Transforming Storyboards into Diagrammatic Models

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Abstract. Design Thinking can be employed to define services, new product (features), innovative processes and disruptive business models collaboratively for digitization. Diagrammatic models play an essential role here as they capture relationships between different aspects of the problem. When computed by means of software they also explicitly show details which in design thinking tools users implicitly fill with their own world-understanding, thus fostering a clear and transparent representation of the problem space. In addition, diagrammatic models can be enriched by semantics and subsequently be queried, analysed and processed.

The paper at hand shows the DigiTrans[1] project approach for an automated transformation process of haptic storyboards into diagrammatic models by means of video-imaging and web-services.

Keywords: Design Thinking, Storyboards, Diagrammatic Models

1   Introduction

Digitization greatly challenges small and medium enterprises (SMEs) to innovate their products/services and/or their business model to remain competitive. Yet strapped for resources they have difficulties in facing these challenges. DigiTrans, an EU-funded project, aims to offer a mixed approach of training and incubation, to increase innovation capabilities of SMEs and support them through the digital transformation process.

Because the problems faced in the digital transformation process tend to be complex and vaguely defined the project recommends different Design Thinking based tools to visualize the problems and to generate innovative solutions. Some of these tools focus on storyboarding as a means to aid innovation. Storyboards are a sequence of scenes that represent the main points of a story. They are designed to communicate intuitively high-level ideas to the viewer. Yet how different scenes relate together and what the exact semantic meaning and importance of each object in a scene is remains largely at the understanding of each individual visualizing it. As shown by [3] in such cases viewers tend to implicitly fill the missing information with their own world-understanding. Yet when aiming to materialize an innovative idea presented in a storyboard different

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[1] http://www.interreg-danube.eu/approved-projects/digitrans

aspects of the problem and the relations between them need to be unambiguously described in order to avoid conflicts. Transforming the haptic storyboard by means of an automated import into diagrammatic models and facilitating semantic enrichment (e.g. by describing object properties) can help increasing information transparency, clarity for model users and model consistency.

The remainder of this paper describes a real-world digital transformation scenario (Ch. 2), the environment provided for prototyping (Ch. 3) and the application experience (Ch. 4).

2   The Digital Transformation Scenario

A manufacturer (an SME) of cleaning products is facing a steep revenue decline. An initial analysis (a series of ideation workshops) has produced the following insights: the company's strong points are its products and customer knowledge. The weak point is the distribution via direct marketing, which the company uses since the 1970's, and which nowadays represents a problem due to the changing structure of households.

The company has identified the opportunity to use online distribution via a mobile app/website to attract a new group of customers. They defined the key customer via a persona description: young women (between 25 and 45), family or double-income-no-kids, disposable income, environmentally aware, interested in the quality of products and low-pollutants ingredients, working. Such a female must be able to choose between a catalogue and electronic order. In the electronic channel she can select the delivery date, place and time according to her availability in addition to her products.

As a next step a storyboard needs to be defined for the interaction between the customer and the company's online channel/mobile app. These scenes represent subsequently interaction points for the company's processes and IT services.

3   Developing the Scene2Model Service Environment

Scene2Model is an end to end process for the software-supported transformation from tangible figures to diagrammatic models with the possibility of simultaneous semantic enrichment of objects. This and the automatic composition of models into storyboards innovate the way diagrams can be used in industry work environments.

Several preparation and development steps were necessary before the Scene2Model service could be used in a workshop setting for design thinking prototypes.

1. ***Prepare the incubation space*** – this includes a table with a transparent top, a web-enabled camera underneath it and haptic storyboard figures with tags glued to their bottoms.

During workshops haptic figures will be positioned on a table. They depict the scenes of a storyboard. These haptic figures are intuitively understandable, easily rearrangeable and help to facilitate the mental design process of people, by allowing them to interact with a physical representation of their thoughts [5]. In our prototypical implementation we used SAP Scenes [4] storyboard figures.

The tags, i.e. unique IDs, glued at the bottom of each figure are used to identify and map the haptic objects to modelling objects (of a modelling application) as well as to calculate their relative position on the table. The camera positioned underneath the table records a live video stream of the tags. The ID and the coordinates are offered over a network interface, which can be used by other applications.

2. *Develop a modelling method and an ontology for transforming the haptic scenes into diagrammatic models*

The prerequisite for the automatic transformation was the development of a modelling method [2] describing the haptic figures. Modelling methods can facilitate the Design Thinking process (cf. [1]). For the prototype a meta-model was created to define syntax, notation and semantics of the different haptic figures or objects. Each meta-model class possesses multiple graphical presentations, which are defined by the *Type* of an object. *Type* is a property, just like the properties *Name* and *Description*. The first one defines an identifier for a modelling object and the second one holds a natural language description. Classes with a *Text* property, show this text directly in diagrammatic model. The class *Character* also implements the properties *Role* and *Age*, which can be used to specify the humans in the modelled scenario.

An ontology is used to map the IDs, from the tag recognition to modelling objects. Therefore, the information from the meta model is saved in the ontology and enhanced with a *TagID* property.

The described meta model was implemented in the ADOxx[2] metamodeling platform, which supports the definition of classes and their properties, the implementation of mechanisms as well as the use of a built-in modelling toolkit, where defined models can be used.

A mechanism implementation is used to trigger the Scene2Model software directly from the ADOxx modeling tool. Data is gathered from the tag recognition software. With the received ID, the additional information is read from the ontology. Then the combination of the ontological information and the position (from the tag recognition) is sent back to ADOxx, where the modelling objects are created and positioned automatically.

4 Applying the Scene2Model Service

The first step in the workshop is the creation of the storyboard. Participants identified ordering via app using a tablet at home as a key scene. The different objects were arranged accordingly. The description of the customer interaction with the app was pinned on handwritten notes on a meta-plan board. As soon as the participants agreed on the scene design, ADO*xx* was triggered and a computable diagrammatic model was created automatically. The results of both steps are shown below in **Fig. 1**.

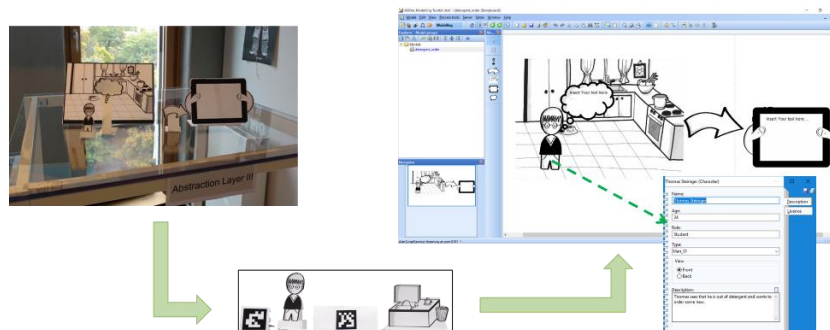[2] https://www.adoxx.org/live/home

Fig. 1. Scene2Model service application

Subsequently participants reviewed the model and entered different properties and explanatory descriptions to the different objects to make the scene more descriptive. Generating and updating models from the new storyboard layout is possible at any time. The differences, at class and attribute level, between the original and the modified storyboard can be queried by mechanisms provided out of the box by the platform.

The workshop participants were positively receptive towards the perceived benefits of the solution, especially in lieu of the time and location-independent preservation of the workshop results as well as their usability to further enhance scenarios by introducing information into the diagrammatic models directly and collecting all information in one place. Further evaluations of the usability and value of the implementation will be done during 2018 in different Central European countries with SMEs.

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