EDAP in Agile Processes

**Requirement Engineering**

Requirement Engineering is concerned with the definition of requirements to a system that will be developed. The goal is to arrive at a set of requirements that completely describe the functionality, the constraints, what the system should and should not do. The requirements guide the implementation and serve as rationale for the systems properties.

There are three activities in Requirements Engineering: Requirements Elicitation, Requirements Analysis, and Requirements Management. In Requirements elicitation, requirements are collected. There are many sources for requirements to be consulted/investigated. A big portion will come from the client. If for example the client wants the system to provide a user interface, one requirement will be: The system shall provide a user interface. Other sources are for example: industry best practices, available resources or security standards. The requirements can be quite specific, or broader. Some requirements might stand in conflict with each other.

In the next step, requirements analysis, the requirements are refined, categorised, broken down and conflicts are solved. Requirements can be categorised into two groups: functional and non-functional requirements. Functional requirements are concerned with the functions a system should have. “The System shall provide a login function” is a functional requirement. Non-functional requirements describe the qualities a system should have. This could be accuracy, performance or security. “The system shall be modifiable to include new functionality in the future” is such a requirement. In practice, the distinction between functional and non-functional requirements can be very difficult. Requirements that contain multiple requirements can be refined by breaking them down into smaller ones. A requirement posed by the client could be “The system shall have a secure login mechanism”. This can be broken down into: “The system shall have a login mechanism” and “The login mechanism shall be secure”. A broad requirement can lead to more specific requirements. When multiple requirements stand in conflict, that conflict has to be resolved. For example, a system should accommodate a number of users, but it should also run on resources that cannot support that number of users. To solve this problem, the maximum number of users could be reduced.

In Requirement Management, requirement change is managed. Requirements can change, sometimes the client changes them, sometimes the environment changes. These changes have to be included, so that the requirements always match up with the finished product. To determine whether to System fulfils its requirements, it has to be tested and verified.

**Goal oriented Requirement Engineering**

Goal oriented requirements engineering is an approach to requirements engineering that uses goals to elicit and analyse requirements. “A goal is an objective the system under consideration should achieve”. Goals can be detected by asking the questions why, how and how else. These questions lead to different levels of goals. Asking why leads to the highest-level questions, “it helps to discover the objectives and rationale behind the goals”. The how question leads to lower-level goals of technical nature. Asking the how else question “helps to identify the alternates to satisfy higher level goals”. These questions are part of the requirement elicitation phase.

To break down and refine goals, the concept of agents is used. Agents are “active components of the system, such as humans, devices, and software”. A goal is broken down, until only one agent is responsible for it. The goal then becomes a requirement. Not only the system itself can be described with goals and requirement, the environment of the system also has goals, “a goal under responsibility of a single agent in the environment of the software-to-be becomes an assumption”

**EDAP**

EDAP – Ethical Deliberation in Agile Processes, is a schema that assists teams in the process of “document[ing] the ethical dimension of their development decisions clearly and concisely, thus facilitating sound and coherent deliberation that is easy to understand and readily verifiable by third parties. “

To illustrate the process, an example will be used. Microsoft has introduced a productivity score tool. It allows employers to inspect an employee's activities. The employer can see how much an individual uses tools like email or how they contribute to shared documents. Microsoft has also filed a patent for a “meeting insight computing system”. It uses data like body language and facial expression of the participants, time of day and the number of participants, to predict how high-quality a meeting will be. In addition to that, it calculates how much work the participants are doing for the meeting, in comparison to other activities, like checking their email. Both the productivity tool as well as the patent have been met with a lot of concern. The implications for the employee’s privacy are grave.

How would EDAP handle a proposed tool like the productivity tool?

The first step is to collect all aspects that have to be considered for the system. This includes the description of the universe that the system will be placed in and the general ethical values that have to be considered. Next, the stakeholders are listed. For each stakeholder, the values represented by that stakeholder are specified. In our example, the stakeholders include the managers that use the tool, the employees whose data will be analysed and the company. The company and managers' interest is to increase productivity. The employee might be interested in being more productive, but also wants to have their privacy protected.

 Finally, the technical aspects of the system are inspected. What are the technical biases? What are the possible technical strategies and what consequences could emerge? The technical strategy that Microsoft has chosen is to monitor the employee’s productivity and show the information to managers or team leaders. What could be consequences that would emerge with the tool’s use? Managers could start to punish employees based on their scores. They could also start to dictate exactly how employees have to work.

This first phase provides the basis for the argumentation to come. All information that is available and relevant to the decisions to be made is collected. The division into universe, stakeholders and technical aspects encourages the developers to consider all aspects of the system and universe. This is important because the ethical deliberation requires the analysis of the impact of the system on its environment, as opposed to viewing the system as isolated from the environment and ethical values. A developer might implement a tool like Microsoft’s meeting analysis and only think about the way inefficient meetings hinder the workflow and block time. This is obviously not enough, because the analysis of employee’s body language or software use is a serious problem for privacy. EDAP helps to inspect all aspects of the system and thus avoid such situations.

In the next phase, conflicts between values, goals and interests are explored. For each conflict, the possible options for action are presented. From the information collected before, the developers can deduce which values lie in conflict with each other. In the productivity tool, conflicting interests are for example the right to privacy against the increase of productivity.

Each conflict is resolved in the next phase. For the options of action, pros and cons are collected. From this information, it is decided whether to stop and choose a different solution to analyse or to go forward. In that case, the technical feasibility is analysed. The final step is testing if the finished System holds the standards that were defined.

Is EDAP a form of RE?

For including EDAP in the development process, it can be helpful to inspect which part of the development process it is most similar to or which part it can be integrated into. The most promising candidate is Requirement Engineering, because, like EDAP, it is concerned with the requirements of the system and their analysis.

Requirements Engineering defines Requirements by collecting and analysing them, to arrive at a set that completely describes the system without contradictions. EDAP inspects the ethical dimension of a system by collecting all values and norms concerning it and solving the ethical conflicts that present themselves. This means that the two processes centre around two concepts: requirements for RE and ethical values and norms for EDAP. To compare the two, it is therefore necessary to compare requirements to ethical values and norms.

Requirements describe the system and define what it should and should not do. Here, the definition of a goal in goal oriented RE is helpful: “A goal is an objective the system under consideration should achieve” (reminder: a requirement is a goal under the responsibility of one agent). This is similar to normative ethics: “Normative ethics [] involves substantive proposals concerning how to act, how to live, or what kind of person to be.”[hK1]  Both concepts are concerned with what an entity should or should not do and how it should or should not be. The question is now: Are requirements and ethical norms the same thing? One can say, in the context of RE, that an ethical norm concerning the system is a type of requirement, but a requirement is not a type of ethical norm. The definition of requirements includes more than just ethical requirements. For example, the requirement “The user interface should be intuitive” is not of ethical nature. The concept of a goal is especially well suited for the integration of ethical norms. “Goals have been recognized to provide the roots for detecting conflicts among requirements and for resolving them eventually.” Similar to that, ethical norms often represent the core of a conflict and EDAP serves to detect and resolve these conflicts.

Thus, for the purposes of integrating ethical deliberation into RE, it can be said that ethical norms are a subgroup of requirements, or more specifically, goals.

We now know that EDAP and RE are concerned with similar concepts. The next step is to inspect the process of both and determine what the common features and differences are.

RE starts with the requirements elicitation phase. Here, all requirements are collected. EDAP has a similar first phase: all aspects, interests and values of the universe, the system and the stakeholders are listed. This means that both EDAP and RE have a first phase which has the goal of collecting all information relevant to the system. The next phase in RE, requirements analysis, transforms the requirements by refining them and solving conflicts between requirements. EDAP also resolves conflicts in its next phase, but it does not focus on refining the other requirements. The purpose of EDAP is to identify and resolve conflicts of ethical nature. This is why this phase is central to the process. It requires the collection of arguments from different ethical theories and a deliberation on what option of action is the right one. Since decisions of ethical nature can have grave consequences, the justification needs to hold to very high standards. RE requires justification, too, but the decisions may not require such a thorough analysis and high standards. In conclusion, the second phases of RE and EDAP both feature conflict resolution. EDAP focuses strongly on it, while RE also refines requirements.

The last phase of RE is the requirement management phase. It includes verifying the requirements and monitoring and integrating changes to the requirements that occur during the development process. This is necessary to guarantee that the system will fulfil all its requirements. In EDAP, the last step is to verify and test whether the decision made in the conflict resolution is fulfilled. EDAP and RE do similar things in this phase, too.

In conclusion, the EDAP and RE processes are centred around similar concepts, requirements and ethical norms. The processes themselves are also similar in their phases. The main difference is that EDAP’s focus lies on the resolution of ethical conflicts, while RE also focuses on the refinement. Since decisions concerning ethical matters carry greater consequences, EDAP requires a more thorough analysis and justification of the decisions being made. In general, the processes do very similar things. This is why, when integrating EDAP into the development process, it can be oriented around how RE is integrated into the development process.