From Posts to Reqs and Back: Investigating Instagram's Potential in Supporting Requirements Engineers. An Empirical Study.

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***Abstract*—Feedback about software products is valuable for assuring software quality and identifying ideas for improvement. Usually, it is gathered from social media platforms or stores with applications and is in textual format. However, there are some social media platforms that contain information in which textual content is combined with pictures or videos. It has not yet been investigated whether feedback expressed in such a way can be useful for requirements engineers. To address this gap, we designed and conducted an empirical study analyzing 576 Instagram posts with pictures concerning 28 different software products. Then, we asked 4 practitioners about the usefulness of the posts. Remarkably, 51% of analyzed posts contained related information. Their textual content conveyed insights about building a community around the product or related to the product-related aspects, its benefits, features, and content, while images complemented the message by providing visual information about UI, user characteristics, content, and context characteristics. Practitioners suggested RE tasks in which such information would be useful. Our study shows that Instagram contains valuable information that might help formulate or improve software requirements. However, there are also several challenges, mainly how to analyze the posts, that open further research directions.**

***Index Terms*—source of requirements, Instagram, empirical study, social media, feeback**

I. Introduction

Requirements engineering (RE) stands as a cornerstone in the development of IT systems, encapsulating vital processes such as elicitation, identification, documentation, analysis, and validation of requirements [1]. Recent research has indicated that despite the existence of numerous methods and techniques for requirements engineering, the industry still encounters challenges in this area. Notably, incomplete or missing requirements rank among the foremost issues [2].

In response to these challenges, many researchers have been working on solutions that support eliciting requirements from different requirements sources. Some previous studies have shown that mobile application digital distribution platforms like the App Store or Google Play [3], as well as social media platforms like the platform X (formerly Twitter) [4] [5] are valuable sources of requirements. These platforms contain user feedback, which helps identify the strong and weak points of applications and ideas for further development. User feedback is expressed in these platforms in textual form.

However, the exchange of information between social media platforms' users can be not only through text but also by combining text with photos or videos. Instagram is a good example of such a platform. It allows users to share their posts (text plus videos or pictures), which are subject to comments, likes, and can be shared among other users. Individuals as well as companies create the posts; software development organizations, such as Microsoft, Google, Meta, etc., are Instagram users, but there are also accounts dedicated to software products, e.g., Spotify, Audible, and Roblox. What is interesting is that there are 95 million photos and videos being shared daily on Instagram [6], and over 50 billion posts since its inception [7]. This huge size of exchanged content and the existence of software-related accounts on Instagram raises the question *whether Instagram can support requirements engineers*.

To answer the stated question thoroughly, a series of studies are needed. With this paper, we decided to do an initial step and see whether this area allows and is worth further investigation. We designed and conducted an empirical study analyzing Instagram posts concerning software products and interviewed RE practitioners about the usefulness of the posts. This paper makes the following contributions – it provides:

(1) General characteristics of Instagram posts related to software products;
(2) An overview of information one might find in the posts;
(3) Insights of practitioners about the usefulness of Instagram posts;
(4) A study design and lessons learned to investigate the area further.

The paper is organized as follows. We describe our research methodology in Section III, report on the results in Section IV, and discuss them in Section V. Our work is compared to the previous works in Section II, and the conclusions are drew in Section VI.

II. Related Work

Analysis of user feedback is valuable for assuring software quality and identifying ideas of improvement as contains information on user perceptions, encountered problems, suggestions, and demands [8], [9], [10]. The high usage of social media platforms (e.g., platform X) or digital distribution

platforms (e.g., AppStore, Google Play) to discuss software-related issues has made them interesting research subjects. Moreover, it has triggered the crowd-based requirements engineering field to grow [11].

In the area of the information posted in social media platforms like X, researchers analyzed the content of information, e.g., Guzman et. al [5], Bougie et al. [12] explored tweets to identify what information they contain and if it is possible to automate the analysis, e.g., Guzmian et al. [5].

Moreover, the other source of feedback from users are digital distribution platforms like App Store, Google Play etc. Researchers analyzed the content to identify what information it brings, e.g., Groen et. al [13] investigated whether non-functional requirements are tackled in reviews of applications. Moreover, since manual analysis is a time-consuming task there have been papers analyzing different methods to extract valuable information automatically, e.g., Maalej et. al. [8], Van Vilet et. al [10].

In both areas, the user feedback is in the form of text which is the main element to communicate the message and some attributes of the feedback, e.g., the number of stars that indicate the general grade of an application. In our study, we examined Instagram content, which is posts that utilize not only text but also pictures to communicate the messages of users to see if such format can pass more/less information.

III. Study Design

Our exploratory empirical study aims to investigate how Instagram posts are used when communicating about software products and whether the posts can support RE tasks related to current or future software products. To achieve this goal, we stated the following research questions:

- **RQ1.** What are the characteristics of Instagram posts that concern software products?
- **RQ2.** What information is present in Instagram posts related to software products?
- **RQ3.** Are Instagram posts related to software products perceived as useful for RE tasks?

RQ1 and RQ2 were answered within an analysis of Instagram posts, while a survey among RE practitioners allowed us to formulate the answer to RQ3. We used the guidelines provided by Wohlin et al. [14] and by Molléri et al. [15].

3.1 Dataset of Instagram posts

In order to create the dataset, the first step was to select software products from various thematic categories. The application selection was based on the ranking prepared by *SimilarWeb* [16] that ranks mobile applications concerning their popularity. For each app category, either one cross-platform application or two applications—one available on Android devices and the other on iOS devices—were chosen. We considered only the products or their companies that had their accounts on Instagram with the status "verified". Table I presents the selected software products also further referred to as applications.

TABLE I
Selected apps.

Category	Google Play Store	Apple Store
Books & Reference	Amazon Kindle	audible
Business	Microsoft Teams	ZOOM Cloud Meetings
Education	ClassDojo	PictureThis
Entertainment	Netflix	TikTok
Finance	Cash App	
Food & Drink	DoorDash	
Games	Pokemon GO	Roblox
Health & Fitness	Fitbit	Planet Fitness Workouts
Lifestyle	Pinterest	
Maps & Navigation	Waze	Google Maps
Medical	Dexcom G6	
Music & Audio	Spotify	
News & Magazines	News Break	Twitter
Shopping	Walgreens	Fetch Rewards
Social	WhatsApp	
Sports	ESPN	DAZN
Video Players & Editors	YouTube	
Weather	Weather - The weather channel	

Instagram users (accounts) can publish posts (e.g., Netflix can publish a post about their software product used to watch movies and series) but also users can publish their posts and refer to other users (it is called *tag a user*) or they can refer to users by using hashtags (e.g., in order to create a post about Netflix application one place in the post comment *netflix* which gives a clue that he/she is talking about Netflix). Thus, we decided that for each of four types of publication about a software product we collect five posts (20 posts per product):

1. posts uploaded by the user (USERPOST),
2. posts in which the account was tagged (USERTAGGED),
3. most popular posts with a specific hashtag at the time (HASHTAGPOPULAR),
4. newest posts with a specific hashtag (HASHTAGLATEST).

3.2 Procedure of analyzing posts

Our analysis consists of two steps: preparation and execution.

The *preparation* step established the dataset, developed the coding guidelines, and selected the tool that would allow us to annotate Instagram posts. We decided to base our coding guidelines on the content categories proposed by Guzman et al. [5] and extend them. Two authors individually performed a pilot coding of 16 posts. Next, we met and discussed each annotation. This step allowed us to understand the coding task better and improve the common understanding of content categories. We decided to use Label Studio application to help us manage annotation.

The study *execution* step consisted of:.

1) Individual coding – each author individually performed coding of each post in the following way. While looking at the post was to:
   a) Assign one label to the whole post to indicate its major category or state that the post is not relevant;
   b) Analyze the content of the text description and assign labels (code) to fragments of the post caption – its textual content;
   c) Analyze the picture of the post, identify the objects(parts) of the picture that concern the software

product, mark them as polygons, and assign labels (codes);
   d) If during each step there was a new type of content category identified, an annotator could add a new label(code);
   e) Add any remarks to the posts;
2) Result merging – after completing the individual coding task, one annotator merged the results manually and placed them in a spreadsheet. The spreadsheet was the basis for discussing any disagreements between the reviewers and whether new codes were justified. In this activity, the measures used to monitor agreement between researchers were calculated–we used Cohen κ. Based on this process, we built our ground truth.

An example of an annotated post is presented in Figure 1.

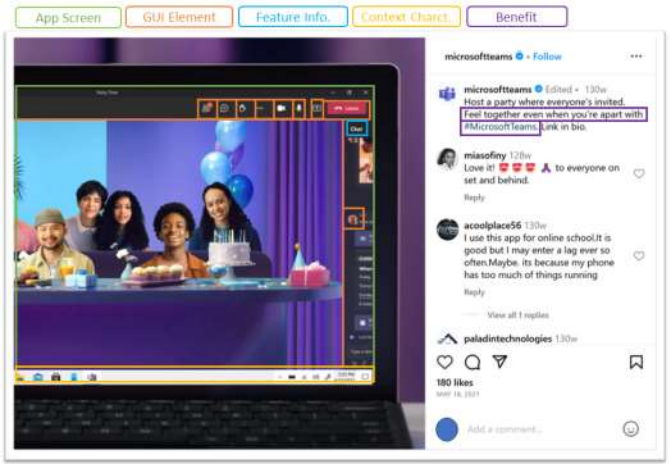

Fig. 1. An example of an annotated post with assigned codes. The post was identified as Advertisement.

3.4.Interviews

Having analyzed our dataset with the insights that Instagram posts contain information that might be helpul for RE tasks but being cautious enough before starting further studies, e.g., mining this dataset, we decided that it is essential to learn how useful this information might truly be. Thus, we conducted interviews with practitioners–representing the target population of participants of software development projects and product teams who have experience in RE. Sampling was done by convenience–we invited our LinkedIn contacts with RE experience. Participation in the study was voluntary. We decided to use semi-structured interviews as they allowed us to collect answers to apriori assumed questions as well as ask deeper ones [17]. Each interview session took 30-40 minutes and constituted of the following phases:

1) Questions about the experience (overall in IT and in RE), and about the usage of social media and Instagram for private and RE-related tasks
2) Assessment of Instagram posts – the interviewees were presented with the randomly selected set of Instagram posts from our dataset of 10-15 posts (the set was randomly selected but in a way that all labels had to be represented). Each time they were asked if they perceived the presented post as useful for RE-related tasks, and if so, for which one(s). They were told that they could take the perspective of somebody working on the software product the post is about, a competitive product, a product to extend or integrate with the presented one, or just any other software product.
3) Overall assessment and Closing up – the interviewer asked how they perceive Instagram's usefulness for RE-related tasks, then thanked and closed up the interview.

The interviews took place at a time convenient for the interviewees through the Zoom video conferencing system. The participants were encouraged to freely express their opinions regardless of whether they were positive or negative. The answers were transcribed during the interview. The interview guide is available at [18].

3.4.Data Analysis

In order to answer the research questions, we used descriptive statistics to study the usage of Instagram posts concerning software products. We analyzed the general characteristics like the length of text content or the number of likes given to posts. Next, we analyzed the content of Instagram posts by applying content analysis techniques described in Section III. Within the content analysis, we identified the categories of information present in Instagram posts, and their parts (picture and text). The grounded theory techniques of coding (open and axial coding) and constant comparison were used as recommended by Charmaz [19] to analyze responses to the questions asked during the interview.

3.4 Threats to Validity

Conclusion validity. To counteract the fishing threat, we used two annotators and established precise coding guidelines, drawing from previous studies. However, our multi-step analysis process might have introduced bias. Despite efforts, only one experienced social media practitioner agreed to interview, possibly leading to conservative conclusions regarding practitioner opinions.

Construct validity. Manual analysis of Instagram posts is subjective, leading to varied categorizations by different researchers. To address this, we conducted a pilot annotation and resolved disagreements through discussion. Cohen's κ was monitored, showing moderate agreement (κ=0.42). Additionally, the informal and ambiguous nature of text-based content, including abbreviations, emojis, etc., posed a challenge. To mitigate this, we employed two annotators with software engineering knowledge, one experienced in annotating user feedback. Furthermore, we focused solely on posts with pictures, potentially limiting insights as some posts contain videos or both.

Internal validity. Internal validity threats arise from our limited code list, derived initially from a study on Twitter and potentially overlooking diverse Instagram post categories. Annotator subjectivity poses another risk, where relevant information may be overlooked or misclassified. Despite our efforts to ensure relevance, interpretations may vary. However, our combined expertise (one of the annotators has over 10

years of experience in requirements engineering, while the other has over 5 years of experience in software development) boosted our confidence in conducting the study. To strengthen the validity of our study, we also interviewed practitioners and developed a replicable interview instrument to strengthen validity. Although we focused on verified Instagram accounts, posts from hashtags or product tags may lack authenticity, yet we accepted this as a common scenario for Instagram post analysis.

External validity. In our study, we analyzed a sample dataset but selected Instagram posts from various applications across different domains to enhance external validity. We avoided bias by not focusing on specific dates or events that could influence results, e.g., a major bug was identified, or an important release was announced. The limited number of practitioners assessing the usefulness of the extracted information also restricts generalization. Our findings may vary across different software product domains and less/more popular applications. Our study's design does not allow us to formulate valid conclusions for all software development products or organizations. Instead, it serves to explore new areas, uncover potential risks, provoke discussion, and raise questions.

IV. Results

RQ1. Characteristics of Instagram Posts

A total of 576 posts were collected (including those from the pilot study). Since a post can have more than one image, the total number of downloaded images was 1,231. There were ca. 49% (280) posts that we identified as Not Related (170 were identified as Unrelated, 100 as Noise, 10 as Unclear). The Related posts we divided into two groups:

– *Strongly Related* 12.33% (71) – posts that might directly pass information concerning software requirements, i.e., App assessment, App screen, Benefit/Rationale, Bug report, Context characteristics, Feature information, How to, Non-functional requirement, Praise, Product, Recommendation, Social interaction, User characteristics, Usage scenario

– *Weakly Related* 39% (225) – posts that do not have the direct goal to pass information concerning to software requirements, i.e., Advertisement, Community building, Company information, Content related, Job advertisement, Knowledge sharing, Other product.

The posts were collected in four distinct ways, Figure 2 illustrates the distribution of posts across them. The highest number of *Strongly Related* posts originated from *USER_POST* and *USER_TAGGED*. The best source of *Weakly related* posts was also *USER_POST*, where the total percentage of all *Related* posts reached over 86%.

All categories of applications had posts identified as Related. The top five concerning the number of related posts are: News and Magazines (24 in total, 1 Strongly Related, 23 Weakly Related), Medical (23, 11, 12), Business (23, 8, 15), Books and Reference (23, 4, 19), Games (22, 4, 18).

In order to learn more about the Instagram posts concerning software products we described them with the characteristics listed in Table II. First, it appears that such posts contain

TABLE II
Characteristics of posts related to software products.

	mean	std	min	median	max
No. of pictures	1.92	2.09	1	1.00	10
No. of words excluding hashtags	48.65	60.67	0	26.00	358
Length of caption excluding hashtags	299.62	361.30	0	171.50	2,172
No. of hashtags	11.62	11.55	0	7.00	34
No. of likes	6,876.20	42,642.96	0	135.50	545,505

from 1-10 pictures, with a median of 1. The textual message without hashtags of the posts has an average 49 words with a maximum of 358. Moreover, it can be adjusted with hashtags – 7 (median) and with a maximum of 34. The posts also gain likes from 0-545,505 with a median of 135 and an average of 6,876. We approached to investigate whether the unrelated and related posts differ with respect to the attributes mentioned in Table II using the analysis using Student's t-test with the significance level set to $\alpha = 0.05$. A statistically significant difference was only observed with the hypothesis that the Related posts have a caption (text content) with more words.

RQ2. What information is present in Instagram posts related to software products?

Since our study has an exploratory nature when analyzing posts, we decided to extend the content categories proposed by Guzman et al. [5], which were used while analyzing tweets – textual content. We identified that in Instagram additionally there is content which can be categorized as: · *App screen* (showing a screen of software product), · *GUI Element* (showing elements of UI of software product), · *Assessment* (evaluation of application mentioning its strong and weak points), · *Benefit* (content concerning the benefits from using certain software product), · *User characteristics*

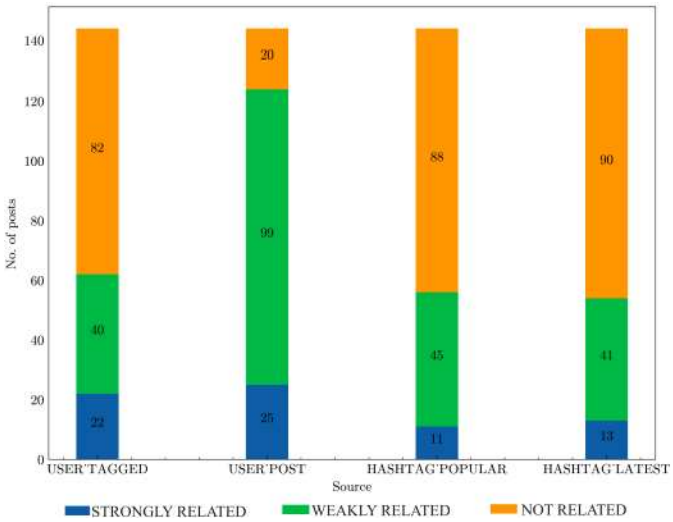

Fig. 2. Number of related posts based on its source.

(characteristics of end users, e.g., what they like, their age), · *Context characteristic* (factors describing the environment in which the software product is used, e.g., on a beach, during night), · *Company information* (information about the organization owning the software product), · *Product* (elements of the software product), · *Usage scenario* (content describing scenario in which the software product is used), · *Community building* (content encouraging to become a part of community around the software product, e.g., follow the user account, participate in some event etc.), · *Recommendation* (content encouraging others to use the software product), · *Knowledge sharing* (content related to software product sharing some knowledge, e.g., knowledge about products that can rise sugar level while describing the feature of displaying the sugar level for an software for diabetes). See [18] for all categories.

Next, we analyzed the general theme of each post classified as related (Strongly or weakly). We found that the majority of posts are community building (82), e.g., they are encouraging to participate in an event or challenge concerning software products, or just suggesting to try some feature for some benefit; then, there are posts that give insights about content that is/will be available in the application (e.g., some interesting podcasts on Spotify or series on Netflix) (62), and thirdly, there were posts just advertising the software product (42) (see Figure 3).

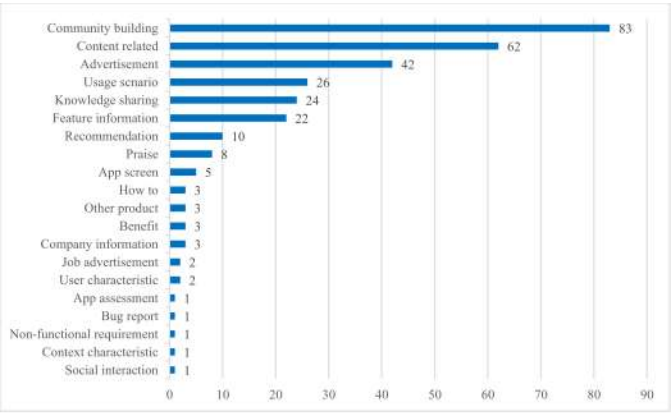

Fig. 3. Number of posts per given code (label) .

Furthermore, we analyzed what information is conveyed using pictures. The five most common types of information carried by pictures are: GUI Element (47, 16%), App screens (39, 13%), User characteristics (37, 12%), Product itself (e.g., its name, how it looks like when combined with some hardware) (32, 11%), Content related pictures (32, 11%), and Context characteristics (23, 8%). See Figure 4 A) for details.

We analyzed what information is passed using captions (textual content). We found that the top five most common types of information passed using text are: Community building (103, 35%), Product related (71, 24%), Benefit (47, 16%), Feature information (54, 18%), and Content related (52, 18%). See Figure 4 B) for details.

TABLE III
DESCRIPTION OF INTERVIEWEES[1])

	P1	P2	P3	P4	P5
Experience in IT (years)	19	5	25	10	5
Experience in RE (years)	10	5	5	10	5
Current Role	Principal Investigator	Reqs Manager	PO, PM	Business Analyst	Analyst, Trainer
Freq. of usage: - social media for private reasons	VF	F	VR	VF	VF
- Instagram for private reasons	N	F	VR	F	R

RQ3. Perceived Usefulness of Instagram Posts

The interviews involved five practitioners with IT experience ranging from 5 to 25 years, specializing in Requirements Engineering for 5 to 10 years. All had at least 3 months' experience as Requirements Engineers, with three also serving as Business Analysts, two as Analysts, one as a Product Owner, and one as a Product Manager. Additionally, four had management roles as Project Managers or Team Leaders. (see Table III[1]).

One of our interviewees has experience using Instagram for RE tasks, mainly for market research and learning more about their users. She perceives Instagram as a useful (4) tool for these tasks (possible answers using: 1(Very useful) – 5 (Very useful)).

All five participants assessed Instagram as at least useful for RE-tasks, with two considering it very useful. However, they stated that its usefulness varies depending on the domain or type of system being considered, e.g., an internally developed system, a system to integrate two other systems, or a security assurance system for a car. Conversely, for domains like mobile apps, entertainment apps, etc., Instagram can be *"super useful"*. Participant P5 emphasized that for mobile app development *"I would say – definitely go for it, that's the right place, the place where your users and customers are!"*.

The tasks participants perceive Instagram posts as useful for are outlined in Figure 5. All participants claim that the posts are useful for user research. Interestingly, P4 suggested that not only a post with a user in the context could provide valuable insights, but she would even prefer to find this user and analyze all his/her posts to see, e.g., how often the product is used, in which situations is it used, has it been used only once etc. Participants P3, P4, P5 said that access to all posts of such users might help to find insights for other products or features that extend or integrate with the product or identify what other problems these users have.

Except for the already mentioned straightforward RE tasks, the participants also mentioned validation ("see if your product

[1]Frequency of usage could be assessed using the scale of Not at all (N), Very Rarely - less than once a month (VR), Rarely - ca. one a month (R), Neither rarely nor frequently - few times per month (NRF), Frequently - ca. once a week (F), Very Frequently - at least once a day (VF))

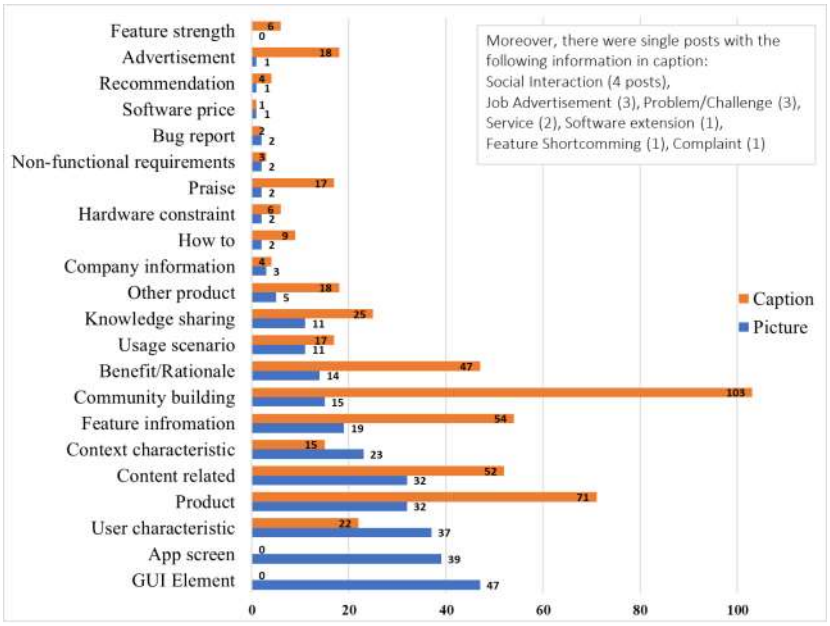

Fig. 4. Number of posts with identified at least one given code (label) in Caption (Textual content) and Picture (Image) .

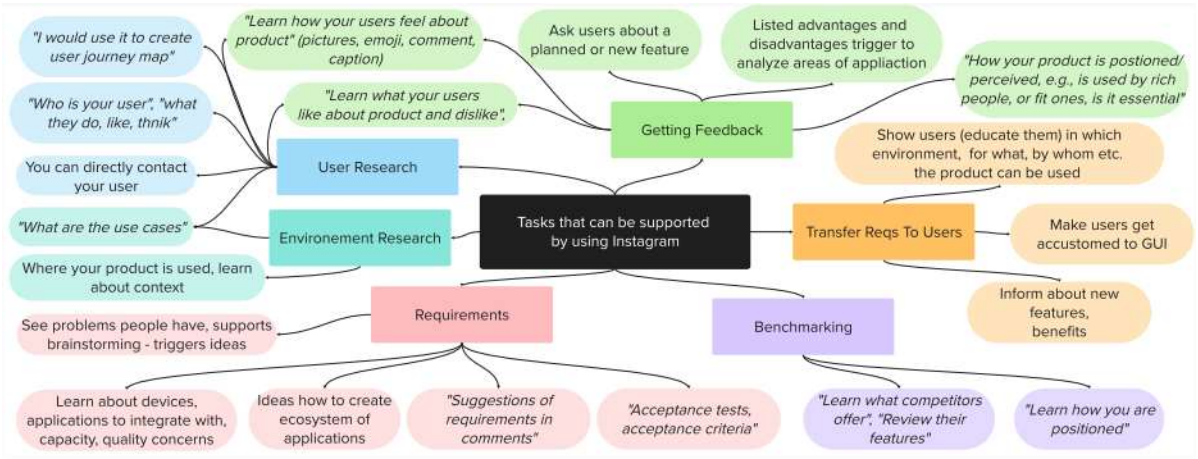

Fig. 5. Tasks for which using Instagram posts is perceived as useful by interviewees .

is used how, by whom, and when it was supposed to") and testing (see if your app looks like it should). Surprisingly, participant P1 proposed that *"it would be great to have an automated tool that would compare my tool with what people post and test if the GUI looks like it should"*. Instagram could be used to support learnability by familiarizing users with product appearances, aiding in user education, and promoting product benefits. So, it allows transferring requirements to users. Moreover, participant P5 said that posts can be used to create standards or trends of how applications look like or are used.

The participants had different opinions about the usefulness of posts featuring screenshots of applications. Three of them found such posts valuable to learn more about the app GUI, passing the look-a-like to users, and facilitating user onboarding, others disagreed saying that *"there are places like websites to get information about GUI and features"* (P1), or *"I would prefer to use the application"*(P3).

The participants also mentioned threats to the information extracted from Instagram, i.e., that the authenticity of users might be questioned or whether users are just sponsored to promote the product, and, thus, the information might not be reliable. We also need to consider that *"the insights might be outliers"* (P1, P3, P5), and not all of them must be addressed. Participant P1 suggested aggregating information, such as feature impressions, from a large number of users/posts to gain more meaningful insights.

Interestingly, participant P4 mentioned that she also uses other social media tools and finds TikTok to be the most useful. In her opinion *"videos are most powerful and can pass various information. You can learn a lot about your users"*. This suggests that Instagram stories could similarly

offer valuable insights.

V. Discussion

It follows from our study that Instagram posts contain information that might be useful to support RE tasks for existing or new products. Most useful might be the posts posted by the software product user accounts (86% contain related information), but also around 40% of posts that refer to these software product accounts by tagging or hashtags might also bring relevant information. The posts concerning software products seem to be popular, with an average of over six thousand likes and a median of 135 likes, whereas an Instagram post's average number of likes is around 200 ([7]). It might also be observed that different types of information are passed using text and pictures, making the message richer than text alone. Moreover, the following implications for practitioners and researchers can be formulated.

· **Implications for Practitioners.**

First, nstagram can serve as a valuable resource for gathering information on user-detected bugs and improvement suggestions, although it may not offer as much textual feedback as digital distribution platforms. However, for understanding user behavior and usage patterns, analyzing Instagram posts is perceived as a good idea.

Second, currently, analyzing a substantial number of Instagram posts demands significant time and effort. It remains a manual process, lacking easily accessible APIs or integrated tools for streamlined analysis. Some technological advancements may facilitate easier post-analysis, enhancing efficiency in this area.

Third, Instagram serves as a valuable resource for individuals seeking inspiration to develop or enhance software products. Through posts, one can gain insights into user demographics or preferences, environments, various use cases, etc. Additionally, software product authors often showcase recent major features and content updates, which allows them to learn and stay competitive in the market.

Moreover, Instagram posts are invaluable for software product marketers. Many posts serve as advertisements, highlighting product benefits, advantages, and various marketing techniques. These include featuring endorsements from celebrities, showcasing product usage at events like local schools, and sharing engaging knowledge relevant to users.

· **Implications for Researchers.**

Our study is a first step toward investigating the use of Instagram for RE-tasks. The observations seem promising and open further research directions.

First, we found that nearly half of Instagram posts were deemed irrelevant. Moreover, we found manual analysis as difficult and time-consuming. This lesson learned provides the rationale for developing automated methods to reliably identify relevant information. Addressing this challenge requires techniques capable of handling both textual and visual content. Future research should explore the applicability of the existing methods for mining social media platforms or application stores to analyze Instagram posts effectively.

Second, the analysis could be extended to include video content, comments and post's attirbutes (e.g., number of likes, sentiment), and more types of software products. Next, given the observation of a greater density of related posts within certain domains, delving deeper into these domains for thorough investigation could yield valuable findings.

Third, to make informed decisions based on the extracted information, some works on reliability and trust in Instagram posts would be valuable so that it is transparent which information might come from, e.g., fictitious accounts, accounts spreading false information.

Furthermore, conducting empirical studies involving Instagram users could provide deeper insights into the efficacy of communication about software products through this platform. Engaging both software authors and users could elucidate their motivations, timing-, and content preferences on Instagram. Such insights might facilitate more detailed observations and formulating recommendations or guidelines.

Lastly, practitioners identified a number of RE-tasks for which they perceived Instagram posts as useful, ranging from requirements elicitation, learning about users and the environment, up to testing, validation, and disseminating information about requirements. This raises a question of what techniques and tools could be useful to use Instagram for the purposes as well as the opposite, i.e., how to use requirements and which ones to create those posts.

VI. Conclusions

The paper reports an empirical investigation on whether Instagram posts can support requirements engineers.

In the study, we analyzed 576 Instagram posts concerning 28 different software products and interviewed 5 RE practitioners concerning the usefulness of Instagram for RE tasks.

Our analysis shows that Instagram posts contain information that might be helpful for requirements engineers. Moreover, it may convey more or other information than the up-to-date analyzed requirement sources, e.g., Twitter. The most frequently found information types in the posts are information about features, usage scenarios, and benefits/rationale. It follows from our analysis that the pictures within posts convey information about features, or GUI (e.g., screens of the applications, elements of GUI), and support the captions by showing usage scenarios. Moreover, they portray the characteristics of end-users and environments. Additionally, some posts highlight software failures or shortcomings, offering insights for product improvement.

Since Instagram contains a large amount of data, and, as we identified, the data is related to software products, with this paper, we would like to start a discussion about further investigations, risks, and opportunities, at least those that we identified with our study (see sections IV and V).

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