

Enriching Requirements Specifications with Videos

The Use of Videos to Support Requirements Communication

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I. INTRODUCTION

The most important requirements engineering (RE) goals are to create *shared understanding* and *specification quality* [1]. A prerequisite for shared understanding is successful requirements communication. This requires appropriate documentation options with high specification quality to convey customers' needs to developers [2]. Since developers and customers hardly ever meet, the ability to answer questions in real-time is often missing [2]. Therefore, textual specifications are the worst documentation option to communicate knowledge due to their low richness and effectiveness [3]. A recent study by Shakeri Hossein Abad et al. [4] identified the need for supporting knowledge visualization in RE, especially for requirement communication. The authors [4] propose to invest more effort in addressing visualizations such as storytelling for example with videos.

Already in the 80's, several researchers [5, 6, 7] proposed the use of videos to support knowledge transfer in RE due to the communication richness and effectiveness of video. However, videos are still not an established part of RE. Hence, researchers continue to propose new and refined approaches of applying videos to support knowledge transfer [2, 8, 9].

Based on our previous work [9], each of 12 comparable student software projects produced a short and low-effort video of the product vision in the early phase of the requirements analysis. The intent of these videos was to support the communication between the requirements engineers and the customer to clarify uncertainties regarding the overall product goals early.

We investigated whether these videos also provide a benefit to support requirements communication by using them as supplementary material for the respective specification. Our study shows that enriching a specification with the respective video of a product vision results in a faster and better understanding by developers who are unfamiliar with the project.

II. RELATED WORK

Several researchers used videos to support the knowledge transfer between a project team and its customers.

Xu et al. [10] presented the "Evolutionary Scenario-Based Design" to support effective communication between developers and customers in agile projects by using videos of visionary scenarios. The "VisionCatcher" of Pham et al. [11] supported the creation of videos of visionary scenarios for a system enhanced with multimedia such as sketches and audio. These videos were intended to improve the communication between requirements engineers and customers to achieve a common ground. Karras et al. [12] proposed the use of videos as a by-product of digital prototyping to capture the dynamic aspect of interaction. They demonstrated that developers could understand a textual scenario faster and better by using such a video compared to static mockups.

All previous approaches used videos of visionary scenarios to support the communication in a specific situation. Since the creation of videos is cumbersome, we want to analyze if such videos of a product vision also provide a benefit by using them as supplementary material for a specification.

III. STUDY

A. Study Design

We investigated whether a video can support requirements communication by enhancing developers' comprehension of the corresponding requirements specification. We asked the following research question:

RQ: Can developers understand a specification faster and better with a supplementary video of the product vision?

We tested the following two null hypotheses:

$H1_0$: The process time to extract information by using a specification supplemented by a video is greater or equal than by using only a specification.

$H2_0$: The number of correct answers based on the extracted information from a specification supplemented by a video is less or equal than by using only a specification.

Each alternative hypothesis $H1_i, i \in \{1,2\}$ considers that a specification supplemented by a video leads to better results.

We performed a between-subjects experiment with two groups, each with 8 subjects. The independent variable was the used material: *Group 1* got only a specification and *group 2* got a specification supplemented by a video of the product vision. We had two dependent variables. We measured the *process time* to extract information from the given material using a stopwatch and the number of *correct answers* using a questionnaire. The questions focused on detailed aspects of the specification such as stakeholders, functionalities, and rationales. The experiment represented a scenario of requirements communication in which the subject is a developer who has to understand the specification to implement the corresponding software.

B. Analysis and Results

We verified that all collected data is normally distributed by applying the *Shapiro-Wilk* test. Subsequently, we performed the one-tailed *t*-test for two independent means ($p = 0.05$).

The first *t*-test showed that the *process time* to extract information from the given material was significantly shorter for *group 2* ($M = 584.4s, SD = 97.2s$) than for *group 1* ($M = 775.8s, SD = 169.6s$), $t(7) = 2.77, p = 0.008$. The null hypothesis $H1_0$ can be rejected. A specification supplemented by a video of the product vision shortens time to extract information compared to using only a specification.

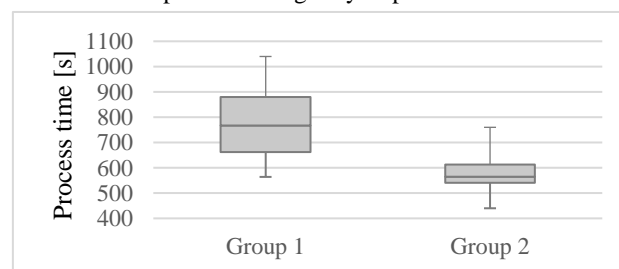


Fig. 1 – Boxplot of the process time

Fig. 1 shows a boxplot of the process time which illustrates that all subjects of *group 2* were faster in extracting information from the given material than 50% of *group 1*.

The second *t*-test indicated that the number of *correct answers* based on the extracted information was significantly greater for *group 2* ($M = 8.5, SD = 1.2$) than for *group 1* ($M = 6.8, SD = 1.0$), $t(7) = 3.13, p = 0.004$. H_{20} can also be rejected. A specification supplemented by a video of the product vision increases the number of correct answers. Fig. 2 illustrates that all subjects of *group 2* gave more correct answers than 50% of *group 1*.

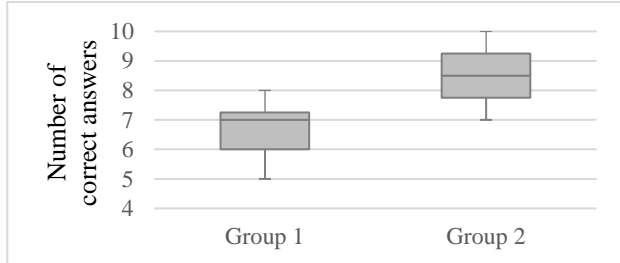


Fig. 2 – Boxplot of the number of correct answers

IV. DISCUSSION

Although several researchers proposed the use of video to support knowledge transfer, videos are still not an established part of RE. Several existing approaches focus on the use of videos of a product vision since a shared vision is essential to achieve shared understanding. However, developers and customers hardly ever meet which is why a textual specification is the worst documentation option for their indirect communication. We investigated whether previously produced videos of a product vision provide a benefit to support requirements communication by using them as supplementary material for a written specification.

Based on our findings, developers can understand a textual specification faster and better with a supplementary video of the product vision. The use of a video as supplementary material for a specification ($M = 584.4s$) leads to 24.67% less *process time* than using only a specification ($M = 775.8s$) to extract information. The number of correct answers also increased by 20.59% using a specification supplemented by video ($M = 8.5$) compared to using only a specification ($M = 6.8$).

We assume that developers understand the described concepts in a textual specification easier if they have an imagination of the overall goals of the product in mind. The shared vision simplifies and enhances the comprehension of the textual concepts. As an answer to our research question, we can summarize:

A: Developers understand a textual specification faster and better with a supplementary video of the product vision. The use of such a video reduces the time to understand and extract information in order to answer more questions correctly.

Therefore, we conclude that enriching requirements specifications with previously created videos of a product vision support successful requirements communication. Thus, we can fulfill the prerequisite for *shared understanding* and increase the *specification quality* by making a textual specification easier to understand. Such videos of a product vision provide a benefit for requirements communication and help to achieve the two most important RE goals. Hence, previously created videos of a product vision should also be used beyond their original purpose in the later phases of a development lifecycle.

In accordance with other researchers [2, 3, 4], we assume that videos provide a neglected potential for RE. Nowadays, the evolved technologies offer new opportunities which facilitate the production and the use of videos by making them cheaper and more accessible. We can integrate videos into existing RE activities easier by focusing on simplicity with respect to used technology and required skills. Thus, the effort to create videos can be reduced which in turn lowers the threshold for using them and makes them more attractive for practitioners.

V. CONCLUSION

This work contributes the insight that videos of a product vision provide a benefit to support requirements communication. Several existing approaches [10, 11, 12] already produce such videos for a respective specific purpose. We can accomplish the need for support of knowledge visualization in RE, especially for requirements communication, by using these videos beyond their original purpose.

Our study showed that the use of such a video as supplementary material helps developers to understand a specification faster and better.

Videos offer a large potential for RE. Although this idea is more than 30 years old and has not changed to this day, videos are still not established as a documentation option in RE. The technological change provides the opportunity to exploit the full potential of videos. The pursuit of a better documentation option for requirements communication could be achieved by enriching requirements specifications with videos.

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