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Procrastination on Social Networks: Triggers and Countermeasures*

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Procrastination on social networking sites (SNS) can impact academic performance and user's well-being. SNSs embed features that encourage users to be always connected and updated, e.g., the notification features. Such persuasive features can exploit peer pressure as well and lead users to believe they are expected to interact immediately, especially for those who may have less impulse control and seek for relatedness and popularity. We argue that SNS can be built to host countermeasures for such behavior and help people regulate their usage and preoccupation about it better. In this paper, we presented a mixed-method study including a qualitative (i.e., focus groups, diary, interviews, and co-design) and a quantitative phase (i.e., a survey) with 334 participants. Through the qualitative phase, we identified: (1) features of an SNS seen by participants as facilitators for procrastination, e.g., notification, immersive design, and surveillance of presence, and (2) countermeasures, such as reminders, chat timer, and goal setting, can be facilitated via SNS design to combat procrastination, and (3) a pairing between the features and the countermeasures. We then (4) confirmed these results and the pairing through the survey phase. Our study showed that countermeasures could be implemented to be universal across all SNS on one or even more device.

Key words: Social Networking, Procrastination, Digital Well-being, Digital Addiction

Highlights:

- Social networking sites (SNS) can trigger procrastination.
- Countermeasures can be introduced to SNS to combat procrastination.
- Participants welcomed such countermeasures in future social media.

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Procrastination is a widespread phenomenon that can be defined as a voluntary delay of activities which often leads people to postpone or avoid working on their original tasks (Klingsieck, 2013; Steel, 2007). Procrastination also refers to self-regulation failure, where people fail to keep satisfactory control over their behaviour (Ferrari, 2001). Delays resulting from procrastination can lead to negative consequences, such as low productivity and poor performance (Barratt, 1959; Klingsieck, 2013; Van Dyke, Midha, & Nemati, 2007). Procrastination can also increase the feeling of guilt or shame, e.g., when people miss deadlines and it can increase work-related stress (Gustavson, Miyake, Hewitt, & Friedman, 2014; Stok, De Ridder, De Vet, & De Wit, 2012). Moreover, numerous studies have suggested that procrastination affects academic performance when students delay working on their assignments until the last minutes (Ferrari, 2001; Steel, 2007; Tice & Bratslavsky, 2000). It can be seen as a disruptive behaviour to education (Szulevicz, Mai, Marsico, & Vaalsiner, 2016), especially when pupils use social networking sites (SNS) to communicate in groups putting pressures on others and distracting them. Instead of studying, students might engage in different activities, such as watching TV and playing electronic games (Klassen & Kuzucu, 2009).

All SNSs have implemented different features that may facilitate and encourage users to be online and engage most of the time. The availability and the ease in accessing SNSs anytime and anywhere can be exploited to apply peer pressure and create a perception and norms that others are always available to interact and are expected to do so. An example of these features is the notification feature, which might trigger the user's attention to online activity. The content of the notification might be personalized, based on user interest, to increase the probability of viewing it, which when combined with endless feeds, can result in procrastination.

With artificial intelligence (AI) and personalization and hosting groups included, SNS provide an avoidance and escapism medium for users with low self-control and less motivation towards their work (Lundh, 2004; Pychyl, Lee, Thibodeau, & Blunt, 2000). Personality can play a role in the susceptibility to procrastination (Zhou, 2019). It has a role in sharing and spreading word-of-mouth (Anastasiei & Dospinescu, 2018) and this also happens online. Some users can feel the urge to share others' posts and reciprocate previous empathy resulting in further engagement and procrastination. Despite the recognition of the role of SNS design in triggering problematic usage patterns, tools around combatting it are still in their infancy. Google Digital Wellbeing and iOS Screen Time are tools at the macro level of using the devices as a whole, and they can be seen as time-management tools. However, SNS usage is a social interaction in the first place and tools should consider the collective nature of procrastination, e.g., in instant messaging amongst peers where tools to set up a maximum time for the conversation for all interacting parties to adhere to, do not exist yet.

In our previous work, we proposed four types of procrastination, namely, avoidance, escapism, emergence, and mood modification in relation to SNSs

(Alblwi, Stefanidis, Phalp, & Ali, 2019a). The work also identified features of SNSs that may facilitate procrastination such as notifications, endless content, variable rewards, and immersive design. Furthermore, we proposed a set of countermeasures that can be used to combat procrastination (Alblwi, Stefanidis, Phalp, & Ali, 2019b) such as reminders, goal setting, time and frequency restriction. In this article, we report additional findings from our qualitative study around the pairing between SNS features and their countermeasures as co-designed and suggested by participants and the results of a survey conducted to examine the pairing.

Method

The study was conducted in two phases, a qualitative and a quantitative phase. The qualitative data were gathered in two stages: an exploration and a design stage. In the second phase, the quantitative one, we used an online survey to examine the findings of the qualitative phase. We distributed the link to the survey to students' emails, mainly in the United Kingdom (UK) and Kingdom of Saudi Arabia (KSA), inviting them to take part in the survey.

The materials that were used in the two phases can be found at (http://eprints.bournemouth.ac.uk/33309/).

Qualitative Phase: Exploration

In this stage, we conducted three qualitative studies; two focus groups, a diary study, and follow-up clarification interviews. In the two focus groups, we recruited sixteen participants (nine females; all aged between 18 and 40). The inclusion criteria involved users who self-declared frequent procrastination on their SNS accounts. The focus group helped to collect the initial findings about how procrastination happens on SNSs and to explore the different SNS features that may facilitate procrastination. In the focus group, we provided the participants with different scenarios to explain how procrastination happens in general. This explanation was intended to provide some theoretical background for the research problem as well. The scenarios aimed to increase the participants' engagement on the discussion and to test whether it affects on their procrastination. The used scenarios were generated based on psychological theories such as self-efficacy and self-esteem theories (Bandura, 1977; Baumeister, Campbell, Krueger, & Vohs, 2005). Afterwards, the diary study was applied for ten days to collect stories about participants' procrastinating on SNS in a real-world context, so we gathered their live experience and enhance the ecological validity of our data and enhanced the credibility of the findings of the focus group (Fraley & Hudson, 2014). It also helped to elaborate more on how features of SNS may facilitate procrastination. For the diary study, we recruited the participants of the focus group aiming to get more insights from them in a real-world context, i.e., the lived experience of procrastination. At the end of this stage, follow-up interviews were used to clarify the collected data where clarification was needed and these involved three participants. This also served as a member checking technique to ensure that our analysis of the data matched what participants meant to say. Member checking is a method that is widely used to increase the validity of t qualitative findings as it allows the subjects to check and approve the collected data (Mayer, Caruso, & Salovey, 1999; Sirois & Pychyl, 2013). We adopted thematic analysis which is a popular analysis method in qualitative research and used it to identify, analyze, and report on recurrent patterns which were then organized as themes and findings. We adopted the steps of thematic analysis as suggested by (Braun & Clarke, 2006).

Qualitative Phase: Co-design

In this stage, we conducted two design sessions with a total of fourteen participants (six females; all aged between 18 and 40) to identify the countermeasures that can be used to combat procrastination on SNS. We used the same inclusion criteria that were used in the exploration stage, i.e., to self- report about frequent procrastination on social networking sites. Co-design method enables people who have this issue to take part in the solution design process and this is supposed to increase the acceptance of such solutions (Payne, Storbacka, & Frow, 2008). Co-design can lead to a better understanding of the end-users' needs, which enhances the possibility of the design's acceptance (Song & Adams, 1993). The design sessions supporting material was built based on the findings of the exploration stage, i.e., we built scenarios representing typical procrastination patterns and prepared cards representing the findings around features of social networking considered to trigger procrastination and countermeasures that can be added to combat it. Together with the participants, we conceptualised and sketched countermeasures that can be used to combat procrastination. We did not restrict the participants to any existing countermeasures or behavioural regulation mechanisms and asked them to freely propose and design what they use and what they like to use in SNS to combat their procrastination. We also identified various modalities on how to apply them, e.g., proactive, reflective, and real-time.

Quantitative Phase: Confirmation

In this phase, we sought to examine the qualitative findings of the previous phase with a sample of the population. This helps to ensure that we established the main features that may facilitate procrastination on SNS and their related countermeasures to combat it. In this phase, we conducted an online survey and distributed it to students' mailing lists in both the UK and the KSA. Leaflets and posters including the invitation and the link to the survey and its QR code were also distributed in the campuses of two universities. In total, 334 participants (147 (44%) females, all aged between 18 and 67, *Mean* = 27, and *SD* = 7.3) successfully completed the questionnaire. 163 (49%) of the respondents from the UK, 123 (37%) form KSA whereas 48 (14%) form other nationalities. The selection criteria for participation in this study involved participants who had at least one active SNS account and also self-declared that they significantly experience procrastination on SNS. The survey sought to examine the extent to which the respondents agreed on the findings of the exploration stage, i.e., focus group, diary study, and the co-design session. The survey also asked questions in relation to personality, self-control and culture with the aim of studying their effects on the selection and agreement of procrastination occurrences and their countermeasures which will be discussed in another paper.

Results

The features triggering procrastination, the countermeasures, and the pairing between the features and countermeasures are results from the qualitative phase, i.e., the exploration and co-design stages and explained in details in (Alblwi et al., 2019a) and (Alblwi et al., 2019b). In the exploration stage, five types of SNS features were identified as procrastination triggers: notification, immersive design, surveillance of presence, interaction, and identity (Alblwi et al., 2019a). Figure 1 shows the level of agreement of the survey participants around the features of social networking sites acting as triggers for procrastination.

In the co-design sessions, suitable countermeasures for procrastination resulting from each feature of the SNS were revealed and suggested. Countermeasures were divided into three types: technical countermeasures, socio-technical countermeasures, and task engagement tools (Alblwi et al., 2019b). The participants discussed how some countermeasures could be more effective than others in different contexts. For example, the suggestion to mute notification when receiving many of them would be a better countermeasure than the use of usage reminder or time and frequency restriction. Figure 2 contains the pairing between procrastination triggers, i.e., SNS features, and their suggested countermeasures.

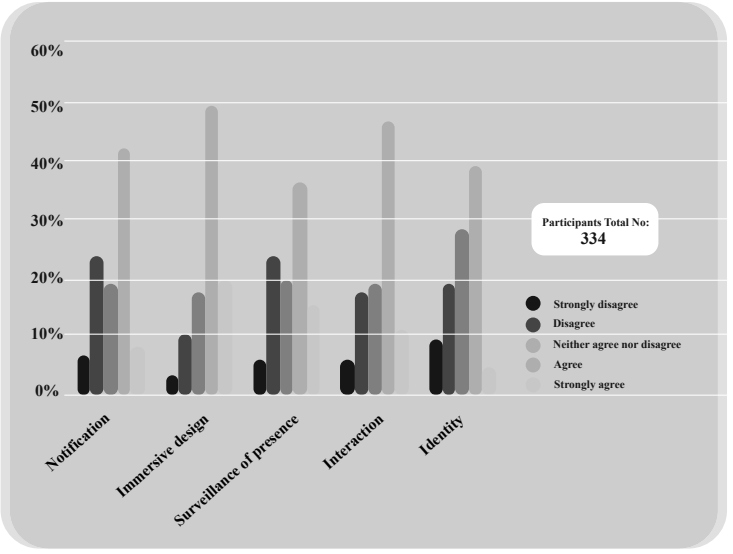

Figure 1. Features of SNSs as procrastination facilitators.

Incorrect choice and implementation of the countermeasures can hurt the user's experience and might introduce some side effects, such as increasing user stress and relapse (Alblwi et al., 2019b). Therefore, we paired SNS features to their related countermeasures in order to minimize the risk of selecting incorrect countermeasures. To confirm that, the survey results showed to which extent the participants agreed on the pairing between SNS features and their related countermeasures (see Figure 3).

The following subsections are organised around each of the features considered to trigger procrastination. The content of the subsections will discuss the feature, its suggested countermeasures and the extent to which survey participants chose each of the countermeasures.

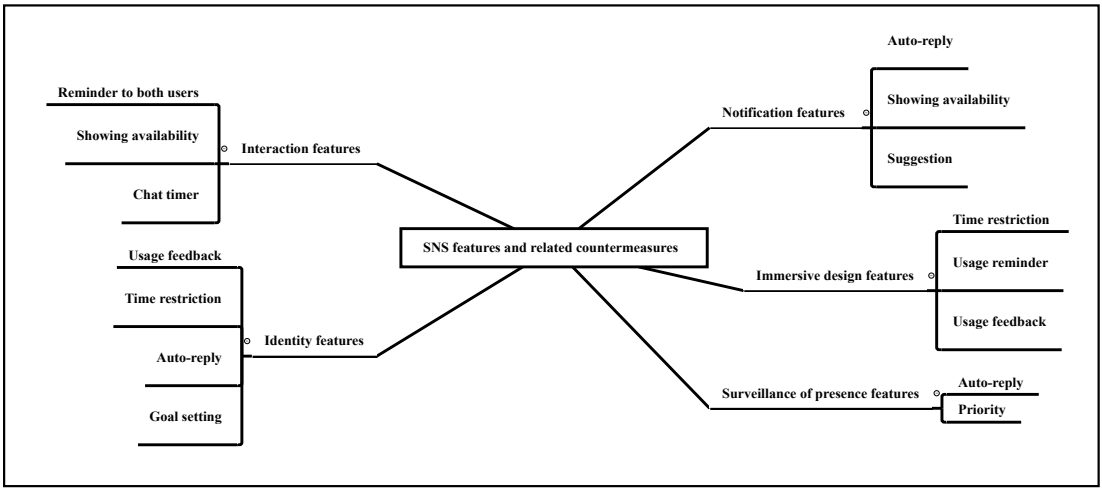

Figure 2. The pairing between SNS features and the suggested countermeasures.

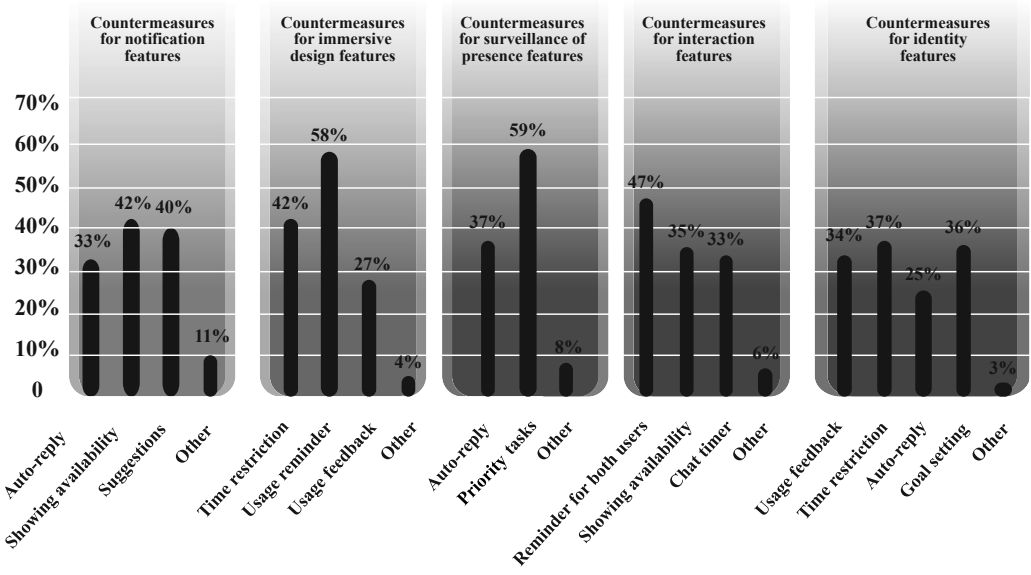

Figure 3. Suggested countermeasures for procrastination resulted from SNS features.

Notification Features and its Countermeasures

Notification features were seen as the first trigger that promotes procrastination among users. Notifications can come in different forms, such as sound alerts, vibrations, or a brief text message. Thus, when the user engages with these notifications, they might have several effects on the user's emotions

and their task performance (Alrobai, McAlaney, Phalp, & Ali, 2016). However, the results of the survey indicated that 167 (50%) of the respondents agreed that notification features trigger their procrastination, whereas 102 (30%) of the respondents disagreed with this assumption (see Figure 1). The content of the notification can also affect the user's emotions, e.g., increasing the temptation to check, which might then lead to a negative emotion when checked, e.g., regret, and thus increase procrastination (Alutaybi et al., 2019; Wortman & Brehm, 1975). Therefore, to reduce the possibility of procrastination, it has been suggested that notifications should be scheduled at breakpoints because this would have a significant effect on the users' ability to concentrate on their tasks (Alutaybi, McAlaney, Stefanidis, Phalp, & Ali, 2018).

In the design sessions, the participants proposed countermeasures to combat procrastination that occurs because of the notifications feature. These countermeasures are showing user's availability, receiving suggestions, and the autoreply. Showing the user's availability can help to manage others' expectations, which might reduce the pressure to check and reply that users may feel when they receive a notification. Furthermore, receiving a suggestion at the same time as the notification can guide the user on how to avoid procrastination, e.g., such as muting them. In addition, the autoreply can help manage others' expectations by confirming the availability time of the user and the expected time to get a response. Hence, the autoreply can help users to set up a different time for the interaction based on the availability of both users, hence, reducing the likelihood of procrastination.

The results from the survey showed that 243 (73%) of the respondents chose at least one of the suggested techniques to combat procrastination resulting from notification. 53 (16%) of respondents chose two countermeasures, and 20 (6%) chose three countermeasures. Only 13 (4%) of respondents did not select any of the suggested countermeasures indicating that they did not see any of them as useful.

Showing availability was the most popular option, selected by 141 (42%). Suggestion techniques were also chosen by 135 (40%) of respondents: i.e., users wanting to receive suggestions about how to avoid procrastination. This indicates that some users struggle to find suitable strategies to manage procrastination. Furthermore, the auto-reply technique was chosen by 110 (33%) of the respondents, whereby users prefer to confirm to others their availability via automated messages (see Figure 3).

Further countermeasures were suggested by the survey respondents including *notification deactivation*, *rewards*, *simulation*, and *social ranks*. However, these countermeasures were not new to us and they had been revealed and discussed in the qualitative phase through the co-design sessions and were excluded as it was noted that applying these countermeasures separately from each other might be detrimental to the user experience and could result in negative side-effects. For example, deactivating user notifications can exacerbate their curiosity to regularly check for new messages. In contrast, using more than one countermeasure at the same time might have a positive impact in terms of

reducing the possibility of procrastinating where users can use auto-reply to tell others about their availability and also deactivate their notifications. Hence, other people's expectations can be managed better and they know when to expect a reply, which reduces any pressure that users feel to respond immediately. The combination of countermeasures was not the focus of this study and we will explore that further in future work.

Immersive Design Features and its Countermeasures

Immersive design features of SNSs are meant to allow and lead the users to interact with the content on SNSs at full scale. In certain cases, such immersion can make users interact in an unconscious manner and be less aware of how time is passing especially when interacting with customised and interesting content, generated by exploiting their previous interaction with the SNS and what is known about them using an the algorithm (Paolillo, 2008). For example, when a user views a video on YouTube, additional suggested content appears and users might view them in an uncontrolled manner, which might negatively impact the user's commitment to their other tasks (de Oliveira, Pentoney, & Pritchard-Berman, 2018). A total of 228 (68%) of our survey respondents agreed that immersive designs trigger their procrastination. This agreement percentage was higher than that for the other features. Only 46 (13%) of respondents disagreed with that assumption and felt that other features of SNS trigger their procrastination more than the immersive design (see Figure 1).

Participants in the co-design sessions suggested that usage feedback, usage reminder, and time restriction techniques can help to combat the procrastination resulted from the immersive design features. Monitoring the user's usage can help to send reminders and feedback to procrastinators. The reminder countermeasures can be customised based on user preferences, such as the time of receiving the reminder or the way of delivering it, whether vibration or alert. Furthermore, users can receive feedback about their procrastination, which might help them to recognise their usage style and reduce the likelihood of procrastination. Some users might face difficulty in controlling their usage even after receiving such reminders, which raises the need for introducing stronger countermeasures, such as time restriction. Time restriction can either allow users to use SNS for a limited time or restrict their usage based on a specific scheduled, e.g., imported from their online calendar site or app.

The survey results show that 230 (69%) of the respondents chose at least one of the suggested countermeasures. Two countermeasures were chosen by around 63 (19%) and three countermeasures were chosen by 23 (7%). Only 5 (1.7%) of the respondents did not select any of the suggested countermeasures meaning that they saw little or no value in them to combat procrastination or that this kind of procrastination did not apply to them. As demonstrated in Figure 3, the usage reminder was chosen by 193 (58%), which indicates that the respondents want to be reminded about the time they spend on SNSs so that the immersion caused by their SNS design is mitigated.

The time restriction countermeasure was chosen by 140 (42%) of the respondents; they wanted to be restricted from browsing SNSs after exceeding a certain period or frequency selected by the users themselves. It has been demonstrated that users who have low self-control might struggle to stop procrastinating and they cannot manage their usage and would need intervention and help (Lee-Won, Herzog, & Park, 2015; Wilson, Fornasier, & White, 2010). The usage feedback countermeasure was chosen by 91 (27%) of the respondents, who prefer to use their usage feedback in more detail to help them make an informed decision and possible action to better manage their procrastination.

Further countermeasures were suggested by the survey participants and this included *comparisons* with peers' usage and *expected time* for viewing relevant content. However, the comparison of usage was already discussed in the exploration and design sessions stages and it was considered counterproductive as it can trigger competition to be more responsive and also create meaningless comparisons as the use of SNS can be for different purposes and some may use it for work, e.g., Facebook groups for discussing assignments and coursework for students. However, showing users the expected time for a certain content to be viewed can be difficult to compute if we consider the different cognitive and learning styles of users but can be interesting countermeasures to investigate in future work.

Surveillance of Presence Features and its Countermeasures

Surveillance of presence features in SNSs enables users to monitor the current status of their peers regarding whether they are active and their latest activities on the SNS (Lundh, 2004). These features were highlighted in the exploration stages as being among the features that trigger procrastination. For example, seeing the visibility of being online might give an indicator that a user is free to chat, which puts more pressure on them to respond when they receive a message and this can distract them from their current task. However, the results of the questionnaire showed that 170 (50%) of the respondents agreed that surveillance presence features trigger procrastination on SNSs, whereas 97 (29%) of the respondents disagreed (see Figure 1).

Participants of the design sessions proposed some techniques to combat procrastination resulting from the surveillance of presence features. Firstly, the user can receive an *auto-reply* to confirm their availability and when they can respond to another's request. This technique can manage others' expectations, as they will less likely to expect a quick reply, something which might lead them to go back to their task. Secondly, users can be reminded about their tasks' priorities so they can decide whether to keep procrastinating or go back to their original tasks.

The results from the survey showed that 295 (88%) of the respondents chose one of the above countermeasures and 26 (7%) chose two countermeasures. However, 21 (6%) did not select any of the suggested countermeasures.

As demonstrated in Figure 3, the majority of the respondents 197 (59%) chose to show the list of priority tasks as a useful countermeasure for procrastination. Moreover, 124 (37%) of the respondents preferred to use auto-

reply which can be used to manage the expectations of others regarding when to expect to receive a reply, which can reduce the pressure that users experience to respond and spend time procrastinating.

Further countermeasures were suggested by the survey participants. The notification was suggested to inform senders when a message is received and read and help them to avoid spending too much time checking SNSs to see their messages status. However, the sender might still procrastinate to see whether the receiver is online and ignoring their messages, as had been discussed in the exploration and design session stages. Therefore, the participants suggested that combining the receipt notifications using auto-reply and task priorities by the sender, which may work better to manage the sender's expectations regarding when they expect to receive a response.

Social Interaction Features and its Countermeasures

Interaction features enable users to interact with each other, such as chatting and instant messaging features and the wall timeline features allowing group interactions (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). The qualitative phase of this research demonstrated that such features facilitate procrastination due to the pressure that users may experience to continue the interaction and conversation. The results of the survey in the quantitative phase (Figure 1) showed that 192 (57%) of the respondents agreed that interaction features trigger their procrastination, whereas 77 (23%) disagreed. These features were the second most chosen features to trigger procrastination, after immersive design features. Therefore, procrastination might occur to empathy and to satisfy others expectation even if to do so is detrimental to the main task and the user's productivity.

The countermeasures suggested in the qualitative phase included a reminder for both users, using a timer for the interaction, and showing user availability based on their online calendar. Participants claimed that reminding only the user who procrastinates can create friction between the need to stop procrastination and the need to show empathy to the other interacting peers. Reminding both parties can help to eliminate that friction. Furthermore, a chat timer can be visible to both parties and can be integrated with the user's calendar to suggest a specific time regarding when users should stop the interaction. In addition, showing the user's availability can be helpful to manage others' expectations regarding whether the user is more likely to interact.

As demonstrated in Figure 3, the respondents to the survey who selected the reminder countermeasure for both users amounted to 157 (47%). Meanwhile, 118 (35%) preferred the show availability countermeasure and 111 (33%) of the respondents preferred the chatting timer. The results showed that one of the suggested countermeasures was selected by 253 (75%) of the respondents and two countermeasures were selected by 50 (14%). Only 16 (4%) of the respondents selected three countermeasures. However, only 13 (3%) of the respondents did not choose any of the suggested countermeasures.

The survey respondents suggested a number of additional techniques, including the use of a free slot, showing a list to do, and turning the phone

off. These countermeasures had previously been suggested and discussed during the exploration stages and design sessions. It would appear that some of the respondents thought they cannot stop procrastinating when they have their smartphone at hand and they consider their smartphone to be a cause of procrastination. In other words, to stop procrastinating they must turn their smartphones off. However, the majority of the respondents believed that smartphones and SNSs can be useful when users browse with them in a healthy way rather than taking an extreme route to switch them off.

Identity Features and its Countermeasures

Identity features enable users to represent themselves with certain information, such as their names, date of birth and profile photos (Kietzmann et al., 2011). The exploration stage of our study suggested that users may procrastinate in an attempt to build a positive self-image, increase their popularity, or maintain good relationships with their followers. The quantitative stage examined the extent to which the respondents agreed that identity features trigger their procrastination. The results show that 145 (43%) agreed that identity features can trigger procrastination, whereas 93 (27%) disagreed (see Figure 1).

Users who procrastinate on SNSs to build a positive self-image or seek popularity for their accounts might manage their procrastination better by using some countermeasures as suggested by the participants through the co-design sessions. This includes usage feedback, auto-reply, goal setting, and time restriction. Usage feedback can help raise a user's awareness about how much they use the SNS and compare that to their scheduled tasks and other sources such as to-do-lists. Auto-reply can help users to still build a positive self-image when they declare the time when they will be able to respond to any request on the SNS. Thus, declaring to others when they can get a response will manage their expectations better and can build a positive self-image when others get responses at the time the user states. Furthermore, goal setting can help users to manage their time better when deciding on the time; they want to be on SNS at and the times to be working on other tasks. Thereby, users can receive reminders and suggestions to motivate them to follow established goals. Based on these goals, users can also decide on the time that they would like to be restricted from using the SNS, either using a time frame or a time limit.

As demonstrated in Figure 3, 125 (37%) of the survey respondents selected the time restriction countermeasure, thereby indicating that they want to be restricted in their use when they exceed an agreed time limit. This suggests that some procrastinators cannot manage their procrastination by themselves and need a third party to force them to stop procrastinating. Meanwhile, 120 (36%) of the respondents chose goal setting, whereby they can see their list of tasks to do, something which helps them to reassess their priorities and pay more attention to their outstanding tasks. Furthermore, 113 (34%) chose usage feedback, thereby indicating that they want to review their usage on a regular basis, which might help them to recognise how much time they spend procrastinating and try to manage their time better. Moreover, 84 (25%) chose

the auto-reply countermeasure to manage other expectations about when they may receive a reply and reduce the pressure they feel to procrastinate.

The survey results showed that 223 (66%) of respondents selected one of the suggested techniques. Meanwhile, 76 (22%) of respondents chose two countermeasures and just 12 (3%) selected three countermeasures. Only 10 (2%) of respondents chose four countermeasures. However, 6 (1%) of respondents did not choose any of the suggested countermeasures.

New techniques were suggested by survey respondents and they fell into two categories. Firstly, universal blockage whereby users are prevented from accessing SNSs while working on their tasks. Secondly, recovery countermeasures, whereby users can get a reward to access SNSs in order to recover from intensive work, which helps to prepare them to continue with upcoming tasks. However, a universal blockage can negatively affect users and might increase their stress level when it happens in one stage. Therefore, the user may follow a gradual approach before reaching this stage. Furthermore, the recovery countermeasures are meant to allow users to still have small breaks during the main tasks which can help them to refresh their mood and return to their tasks at an appropriate time.

We now utilise our findings to assess Google Digital Wellbeing[12] (GDW) features against our suggested countermeasures and propose enhancements when needed. The GDW is produced by Google that also produces the Android operating systems and this makes it powerful in terms of ability to access the apps usage and activities on smartphone and browsers like Chrome. In contrast to other commercial products, Google stated that the toolkit is based on research and expert advices. GDW tools are meant to help users have healthier smartphones usage and a balance between technology and life. We evaluate the features of GDW to discover the extent to which their features support our suggested countermeasures (Table 1). An example of these features is usage feedback and limit so users can manage their usage time and style better to avoid distraction and procrastination. Overall, our suggested countermeasures were either partially supported or not supported at all in GDW. This could be due to the fact that operating systems, such as Google Android, are not expected to interfere with social networking applications interact with users and catch their attention. However, given the lack of facilities and permissions offered to third-party applications to access usage data of applications and digital devices, with user consent, the implementation of our countermeasures, at the moment, can only be done by the operating system or the SNS designers who have sole access to such data and mechanics. We advocate that such openness and transparency from the operating systems and the SNS providers that allows third-party applications, authorised by users, to access their data is critically needed to implement a wider and more innovative range of countermeasures, e.g., those that are cross-application like an autoreply that spans across multiple SNSs. It is also needed for ethical and professional reasons such as allowing people to choose the service provider that they like and trust to help their digital wellbeing.

12 https://wellbeing.google/tools/

Table 1
Assessing Google Digital Wellbeing Against Our Suggested Countermeasures

Countermeasures	Level of support	GDW support of the countermeasure and suggestions for improvement
Showing users availability	×	This countermeasure is not supported and this is left to the individual SNS to implement. A universal availability status administered at the level of the operating system, and GDW is still missing.
Suggestion	×	This is either left to the individual SNS or integrated with some Google programs, e.g., YouTube. Suggestion countermeasures towards the device usage or collective usage of a set of SNS are still missing.
Auto-reply	○	This countermeasure is partially supported by Google applications, e.g., Gmail as an emailing system, i.e., Gmail's out-of-office. Universal auto-reply, spanning across SNS applications multiple devices, and an auto-replay which is automatically or semi-automatically generate, e.g., based on the context and the online calendar, are still missing.
Time restriction	○	This countermeasure is partially supported by GDW where the user can set the time limit that they wish to spend online. They are reminded when approaching the limit and then restricted from using the application or the device when they exceed the limit. Time restriction countermeasure could be integrated with users' online calendar and to-do-list in order to provide more customised time based on the user context. This requires further tools to collect such data from users, explicitly or implicitly, with their consent.
Usage reminder	○	This countermeasure is partially supported by DGW and mostly correlated with the time restriction and has the same limitations as time restriction and suggestions.
Usage feedback	○	The usage feedback in GDW is mainly centered on the time of using the phone and applications. Usage feedback could provide more details about actual procrastination time over the day through accessing and intelligently processing context and tasks data, collected automatically or through self-report. Feedback can also relate to the usage sentiments and not only time, e.g., through natural languages processing of the posts and through smartwatch data to infer sentiments.
Priority tasks	×	This countermeasure is not supported and is left for applications dedicated to time and work management.
Reminder for interacting users	×	This countermeasure is not supported and is left to SNS designers. A universal countermeasure supported by the operating system would enhance users experience and reduce effort through being embedded as a service to add to each social interaction application.
Chat timer	×	This countermeasure is not supported and can be supported in a way similar to the Reminders to interacting users.
Goal setting	○	This countermeasure is partially supported in GDW through techniques like "Do not disturb" and Mute Notification allowing the user to focus on their goals and tasks. However, an explicit setup of them is not yet supported. This can enhance situational awareness and empathy if explained to the other interacting parties on SNS and reduce the worry about misinterpretation.

Note. ○ = Partially supported; × = Not Supported at all.

Discussion

The suggested countermeasures found in our study are meant to utilize and augment the SNS design to help users gain greater control over their procrastination. However, implementing these countermeasures is a challenging task as it can introduce side-effects that might be detrimental to the user's experience and also their digital wellbeing. Cultural differences are an example of the factors that must be taken into account when implementing these countermeasures. Power distance is higher in certain cultures and this can introduce the risk of increasing users' stress when a chat timer or an autoreply are used when interacting with someone who they perceive to be in a higher position. Power distance is one of the five dimensions developed by (Hofstede, 2011) and it refers to the level of power inequality that people accept. Another example of a challenge relates to showing availability status as a countermeasure for procrastination as it might help to manage the expectations of others and reduce the pressure on users to procrastinate. Despite the benefits, it can introduce the risk of preoccupation where users might fear being excluded from participating in an important event or communication during the time when they are unavailable. It has been argued that certain design features of social networks can trigger such a fear of missing out (FoMO) and one of them is that people may interpret unavailability online as lack of interest (Alutaybi et al., 2019; Alutaybi et al., 2018). This introduces the need to consider more holistic solutions than our proposed countermeasures; solutions which require digital literacy and the utilization of social norms and situational awareness.

Users' personality is also a factor and can affect the type of countermeasures. For example, some users might procrastinate and refuse to acknowledge their procrastination despite objective measures, e.g., usage feedback, due to denial and a low level of agreeableness. The denial strategy refers to a defense mechanism that some people use to protect themselves from illness resulting from negative behaviour such as the feeling of guilt (Roth & Cohen, 1986). Therefore, providing users with feedback about their procrastination might introduce the risk of users avoiding the tools introduced to help them. Moreover, some users might use SNSs as a coping strategy to relieve stress and modify their mood. Those users have reasons to procrastinate and are conscious of their procrastination. Reminder and suggestion countermeasures can increase their stress level and prove detrimental to their experience with the SNS as a mood modification medium. These challenges are to be taken into account when designing the software and we argue that besides the usual software-related testing such as the functional and user testing, a psychological test of their efficiency and potential harm to wellbeing is much needed. The modality of application can differ, and this can increase or decrease the risks, e.g., it matters whether the users or the software apply the countermeasures. Involving the users in a semi-automated style to set countermeasures can increase the likelihood of acceptance and reduce side-effects. At the same time, applying heuristics may be beneficial to users in order to assess whether any of the recurrent risks are likely to apply to them.

Procrastination can occur due to internal or external factors. Internal factors are when users procrastinate due to low self-control, low self-esteem, and low self-efficacy (Klassen, Krawchuk, & Rajani, 2008; Nielsen, Clemmensen,

& Yssing, 2002; Tice, Bratslavsky, & Baumeister, 2001). In contrast, external factors are where users procrastinate due to social pressure, to satisfy others' expectations or to gain an external reward. Social pressure and the need to agree on what others suggest can be triggers for procrastination (Chen, Shi, & Wang, 2016; Eckert, Ebert, Lehr, Sieland, & Berking, 2016). However, the suggested countermeasures can be divided into two subcategories based on the preferences of the user. Firstly, proactive countermeasures enable users to plan and prepare to avoid procrastination in advance, e.g., showing availability and the auto-reply. Using proactive countermeasures can reduce the effect of external factors that may trigger procrastination, e.g., social pressure. Furthermore, proactive countermeasures can reduce the possibility of silent procrastination where users keep thinking about whether they have been contacted while they are offline. Secondly, reactive countermeasures enable users to combat the internal factors of procrastination and to take immediate reaction when the procrastination takes place. The reactive countermeasures, such as reminders and suggestions, can raise users' awareness and help them gain greater control over their procrastination.

Auto-reply, time restrictions, and usage reminder countermeasures are supported partially in GDW program. To maximize the suggested countermeasures, we suggest that the countermeasures, with proper consent from the users, are integrated with their calendars so that processes are automated and user experience is enhanced. In contrast, in GDW features, users must set up their preference manually. The automated processes enable users to be less distracted when setting the limits and scheduling the allowed times for the usage, which may themselves trigger further procrastination. Furthermore, GDW features do not support other advanced countermeasures, such as showing users' availability, suggestion, priority, reminder for both users, chat timer, and goal setting. This is currently left entirely to SNS designers, and we reiterate that some countermeasures are better set to be universal across all applications of the device and this requires a role of the operating system as well. For example, suggestion around muting notification and limiting chat times would apply to the use of the device as a whole and it will be tedious for the users to set that individually for each application.

Conclusions

In this paper, we paired between social media triggers of procrastination and potential countermeasures and conducted a survey study to measure the extent to which people who self-declare to procrastinate on social media agree with our pairing and suggestions. Examples of the suggested countermeasures are auto-reply, showing availability, suggestions, time restriction, usage reminder, usage feedback, priority tasks, chat timer, and goal setting. We presented a pairing between the features and the countermeasures and discussed implications of implementing and applying these countermeasures on user experience and digital wellbeing, both positively and negatively. Our study also showed that countermeasures could be implemented to be universal across all SNS on one or even more device. This requires greater collaboration and transparency from operating systems and SNS providers; an openness to each other and also to

third-party applications to which a user gives a consent to access and help them manage their digital usage. We also call for the process of engineering such tools to be multi-disciplinary involving fields like software engineering, data analytics, sociology and psychology. This is due to the delicate nature of the mechanics for behaviour change and their associated risks such as reactance and relapse (Alrobai et al., 2016; Wortman & Brehm, 1975). In our future work, we will test the effectiveness of the countermeasures through building actual tools which implement them. We noted here that some of the countermeasures can be hard to implement unless a change in the policy of tech industry happens, e.g., by allowing third-party applications to network with them and access a user's data, with user's consent, and interact with users as part of the SNS native interfaces. Such applications are expected to be cross-SNS as procrastination happens usually on different SNS platforms and access to one SNS would lead to part of the behaviour only. We also noted the passive procrastination, i.e., the preoccupation about SNS when one is supposed to be focusing on something else and this would need different approaches to handle including behavioural therapy.

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Prokrastinacija na socijalnim mrežama: okidači i odbrambene mere (protivmere)

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Prokrastinacija na društvenim mrežama (eng. social networking sites; SNS) može uticati na akademsko postignuće i blagostanje korisnika. Društvene mreže imaju funkcije koje ohrabruju korisnike da stalno budu na mreži npr. kroz funkcije obaveštenja. Ovakve funkcije se nekad oslanjaju i na socijalni pritisak i navode korisnike da poveruju da se od njih očekuje da odgovaraju odmah, a ovo može posebno biti slučaj kod onih koji imaju slabiju kontrolu impulsa i traže povezanost i popularnost. Zastupamo stav da se društvene mreže mogu napraviti tako da u njih budu uključene protivmere takvom ponašanju, te da mogu pomoći ljudima da bolje regulišu upotrebu ovih sajtova. U ovom radu, predstavili smo studiju u kojoj smo kombinovali kvalitativne (fokus grupe, dnevnik, intervjui, kodizajniranje) i kvantitativne metode (anketa sprovedena na uzorku od 334 osobe). Kroz kvalitativnu fazu, identifikovali smo: (1) svojstva društvenih mreža koja korisnici opažaju kao facilitatore prokrastinacije kao na primer, obaveštenja, dizajn koji podstiče "uranjanje" korisnika i praćenje prisustva i (2) protivmere poput podsetnika, sata koji prikazuje vreme provedeno u ćaskanju (eng. chat timer) i postavljanja ciljeva čije uvođenje može biti olakšano kroz dizajn društvenih mreža, a u cilju sprečavanja prokrastinacije, kao i (3) koresponednciju između karakteristika društvenih mreža koje podstiču prokrastinaciju i protivmera. Potom smo (4) potvrdili ove rezultate i korespondenciju kroz kvantitativnu fazu, tj. kroz anketu. Rezultati našeg istraživanja su pokazali da se protivmere mogu implementirati kao univerzalne u sve društvene mreže na jednom ili više uređaja.

Ključne reči: društvene mreže, prokrastinacija, digitalno blagostanje, zavisnost od digitalnih sadržaja

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