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Lecture Recordings at the University – Analysis and Evaluation of Implementation Possibilities

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Abstract. Despite constant criticism on lectures as didactic instruments, they remain the most common form of teaching [11]. Due to the rising need for flexibility in the learning process, lecture recordings are seen as a possibility to capture this demand. This paper presents an empirical study conducted at the University of Bamberg, Germany, and a literature review that evaluated main requirements for a lecture recording solution in the specific blended learning scenario at the faculty of Information Systems and Applied Computer Sciences at the University of Bamberg. Additionally, possible recording and distribution solutions have been analyzed. The results have been captured in a summarizing recommendation for the specific case at the University of Bamberg.

Keywords: Blended learning · Lecture recordings · Requirements

1 Motivation and Introduction

Today's society lives in a world of constant change. Within the growing digitization of our lives, the process of learning happens more and more independent from time and place [3, p. 53]. Therefore, flexible learning scenarios seem to play a major role in today's modern society. This change poses main challenges for universities. Mastering these challenges can be important to match up in a digitized world [20, p. 102]. In contrast, e-learning at universities itself has been in process for over 20 years [20, p. 104]. New media is used for planning and preparing lessons, but lesser for imparting content [7, p. 57f.]. As one option in this direction lecture recordings are frequently used at universities. In relation to the need of flexibility in the learning process, lecture recordings can capture the demand for flexible learning [22, p. 210]. At the faculty of Information Systems and Applied Computer Sciences (IS & ACS) at the University of Bamberg, only a few chairs use this digitized form of teaching. As the chairs have different approaches and settings of their lecture recordings, introducing a standardized solution would facilitate the maintenance for the lecturers and the ease of use for students.

The following paper presents the results of a research study at the Chair of Media Informatics at the University of Bamberg. Main goal of this study was to identify specific requirements for lecture recording systems in a blended learning scenario as well as presenting and analyzing some possible capture and distribution solutions. The

priority of this paper is to present the main results of the requirements analysis. In the beginning, a short summary of the background and related work is presented. Subsequently a literature review in Sect. 3 and the presentation of an empirical study at the University of Bamberg in Sect. 4 form the requirements analysis. In Sects. 5 and 6 a short summary of the investigated recording and distribution solutions is given. The resulting recommendation for the IS & ACS faculty and the University of Bamberg is presented in Sect. 7.

2 Background and Related Work

In the following, the lecture itself, its recording as well as the advantages and disadvantages of lecture recordings will be described more concretely. Despite constant criticism on lectures as didactic instruments, they remain the most common form of teaching [11].¹ The main reason is the possibility to communicate knowledge efficiently and economically [4, p. 603]. Furthermore, the lecture represents the personality of the lecturer better than a book [10, p. 42]. More concretely, the credibility and the motivation of the lecturer play an important role in the learning process [18, p. 500f.]. With regard to digitization, the lecture is particularly well suited for recording and making it available on the Internet compared to other forms of teaching at the university [12, p. 7].

The term lecture recording can be defined in many ways. Demetriadis and Pombortis [2, p. 147] for example differentiate strictly between e-lectures and live-digitized-lectures, whereas Glowalla [4, p. 606] uses a more open definition. In this paper, lecture recordings are defined as video-recordings of a lecturer's lesson independent from the place of the recording that is provided to the students [19, p. 13]. From a didactic perspective, the idea of lecture recordings is to give the students the possibility to use the video of the lecture to review the lecture and prepare for the exam [6, p. 63]. In a logfile analysis, Zupancic and Horz [24] have found that, especially during the audit period, the number of uses of the recordings rises. Both the revision and the preparation for the exam are good examples for the flexibility that lecture recordings provide. There are a few other reasons why this flexibility is needed. From the lecturer's perspective, lecture recordings can compensate the lecturer's occasional absence during illness or professional travel [15, p. 81]. From the student's perspective, lecture recordings enable him or her to study even in case of illness, long distance to the university, and in life situations that make it difficult to study in a regular way [21, p. 236]. Moreover, lecture recordings can be a solution for universities comprising locations scattered all over a city [21, p. 236].

In general, lecture recordings are seen as a noticeable relief in everyday study life for students and lecturers [21, p. 240] [22, p. 214f.]. This can be confirmed by the desire for a higher supply of lecture recordings [22, p. 214f.]. However, there are some negative aspects in the use of lecture recordings. One of the main critical points is the lack of interaction with the lecturer [15, p. 86]. Students do not see the relevance to ask questions if a lecture is recorded [21, p. 236]. Another common problem is reduced

¹ Already in 1902 Paulsen [16, p.237f.] reported that the lecture was criticized in its role as the dominant form of teaching in higher education.

attendance when recordings are available for a lecture [13, p. 35] [23, p. 200]. This is only one fear that lecturers have about the use of lecture recordings. The handling of new software and hardware can be perceived as a burden, copyright and intellectual property lead to legally unclear situations and comparison with other lecturers is regarded as a concern [1, p. 80]. All these aspects indicate possible hurdles in the establishment of lecture recordings. Since the lecturers can be seen as critical stakeholders for the establishment of lecture recordings at a university due to the worries and the resulting acceptance hurdles, appropriate measures should be taken with this group [6, p. 69].

So far, the key terms as well as the main benefits and disadvantages of lecture recordings were described. Based on this, relevant functions of a system for recording lectures will be presented in the following section.

3 Literature Review

This section summarizes a literature review on important functions of lecture recordings. These requirements will be compared with the results of the conducted empirical study later in this paper.

In principle, a lecture recording should provide the same information as the classroom lecture. This includes, among other things, that the lecturer is both audible and visible [4, p. 605]. A lecture recording should therefore at least ensure the speaker's voice and a recording of the script [13, p. 27]. The addition of a video is controversially discussed in the literature. While the higher (personnel) costs and the restriction of the lecturer's freedom of movement have to be accepted [13, p. 27], the recording of the lecturer offers significant advantages. With a video recording of the lecturer, the majority of students rate their work with the lecture recording as more effective than attending the lecture [4, p. 612]. Similar evidence can be found for the concentration in learning [4, p. 612f.]. A "talking head" also leads to a higher commitment of the students [5, p. 45].

An important feature of lecture recordings is the possibility to take notes. Adding own notes as well as seeing the lecturer's notes are both rated as important features of a lecture recording from the student's perspective [8, p. 45f.]. In addition, students should be able to use keywords to selectively navigate to specific parts of the recording in order to recapitulate selected topics [4, p. 605]. As mentioned in the previous section, lecture recordings are frequently used to prepare for the exam. In this case, the search and navigation with specific keywords is a highly relevant feature. Another function desired by students is the adjustment of the playback speed, to improve the understanding of the content [8, p. 49]. Thus students can independently deal with a lecture at their own learning pace [15, p. 81] [6, p. 73]. As a result, students can take individual breaks in case of attention difficulties without missing any content [6, p. 72].

As mentioned in the previous sections, lecture recordings are criticized because of the missing social aspect. Therefore, forms of social interaction can be relevant for lecture recordings. Possible solutions might be, for example, a feedback channel to the lecturer via e-mail, the exchange between students through discussion forums or a chat function [14, p. 7]. However, lecture recordings are not intended to be a communication or interaction medium, but merely an information instrument [15, p. 86].

In general, central elements regarding the acceptance of a software are its perceived usability and ease of use [6, p. 64]. Therefore, these elements should also be considered in the context of possible lecture recording solutions. Another important factor is the deployment of the lecture recordings. Lampi et al. [13, p. 29] demand a fast availability of the recordings. More specifically, a period between 4 and 24 h can be assumed [21, p. 237]. In addition, the software should support the interactive elements of a lecture as well as enable a simple preparation and integration into the learning management system [13, p. 29]. For optimal video length, Guo et al. [5, p. 44] recommend to divide the video into small parts of less than six minutes, due to the result, that the engagement has decreased with increasing video duration. From a didactic point of view, it would therefore be conceivable to divide the lecture recordings into smaller parts.

4 Empirical Study at the University of Bamberg

Two separate online surveys were conducted to evaluate the main requirements for a lecture recording system from the perspective of the students and the lecturers. The structure of the questionnaire was based on the functions from the literature review as well as on the questionnaires of Rohs and Streule [17] and Höver et al. [9]. 10 lecturers and 143 students from the faculty of IS & ACS participated in the online surveys. Correspondingly, 8.4% of the students at the IS & ACS faculty took part in the online survey. The students were able to participate in the online survey in July 2018 for about three weeks. Regarding the online survey for the lecturers, 16 lecturers received a personal invitation via e-mail. The participation on the online survey was restricted to the professors and their temporary lecturers because these two groups hold the lectures. The lecturers were able to participate in the online survey in July and August 2018 for about four weeks. Following the survey, the lecturers had the possibility to attend a separate interview. Hence, three lecturers were interviewed. The main results of the surveys and interviews will be presented hereafter.

To evaluate the relevance of lecture recordings at the University of Bamberg, students and lecturers were asked to rate the supply and demand of lecture recordings in general. Therefore, both groups were confronted with items (statements) which they had to evaluate on a scale from 1 (do not agree at all) to 5 (fully agree). The students rated the sufficient supply of lecture recordings with a mean of 1.76, a median of 2 and a standard deviation (SD) of 0.878. Half of the lecturers did not see a sufficient supply of lecture recordings (1.0) whereas the other half did not answer this question. A similar result can be seen in the demand for lecture recordings. For the students a scale over four items showed a mean of 4.3, a median of 4.5 and a SD of 0.7. The results of the lecturers are a bit lower. There a scale over three items was rated with a mean of 3.2, a median of 3.33 and a SD of 1.433. These results support the high demand for lecture recordings described in the literature analysis. In the specific case of the IS & ACS faculty of the University of Bamberg the results indicate that there is a major demand and a significant relevance for the use of lecture recordings.

Furthermore, the lecturers were asked about their hopes and fears regarding lecture recordings. Most lecturers have the hope that lecture recordings enable a flexible learning for the students and that they will understand the contents of the lecture better.

The most common fear is that students will be absent due to the recording of the lecture. Three lecturers have also selected data protection problems and legal vulnerability due to errors in content. These fears coincide with the descriptions in Sect. 3. These aspects will be considered in the concluding recommendation at the end of this paper.

The central aim of the empirical study was to evaluate the main requirements of a lecture recording system. The following paragraphs will present the relevant results, beginning with the core functions from students' and lecturers' point of view. Therefore, Table 1 shows the comparison of relevant functions from the users' view between the students and lecturers.

Table 1. Rated features of lecture recordings from the users' perspective (sorted with respect to the student rating; 1 = "not important at all" to 5 = "very important").

Function	Student			Lecturers		
	Mean	Median	SD	Mean	Median	SD
Download option	4.14	5	1.195	3.78	5	1.716
Table of contents with navigation	3.98	4	1.087	4.11	5	1.054
Adjusting the playback speed	3.89	4	1.418	4.29	5	0.951
Video of the lecturer	3.88	4	1.080	4.11	5	1.167
Search option	3.65	4	1.125	4.22	4	0.833
Creating notes	3.05	3	1.435	2.78	2	1.716
Save and export notes	2.98	3	1.395	2.38	2	1.685
Leave questions for lecturers	2.89	3	1.256	2.88	3	1.458
Leave questions for other students	2.37	2	1.186	3.5	3.5	1.309
Subtitle	2.23	2	1.232	3.33	3	1.323
Chat to discuss with other students	2.14	2	1.141	3.0	3	1.414

Interpreting the table, it becomes clear that both lecturers and students rate the same five functions as important or very important. Only the order is different. Some of the evaluated functions were already discussed in the literature review. The table of contents with navigation and the search options are needed to enable the students to navigate to specific parts of a lecture and search for specific content. The adjustment of the playback speed helps the students to learn in their own pace. The video of the lecturer has also been discussed previously. The results indicate that for the realization of lecture recordings at the University of Bamberg, a video recording of the lecturers should be integrated into the recording. Both lecturers and students voted it as important. The SD of these five functions is about 1, except for the adjustment of the playback speed by the students and the download option by the teachers. With the help of this overview, it is also possible to exclude some requirements for the implementation at the University of Bamberg. The creation of notes and a direct possibility for social interaction do not seem to be relevant for students and lecturers. Another question for the students showed, that only one in three students asks questions in a lecture. Students were also asked how often they take notes during a lecture. The

majority of students just rarely or sometimes take notes. These results verify the less valued functions in Table 1. However, these aspects have been seen as relevant in the literature review in Sect. 3. The results of this empiric study indicate, that for the specific blended learning scenario at the IS & ACS faculty of the University of Bamberg, these functions might not be relevant. Subtitles seem irrelevant, too. However, the relevance should be discussed. Comparing the answers from students and lecturers, the different opinions regarding subtitles' importance might arise from the structure of this empiric study. The online survey was only available in German. International students therefore probably did not participate in this study. However, a subtitle might be particularly relevant for this group.

Additionally, lecturers were asked about the important functions of a lecture recording system from the producer's point of view. Table 2 shows the results. Like in the previous section, the highest valued functions (with a mean of more than 3.5 and a median of at least 4) were integrated into the list of requirements. Some of these points have also been verified by the interviews discussed later in this paper. Even though the integration of interactive elements is less valued, it will be integrated into the list of requirements because of the results of the interviews. In comparison to the literature review, especially the possibility to directly upload the recorded lectures into the learning management system is rated as important. This result indicates that for the case of the University of Bamberg, there is a need for a possible recording or distribution solution to enable this feature for the used learning management system Moodle. The SD reveals that the lecturers sometimes had very different opinions. The export to common file formats, the automated post-processing and the mentioned direct upload to the learning management system all have a SD of more than 1.3. This fact leads to a less important role of these functions.

Table 2. Rated functions of lecture recordings from the producer's view.

Function	Mean	Median	SD
Simple and time-saving recording function	4.78	5	0.667
Recording system independent from presentation computer	4.63	5	1.061
Export to common file formats (e.g. AVI, MPEG4, MP4)	4.56	5	1.333
Integration of a lecturer video	4.56	5	0.726
Automated post-processing/cutting	4.00	4	1.323
Direct upload to learning management system (e.g. Moodle)	3.89	5	1.537
Recording of multiple screens	3.67	3	1.323
Recording with multiple cameras	3.56	3	0.882
Placement of annotations	3.33	4	1.414
Recording of public questions	2.89	3	1.537
Integration of interactive elements (e.g. Quiz)	2.89	3	1.537

Besides these functions, the survey also evaluated the time of provision, the length of a lecture recording and the used devices from the students' perspective. At the time

of provision, the majority of the students have opted for an availability of the lecture recordings within a few days (74 mentions) or hours (49) after the face-to-face lecture. In combination with the knowledge of Sect. 3, this seems to be an appropriate period of time to provide a lecture recording.

The major part of the students prefer a length of 60–90 min for a recording (42.7%) followed by a 31–45 min recording (28%). In contrast to the recommendation of Guo, Kim and Rubin [5, p. 44] to shorten the video, this result implies to remain with the classical lecture length for a recording. Among the used devices, laptops predominate with 93%. Slightly more than half of the students (58.7%) use a desktop PCs to watch recorded lectures. 33.6% of the students use a tablet and 29.4% use their mobile phone to watch a lecture recording. Since about one third of the students uses mobile devices, it becomes clear that a lecture recording should be optimized for these devices, too.

At last, the results of the interviews are presented. For a more structured presentation, the results are differentiated between technical and organizational requirements. The technical requirements are relevant for the list of requirements at the end of this section. The organizational requirements will later be applied when formulating an implementation recommendation for the IS & ACS faculty and the University of Bamberg. The interviews showed partly dissenting opinions regarding the requirements of the lecture recording system. Hence, a wish from one lecturer to establish one lecture recording solution for the whole university seems difficult to realize.

In order to take the different requirements into consideration, previously excluded aspects are also discussed again if necessary. Despite being rated as less important in Table 2, the support of interactive elements will be integrated in the list of requirements. It might be important for those lecturers, who want to organize their lectures more interactively. Therefore, a lecture recording system should support this opportunity. Consequently, the possibility to create simple learning videos independent from a lecture recording should be supported too. Two of the interviewed lecturers emphasized stability and user-friendliness as one of the central requirements for the recording system. In terms of user-friendliness, the focus is not only on a simple recording function but also on a short set-up time. This is also in line with the previous results of the survey. As well, there is a clear trend in the amount of the post-processing. All three lecturers support a solution, which, in the ideal case, would be completely applicable without post-processing. Especially with this time-consuming task, the desire for a central support office at the university becomes obvious. Beyond the technical support, one of the interviewed lecturers sees the need for legal support from the university in order to prevent anxiety among the lecturers. He sees legal uncertainties in the publication of recordings as a central hurdle to making lecture recordings freely available.

Concluding the previously shown results, Table 3 shows the list of requirements for a lecture recording solution in the specific blended-learning context of the IS & ACS faculty at the University of Bamberg. To this end, a separation between functional and non-functional requirements was used.

Table 3. List of important requirements for a lecture recording system.

Functional requirements	Non-functional requirements
Adjusting the playback speed	Fast deployment
Table of contents with navigation	Support of mobile devices
Search option	Simple recording function
Download option	Independence of presentation computer
Video of the lecturer	Independence of operating system
Support for interactive elements	Automated post-processing
Export to common file formats	
Direct upload to learning management system (e.g. Moodle)	
Creation of learning videos	

5 Consideration of Exemplary Recording Systems

Based on the derived list of requirements in Table 3, four lecture-recording solutions were analyzed: OBS-Studio, Camtasia, ActivePresenter and Panopto.²

The Open Broadcaster Software (OBS-Studio) is a free and open source software for video recording.³ OBS-Studio is available for Windows, MacOS and Linux. At the University of Bamberg, the chair of Privacy and Security in Information Systems uses this software. The free and open availability of the source code is one big advantage of OBS-Studio. It is also possible to capture different scenes and switch these within the recording process. Furthermore, OBS-Studio is a simple and clear recording tool that enables lecture recordings independent of the presentation computer. However, it should be noted that this simplicity also means that limited functions have to be accepted.

Camtasia is a screen-capturing tool, which offers extensive editing options for the recorded video clips in addition to the recording function.⁴ Camtasia is offered as a single or volume license and is available for Windows and MacOS. At the University of Bamberg the chair of Media Informatics is recording the lectures with Camtasia. With regard to the functional requirements, especially the comprehensive HTML5-Player can be evaluated as positive. However, the rather rigid format and the dependence on the presentation computer has to be criticized. Camtasia's project files are stored in a proprietary format that does not allow easy processing outside of Camtasia. In addition, the recording sources are limited to the screen and one camera. It is therefore not possible to record different scenes and does not allow more than one camera perspective.

² Please note that we have evaluated the current versions in 2018 according to our best possibilities. Errors in the evaluation can therefore not be excluded.

³ <https://obsproject.com/> [28.03.2019].

⁴ <https://www.techsmith.com/video-editor.html> [28.03.2019].

ActivePresenter is an e-learning authoring tool that also contains a screen recorder and a video editor.⁵ The program is available in three successive variants for Windows and MacOS: a Free Edition, a Standard Edition and a Pro Edition. The extensive functions offered by the program allow different application scenarios. However, the dependency on the presentation computer as well as a proprietary file format can be listed as points of criticism. An advantage of ActivePresenter is the possibility of responsive design. In order to use all relevant advantages of ActivePresenter, the Pro Edition is required.

Panopto is an all-in-one video content management system.⁶ The program includes video recording, editing and publishing, as well as an integrated video management system. The Computing Centre of the University of Bamberg currently has a Panopto test system at its disposal. In this section, only the video recording and viewing features will be shortly assessed. The editing, publishing and integrated video management system will follow in the next section. Panopto contains a separate recorder software and an extensive video player. The recorder is available for Windows and MacOS. Lecturers need to install it on their presentation computer and can use it for creating and uploading the lecture recordings. If technically equipped lecture rooms are offered, Panopto also enables a recording independent from the presentation computer. Moreover, the lecturer can control and manage the recording via the browser or the Panopto App. The post-processing is happening online integrated in the Panopto video management system. The Panopto player is also integrated into the video platform. It enables most of the evaluated functional requirements and much more besides. Overall, Panopto is a very powerful and comprehensive all-in-one solution for creating lecture recordings and other video content. The functions allow a wide range of application scenarios.

6 Distribution and Presentation Solutions

In Sect. 5, four software solutions for recording lectures were examined and compared. With the exception of Panopto's all-in-one solution, the reviewed software were primarily recording solutions. An open point is the distribution and presentation of the recordings. Therefore, the following section introduces the compared distribution solutions.

Following on from the previous section, Panopto's video platform will first be considered. The video management system of Panopto enables a wide-range of post-processing options for the recorded lectures. Moreover, interactive content in form of quizzes can be added. The direct integration of recorded lectures into a learning management system is supported too. For the University of Bamberg, Moodle is relevant here. The text editor in Moodle can be used to integrate videos directly from Panopto with the help of a special button. A small disadvantage remains: The embedded player in Moodle supports only a part of the comprehensive functions of the Panopto Player. Furthermore, Panopto offers a wide-ranging analysis of the usage data.

⁵ <https://atomisystems.com/activepresenter/> [28.03.2019].

⁶ <https://www.panopto.com/> [28.03.2019].

A free counterpart to Panopto is Opencast. Opencast is an open source system for recording, editing, publishing and managing video content in the academic field.⁷ The features of Opencast include all steps involved in creating a recording. Lecture recordings can be scheduled and automatically recorded via capture agents. Alternatively, self-recorded lectures can be uploaded. The videos are distributed via the video management system of Opencast and can be integrated into learning management systems. As an open source solution, Opencast offers many opportunities but also several hurdles. The open source code as well as the large and active community offer the possibility to customize Opencast freely according one's own needs and to benefit from the experiences of the community. However, Opencast is also very complex, since the university has to master the necessary skills for maintenance and operation by itself. With regard to the use for lecture recordings, Opencast is also convincing because it was created by universities for precisely this purpose and is therefore optimized for the academic use.

Beyond Panopto and Opencast, two other solutions were discussed: Lecture2Go and Open edX. Lecture2Go is a platform for the distribution of video recordings developed by the regional computer centre of the University of Hamburg. The portal software is available to other educational institutions as open source. Furthermore, Open edX is a free open source course management system, that is used for the provision of massive open online courses. In addition to the Open edX Studio for the creation of courses, the system also includes its own learning management system. Compared with Opencast and Panopto, Lecture2Go and Open edX have some disadvantages that made them less convincing for the use at the University of Bamberg.

7 Recommendations

Concluding the results of the previous sections, this section will summarize them in a short recommendation for the IS & ACS faculty and the University of Bamberg. This recommendation consists of three areas: general organizational aspects, comparison of the recording system and recommendable distribution and presentation solutions.

Organizational Recommendations. The survey of the lecturers showed that a pure fixation on lecture recordings is not the solution to all problems. More interactive instructional videos are also desired, which should be taken into account in a potential software solution to enable a university-wide recording solution. Furthermore, the demand for technically equipped lecture rooms can be extracted from the interviews. Equipped lecture rooms would offer the potential for individual recording solutions to enable a computer-independent recording, as well as being a simple and timesaving recording option to the lecturer. Both, the statements from the interviews and some of the results of the online survey, indicate that lecturers want more support from the university. In comparison to Sect. 3 this might lead to less restraint of the lecturers in using a lecture recording system. These factors are especially relevant because, as mentioned earlier, the lecturers are a critical part in establishing a lecture recording solution at a university.

⁷ <https://opencast.org/> [28.03.2019].

Recording Software. In Sect. 5, four possible programs for recording lectures were analyzed. With regard to the IS & ACS faculty in Bamberg, it is difficult to find a solution acceptable to all lecturers due to the diverse requirements. Considering the recording program alone, Camtasia is suitable for many recording purposes and offers a powerful HTML5 player. However, the main drawback is the dependency on the presentation computer. OBS-Studio, is the only one of the three considered pure recording programs that allows remote controlled recording. On the contrary, OBS-Studio is limited with regard to the player functions and the application scenarios and can only be expanded by a great deal of effort. Panopto as a comprehensive solution can score here, as both recording variants are possible, but have certain limitations.

Distribution and Presentation. Compared with Opencast and Panopto, Lecture2Go and Open edX have some disadvantages that made them inappropriate for the use at the University of Bamberg: Lecture2Go offers only a small community and less functions, while Open edX is a competitor of the well-used learning management system Moodle, which indicates that the use at the University of Bamberg might not be advisable. Opencast and Panopto, however, seem to be possible solutions. Panopto as well as Opencast fulfill a large part of the evaluated requirements. Both solutions would therefore be conceivable for the University of Bamberg. Compared to Panopto, Opencast probably offers more flexibility regarding new features because of the freely available source code. However, problems would have to be solved either independently or with the help of the community. Panopto would be the much simpler solution because of the support of the provider. There are two possible ways. The decision for a provider such as Panopto or a recording solution implemented in-house like Opencast should be based on the strategic orientation of the university.

8 Summary and Future Work

This paper showed the relevant requirements for a recording solution in the specific context of a blended-learning scenario at the IS & ACS faculty of the University of Bamberg. Moreover, possible recording and distribution solutions have been discussed and compared. The results of the study as well as the comparison of the recording and distribution solutions have been summarized in a recommendation for the University of Bamberg and the IS & ACS faculty.

The legal discussion regarding lecture recordings as well as financial feasibility of the recommended aspects remain open. For these topics, an independent consideration in the context of further work is recommended.

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