

# Scenarios: Heuristics for action

**Antonio Rizzo**

Università degli Studi di Siena  
Dipartimento di Scienze della Comunicazione  
Via dei Termini, 6  
53100 Siena, Italy  
rizzo@unisi.it

**Margherita Bacigalupo**

Università degli Studi di Siena  
Dipartimento di Scienze della Comunicazione  
Via dei Termini, 6  
53100 Siena, Italy  
baciga@media.unisi.it

## ABSTRACT

This paper presents a heuristic model to ease scenario construction and usage in interaction design processes. We argue that the role of scenarios varies: I) along the design process, thus scenario building and usage have to be attuned to the particular goal of the design phase; II) in respect to the people that will use them (e.g., design team, client, user), thereby scenarios have to suit in structure and form the operations/manipulations people are asked to perform in interaction with these “artefacts.”

The proposed model is exemplified by concrete scenarios coming from the work carried out by the authors in the CREA! project (Creative Research Environment for Air Traffic Management) funded by EUROCONTROL, the European Organisation for the Safety of Air Navigation, under the CARE Innovative Action Programme.

## Keywords

Design, methods, activity analysis, concept design, mock-up, prototyping, evaluation.

## INTRODUCTION

Dictionaries define a scenario as “an outline of the plot of a play or of a dramatic work”, or “a written version of a screenplay, etc., in a film production, with details of the scenes, etc.” In design, the future situation of use is a scene where the artefact is being used, and a scenario serves to provide the details of such a scene, vividly enough to give a clear picture of what takes place there. John Carroll’s (1995) description captures the essence of scenarios remarkably well:

“The defining property of a scenario is that it projects a concrete description of activity that the user engages in when performing a specific task, a description sufficiently detailed so that design implications can be inferred and reasoned about. Using scenarios in system development helps keep the future use of the envisioned system in view as the system is designed and implemented; it makes use concrete—which makes it easier to discuss use and to design use”. (p. 4)

Carroll makes clear the relation between how the scenario recreates “the future use of the envisioned system”, and how it serves the designer’s work: this future use becomes easier to discuss, to think about, and to reason about—and thereby easier to design. For such reasons Carroll (1995, p. 6) describes them as the “fulcrum” of the system development lifecycle.

The primary benefit of scenarios is thereby *cognitive*: they are powerful artefacts in the activity of design, and it is in this sense that they are considered in this article. As any other artefact, in order to successfully achieve the goals they have been designed for, they have to represent the modality of use of their content. The present paper aims at showing how designers can support specific design phases and goals manipulating scenarios in terms of structure and form.

## SCENARIOS AS ARTEFACTS MEDIATING THE DESIGN PROCESS

Scenarios can be used in different phases of the design process: they are a very effective technique for structuring data gathered through activity analysis, for envisioning system role and functionalities, and finally to assess and validate envisioned solutions.



Indeed narrative elements are composed considering what the scenario target will be. For instance, if we wanted to present the advantages of a new system to an audience that has never heard of it before, we would probably have resort to a rhetoric narrative structure. In this case we will clearly define characters transforming them in stereotypes, we will construct an easily understandable plot with a linear sequence of events, operating on agencies and causality in order to support the message we want to convey. On the other hand, if we wanted to support brainstorming with end users about a set of envisioned solutions, we would define characters and the scene, introduce some elements about artefacts as agents that may modify occurring events and then let end-user manipulate the remaining elements (other agencies, conflicts/interactions, resolutions...).

The matrix reported in Table 1 illustrates which narrative elements are in the focus for the different type of scenarios along the design phases. The narrative elements are differentiated according to the moment in which there are defined with respect to scenario construction and use.

Black boxes indicate narrative aspects that are fully determined by scenario constructors at the moment of scenario definition. Grey boxes indicate the aspects that are only partially defined by scenario builders, and are refined at the moment of scenario usage in interaction with involved stakeholders; white boxes finally represent the outputs of the different scenario based activities indicating what should emerge through the work that scenario users construct on the basis of the other fixed elements.

It is important to underline that this attempt to formalize the differences existing among scenarios has a low definition validity since scenarios are heuristic tools that may dramatically vary with respect to the design context in which they are applied.

The last aspect that will be tackled concerns the forms that scenarios may assume. We argue that scenarios can be characterized by three different format typologies: sequential art, video art and dramatisation.

Sequential art forms like storyboards, photo-boards and descriptive report are appropriate when temporal aspects are not essential for narration. These forms of expression best suit description of linear sequence of events, where the plot gives the pace to narrative development.

Video art (documentaries, video-clips, animated presentations) on the other hand is to be preferred when the temporal dimension of the script is essential for meaning construction. This can happen both for reality documentation and for the representation of fictional events.

Dramatisation finally constitutes a format that allows real time enactment and interaction. It is mostly used for scenario based evaluation when end-users manipulate artefacts (mock-ups or prototypes of the system under design) and take an active role in the definition of the narrative elements of the story. Dramatisation can also be used for interactive demos, an in all those cases in which at least one of the scenario target is to be involved in a live experience.

Scenarios can eventually come out from a mixed use of these techniques: dramatisation for instance in most cases involves and stems from either sequential art extracts or video-based materials.

### **Stories that build artefacts**

As Carroll states (1999) scenarios are basically stories, but their essence dramatically changes reflecting the kind of operations scenario constructors want to afford to people that are going to be engaged in a scenario-based activity. In the following the various types of scenarios will be addressed to highlight: I) what kind of knowledge they intend to express, II) what is the focus in narrative structure, and III) what type of activity they are built to afford.

In order to clarify our argument we will provide some examples from the work carried out within the CREA! project, a project aiming at developing innovative concepts for Air Traffic Management (ATM), suitable for the current air traffic management scenario, where control is centralised and managed by control units on ground, but also for more futuristic scenarios, like the free flight, where traffic management is decentralised and control is moved on board to the aircraft.

*Activity scenarios*

Activity scenarios stem from the field work analysis. They are grounded and built on data collected with ethnographic observation and story telling through focus groups, interviews, diaries, cultural probes. Activity scenarios account for concrete use episodes, from standard practices to routines taken to the extreme, from routine activities to exceptional circumstances faced in daily work situations. One of their aims is to provide an overview of the variety of goals, tasks, and actions that may be part of a complex activity such as the daily work of an air traffic controller with little abstraction and contextual richness.

A deep understanding of how people organize their current activities helps designers to explore where and how their work will impact on end-users' activities. Their very existence is motivated by the need of describing particular instances and to reduce ambiguities in the particularly delicate phase of exploratory design when nothing is settled yet, sometimes not even the design problem. . Table 2 provides an excerpt of a scenario describing the activity of an air traffic controller at the radar screen.

Though an initial understanding of the activity to be re-designed through the development of new artefacts is necessary, it seldom happens that all data related to end-user activities are collected before design actually starts.

User understanding is incrementally enriched by the development of the design process, which favours the elicitation of users' knowledge about their own activities through their involvement in a process of meaning co-construction.

Scenarios in general, and activity scenarios in particular, cover a catalyst role in the communication process of design team among the project stakeholders and between the design team and end-users, who assess their appropriateness. They are designed to capture both action and motivation so to guide the project vision.

Activity scenarios provide the basis for a common understanding of what design will do with respect to current activities. The aim of the activity is the core of these scenarios, they are built to share within the design team the understanding of why that activity exists and is important in people's life.

Activity scenarios fix the whole set of narrative aspects and may give a bigger emphasis either to the motivations that guide a given activity, either to major breakdowns and "pieces of cake" of the activity itself. In the first case they describe with great detail the main character's profile, providing stereotyped sequence of events, in the second case they rather highlight exceptional agencies, conflict and interactions that characterise r the activity under analysis.

Usually activity scenarios include narrative descriptions, but they may also be displayed as video-taped evidences of peculiar aspect of the activity, storyboards or animated presentations highlighting the key aspects of the activity itself.

**Location:** Ciampino, OPS room, EW1 sector

**Time:** Saturday August 19, h13.15- 13.30

**Who:** EXC Giorgio and PLC



**Figure 1: A working position at Ciampino ACC**

**General description:** A lot of traffic as usual in Summer, particularly on the northern area of the sector, many arrivals/departures for Olbia, and traffic over Alghero. UL 125 is closed for military activities at Solenzara even today, Saturday 19th August (the information was given via NOTAM). The firing areas of Decimo Mannu are always prohibited.

**Weather condition:** a perturbation is foreseen

**Context description: happenings and facts.** Some aircraft contact Giorgio to report embedded cumulonimbus at high levels (280-330) around POZZO-MADKA-TALIN-SUKUN.

The problem affects en route aircraft flying east/westbound on UL5 and on UM603 and north/southbound on UM622, but does not affect departures/arrivals for OLBIA nor the approach to Alghero.

Pilots report wind from north west, thus the cumulus will approximately move towards south east, but it is very difficult to know in how much time.

**Context description: motivation and intentions.** Since it is a high traffic situation, he decides to give them a heading instruction without limit, and then he will see how and when they can resume their navigation, basing on the other traffic. Giorgio sets up the speed vectors to them as a reminder for himself and to allow them to resume navigation later on.

**Table 2: An excerpt of a scenario describing in detail the intentions of an air traffic controller**

*Envisioning scenarios*

As clearly stated by Susanne Bødker: “scenarios are not a detached description of user tasks and actions, but selective scripts or stories that stage user actions with a future artefact. They are means of holding on to situations, and how they may be changed because of a design” (2000, p.74). In other words scenarios also represent a tool to envision the future system, a very first way to embody ideas, exploring the possibilities of support. In this sense they are design objects and may be augmented and rearranged as the design evolves.

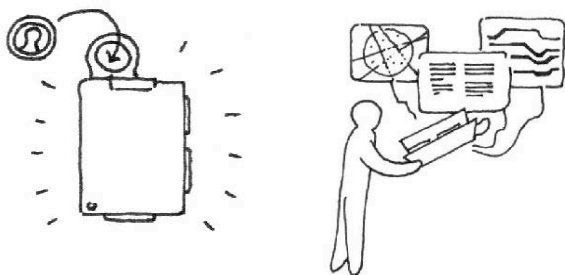
Envisioning scenarios are one of the products of the inspiration phase of the design process. They play an essential role supporting the construction of a sound and compelling vision of the project, representing a test bed for concepts, and facilitating the sharing of the values and the qualities the project within the design team and stakeholders. Envisioning scenarios fix some of the narrative elements and use them as leverage for creative generation of design solutions. In these scenarios characters and motivations are to some extent given, as well as mood and major tension elements; instead the causing role of artefacts and other agencies is left to the users of the scenario (e.g. Stakeholders, Users, Designers). The manipulation of the scenario is the very object of creative production in the envisioning phase of design.

Envisioning scenarios can take the form of storyboards, mood-boards or video-based simulations, as well as interactive presentations. Table 3 shows one of the envisioning scenarios developed to present to air traffic controllers the concept of the Trittico.

*Mock-up scenarios*

Mock-up scenarios represent a means to reflect in the context of “doing design”. They are focused on representing in an

**Table 3: An example of descriptive envisioning scenario accompanied by a picture of an air traffic controller interacting with first mock up developed to support the assessment of Trittico concept**



**Figure 3: An excerpt of the storyboard used for the scenario based assessment of the HardBook mock-up showing the activation of the HardBook and the information update before getting on turn**



**Figure 4 An air traffic controller assessing the solidity of the interaction concepts embedded in the HardBook mock-up**

The Trittico, is a multiple display tool that constitutes the main interface for the operational work. It is an interaction space based on the combination of different displays that can be configured in order to visualize, like in a medieval triptych, spatial relations and hierarchies between contents related to the air traffic control, including the visualization of aircraft in a specific air-sector, the tracking of communication process, the flight plan etc.

**The weather information scenario.**

It is a very foggy day in the approach area of Milan. The fog continuously moves up and down, and Massimo Menegoni would like to know which levels are now affected by the fog. The Tower Controllers announced variability in the number of flight that can be cleared to land. Massimo wants to avoid ask to have more than ten a/c holding over Malpensa Airport. He activates the Weather Information visualisation over the radar screen. The “no-fly zone” is dynamically updated by the system so that he can guide the a/c out of the bad weather zone.



**Figure 2: An air traffic controller envisions the role of the proposed tool**

explicit form what function the system will serve in a user's life, what role it will cover in their activities. Mock-up scenarios, as Kyng would argue, intend to "simulate future use situations in order to allow end users to *experience* what it would be like to work with the system under development and thereby to draw on their tacit, non explicit knowledge and experience" (1995, p. 88). They basically aim at providing a global sense of what impact the artefacts will have on current work practices. They describe (at various level of abstraction) the functional requirements of the system under design, indicating what capabilities must be provided. In this case scenarios support the design team in exploring the consequence of design decisions, and in eliciting feedback from end-users feeding re-design cycles.

The narrative structure of mock-up scenarios is intended to support the dramatisation of interaction trials with the mock-up, thus only partially defines characters, their goals and motivations, the scene where characters act providing information about relevant contextual elements.

Mock-up scenarios emphasize the role that new artefacts can play in the previously described context of use and leave conflicts, interactions and resolutions emerge in the discussion with prospective end-user that are the core target of mock-up based activities. Mock-up scenarios indeed are mostly used for concept assessment. Thus they are addressed to support evaluation with end users. In particular, as argued above, they are built to represent the role that the new artefact will play in users' lives. In some cases mock-up scenarios are also used to show stakeholders the functionalities of designed tools, in such occasions their narrative structure is less open since the goal is not to scaffold brainstorming, but rather to convey a meaningful insight on the state of the art.

Role scenarios are basically narrative descriptions of user interactions; they can be incorporated in script to be performed in unstructured simulations, but can also be described by storyboards (as shown by Table 4) and video simulations. When this kind of scenarios is not used for mock-up assessment, but for functionality presentation their presentation often has recourse to sequential art or video-based material.

#### *Prototype Evaluation Scenarios*

According to the approach proposed by Houde and Hill (1997), interactive prototypes represent the evolution of mock-ups, integrating "Role", "Look and feel" with "Implementation" aspects. Scenarios for prototype evaluation represent detailed interaction paths, and have the function to allow the refining of the interaction modalities and the sensorial features of the prototypes.

The narrative structure of prototype evaluation scenarios is rich and detailed. This type of scenarios generally implies a dramatisation that takes place with a great involvement of end users. When the evaluation session is over all aspects of the narrative structure are quite defined. Scenarios for prototype evaluation must enable a clear grasp of the contextual elements, and have to afford given interaction paths. To do so, they start describing characters driving motivations, aims and mood; they clearly define artefacts and agencies and propose both conflict and resolutions. The last two elements represent the object of evaluation and are thus enriched and further explored by the interaction modes undertaken by involved users. It can be argued that scenario constructors define a script but the final scenario is the output of on stage improvisation. This is why in this kind of scenarios the narration point of view is in most cases linked to the major characters; and indeed is their point of view that provides feedback for future improvements of the prototype. As mock-up scenarios, prototypes and prototype scenarios are basically addressed to end-users for iterative evaluation sessions. They are representations of design ideas to be assessed by prospective users, thus they have to afford reflection over design choices. End-users represent the privileged target of prototype scenarios, but, as we said, they also play a role in their final construction. Prototype scenarios may also be addressed to stakeholders other than end-users, in these cases the target is generally not involved in the process of scenario construction.

In the prototype evaluation phase scenarios may take different forms, often the macro level is described by narratives or video while the micro level is embedded in the interaction being composed both by the functionalities implemented in the prototype and the way the subject do actually access to those functionalities. Prototype evaluation scenarios always require a dramatization component. Prototype demo scenarios on the other hand may propose interaction modalities in an asynchronous way thanks to video edited presentations.



**Figure 5: An evaluation session where a controller interacts with the Trittico and the Hardbook prototypes, staging a scenario in real time**

### *Scenarios of Integration*

Scenarios of integration aim at depicting the impact the designed system will have on the Institution that will adopt them. Scenarios of integration focus on describing the possible ways in which the new organizational system will change its assets, in terms of values, service provision, internal and external workflows and procedures, organizational structures, perceived image. This kind of scenarios may be built at different stages of the lifecycle of a project, as a consequence their structure and format may vary a lot.

We assume that the privileged time for the presentation of scenarios of integration corresponds to the end of the design phase, before implementation starts.

At this very moment the design team has collected so much information that a full-scale scenario can be built detailing at best all relevant aspects of the designed system. The narrative structure of integration scenarios is extremely rich, since it has to convey an insight of the impact of a new system on the organisational structure that will adopt

them.

Scenarios of integration therefore focus on the resolutions aspect, documenting the way conflicts and interactions are related to agencies and artefacts, describing in detail actors' aims and motivations their feelings and the ambient qualities of the environment hosting their activities.

Integration scenarios are addressed to stakeholders. Some of them have followed the progress of the project and already have an idea of its values and the way it will affect current practices, some others may have no idea about the project aims and results.

Scenarios of integration generally take the form of interactive presentations where narrative descriptions and video art are deeply intertwined. In some cases real-time demo can be set so to allow stakeholders interact with prospective end-user and discuss with them pluses and minuses of the proposed system.

### **CONCLUSIONS**

The model for scenario construction and use proposed in this paper represents a heuristic tool to orient and sustain design with respect to specific intervention goals. According to the specific level of intervention (Marti, Rizzo, 2003), indeed, scenarios play a crucial role in the design process by supporting user centred evaluation sessions and user requirement elicitation activities, but they also show a critical potential to enable forms of creative design that do not aim at solving specific problems but rather at shaping new activities that could not exist without the artefact or system being designed. The heuristic model for building and using scenarios described in this paper is an attempt to show what elements in scenario construction can be manipulated in order to enhance a participatory and co-evolutionary design process that results in the definition of a new the role of the user and the system in a specific context of use.

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**Figure 6: A screenshot from the video scenario created to present the CREA! project results: it shows the moment of the turn shift among two controllers**

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