

TEAUS: Task Exploration and Analysis Using Scenarios

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This paper examines use of scenarios in task analysis of human-computer interaction. Scenario-based task analysis is categorized into inspection methods. It uses scenarios—concrete stories and examples of past use of existing systems as well as future use of potential systems—as basic tool for task analysis. This paper discusses two types of techniques. On one hand, it illustrates scenario exploration technique, in which we iteratively create scenarios and pose 5W+1H and What-if questions. This activity can be done in group sessions with various stakeholders in system design; in this case, it provides various viewpoints in system analysis. On the other hand, it emphasizes claims analysis technique, in which articulation of claims of technology in scenarios (i.e., systematic enumeration of its potential tradeoffs) provides fair analysis on pros and cons of its consequences. These systematic questions, which system might afford, provide the opportunity to do reflection of analyst's past experiences. In order to remove the cost of task analysis with user participation, this paper points out the importance of the early enrolment of potential users in scenario design meeting. The reason is, once analysts obtain users' goal, task and background information working through scenarios with potential users, they can reuse that information for analysts' walkthrough of new or alternative design. In other words, with the information the analysts can role-play potential users in realistic manner. It will reduce cost of every-time assessments by potential users. As task analysis at the present time provides a broader scope, furthermore, this paper discusses the merit of using scenarios in system design and analysis—such as team building and project management.

Keywords: claim, claim analysis, scenario, scenario-based design, scenario-based task analysis, tradeoff analysis

Introduction

Every designer, without exception, would like to design a usable and useful system. No designer hopes that nobody will use the system he/she is designing. In this sense, designer focuses attention on users and their tasks. Levels of focus on users and their tasks are varies depending on project culture. A systematic engineering project may articulate user tasks in several forms of descriptions and decompose and analyse them to understand user's cognitive states during system use. A less organized, craft project may be based on designer's own knowledge and experience without describing them. All projects, to some extent, create users' story during the course of design in order to make use explicit and reused.

Scenario facilitates this design activity to provide a lightweight way of creating and reusing use situation (Carroll 2000). Scenario is an integrated and flexible, use-oriented design representation, which is easily developed, shared, and manipulated. It is applicable to many system development activities. It is a fundamental design artefact in human-computer interaction and has several roles throughout the system lifecycle. For example, it facilitates user-designer communication as a vehicle of knowledge. It will treat unforeseen activities by users as if it were tangible design artefact.

This paper focuses on this role of scenario. It discusses how unforeseen user tasks are envisioned and how they evoke the basic concept of system design. Task Exploration and Analysis Using Scenarios (TEAUS) provides a framework on systematic questioning process. It envisions scenarios to analyse and evaluate human goals and activities. TEAUS is a finer implementation of Scenario-Based Requirements Analysis (SBRA) by Rosson and Carroll (2001). This paper, therefore, includes a summary of SBRA also.

Scenario-Based Task Analysis: Ideas and Concepts

This section defines basic terms on scenario-based task analysis. It specifies scenario and claim. It includes a short summary of SBRA; then it illustrates a basic concept of TEAUS. Both SBRA and TEAUS use claims analysis as a key technique for analysis; thus, this paper defines claims analysis. In addition, TEAUS contains scenario exploration as another key technique. This section, therefore, goes on to explain scenario exploration. Even though scenario exploration is not scenario analysis in conventional notion, it is important part of scenario-based task analysis.

Scenario

Scenario is a description that contains actors, background information on the actors and assumptions about their environment, actors' goals or objectives, and sequences of actions and events. It may include actor's obstacles, contingencies, and outcomes. Some applications may omit one of the elements, or they simply or implicitly express it.

It is a shared story among various stakeholders in system design. For example, customers or project managers tell their vision in episode. Users talk the problem they faced as happening. Designers record the rationales of design as example form as well as develop mock-ups to illustrate what users do with the design. Technical writers explain the task of users in manual and document as story. These are examples of scenario shared among stakeholders and distributed throughout design cycle.

Scenarios are expressed in various media and forms. For example, scenarios can be textual narratives, storyboards, video mock-ups, or scripted prototypes. In addition, they may be in formal, semi-formal, or informal notation. A typical example of an informal scenario is a story, a kind of scenario frequently used for envisioning user tasks in human-computer interaction.

The following is an example of textural narrative scenario, excerpt from Carroll (2000). It envisions the ideas on interface and interaction on a video information system.

Looking for the fast-forward button

Walter has been browsing some clips pertaining to the project manager's views of the lexical network as they developed through the course of the project. One clip in

particular seems to drag a bit, and he wonders how to fast forward through the rest of it—perhaps he can just stop the payout?

Claim

Designed artefact may contain various *tradeoffs*. Tradeoffs are pros and cons of artefact. In contrast, *Claims* are more specific in context than tradeoffs. Claim is a description of tradeoffs relating to specific usability concern with a given artefact; in other words, it creates an instance of tradeoffs. It articulates the upsides and downsides of artefact usability.

Claims enumerate implicit causal relations in scenario. They describe tradeoffs instantiated in a scenario context (and in that sense, they explain the scenario). Combined use of claims and scenarios, therefore, helps designers discuss the consequences of design move at various levels of analysis. Considering the “looking for the fast-forward button” scenario, for instance, the nature of video data has two sides: it is a very rich, intrinsically appealing medium, but difficult to search, and must be viewed linearly in real time. Articulating this important yet implicit nature together with the scenario enriches use of scenarios in system design and analysis.

It is useful to provide a format for tradeoffs and claims in order to produce, document, analyse, and reuse them. Carroll and Rosson (1992) suggest the following practical form:

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{Some design feature}
+ causes {desirable consequences}
- causes {undesirable consequences}
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For example, a claim on video information related to the “looking for the fast-forward button” scenario can be described as:

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Video Information claim: video information
+ is a very rich, intrinsically appealing medium
- is difficult to search, and must be viewed linearly in real time
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This form of claims is useful for analysts because they can understand what is missing. For example, if there are several downsides listed in a claim of an artefact without any upsides, then analysts should keep in mind of considering its upsides.

Scenario-based design

Scenario-Based Design (SBD) uses scenarios (and thereby claims) as a central representation throughout the entire system lifecycle. SBD has three key characteristics: (1) it is a lifecycle methodology; (2) it is strongly oriented toward inquiry (in Pott’s sense); and (3) it can be employed in a wide variety of ways.

(1) SBD covers everything from requirements and visions through to summative evaluation; most task analysis methods are employed at a particular point in system development, and neither leverage nor are leveraged by any other representation or technique employed anywhere else in the system development lifecycle. This lack of integration with lifecycle development activities could be one reason that these other task analysis methods have had little impact (as Diaper (2002) admits in his review of Making Use) and are adopted only in organisations that employ formal waterfall methods (like the military contractors or insurance companies).

(2) SBD is strongly oriented to inquiry. Most task analysis methods take some sort of specification as a given and then further articulate it, and perhaps refactor it. However this is mild stuff if one is interested in discovering insights into human activity, radically new ways of doing familiar things, or entirely new types of things to do. SBD includes and addresses these other, more creative, concerns. It may worry a person with very structured task analytic perspective that SBD helps to generate all sorts of novel activity concepts, because such a person may see that as just beyond the purview of task analysis. But it clearly is useful to imagine new tasks, and in creative and rapidly-emerging areas of information technology, imagining new tasks may be much more critical to success than finely analysing out-of-date task concepts.

(3) Many task analysis methods seek to achieve highly precise procedural specification, so that a task analyst knows just what steps to carry out, just how to carry them out, and just what order to carry them out in. This is highly desirable, and especially important if the task analyst is marginally competent or not very creative. This is where structured methods really prove their value. However, the cost or downside of well-specified method scripts is that they lack flexibility. Thus, if circumstances are novel, if new opportunities present themselves, the highly-structured methods still just chug ahead just as they always do. SBD is highly flexible and accommodates different practitioner styles, different contexts of application, and idiosyncratic constraints and opportunities in a particular project. One can just envision a scenario; one can employ the concepts from Making Use, one can methodically follow the more structured approach of SBRA or TEAUS (discussed later), one can even employ a Sheperd-like hierarchical task analysis of a systematic sample of scenarios. All of these approaches belong to the family of SBD methods, and each can be employed when it is most appropriate.

Scenario-based requirements analysis

Scenario-Based Requirements analysis (SBRA) is developed as the starting-point activity in SBD of human-computer interaction (Rosson and Carroll 2001). Its framework is illustrated in Figure 1.

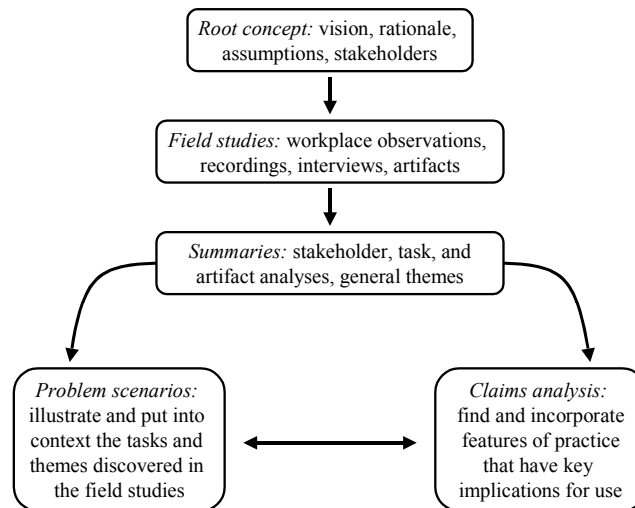


Figure 1. Overview of scenario-based requirements analysis (Rosson and Carroll 2001)

Initiating SBRA, analysts prepare *root concept* prior to go into the field. Root concept is a document describing vision, rationale, assumptions, and stakeholders on the target system. It is derived from various sources. For example, vision may come from open-ended discussions

among various people relating to the target project. Identifying those people—stakeholders—also is part of root concept. Rationale may come from discussions about the current technology and problems in the target domain. Finally, listing assumptions on the project and their impacts to it provides prepared minds for analysts.

Had the root concept and questions on it ready, they conduct *field studies*. They use several tools and techniques of task observation and recording (Diaper 1989). They will conduct qualitative researches: observing workplace, recording work setting and activities, interviewing stakeholders, and analysing artefacts.

Then they summarise the collected data to identify and illustrate the stakeholders, activities, and tools or artefacts of the project. Also, they recognise the general themes or workplace themes of the project. During this process, analysts use task analysis techniques such as *Hierarchical Task Analysis* (Shepherd 1989) to decompose complex tasks into subtasks. In addition, this summarising step may employ a similar technique to *affinity diagram* method of contextual design (Beyer and Holtzblatt 1998). Analysts use post-it notes to write down ideas then make a group of them. They will put a title of the group. More recently, practitioners implemented those techniques into design projects and reported their experiences.

Identified the basic elements from the field data, analysts enter into iterative cycles of scenario description and claims analysis. First, they put all information to current practice to create *problem scenario*. Problem scenario contains the identified elements such as project's stakeholders, their activities, and tools or artefacts they use. It represents and illustrates the current practice of the project. Based on that, they conduct *claims analysis*. Claims analysis is explained later in this section.

Task exploration and analysis using scenarios

The previous sections defined terms used in scenario-based task analysis. This section now demonstrates *Task Exploration and Analysis Using Scenarios (TEAUS)* as a practical tool of scenario-based task analysis. The basic philosophy underlying TEAUS originates from scenario-based design by Carroll (2000): scenario and claims are shared vocabulary and rationales among stakeholders in system design.

TEAUS consists of the following six steps.

- Step 1: Set up actors
- Step 2: Identify basic scenarios
- Step 3: Conduct *Scenario Exploration*
- Step 4: Sketch artefacts
- Step 5: Conduct *Claims Analysis*
- Step 6: Make a decision

At the first two steps, the analysts work on setting up actors and identifying basic scenarios. These steps may have two cases. If the analysts finished root concept, field studies, and summaries, then these steps are relatively straightforward. They can reuse the root concept; in other words, they can pick up any stakeholder and root concept for actors and basic scenario. If the project is just envisioning driven, then they do these activities. At this point, a useful technique for them is affinity diagram method mentioned earlier.

Actors are the sociological sense of stakeholders; therefore, the actors do not have to be active, they have to have a stake in the action and activity. Actors and stakeholders can be reused from the observation of the current activities. Thus, observing the social setting surrounding the current technology or similar technologies to the target domain would be the first step toward identifying potential actors and stakeholders. Analysts' past experiences also are the valuable source of information; in fact, their imagination suggests potential actors and stakeholders. Then, the analysts collect all the information to categorise, abstract, and select key actors and stakeholders with basic scenarios by using the affinity diagram method. Found out the main actors and stakeholders, the analysts instantiate them into concrete actors and stakeholders. Adding any specific details to the actors and stakeholders helps the analysts imagine and create various scenarios at the Scenario Exploration step.

Step 3 is *Scenario Exploration*, which consists of systematic query cycles about envisioning scenarios of use. Based on the actors and basic scenarios identified at the first two steps, it will produce many scenarios and their questions—they form a map of scenario and question. Scenario Exploration will be discussed later in this paper.

Step 4 is to sketch artefacts, which provide support on the tasks envisioned during scenario exploration. Analysts choose a story from the map of scenarios and questions; then, we draw a picture about technology (interface, device, screen layout, menu, icon, or anything else) that supports the story.

At Step 5, analysts conduct claims analysis on the functions and features described in the envisioned scenarios and the sketch so that analysts can identify potential pros and cons of them. This step also discussed later in this paper.

Activities at Step 4 and Step 5 may produce new scenarios and questions. These additional scenarios and questions are encouraged because TEAUS is a structured brainstorming method and any new ideas are always welcome.

Finally, Step 6 is to make a decision prioritising scenarios and claims. At this step, analysts decide the levels of importance of the story (or any course of scenarios on the map). This decision should be made based on wider viewpoints including social and organisational views as well as system requirements.

Claims analysis

Claims analysis is an analytic evaluation method involving the identification of scenario features that have significant positive and negative usability consequences. It may produce claims formatted as described the previous subsection.

Articulating claims of technology in scenarios (i.e., systematically enumerating its potential tradeoffs) provides fair analysis on pros and cons of its consequences. Usability experts may have tendency to produce and address downsides of artefact.

During claims analysis, analysts can employ any knowledge and past experience they have. In addition, they may reuse the theory and knowledge in HCI. Usability guidelines in usability inspection methods are used. For example, Nielsen (1994) provides ten usability guidelines including visibility of system status, match between system and the real world, user control and freedom and so forth.

Claims analysis can be categorized based on user participation. Users themselves can conduct claims analysis; this is called participatory analysis. Without users, cognitive walkthrough techniques are used.

Scenario exploration

Requirements analysis can be seen as *inquiry process* (Potts, Takahashi, and Anton 1994). Scenario exploration is categorized into this view. Scenario exploration is a structured brainstorming session, in which a group of analysts conducts systematic inquiry on use situation. It may include actual users and customers as well as various stakeholders in system design. Its members start from a basic scenario illustrating part of the root concept of the target domain. They will put questions to the scenario. Typical question from is in 5W+1H question and What-if question. For each question, they will provide solutions as scenarios. Figure 2 illustrates a conceptual idea of revolving inquiry process of scenarios. Scenario and questions are iteratively evolved as analysis progresses.

Various stakeholders in system analysis and design can contribute to the activity of scenario exploration. Usability specialists use the past experiences and knowledge of usability in addition to design heuristics and theories in human-computer interaction. Users can participate in this activity to provide their domain knowledge.

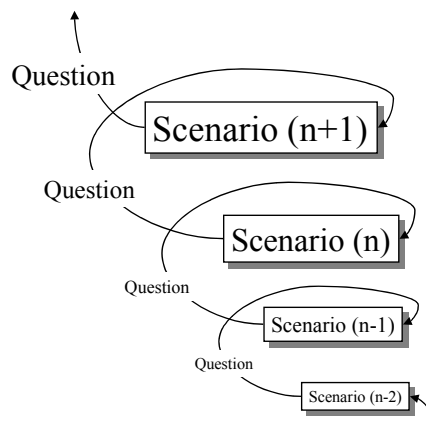


Figure 2. Revolving inquiry process of scenarios

Scenario exploration employs simple tools: piece of papers such as post-it notes, and wide-open area such as wall, whiteboard or table. There are two types of paper: scenario slip and question slip. On scenario slip analysts write a scenario; on question slip, they write a question (5W+1H or what-if question) about the scenario. Analysts put them side-by-side or top-to-bottom (possibly with link or line) on a wide-open area. The answers to the question form scenarios; therefore, analysts write it on a scenario slip and put it next to the question slip. Again, the scenario evokes new questions. Analysts continue working on this then they obtain a large map of scenarios and questions in relatively short time in a group session. As schematised in Figure 2, it may spiral up envisioned ideas of future use and systems.

Summary of the basic ideas and concepts

This section presented basic terms on scenario-based task analysis. Analysts and designers create scenarios to envision, record, analyse, share, and reuse their knowledge on user tasks. Scenarios work as the fundamental medium for communication among various stakeholders in system design. Claim enumerates both the upsides and downsides of usability concerns on a given artefact. It is an instantiation of tradeoffs about technology. Claim describes tradeoffs instantiated in a scenario context; therefore, claim and scenario complement each other and work together to better articulate use situation and consequences behind it.

Scenario-Based Design (SBD) contains a family of techniques focused on system use as scenario. SBD is a lifecycle methodology; it is strongly oriented toward inquiry. Also, it can be employed in a wide variety of ways.

Scenario-based requirements analysis (SBRA) is a systematic requirements analysis technique, in which analysts develop root concept, conduct field study, summarise them. Then, they iteratively elaborate problem scenarios and their claims.

Task exploration and analysis using scenarios (TEAUS) implement part of SBRA. TEAUS provides a systematic questioning process using scenarios. It consists of six steps: setting up actors, conducting scenario exploration, sketching artefacts, conducting claims analysis, and making a decision.

SBRA and TEAUS employ claims analysis as a key technique for analysis. Claims analysis is a qualitative analysis method; it enumerates advantageous and disadvantageous consequences of usability about a given artefact.

In addition to claims analysis, TEAUS employs scenario exploration as another key technique. Scenario exploration employs simple tools: post-it notes. Scenarios and questions are graphically mapped on to a wide-open area such as whiteboard. This activity iterates in short time and can be work together with actual customers and users.

Carrying Out Scenario Based Task Analysis

This section illustrates TEAUS; it focuses on scenario exploration, in particular. Through the following example, analysts envision photocopier use in office setting. Their goal of the exploration activity is to derive a general rationale of photocopier design, yet it is not clearly guided or given beforehand.

Example: envisioning photocopier use

This example illustrates how to conduct scenario exploration. It assumes that the main actor is a secretary in a university department and her basic task is to make a copy of documents using a photocopier. The analysts identify those items at Step 1 and Step 2 of TEAUS.

At the beginning of the Scenario Exploration (Step 3, TEAUS), the analysts take notes of the basic task on a scenario slip. In this example, they specify “Photocopy” task. Then, they pick up any episodes, examples, and anecdotes. One of the analysts described what he observed when a department secretary used a photocopier.

Basic Scenario:

Scenario: Photocopy

Concrete Scenarios (Observed Scenarios)

Scenario 1-a: At the department office, a faculty member requests a form of students. The department secretary opens a filing cabinet and finds the original copy of the form left. She wants to make several copies of it using the photocopier in the office and give one of them to the faculty member. Because the photocopier is at the other side of the secretary's desk, she sets the original copy to the document holder over the desk (see Figure 3); then, she presses the start button (Figure 4).

Scenario 1-b: The department secretary quickly takes the original copy to the photocopier room. She makes forty copies of it using the multi-functional photocopier that is faster than the photocopier in the department office.

These scenarios are written down on scenario slips and arranged as Figure 5. Basic scenario is instantiated to Scenario 1-a and Scenario 1-b; therefore, they are connected with arrows.

The analysts quickly get into analysis mode. They pose questions on the photocopier usage. Because this activity is brainstorming, they do not criticize any scenarios and questions. Some questions may not be derived from a given scenario; similarly, some scenarios may not provide answers to a given question. Nevertheless, vast variety of scenarios and questions are welcome.

An analyst poses questions on the accessibility of the photocopier from secretary's seat. How far is the photocopier from the secretary's desk? In other words, how does she set the original copy over her desk? (Question 1-b) Figure 6 illustrates the question slip written the question, which has different colour from that of the scenario slip. The rest of the questions at this point are described below.

Questions (5W+1H and What-if)

Question 1-a: What is the type of document holder? Does the document holder have automatic document feeder?

Question 1-b: How far is the photocopier from the secretary's desk? How does she set the original copy over her desk?

Question 1-c: How much does the secretary care about the side of the copy?

Question 1-d: What if the photocopy room is not in the same building?



Figure 3 Department secretary sets the original copy to the document holder of the photocopier over the desk (Scenario 1-a)



Figure 4. Department secretary presses the start button of the photocopier over the desk (Scenario 1-a, continued)

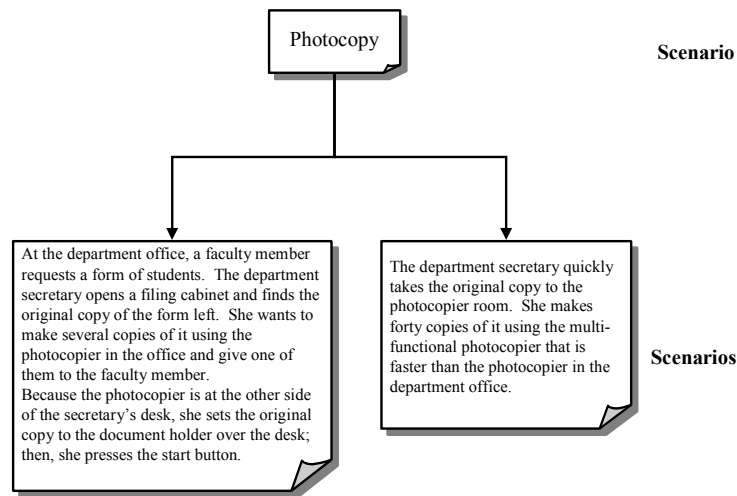


Figure 5. The first step of scenario exploration

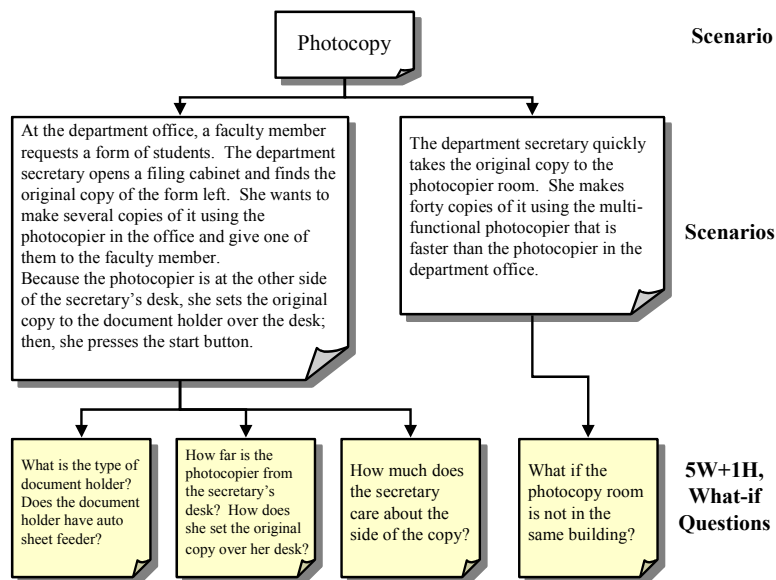


Figure 6. Adding questions to the scenarios

The analysts continue working on scenarios and questions. They envision additional scenarios to answer the questions they posed. In this case, they add Scenario 2-a and Scenario 2-b, below, to answer Question 1-b. Also, they provide Scenario 2-c and Scenario 2-d to Question 1-b.

Envisioned Scenarios

Scenario 2-a: She takes the lid off the flatbed document holder of the photocopier to set the original copy.

Scenario 2-b: She set the original copy to the automatic document feeder of the photocopier.

Scenario 2-c: She goes around her desk to the photocopier to set the original copy to the document holder because the start button is out of her reach.

Scenario 2-d: Although the start button is out of her reach, she picks up a ballpoint pen to press down the start button.

These scenarios afford further questions. The analysts focus on the use of ballpoint pen in Scenario 2-d. They add two questions here. Figure 7 shows the tree of scenario and question evolved in this example. In general, as scenario and question evolve, the tree may become a map or graph—scenario and question are connected with cycles.

Questions (5W+1H and What-if)

Question 2-a: What is the size and material of the start button? Does the ballpoint pen slip on the start button?

Question 2-b: Do the start button and the outer cover of the photocopier become stained by ballpoint pen?

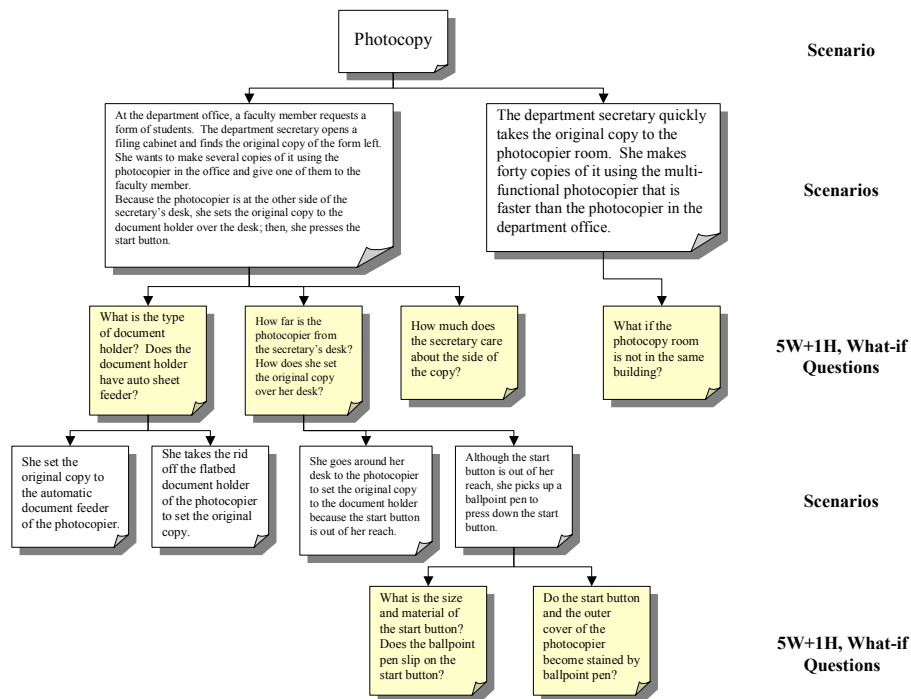


Figure 7. Tree of scenarios and questions produced in photocopier example

These scenario-question activities do not necessarily to be a sequential order; rather, they are intertwined. Coloured slips and their graphical arrangement, however, help analysts grasp the overview as well as local relationship between a scenario and its questions. Reviewing overview

affords what course of scenario and question is missing for envisioning (Nakakoji et al 2000), more importantly, what course of scenario and question thought to be critical by the designers.

In this example, a *stopping heuristic* (P. 284, Carroll 2000) is to produce a general rationale on usability about user-photocopier interaction. Questions 2-a and Question 2-b suggest an idea on *Universal Design* (Connell, et al. 1997): the potential users may press the buttons of a photocopier using a support tool. This concept can be applied for the overall photocopier design. The inquiry process, therefore, may stop at this point.

Discussion

Iterating TEAUS: Reducing the cost of user participation

Because of the participative nature of TEAUS, the cost of user participation may be an obstacle to introduce it into design process. Therefore, iterating TEAUS might be more difficult than just introducing it one time at the early stage of design. In order to remove the cost of task analysis with user participation, the early enrolment of potential users in scenario design meeting becomes a pragmatic solution. Analysts can reuse root concept and some of the scenario elements identified together with users to role-play additional and revised scenarios (Erskine, Carter-Tod, and Burton 1997). With that information, in other words, the analysts can role-play potential users in realistic manner. It will reduce cost of every-time assessments by potential users. As task analysis at the present time provides a broader scope, furthermore, this paper discusses the merit of using scenarios in system design and analysis-such as team building and project management.

Tools for creativity

Mountford (1990) provided tools for creativity in human-computer interface design. She pointed out the importance of metaphors and user observation in human computer interface design. In addition, she described techniques including reconstruction, operation, adaptation, modification, combination, and rearrangement of user interface objects. She indicates the effect of role-playing to give various viewpoints in a project in order to avoid individual's myopic view. It can be seen as problem solving through story building of various actors in design.

TEAUS implements the short time iteration of inquiry process on story building. Systematic questions can offer new course of ideas, while what-if questions provide a new course. This concept is schematised in Figure 8. Questions in 5W+1H guide more explanation on the original scenario. Answers to the questions add further information to the original scenario, enumerate possibilities, decompose it, and elaborate it. In contrast, what-if questions change the course of scenario and question. It creates a new possibility providing alternative scenario as a solution.

Analysts may conduct TEAUS in individual or group basis. Individual analyst requires deep understanding and reflection about the target domain to envision scenarios and pose appropriate questions. Even though the analyst can take different views and perform role-playing, he/she might fall into a narrow-minded view. Collaborative work by analysts, at least, can prevent this tendency. Working TEAUS in a group offers the power of collaboration. It is story building in a community; it actually may be fun activity for participants. In fact, externalising the individual's idea as scenario slips and questions gives reflections in collaboration (Nakakoji et al. 2000).

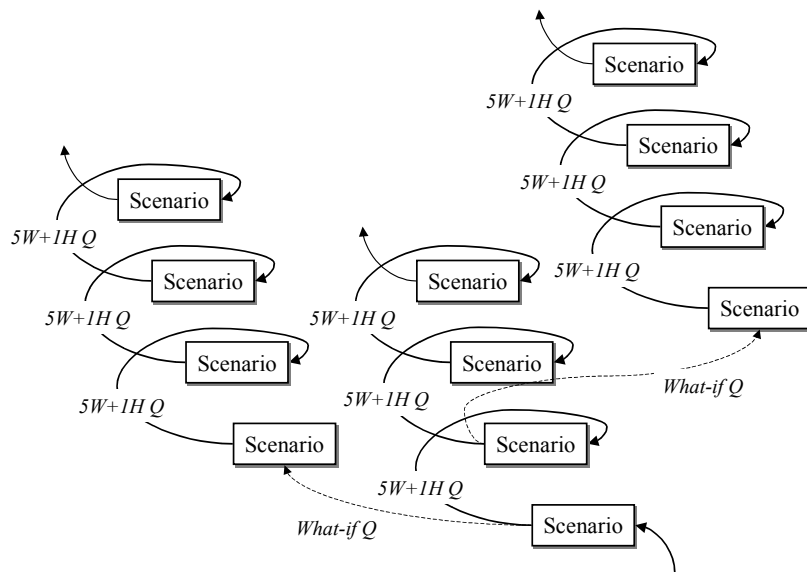


Figure 8. Evolution of scenario ideas

Characteristics of scenario-based task analysis

Scenarios are used in any system design activities including task analysis. They are used as communication purpose to share vision, concept, knowledge and experience. They are used to distribute even feeling and emotion among stakeholders in design. Scenario-based task analysis, therefore, suitable for early—in some sense, chaotic—activities in system design, where quantitative techniques are difficult to apply. As a scenario-based approach, TEAUS attempts to exploit the advantages of scenario.

TEAUS intends to be an inspection method—therefore, the informality of conducting analysis is the key. It relies on analyst’s knowledge, past experience, skill, and rules of thumb. It may include user participation as analyst.

TEAUS aims at analytic method. It examines the user interaction with artefacts required to perform central or critical tasks. Usability experts and designers conduct evaluation based on a careful analysis or theoretical modelling of user interface features. They utilize the past experiences and domain knowledge; for this purpose, customers and users can participate with them in analysis.

Finally, TEAUS is an inquiry method; therefore, even it contains decision step, it will produce more questions on use. As TEAUS is used mainly at the early stages of system analysis and design, this characteristic promotes rich discussions among stakeholders and facilitates their communication.

Conclusion

This paper has attempted to illustrate a scenario-based task analysis. *Task Exploration and Analysis Using Scenarios* (TEAUS) focuses on the early design activities in system design. It is a brainstorming tool. In TEAUS, analysts may perform systematic inquiry about scenarios of use in collaboration, as well as they may do independently.

Scenario-based system design is an approach that employs scenarios as a central representation throughout the entire system lifecycle. The approach encourages user involvement in system design, provides shared vocabulary among the people participating in the system development project, envisions the uncertain future tasks of the system users, and enhances ease of developing instructional materials. It provides a good brainstorming tool for planning and allows the stakeholders to consider alternative choices in decision-making. It addresses dynamic, multiple, parallel, and/or distributed factors in a manageable manner. This rich variety of roles is selectively used from different viewpoints in diverse communities including human-computer interaction, strategic planning, requirements engineering, and object-oriented analysis/design.

There is much work need to be done in future especially on the relationship between scenario and task analysis. Diaper (2002) provided a critical review on a monograph by Carroll (2000). Diaper contrasts scenarios and task analysis and scenario-based approach; he points out that scenario-based approaches can gain various systematic techniques from task analysis. In fact, Rosson and Carroll (2002) used hierarchical task analysis in their scenario-based requirements analysis to integrate scenario-based design and task analysis.

In the human-computer interaction community, there was a series of discussion on scenarios in early 1990s (Go, Carroll, 1999; SIGCHI Bulletin, 1992). The discussion has been continuing in the community involving other disciplines such as planning, requirements and software engineering (Jarke, Bui, Carroll, 1998), furthermore, it emerges a new course of discussion such as Diaper (2002). In brief, TEAUS contributes to these discussions emphasizing how unforeseen user tasks are envisioned and how they evoke the basic concept of system design using scenarios.

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