results claim the correctness of proposed methodology. This technique can very well help in identifying and detecting defects in the security requirements.

However, there are a few weak points of this paper. First of all, the paper assumes that Requirements shall be given in the form of user-stories with 3 blocks must present in them. This can't be the case always. A user isn't bound to give requirements in one specified format. The user will keep thinking about sticking to the formal rather than

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brainstorming about the requirements of his product. Agile is already a fast charactered SDLC and no Requirements Engineering Team can afford getting requirements first and then moulding them to the desired 'User stories format.'

A user story format doesn't necessarily have 3 blocks. The template 'As a [role], I want to [feature], so that [reason]' falls flat at places where user has no reason to give in a story. It might be that he wants a feature because he likes it etc. Hence sticking to 'User Stories' format is a battle for client and for the ~~deve~~ Requirements Engineering Team.

The other problem in the paper is that there is nothing mentioned about the presence of a Security Engineer as a stakeholder at Requirements Elicitation session. This is problematic as the client or rest of the stakeholders cannot always predict/state the security requirements of their

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project. Moreover, the client may also be naive who doesn't have proficiency in English and he is barely communicating the Requirements. In such cases, presence of Security Engineer is a must. Sometimes a user Requirement is such that it is giving rise to a security concern that only a Security Engineer can point out.

In Figure 3, the description says that Trial 2 (Graduates) got a more refined / easier set of requirements as the previous trial participants complained about the complexity of words. Even though it hasn't affected the crux of experimental results but still it disturbed the integrity of experiment.

~~The other proble~~

⇒ Conclusion:

The paper and the whole critique both makes it clear that even though the proposed research is a very well-thought idea missed some important marks to

good work
minor issues
-1

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touch. The proposed technique is quite helpful for a naive security engineer but it still requires external validation, independence from OWASP as that repository is limited, ~~and~~ expension to other application domains of Agile SDLC and a little refinement with input's structure.

(Word Count ≈ 1090 words)

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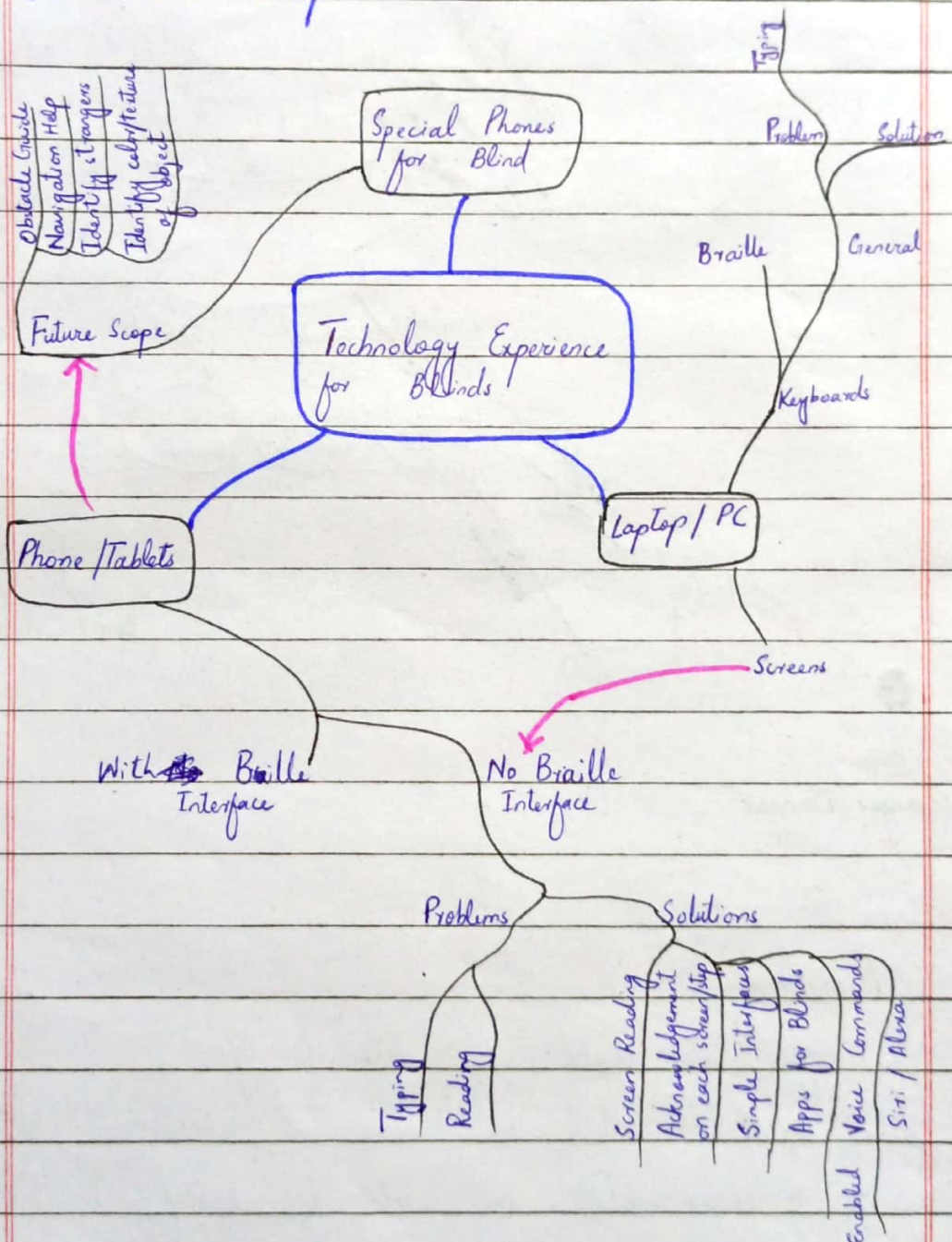
Question No. 03

Mind Map and Requirements

Answer:

(a) Mind Map



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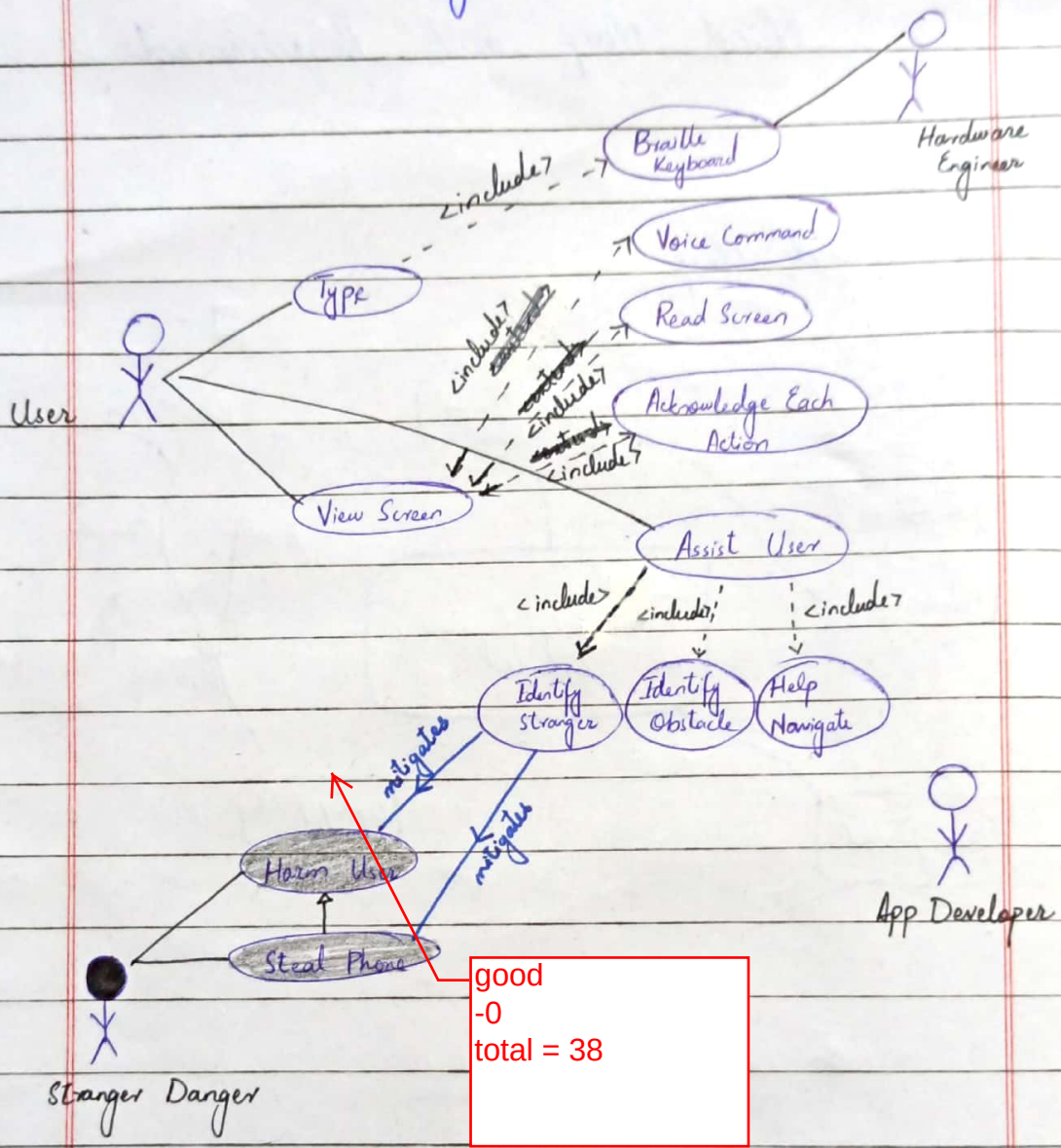
(b) Use Case Diagram



good
-0
total = 38

Requirements:

1- User shall be able to type.

2- User shall be able to view screen.

3- User shall be able to identify strangers and obstacles.

4- User shall get help in navigation.