VidLyz: An Interactive Approach to Assist Novice Entrepreneurs in Making Persuasive Campaign Videos

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Videos are essential for successful crowdfunding campaigns. However, without knowledge of the underlying persuasion factors, novice entrepreneurs may find it difficult to optimize their videos for success. This paper presents VidLyz, a novel assistive tool that allows users to explore the implications of audience-engagement persuasion factors in the context of campaign videos through contrasting examples, crowd-sourced subjective ratings, and feedback on engagement factors. VidLyz promotes active thinking about the impact of audience persuasion factors in making an effective campaign video by guiding novice entrepreneurs in planning materials of their videos on their own, with consideration of the product category, the target audience, and audience-product interactions. To evaluate our system, we collected subjective ratings and feedback on persuasion factors for 140 Kickstarter campaign videos from 2100 crowd workers and presented them through our prototype VidLyz tool. A user study with 45 novice users and five previous campaign creators found that our tool was useful for understanding the implication and relative importance of the persuasion factors of the campaign videos. The interactive and active thinking elements of VidLyz promoted novice users to make coherent and persuasive pre-production plan (using storyboards) for their proposed campaign videos. A follow-up user study showed that these storyboards had a higher likelihood of getting funded by crowd workers than those with less persuasive pre-production plan. We concluded with design implications to better support novice entrepreneurs.

CCS Concepts: • **Human-centered Computing**; • **Human computer interaction (HCI)**; • **Interactive systems and tools**;

Additional Key Words and Phrases: crowdfunding campaign videos; persuasion factors; novice entrepreneurs; interactive assistive tool; guided planning module

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1 INTRODUCTION

Crowdfunding platforms, such as Kickstarter and Indiegogo, have gained popularity among new entrepreneurs by providing the opportunity to collect funding from millions of common people with almost no initial investment. These web platforms allow entrepreneurs to present their ideas using project descriptions, pictures, and videos. Naturally, video plays an essential role in crowdfunding campaigns, particularly for its storytelling power [9, 28].

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While a video is crucial in convincing people to donate for crowdfunding campaigns, creating an appealing video is a challenging task for novice entrepreneurs [20]. Making a professional video involves several elements such as storyline, script, camera movements, editing, post-production editing, and so on. Most importantly, there are many audience persuasion factors, which are critical to optimize when making a campaign video persuasive to the audience. These factors are challenging to apply in videos without professional training in advertising and marketing. Unfortunately, novice entrepreneurs – while experts on their products – often do not even know what factors make a video generally persuasive, much less, what factors would make a video most persuasive for their specific audience.

Past research identified many of these persuasion factors that can make campaign videos appealing to the audience [13]. Although these findings are valuable to researchers and advertising professionals, they do not help inexperienced entrepreneurs to effectively optimize their videos. The impact of these factors depends on campaign type, and often, their impacts are not intuitive. For instance, a complex representation of a fashion product is interpreted as evidence of fine craftsmanship by the general audience. Conversely, a video showing the complexity of a technology product, does not work favorably for the campaign. In this case, the audience assumes the product is difficult to use and it negatively impacts their overall impression of the campaign [13]. Without any true guidance or examples of best practices, the implication of such persuasion factors are hard for novice entrepreneurs to understand.

Traditionally companies consult advertising agencies for creating persuasive product videos. However, the majority of the entrepreneurs on crowdfunding platforms are beginners and cannot afford such resources due to a limited budget. As an alternative, novice entrepreneurs attempt to learn using past campaign videos as examples, seek suggestions from peers and family members [20], and look for tips and strategies on the web [6, 37]. Many entrepreneurs depend on free counseling from film experts to compensate for their lack of experience in making videos [20]. Since Kickstarter does not allow creators to search through failed campaigns, novice entrepreneurs even go through third-party tools and blogs to compare and contrast ideas of their campaign videos. Unfortunately, this process can take three to six months of extensive work [20] and can still result in ineffective campaign videos.

The goal of this paper is to understand whether and how we can develop assistive tools to help novice entrepreneurs learn how to apply persuasion factors to make effective campaign videos for their target donor audience. To this end, we focused on two main hypotheses based on the literature from HCI, and cognitive and learning science. First, given that novice entrepreneurs have difficulty predicting how combinations of persuasion factors will impact the success of their campaigns, we hypothesize that a tool that assists them in exploring effects of these factors on campaign outcomes through a process of structured interactivity will help them to a) learn the impact of these factors and, b) apply them in making their own videos more persuasive. Second, given that people learn new concepts better by thinking deeply about the concept and by generating materials by themselves, we hypothesize that a tool that guides novice entrepreneurs, in a step-by-step manner, to actively think about the critical aspects of persuasive campaign videos and to generate the planning materials of their videos by themselves will result in more appealing and creative plans for their videos.

In this paper, we developed a functional prototype of VidLyz, an assistive web-based tool which consists of the following two modules: an interactive interface module that helps novice entrepreneurs learn the nuances of persuasion factors and enables them to make a comprehensive plan for their campaign video with the help of positive and negative example videos, interpretable explanations and measurement scales of persuasion factors, crowd-sourced feedback, and prediction models towards the success of the campaign (H1). From our second hypothesis, we designed another

module, called the *guided planning module*, that guides novice entrepreneurs to actively think of the campaign video from the perspective of their own target audience and specific product category (H2).

To evaluate the effectiveness of the VidLyz tool, we conducted an in-lab user study with 45 participants and interviewed five previous campaign creators with different backgrounds and experiences. The primary objective of our evaluation was the following: 1) whether VidLyz can assist in learning of the implication of persuasion factors and 2) whether this learning can help them make better plans for their campaign videos. To this end, we created two different versions of our VidLyz tool: 1) a non-interactive version (a simple version without any interactive properties or guided active thinking) and 2) a comprehensive version (highlighting the interactive features and incorporating the guided planning module). We also recruited participants in the control group, which included no tool but a list of example campaign videos categorized based on the final outcome (success/failure) of their corresponding campaigns.

We randomly assigned each version of the VidLyz tool to 15 different participants and asked them to explore the tool to understand how persuasion factors can impact the effectiveness of campaign videos for prospective donors. In the end, all participants had to make their own plans for a campaign video of their pre-assigned product using a storyboard (a pre-production planning tool widely used by advertising agencies and film makers to make low-fidelity, easily customizable plans for videos).

Results show that the comprehensive version of the VidLyz tool helped novice users gain a deeper understanding of the relative importance of the persuasion factors. The combination of the interactive interface and the guided planning module helped participants create coherent and persuasive storyboards for their proposed campaign videos. Overall, their storyboards were suitable for their target audience, which is a key element for an effective campaign video. A follow-up user study showed that crowd workers found the storyboards of the comprehensive group to be persuasive. Finally, semi-structured interviews with participants and five prior and one future campaign owners informed us of the aspects of the VidLyz tool that can be improved in the future to better assist novice entrepreneurs in making their campaign videos persuasive.

2 RELATED WORK

2.1 Persuasion Theories and its application in Television Advertisements

With the innovation of online videos, social media, interactive systems, and others, designers often try to make their product persuasive to the audience. A persuasive system or media can have a wide range of effect on the audience. On one side, it can change people's behavior, whereas on the other side, it can convince consumers to buy a product. In spite of their wide range of effects, designers cannot successfully build persuasive systems that can change people's behavior. Prior work proposed a model to explain the conditions that can nudge users to make necessary changes in their behavior in order to adopt a new system: 1) when they have sufficient motivation, 2) when they have the ability to adopt a new system, and finally, 3) when they receive an effective trigger from the system [16]. This model is known as Fogg Behavior Model (FBM). Oinas-Kukkonen et al. [30] adopted this model and explained how this conceptual model can be interpreted through design principles and therefore, can be used to implement functionality for persuasive systems. One domain where theories such as FBM is applied heavily to design persuasive systems is advertising.

Like campaign videos, television advertisements are created to persuade target buyers to purchase a particular product or service. To make a persuasive advertisement, it is important to understand what factors make an advertisement persuasive. However, measuring the effectiveness of advertisements has many challenges [42]. There are various user-specific and context-specific factors, such

as the viewers' prior experience, product availability, buying capacity, and brand popularity, that can potentially impact viewers' reactions to an advertisement [42]. However, despite all of these external factors, prior studies have found that some factors can predict the audience's attitude towards the advertisement with high precision. For example, the higher production quality of video advertisements [38] and higher involvement[32] with the advertisement are considered effective predictors of the viewers' positive attitudes towards the advertisement.

To create a comprehensive list of factors for measuring the effectiveness of advertisements, initially, Lucas et al. [23] and later Wells et al. [44] took some early initiative and came up with a set of factors applied both in academia and in industry research to measure advertising effectiveness. Dey et al. [13] showed that some of these factors could be reliably used to analyze campaign videos to predict the success of crowdfunding campaigns. This work motivated us to use these factors to develop VidLyz for novice entrepreneurs to apply directly to make plans for their campaign videos.

2.2 Video Content Analysis

Hanjalic et al. [18] found that video content can be analyzed on two basic levels: 1) cognitive and 2) affective. The cognitive level aims at extracting information that describes the "facts", e.g., the structure of the story or the composition of a scene. On the other hand, the affective level can be defined as the amount and type of affect (feeling or emotion) present in a video and expected to arise in users while watching the video. In crowdfunding, novice entrepreneurs often explore videos from successful campaigns based on the affective level to understand what factors make them appealing to the audience. However, this task is hard without any guidance or prior training and can be biased by including only the perspective of the individual entrepreneur (versus perception of the "crowd"). To explore the affective level of campaign videos, Dey et al. [13] utilized the opinion of crowd workers. We followed the same approach and collected crowd-sourced ratings and feedback on past campaign videos to build the prototype of the VidLyz tool.

2.3 Predicting the Success of Crowdfunding Campaigns

A large number of research studies have identified predictors of success in crowdfunding campaigns. Researchers [14, 17, 28, 34, 46] have shown that campaigns' success can be predicted with high accuracy (around 74%) through a set of campaign elements such as project goals, types of rewards, the amount of money donated across time, the size of the campaign owner's social network, and project updates. The length, reliability, and use of certain phrases in the text description of a campaign [17, 27] can also impact its final outcome. In this paper, we built VidLyz by focusing only on the factors extracted from campaign videos which were found to be a strong predictor to the success of the campaigns [13]. Examples of these video persuasion factors are: relevance, complexity, involvement, purchase intent, perception of duration, audio/video quality, and attitude towards the video. Although, all seven factors were extracted from responses to existing campaign videos, the first four of these factors were related to the products shown in those campaign videos whereas the last three factors were related to the quality and impact of the video itself. VidLyz helps users to relate all these factors to past campaign video examples with the help of crowd-sourced ratings and feedback.

2.4 The Effect of interactive tools in engagement and learning

Interactive tools and videos are considered as effective elements for learning and exploration in many contexts. Prior research found that interactive tools can increase engagement of the students in classroom environments [3] and independent learning [47]. Acknowledging the importance of interaction in learning and exploration, Google launched Oppia [10], an education tool, that allows

anyone to create interactive activities for teaching. Adly et al. [1] found that interactive simulation-based teaching tool can significantly improve student's engagement in the learning process and can help them better understand the abstract concepts. We took inspiration from the previous literature and designed the interactive interface module of the VidLyz tool. Our goal is to design the interactive representation of the persuasion factors accompanying crowd-sourced ratings and feedback in such a way so that it can provide necessary guidance to novice entrepreneurs which, in effect, should assist them in applying these factors in making their own effective campaign videos.

2.5 Impact of the Generation Effect

In cognitive science, researchers found that when learners were asked to generate study materials rather than only reading them, they achieved better retention and generalization of learning. This phenomenon is called the generation effect. One explanation of the generation effect was the lexical activation hypothesis which claims that when engaged in self-generation, the person will need to activate and associate relevant semantic knowledge, which strengthens connections between the new information and existing knowledge. As a result, self-generation often leads to better understanding and retention of information [29, 36]. Cognitive scientists [2] utilized the generation effect to design computer-based cognitive tutors that can encourage students to do self-explanation in a classroom setting. Self-explanation stimulated generation effect which helped students achieve better understanding and better transfer of learning. To encourage novice entrepreneurs to learn more about persuasive campaign videos through lexical activation, we designed the guided planning module. We believe this module will allow users to think actively about their product on their own instead of going through videos made for other products.

2.6 Storyboards and their importance in planning videos

The success of a video largely depends on the pre-production planning. Video shooting and post-production editing are expensive and time-consuming, so producers prefer to utilize storyboards as their pre-production planning tool. A storyboard is a visual representation of the video that illuminates and augments the script narrative [19]. It is a sequence of simple hand-drawn sketches and annotations scribbled in the margins that shows the narrative flow of the video, scene by scene.

A storyboard works like a map for the video production team [8]. It allows people to share their ideas at a very early stage with minimum expense. Since novice entrepreneurs face a lot of challenges in planning for their campaign video, we believe a detailed planning tool such as storyboard will allow them to prepare an elaborate pre-plan for their videos. We also hypothesize that this will enable them to go through the actual production phase of the video much faster, which consumes the majority of their campaign video budget.

Our motivation and the related literature above led us to introduce two research questions that guide the remainder of this paper:

RQ1: Can VidLyz assist novice entrepreneurs in learning about the significance of persuasion factors in making effective campaign videos from example videos, crowd-sourced feedback, and interpretable explanations?

RQ2: Can this learning assist them in making a well-structured plan for their persuasive campaign videos?

3 INFORMING THE DESIGN

One critical issue in helping novice users make a persuasive campaign video is to identify what possible challenges campaign video novices may face in making a persuasive video. To address this issue, we interviewed 15 novice participants (9 female). 10 of them made some form of promotional

videos either for their course projects or for their college fairs in the past. However, none of them had made any campaign video on their own or helped someone else to make a campaign video in the past. So, in terms of experience in making campaign videos, these participants were comparable to novice entrepreneurs who have no prior experience in making a campaign video. To understand how well they could interpret the known persuasion factors in campaign videos, we presented them the list of product and video related factors found by Dey et al. [13]. We also explained how those factors were used to design a logistic regression model in predicting the success of a campaign.

Next, we asked them to think of an imaginary scenario where they have created a new product and wanted to launch a crowdfunding campaign for their product. Before launching the campaign, they would need to make their own campaign video without hiring a professional agency due to limited funds. In the context of this imaginary scenario, we asked them the following questions:

(1) What are the challenges you may face in the process of making a persuasive campaign video?
(2) Whether and how can the factors explained by Dey et al. [13] be useful for you to make your video persuasive?

The interviews were semi-structured. We asked each participant the basic questions mentioned above as well as some follow-up questions based on their responses. Here, we summarized our findings from the interviews:

First, participants described their challenges in four stages: 1) initial planning, 2) building a coherent storyline, 3) shooting the video, and 4) editing and post-processing the video. Since the challenges involved in the last two stages are out of the scope of this work, we focused on the challenges identified by our participants in the first two stages.

Eleven participants emphasized the importance of having a planning tool for novice campaign creators. As one participant mentioned:

> *When I had to make a video to promote the science fair in my college, I had no idea how to do that. Should I ask friends for suggestions or should I go to the internet to look for some ideas? It was so overwhelming for me that I did not even want to start working on it.*[I4]

Next, we found that our participants (N = 9) struggled to make a coherent storyline for their videos. Participants described that when they had to make a video, they were unable to decide which elements would make their videos persuasive to the target audience. Finally, they found it challenging to come up with a storyline that would convey their messages clearly to the audience.

In response to our second question, all participants felt that the product and video related factors we presented to them would be useful for new entrepreneurs. However, when they were asked to reflect on how those findings would be useful for making their own videos persuasive, participants found most of the factors ambiguous. They explained that just from seeing the names of those factors, they were not sure how researchers measured those factors for the actual campaign videos.

From the responses, we identified four assistive elements that would be desired by novice users for planning a persuasive campaign video. First, example campaign videos that would allow novice users to understand how they could apply persuasion factors in their own videos. Second, criteria for all the product and video related factors that were used by crowd workers to rate the existing campaign videos. Third, a tool that could allow novice users a way to explore how each factor contributes to making the video persuasive to the audience. As I5 mentioned:

> *Ideally, I would like to take into account everything that makes a video appealing to the audience, but in reality, it is hard to accommodate everything in a fixed time and with a limited budget. I need to know what factors are essential and how much they would affect the overall quality of my video.*[I5]

Finally, our participants wanted a structured way to plan for a video that would eliminate the initial confusion and unorganized way of thinking about the video.

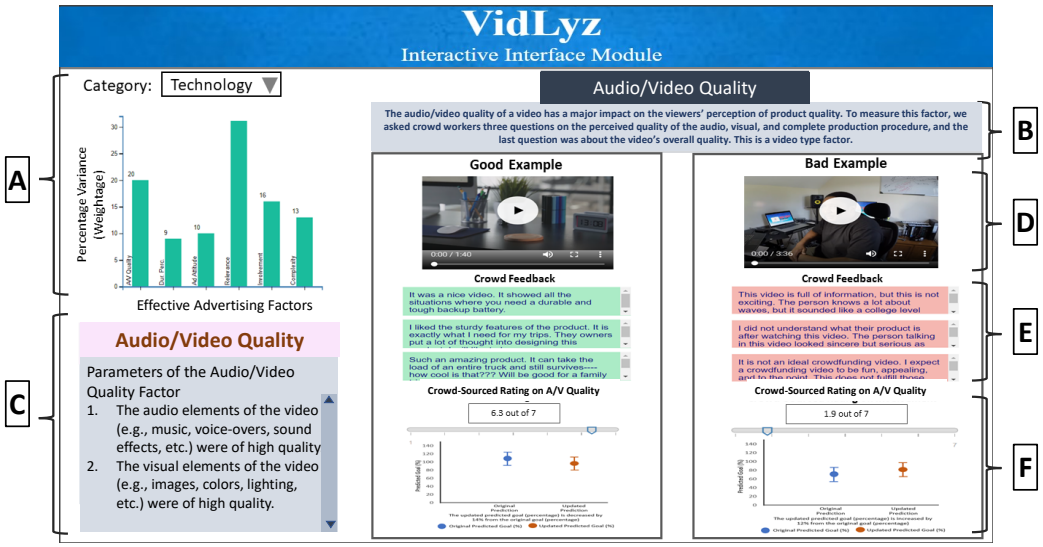

Fig. 1. The interactive interface module of the VidLyz tool (comprehensive version). The bar chart (A) on the top-left side shows the percentage variances of all the persuasion factors (Audio/Video Quality, Duration Perception, Attitude to the Ad, Relevance, Involvement, and Complexity) for a specific product category. On the right side, VidLyz presents one good and another bad example videos (D) along with crowd-sourced feedback (E) and prediction model (F) for each persuasion factor separately.

Based on the findings from our interviews, we designed and implemented the VidLyz tool consisting of 1) a novel web interface that can assist novice users in understanding how product and video related factors impact the overall quality of campaign videos (fulfilling the requirements of the first three assistive elements) and 2) a guided planning module that can guide novice users to think actively about their campaign videos like an advertising agency professional (fulfilling the requirement of the last assistive element).

4 DESIGN

To meet the requirements identified from our interview study, we designed the interactive interface and the guided planning module as part of the functional prototype of the VidLyz tool. In this section, we explained the design of these two components.

4.1 Design of the Interactive Interface Module

The main purpose of an interactive interface module was to explain the implication of persuasion factors in the context of campaign videos through explanations, scales, and crowd-sourced feedback. Our goal was to present the perception about existing campaign videos of those people who could represent the potential donors of crowdfunding campaigns. Here, we explained all the steps that we followed to design this module.

4.1.1 Subjective Rating Collection. We considered two campaign categories to design this module: 1) fashion and 2) technology, since campaign videos in these two categories were found to be significantly different from each other [13]. We collected a list of 9,810 publicly available URLs of fashion and technology campaigns launched between April 2014 and February 2015 on Kickstarter.

We randomly chose 70 campaigns (35 successful and 35 failed) from each category and collected their corresponding campaign videos. In total, we selected 140 videos for our study.

Since we were interested in people's subjective assessment of campaign videos to inform the design of our interactive interface, we recruited MTurk workers to rate our videos. Prior work has shown that MTurk workers can perform complex, skill-intensive, and subjective rating tasks [4, 7, 24, 45, 46]. Since participants' natural interest for a certain product category might influence their feedback, each MTurk worker was asked for their preference between the fashion and technology category on Kickstarter. Based on their preference, they were asked to watch a randomly assigned campaign video of their preferred category from our collection.

Once they finished watching the video, we asked workers to rate it based on the following six effective advertising factors, which were found to be persuasive for crowdfunding campaign videos: 1) relevance, 2) complexity, 3) involvement, 4) perception of video duration, 5) audio/video quality, and 6) attitude toward the video [13, 25, 38, 39, 48]. We did not consider "purchase intent" because it was found to be closely correlated with the "relevance" factor in the previous work [13]. We collected ratings from 15 different MTurk workers for each video. In total, 2100 MTurk workers participated in our study. We paid 33 cents for each completed task. 36% of our participants had donated to at least one reward-based crowdfunding campaign (such as Kickstarter campaigns) in the past and the majority (>89%) of our participants were familiar with crowdfunding platforms.

To make sure that the MTurk workers watched their assigned campaign video till the end, we closely followed the strategy previously used by Dey et al. [13]. We removed all the controls of the video player (pause, forward, backward, stop, play). We also embedded two single-digit numbers in each video. Before presenting the campaign video, we informed our participants that they would find two numbers in the middle of the video that they would have to report in the end. At the end of the video, we asked MTurk workers to report those numbers and discarded the survey responses of those MTurk workers who failed to report those numbers. We rejected responses of 114 participants for this reason. We also conducted three rounds of pilot studies to estimate the average time required to complete our task. On average, participants took 16.45 minutes to complete our task during the pilot study. Since all videos were more than three minutes long, we discarded the responses of those participants (N = 7) who took less than five minutes to complete the study. We also conducted an attention check in our survey where we asked participants to not answer one specific question. We discarded the responses of participants who failed the attention check (N = 15). In total, we discarded 6.5% responses through these validity checks.

4.1.2 Interface Design. We used subjective ratings of the campaign videos to design the interface module. We conducted three rounds of preliminary pilot studies with eight participants and revised the design of our interface module based on the participants' feedback. None of these eight participants had any prior experience in making promotional campaign videos. All these participants were at least high school graduates so they should have basic knowledge of how to follow step-by-step instructions and structured workflow. We believe that the majority of the novice entrepreneurs will also have that experience since launching a crowdfunding campaign in an online platform such as Kickstarter will also require them to follow a structured workflow. To explain the design of our interface module, let us consider a hypothetical scenario where Alice, a novice user, needs to make a persuasive campaign video for her product. Her primary goal is to make a coherent storyline for her video. Here we explain the functionality of the interactive interface module that is designed to help Alice to meet her goal. The interface module has six coordinated sections (shown in Fig 1 with labels A-F). They are explained here:

Category specific percentage variance graph (Section A). First, the user needs to choose the category that best matches her product from the drop-down box at the top left corner (section A in Fig 1) of

our interface module. In our prototype, we included two categories: technology and fashion. Imagine that Alice chooses the technology category. She will find a bar chart highlighting the percentage variances of all the effective advertising factors for the technology category. We performed a factor analysis on the crowd-sourced subjective ratings to calculate the percentage variances.

Since the primary objective of this interface is to make users better understand and be sensitive to the significance of the persuasive advertising factors, we made this bar chart interactive so that users can click on any specific bar on the chart and be presented with five additional pieces of information regarding the corresponding factor in section B, C, D, E, and F. We explain these sections below.

Interpretable explanation and scale of persuasive advertising factors (Sections B and C). Imagine that Alice has chosen the bar corresponding the factor "Audio/Video Quality" in the technology category. Section B briefly explains the meaning of the "Audio/Video Quality" factor in the context of campaign videos using layman's term. We composed these explanations in such a way so that anyone without any prior experience in advertising can understand them without any external assistance. Next, section C shows the survey questions used in the MTurk study to rate a video on the "Audio/Video Quality" factor. These questions increase the transparency of the scale used for each factor to Alice.

Example videos (Section D). Section D presents two example campaign videos on "Audio/Video Quality" chosen from the technology category. On the left side, there is an example video that was rated very high on the "Audio/Video Quality" factor by MTurk workers. The video on the right-hand side was rated very low on this factor. Prior work [22, 33, 35] found that people learning new concepts and procedural tasks perform better with examples. We used contrasting examples to emphasize how a specific persuasion factor can either positively or negatively a campaign video.

Explanatory comments on example videos (Section E). On the left side of section E, our interface module presents three comments made by MTurk workers about the example video shown on the left side of section D regarding "Audio/Video Quality". These comments highlight the positive aspects of the video on "Audio/Video Quality" observed by MTurkers in this video. Similarly, on the right side of section E, we show three negative comments about the example video shown on the right side of section D regarding "Audio/Video Quality". The purpose of these comments is to explain to creators how these videos were perceived from the perspective of the audience, which may provide a better understanding of these factors to novice video creators.

Prediction of the Goal Amount (Section F). Finally, on the left side of section F, we show the rating of the video shown on the left side of the section D. This section also presents a slider which is by default set to the rating of the same video on the "Audio/Video Quality". The graph below the slider shows the predicted goal amount (in percentage) for the corresponding campaign based on a multiple linear regression model. We built the multiple linear regression model on the subjective ratings provided by the MTurkers on effective persuasion factors where the dependent variable was the percentage of the campaign goal amount. Alice can change the rating shown in the slider and our backend engine will then predict the updated percentage of the goal amount of the corresponding campaign, keeping the ratings of all other factors constant but only changing the rating for "Audio/Video Quality". On the right side of section F, we implemented the same prediction model as we did on the left side, but for the other example video shown on the right side of section D.

4.2 Design of the Guided Planning Module

Previous work has found that for effective learning, theoretical learning of skills alone is not sufficient. Learners need to have opportunities to apply that skill too in order to actively making sense of learning [11]. In order to complement this learning process, we aimed to design a guided planning module that helps novice entrepreneurs think about and apply their learned knowledge for preparing their own campaign videos.

Since there is no well-defined way about how a planning module can encourage novice entrepreneurs to think actively about their campaign videos, we studied the procedure conventionally followed by professional advertising agencies for the same task. We aimed to design a step-by-step guided planning module that would motivate novice users to think like a professional doing pre-production planning for the video. Advertising agencies usually follow a structured workflow to produce an ad for a client, from understanding the requirements of the client until making a video advertisement. In a recent book [21], Kocek explained this process from the perspective of an account planner. An account planner identifies the needs of the consumer and then decides how an ad can motivate that consumer. A systematic and structured step-by-step workflow is also effective outside the advertising domain. Vaish et al. [43] showed that a structured workflow could even enable a crowd-sourced team to produce collaborative videos for scientific papers.

From the workflow of an account planner, we identified six questions for our planning module that we believe will help novice users make comprehensive plans for their persuasive videos. We also considered one additional question for our planning module about the "reasons for donation" as it was found important for campaign videos in previous work [13]. In total, we have included seven questions in our planning module. We hypothesized that to gain the benefit of guided active planning, novice entrepreneurs need to follow the steps of the guided planning module and need to thoroughly think about responses from the perspective of their target audience and the product. The process of writing down these answers will provide the benefit of a generation effect which will enable them to think of their responses more critically and later will help them create a more coherent and consistent storyline for their campaign videos. Thus, we call this the "guided planning module". Here we briefly explain the seven questions of the guided planning module.

4.2.1 Benefits and Utility of the product. The main purpose of a promotional campaign video is to positively present the product to the target audience. In advertising agencies, account planners discuss iteratively with their audience and clients to identify all the uses and benefits of the product. In our planning module, we included this question because we believe this will prompt novice entrepreneurs to think creatively about the benefits of using their product and list all of the possible benefits and utilities of their product that are worth highlighting in their campaign video.

4.2.2 Unique characteristics of the product. A promotional ad usually focuses on the specific characteristics of the product that makes the product unique among other products in the market (unique selling proposition). We included this item because this could help novice entrepreneurs think about what is unique about their product compared to existing products.

4.2.3 Hidden insight of the product. In advertising agencies, account planners start the process of creating a campaign by writing a creative brief. The creative brief sets up the goal of the advertisement so that it can be followed by the creative team when making an ad. One important element of a creative brief is finding the hidden insight of the product. Hidden insight focuses on benefits or uses of the product that people may not be obvious, but account planners think that if highlighted, would make the product more desirable to the audience. We included this element to help novice inventors think outside of the box.

4.2.4 Main takeaway of the campaign. Both print and video ads strive to have a takeaway message in their content that they expect their audience to remember for a longer duration. For traditional product advertisements, this is regarded as an important factor because of the time gap between the viewing of an ad and customers buying the product (e.g., buying a car or milk). In crowdfunding, although the audience can donate immediately after watching the campaign video, a memorable takeaway may motivate viewers to spread the word about the campaign more actively through social media and other forums.

4.2.5 A tagline for the product. In advertising, a tagline is used to make a product memorable for the audience. This is also used to create a product identity which can make the product seem unique among other similar products. For example, Coca-Cola used the tagline, "Taste the Feeling" in an attempt to make their product easily relatable to everyday feelings such as "the first date" [37]. Although coming up with an effective tagline takes a long time even for professionals, we included it in our module so that novice entrepreneurs can think about the main theme of their video and plan everything around that theme.

4.2.6 Target consumers of the product. Usually, advertising agencies perform a series of segmentation studies to identify potential target customers of a product before making an ad. These studies help agencies understand the lifestyle, demographics, daily routines, and habits of target customers to inform the mood and theme of the ad. In our planning module, we included this aspect because it could motivate novice entrepreneurs to think about the campaign video from the perspective of the target audience (donors and consumers), rather than just from the perspective of themselves – the campaign creators.

4.2.7 Reasons for donation. In most of the successful campaign videos on Kickstarter, we found that inventors explain explicitly why they need donation from the crowd. Dey et al. [13] also found that when inventors did not explain this aspect in their video explicitly, crowd workers often raised suspicion about why they needed donations for the product. We included this prompt in our module to remind novice entrepreneurs to include the explanation of how the donated amount will be spent in their campaign video.

5 EVALUATION

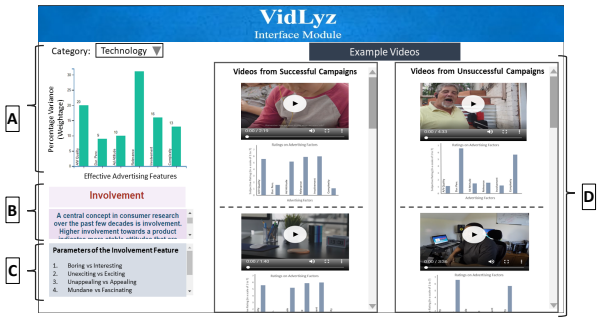

Fig. 2. The non-interactive version of the interface module of the VidLyz tool

Since designing an assistive tool to help novice entrepreneurs make persuasive videos is still a new direction of research, in our evaluation, we aimed to gauge the usefulness of the interactive interface and the guided planning module and to gain insights about how we can improve the VidLyz tool in the future. To evaluate the usefulness and effectiveness of VidLyz, we conducted a

user study by recruiting participants and randomly assigning them to a group: 1) control group, 2) non-interactive group, or 3) comprehensive group.

The control group was created to validate the assumption that a novice video creator would face difficulty in planning a persuasive campaign video without external assistance. Participants in this group did not have access to any module or tool; however, we just provided them access to a list of past videos categorized in technology and fashion categories because past research showed that novice creators typically search out past examples when making a video on their own. In each category, the example videos were further categorized as successful or unsuccessful. We asked them to come up with a plan for a persuasive campaign video for a pre-assigned product.

Participants in the non-interactive group used a non-interactive version 2 of the VidLyz tool. We aimed to design the non-interactive version in a way so that participants could passively access the example campaign videos with minimum interaction just as they would do during a regular web search. For the two product categories, we showed the percentage variance of the effective persuasion factors using a bar chart in the non-interactive version as we did in the comprehensive version. However, when participants clicked on each bar in this version, we only showed them a brief definition of the factor and the list of questions used in the MTurk survey to rate a video for that corresponding factor. Instead of contrasting video examples used in the comprehensive version, we presented 12 example videos at the same time, categorized based on the product categories (technology or fashion) and the final outcome of their corresponding campaigns (successful and unsuccessful). Six of these videos were collected from successful campaigns, and the other six videos were collected from unsuccessful campaigns. We also presented MTurkers ratings of each video across the persuasion factors. However, the example videos were not individually explained with crowd-sourced feedback and interactive prediction model which, we hypothesized, would be essential to understand the impact of the factors in making effective campaign videos.

Finally, participants in the comprehensive group used a complete version of the VidLyz tool. We hypothesized that participants in the comprehensive group would be able to learn the significance of persuasion factors most effectively (vs. the control group and the non-interactive group). We also hypothesized that this learning would allow the participants in the comprehensive group to come up with more persuasive plans for a campaign video compared to the participants in the control group and the non-interactive group.

5.1 Participants

We attempted to hire novice entrepreneurs for our user study from a Midwestern university town in the United States by posting flyers in restaurants, cafes, and public libraries and by sending invitation emails to campus-wide mailing lists for faculty, university staff, and student communities. Despite multiple attempts, we did not receive any response and finally decided to recruit participants who were not current novice entrepreneurs but were interested in crowdfunding and were not experienced with making professional videos since the most important element we were interested in was how our system could assist novice videomakers. We recruited 45 participants for our user study. None of these participants were experts in making professional promotional videos, and no one had any prior experience in making campaign videos (novice campaign video creators). However, 13 of these participants had made some kind of video in the past. These 13 were equally distributed between groups: five of these participants were assigned to the control group, four were assigned to the non-interactive group, and the remaining four participants were assigned to the comprehensive group. Participants' average age was 26.81 (SD=6.76), and 53% were females. 83% of participants were familiar with crowdfunding platforms, such as Kickstarter and Indiegogo, and 28.42% had donated to at least one crowdfunding campaign prior to participating in the study. On

Fig. 3. (a) Magnetic levitation floating holder, (b) Men's shoes, and (c) Women's shoes.

average, each participant took one hour 15 minutes to complete the study and received $10/hour for their participation.

5.2 Procedure

For our user study, we randomly assigned each participant in one of the three user groups. We asked all participants to imagine the scenario that we used in our design informing interview. We then presented two products to each participant: 1) a magnetic levitation floating holder (a technology product, shown in Fig 3a) and 2) a pair of men's or women's shoes (a fashion product, shown in Fig 3b and Fig 3c). We asked each participant to choose one product that they would like to make a promotional campaign video for. Other than the simple description of these products, we did not mention any other information about these products to our participants. Rather, we asked them to imagine that they themselves were the inventors of their chosen products so that they would have the freedom to decide how they wanted to make a campaign video for their product.

Each participant first completed an introductory survey where we asked them about their familiarity with Kickstarter and whether they had donated for a campaign before or not. This information helped the experimenter know how to introduce the interactive interface module to the participants. Next, our experimenter took around 10 minutes to explain the motivation of the study and the expectation of designing a storyboard at the end of the experiment. The experimenter also explained how the interface module (either the comprehensive version or non-interactive version) was designed and the functionality of each section of the module. Since participants in the control group did not have access to any tool, the experimenter spent this time to explain the list of example videos that they had access to. The experimenter also showed the findings of Dey et al. [13] and explained briefly the importance of persuasion factors in making a campaign video effective. Next, all participants explored their resources – either example videos (control) or their assigned version of the VidLyz tool – on their own. Once they finished exploring their resources, they completed a Persuasion factor survey to explain the persuasion factors in their own words.

Next, the experimenter asked participants using the comprehensive version to answer the questions of the guided planning module from the perspective of their target audience and of the product that they had chosen at the beginning of the experiment. For participants in the control group and the non-interactive group, the procedure was the same except the experimenter asked them to think about the answers to those questions rather than writing them down. We hypothesized that by not writing down the answers of the questions of the guided planning module, participants in the control group and the non-interactive group would not generate in-depth responses step-by-step from the perspective of their product and their target audience. Glancing over these questions without writing answers would be equivalent of simply reading about the importance of these steps in effective campaign videos on a website; while it provides information, it would not allow them to gain the benefit of the generation effect. Thus, those that simply read

about considerations would find the ultimate storyboard task to be more challenging than would participants in the comprehensive group.

Finally, the experimenter asked all participants to draw a storyboard for a campaign video for their assigned product. Our experimenter briefly explained the main concept of a storyboard to each participant. Each participant answered the following two questions before drawing the storyboard: 1) the main problem that they wanted to solve with their assigned product, and 2) their target audience. Later, we used the answers to these questions to evaluate the quality of the storyboards drawn by our participants. Once they finished drawing the storyboard, we conducted a short semi-structured interview (10 min) to understand their overall experience about using the VidLyz tool and to ask for suggestions on how to improve our tool in future. In the end, each participant completed a demographic survey.

To understand whether VidLyz can assist novice creators to learn and apply persuasion factors in making a more effective campaign video (RQ1), we analyzed the responses from the "Persuasion factor survey". We also had two media production experts (blinded to condition) evaluate the quality of the storyboards to understand whether learning of the significance of the persuasion factors can help novice entrepreneurs to make a well-structured plan for their persuasive campaign video (RQ2). In the process of answering RQ2, to include potential audience responses, we also recruited participants from MTurk to evaluate the persuasiveness of the storyboards. Additionally, we analyzed the interviews with our participants to understand the scope of improvement of the VidLyz tool. Finally, we interviewed five entrepreneurs who had prior experience creating campaign videos for their own campaign launches on Kickstarter. The goal of these interviews was to receive feedback on VidLyz from people who themselves had faced the challenges of making a persuasive campaign video as a novice.

6 RESULTS

To answer RQ1, we analyzed the responses of our participants in the "Persuasion factor survey". We hypothesized that VidLyz would assist participants to better understand the significance of persuasion factors in the context of crowdfunding campaign videos which, in effect, would inspire them to consider those factors in making their storyboards more persuasive for the target audience. To answer RQ2, media production experts first evaluated the persuasiveness of their storyboards. We also evaluated the storyboards with crowd workers to understand the potential effectiveness of these storyboards in seeking crowdfunding. Here, we hypothesized that VidLyz would assist our participants to come up with more persuasive pre-production plans for their campaign videos. Finally, we interviewed previous and future campaign creators to explore how VidLyz can be improved in the future to better assist novice campaign creators in making persuasive plans for their campaign videos.

6.1 Evaluation of the responses of persuasion factor survey (RQ1)

To analyze the free-form responses of our participants, we performed iterative open-ended coding [40, 41], followed by thematic analysis [12, 26, 31]. Thematic analysis is an inductive analytical technique that consists of exploring the data to identify and classify recurring patterns. The lead author of the paper cooperated with the primary analyst in a review of the raw analysis to look for complexities, organize and refine the themes, and corroborate the findings. Four major themes emerged from the responses: 1) Elaborate description, 2) Implied significance, 3) Contextual insight, and 4) Proposed solution.

6.1.1 Elaborate description. Participants explained the effective advertising factors more elaborately than the brief explanation provided in the VidLyz tool or the research paper [13]. For

example, P3 mentioned factors such as graphical fonts, lighting, background sounds, music choice, and change in tempo could eventually impact the "Audio-Video Quality" of a video.

6.1.2 Implied significance. Participants reflected on the implied significance of the persuasion factors that can impact the overall impression of the donors about the campaign/creator and their intent. As P5 commented:

> *Good audio and video quality of a campaign video implies that the creator of the campaign is serious and cares a lot about the issues being addressed by the product.*[P5]

6.1.3 Contextual insight. Participants emphasized the context of crowdfunding campaigns while they discussed effective advertising factors. They explained how traditional advertising factors could be interpreted differently when the focus was on campaign videos. As P27 mentioned:

> *... Many Kickstarter's are trying to sell a unique brand with a distinct mission. ... When a campaign video omits the owner or the key player, they lose their trustworthiness since it appears that they are unwilling to stick up for their own product.*[P27]

6.1.4 Proposed solution. Participants not only explained the effective advertising factors in the context of crowdfunding but also suggested strategies that could make campaign videos more engaging to the target audience. For example, P7 explained how campaign videos could increase viewers' involvement by establishing a relationship between the product and a well-known social movement.

Next, we asked two independent coders to rate each response from our survey based on these four major themes explained above. Our coders coded each response on a binary scale, i.e., when a response or part of a response matched a theme, it received one point for that theme, if not, it received 0 points. Cohen's kappa test showed a substantial agreement between the two coders (K = 0.84). Therefore, we averaged their scores to perform multinomial logistic regression analysis. We considered each major theme score as an independent variable, and the group ID (condition) of each participant was the dependent variable. Our goal was to understand how accurately we could predict the group ID of a participant based on the ratings on their storyboards across all four themes.

Since we took an average of the ratings of two coders, for each theme the rating value is one of three possible options: low(0), medium(0.5), or high(1). Similarly, our dependent variable also had three categories: 1(control group), 2 (non-interactive group), and 3 (comprehensive group). First, we verified how well our observed dataset corresponded to the regression model. We calculated Pearson goodness-of-fit statistic and found that the model fit our data well ($p = 0.89$) ($p > 0.05$ indicates that the model fits the data). Next, we formed the likelihood ratio test for our independent variables. We found that (Elaborate description ($p = 0.01$), Contextual insight ($p < 0.01$), and Proposed solution ($p = 0.03$)) were each statistically significant but Implied significance ($p = 0.19$) was not. Finally, we observed the parameter estimates of our model to compare our user groups. First, we kept the control group as the reference group and compared the comprehensive group to the control group and the non-interactive group to the control group through parameter estimates. We found that participants in the comprehensive group were rated more highly on Elaborate description (B = 1.21, SE = 0.16 , $p < 0.01$), Contextual insight (B = 0.87, SE = 0.33, $p = 0.01$), and Proposed solution (B = 0.56, SE = 0.21 , $p = 0.03$) than participants in the control group. We also found that participants in the non-interactive group had higher ratings than the control group on Elaborate description (B = 0.91, SE = 0.43, $p = 0.01$) and Proposed solution (B = 0.78, SE = 0.14, $p = 0.03$). Finally, we recalculated the model to compare the relationship between the comprehensive group and the non-interactive group (keeping non-interactive group as the reference group). Participants in the comprehensive group were rated higher on Elaborate description (B = 0.25, SE = 0.11, $p = 0.04$) and

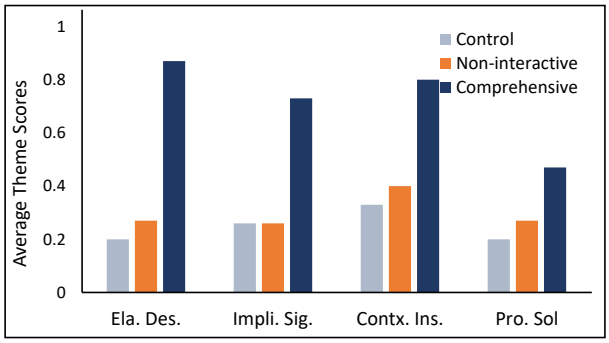

Fig. 4. Average theme scores based on "Persuasion factor survey" for participants in the control group, non-interactive group, and comprehensive group

Proposed solutions (B = 0.29, SE = 0.18, p = 0.04) than participants in the non-interactive group. Our findings were consistent with our initial hypothesis that the interactive interface module and guided planning module assisted novice participants in learning the significance of the persuasion factors in the context of campaign videos.

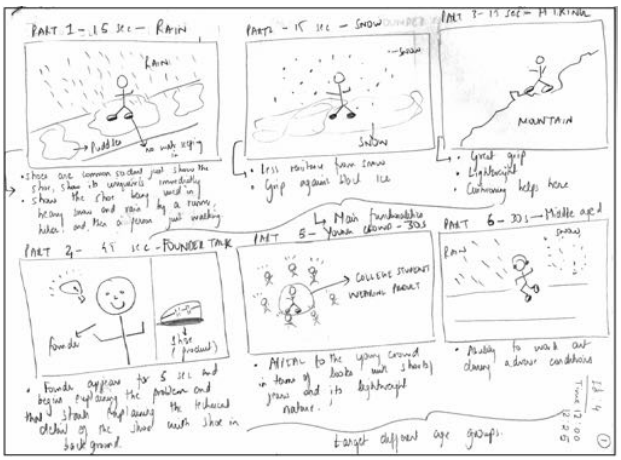

Fig. 5. This storyboard was drawn by participant P8 who used the comprehensive version of VidLyz

6.2 Consideration of persuasion factors in drawing Storyboards (RQ1)

We asked participants whether they considered any engaging advertising factors when they drew their storyboards. If yes, we asked participants to list those factors next to each segment of the storyboard. Our goal was to understand whether participants considering diverse persuasion factors could generate more effective storyboards. We found that participants using the comprehensive version considered 6.07 factors on average (SD=0.82) for each storyboard. In contrast, participants in the control group considered only 3.80 factors on average (SD=1.31) for each storyboard, whereas participants in the non-interactive group considered 4.02 factors on average (SD=1.23) for their storyboards. One-way ANOVA analysis showed that the number of factors considered by participants of each group was statistically significantly different ($F(2, 42) = 17.24$, $p < 0.01$, partial $\eta^2 = 0.45$). Post-hoc Tukey analysis showed that participants of the comprehensive group considered

Table 1. Frequency (in percentage) of the effective advertising factors mentioned in the storyboard segments by participants of the control, non-interactive, and comprehensive group

	Control	Non-interactive	Comprehensive
A/V Quality	61.33%	26.89%	16.66%
Dur. Perc.	5.34%	3.44%	7.69%
Ad Attitude	2.55%	3.86%	21.79%
Relevance	20.33%	17.58%	18.24%
Involvement	3.58%	7.60%	20.23%
Complexity	6.87%	41.03%	15.38%

significantly more persuasion factors to draw their storyboards compared to the participants in the control group ($p = 0.02$) and the participants in the non-interactive group ($p = 0.02$).

Table 1 shows the frequency (in percentage) of each effective advertising factor mentioned by our participants. Participants in the control group considered the A/V quality factor most frequently followed by the relevance factor. Similarly, participants in the non-interactive group considered the A/V quality, relevance, and complexity factors most frequently (frequency at least over 10%). In contrast, participants of the comprehensive version considered almost all factors (except duration perception) when they drew their storyboards. One explanation is that participants in the control group and the non-interactive group did not understand the significance of the persuasion factors in making a campaign video persuasive, especially those factors which were not intuitive to novice users. Due to the lack of the interactive elements incorporated in the comprehensive version, participants in the control group and the non-interactive group considered only those factors which were more intuitive for them to understand (such as A/V Quality). This finding indicates that the interactive property and the guidance of the VidLyz tool were useful for novice participants to understand the significance of persuasion factors in the context of campaign videos.

6.3 Evaluation of the Storyboard (RQ2)

To answer RQ2, we analyzed the storyboards created by our participants. All participant drew storyboards to make the pre-production plan of their campaign videos for their corresponding product (either a levitation holder or a pair of shoes). Fig 5 shows a screen-shot of the storyboard drawn by P8 for a pair of shoes. On average, participants in the control group spent 43.07 (SD = 8.23) minutes to draw their storyboards, whereas participants in the non-interactive group spent 35.45 (SD = 5.03) minutes to complete their storyboards. Finally, participants using the comprehensive version spent 28.12 (SD = 3.76) minutes on average. One way ANOVA test showed that the time difference was statistically significant ($F(2,42) = 23.07$, $p < 0.01$, partial $\eta^2 = 0.52$). Post-hoc Tukey analysis showed that participants in the comprehensive group took significantly less time than the participants of the non-interactive group ($p = 0.01$) and the control group ($p = 0.01$). Similarly, participants in the non-interactive group took significantly less time than participants in the control group ($p = 0.01$) to draw their storyboards.

Two coders with prior experience in media studies evaluated the storyboards independently based on the following three parameters: 1) whether the storyboard addressed the main problem that the participant wanted to solve with the product (mentioned by each participant), 2) whether the idea presented in the storyboard was appropriate for the target audience (each participant mentioned their target audience in the beginning), and finally, 3) whether the storyboard was creative and appealing. We adopted this evaluation criteria from principles followed by advertising agencies where they use this criterion to evaluate the creative strategy of advertisements [21].

Our coders used a five-point Likert-scale ranging from strongly disagree (1) to strongly agree (5) for each criterion to rate the storyboards. Since there was a substantial agreement between two

Table 2. Average ratings on all three criteria for the storyboards drawn by our participants of control group, non-interactive group, and comprehensive group

	Control M (SD)	Non-interactive M (SD)	Comprehensive M (SD)
Solving Main Problem	2.98 (0.72)	3.42 (0.69)	4.29 (0.48)
Suitable for Target Audience	2.87 (0.71)	3.21 (0.87)	4.34 (0.62)
Creative and Appealing	3.02 (1.17)	3.53 (1.08)	4.47 (0.56)

coders for all three criteria based on Cohen's kappa test (K = 0.82 for the first criteria, K = 0.80 for the second criteria, K = 0.86 for the third criteria), we averaged their scores for each storyboard for all three criteria. Table 2 shows the average scores of the storyboards across all three criteria.

We performed multinomial logistic regression to understand how accurately storyboard ratings of the participants can predict their corresponding assigned group in the user study. For our analysis, we considered three independent variables: Likert scale ratings of the storyboards in three criteria (solves main problem, suitable for target audience, and creative and appealing). Our dependent variable was the participants' assigned group membership (condition). Pearson goodness-of-fit statistic showed that the regression model fitted our dataset well ($p = 0.72$; $p > 0.05$ indicates model fit). We calculated the likelihood ratio to identify statistically significant independent variables. We found that all independent variables were statistically significant (solving main problem ($p = 0.02$), suitable for target audience ($p = 0.02$), and creative and appealing ($p = 0.02$).

Finally, we compared our groups through parameter estimates. We found that participants in the comprehensive group were more likely than participants in the control group to be rated higher on solving the problem ($B = 0.96$, $SE = 0.22$, $p = 0.01$), suitable for target audience ($B = 1.12$, $SE = 0.23$, $p < 0.01$), and creative and appealing ($B = 1.07$, $SE = 0.31$, $p < 0.01$). We also found that participants of the comprehensive group had higher likelihood than participants in the non-interactive group to be rated higher on solving the problem ($B = 0.64$, $SE = 0.19$, $p = 0.02$), suitable for target audience ($B = 0.84$, $SE = 0.33$, $p = 0.01$), and creative and appealing ($B = 0.79$, $SE = 0.21$, $p = 0.01$). Participants in the non-interactive group were statistically similar to participants of the control group in all criteria. These findings supported our hypothesis that the interactive interface and the guided planning module of the comprehensive version of the VidLyz tool helped participants to come up with effective and more persuasive pre-production plans for their campaign videos.

6.4 Evaluation of the storyboards based on guided planning module (RQ2)

To understand how closely participants followed the guided planning module to draw their storyboards, we compared their responses with their corresponding storyboards. Since only the participants in the comprehensive group explicitly wrote down their responses for the questions in the guided planning module ((as we instructed the participants in the control group and the non-interactive group to think about their responses instead of writing them down), we could directly compare only the responses of the participants of the comprehensive group for this evaluation process. To understand the impact of the guided planning module on the participants of the control group and the non-interactive group, we analyzed their responses from the semi-structured interviews. We discussed the insight gained from those responses in section 6.6.

The experimenter did not ask any participants to follow the guidelines provided by the guided planning module to draw their storyboards. Rather, the experimenter mentioned that those guidelines are conventionally followed by professional ad-agencies to make effective TV advertisements. Our goal was to observe how many participants naturally felt the need to follow the guidelines

Table 3. Number of the participants from the comprehensive group who closely followed each guideline from the guided planning module to draw their storyboards

Topics of the Guided Planning Module	Number of Participants (out of 15)
Benefits and Utility	15
Unique Characteristics	12
Hidden Insight	3
Main Takeaway	9
Tagline	5
Target Consumers	10
Reasons for Donation	11

to draw their storyboards. This technique allowed us to observe the natural attitude of the participants toward the guided planning module. Table 3 lists all the seven guidelines of the guided planning module along with the number of participants who followed those guidelines to draw their storyboards. All participants in the comprehensive group reflected on the benefit and utility of their chosen product in their storyboard. This was not surprising to us since the main task of a campaign video is to explain the benefits and utility of the product to the prospective donors. Both "unique characteristics" and "reasons for donation" factors were also addressed by 11 participants. Prior work showed that explaining the reasons for the donation request is an important aspect of a successful campaign video as it justifies the core purpose of launching the crowdfunding campaign to the prospective donors [13].

Only five participants used their taglines in their videos. One possible explanation is that generating an intriguing tagline takes a long time and multiple iterations even for professional copywriters. Since our participants spent a short amount of time to prepare their taglines as part of the guided planning module, most of them naturally did not come up with an interesting tagline, and that may be the reason why they decided to not use that in their storyboards. Since novice entrepreneurs will most likely have more time to reflect on their taglines, we believe they will be more encouraged to use this element in their videos. Another topic of the guided planning module which was used sparingly by participants was the "hidden insight". Participants in our user study found it hard to differentiate between the "unique characteristics" and the "hidden insight" of a product. Ad-agencies find the "hidden insight" of a brand or product by rigorously researching the product with the help of the product's company and through market research. In our case, the participants were neither the creators of their products nor got a chance to do market research on their assigned product. Only four participants gave an answer that was different from their response for the "unique characteristics" question and out of those four participants, three of them used it in their storyboards. Overall, the guided planning module helped participants to draw their storyboards. Although responses from the "tagline" and "hidden insight" questions were challenging for participants to incorporate in their storyboards, we believe real entrepreneurs might find them easier to incorporate because of their higher involvement with the product. In the future, we would like to add more explanation and examples for those two questions to make them more accessible for novice videomakers.

6.5 Evaluation of the storyboards with crowd workers (RQ2)

Finally, we recruited 75 participants from MTurk to evaluate the persuasiveness of the storyboards created by our participants. We aimed to understand whether crowd workers would find the

storyboards created by the comprehensive group more persuasive compared to the storyboards created by the participants of the control and non-interactive groups. To this end, we presented an imaginary scenario to MTurkers where they had to decide how much they would like to donate to a sample crowdfunding campaign. Based on their preference, we showed a sample Kickstarter campaign to each MTurker either about a pair of shoes (fashion campaign) or about a magnetic levitation floating holder (technology campaign). The campaign looked similar to any other typical Kickstarter campaign except the campaign video section was empty. We told participants that the creator of the campaign was trying to make a video appropriate for the campaign; however, the creator needed help from MTurkers to decide a plan for the video out of three different plans. Here, we presented three storyboards to each MTurker. One of them was drawn by a participant from the control group, the second one by a participant of the non-interactive group, and the last one by a participant from the comprehensive group. The order of the storyboards were counterbalanced. We asked MTurkers to write down, for each version of the storyboard, how much they would like to donate to that campaign. Overall, for each storyboard, we collected intended donation amount from five different MTurkers and averaged them to minimize individual differences.

On average, crowd workers wanted to donate $26.53 (SD = 6.88) for the corresponding campaigns of the storyboards drawn by the participants in the comprehensive group. MTurkers wanted to donate $13.60 and $9.00 for the campaigns of the storyboards drawn by the participants of the non-interactive group and the control group respectively. We performed a one-way ANOVA on the intended donation amount to understand if there was any significant difference among the groups. We found that the intended donation amounts were significantly different for storyboards across three different groups $F(2,42) = 19.10$, $p < 0.01$, partial $\eta^2 = 0.48$. Post-hoc Tukey analysis showed that MTurkers intended to donate significantly more money for storyboards created by the comprehensive group compared to the control group ($p < 0.01$) and the non-interactive group ($p < 0.01$). No statistically significant difference was found between the intended donation amount of the non-interactive group and the control group. This indicates that interactive interface and the guided planning module helped participants of the comprehensive group to come up with persuasive storyboards for their campaigns, which in effect motivated MTurkers to report higher intended donation amount.

6.6 Participants' Opinion

At the end of the user study, we conducted a short interview (10 minutes) with each participant. Our goal was to understand their experiences about using the VidLyz tool and get feedback to improve the tool in the future. We transcribed the interviews manually in the lab and performed interactive open coding to identify the main themes of the interviews. First, we asked the participants of the non-interactive group and the comprehensive group which module of the VidLyz tool they found the most useful to help them draw their storyboards. 16 participants (10: comprehensive version and 6: non-interactive version) found the interactive interface module more useful than the guided planning module for creating a storyboard. They felt that coordinated example videos and crowd-sourced feedback were the elements that helped them come up with their own storyboards. In contrast, 6 participants (2: comprehensive version and 4: non-interactive version) felt the opposite since they felt that the planning module guided them to think only about the topics that were key to the storyboard. Finally, 8 participants (3: comprehensive version and 5: non-interactive version) found them equally important for drawing a storyboard as they felt that the elements of the interface module and the planning module were complementing each other. Since participants in the control group could not access any tool, they were not asked this question.

Next, we asked all participants if they had any suggestion for improvements. Participants pointed out a few areas where the VidLyz could be improved in the future. Four participants of

the comprehensive version suggested including an additional example video for each persuasion factor which has an average rating and, therefore more opportunities for improvement compared to the highly rated example videos. Participants felt that this would allow them to understand the implication of each persuasion factor better. Three participants, who had prior experience in drawing storyboards, suggested including a digital drawing tool for drawing the storyboard. P4 felt that a digital drawing tool would allow users to comfortably iterate over their storyboards at their own pace. Two participants from the comprehensive version wanted to see some standard topic modeling on the MTurkers' feedback to identify the main themes of those feedback. Finally, four participants of the non-interactive group mentioned the necessity of completing the planning module before attempting to create a storyboard. As P19 mentioned:

> *I did not pay much attention to the planning module first. But later, when I had to think of the storyboard, I realized why the planning module included those questions. It was guiding me through the storyboard.*[P18]

This explains why participants of the non-interactive group and control group took significantly more time to draw the storyboard than those of the comprehensive version. Since control group participants could not specifically talk about any improvement opportunities for the VidLyz tool, they mostly (N = 11) asked for a better organization of the example campaign videos. P37 asked for annotated example videos as she felt that annotations would help her to identify the strengths and the weaknesses of the example videos without spending time in going through all the videos one by one.

6.7 Comments from the Previous Campaign Creators

We conducted one-on-one 30-min interviews with five participants who had previously launched a crowdfunding campaign either on Kickstarter or on Indiegogo. They did not receive any remuneration for participating in these interviews. All participants followed the all-or-nothing funding model for their campaigns. Four of our participants completed their campaigns successfully, and one participant was not able to reach the target amount on time. Two of these participants launched their campaigns in the technology category, one in the fashion category, one in the design category, and the final participant in the art category. All these campaign creators included a video in their campaigns.

We demonstrated the non-interactive and the comprehensive version to all participants. All participants expressed enthusiasm about the overall design of the VidLyz tool. Four participants preferred the comprehensive version of the VidLyz tool. One participant (E3) suggested combining these two versions by including the scores of all the persuasion factors for each example video in our comprehensive version. E3 agreed that this inclusion of raw scores might become overwhelming for some users. He suggested adding these scores as a hidden property so that anyone interested in knowing these scores could access them at their own convenience. E1 wanted to access more than one good example videos for each persuasion factor as these examples could highlight different aspects of a single factor. E2 also wanted to see more examples but for a wide variety of products. As E2 mentioned: "*In the fashion category, you will find several (eight) sub-categories in Kickstarter. A campaign video for an apparel should look much different from that of a pet fashion accessory. I want to find at least one example from each sub-category in this platform*". E1 also mentioned that along with past examples, VidLyz should allow users to access short clips of campaign videos highlighting only one specific topic such as product demo:

> *When I made a campaign for my portable 3D printer, I knew that I had to show the demo of my product. But I was not sure how much details I should include in my demo. A library*

of video clips where people are only showing the demo of their products would be useful at that point.[E1]

Two participants (E2 and E3) felt that the tool should allow experienced campaign creators to include new materials into the platform. This will help to build a community among novice and experienced campaign creators and enrich the tool's functionality significantly over time. E4 asked for the experience and the personal interest of the MTurkers who commented on the example campaign videos. Since he launched his campaign in the "Art" category, from his personal experience he felt that many MTurkers may not find the campaigns – planning to restore artists' communities – appealing and creative. He felt that incorporating some details of the MTurkers would enable novice entrepreneurs to judge the merit of the feedback before considering changing the plan for their own videos based on the specific feedback.

Four out of five participants felt that the inclusion of the guided planning module would be useful for entrepreneurs irrespective of their experience level. They felt that this module could work as a checklist for campaign creators to make their videos suitable for the target audience. They also felt that this module would encourage campaign creators to think about their product and video ideas from the perspective of the audience before they made the plan for their videos.

In addition to interviewing these five participants, we interviewed one more participant (N1) who had previously had a campaign and was also planning to launch a campaign within the next few months. N1 was in the process of making a plan for his campaign video at the time of the interview. N1 owned a small garden store in a shred-space shop in the downtown area and was planning to launch a campaign to rent a solo retail space for his store. We presented both the non-interactive and the comprehensive version of VidLyz to N1 and asked his opinion about the tool. As expected, accessing the example videos in technology and fashion categories did not directly help him to make a plan for his own video (since he was planning to launch his own campaign in the retail category), however, he still found it useful to watch the example videos as he felt that the best or worst examples gave him a general idea about making a better campaign video from scratch. N1 also found those examples useful because those videos helped him understand how he could produce his own video with good audio and video quality. For example, he mentioned that he now would like to use a steadicam instead of a hand-held camera to shoot his own video as it would make the video more stable even if he shoots it in an outdoor retail location.

N1 also wanted to watch more than one bad example videos for each persuasion factor as he felt that watching more bad examples would help him to avoid making obvious mistakes in his own video. After watching the example videos, N1 expressed the need for a script for his own video. He felt that having a well-planned script will be useful for his own video because in many of our bad examples, campaign owners fumbled multiple times which N1 interpreted as a lack of sincerity on the campaign owners' part. Finally, N1 wanted to get some feedback from the crowd during the course of making his own video. He felt that early feedback from the crowd would allow him to produce an appealing video that will attract donations not just from friends and family but also from more strangers on the platform.

7 DISCUSSION AND FUTURE WORK

The interactive interface module of our VidLyz tool helped novice users understand the implication of persuasion factors in making campaign videos engaging and effective. In addition, the guided planning module encouraged novice users to actively think of all the critical elements of their proposed campaign videos from the perspective of a professional account planner. More importantly, our evaluation showed that VidLyz can assist novice users in developing well-structured pre-production plans for their persuasive campaign videos persuasive. Since a well-structured plan

for a video ad, such as a commercial, is highly valued by advertising agencies [21], VidLyz can potentially be a useful tool for novice entrepreneurs who want to make their videos persuasive without having to hire outside professionals.

Our current prototype of the VidLyz tool is primarily designed to assist novice entrepreneurs in the process of making their campaign videos. However, if desired, the core concepts of interactive interface and active learning can be used to assist other communities too. For example, everyday people upload thousands of cooking videos onto YouTube. Some of them manage to get thousands of views, whereas others cannot manage to get as many views as they expect. It could be promising to design an extension of VidLyz that will serve other groups of people making online videos.

The main contribution of VidLyz is two-fold. First, VidLyz showed that if persuasion factors, identified by advertising professionals and crowd based on potential factors from the literature, are presented in an interpretable way to novice entrepreneurs with the help of example campaign videos, crowd-sourced feedback, and final outcome prediction models, novice entrepreneurs can learn the effect of these factors and can potentially apply them in making plans for their campaign videos. The interactive design of the tool can make this learning process tailored and convenient for novice creators. Second, this can enable novice entrepreneurs to make persuasive pre-production plans for their videos which they can use later to shoot the actual videos for their campaigns. In the process of preparing materials for crowdfunding campaigns, the production of the video can be one of the most challenging tasks. We believe that VidLyz can be a helpful tool for those novice entrepreneurs who do not have prior experience in making promotional videos but who either cannot afford or do not want to spend a large amount of money to hire professionals for doing the same. That said, the motivation of this work is to help those entrepreneurs who want to raise money, not to exploit potential donors of crowdfunding campaigns by convincing them to donate to potentially fraudulent campaigns presented through persuasive campaign videos. All stake-holders involved in crowdfunding campaigns need to be vigilant to eliminate fraudulent campaigns from the platforms. We believe that VidLyz will assist entrepreneurs who have good products but may fail to successfully attract donors' attention because of not having the money to hire someone to create appealing campaign videos.

In this paper, we designed the prototype of the VidLyz tool for the following persuasion factors: relevance, complexity, involvement, perception of duration, audio/video quality, and attitude towards the video. In the future, more factors can be included in the design of the interactive interface module, depending upon the requirement. Moreover, VidLyz used feedback and ratings generated by crowd workers. While other entrepreneurs are generally not the intended audience of a campaign video, feedback and ratings could also be collected from other online communities such as experienced crowdfunding entrepreneurs. Feedback from previous campaign creators indicated that building a community of novice and experienced campaign creators around the tool could help novices receive feedback consistent with the latest crowdfunding trends. A related future study would be to compare the feedback generated by crowd workers and by peer entrepreneurs. Involving peer entrepreneurs in the feedback system may also enrich the overall quality of the feedback. Experienced entrepreneurs can express their feedback based on their personal experiences in this domain.

During the evaluation phase of the VidLyz tool, we recruited participants who were mostly familiar with crowdfunding platforms such as Kickstarter. However, none of these participants were preparing to launch their own campaign at the time of participating in our user study. We tried to recruit novice entrepreneurs preparing to make a campaign video by circulating emails through campus-wide email distribution lists and by distributing flyers in our locality multiple times. Unfortunately, we did not receive any positive response. Being unsuccessful to recruit novice entrepreneurs, we decided to recruit participants who were interested in crowdfunding in general

but did not have any professional experience in making promotional videos for our user study. We assumed that in terms of videomaking experience and expertise, these participants would be comparable to novice entrepreneurs. However, unlike novice entrepreneurs, they did not have any immediate motivation for making persuasive campaign videos on their own, which can be considered a limitation of the evaluation process of this paper. In the future, we would like to evaluate the effectiveness of VidLyz by recruiting novice entrepreneurs who are planning to launch campaigns for their own products. We believe those participants will be more motivated to use this tool because of their personal involvement in the project. Moreover, we believe that repeating the user study with novice entrepreneurs will not invalidate our current findings; rather, that will reconfirm our findings, and we hope effect size will be stronger in that scenario.

Finally, at this point, the design of the VidLyz tool can serve novice entrepreneurs to make plans for their campaign videos. We would like to expand the functionality of the VidLyz tool so that it can assist novice users in gathering feedback on pilot versions of their campaign videos. This will allow novice users to iterate on their videos multiple times and to receive unbiased feedback from the anonymous crowd at every stage of the video. Prior work showed that novice entrepreneurs often find it challenging to receive unbiased feedback from their friends and family since friends and family do not necessarily feel comfortable expressing their honest negative opinion to closed ones [5, 15]. It would be interesting to observe how VidLyz is utilized throughout a complete cycle of making campaign videos and how the generated feedback prompts iterations on them. In the future, applying VidLyz during the life-cycle of real campaigns will allow us to understand how it can assist entrepreneurs to reach their target donation amount for their campaigns.

8 CONCLUSION

Novice entrepreneurs put a lot of effort in making the materials of their crowdfunding campaigns. One of the most complicated things to make can be the campaign video. Persuasive campaign videos can increase the probability of success for crowdfunding campaigns significantly. However, making a persuasive video may not be an easy task for novice entrepreneurs. In this paper, we identified the challenges that novice entrepreneurs may face to make their videos persuasive with limited knowledge. We proposed VidLyz, an assistive tool to help novice entrepreneurs understand how persuasion factors can make a campaign video engaging to the audience. The primary design goals and components of VidLyz contribute to the domain of building a persuasive system for the end-user. Our evaluation suggests that through an interactive interface and guided active thinking, VidLyz can assist novice entrepreneurs in planning an effective persuasive campaign video.

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