Textlinguistik & Technikkommunikation | HCIC - Human-Computer Interaction Center | RWTH AACHEN UNIVERSITY

How-To: Instructional Video

Recommendations For The Design of Software Video Trainings for Production Workers

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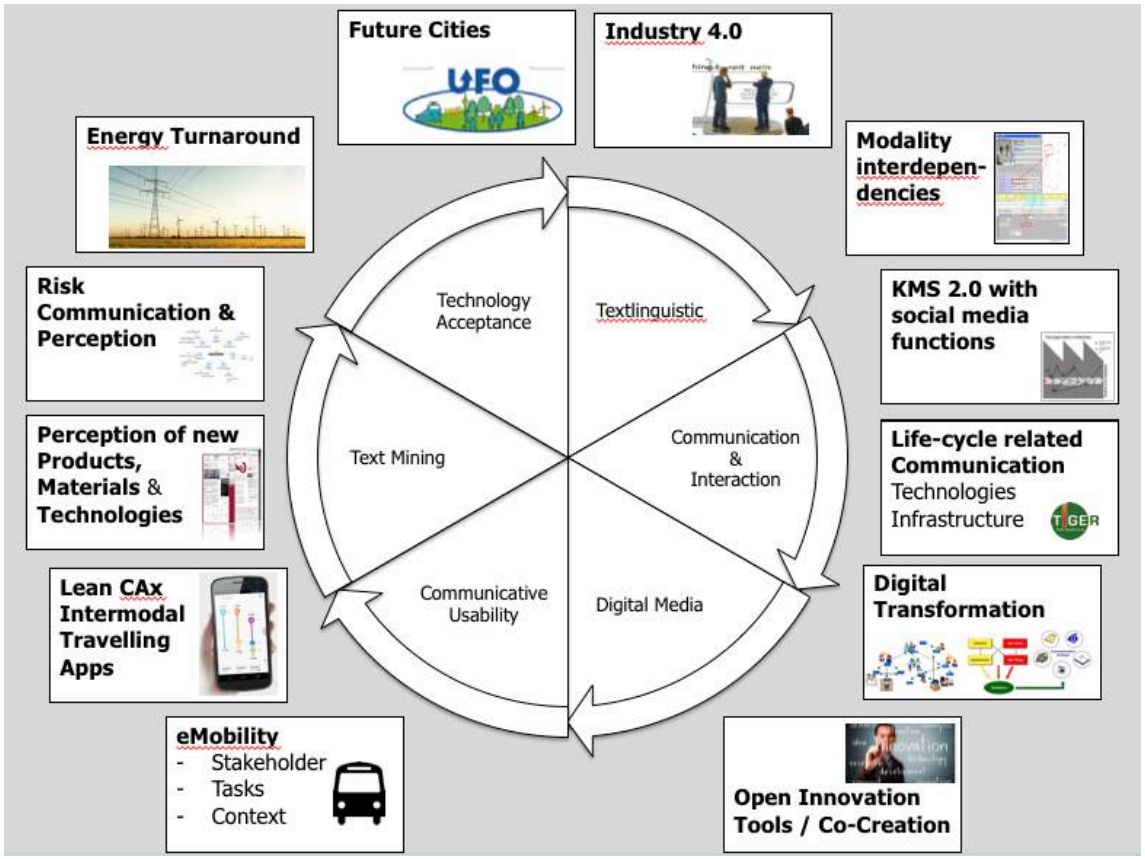
Human-Computer Interaction Center: Textlinguistics and Technical Communication



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Presentation Overview

- R&D project „WerkerLab“
  - Motivation
  - Objective
- Literature Review: Recommendations for Video Software Training with Instructional Videos
- Questions and Discussion

Background: Industry 4.0 and the Need for Qualification

- Industrial trends:
  - Industry 4.0
  - Increased complexity of processes
  - New requirements for workers
  - Training measures often too theoretical
  - Mastery of new trends in everyday work
  - Flexible work deployment
  - Knowledge always up-to-date

→ Realizable and individual training

- In which industrial contexts can videos be used?
- How should videos be designed?

Research Project: WerkerLab

- **Objective:** Development of a modular training concept for SMEs in the production technology environment

- Our focus: Instructional Videos

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Instructional Videos: Arguments for Use

Independence of place and time

That is the advantage I see: tutorials really can be used at any time. **Early, late, night shift**. We have a huge effort to reach the three shifts within the shortest time. **With the videos I can really, as I said before, show it to the person at any time**. (mechanic, manufacturing company)

Knowledge for recurring tasks

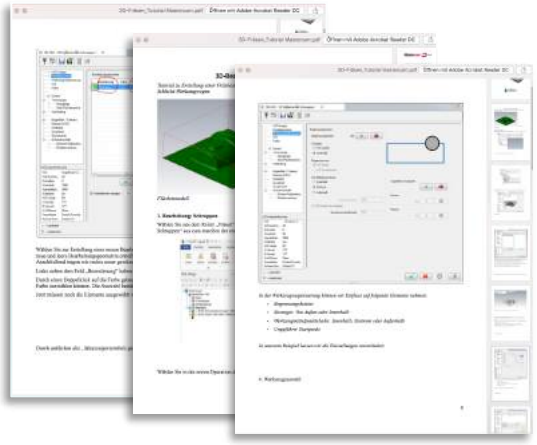
I find it a considerable advantage to **capture recurring tasks** on video. If I haven't done things for two years, then I have to learn how to do it myself. Then **I only have to click on this video and I know how it was** or how it is working. (trainer, manufacturing company)

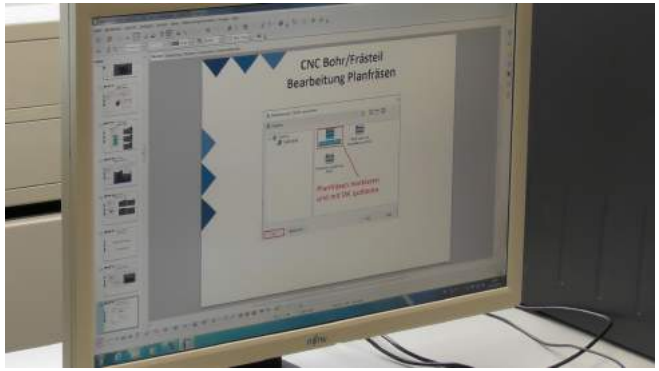
Methodology

Literature Study

In-Depth Interviews with Experts

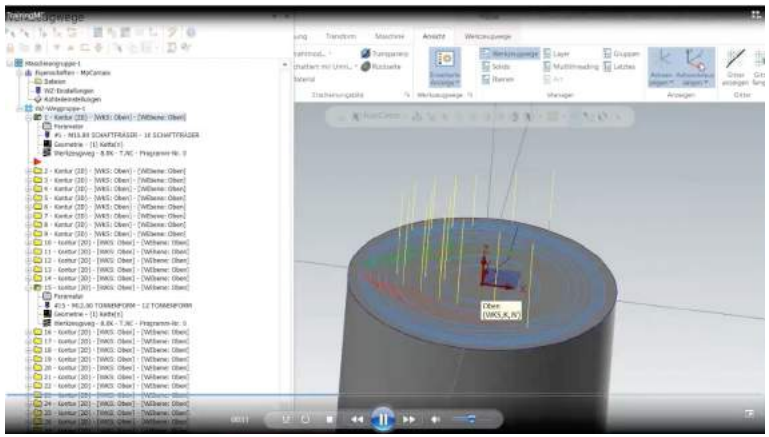
Document Analysis





Instructional Videos: Design

- Design limited by:
  - The object (e.g. software product)
  - Contextual factors (domain, production sector, values and conventions, cultural-economic factors)
  - Situation-related factors (e.g. conditions of reception, access to online resources, didactic embedding)
  - Material-technical conditions and implementations
  - Addressees and their social relationships



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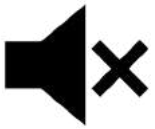
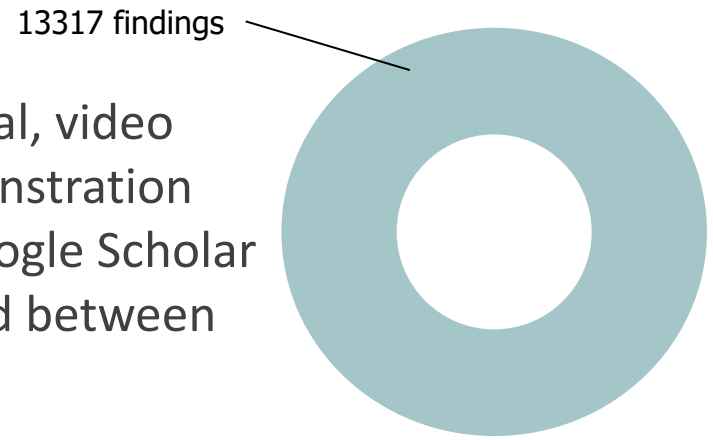


Methodology: Literature Review

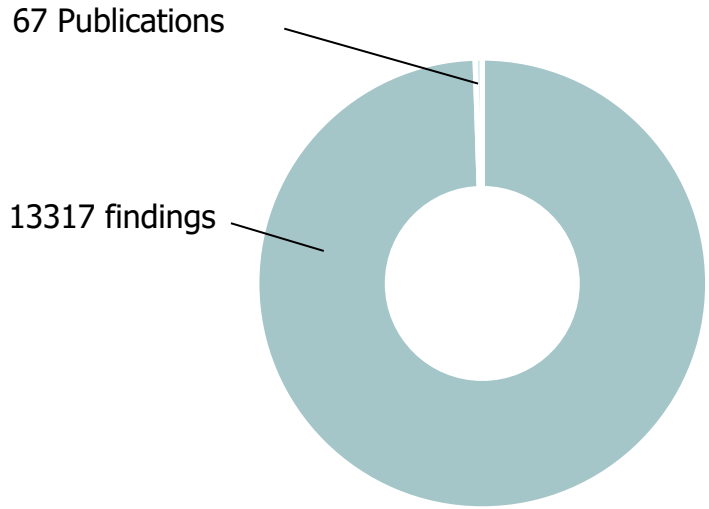
Step 1: Literature Research:

- Keywords: instructional video, video tutorial, video instructions, how-to video, recorded demonstration
- Databases: Scopus, Web of knowledge, Google Scholar
- Only German and English articles published between 2004 and 2019



Step 2: Restriction to:

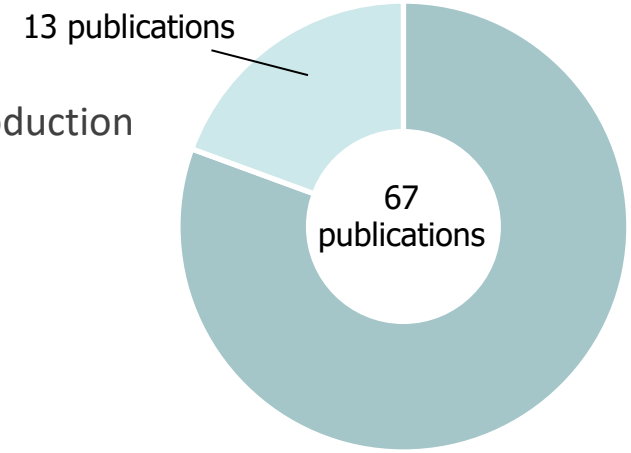
- Video tutorials as learning material
- Software application



Methodology: Literature Review

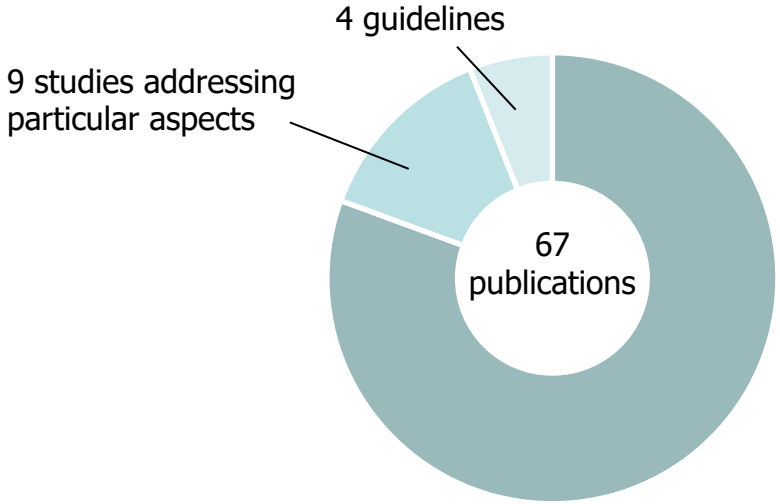
Step 3: Topic-related Selection:

- Video tutorials for software in the context of industiral production
- Guidelines for creating videos



Step 4: Categorization:

- (Case) studies on the topic
- Guidelines for creating videos



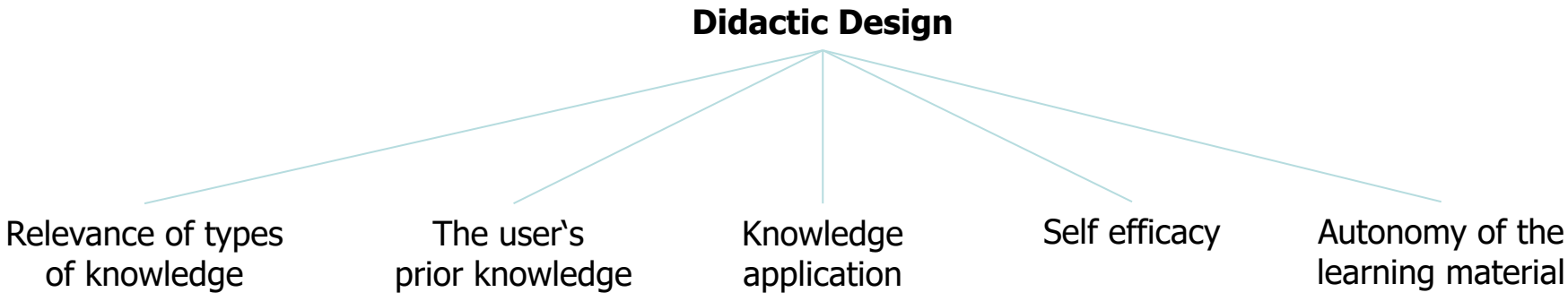
Guidelines

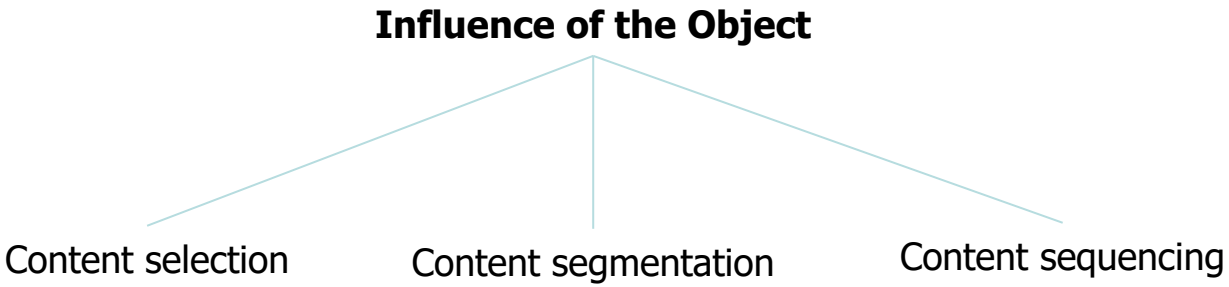
Title	Author	Year of publication
Eight Guidelines for the Design of Instructional Videos for Software Training	H. van der Meij; J. van der Meij	2013
Complex Software Training: Harnessing and Optimizing Video Instruction	J. Brar; H. van der Meij	2017
New Modes of Help: Best Practices for Instructional Video	J. Swarts	2012
Show Me! Guidelines for Producing Recorded Demonstrations	C. Plaisant; B. Shneiderman	2005

Studies

Title	Author	Year of publication
Work in Progress. Using Video Tutorials To Assist Biomedical Engineering Students in Learning Solid Modelling Skills	Amini	2014
Individualized Learning With Instructional Videos in Engineering Simulation Education	Brenner; Walter	2018
Teaching People How to Teach Robots. The Effect of Instructional Materials and Dialog Design	Cakmak; Takayama	2014
Development of Instructional Software for Demonstrating CAD,FEA Integration Best Practices	Chabura et al.	2004
How video production affects student engagement. An empirical study of MOOC videos	Guo; Kim; Rubin	2014
Multimedia support for education of mechatronics	Haffner	2018
Too long, Didn't watch it. Extracting relevant fragments from software development video tutorials	Ponzanelli et al.	2016
Developing and Testing a Video Tutorial for Software Training	van der Meij	2014
Advance organizers in videos for software training of chinese students	van der Meij	2019

Results: Category System





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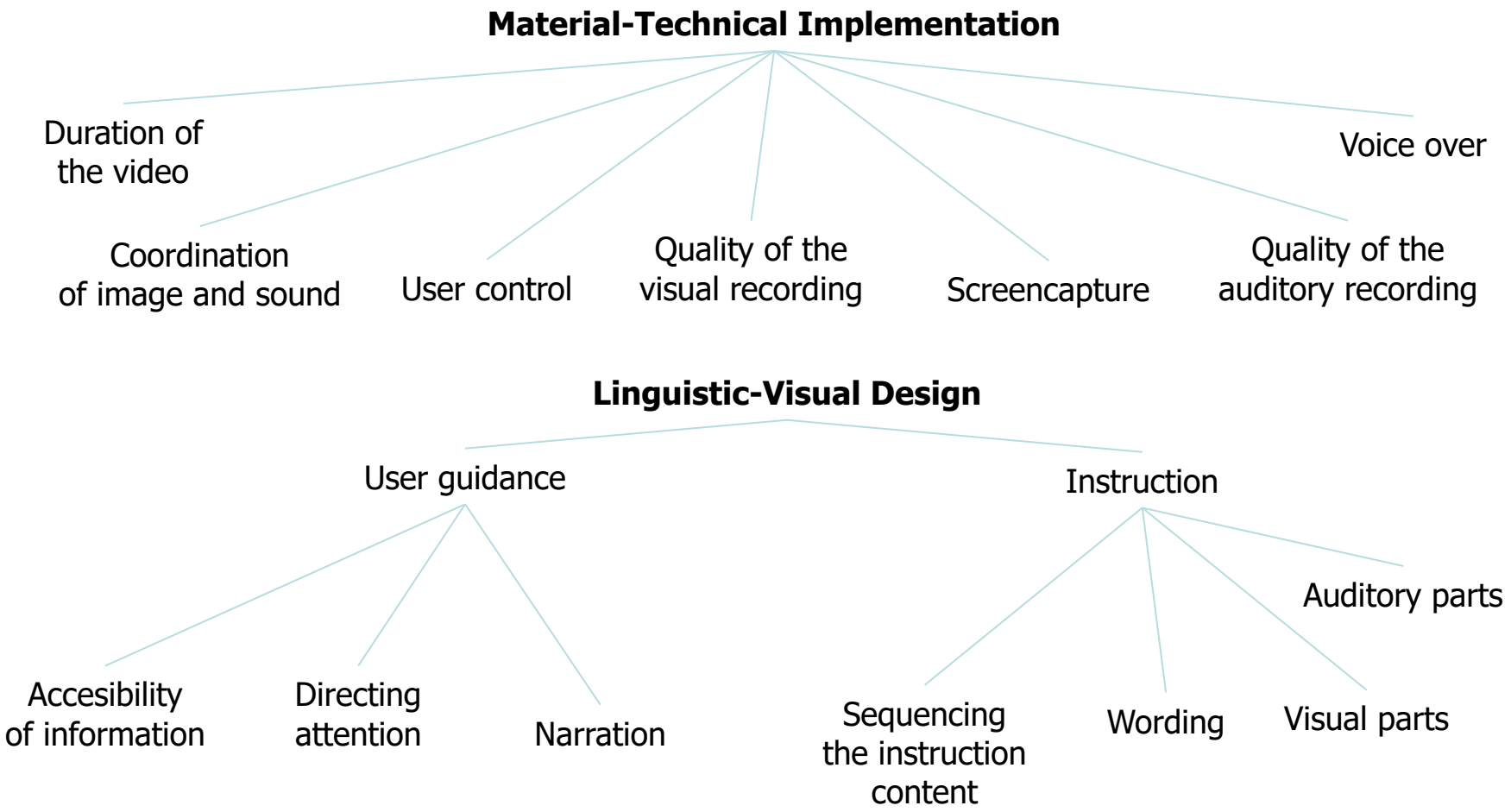

Instructional Videos: Design Recommendations

Didactic Design

- Mainly teach procedural knowledge
- Perform activities in the video consciously and safely
- Repeat important information
- Using Advanced Organizers
- Let knowledge apply

Influence of the object

- Only content from the working environment of the users
- Only convey current contents
- Dividing complex content into segments
- Align sequencing in the video with the sequence of activity steps
- If not determined by object: Simple-to-complex sequencing

Addressed in the literature | Addressed by trainers | Addressed by workers

Instructional Videos: Design Recommendations

Didactic Design

Mainly teach procedural knowledge

Perform activities in the video

Using Advanced Organizers

Let knowledge apply

> We don't want to say "Yes, yes, wait a minute but it's different with us" at every training session. And so I have the point: Now **I'm going to do a tutorial myself**, maybe based on what I already have, **but with my own people**. (mechanic, manufacturing company)

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Instructional Videos: Design Recommendations

Material-Technical Implementation

- Keep videos as short as possible
- Synchronize picture and sound (sound shortly before)
- Name individual segments and make them selectable
  -> insert pauses, black screens
- produce videos in at least 720P (vertical resolution)
- Produce in high-resolution audio
- Use a human voice as narrator
- Use zoom effects to increase readability
- Highlight the mouse cursor
- Screencapture: Show interface completely
- Give users the control (in the player with buttons, timeline)
- Make the video overall color pleasant
- Screencapture: Same software version from producer and user

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Screencapture: Same software version from producer and user

Yes, it also **depends on the length of the videos**. At some point, the concentration fades. So I personally do not need a video, which is 90 minutes or 60 minutes... So if the videos are then kept short - **15 minutes, I'd say as a value**. (Cutting machine operator)

Addressed in the literature | Addressed by trainers | Addressed by workers

Instructional Videos: Design Recommendations

Linguistic-Visual Design

- Reduce speech rate
- Formulate the learning objective at the beginning of the video
- Give a content overview at the beginning of the video and treat this content in the video
- Choose a suitable title
- Use table of contents, index or keywords
- Introduce the mainscreen of the interface, or the object roughly in a “preview-tour"at the beginning
- Direct the user's attention (visual and auditory)
- Use a functional, but personal language
- Sequence in: (1) starting state, (2) solution path, (3) target state
- Explain technical and foreign language expressions during the demonstration
- Avoid abbreviations
- Formulate sentences briefly and actively
- Speak without accent

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Instructional videos: design recommendations

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In any case, explain the **task with the goal**. Where do I want to go? (mechanic, manufacturing company)

Addressed in the literature | Addressed by trainers | Addressed by workers

Limitations

- Recommendations are very subject-related. There may be very specific design requirements for specific software products that are not discussed
- Limited to English and German literature only
- The keyword based search has further limited the corpus

Conclusion

- Instructional videos as learning material have high potential for training software skills in industrial contexts
- Best practice + research based approaches required
- Linguistic-visual aspects rarely adressed compared to material-technical aspects
- Requirements of the experts (workers & trainers) match the recommendations in the guidelines referreing to material-technical aspects
- Didactic design, influence of the object, and linguistic-visual aspects are hardly seen by experts
- Feedback from partners: criteria help to produce videos by themselves

Further study is required:

- Central aspects of the design of videos for CAD/CAM training
- Quality-relevant items (e.g., segmentation, sequencing)
- Linguistic design of the functional parts of instructional videos for CAD/CAM training

Literature & Sources

Literature:

- Jakobs/ Tandi/ Rußkamp (2019): Gut bedienbar gestaltete CAx-Nutzeroberflächen für Industrie 4.0. Eine Handreichung für Entwickler. Projektbericht zum EFRE-geförderten Forschungsprojekt Lean-CAx. Aachen: RWTH Aachen University. ISBN: 978-3-9815210-5-4
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Sources:

- Icons: flaticon.com/authors/freepik
- Photos: shutterstock.com

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