Mobile Instant Video Sharing: Does More Information Help?

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ABSTRACT

Videos are an important part of social platforms. With growing data speeds and high resolution cameras on mobile devices and smartphones, mobile instant and live video clip sharing become increasingly popular. However, video uploads are resource consuming which leads to long upload times, especially in environments with poor data connections. In current mobile applications, the user has little to no influence on optimizing the upload of her/his video according to the current (network) context. In this work, we propose a mobile application that shows an accurate upload time estimation and a current network speed indication. The user can select a video quality for uploading and by that possibly reach faster uploads in low bandwidth connection areas. In a user study with 21 users, we show that users perceive the upload speed as higher with given upload estimation and network speed indication when they have less bandwidth available. With this information, participants perceive the application as more reliable and have an increased feeling of control over the upload process. All users liked the proposed video quality customization feature. Compared to a graphical representation of the network speed, the upload time was the more helpful information to customize the upload.

KEYWORDS

Mobile instant video sharing, Video sharing, Video quality, Upload time, Customization, User feedback, User interface

1 INTRODUCTION

Videos on social media platforms become more and more important. More than 90 percent of mobile video viewers also share them with others [15]. Videos are integral parts in blog posts [8] and in people's news feeds [13]. They attract viewers and make information easier accessible. On Facebook, people were posting 75% more videos than they did a year ago [in 2014], especially in the US, where 94% more videos were posted [13]. According to Facebook CEO Mark Zuckerberg, "Video is a very big priority," and "a lot of the content that people share will be video" in the future [13]. In 2014, Facebook also integrated instant video clip sharing into the Messenger app [2]. With growing data speeds and high resolution cameras on mobile devices and smartphones, mobile instant and live video clip sharing is becoming commonplace. "The instant popularity of Meerkat, Periscope, Snapchat, and now Facebook Live serves to illustrate the importance of authentic, "off-the-cuff," and in-the-moment content with audiences worldwide" [10].

Users often share contents at special events like the Oktoberfest in Munich or Kings Day in the Netherlands, or during outdoor activities like hiking, skiing, or trail-riding. These events have in common that the available bandwidth for video uploads is low: either the networks are crowded or data rates in remote locations are low in general. However, sometimes users want to share videos as soon as possible, for example in a case of emergency. Then people may not need the best video quality to describe a situation, but time is a critical factor. In other cases, higher video quality may be preferred. However, current applications and mobile interfaces do not provide the user with information on network load or video upload time, nor do they give users mechanisms to manually customize the video quality according to available bandwidth and estimated upload times. Giving the users information about upload times and a way to customize video quality in relation to available bandwidth may be a solution. Accordingly, the goal of this work is to understand:

RQ1: *Do users perceive differences in upload speed, when information about network conditions is shown?*

RQ2: *Do users perceive video uploads as more reliable, when information about network conditions is shown?*

RQ3: *Do users feel more in control, when information about network conditions is shown?*

RQ4: *Does information about video quality and related upload times support the user in selecting a video quality?*

We conducted a study with 21 people to understand their impressions and preferences with regards to the above questions. We found that showing an accurate upload time and network load indicator increases the perceived upload speed for slow uploads, and overall increases the perceived reliability and feeling of control.

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Most participants liked the feature where the application provides a video quality recommendation based on the current network load. All participants like the option to select a custom video quality.

The remainder of this work is structured as follows: We first give an overview of related work. We then give an overview of GUI and implementation of our system (Section 3). After that we describe our methodology (Section 4) and the results (Section 5). We discuss our findings in Section 6 and give an overview of this paper and an outlook on future work in Section 7.

2 RELATED WORK

A thorough analysis of related work showed, that many algorithms and solutions were implemented to improve and optimize upload speeds, especially for high volume multimedia data like videos. However, user interaction was considered less, and to the best of our knowledge, no interfaces exist or were evaluated, that allow the user to manually adapt the video quality to the available bandwidth if she/he wants to share the video faster.

Flintham et al. [4] conducted a study on crowd-sourced collection of video footage during a running event. They provided an app for video recording and upload during a marathon to find out what type of videos spectators produce. After their live trial, they concluded that an intelligent video upload mechanism is necessary. Assuming that metadata about videos are available, they propose selective uploads for prioritized or highly demanded videos to minimize network congestion. They also recommend showing estimates when requested videos may be available. Hao et al. [6] describe a system that records geo-information with a video. Their goal is to provide mechanisms to deal with power and bandwidth constraints on mobile devices during the uploads of large amounts of video data. In their solution, users can select if they want to upload only the geo-information or both, geo-information and video. If only geo-information is uploaded, videos may be uploaded later. Both described approaches are similar, using metadata to allow delayed video uploads. However, they do not discuss or test how user selected video quality may be of use.

Solutions for certain specific use cases try to prioritize or localize content uploads. Richerzhagen et al. propose "a set of strategies to collaboratively upload the most relevant streams [for crowd-sourced live event coverage] at high quality by utilizing freed resources" [17]. Schmitt et al. propose a solution that transforms and redistributes media elements based on the assumption that "media content produced by local users is often heavily consumed by local users" [18]. Abboud et al. [1] describe upload strategies for collaborative P2P video-on-demand environments. These implementations try to take the user behavior into consideration, however, they only optimize on the network side and do not give any control to the user.

Several algorithms are proposed that purely focus on the video upload, assuming that "users prefer uploading the highest video quality available from their mobile devices, regardless of their wireless environment; users expect their uploaded videos to be available immediately after they upload them; and users also expect to watch videos at high quality, despite a limited wireless capacity in their environment" [19]. The works described hereafter try to optimize the uploads regarding these goals: Wilk et al. "propose a novel mobile broadcasting framework, which exchanges different uploading protocols during the runtime of the application" [23]. Pu and Nakao [16] propose an uploading acceleration service for WiFi APs introducing a mobile device framework for upload acceleration. Wang et al. "intelligently schedule delay tolerant data to more favorable network conditions in order to potentially reduce network resource consumption, alleviate network congestion, and improve battery lifetime" [22]. They use the user network profile to predict future conditions which helps to save network resources by efficiently leveraging delay tolerance. Siekkinen et al. "provide close to optimal algorithms for scheduling video chunk upload for multiple clients having different viewing delays" [20]. In their use case, live video content is shared by a mobile user. Seo et al. describe an "approach that provides compatibility with DASH and at the same time improves content availability by reducing the end-to-end delay from the recording time of mobile videos to the publishing of the first segment of the multi-bitrate encoded versions through a careful pipelining of the overall process" [19].

None of the works described here considers that a user may prefer a quicker upload over higher quality, for example because she/he instantly wants to share something she/he saw with friends or is in an emergency situation where saving time is highly relevant. Also, none of these works provides a GUI where the user can adjust settings. In this paper, we combine an uploading acceleration service with a GUI that (1) informs the user about the current upload speed, (2) provides the user an accurate estimation of the video upload time, and (3) offers the user a mechanism to customize the video quality.

3 SYSTEM DESCRIPTION

In this section, we describe the GUI of our mobile video upload application. Our fully functional prototype is designed for Apple's iOS platform[1]. With our application, users can record short video clips and instantly share them on a video feed. As such, our application closely resembles the applications from YouTube[2], Vimeo[3], and Vine[4]. We differentiate our application by displaying an indication of the network speed and providing an accurate estimation of the upload time. Furthermore, we provide a video quality customization option to the user.

Figure 1: Network speed indicator (from left to right: low to high upload speed)

The network speed is visualized in the form of a cloud and three vertical bars, as shown in Figure 1. When more bars are colored, then there is more bandwidth available for uploading a video. The number of colored bars is directly mapped to the video quality presets listed in Table 1. This results in one colored bar when the available upload bandwidth is less than 600 kbit/s. Two colored bars

[1] https://www.apple.com/ios/ios-10/ (accessed April 18, 2017)
[2] https://www.youtube.com/yt/devices/ (accessed April 18, 2017)
[3] https://vimeo.com/everywhere (accessed April 18, 2017)
[4] https://vine.co (accessed April 18, 2017)

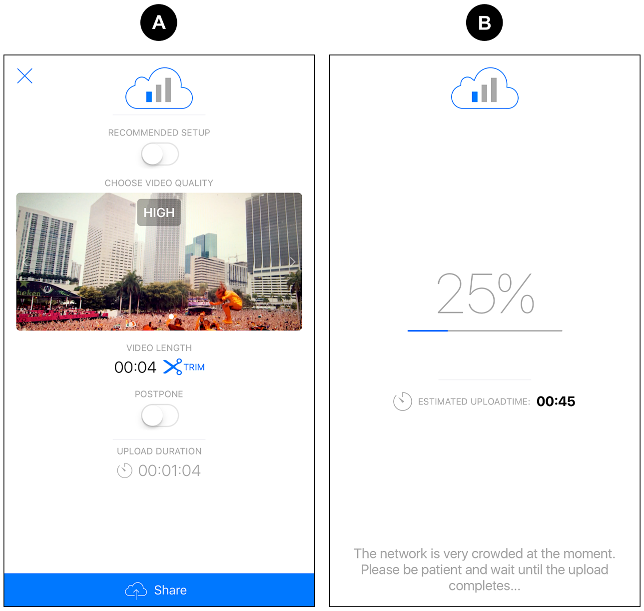

Figure 2: Screenshots of the settings screen (left) and the progress screen (right)

are shown when the upload speed is between 600 kbit/s and 2500 kbit/s. Three colored bars are shown when the available upload bandwidth is higher than 2500 kbit/s. Using these settings, the users get a hint on what video quality to select for a given network setting, such that uploading a video would not take longer than recording itself.

A screenshot of how the network speed indicator is displayed to the user is shown in Figure 2(A). This GUI is shown directly after recording a video clip or selecting a pre-recorded clip from the phone's library, and right before the upload starts. The GUI also shows a preview of the video in the selected quality and the estimated upload time. Our application prototype also includes features to trim the video and postpone the upload, but are not evaluated in this user study. The video quality is set to a preset from Table 1, recommended based on the current network upload speed. The recommended video quality is the highest quality such that an upload does not take longer than 80 seconds. Uploads taking longer than 80 seconds result in a bad quality of experience [3]. By swiping the video preview left or right, the user can select a custom video quality (from the available presets). Changing the video quality updates the preview and the upload time indication. While uploading, the upload speed indicator, a progress bar, and the estimated upload time are displayed as shown in Figure 2(B).

Our application receives the upload speed indication and the upload time estimation from our modified Wi-Fi router. This Wi-Fi router continuously monitors network traffic and reports this back to the mobile video sharing application. In addition, the Wi-Fi router provides an application programming interface (API) to the application for reserving bandwidth. This enables accurate upload time estimations in our video sharing application. The technical description of our Wi-Fi router is outside the scope of this paper.

Table 1: Video encoding presets [12]

Preset	Resolution	Video bitrate	Audio bitrate
Low	424 x 240 (240p)	576 kbit/s	64 kbit/s
Medium	848 x 480 (480p)	1216 kbit/s	128 kbit/s
High	1280 x 720 (720p)	2496 kbit/s	192 kbit/s

Table 2: Demographics and information about users (in absolute numbers)

		#
Age	below 25	12
	25-30	7
	above 30	2
Gender	Male	15
	Female	6
Familiarity with iOS platform	Very familiar	10
	Not very familiar	7
	Familiar	3
	Never used iOS	1

4 METHODOLOGY

Trying to answer the research questions as stated in the introduction, we performed a user study with 21 participants that were given the task to upload video clips under different conditions (network speed and amount of information about network context that is displayed). We investigated if showing information affects the perception of time, perceived reliability of the system, and feeling of control. In addition, we evaluated the features of video recommendations based on current network conditions and customizability of the video quality.

4.1 Participants

Participants were recruited through Social Network Systems. We used postings on Facebook trying to find as many participants as possible. The demographics as well as other relevant data are summarized in Table 2. Most participants were 30 years or younger. About two thirds of the participants were male and one third were female. The respondents can be considered representative taking statistical data about social media platforms with mobile instant video clip sharing into account [14, 21]. Taking a look at the user group of Vine, these findings are confirmed: it can be noticed that especially younger people are using this service, for example "71% of Vine users are millennials" and "28% of Vine users are are between 18 and 24"[5].

4.2 System Setup

We provided the participants an iPhone 6 Plus[6] to record and share video clips. The smartphone had our application pre-installed and was configured to receive information from our Wi-Fi network. The Wi-Fi network was designated to our study, ensuring predictable networking conditions. Different network conditions were simulated by limiting the upload speed in the router using Linux tc[7]. We set the upload speed to 10 Mbit/s to simulate fast uploads. This

[5] http://expandedramblings.com/index.php/vine-statistics/ (accessed April 06, 2017)
[6] https://www.apple.com/iphone-6s/specs/ (accessed April 13, 2017)
[7] http://lartc.org/manpages/tc-htb.html (accessed April 13, 2017)

Table 3: Questions for the evaluation of our mobile video sharing application

Id.	Question	Lowest (1)	Highest (5)
Q1	Rate the upload time	Short	Long
Q2	Rate the upload speed	Slow	Fast
Q3	The system performs reliable	Strongly disagree	Strongly agree
Q4	When I was using the application, I felt in control	Strongly disagree	Strongly agree
Q5	I liked that the application provided me a recommendation for the video quality	Strongly disagree	Strongly agree
Q6	I liked the video quality recommendation that the application provided me	Strongly disagree	Strongly agree
Q7	The upload time indicator helped me understand the video quality recommendation	Strongly disagree	Strongly agree
Q8	The network speed indicator (cloud) helped me to understand the video quality recommendation	Strongly disagree	Strongly agree
Q9	I liked that I could set the video quality myself	Strongly disagree	Strongly agree
Q10	The upload times indicator helped me in picking a video quality	Strongly disagree	Strongly agree
Q11	The network speed indicator (cloud) helped me in picking a video quality	Strongly disagree	Strongly agree

represents a common upload speed in a mobile LTE network [11]. To simulate slow uploads, we limited the upload speed to 600 Kbit/s. This upload speed is sufficient to upload low quality video (see Table 1) in real-time.

4.3 Procedure/Data Collection

Our user study was conducted in multiple sessions, with one participant per session. The sessions took place in a usability lab that closely resembles a living room. At the beginning of each session, the application was explained, including the meaning of the time indicator and the network load indicator. Then, the participants recorded a 30 second video. We asked participants to walk around and record the room (instead of a static clip) to simulate the recording process. Nonetheless, the video content itself or its aesthetic value was not relevant for this study. A test upload was performed ensuring that participants knew how to work with the application.

After the introduction, the recorded video was shared four times under different conditions. The conditions differed in upload speed and the amount of information about the upload that was displayed to the participants. The order in which the conditions was presented to the participants were counterbalanced. The conditions were:

- *Fast upload setting:* A network with 10 Mbit/s upload speed; the application did not display additional information, it only showed the progress bar (Figure 2(B)).
- *Fast upload setting with information:* A network with 10 Mbit/s upload speed; the application showed an indication of the current upload speed (fast), expected upload time, a video quality recommendation (high quality) (Figure 2(A)), and the progress bar (Figure 2(B)).
- *Slow upload setting:* A network with 0.6 Mbit/s upload speed. the application did not display additional information, it only showed the progress bar (Figure 2(B)).
- *Slow upload setting with information:* A network with 0.6 Mbit/s upload speed; the application showed an indication of the current upload speed (slow), expected upload time, and a video quality recommendation (low quality) (Figure 2(A)), and the progress bar (Figure 2(B)).

In these four uploads, the participants accepted the quality recommendation when it was available in the application (i.e. when information was displayed on the settings screen). In the uploads without information, the application internally applied the recommendation to create comparable upload times. An additional fifth upload was performed where users customized the video quality:

- *Customize video quality:* A network with 0.6 Mbit/s upload speed; the application showed the upload speed (slow), preview of the currently selected video quality, expected upload time for the selected quality (Figure 2(A)), and the progress bar (Figure 2(B))

Participants rated the application and their uploading experience on a five-point Likert scale. The questions are listed in Table 3. Upload time (Q1), upload speed (Q2), reliability (Q3), and feeling of control (Q4) were rating after each upload. Video quality recommendation (Q5/6), and effect of information on understanding the recommendation (Q7/8) were rated after uploading a video clip twice (fast upload and slow upload), while showing information. The video quality customization functionality (Q9) and usefulness of the indicators (Q10/11) were rated after the customized upload was completed.

5 ANALYSIS AND RESULTS

In this section, we present the results from our user study. As our data was obtained using Likert-like scales, we treat it as ordinal data. The data was not normally distributed. The two data-sets, comparing uploads without information to uploads with information, come from the same participants as paired groups. Therefore, we used the Wilcoxon signed rank test [7] to check for statistical significance of differences in our data. Despite having a full factorial two factor design we checked only on the factor information/no information but not on the upload speed factor, which we see as an underlying condition. All statistics presented hereafter are results from this tests. All p-values < 0.05 indicate a statistical significant difference of the results. In our analysis, we test the following conditions (in Sections 5.1 to 5.3):

(a) We check whether showing information has an effect on the perceived upload speed for all speed settings overall, reported as Z_a and p_a
(b) Like (a), but only for fast upload settings, as Z_b and p_b
(c) Like (a), but only for slow upload settings, as Z_c and p_c

The figures in this section show the percentages of the ratings given by the participants on a Likert scale. Bars to the left indicate low ratings, bars to the right indicate high ratings.

5.1 Perceived Difference in Upload Speed (RQ1)

We first try to answer the research question: *"Do users perceive differences in upload speed, when information about network conditions is shown?"*. We explore if showing upfront how long an upload will take, combined with an indication of the current network load, affects how long users perceive the upload time. The actual upload times were kept the same in both settings (without/with information). Ratings for the perceived upload times are shown in Figure 3.

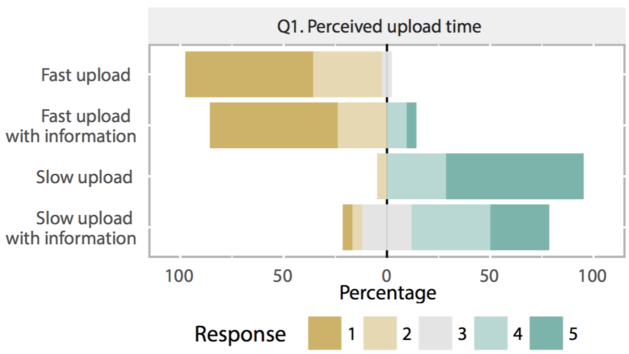

Figure 3: Perceived time for the upload (1 = short, 5 = long)

In the fast upload setting, 15 participants reported the same perceived upload time for the setting with and without information. Four participants reported that the upload took longer when information was displayed. Two rated the upload time as shorter. For the slow upload setting, half of the participants (11) reported a shorter upload time when additional information was displayed. Nine participants rated the time as the same. One participant reported that the upload took longer.

In general, providing an accurate estimation of the upload time and information on current network load does not yield a difference in perceived upload time ($Z_a = 1.2875$, $p_a = 0.1941$). Given fast upload settings, displaying information does not affect the perceived upload time ($Z_b = -1.1627$, $p_b = 0.3125$). In contrast, for the slow upload setting, there is a significant effect of showing upload time and network load indicator on perceived upload time ($Z_c = 2.8181$, $p_c = 0.003906$). Upload time and upload speed are negatively correlated to each other with a Pearson's product-moment correlation coefficient of $r = -0.7975808$ ($p < 2.2e{-16}$). This confirms the results for the perceived upload time.

From these results, we can conclude that showing network related information only affects the perception of upload time and speed in networks with low available bandwidth, when uploads take longer.

5.2 Perceived Reliability (RQ2)

For the second research question, *"Do users perceive video upload as more reliable, when information about network conditions is shown?"*, we asked participants to rate the system's reliability after each upload. The results for perceived reliability are shown in Figure 4.

In the fast upload setting, eight participants rated the reliability higher with information than without. Eleven participants gave the same rating for both settings. Two participants reported the reliability to be lower. In slow upload settings, system reliability was rated higher by fourteen participants when information was provided. Five participants reported the same reliability, while two participants rated it lower.

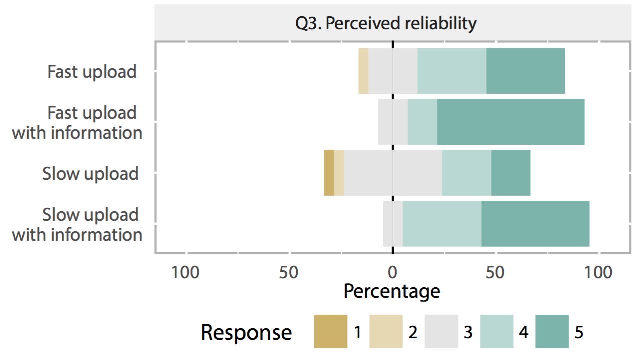

Figure 4: Perceived reliability of the system (1 = strongly disagree, 5 = strongly agree)

Even though uploads always succeeded, and upload times were kept the same when information was shown or hidden, there is an effect of displayed information on the perceived reliability ($Z_a = -3.749$, $p_a = 0.00006$). In the fast upload settings, participants perceive the system as more reliable when information is displayed ($Z_b = -2.1446$, $p_b = 0.04297$). Also in the slow upload settings, the perceived reliability is better when showing information in the crowded network setting ($Z_c = -3.0799$, $p_c = 0.0014$).

Summarizing the findings for the second research question, we can say, that the perceived reliability improves when information about upload speed and upload time is given.

5.3 Feeling of Control (RQ3)

Close to perceived reliability is the feeling of control over the application and the upload process. Answering the research question *"Do users feel more in control, when information about network conditions is shown"*, we asked the participants about feeling in control when using the app. The ratings for the feeling of control are shown in Figure 5.

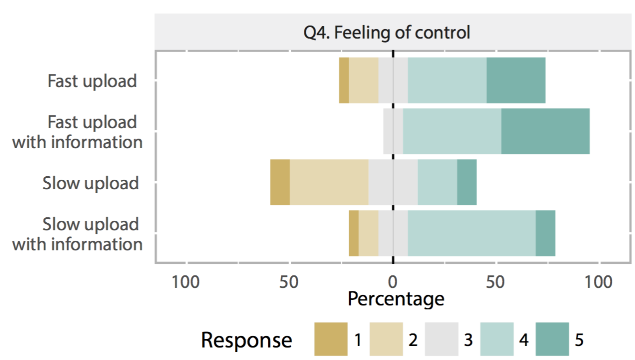

Figure 5: Feeling of control for the upload (1 = strongly disagree, 5 = strongly agree)

In the fast upload settings, the feeling of control increased for fourteen participants. Four participants experienced the same level of control. Three participants gave a lower rating when displaying information. In the slow upload settings, about half of the participants (12) reported a higher feeling of control when upload times and network information were displayed. Seven participants perceived the same level of control, two participants rated it lower.

We recognize an overall positive effect of displaying upload time and network load indication on the feeling of control ($Z_a = -3.6361$, $p_a = 0.00014$). In the fast upload settings, the feeling of control moderately improved ($Z_b = -2.2948$, $p_b = 0.02563$). A significant effect of displaying network conditions on the feeling of control can be seen in the slow upload settings ($Z_c = -2.8738$, $p_c = 0.003632$).

Summarizing the findings for the third research question, we conclude that users feel more in control when information about upload speed and upload time is given.

The participants were also given the possibility to select a custom video quality that was different from the recommendation provided by the application. Comparing to only displaying upload time and network load information, eight participants rated the feeling of control higher in the slow upload setting after selecting the video quality themselves. Ten participants perceived the same level of control. Three participants experienced less control. These results hint at a further increase of control when providing the video quality customization functionality. Comparing only displaying information to customizing the video quality, we cannot claim a significant effect on the feeling of control given our results ($Z_c = -1.4667$, $p_c = 0.1895$, see Figure 6).

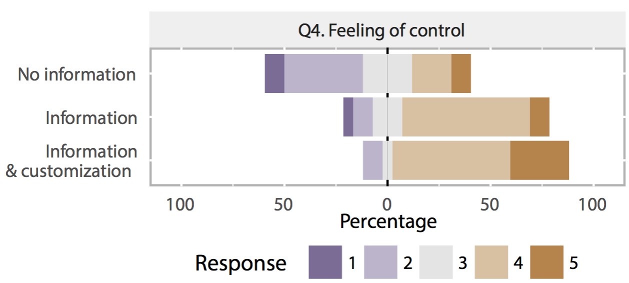

Figure 6: Feeling of control for different information and customization settings (1 = strongly disagree, 5 = strongly agree)

5.4 Influence of Information (RQ4)

Hereafter we analyze the experiences with the recommendation and customization features in general (without comparing for the different upload speeds). Answering the fourth research question, *"Does information about video quality and related upload times support the user in selecting a video quality?"*, we asked the participants how the video quality recommendation and customization are perceived.

By default, the application provides users a video quality recommendation before uploading the video clip. This recommendation is based on the current network speed. The results for the questions on the video quality recommendation are presented in Figure 7. Overall, the new features were evaluated as positive. Most of

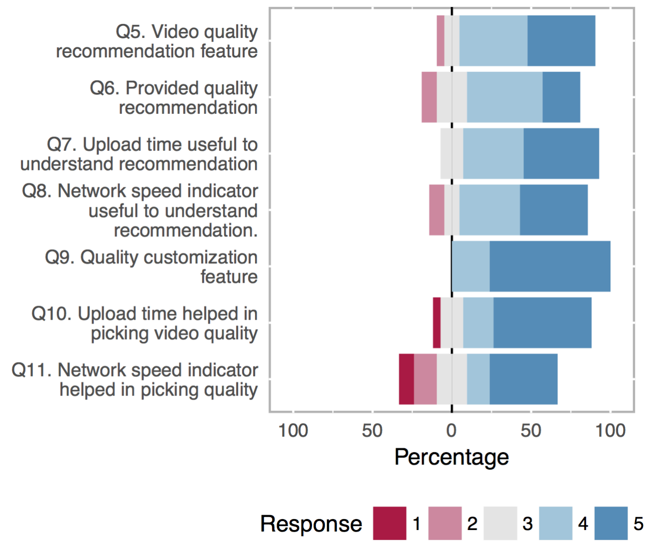

Figure 7: Helpfulness of provided information when picking video quality (1 = strongly disagree, 5 = strongly agree)

the participants (18) reported to like the quality recommendation feature. Three participants had a neutral attitude. One participant reported disliking the recommendation feature. The actual recommendation was slightly less received. Fifteen participants liked the recommendation for the video quality provided by the application. Four participants were neutral, two disliked the recommendation. The upload time duration was the most useful indicator to explain the recommendation. Eighteen participants reported that the upload time helped to understand the application's recommendation. Sixteen participants found the upload speed indicator also helpful. Two of the 21 participants rated the cloud indicator as not useful.

The goal of the video quality recommendation is to provide users a sensible default, which can be overridden by the user. Selecting a custom video quality is a well received functionality. All 21 participants liked this functionality. Participants found the upload time more helpful than the upload speed indicator for selecting the video quality. Seventeen participants agreed with the statement *"The upload time helped me in picking the video quality"*. Three participants neither agreed or disagreed. One participant found the upload time not to be helpful. Comparing to the upload time, the upload speed indicator was only found useful by twelve participants. Four participants were neutral, five participants rated the upload speed indicator as not helpful.

Summarizing the findings for the fourth research question, it can be noted, that users like that the application provides a recommendation of the video quality based on current networking conditions. The possibility to customize the video quality was appreciated.

6 DISCUSSION

Instant mobile video clip sharing plays an important role in different applications: Video clips are shared in chat applications, social media websites, or on video sharing websites. Several platforms offer users a mobile application where they can upload and share video clips. Different applications have different intentions, which translate in how video uploads are handled. The applications use their own predefined settings for video compression, before uploading to the servers. Some applications may optimize for speed and use a lower video bitrate, while others target high quality video and encode using a higher bitrate. On the one hand, the chat applications WhatsApp and WeChat seem to optimize for quicker uploads. They encode videos at 800 kbit/s on iOS devices [9]. Vine also compresses the video before uploading it to the servers [25]. On the other hand, YouTube seems to target high quality uploads and recommends 1080p uploads of at least 8 Mbit/s [24].

None of the applications, however, takes video content, context wherein the video is shared, video communication urgency, or the necessity of detail in the video into account. The context of the users and their intentions are essential to identify the quality in which the upload should happen. In many cases, a medium video quality with a resulting medium upload speed may be sufficient. But in emergency situations where time is the crucial factor, low quality may be acceptable if the video can be shared quicker. In other situations time may be less important, but small details should be visible in the video requiring higher resolutions and more data. Currently, the user is limited to the predefined application settings. This way, users neither have control over the video quality, nor over the upload time. The video sharing application that we presented in this paper is a first step in this direction, by informing users about network conditions and providing the mechanisms to change the video quality. Our results indicate that increasing awareness improves the perception of reliability and feeling of control over the upload process. We observed that participants prefer concrete information in the form of the upload time, over abstract clues like the network speed indicator (cloud), when customizing the quality.

It is important that the information about the current network context (upload speed and time) is accurate for making a decision on the video quality. In our application, we realize this via an interface to the Wi-Fi router. Such interfaces are not the standard and we had to modify our Wi-Fi router to supply our application with information. However, with the rise of technologies like Software Defined Networking [5] such interfaces may become available in the future. Allowing interaction between application and network empowers networks to better serve the needs of the user. It enables optimization strategies that can be applied to reduce load in crowded networks or to improve network fairness. For instance, reducing load can be accomplished by uploading clips in low quality by default, but providing high quality upload when users find this necessary. Network fairness can be improved by stretching high quality uploads over longer time (and thus reduce the high demand on the network), when time is not of the essence. The design and implementation of such strategies, that optimize network resources, but include the user and its context, is an interesting topic for further study.

7 CONCLUSION

In this paper, we present a user interface for video upload applications that (a) provides users information (given upload estimation and network load indication) about the current state of the network and (b) lets users customize their desired video quality for uploading. Choosing a lower video quality makes faster uploads in low bandwidth connection areas or crowded networks possible. We conducted a study with 21 users who tested a prototypical implementation of the application. We found that users perceive the video upload speed as higher with given upload estimation and network load indication when they have less bandwidth available. When users are given more information, they perceive the application as more reliable and have an increased feeling of control over the upload process. The customization feature for the uploads was liked by all users. They rated the display of the upload time as more helpful to customize the upload than a graphical representation with a cloud and bars. This assists the user by recommending high video bitrates in networks with high upload speeds and low bitrates in networks with low upload speeds. Future versions of our application may include more context factors (like for example location or activity) to be able to provide better quality recommendation and better presets for customizing the video quality. However, additional studies are necessary to understand why users like the quality recommendation and customization features. Decisions made while customizing the video quality also need to be further explored, understanding what factors are leading in selecting the trade-off between video quality and upload time.

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