"Looks cool, I'll try this later!":
Understanding the Faces and Uses of Online Tutorials

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ABSTRACT

Despite their prevalence, little is known about how users make use of web tutorials for feature-rich applications, and why authors take the time to create them. In this paper, we analyze comments posted to web tutorials to understand the purposes that tutorials serve for users, and examine the tutorials themselves to understand their structure and authors' motivations to create them. Our results indicate that users come to tutorials for help performing specific tasks, but also to validate their existing skills, learn new techniques with applications, and to achieve complex end results beyond their current expertise. As for tutorial authors, we found that most tutorials had clear extrinsic reasons for existing, including earning ad or referral revenue, promoting premium products or services, or acting as portfolios for their authors. Based on these results, we suggest a number of improvements to current tutorial interfaces.

KEYWORDS: Tutorials, How-To, Help, Learning.

INDEX TERMS: H5.3. Information interfaces and presentation (e.g., HCI): Group and Organization Interfaces: Web-based Interaction.

1 INTRODUCTION

A large body of tutorial content for feature-rich applications exists on the web. For example, Tutorialized, a tutorial aggregator site, lists over 40,000 tutorials on a wide range of applications, including more than 16,000 for Adobe Photoshop. Despite these numbers, there has been little work examining the purposes tutorials serve for users, or authors' reasons for creating them. It's reasonable to assume that tutorials play a role in users' understanding and use of feature-rich applications. A more complete understanding of the tutorial ecosystem can thus contribute to improving the benefits it offers to users.

In this paper, we present a qualitative analysis of comments posted on web tutorials and the sites themselves to answer the following questions:

- What types of comments do users post on tutorials?
- What do comments tell us about users' motivations and purposes for using tutorials?
- What do tutorial sites tell us about authors' reasons for creating tutorials?

Finally, based on our findings above,

- How can we improve tutorial interfaces to better support existing community practices, authors, and users of tutorials?

We analyzed a sample of 42 tutorials, with a total of 664 comments. The tutorials corresponded to commonly searched tasks in Microsoft Word, Excel, and Adobe Photoshop. Our analysis revealed that individuals use tutorials for *in-task help*, *ongoing skill refinement*, and *expert shadowing*, each of which we briefly describe.

We found that tutorials serve as *in-task help* for users, a use that

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appeals to common intuition. In this scenario, users find a tutorial that matches their current needs and attempt to apply the tutorial instructions to their situation. As they do so, they act as *human interpreters* of the tutorial instructions, executing them step-by-step to try to achieve their goal. If they run into trouble, they sometimes post *"help-me" stack traces*—comments documenting where in the tutorial they got stuck, with additional context they feel might be useful to others as they seek assistance in debugging their use of the tutorial.

Users seeking help with tasks also use online tutorial forums as *interaction-pinned support groups* in which they ask about extensions or variations on the task presented. At times, their questions are far afield of the original subject of the tutorial.

Users often *collaboratively refine* the help provided by tutorials by answering questions, contributing tips and alternate solutions, suggesting improvements to the tutorial, and providing testimonials for alternative solutions, based on their experiences.

Our analysis also indicates that tutorials serve several purposes outside of accomplishing an immediate task. More specifically, tutorials support *ongoing skill refinement*, allowing a user to validate and hone their existing skill set with an application.

Finally, certain tutorials support *expert shadowing*, a scenario in which a user will attempt to follow an expert workflow beyond their current abilities for the challenge and intrinsic satisfaction of using the application to create an impressive end result.

One might expect that tutorial authors are primarily rewarded by the satisfaction of helping others. However, our analysis of tutorial sites revealed a range of primarily extrinsic (and typically financial) motivations. These include advertising, selling premium content or services, or serving as a portfolio for the tutorial's author to promote their skills and abilities. This contrasts with previous findings on authorship of How-To pages in the hobbyist domain [13].

The rest of this paper is organized as follows. We start by reviewing related work, and presenting our method of sampling and analyzing tutorials and their comments. We then briefly examine the structure of the sampled tutorials. Next, we examine what users' comments reveal about their use of tutorials, and what tutorial sites reveal about authors' motivations for creating them. We conclude with a discussion of the implications of our findings for improving the design of tutorial presentation and commenting systems.

2 RELATED WORK

This research is related to existing work analyzing activities in online help systems, as well as studies of how people create and use How-To pages and craft knowledge on the Internet. We review each of these areas in turn.

2.1 Analyses of Online Help

Existing studies of interactions between users in online help systems have focused on sites and services with a question/answer paradigm: a user poses a question and an expert or other users respond. These include forums, question and answer sites, and web-based technical-support systems. Studies of these systems have examined the time or number of messages before a question

is resolved [1,10,11], rates of successful responses [1,4,10,11], types of requests or responses [4,10,11], and multimedia formats used to articulate problems or solutions [4].

In contrast, tutorials have a qualitatively different structure, one in which the question/answer paradigm is inverted. Instead of a user asking a question and receiving a response, authors of tutorials create and share content. Users are then free to make use of this content and may choose to respond to it. Despite this difference, our analysis of comments identified a number of parallels with the work above. We observed comments that mirrored the types of comments posted to help forums [11]; users sometimes struggled with the level of explanation and the specificity of written solutions, as in question and answer systems [1]; and tutorials made use of a range of multimedia formats, as do technical-help interactions [4]. We more specifically highlight parallels and contrasts in our findings and discussion.

2.2   How-To Pages and Craft Knowledge

Given their step-by-step nature, tutorials for feature-rich applications share a number of similarities with How-To documents for do-it-yourself or craft projects. In both cases, authors face the challenge of breaking a complex task into documented steps, and users face the converse problem of interpreting the documented steps.

Torrey *et al.* used semi-structured interviews of computer and electronics hobbyists to examine how they create How-To pages to document their projects [13]. The authors examine motivations for starting a project, the processes of documenting a project, and how users promote their How-To pages once created. A notable finding is that users document projects as portfolios demonstrating their skills and abilities. We found evidence of this motivation for authors of tutorials for feature-rich applications, but it was a minority among a range of other extrinsic motivations.

In a separate interview study, Torrey *et al.* examined how people use the Internet to learn physical crafts [12]. They found that users made use of the Internet for technical information on how to perform crafts, but also for inspiration or to connect with other people around a craft. We found evidence of these uses for feature-rich application tutorials as well.

Torrey *et al.* also found that users encounter difficulties making sense of online information when their own materials or tools for a craft differed from those of a tutorial's author, and that users often needed to enact online instructions about physical crafts to gain a full understanding of them. Paralleling these findings, we found that users encountered difficulties when their version of an application differed from that of the tutorial author, and that users gained particular benefits by actually carrying out tutorial instructions step-by-step, rather than simply reading them.

3   METHOD

In this section, we describe our method of sampling and analyzing tutorials. Our objective was to sample a set of tutorials that included *user comments* for Microsoft Word, Excel, and Adobe Photoshop. These particular applications were chosen because they cover a range of different domains (text, spreadsheets, and images). For each application, we were also interested in sampling a range of tutorials on a number of different topics for the application. We describe how we performed this sampling below.

The problem of selecting a representative sample of tutorials from a space as large and diverse as the web is a non-trivial task. We therefore investigated several methods before settling on a final method. We first considered focusing our sampling on specific tutorial publishing sites. However, we felt that choosing the tutorial sites *a priori* could bias the results to a certain style of

tutorial popular on those sites. We also considered sampling from Tutorialized (www.tutorialized.com), a large tutorial aggregator site. While this site offered an attractive 16,000 tutorials for Adobe Photoshop, its coverage for the other applications in which we were interested was not as strong, and a preliminary sample of Word and Excel tutorials raised questions about how representative their catalogue was of the larger body of tutorials on the web.

Both of the above methods suffer from the additional drawback that they make it difficult to sample multiple tutorials for a specific task. We felt that better insight could be gained by examining the diversity of tutorials and comments for a small subset of well-chosen tasks, than by examining a body of tutorials for a wide range of unrelated tasks. We thus devised the following method of sampling tutorials using common web search queries.

For each application, we first extracted common Google search queries for the applications using the CUTS technique [6]. CUTS approximates the yearly volume of search queries associated with an application using a combination of data from Google's search autocompletion feature and its tools for advertisers. The result is a ranked list of search queries containing the application's name. We filtered this list to only include queries containing "how to" (e.g. "how to feather in photoshop"), reasoning that queries of this form are more likely to indicate tasks in the application. We then examined this filtered list and selected the three highest ranked queries that indicated *specific* tasks for each application, filtering out broad queries such as "how to use photoshop" and queries not related to using the application itself, such as "how to get photoshop for free". In the CUTS data for Microsoft Word, we found a large number of queries related to using the application in other languages (e.g. "how to write in hindi in ms word") that we also chose to filter out. The result of this selection procedure is the list of queries below. For reasons explained momentarily, there is one extra query for Microsoft Word.

> "how to cut out an image in photoshop"
> "how to feather in photoshop"
> "how to make a mixtape cover in photoshop"
> "how to convert ms word to pdf"
> "how to delete a page in ms word"
> "how to count words in ms word"
> "how to rotate text in ms word"
> "how to make a graph in excel"
> "how to merge cells in excel"
> "how to lock cells in excel"

We performed each of the above searches in the Google search engine and inspected pages sequentially, starting with the highest-ranked result. Pages were included in our sample if they met the following set of criteria. They:

- provided sequential instructions;
- delivered content using text and/or images;
- were for Microsoft Word, Excel, or Photoshop;
- included a commenting system on the tutorial site;
- and included at least one user comment.

While video tutorial content is an area of growing popularity, we opted to confine our focus to tutorials with text and images for this study. In addition to the above rules, we skipped Q&A sites and forums since they are structured to provide a platform for users to ask questions of other users (rather than a platform for posting a tutorial). We included help sites created by the application developers if they met all of the above criteria, though these constitute only a small subset of our sample.

For each query, we retrieved five different pages on the topic meeting or criteria, unless we could not find five different pages

Element	Median	IQR	Min	Max	% With Element
Words	310	227	90	1337	100
Words in Introduction	66	58	0	233	95
Number of Steps	6	5	0	23	93
Images	4	6	0	29	76
Images of Interfaces	1	3	0	10	67
Images w/ Parameters	0	1	0	7	43
Images w/ Annotations	0	0	0	4	24
Explanations	1	2	0	5	55
Tips and Hints	1	3	0	9	69
Comments	11	20	1	84	100

Table 1: Quantitative metrics for sampled tutorials.

Metric	%
Source file(s) included	29
Version included	60
Use of images to delineate steps	33
Comment section following tutorial	90
Comments ordered chronologically	86
Threaded comments	48

Table 2: Binary (yes/no) metrics.

within the first four pages of Google search results. Since our goal was to find tutorials that people would likely use, our expectation was that tutorials found later in search results would rarely be discovered or used in practice.

In the case of Microsoft Word, we added the extra query "how to rotate text in ms word" because the query "how to count words in ms word" yielded only one tutorial with a single comment.

The result of our sampling was 42 tutorials (15 for Excel, 14 for Word, 13 for Photoshop) with a total of 664 comments (Excel 199, Word 192, Photoshop 273) from 30 unique domains. The queries that did not yield five tutorials matching our criteria were "how to make a mixtape cover in photoshop" (3), "how to rotate text in ms word" (4), "how to convert ms word to pdf" (4), and "how to count words in ms word" (1, as mentioned above).

Comments were qualitatively analyzed using an approach drawing on grounded theory methods [5]. This began with an open-coding of comments for each tutorial, considered in-order by posting time. This coding was carried out entirely by the first author of the paper. However, the author used a starting set of codes from a pilot study of 30 tutorials, which had been discussed by all authors of the paper. The coding scheme did not change significantly during the coding of comments. Table 3 lists the codes assigned to greater than 5% of comments.

Once all comments had been coded, an iterative process was followed to draw concepts from the data. In each iteration, we attempted to name and describe emerging concepts and their relationships to one another. These external representations were discussed, along with frequent returns to the raw comment data, and this fed into subsequent iterations of the analysis. This process was repeated until we were satisfied that we had developed a robust theory of users' comments to tutorials, grounded in the comment data.

A similar method was followed to gain insights into the motivations of tutorial authors by examining tutorial content, and the sites on which tutorials were posted. In this case, once higher-level categories had been developed for author motivation, the second author re-examined and labelled each tutorial with one or more of the emergent categories.

Separate from the qualitative coding discussed above, three researchers examined and coded the sample set of tutorials on the quantitative and binary metrics shown in Tables 1 and 2.

4 TUTORIAL STRUCTURE

Before presenting the results of our qualitative analysis, we briefly describe the structure of tutorials in our sample using a mix of quantitative metrics (summarized in Table 1) and binary (yes/no)

metrics (summarized in Table 2). These metrics were derived primarily through consultation with the literature, and supplemented with additional metrics that we felt shed light on the form of tutorials.

In our metrics, the number of *steps* and the number of *images* serve as indicators of the effort put forth by the tutorial author, and of task complexity. The presence of *source files* may indicate the tutorial is easier to follow, while a reference to software's *version* may help the user to assess tutorial compatibility. The number of *explanations* (text providing rationale for an individual step) may indicate how well a tutorial supports a user in applying its instructions in a different situation.

All but two of the tutorials (95%) started with an introduction presenting the intent or context for the tutorial, or an overview of the content to follow. These sections were typically short, only a paragraph or two long (median 66 words, IQR 58).

Tutorials tended not to be overly verbose, typically containing approximately one half of a page of text in total (median 310 words, IQR 227).

Most tutorials (93%) were conveyed via a sequence of steps. There was a median of 6 steps per tutorial (IQR 5). The majority of tutorials (57%) used numbered steps. Images were also often used to break text into steps, explaining the close relationship between the median number of steps and the median number of images. Explanations of the intent of particular steps were not common, with a median of only 1 per tutorial (IQR 2) and 45% of tutorials including none. More than two-thirds of the tutorials (69%) included at least one tip or hint (median 1, IQR 3).

Of the 207 images across all tutorials, 83 (40%) contained at least one image of a user interface component (median 1 per tutorial, IQR 3), and 24 (12%) contained some form of annotation. The frequent use of images of interface elements suggests their utility for explaining application context, but the use of annotations suggests that raw screenshots are often not enough. This mirrors previous findings from the technical help domain [4] which found that raw multimedia attachments were often not enough for experts to interpret a user's problem.

We found few significant differences in tutorial structure between the different applications we studied. As might be expected, Photoshop tutorials contained significantly more images than Word or Excel tutorials. Photoshop tutorials were also more likely to provide a second type of reference material than the other two applications.

As a result of our sampling method, all tutorials included an area for user comments. For the majority of tutorials (90%), the comments section was located at the bottom of the same page as the tutorial content; for the remainder, comments were located on a separate page. Comments were generally ordered chronologically by posting time (86%), with the remainder ordered based on either a score derived from users voting a comment up or down. Half of the tutorials (48%) allowed for threaded conversations in comments. The median number of comments per tutorial was 11 (IQR 20).

Code	Comments	%
Praise and encouragement	279	42
Thanking the author	188	28
Responding to another user	115	17
Discussing the application	109	16
Questions beyond the process of the tutorial	82	12
Mentioning a specific version of the application	75	11
Mentioning a problem or failing (in use of the tutorial, or in tutorial content)	66	10
Suggestion of alternate methods, solutions, or improvements to the tutorial	66	10
Post by the tutorial author	58	9
Sharing personal results from using the tutorial, or personal context around use of the tutorial	53	8
Request for clarification (e.g. of tutorial instructions or another user's comment)	49	7
Providing tips or advice related to the tutorial	42	6
Discussing the end results of the tutorial technique	40	6
Includes a URL	40	6
Provides context around part of the tutorial where the user encountered problems	39	6

Table 3. Comments labeled with each code, for codes assigned to greater than 5% of comments.

In the next section, we present our qualitative analysis of user comments and examine what they revealed about the purposes with which users used tutorials.

5   TUTORIAL COMMENTS

In this section we start with an overview of the kinds of comments that users posted to tutorials and then examine what these comments reveal about how users make use of tutorials. A summary of the results of our qualitative coding, including all codes that were assigned to more than 5% of comments, is shown in Table 3.

The most common use of comments that we observed was to provide praise, encouragement, or thanks to the tutorial author, with more than half of all comments (51%) serving one of these purposes. These comments were often short and provided little additional context, such as the following example:

> *Fantastic! Thank you*

Praise, encouragement, and thanks were also included at the start or end of posts on other subjects. The prevalence of these themes in comments suggests recognition by users of the time and effort put in by the author, and also a sense that the commenter is a guest in the author's domain. Further evidence for this is suggested by the rarity of negative comments, of which we observed only 5 (less than 1% of all comments).

Unsurprisingly, a significant number of comments discussed tutorial content, with 19% coded as including questions or requests for clarification and 17% responding to comments by other users.

Another notable theme was the frequency with which users mentioned the application or versions of the application in their comments (one or both were mentioned in 18% of comments). Contexts ranged from pragmatic matters of whether the tutorial would work in a particular version of the software to comments complaining about or praising the application.

We now consider what these comments imply about *how* individuals use the tutorials. Our analysis revealed that users make use of tutorials for *in-task help*, for *ongoing skill refinement*, and

for *expert shadowing*. We examine each of these phenomena in turn in the sections that follow.

5.1   Tutorials as In-Task Help

Our analysis revealed that users often came to tutorials searching for a solution to a particular problem. Examples of these comments include:

> *Hi*
> *Thanks*
> *It really helped me in my presentation*

and

> *Geez thanks so much for this post...i'd been franctically looking for this*

Both of the above comments indicate that the user had a need for the presented information when they came upon the tutorial, and that the tutorial met that need. The user in the first comment reveals the larger context around their need for help (working on a presentation) and the latter comment explicitly states that the user had been searching for the presented information.

We now look at cases where users were less successful in achieving their goal. As users make use of a tutorial, they act as *human interpreters*, following the procedural instructions step-by-step, not unlike a scripting system. However, unlike a scripting system, each user performs a step based on their personal understanding of the instructions, intent, and the purpose of the step. A user may carry out the instructions precisely as described, or they may follow a different route to achieve the same goal. They may gain an understanding of a step through the experience of performing it, or they may never gain such an understanding. Comments revealed that some users had little understanding of the purpose or intent of the steps they were performing, even when they were sometimes successful. This phenomenon of "doing without understanding" has been identified in previous work [3] and is suggested by our explanations metric from the previous section, which demonstrates that tutorials typically include few explanations of why individual steps are necessary.

We observed a number of types of comments posted by users who encountered problems while following a tutorial. In "*help-me*" stack traces, the user reports a difficulty in performing the task and includes information on the step of the tutorial where they had difficulty, or other context related to their difficulty. The following comment from a Photoshop tutorial demonstrates this:

> *I'm not really getting step 3. The clouds cover everything (CS4).*

The comment identifies the particular step of the tutorial where the user had trouble, the unexpected result that they got, and the version of the application that they were using. This particular tutorial step involves using a smart layer to apply a subtle texture to a block of text, and caused trouble for a number of users, including the poster of this next comment:

> *I'm trying to do this tutorial, and im only up to the Filter > Render > Clouds bit. It says about putting it into a smart object, but when i do this, i can't do the clouds without rasterizing, and if i put it on a layer mask then it just doesn't show up!*
> *This probably sounds really n00bish, but can you please help?*

As with the first comment, the user identifies the step of the tutorial where they got stuck, as well as the unexpected result. This user also reports an alternate method that they tried (putting the Clouds filter on a layer mask) and the unexpected result of that attempt. This alternate method was not suggested in the tutorial itself, and gives insights into the user's understanding of the intent of that particular step.

A final example has a slightly different character from the two above. The following comment was posted to a tutorial on converting Word documents to PDF format:

> *Well, it does not convert Word documents correctly. It is easy to reproduce this situation. Go to Microsoft Word -> Insert -> Object -> Microsoft Equation and type [(a+b)]. Type square brackets not as separate characters, but choose them from Fence Templates in Microsoft Equation. Try to convert this file to pdf. Square brackets will look weird.*

In this case, the user did not have trouble completing the tutorial, but results were not what they expected. The user communicates that their particular needs are not being met by the tutorial, documenting a bug in the tutorial's method under certain conditions.

55% of comments reporting problems and 37% of comments requesting clarification respectively included some contextual information. In some sense, this is not that surprising—it's difficult to imagine how a user could expect to receive assistance if they don't provide some context on the problem they've encountered. That said, the information in these types of comments has the potential to be useful to both authors and other users of a tutorial. For the authors, the comments demonstrate parts of the tutorial that users commonly have difficulty with, and for users they document common failures and suggest how the tutorial could be improved by highlighting situations in which the tutorial's technique gives incorrect results.

5.1.1   Collaborative Refinement of Tutorials

A number of other practices that we observed in comments also had the potential to improve tutorial content.

In reporting the success or failure of completing a tutorial, users often performed a quality assurance role, testing if techniques worked or didn't work in particular versions of the software, as in the following comment.

> *Thanks for your comments, everyone. The PowerPoint option worked best for me. I tried the text box options, but still couldn't rotate the shape in Word 2007.*

The comment indicates how the user solved the problem, but notes another method that was presented did not work in Word 2007. In one exceptional example, we observed a user testing a solution on a wide range of different versions of an application:

> *Wow, I can't remember coming across this Fill>Justify tip before. Nice one. I checked Excel 2003, 2007, 2010, and Mac versions 2008, and 2011 to see if it works and it did. Amazing!*

Comments such as the ones above are important because version issues were a common source of problems for users. Application versions were mentioned in 33% of tutorials that reported problems and 22% of tutorials requesting clarification. This is in line with qualitative findings by Torrey *et al.* for users looking up information on physical crafts, who often encountered difficulty when the tools or materials they were working with differed from those described in online documentation [12].

Another way that users improved tutorial content was by directly providing information to other users. 16% of comments provided advice, suggestions, or alternate methods of solving a problem. These posts, and users' responses to them, act as in-place community refinements of the tutorials. This may seem like a small number, but in some sense it's surprising that it happens at all, given that users have an impoverished medium of expression (many commenting systems are restricted to not allow links or images). For example, the following comment was posted to a tutorial on removing unwanted blank pages from a Microsoft Word document:

> *There is a much simpler way to do this, which I have practised for 15 years. Just format that last paragraph as "hidden", and that irritating page will disappear.*

The user provides a solution distinct from those presented in the tutorial, and a testimonial to its effectiveness (that they've used this technique for 15 years).

In other cases, users' comments refined only part of a tutorial. The following comment was posted in response to a Photoshop tutorial that presented two techniques for cutting out a figure in an image:

> *I use the first technique all the time. I'd suggest a layer mask instead of copying and pasting the selection (Load Selection> Layers Panel > Add Layer Mask. That way, you can paint and smudge the mask to refine the knockout, and it's non- destructive*

This comment offers several refinements. It provides an alternate way to perform a particular step (using a layer mask instead of copying and pasting a selection), points to the relevant functionality in the interface, and points out the advantage of this alternate technique (the ability to refine the cut-out of the figure after it is put on a new background).

The comment above also provides a testimonial for one of the two techniques presented by the author ("I use the first technique all the time.") We observed a number of instances of testimonials for particular methods or solutions when multiple solutions were presented. Notably, this wasn't confined to evaluating solutions presented in the original tutorial. The following comment is a testimonial for a solution provided by another user in a comment:

> *Thanks for your comments, everyone. The PowerPoint option worked best for me. I tried the text box options, but still couldn't rotate the shape in Word 2007.*

In summary, users' comments provided information that could be used to refine the method of a tutorial by presenting alternate solutions, evaluating solutions posted by other users, providing tips on how to get a good outcome, and providing refinements to individual steps.

5.1.2   Interaction-Pinned Support Groups

Users frequently used comments as a forum for asking about tasks that extend beyond the scope of the tutorial. This included asking questions about how to continue from where the tutorial left off, or how to customize the solution presented, but also included questions about tasks that were variations or significant departures from the original tutorial. In these cases, we speculate that users are recognizing that the author and other users of the tutorial may have the knowledge to help them. That is, the tutorial acts as a gathering place for users with knowledge of a particular context of use in the application, and other users take advantage of this to ask about tasks related or similar to that particular use.

An example of a user asking a question that extends the original scope of the tutorial can be seen in the following comment posted on a tutorial on creating a chart in Excel:

> *Thanks a bunch!! I created a chart in Excel, but how do I put it on my website? I can't seem to save it as an image? Is there any way to convert the Excel chart to an image? Thanks*

The tutorial provided no details on how to export a chart from the spreadsheet. The author of the tutorial may have assumed that the intent was to create a chart for viewing inside Excel, but from the perspective of the user posting the comment, the tutorial ended prematurely.

This next comment asks how to perform a task that is a variation on the task presented in the original tutorial. The tutorial explained how to create a formula that merges two columnar lists

into a list containing all of the elements of the first list, followed by all of the elements of the second list. In the comment, the user is asking about a more sophisticated operation that removes duplicate items when merging:

> is there a way to merge two columns of dates in this similar way but only combine the dates that appear on both columns? ie. without duplicating them in the newly created column?

The author of the tutorial responded with a variation of the original solution modified to achieve this goal.

Finally, an extreme example comes from a tutorial on how to delete stubborn page or column breaks in Word. The user's question is about how to delete a horizontal line inserted by Word's automatic formatting when the user types "----":

> In a newsletter that I edit, I keep having a problem that after each item, I put in a line by '----' most of the way across the page.
>
> When I go to edit this later, I cannot get rid of the line. I am using Word 2000.
>
> The 'What's this' help thing tells me that the paragraph style is Direct: Border: Bottom (single solid line)
>
> BUT I CAN't get rid of it. can Anyone advise?

This question only has a loose connection to the problem of removing page and section breaks, but shares a lot of application-use context with this problem. Horizontal lines and page breaks are visually similar (when Word is in Draft view and you can see the page breaks), and both can be difficult to remove, though for different reasons.

Despite this question's loose connection to the problem of removing page and section breaks, the user received a good answer:

> In Word 2003, you can do at least two things to delete an unwanted line (aka border):
>
> 1) Click Format > Styles and Formatting > Clear Formatting.
>
> 2) Position your cursor on the line. Click the arrow next to the border icon (it looks like a square or an underline depending on what border effect you last used). Click the "No Border" icon.

In summary, we found that tutorials can act as *interaction-pinned support groups*, representing particular contexts of use of an application, and this makes them a natural place to ask questions about other tasks with a related use context.

In the next section we examine the roles that tutorials play outside of helping a user to achieve an immediate task.

5.2 Tutorials Outside of Immediate Tasks

In the previous section, we focused on scenarios where a user came to a tutorial with an immediate problem that they needed to solve. In this section, we present a number of purposes that tutorials serve outside of an immediate need to get something done.

The first example of this is *ongoing skill refinement*—users viewing tutorials to validate or refine their existing skill set with an application. The following comment posted to a Photoshop tutorial illustrates one example of this:

> Very Nice tut. I think some of these tips will come in handy in my next project.

The user indicates that they have learned something from the tutorial, but it is clear that they had no immediate need for this information. In some cases, it was much easier to discern what the user had learned from the tutorial:

> I would have never thought of using the smudge tool to simulate hair. What a fantastic idea!

Further evidence that tutorials serve the purpose of demonstrating alternate or novel techniques was found on tutorial pages themselves, as in this introductory paragraph from a Photoshop tutorial (emphasis by the tutorial author):

> There are many different ways to cut out images in Photoshop. Well, in this tutorial I am going to show you how I cut out images. I haven't really seen this method anywhere else on the web, so I figured I'd share it. It uses a soft brush edge so the edges don't look so sharp. This is **not a magic wand** tutorial!

The tutorial author explicitly states that there are many ways to cut out images, and that they had created the tutorial to share one that they hadn't seen documented before. They emphasize that this is different from the naïve method of performing this task (using the magic wand tool), demonstrating that they expect their audience to already be aware of one technique for performing this task.

Comments also suggested that users view tutorials to validate their existing skill set. The following comment was posted to a tutorial on cutting out a figure in an image:

> Wow. I've never used any of those methods (though I have gotten compliments on how cleanly the image was cut regardless). Man, alive, do I feel stupid. I guess I'll have to try these methods out sometime. Out of curiosity...just how dumb is it to cut out using paths? (Or whatever the photoshop equivalent is...I'm a GIMP'er myself)

The user seems self-conscious about not being aware of the techniques presented in the tutorial ("I feel stupid", "…just how dumb is it to cut out using paths?"), but also provides evidence for the efficacy of their existing skill set ("I have gotten compliments on how cleanly the image was cut regardless"). This shows that they are evaluating their own skills with the application in light of the tutorial content. There is also a sense that the user is looking for social validation of their skill set from other commenters.

In the next section we describe a very different way that users make use of tutorials outside of performing a current task.

5.2.1 Expert Shadowing

The query "how to make a mixtape cover in photoshop" uncovered two tutorials with a distinct character from the others in our sample. These tutorials are long (with 14 and 23 steps respectively) and describe how to recreate a complex workflow. For example, the tutorial at http://psdlearning.com/2008/07/cd-cover-design describes a process for recreating the album cover for a Ministry of Sound album, starting from a blank document.

Comments posted to this tutorial suggested that it serves many of the skill refinement purposes described in the previous section, but they also suggested a practice of *expert shadowing*, in which the user follows the tutorial step-by-step from its beginning, mimicking the workflow of the tutorial author to recreate a complex end result.

Comments to the above tutorial indicated that many users had attempted to follow it from start to finish: 14 comments indicated some attempt at performing the tutorial from the start. This included three users who indicated success, nine users who indicated trouble and requested help, and two for which the results were unclear. For example:

> Amazing Tutorial!! Never thought I would be able to make something sooo good. Some tricky bits where I had to search up google for how to do stuff but got there in the end.
>
> THANKS!!! =D

The user enthusiastically expresses a sense of accomplishment, as well as a personal ownership of the results ("Never thought I

would be able to make something sooo good"). They also indicate that there were parts of the tutorial that they struggled with but overcame by consulting other help sources ("Some tricky bits where I had to search up google for how to do stuff but got there in the end.") The user's expression of accomplishment, coupled with the fact that they struggled with certain steps, suggest that the tutorial allowed the user to perform a workflow that was beyond their current level of expertise with the application. There is also no indication that the user was applying the tutorial's procedure to a different project. That is, following the tutorial was an end in-itself. Further evidence of this comes from a comment from another user:

> *Made http://angellover89.deviantart.com/art/New-ID-98833207 with it :)*

This comment contains a link to the user's own results from following the tutorial. The user has made some minor modifications, including substituting in their username for the album title, modifying the font, and adding a few extra visual effects, but the result is recognizably very similar to the final result by the original tutorial author.

There are parallels between this expert shadowing phenomenon and Torrey *et al.*'s findings on how users make use of craft knowledge on the Internet. A key finding from Torrey *et al.*'s work was that users need to enact digital knowledge, transforming it into action, before it can be fully understood [12]. Our findings suggest that this result extends to use of feature-rich applications with more abstract interactions as well.

In the next section we examine some reasons why tutorials are created by their authors.

6 MOTIVATION FOR CREATING TUTORIALS

Our analysis suggests that the majority of sampled tutorials were created with extrinsic motivations in mind, beyond the altruistic sharing of procedural knowledge. These motivations include earning money by serving ads or product referrals, selling premium products or services, and serving as portfolios for their authors. Finally, we did find a few examples of tutorials whose authors appeared to be motivated by social motivations and sharing with a community of users.

6.1 Ad real estate and referral

(e.g. http://www.addictivetips.com/)

The vast majority of tutorials (93%) included ads, though the number and placement of ads on the tutorial pages varied. Ads often appeared in side bars and above and below tutorial content, but were also sometimes interleaved between steps in a tutorial, or in a block between the title of the tutorial and the start of tutorial content. We also observed contextual ads that popped up when the mouse cursor was hovered over double-underlined text in the tutorial. We feel that this inclusion of intrusive ad content within tutorial content indicates that earning revenue from ads was at least as high a priority for the publisher of the tutorial as was providing tutorial content to users. Along the same lines, we found that sites with no other obvious extrinsic motivation for posting content (we discuss other motivations below) tended to have the most intrusive ads. Sites whose primary function was for ad real estate or referrals (63%) had a median number of advertisements of 8 (IQR 6), compared to 2 (IQR 5) for sites whose primary motivations went beyond selling advertisements. They also had a median of 1 intrusive advertisements per tutorial (IQR 4), as opposed to 0 (IQR 0) for sites with other motivations.

6.2 Premium and Freemium sites

(e.g. http://chandoo.org/)

A number of sites followed a "freemium" business model [2] where tutorial content was given away for free but the sites charged for access to premium content. For example, some Photoshop sites required a paid membership for access to Photoshop-format (PSD) files for the end result of posted tutorials. Because these PSD file contain all the layer information for the final image, they provide a further source of information on the presented workflow and could allow someone to apply an effect without going through all of the tutorial steps. We observed this phenomenon for Excel as well, with sites that sold sets of Excel templates.

Along similar lines, some sites offered a subset of tutorials for free and reserved certain tutorials for members, or charged for e-books on how to use the application. In these cases, the free tutorials can be seen as a sample demonstrating the quality of instruction that users can expect if they become premium members or purchase other instructional content. 12% of tutorials included motivations of charging for additional privileges or content.

6.3 Portfolio sites

(e.g. http://www.blog.spoongraphics.co.uk/tutorials/
handy-techniques-for-cutting-out-hair-in-photoshop)

We observed a number of sites with tutorials that acted as portfolios for their authors. In contrast to the previous categories, where there is an immediately tangible benefit to attention from users (ad revenue or sales of premium content), these sites act as advertisements for the skills of the author in their chosen domain, and to raise awareness of them in their community. These sites tended to have more of the author's personality put into them, with an elaborate "About" page or a bio of the author somewhere on the site.

In contrast with How-To pages for the hobbyist domain as explored by Torrey *et al.*, which found that users primarily created tutorials as portfolios and personal histories [13], we found that these made up a minority of the sites that we examined (15%).

6.4 Community sites

(e.g. http://www.deviantart.com/)

These are large sites that allow anyone to sign up and share content, and provide tools for users to communicate with one another. We observed two community sites (5% of tutorials) in our coding, deviantART and Squidoo. deviantART bills itself as "The world's largest online community of artists and art-lovers!", and has more than 12 million members and 100 million pieces of art posted on it. Squidoo allows users to create "lenses", or overview pages on particular topics.

Squidoo allows its members to make money off of the ads and referral links placed on the content they author, and deviantART members can make money by selling their art through the site. For this reason, many of the motivations discussed above apply to these sites as well. However, because these sites foster communities of users with like-interests, social reasons and gaining stature in the community are also likely motivators.

6.5 Documentation by the application developer

(e.g. http://help.adobe.com/)

Finally, we came across tutorial content authored by the application developer (7% of tutorials), in the form of technical documentation or blogs set up to promote and help users with their software. In these cases, the developers have a clear motivation for doing this to increase use of their software.

In summary, we found evidence for a range of extrinsic reasons that may be motivating tutorial authors, beyond simply sharing knowledge.

7 DISCUSSION

In this section, we consider design implications arising from our results, as well as limitations of our study.

7.1 Design Implications

We found that users exhibited a range of different motivations for using tutorial content. Given this, we explore design implications for the various uses of tutorials.

Some users come to a tutorial for help with achieving a specific task. These users wish to expend a minimal amount of time and effort to apply the instructions to their particular problem. Tutorials are an imperfect solution for this group of users, who would be better served by an automated means of gathering information from the tutorial and applying it to their data. Some work has already been investigated in this direction. Work by Leshed *et al.* [9] on CoScripter presents a system that can interpret textual instructions for performing tasks in web pages, and includes the ability to automatically adapt parts of the task to the user's context. Work by Grabler *et al.* [7] explores techniques for abstracting operations in image manipulation tutorials (e.g. selecting the eyes in an image) as a first step toward automatically adapting complex image manipulation operations to particular users' tasks. Both of these solutions require application support.

In lieu of automated application support, there are several ways the interfaces of tutorials could be improved to support task-focused users. One way would be to allow tutorials to more gracefully improve over time based on how a community of users uses them. Our analysis of comments revealed a wealth of information provided by users that could help refine tutorial content over time: Users answer questions by other users, post tips and alternate solutions, and point out bugs in tutorial procedures. Indirectly, users identify difficult steps of the tutorial, provide insights into their misunderstandings of tutorial content, test tutorials on different versions of the software, and provide testimonials for particular solutions.

Unfortunately, these comments are "second class citizens" in current tutorial interfaces. Comment areas are separated from tutorial content, typically at the bottom of the page, and comments are ordered chronologically, interleaving potentially useful comments with social comments that provide little value to other users. The result is that useful information is inaccessible when users need it most: when they are following the tutorial's steps. An improved design would place valuable comments such as tips, "help-me" stack traces, and suggested improvements alongside the relevant steps so they could provide benefit to users while they are in the process of following a tutorial. This could be achieved by either allowing commenting on individual steps, or by providing users with a way to tag a comment to a particular step in the tutorial, as can be done in YouTube comments.

Other users come to tutorials to improve their skill set or to perform a workflow as an end in-itself. In addition to the suggestions mentioned above, these users would benefit from systems that make it easier and more convenient for authors to create tutorials that share their knowledge with an application. Work by Grabler *et al.* [7] on creating photo manipulation tutorials by demonstration and work by Grossman *et al.* [8] on embedding history in documents are steps in this direction. However, the practice of workflow shadowing suggests a focus on systems that could produce results particularly tailored to novice users, as it appears that

part of the enjoyment is in performing a task that the user could not perform unaided.

7.2 Limitations

Because we only sampled tutorials with comments, our characterizations cannot be considered exhaustive, and may not extend to all tutorial content for feature-rich applications on the web. Moreover, we noticed significant differences between comments for Photoshop (an artistic application), and Microsoft Word and Excel (productivity applications), indicating that tutorial use is related with the application's domain. However, we believe these results provide an important first look at the culture of tutorial creation and use on the web.

8 CONCLUSION

In this study we examined the uses of web tutorials for feature-rich applications from the perspectives of their users and their authors. Our analysis revealed a number of scenarios of use for tutorials, including as a source for in-task help, to validate and refine a user's skill set, and as a way for some users to recreationally create results beyond their skill level with an application. From the perspective of tutorial authors, we found that tutorials serve a chiefly extrinsic role as a means of earning money through ads or product referrals, selling premium products or services, or by serving as a portfolio for the author.

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