Master

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FocusSession

An approach to support knowledge workers by decreasing communication disruptions and context switches

Philip Hofmann

of Rothrist, Switzerland (14-710-842)

supervised by

Prof. Dr. Thomas Fritz

Dr. André Meyer

University of Zurich[UZH]

s.e.a.l.

software evolution & architecture lab

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Author: Philip Hofmann, philip.hofmann@uzh.ch
URL: phhofm.github.io

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Software Evolution & Architecture Lab
Department of Informatics, University of Zurich

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Abstract

Knowledge workers receive multiple inquiries via communication messages, often interfering with their current workflow and leading to context switches, consequently impeding progress on the endeavored task. To address this quandary, we investigate the following research question:

Can we develop an approach that

1. assists the participant to focus on a specific task and
2. reduces the number of context switches during this timeframe?

This thesis establishes a particular set of concepts and describes their implementation in a prototype called FocusSession. In a subsequent preliminary evaluation, as outlined in this research, participants examine this prototype in their respective work environments.

Interpreting the data and interview transcripts, FocusSession appears to positively impact the participants' focus continuation on a specific task while enhancing the perception of context switches. Furthermore, subsidiary areas of interest for future research are drafted, such as establishing different profiles to cater to knowledge workers' diverse needs.

We acknowledge the necessity for a study with adequate sample size to validate or further investigate the preliminary evaluation's findings.

We are confident that the FocusSession approach helps knowledge workers be more productive overall by empowering them to focus on a specific task for a selected timeframe.

Zusammenfassung

Wissensarbeiter erhalten zahlreiche Anfragen über Kommunikationskanäle wie E-Mail oder Chatapplikationen, welche sich oft unterbrechend auf den aktuellen Arbeitsprozess auswirken. Das unmittelbare Bearbeiten dieser Nachrichten impliziert einen Kontextwechsel für den Arbeiter und hindert dadurch den Fortschritt der Tätigkeit, an welcher vor dem Erhalt der Nachricht gearbeitet wurde. Um dieses Problem zu bewältigen, untersuchen wir die folgende Fragestellung:

Können wie einen Ansatz entwickeln, welcher

1. den Wissensarbeiter unterstützt, sich auf eine Aufgabe zu fokussieren und
2. die Anzahl von Kontextwechsel reduziert?

Diese Thesis etabliert ein spezifisches Set von Konzepten und implementiert diese in einem Prototypen, welcher wir FocusSession nennen. In einer vorläufigen Evaluierung benutzen drei Teilnehmer FocusSession in ihrem respektiven Arbeitsumfeld.

Die Auswertung der gesammelten Daten und der transkribierten Interviews ergibt, dass FocusSession einen positiven Einfluss auf die Fokus-Dauer der Teilnehmer auf eine Aufgabe hat und gleichzeitig die Wahrnehmung bezüglich Kontextwechsel verbessert. Es werden interessante Gebiete für weitergehende Forschungsarbeiten entworfen, wie die Ausarbeitung verschiedener Profile, um die unterschiedlichen Bedürfnisse der Wissensarbeiter abzudecken.

Eine Studie mit adäquater Teilnehmerzahl wird benötigt, um die Ergebnisse dieser Evaluierung zu verifizieren und die erwähnten Gebiete zu untersuchen.

Wir sind zuversichtlich, dass der FocusSession-Ansatz Wissensarbeiter befähigen kann, sich für eine definierte Zeitspanne gezielt auf eine Aufgaben zu fokussieren.

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Chapter 1

Introduction And Motivation

1.1 Context

Knowledge workers are bombarded with an avalanche of communication messages every day throughout numerous communication channels. These workers commonly sense the urge to answer these messages promptly due to self-imposed and external expectations. This particular behavior of instantly reacting to received messages frequently constitutes an interruption in the knowledge workers' current workflow.

Studies indicate the harmful effects of interruptions, which increase the workers' perceived workload. Concurrently the workers experience difficulties in resuming the central task after the occurrence of an interruption [MGK08]. Spending time in emails [MIC+16] or frequently switching and checking for new messages [WKHG16] negatively affects perceived productivity. Adscititiously, Ritu Agarwal and Elena Karahanna reveal that in monotasking, it takes less time to perform a task than with task switching [AK00]. Consequently, the behavior of instantly replying to incoming communication messages, out of the time and mental costs of the belonging task- and mental context switches, will lead to a slower progression of the worker's task.

We endeavor to support the knowledge worker with more control over focus and time spent on tasks by reducing communication disruptions and context switches, ameliorating the knowledge workers' focus and workflow for a specific task.

1.2 Research Question

To address the quandary as described, we investigate the following research question:

Can we develop an approach that

1. assists the participant to focus on a specific task and

2. reduces the number of context switches during this timeframe?

These questions are central in discovering a solution to the previously stated quandary that knowledge workers frequently are interrupted and distracted while working on a task, hence slowing down the current task's progress overall. Not only do we want to find a solution that supports the worker to focus on a specific task, but concurrently reduce the number of context switches.

1.3 Related Work

Interruptions

Studies reveal that knowledge workers encounter numerous interruptions throughout their workday [CHW04] [OF95]. These interruptions seem to not only increase the perceived workload [MGK08], but research highlights the arduousness that workers have with returning to disrupted tasks following an interruption, such as an instant message, phone call, or engagement by a colleague [CCH00] [GB89] [HD94] [MC99] [McF02] [OF95].

Increasing numbers of interruptions reduce the worker's daily productivity by affecting prospective memory [OF95], which describes the failure of remembering a required task to be performed in the future [EK00].

Not only are interruptions externally generated, but workers frequently interrupt their current task by checking communication applications despite the task not requiring this operation [MVC12] [JD09] [WT12]. While Kim, Jaejeung, and Cho [KCL17] assumed that external interruptions could be easily ignored and therefore deemed unimportant, as they focus on mitigating self-interruptions or distractions, we favor the idea that the opposite is the case.

Similar works address interruptions by developing systems that indicate non-disruptive times to engage a worker derived from the worker's computer interaction data, which resulted in reduced interruptions and increased awareness of the potential interruption caused by engaging a coworker [ZMFS19].

Task Switching

Not only do knowledge workers encounter numerous interruptions, but perform significant amounts of task switching, often caused by external interruptions [CHW04]. A knowledge workers' day is additionally highly fragmented [GM04] [MGH05] [SRG15].

These task switches affect productivity, as not only have times with fewer task switches been perceived as more productive [MICJ15] [MFMZ14], or the constant switching and checking of new messages been perceived as less productive [WKHG16], but it has been shown that in monotasking, it took less time to perform a task than with task switching [AK00]. Monotasking is a tendency observed among workers, by deferring interruptions until the mental workload is minimized [SB10].

Interestingly, interaction data can be used to detect task switches of the developer automatically [MSZ+20]. There have also been approaches based on the visual prominence model to visually highlight or predict relevant open windows to reduce switches and increase focus [PRM+20].

Blocking

Blocking interruptions and sources of distractions has been attested to increase the perceived productivity of the participants [MIC17] [MVC12] [MCI18].

Blocking has been found to simultaneously lower perceived stress [KCL17], but this perception being dependant on the personality of the participant [MIC17] [MCI18].

Chapter 2

FocusSession

2.1 Approach

We list the outline of the approach used in this thesis as follows.

1. Formulate concepts
2. Develop a prototype with the concepts implemented
3. Carry out a preliminary evaluation
4. Analyze the accumulated data

The formulated concepts are ideas connected to the research question, that combined provide a solution to the stated problem in the introduction. We describe the specific set of concepts established and used in section 2.2.

This set of concepts is implemented in a prototype. It is a proof of concept, as the prototype's development will demonstrate that these concepts are not only theoretical ideas but can be applied and used in practice. We describe the development of the prototype in section 2.3.

To evaluate the usefulness of these concepts concerning our research question and its associated goal of supporting the knowledge worker, and to verify that the prototype does not only work on the author's machine and for the authors' personal needs but on different machines and different work environments, we carry out a preliminary evaluation. We cannot conduct a full study due to time constraints, but a preliminary evaluation with few participants to gather relevant data, which we describe in the next chapter 3.

Subsequently, we analyze the data gathered in connection with the research question stated, to see if we get results that hint towards the usefulness or non-usefulness of the concepts concerning our research question, or find exciting areas for future research, which outcome we describe in chapters 4 and 5 respectively.

2.2 Concepts

To assist the knowledge worker, we deem the reduction of both externally generated and self-interruptions as necessary, since both lead to a decreased progression of the workers' task, as described in section 1.3.

We reduce external interruptions by suppressing notifications of incoming messages and integrating the strategy of communicating non-disruptive times to engage the user as has been

proven to be successful in FlowLight [ZMFS19]. , simultaneously, handling existing external expectations.

To reduce self-interruptions and context switches, we increase usage-awareness of potentially distracting applications, where task-relatedness is not automatically inferred from usage data as suggested in [MSZ+20] but is assigned by the user, which possesses insight of the relatedness of applications to the task.

Since research had shown that fully blocking applications or websites has increased stress for participants with less self-control [MIC17], we chose to indicate potentially distracting applications instead of preventing its usage. Based on these ideas, we focus on the following five worked-out concepts listed and described in more detail below:

1. Focus Session
2. Notification Suppression
3. Window Flagger
4. Expectation Management
5. Focus Session Summary

Focus Session

The first concept is about creating a commitment for the knowledge worker to work on a single task during a specific fixed or flexible timeframe, called a focus session. It is the central concept, and all other concepts will be active during a focus session. These focus sessions support the worker in mentally separating between work tasks and break time, concentrating on one specific task, not getting self-distracted, while also managing time spent on tasks. A programmer could use a focus session to code a specific feature, another session to debug a specific error, and another session to respond to email-inquiries of colleagues asking about specific parts of code written by this programmer, while taking small breaks between those sessions.

We assume that certain of these tasks can be put into a specific timeframe, like replying to emails for the next 15 minutes, while others are difficult to define, like a video-conference that is allegedly set for one hour but will run as long as is needed. To accommodate this circumstance, we envision two modes for focus sessions.

The first mode is called a closed focus session, where the worker will, in advance, define a specific duration for the focus session, after which the focus session will terminate. The second mode is called an open focus session, where the worker starts a focus session for an indefinite period and commits to work on a task until manually stopping the active focus session.

Notification Suppression

The second concept is to create a distraction-free environment through suppressing notifications to decrease interruptions.

Since incoming messages might disturb the worker and draw away the workers' mental focus from the current task being worked on, we assume that suppressing these notifications will reduce the likelihood that knowledge workers switch to, and get distracted by, these communication applications. This behavior of checking the communication application after getting notified would take time away from the task by the worker reading and responding to the message, as well as the time to get into the mindset required for the previously worked on task.

While primarily meant to suppress notifications of communication applications, all notifications such as available operating system updates are deemed as potentially distracting.

Window Flagger

The third concept is about increasing usage-awareness of potentially distracting applications. Internal distractions, like the worker checking social media posts or communication applications even when not required to do so as stated in section 1.3, are not covered by the previous concept of suppressing external distractions like notifications of incoming messages. As a counter-measure, this concept is meant to flag all potentially distracting applications, increasing the knowledge workers' awareness of the usage and the potential of such applications to distract from the task.

We advocate against entirely preventing the usage of such applications, since an application might be relevant in one task, but not in another. Therefore, instead of blocking, we flag the application and let the knowledge worker decide about such an application's usage and task-relevance. This concept supports the knowledge worker to maintain focus on a task and reduce context switches by being more mindful of using such applications during a session.

Expectation Management

The fourth concept is about managing external expectations concerning message response times. A sender of a message might be expecting a response within a short timeframe, which might also be influenced by company culture or the specific work field. Especially in the information technology field, coworkers might be used to the worker always being reachable and responding quickly to messages.

These circumstances can prevent the knowledge worker to work on a specific task because of the urge to meet expectations and instantly react to received messages. In the case of notifications being suppressed as suggested, we might observe the knowledge worker's behavior of constantly manually checking communication applications during focus sessions.

To prevent the behavior mentioned above and assist the knowledge worker, we tackle expectations by explicitly communicating responsiveness. Upon receiving messages, we send an automatic reply, which explicitly states that the recipient of the message is working concentratedly on a specific task and will currently not be notified of incoming messages. After completion of the task, the recipient will be notified and respond to this received message. This gives the sender the information not to expect an immediate response. In case of a closed session, we can even communicate non-disruptive times to engage the user by including the session elapse time or how long the recipient will continue working on the task until being reachable again. Explicitly communication non-disruptive engagement times has been confirmed successful in related research as mentioned in section 1.3 and, in this case, simultaneously supplies the sender of the message with the earliest expected response time.

This concept is similar to out-of-office messages in communicating current non-reachability, but being activated and its content is generated automatically, while the worker actually is in the office working on a task, meant for the duration of minutes, never communicating full days of non-reachability. It is also similar to FlowLight [ZMFS19] in its purpose, indicating non-disruptive engagement times during work hours in the office, but through existing communication channels rather than additionally deploying a connected visual light system.

We expect this concept to have the effect of increasing awareness that sending messages to workers might generate context-switching costs for the recipient and also be a possible disturbance in the recipients' current workflow. Therefore, this concept should lead to an improved experience for both the sender, in managing their time and expectations concerning response times, and the recipient of such a message, knowing that messages are being responded to while focusing on a task.

Focus Session Summary

The last concept is about directing the knowledge workers' attention after a focus session. Since notifications of incoming messages are suppressed, the worker might feel obligated, out of curiosity, or pressured by the fear of missing out, to open all communication applications and check for potentially missed messages during the previously active focus session. Such behavior could lead to inefficient usage of time, especially in checking all these applications after many short focus sessions.

Therefore, this concept is to list any missed incoming messages during the focus session to guide the workers attention. In case of no received messages, the worker does not need to check the communication applications but can continue working with another focus session right away.

In this summary, we can also inform the worker on the amount of automatically responded messages.

The summary can also display other relevant information or statistics, like the total time of sessions run during the day.

2.3 Prototype

We built the prototype into the Personal Analytics tool, which is found on their website https://pluto.ifi.uzh.ch/PersonalAnalytics. The developers described this project in their GitHub's repository readme as quoted in the following :

> Personal Analytics project was originally initiated by Prof. Dr. Thomas Fritz and André N. Meyer from the SEAL Lab at the University of Zurich (UZH). Our goal is to build a self-monitoring tool that knowledge workers (e.g. developers, designers, administrators) install on their computer and that allows them to get insights into their work and productivity, and come up with positive behavior changes. The basis are a number of computer interaction trackers (e.g. application usage, emails/meetings, user input) and biometric trackers (e.g. Fitbit, Polar, Garmin, Muse, Tobii) that non-intrusively track data, store them locally on the users machine (to avoid privacy issues!) and then visualize them in a daily/weekly summary, the Retrospection.
>
> *- André N. Meyer, Prof. Dr. Thomas Fritz, Manuela Züger, Sebastian Müller, Chris Satterfield, Roy Rutishauser, Dr. Tom Zimmermann and Prof. Dr. Gail C. Murphy. PersonalAnalytics GitHub repository: https://github.com/sealuzh/PersonalAnalytics. Accessed September 7, 2020.*

We build upon the windows version of Personal Analytics. After a longer initial time to read and understand the existing codebase, and this application working on the Windows operating system only, the advantage of integrating our prototype into the Personal Analytics tool is that we should be able to develop our prototype faster than starting from scratch, also profiting from established routines like deployment, installation procedure and update mechanisms, as well as any already integrated functionality.

The code of PersonalAnalytics is accessible on Github under https://github.com/sealuzh/PersonalAnalytics, which we forked and built upon the dev-am branch. The developed prototype is called the PersonalAnalytics-FocusSession tool since it is an extension to the already existing tool, but will be called FocusSession for brevity.

2.3.1 Sessions

Retrospection Control View

To integrate the session concept, at first, we created a control view within the Retrospection, as shown in Figure 2.1. In this control view, we added a start and a stop button for an open focus session. Underneath, an input field for the number of minutes a closed focus session should run together with the button to start it, with the idea of also integrating a countdown display when starting a closed focus session. Furthermore, we added a section of predefined timers for a closed focus session's faster start, allowing the user to experiment with different timeframes.

The main drawback was that it took multiple seconds until the window would display when opening the Retrospection. We needed a quicker way to start a session. Therefore we moved the session controls into the context menu.

When right-clicking on the icon, the context menu presents different options. To start an open focus session, the user clicks on the first option labeled 'Start Open Focus Session'. The label of this context menu option then changes to 'Stop Closed Focus Session', which enables the user to stop the currently active open focus session. Changing the same option label also indicates that an

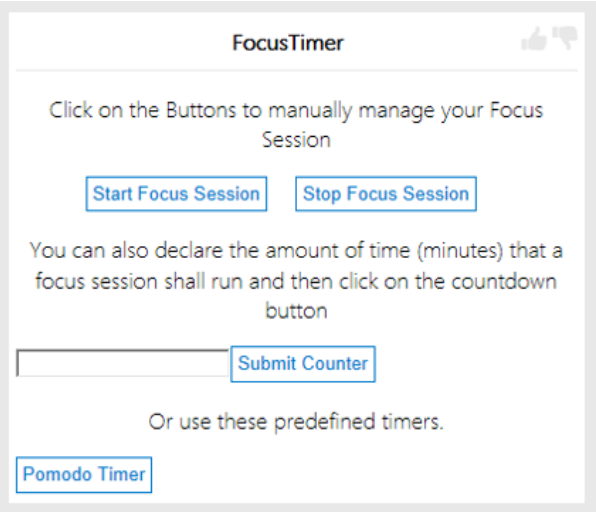

Figure 2.1: FocusTimer Control View in Retrospection

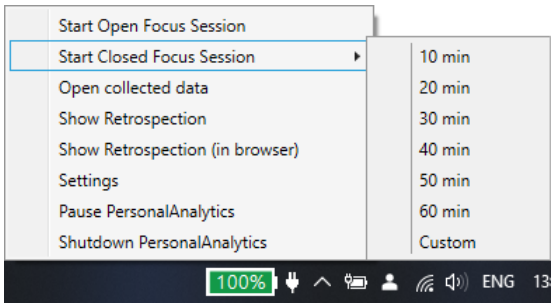

Figure 2.2: Context Menu Options: Starting A Closed Session

open focus session is currently active and prevents the user from starting another open focus session, as could previously have been attempted by having separate buttons in the Retrospection's FocusSession control view.

The second context menu option is to start a closed focus session, which, when hovering over with the mouse, will expand a submenu, as depicted in Figure 2.2. In the submenu, the user can choose predefined timers, or a custom timer, which time duration the user previously defines in the settings. When a closed session is active, the context menu option label changes to 'Cancel Closed Focus Session' with the submenu of timers removed.

Session Collision

If the user chooses to start a closed focus session while an open focus session is currently running, a message box displays an open focus session already being active. The message will adapt if the user tried to start an open focus session with a closed focus session already running.

Visibility

To increase the visibility of an active focus session without clicking on the FocusSession icon, we included an icon that appears in the taskbar when a focus session is currently active. This information icon enables the user to perceive if a session is active without interaction.

Simultaneously, we included the session time into the hover information of the FocusSession icon. The user can accordingly monitor how long an open session has already been running, or in case of a closed session, the remaining time until the session will elapse. See Figure 2.3

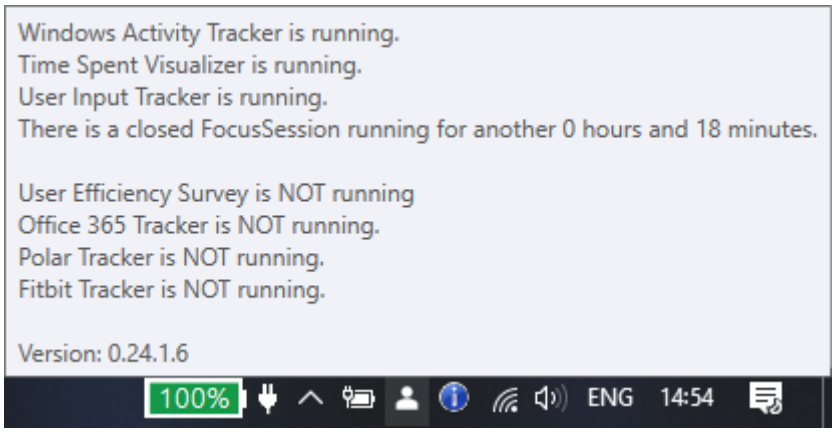

Figure 2.3: FocusSession Hover Information and Active Session Indicator Icon

Settings

As mentioned, we included the option to start a custom timer, which is definable in the settings of FocusSession, as seen in Figure 2.4.

Logging

We created a new data table to store information relating to sessions in the SQLite database, such as start time, end time, and time duration of the session, as portrayed in Figure 2.5.

Simultaneously, events like the user starting, stopping, canceling a session, or the user trying to start a focus session with another focus session already running, are recorded together with the time stamp in the log table as illustrated in Figure 2.6

2.3.2 Suppressing Notifications

When checking on how to suppress notifications on the Windows operating system to create a more distraction-free environment, we wanted to automatically enable the Windows Focus Assist feature on session start and deactivate it on session end.

Focus Assist is a feature integrated into Windows 10, which was previously known under the name of Quiet Hours. It is a feature integrated into the operating system itself, therefore having access and the ability to stop or minimize all notifications generated by applications or the operating system itself.

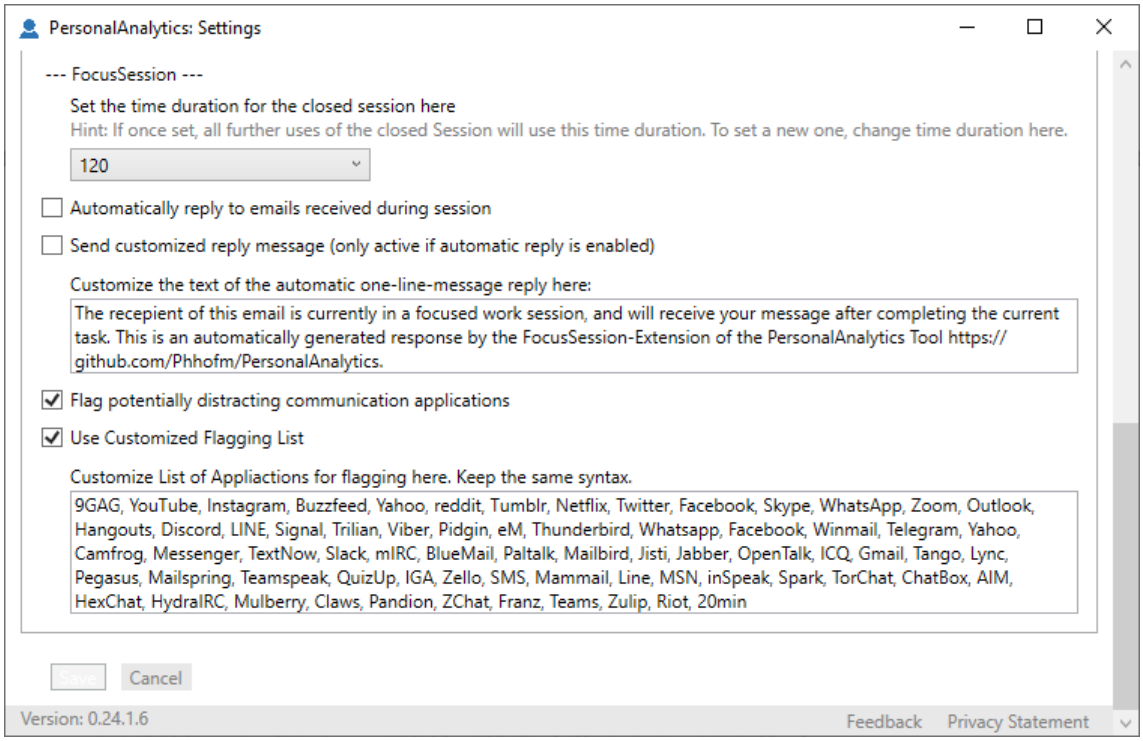

Figure 2.4: FocusSession Settings

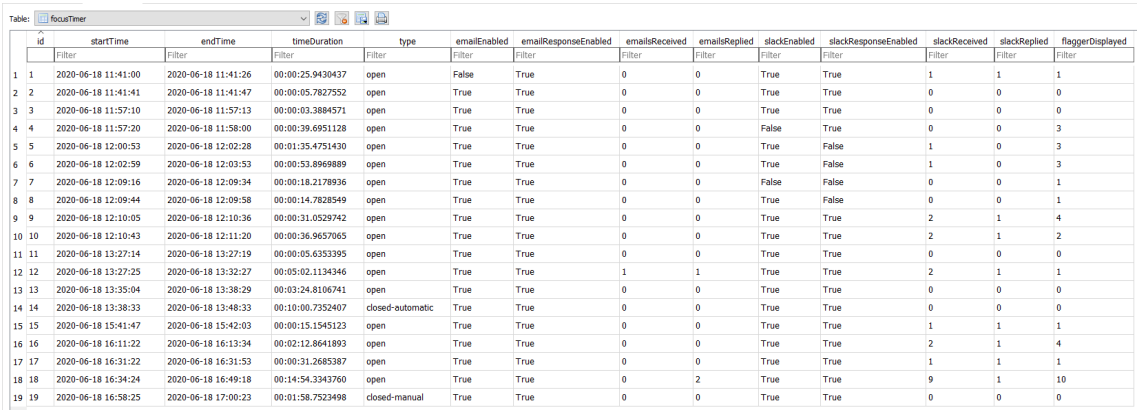

Table: focusTimer

	id	startTime	endTime	timeDuration	type	emailEnabled	emailResponseEnabled	emailsReceived	emailsReplied	slackEnabled	slackResponseEnabled	slackReceived	slackReplied	flaggerDisplayed
		Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1	1	2020-06-18 11:41:00	2020-06-18 11:41:26	00:00:25.9430437	open	False	True	0	0	True	True	1	1	1
2	2	2020-06-18 11:41:41	2020-06-18 11:41:47	00:00:05.7827552	open	True	True	0	0	True	True	0	0	0
3	3	2020-06-18 11:57:10	2020-06-18 11:57:13	00:00:03.3884571	open	True	True	0	0	True	True	0	0	0
4	4	2020-06-18 11:57:20	2020-06-18 11:58:00	00:00:39.6951128	open	True	True	0	0	False	True	0	0	3
5	5	2020-06-18 12:00:53	2020-06-18 12:02:28	00:01:35.4751430	open	True	True	0	0	True	False	1	0	3
6	6	2020-06-18 12:02:59	2020-06-18 12:03:53	00:00:53.8969889	open	True	True	0	0	True	False	1	0	3
7	7	2020-06-18 12:09:16	2020-06-18 12:09:34	00:00:18.2178936	open	True	True	0	0	False	False	0	0	1
8	8	2020-06-18 12:09:44	2020-06-18 12:09:58	00:00:14.7828549	open	True	True	0	0	True	False	0	0	1
9	9	2020-06-18 12:10:05	2020-06-18 12:10:36	00:00:31.0529742	open	True	True	0	0	True	True	2	1	4
10	10	2020-06-18 12:10:43	2020-06-18 12:11:20	00:00:36.9657065	open	True	True	0	0	True	True	2	1	2
11	11	2020-06-18 13:27:14	2020-06-18 13:27:19	00:00:05.6353395	open	True	True	0	0	True	True	0	0	0
12	12	2020-06-18 13:27:25	2020-06-18 13:32:27	00:05:02.1134346	open	True	True	1	1	True	True	2	1	1
13	13	2020-06-18 13:35:04	2020-06-18 13:38:29	00:03:24.8106741	open	True	True	0	0	True	True	0	0	0
14	14	2020-06-18 13:38:33	2020-06-18 13:48:33	00:10:00.7352407	closed-automatic	True	True	0	0	True	True	0	0	0
15	15	2020-06-18 15:41:47	2020-06-18 15:42:03	00:00:15.1545123	open	True	True	0	0	True	True	1	1	1
16	16	2020-06-18 16:11:22	2020-06-18 16:13:34	00:02:12.8641893	open	True	True	0	0	True	True	2	1	4
17	17	2020-06-18 16:31:22	2020-06-18 16:31:53	00:00:31.2685387	open	True	True	0	0	True	True	1	1	1
18	18	2020-06-18 16:34:24	2020-06-18 16:49:18	00:14:54.3343760	open	True	True	0	2	True	True	9	1	10
19	19	2020-06-18 16:58:25	2020-06-18 17:00:23	00:01:58.7523498	closed-manual	True	True	0	0	True	True	0	0	0

Figure 2.5: FocusSession SQLite FocusTimer Table

Table: log

	id	created	message	type
	...	Filter	Filter	Filter
1	1	2020-06-29 14:37:09	Opened the connection to the database (File = C:\Users\phil\AppData\Roaming\PersonalAnalytics\pa.dat).	Info
2	2	2020-06-29 14:37:26	Successfully logged in with Office 365 (as Philip Hofmann).	Info
3	3	2020-06-29 14:37:30	Successfully logged in with Office 365 (as Philip Hofmann).	Info
4	4	2020-06-29 14:37:30	TrackerManager (V?.?.?.?) started with 6 trackers: Windows Activity Tracker (3.0.7485.26311), Time Spent ...	Info
5	5	2020-06-29 14:37:32	StartSession : The participant started an openFocusSession at 29/06/2020 14:37:32	FocusInfo
6	6	2020-06-29 14:37:36	StopSession : The participant stopped an openFocusSession at 29/06/2020 14:37:36	FocusInfo
7	7	2020-06-29 14:37:36	StopSession : The session had been running for 00:00:03.9649999	FocusInfo
8	8	2020-06-29 14:37:41	StartSession : The participant started a closedFocusSession at 29/06/2020 14:37:41 for 10 minutes.	FocusInfo
9	9	2020-06-29 14:37:46	WindowFlagger : The participant opened Thunderbird and was shown the WindowFlagger Messagebox	FocusInfo
10	10	2020-06-29 14:37:46	WindowFlagger : The participant opened Thunderbird to read or reply to a message that is not task-related	FocusInfo
11	11	2020-06-29 14:37:59	WindowFlagger : The participant opened Thunderbird and was shown the WindowFlagger Messagebox	FocusInfo
12	12	2020-06-29 14:37:59	WindowFlagger : The participant opened Thunderbird to read or reply to a message that is not task-related	FocusInfo
13	13	2020-06-29 14:39:35	WindowFlagger : The participant opened Thunderbird and was shown the WindowFlagger Messagebox	FocusInfo
14	14	2020-06-29 14:39:35	WindowFlagger : The participant opened Thunderbird to read or reply to a message that is not task-related	FocusInfo
15	15	2020-06-29 14:47:42	StopSession : A closedFocusSession ran out at 29/06/2020 14:47:42	FocusInfo
16	16	2020-06-29 14:47:42	StopSession : The session had been running for 00:10:00.7134400	FocusInfo

Figure 2.6: FocusSession SQLite Log Table

Windows Focus Assist is runnable in three modes:

- Off, where the user will receive all notifications
- Priority only, where only notifications from a list of prioritized applications will be received
- Alarms only, where all notifications will be suppressed, except alarms.

The user can manually activate Windows Focus Assist in the Windows settings or in the Windows Action Center. Focus Assist can automatically trigger in certain conditions, these being when the display is duplicated, when an application runs in full-screen mode, when a game is being played, or during specific predefined hours. When searching for a programmatical way to activate Focus Assist when the user starts a session, we found out that at the time of developing FocusSession, Microsoft does not provide an API for developers to access this feature through their applications.

The next closest idea was to check the status of Focus Assist and notify the user to activate this feature when starting a session if Focus Assist is not set to Alarms only. However, since Microsoft provides no officially supported way to check the status of Focus Assist, even when finding a way to check on Focus Assist programmatically, this solution could change or break with any future update. When finding a native node module on GitHub claiming to check the current Focus Assist mode automatically, they declared in the Readme that this module could change or break anytime in the future, as can be found on https://github.com/bitdisaster/windows-focus-assist.

We eventually opted for a workaround we considered that will not break in the future unless the functionality and purpose of Focus Assist would change dramatically, not suppressing notifications anymore. This solution is merely making use of the fact that Focus Assist should suppress notifications. Instead of programmatically accessing or checking the current mode of Focus Assist, we display a notification to the user on session start that the user should set the Focus Assist to the 'Alarms only' mode, as shown in Figure 2.7.

In the case of Focus Assist already being active and working, it will suppress this notification. So instead of using a way to programmatically check the current mode of Focus Assist, which

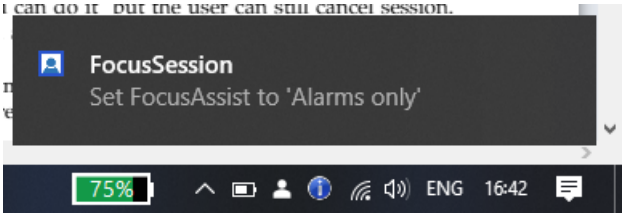

Figure 2.7: Focus Assist Set Mode Notification

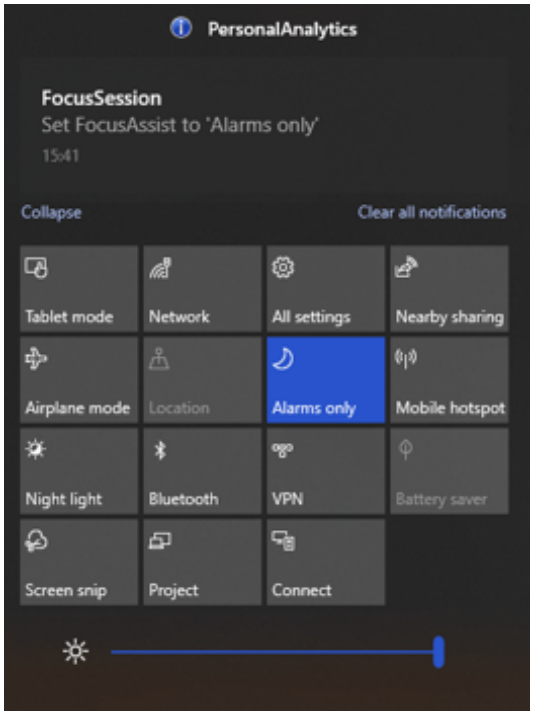

Figure 2.8: Windows Action Center Set Focus Assist

might break in the future, and to notify then the user of setting Focus Session to an active mode in case of Focus Session not being active, we simplify this process by putting out a notification always. However, if Focus Assist is working, it will not display the notification to the user. Therefore, we are using the functionality instead of using an unsupported way to check the status.

Upon seeing the notification, the user knows to set the Focus Assist in the Action Center, as shown in Figure 2.8.

With Focus Assist set to Alarms only, notifications will now be suppressed, and the user should be able to work distraction-free, protected from notifications of incoming messages or similar interruptions or distractions through notifications.

2.3.3 Window Flagger

To check for potentially distracting applications, we used a functionality already built into PersonalAnalytics, which checks the currently active application window's window title on application switching. We compiled a list of applications by browsing for popular communication applications that are used on Windows like Skype, Discord, Slack, Zoom, Line, and Teamspeak, and on each application switch, we trigger the event that checks if any of the names in this list is included in the current window title. In the case there is a match, a message box will be displayed to the user, informing that this application might be potentially distracting, saving this event in the focusTimer table and the log table. We then added a question to the message box, if this application were related to the current task being focussed on, or not, together with the user's options to click or choose the correct answer, as depicted in Figure 2.9.

This question was added with the idea that we can only flag potentially distracting applications, but we do not know of the users' working sphere, which applications are distracting, and which are needed to work on the task currently being focused on by the user. Therefore, when the user replies the application's task-relatedness, this application is whitelisted for the current session and will not be flagged again. The application will only be whitelisted for the currently running session since an application's task-relatedness can change with each session. The user can whitelist an application over all sessions by adapting the list in the settings and adding potentially distracting applications to flag. The user's reply, together with the application title, will be stored in the log table.

Since this implementation works on browser titles, we also added some potentially distracting websites to the list, such as Facebook, Instagram, Youtube, and other news or social media sites.

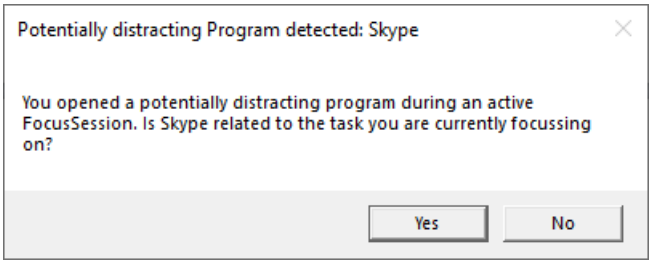

Figure 2.9: Window Flagger Messagebox

2.3.4 Expectation Management

To implement expectation management, as a proof of concept, we wanted to integrate one email service provider as well as one instant messaging communication provider.

PersonalAnalytics already having an Office365 API integrated, and the author of this thesis also using Office365 mail, therefore is this the email service provider we integrated.

Since the author has been primarily using slack for programming projects at university, having used it in the development team for ACCESS recently, which is an application developed for our master project that checks students code submissions and grades them by running their code against test-suites on the server within docker-containers, having been used by the University of Zuerich for the informatics 1 lecture where over 400 students solved their weekly exercises over a semester. Slack announced having more than 12 million active daily users in September 2019 as published on businesswire [https://www.businesswire.com/news/home/20191010005813/en/].

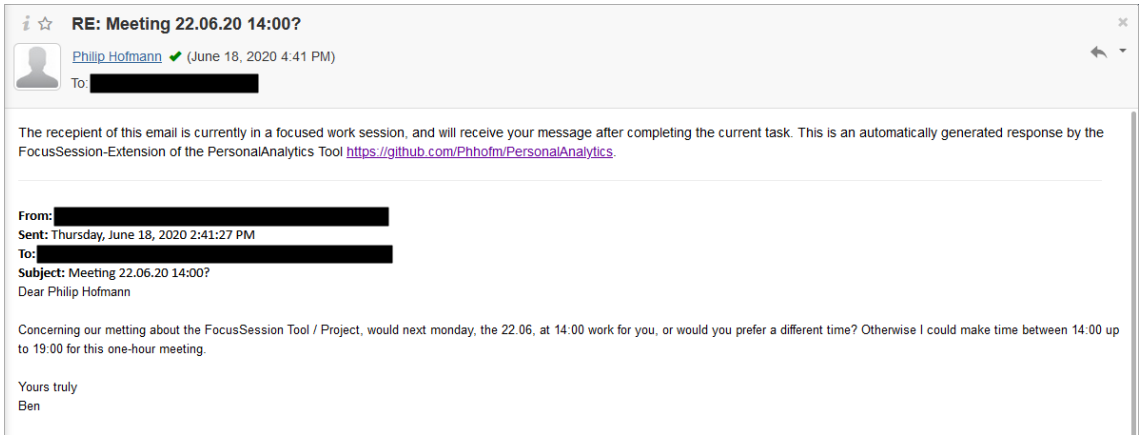

Figure 2.10: Expectation Management Automatic Email Response

Therefore, this would be the instant messaging application integrated into FocusSession.

Office365

There has already been an API and an authentication process integrated into PersonalAnalytics.

We added the functionality that if a user starts a session, FocusSession will repeatedly check in a short fixed time-interval for received messages during the session.

If a message gets received during an active session, FocusSession will send a reply message to the sender, informing the sender of the user currently focusing on a specific task by using FocusSession and therefore receiving the message delayed manner. This is depicted in Figure 2.10.

If the user is running a closed session, we added in the default message also the remaining time of the closed focus session running as in "The recipient of this email is currently in a focused work session for another " + RemainingSessionDuration + " minutes, and will receive your message after completing the current task".

We envision this to create value for the sender of the message to know when to earliest expect a response from the recipient, managing expectations and time resources accordingly. The user can overwrite this time-inclusion by enabling the prewritten but adjustable custom reply message in the settings, where also the sending of automatic replies and the checking for emails can be enabled or deactivated by the user.

Slack

To integrate slack, we included a third party .NET implementation of Slack's API written in C# on Github that can be found on https://github.com/Inumedia/SlackAPI, which supports Slack's Real-Time Messaging (RTM) API as well as their Web API.

We then created a Slack App called FocusSession and a slack workspace called FocusSession for development, and installed the app to the workspace as a bot user.

After installing the app, we get a single access token to authenticate API calls on behalf of the app.

Since there are multiple channels, we opted that the FocusSession bot needs to be added to each public channel the user wants to have managed by FocusSession. This allows the user to

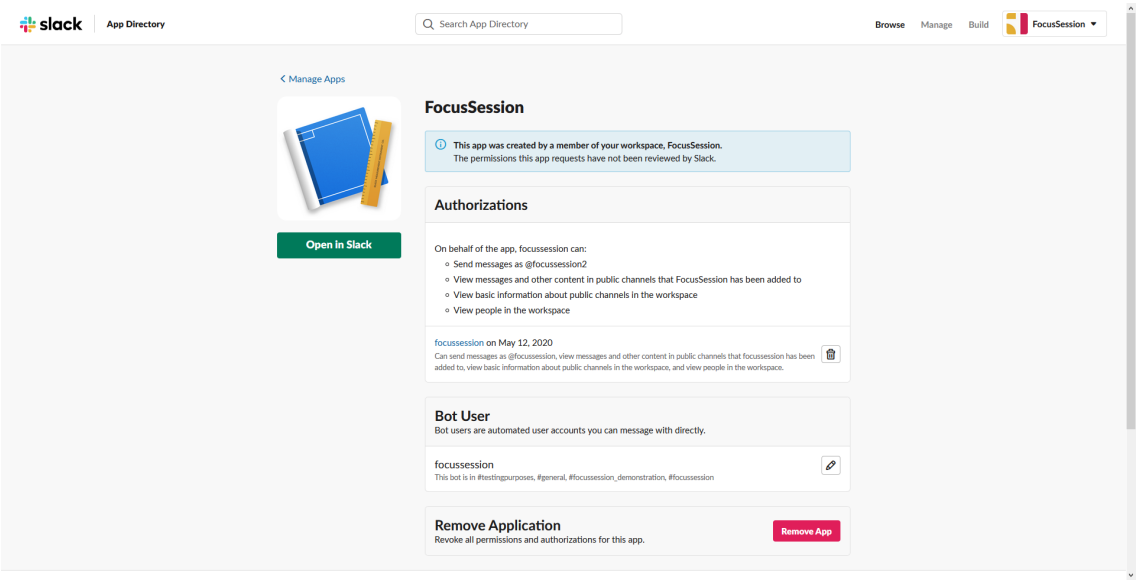

Figure 2.11: Slack FocusSession App

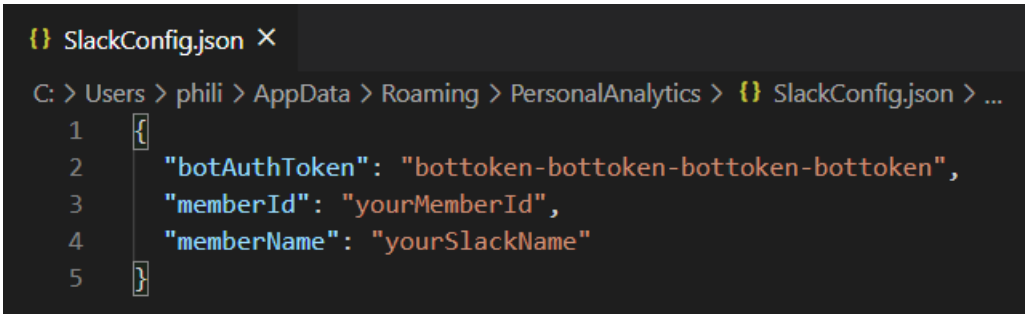

Figure 2.12: Slack Configuration

control which channels the FocusSession bot is active in, instead of instantly having the bot observe all channels existing within a workspace.

The FocusSession bot will keep track of any incoming messages during an active session in the same way the office365 expectation management works. If the user is mentioned in a message in a public channel of the workspace where the FocusSession bot is added, the bot will automatically reply with a message as showcased in Figure 2.13.

We generate a SlackConfig.json file, as seen in Figure 2.12 on startup of the application, that needs the access token to the respective workspace.

For the FocusSession bot to know what user mention to track, the user needs to add his slack member if of this workspace, as well as the Slack Member Name in order for the FocusSession Bot to mention the user in the reply message, as demonstrated in the reply message demonstration 2.13.

Every created Slack app is a single-workspace app by default, and can only be installed in the associated workspace. We activated public distribution to allow the application to be distributed to multiple workspaces through a shareable installation url and built it as a bot user to act in-

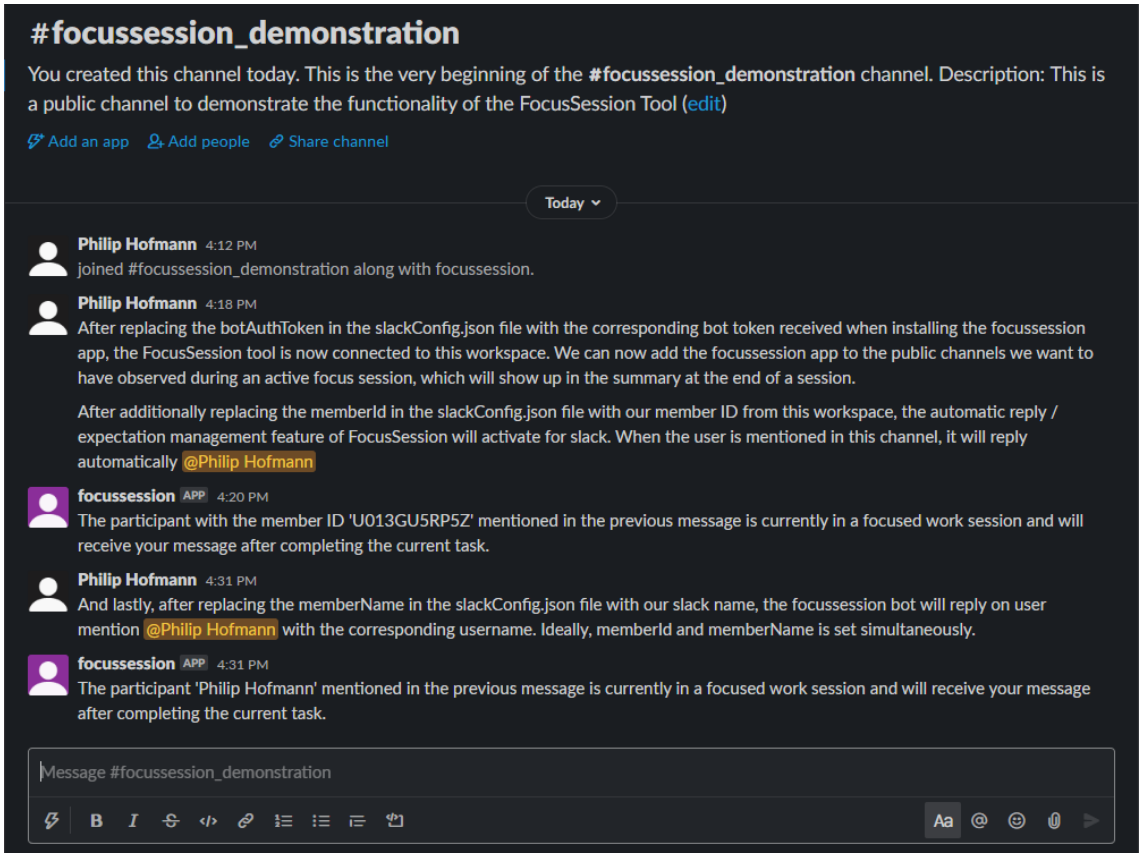

Figure 2.13: Slack Reply Demonstration

dependently of user tokens. The design of our prototype with a config file for one workspace therefore currently supports only using one workspace per user.

2.3.5 Focus Session Summary

As previously mentioned, we want to direct the users' attention at the end of a session, therefore we implemented a message box appearing displaying relevant information concerning the session run.

We show the user the session's duration, an overview of expectation management services or features used, how many messages were received or even automatically responded to, and relevant statistics, as shown in Figure 2.14.

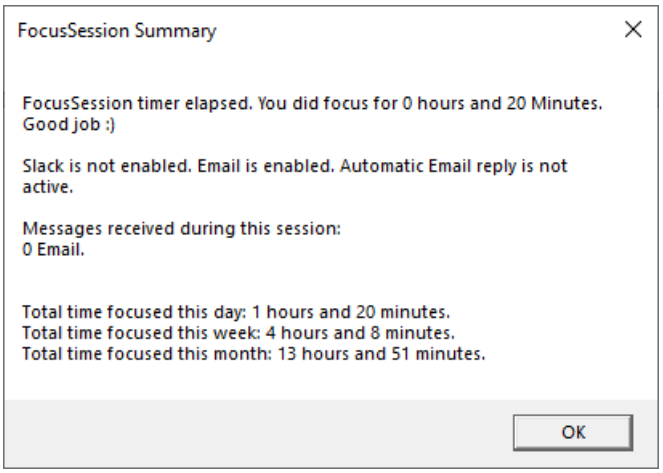

Figure 2.14: Focus Session Summary Window

2.3.6 Additional Notes

All the data gathered or generated by FocusSession can be viewed or even modified by the user when choosing the 'Open collected data' option in the context menu, which will open the corresponding folder.

We integrated a small view into the Retrospection with some statistics, as depicted in Figure 2.15.

The code of the prototype is accessible on GitHub under
https://github.com/Phhofm/PersonalAnalytics-FocusSession.

On the first start of the application, the user is greeted with views giving information or setup instructions. We adjusted these by adding relevant information.

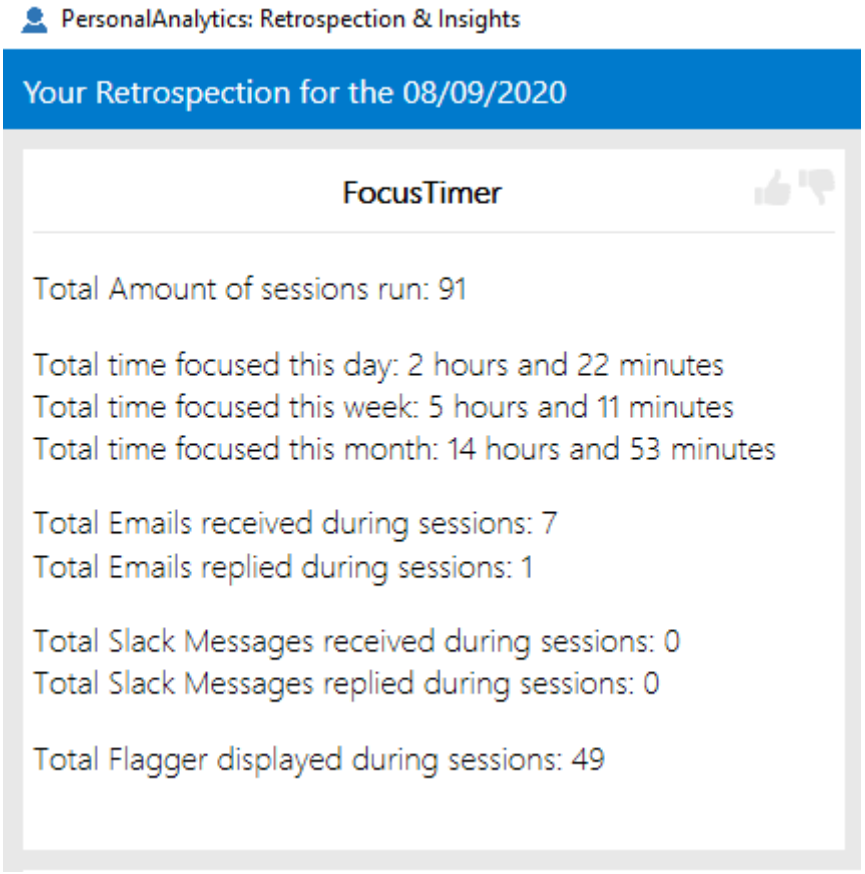

Figure 2.15: Retrospection FocusSession Info View

Chapter 3

Preliminary Evaluation

3.1 Introduction

This preliminary evaluation aims to gather data relating to the declared research question. We are interested in knowing if the tool has a measurable effect regarding those two specified questions.

FocusSession had been built with the research question in mind, being integrated into the PersonalAnalytics Tool. FocusSession lets the participant choose a specific timeframe, during which the participant commits to work and focus on a specific task.

FocusSession will help to suppress communication notifications to reduce interruptions during the related timeframe. Simultaneously, suppressing notifications obstructs the participant in instantly reading received messages, therefore expectedly reducing context switches. These messages received during a focus session can also be automatically replied to by the tool as part of the expectation management concept. Currently, the prototype supports Office 365 mail and Slack, but more apps and email-providers can be integrated in the future.

At times, receiving dozens of unread email or chat-messages might be quite overwhelming, especially when the senders expect a timely response. Responding to every inquiry within a few minutes is often infeasible and not advisable, as the worker will neglect other tasks and might be frustrated due to limited progress on those tasks. Therefore, we added an automatic reply functionality as an expectation management utility to help the participant guide the senders' expectations concerning response times.

Suppose the prototype detects a communication application opened by the participant. In that case, it will flag it as a potentially distracting application, since we recognize the participant reading or answering messages not associated with the current task as an undesired context switch.

In summary, the prototype assists the participant through the following features:

1. It supports the participant to commit working on a task for a fixed or flexible timeframe through focus sessions.
2. The participant can check the session duration in the hover information.
3. During a session, the prototype decreases interruptions of the participants' workflow by reminding them to activate Focus Assist to suppress notifications.
4. During a session, the prototype increases usage awareness by flagging and asking about task relatedness of potentially distracting communication applications and websites, expectedly decreasing context switches.
5. During a session, the prototype manages external expectations concerning the participant's response times by sending automatic message replies.

6. At the end of a session, the prototype guides the participants' attention by summarizing missed messages. If messages were received during the session, the participant knows which communication applications to check.

3.2 Procedure

We conduct an in-situ evaluation. The ideal participant works on a computer regularly and needs to focus on a specific task for a specific time duration. The requirement is that the participant uses Windows as Operating System, as this prototype was developed specifically for this platform.

It is not required for the participant to use Office365 mail or Slack, although it will increase the prototype's effectiveness since those are the services integrated for the expectation management concepts.

We ask the participant to use the prototype for three consecutive workdays, running three to four active sessions per day, preferably more.

We have a video call with the participant, ensuring that the prototype is set up correctly and running, that the data is collected, and that the participant understands how to use it. After the participant had the opportunity to use the prototype, we conduct a concluding interview video call.

For an overview, see Table 3.1.

Phase	Details
Preparation	Video call with the participant, detailed in chapter 3.3 1. Introduction and Participant Instructions 2. Demographic Survey 3. Consent Form 4. PersonalAnalytics-FocusSession Installation, Setup and Tutorial.
Evaluation	Usage of the prototype by the participant for at least three consecutive workdays.
Conclusion	1. Concluding Interview, see chapter 3.6 2. Data Collection, see chapter 3.7 3. If desired, prototype deinstallation and data removal (see 3.1)

Table 3.1: Procedure Overview Table

3.3 Evaluation Start Meeting

Introduction

The participant will be informed of this evaluation's purpose, as outlined in chapter 3.1. See also Appendix Figures 7.1, 7.2 and 7.3.

Demographic Information

The participant will be given a list of questions to fill out and return, as outlined in chapter 3.4.

Consent Form

The participant will be given the consent form to sign and return, as displayed in the Appendix Figures 7.4, 7.5 and 7.6

Installation

The participant will be guided to download and install the prototype. See chapter 3.8. The participant will also be guided in enabling and connecting the Office365 Tracker as well as Slack.

Tutorial

The participant will be guided in the usage of the tool, as outlined in chapter 3.5.

3.4 Demographic Information

We give this list to the participant to fill out and return to us to get some insight into the participants work environment

1. Name:
2. Age:
3. Male / Female / Other / Prefer not to say:
4. Occupation / Role:
5. For how many years:
6. Currently in education? What field? Highest Degree?:
7. How much time are you spending at a computer during a workday on average?:
8. How many emails or instant messages do you receive on such a day? (estimate):
9. Do you think of messages as interrupting during work?:
10. How often or quickly to you reply to messages?:
11. What do you feel is an appropriate timeframe within a message should be answered?:
12. What tool are you primarily using when working?:
13. What tools are you using for communication?

3.5 Tutorial

The tutorial aims to familiarize the participant with the functionality of the prototype. These actions are performed by the participant, which ideally shares the screen, being guided audibly. In the following, we list the steps of the tutorial:

1. If the prototype icon is in the hidden icons section of the taskbar, we have the participant drag it into the taskbar's visible section for better visibility.
2. We instruct the participant to right-click the icon -> We explain the context menu options and that only the sessions and the settings options are relevant for this evaluation.
3. We let the participant start an open session. If a notification shows about the Focus Assistant, we guide the user to set it to alarms only.
4. We draw the participants' attention to the icon showing an active session running.
5. We let the participant hover over the icon. We show the participant the indication of how long the session is running.
6. If present on the system, we let the participant open a potentially distracting application, explain the appearing message box and the options, and have the participant click on one option.
7. We let the participant stop the open session. We explain the appearing focus session summary.
8. We let the participant click on the closed session submenu and explain the options.
9. We let the participant start a 10 min closed session.
10. We let the participant hover over the icon, explain that this time it indicates how long the timer will still be running.
11. We let the participant cancel the closed session.
12. We let the participant click on Settings.
13. We explain to the participant the different options in the settings.
14. We let the participant choose a distinct time duration for the custom timer, and let the participant click save.
15. We also specifically show the window flagger application list to the participant and ask if the participant would like to extend this list by adding a specific application or website that might distract this participant. If yes, we let the participant enable the option of using the customized flagging list, add the application, and save the settings. In this case, we also let the participant test if the application gets flagged in a session.

3.6 End-Of-Evaluation Questions

We conduct a semi-structured interview with the participant at the end of the evaluation, using the following questions as a guide, but being able to deviate:

1. (General usage) Can you tell me about how you were using FocusSession? What did go well? Were there any problems?

2. (Session) Did you make use of the session functionality? Can you remember how many sessions you run per day? How did you decide whether to run a closed or open session? When having a session active, were you consciously aware that a session was running, or were you focusing on a task and forgetting about the tool? Do you remember if you ever canceled a closed session and if yes, for what reason?

3. (Hover Information) Do you remember if you used the hover information or checked for the session active icon?

4. (Timeframe) What do you feel is a good timeframe for you to focus on a specific task? Did the tool help you be more conscious about those timeframes?

5. (Communication disruptions) Do you feel that FocusSession helped reduce communication disruptions? How did the tool help or not help to reduce communication disruptions?

6. (Context switches) Did you actively use communication apps during an active session such as email or instant messaging apps? Were you more consciously using these communication apps, or did the tool not influence the use of communication apps? Did the appearing message box when opening a communication app during a FocusSession help you stay focused on the task?

7. (Automatic reply) Did you enable and use the automatic reply functionality in Slack or email? How did it work for you? Did you receive any feedback on it from your peers?

8. (Focus) Do you feel like the tool had an impact on your work or productivity? How did the tool have an impact, and what impact did it have? Did it have an impact on your focus? How did the tool have an impact on your focus? Do you think this tool could help users focus on a specific task? Do you think this tool could help reduce stress, since the tool allows integrating messaging services, automatically replying to coworkers that they are focusing and will respond later?

9. (Functionality) What do you think about the tool's functionality? Are there any features missing?

10. (General closing remarks) Do you have any other feedback on the study or tool you would like to share?

3.7 Data Collection

The data gathered consists of the participants' usage of sessions, the settings, responses to the window flagger, application window titles, and communication messages received and automatically responded. In general, all the information logged by the prototype as described in section 2.3.

To get information related to the research question and derive the usefulness of the concepts regarding the aim to support knowledge workers, we list the data points collected and their purpose in Table 3.2.

Data collected	Purpose
Session: Timestamps: Start, Stop/Cancellation. General: Type, Duration, Email enabled, Email response enabled, Emails received, Emails replied, Slack enabled, Slack response enabled, Slack received, Slack replied, number of windowFlagger message box displayed.	Evaluate tool usage. Sessions are the main functionality. How often sessions are run, for what time, what type, if canceled or ran out. Which features were active during that session, and how active they were.
Settings: Custom timer duration adjusted and how Automatic reply enabled/disabled Custom reply enabled/disabled Custom reply adjusted Flagging enabled/disabled Flagging list adjusted	Evaluate which functionality of the tool the participant uses and how (changes).
Messages Received	How many messages the tool helped suppress for the participant to focus on a task while being in an active session.
Automatically Replies Messages	How many messages the tool replied to as to manage external expectations during an active session.
Flagging Event	Evaluate how often a participant opened a potentially distracting application during an active session by how often the participant was shown the flagger message box. It is stored in the database.
Programs used	Did the participant open communication applications outside of sessions? Usage duration - did the participant leave a potentially distracting application after it had been flagged or continues usage? Is there an effect?
Flagging reply	Aligning with the concept of working spheres, we store the participants' replies to if this use of the potentially distracting application is task-related. If not, we are interested if this prompting leads the participant to close the application again, as being derivable from 'programs used' datapoints.

Table 3.2: Data Collection Overview Table

3.8 Tool Installation And Deinstallation

Installation

The participant can download the most current version of the prototype from https://pluto.ifi.uzh.ch/PersonalAnalytics-FocusSession/. The prototype is installed by running the setup.exe file. In case the installation was successful, a new icon should appear in the system tray, and a process labeled PersonalAnalytics.exe can be found in the task manager. This system tray icon can be used for all actions.

Deinstallation And Cleanup

All data stored and related to FocusSession can be found and removed under C:\Users\[user]\AppData\Roaming\PersonalAnalytics, which folder will also be opened when choosing the Open Collected Data in the context menu. The prototype's removal is done via the windows control panel under programs and features, where the application can be chosen to deinstall. Therefore the process is the same as removing any other Windows application.

3.9 Execution

After reaching out to friends, we found three participants that fulfilled the requirement of working on a Windows operating system and being willing to take part in this preliminary evaluation.

Before the Evaluation Start Meeting, we sent the participants the documents with the Participant Information, the Consent Form, and the Demographic Information questions per email. The participants replied per email with the requested information and Consent Form either before or after the meeting.

We conducted the meeting as previously outlined, using Skype or Discord. In this meeting, we agreed with the participant on the specific start date when the participant would actively use or test the prototype, and set a date for the concluding interview.

The end-of-evaluation interviews were done electronically and were recorded, as the participant had been previously informed. The participants additionally provided us with their pa.dat file, being the SQLite database file with the prototype's data. None of the participants accepted the offer of a guided deinstallation of the prototype. One participant specifically asked if it were okay to continue the usage of the prototype.

We afterward transcribed the interviews, which are included in the appendix.

After transcribing the interviews, we analyzed their content according to specific keywords, as depicted in Figure 3.1. Together with the participants' data, the findings are described in chapter 4.

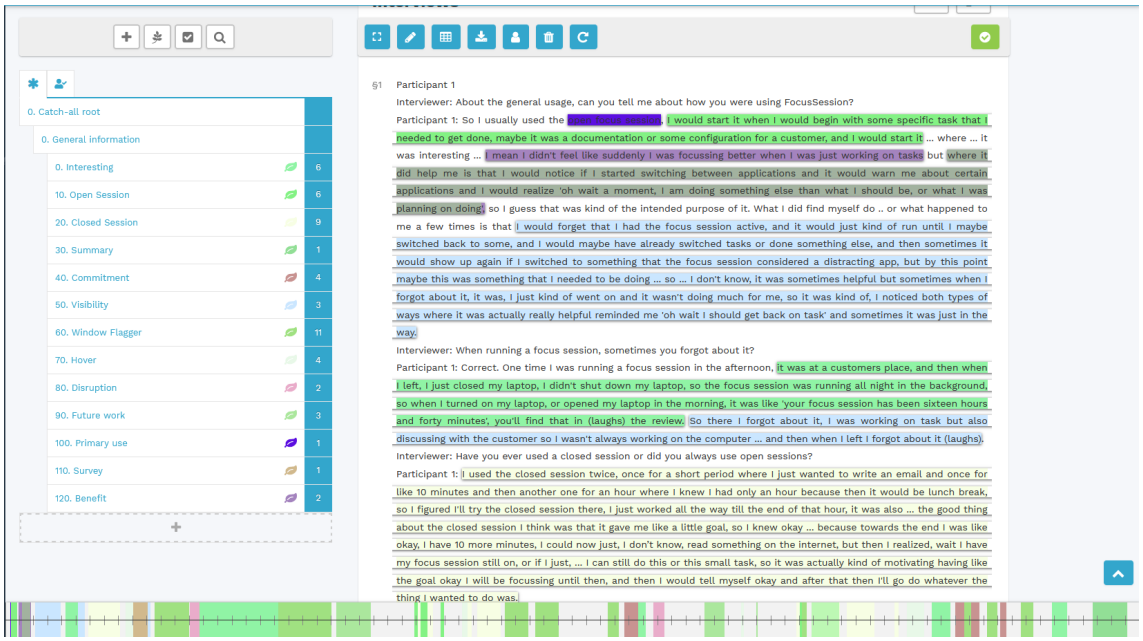

Figure 3.1: Interview Coding

Chapter 4

Results

The purpose of this preliminary evaluation was to gather information from the three participants concerning our research question:

Can we develop an approach that

1. assists the participant to focus on a specific task and
2. reduces the number of context switches during this timeframe?

We will look at those two subquestions in the following. It needs to be noted that this preliminary evaluation was done with a small sample size. General statements need to be taken very cautiously. A study with adequate sample size needs to be done to have enough data to draw general conclusions. Still, this preliminary evaluation, even with a small sample size, gave us valuable insights.

4.1 Focus

The concepts that we used to help a participant focus on a specific task during a specified timeframe were

1. sessions as a self-commitment tool
2. distraction-free environment through the use of focus assist

4.1.1 Sessions

Modes

Looking at the data, in total, the participants together ran the same amount of open sessions as closed sessions, that being 12 each out of 24 total sessions. However, there is a difference between participants, participant 1 favoring open sessions, participant 2 having around the same amount, participant 3 having twice as many closed sessions as open sessions.

Open sessions were used for more extended periods, the smallest one being 52 minutes, the longest ones over 18 hours.

Participants remarked that they would choose between the modes based on time-constraints: If they had limited time available, they would run a closed session. If they wanted to work on a task for an undefined period of time, they would choose an open session.

Participant 2 mentioned that he felt that longer session times were, in general, more beneficial than shorter ones, taking time to get into the right mindset to work on his task.

Open Focus Session

Open sessions seem prone to be forgotten: Participant 1 mentioned forgetting about an active focus session running in the afternoon while being at a customers place, and when leaving, just closing the laptop, the focus session running all night in the background, and then when opening the laptop in the morning, consequently getting the summary message of a successful focus session over 18 hours.

Participant 2 also mentioned forgetting about active open sessions, having no clear goal, being less motivated to stay concentrated. The data complement this notion with two open sessions running over 18 hours from both participants.

Closed Focus Session

The participants mentioned the closed session being perceived as more helpful than the open session, motivating them to keep on focussing on the task for the remaining time, giving them a clear time-based goal to work towards, to stay on task.

Closed Sessions, therefore, seem to help against self-distraction, as participant 1 recounted to set out to read non-task-related information, but seeing that the closed session will be running for another 10 minutes before the lunch break, deciding to use the remaining time resourcefully.

Time Management

Participant 2 deemed the sessions helpful in distinguishing between time to work and time to hang out, mentioned it was like officially saying it is time to work.

Participant 3 specifically mentioned using the closed sessions as a time-management functionality, setting the duration relating to how much time was left before an appointment, using the session elapsed message as a reminder for the upcoming appointment.

Commitment

The effectiveness of the sessions as a self-commitment functionality seems to differ for the participants. While Participant 1 did seem to see the session more as an activation function for the window flagger, in contrast, the self-commitment part of sessions to work on a task for the sessions' duration did seem to play a big role in participant 3 experience and usage of the tool, as in the interview he mentioned that the tool helped him focus even better and more, because he knew, he should, feeling a commitment to focus while a session being active.

Hover Information

Participant 2 mentioned checking the hover information often for the session duration. The other participants did not seem to use the hover information much.

4.1.2 Distraction-free Environment

It is difficult to make statements concerning the influence or effectiveness of suppressing notifications relating to the participants' focus on a specific task during a session.

Preliminary Evaluation Session Data			
Participant	1	2	3
Days used	3	6	5
Sessions Total	6	9	9
Open Sessions Total	4	5	3
Open Sessions Time	78 min 52 min 92 min >18 h	95 min 348 min 384 min >18 h 469 min	145 min 67 min 105 min
Closed Sessions Total	2	4	6
Closed-Cancelled Sessions Total	0	2	0
Closed-Cancellled Sessions Time		31 min 41 min	
Closed-Elapsed Sessions Total	2	2	6
Closed-Elapsed Sessions Time	10 min 60 min	20 min 30 min	20 min 20 min 30 min 30 min 30 min 60 min
Window Flagger Total	30	32	0

Table 4.1: Preliminary Evaluation Sessions Data Table. Sessions smaller than 10 minutes, the smallest closed session option, were excluded and regarded as test-runs.

We wanted to use the gathering of messages received, and therefore notifications suppressed, as an indicator of this concept's usefulness. The more messages a participant would have received during a session, but would not have opened the corresponding communication application, the more resourceful this feature is since a message is deemed potentially distracting from the participants' focus or workflow on a task. Since none of the participants could use the outlook365 service for emails or slack integration for slack messages, we do not have any data on how many message notifications were suppressed during a session.

We regretfully did also not measure any notifications being generated and therefore suppressed by other applications or the operating system itself, which would indicate possible distractions averted during a session. Since we do not have the data, we can only guess on the usefulness of this concept.

From the information available, we can assume that in the case of participant 1, which actively used communication applications during sessions, with the internally motivated intent of answering messages as soon as they are noticed, the suppressing of incoming messages notifications may not have an impact, since the participant checks the message inbox regularly.

In the case of Participant 3, only opening communication applications outside of sessions, the suppressing of notifications might have helped. However, it could also be the case that this participant did not receive any messages during sessions; therefore, no notifications about incoming messages being suppressed. A study would be needed, which would measure notifications suppressed and the participants' normal behavior, without this concept being active, in case of received notifications, to make a statement concerning this concepts influence the focus of a participant.

4.1.3 Conclusion

Even though results differ between the participants, we get the notion from this preliminary evaluation that the session concept does help the participants focus on a task.

While some participants mentioned that the tool helped them focus better, and even more, other participants mentioned not to suddenly feel more focused when starting a session, but it helped to use the remaining session time more productively.

While open sessions were prone to be forgotten, closed sessions were remarked as beneficial. Sessions also had the benefit of being usable as a time-management tool before appointments, and to help separate between work and break time.

From this preliminary evaluation, we cannot conclude the second concept's influence on the participants' focus on a task. An evaluation would be needed, where the participants' behavior would be observed in an environment where notifications are not suppressed and then to compare this behavior to the participants' behavior in the same environment but with suppressed notifications concerning the focus on a specific task.

4.2 Context Switches

The concepts we used to help a participant reduce context switches during a session were

1. window flagger
2. expectation management

4.2.1 Window Flagger

This concept did not seem to affect participant 3 since no potential distracting applications were opened in sessions. In contrast, both participants 1 and 2 mentioned this feature being useful, and both have around 30 flags for applications like Youtube, Skype, Discord, and Gmail.

They mentioned that this feature helped them stay on track, to move away from that application, and could help against self-interruptions. Nevertheless, both mentioned that it were easy to circumvent by just clicking that this application were not related to the current task but then to continue to use that application.

This would lead to different observed behavior. Sometimes the participant would leave the application after the window flagger displayed the message box. Other times they would continue with the use of the application. They still deemed it a useful concept because it would give them a nudge in the conscious and remind them of an active session, wanting to focus on a specific task.

Participant 1 mentioned that the answer felt too binary, wished for the choice of time-limited usefulness of the application, like that it were relevant to the task only for the next 10 minutes.

4.2.2 Expectation Management

Rather deemed a vital concept by the authors, sadly, none of the participants could use the expectation management as they used services than those integrated into this tool. A study where participants could integrate this concept would be needed to gather information on this concept's usefulness.

In the interviews, Participant 1 mentioned that he was strongly internally motivated to read and answer emails upon receival. That participant would not use the automatic email reply functionality but could see himself using it for instant messaging when working on a customer installation and not being reachable. Participant 2 mentioned this as being useful and designed for people receiving a lot of non-work-related emails. Participant 3 mentioned not using communication applications while studying.

4.2.3 Conclusion

The window flagger concept was deemed useful and accomplished its intended purpose of giving the participants the awareness of a potentially disturbing application. The participants were observed sometimes to move away from the application after the message box was displayed. Therefore we can say that this concept certainly affected context switches.

The participants had not used the expectation management concept. A study would be needed where participants could make use of this concept to evaluate its usefulness.

4.3 Other Findings

Diverse Needs

An important observation is that even in this preliminary evaluation with a small sample size of three participants, the results highly differ between the participants.

The differences are very apparent in participant 3 not having any flags during all sessions, participant 1 being internally strongly motivated to read and answer incoming emails, participant 2 favoring very long sessions. We assume that users of FocusSession will likely show very different behavior based on very different needs.

Visibility

Based on the sessions section's findings, it seems that the tool in its current state lacks visibility. Participants forget about active sessions, being reminded by the window flagger displaying a message box.

Participant 1 agreed on more visibility and reminder functions potentially being helpful.

Focus Session Summary Intrusiveness

Another finding, explicitly coming from Participant 3, was that the summary at the end of each session seemed to be motivational, encouraging the participant by showing statistics of how long the participant has been focusing so far through sessions.

It was also noted that the pop up of the message box of the summary might be too intrusive since the participant opted for open sessions when wanting not to be interrupted by the summary window.

Goal setting

According to the participants' statements, the closed focus session seemed beneficial over the open focus session because of its inherent goal setting. Goal-setting might be an essential part, and its role so far underestimated.

Breaks

The session concept had been created with somewhat shorter session times in mind, naturally giving breaks to the user. We observed participant 2 going for very long session times, therefore not having any breaks. Participant 2, in the interview, stated the desire for programmable breaks during active sessions.

Context Menu Custom Timer Option

The custom timer option does not seem to be needed when looking at the session data table 4.1. There were no closed sessions run outside of the already defined options in the context menu.

Hover Information Usage

We notice that participant 2 often used this functionality, while the other participants seldomly used this functionality.

Observer Effect

Since this preliminary evaluation was run for a brief period of only three days in mind, and the participants were aware of the tool recording data, they might have behaved differently then they would typically, or in a study over a longer time. Participant 2 mentioned this effect in the interview.

Continual Usage

None of the participants took the offer of deinstalling the program after the preliminary evaluation ended. Participant 3 even specifically asked if it were okay to continue to use the program as it helps him for his exam preparations.

Chapter 5

Discussion And Future Work

Study Needed

The preliminary evaluation, with its small sample size of three participants, gave us some insights into exciting areas that would need to be further researched. Especially concerning the expectation management concept, we do not gain any relevant insight from this preliminary evaluation, since none of the participants could make use of this feature. The more communication services like Gmail, Discord, Skype, and others are integrated, the higher the likelihood that participants could make use of this concept, but we need to be mindful of companies running their own email servers.

In general, we need to note that a preliminary evaluation is not enough. A well-defined study would need to be done, with a more significant sample size, and over an extended timeperiod, where especially also the participants would be observed in their everyday working behavior and then observed actively making use of this tool to have comparable data on the influence of this tool on a single knowledge worker.

Expectation Management

Even though none of the participants could use the expectation management concept, in the interviews, participant 3 remarked not using communication applications at all while using our tool. Participant 1 addressed not wanting to use the email reply function even if available, but maybe using it for instant communication services. Participant 2 stated that it might be useful for knowledge workers that get interrupted by non-work related emails.

It seems that the participants are cautious about the usage or the usefulness of such a feature. As already stated, a study with a bigger sample size would be needed, but it could be that our underlying assumption of such a concept being resourceful to most knowledge workers might be wrong. It might also be the case that this concept might only be beneficial in specific circumstances, like being dependant on the users' behavior/personality or the users' job requirements. This would need to be included in a future study design.

The expectation management concept could also be used, since it integrates with communication services, to interact with the distraction-free environment concept. We could provide the user with the option to whitelist individual addresses, such as an essential coworker on a shared project or a romantic partner, to inform the user of an incoming message from such an address even during an active focus session.

Additionally, a specific keyword could be set, which would inform the user of any incoming message having that keyword in its content. The automatic reply could inform the sender of the recipient being in a focus session, but sending another message with this specific keyword

would inform the recipient of this message, which could be used in case of urgencies. This would also cover cases where it is important for the user to receive a message during an active focus session but not having whitelisted the senders' address. These extensions could be necessary for work environments where still getting instantly notified about messages from specific addresses or reachability of the user in case of urgency is required.

As stated, we assume that the more services are integrated, the higher the chance the user can use this concept; therefore, integrating more communication services in the future could be helpful.

Profiles To Adress Diverse Needs

An important point is that in this evaluation with three participants, for each, the results were different. Different behaviors seem to involve different needs concerning the FocusSession approach. Participant 3 has only seen the window flagger notification during the setup-interview, but never during the evaluation, whereas Participant 1 deemed it the most useful feature.

We also see differences in session-usage; participant 2 noting in the interview that short sessions were not worth it, wishing for more extended closed session options in the context menu, and also wishing for programmable breaks because of the long session duration, while Participant 3 planned his sessions with breaks after session end in mind.

This could be used to work out different profiles for the FocusSession approach, relating to the different types and their respective needs. Those profiles could be used by the workers when installing the tool for a quick definition of the settings and features.

There might be the communication-work sphere type, were responding to messages is considered belonging to the work sphere, either since the job requires it or because of the worker's intrinsic motivation. There, context-switches belonging to communication applications would not be deemed distracting but as important, removing communication applications from the flagging list, not suppressing those notifications, and actively informing the user about incoming messages with connected services. Whereas participant 3 would be a no-communications type, where all communications applications should be included in the flagging list, and all notifications concerning messages suppressed.

There might be a long session type, where we could exchange the closed session options with longer session times, starting with 60 minutes and increasing by 30 min intervals. Also, have programmable breaks active, where the tool itself suggests a break to the worker each x minutes during a session. Default x minutes can be chosen by related research based on the average optimal break times for a knowledge worker, but of course, be adjustable by the worker. These breaks could even suggest a specific activity, like to stand up and take a short walk.

These would be initial profiles to be chosen by the worker on the tool's setup, but they need to be more defined and then evaluated in future work.

Binary Window Flagger

As stated by participant 1, we could include the option in the window flagger to make an application task-relevant but for a limited time within that session.

Currently, if the user states that this application is task-relevant, it will be whitelisted for that whole session. If the user would want to only use the application for a limited time, but still want the application to be flagged within that session, the only option currently would be to answer that the application were not task-relevant, but to continue using it for the timeframe deemed relevant before switching to other applications. Such behavior could lead to many flags, where the participant assigns non-task-relevance to the application but does not move away from it after the message box appeared.

Another phenomenon we have seen in the preliminary evaluation was the participants presumably using background music while working on a task. Participant 1 used youtube music, sometimes moves away, sometimes stayed, but we do not track applications being active in the background. Therefore, adding an option that an application were not task-relevant but simultaneously not interfering with a task, like listening to background music while working on a task, where the application would be whitelisted for that session, would be required for this case.

It could be that the window flagger also invites self-reflection of application usage behavior and reflection upon what belongs to a task and what not.

Visibility And Goal Setting

It seems that goal setting and visibility are essential and are lacking in the current implementation, as it is also apparent by participants forgetting about an open session being active.

Visibility could be increased by enhancing the window flagger concept with a visual labeling indicator. Specifically, we could make groups of applications, like communication applications, productivity applications, as PersonalAnalytics is already doing, but then give visual clues to the user by coloring the application window's border with a specific color-coding. Productivity applications could receive a light blue color, while communication applications listed as potentially distracting might receive a bright red border. If the user whitelists that application for that session, its border color would change to light green. All communication applications not listed as potentially distracting might receive an orange border. The whole idea behind these visual clues is that it not only increases awareness of the types of applications used, but it increases visibility, indicating to the user that a session is being active without checking for the icon in the system tray.

Since participants mentioned being more aware of a closed session being active than an open session, both having the same visibility, goal setting seems to be a crucial part of the users' awareness of the session. We could implement additional labeling of tasks, where the knowledge worker previously to starting a session would need to label that session with its intended purpose or goal of the specific task being worked on.

Additionally, we could also increase the session's visibility and goal by displaying the session time or remaining session time together with its label, either in the taskbar or in a small overlay always being on top.

Learning Algorithm

As of participant 1's suggestion, this tool could be enhanced with learning algorithms, like automatically adjusting the window flagger list.

If the user assigns a flagged program as being task-relevant often, the tool could suggest removing that application from the potentially distracting applications list automatically. In contrast, if an application gets often used outside of sessions, but seldomly inside sessions, this might hint towards that application being non-work related, and further input of the user could be inquired if this application should be added to the list of potentially distracting applications.

Also, the tool could observe which applications get used the most during active focus sessions. If such an application gets opened and worked in, after a timeframe of, for example, 5 minutes, the tool might show a tooltip suggesting to the user to start a focus session for this task, which would serve as a session reminder functionality but also increase the visibility of the tool.

Interesting for user awareness and self-monitoring could be to measure session times, display the average session time in open focus sessions, or which closed focus session time is the most used, during what time of the day such sessions typically are run, and if there is a pattern between weekdays and session-modes and session types. In this way, we could not only suggest starting a

focus session based on application but based on session history and time-of-day relevance, which would especially favor recurring appointments, like for example, the user always having a skype-meeting at 9 am on Wednesdays for an hour, which could be done in a focus session.

Also, an interaction with a calendar would be interesting, where, for example, meetings are marked, and the tool automatically starts a focus session or suggests starting a focus session based on calendar entries.

Breaks Inclusion

As we have seen participant 2 running long sessions, we could include a break suggestion feature in the tool.

Breaks might play an essential role in the workers' ability to focus on a task, as there has undoubtedly already been much research done on this field. Based on that research, we could set a timeframe, after which the tool will suggest taking a break together with suggestions that might also improve the workers' well-being, like 'how about standing up and drinking some water'? We need to be careful when including such features not to disturb the user of the tool in active focus sessions, as we try to support the users by suppressing distractions. When an opportune time is and how to engage the user would be necessary research to implement this feature.

Session Elapsion Intrusiveness

The focus session summary has been described as motivational, but it has also been described as too intrusive by participant 3. Sessions are meant to support the user to focus on a task, but not to disturb the user on elapsing in a closed session.

A less intrusive way, by showing a tooltip with information, but not overlapping the active window with a message box, could be tested.

If activated, the summary currently shows how many emails have been missed in an integer value, but does not hint towards importance. If we include how many of these messages have an 'importance' flag set, who the sender was, or what the subject is, the user might decide if these messages were important to be checked now or could be checked later, after another focus session.

Cross-Platform Synchronization

Currently, this application is only designed for the Windows operating system. Since the author, his coworkers, and some friends who were asked to participate in the preliminary evaluation use a Linux system at work, an application that could be used cross-platform would be helpful. The operating system seems like a big hurdle for the usage of this tool.

Another compelling aspect for the future would also be to have a mobile application of this tool, synchronizing mobile and desktop systems. The user could currently start a focus session on the desktop system, but still be interrupted by incoming messages on the mobile phone. A synchronized system, where the start of a focus session would also activate a focus session on all other connected devices, like tablets and mobile phones, would more throughly support the user, since we acknowledge that users often have multiple electronical devices that could act as a potential disturbance of the users goal to focus on a specific task for a specific time duration.

Observer Effect

Something else that is important to note and that Participant 2 mentioned that the observer effect might influence this evaluation since the participants were aware that the tool would record the

window titles of the applications they were actively using. Participant 2 mentioned that he felt observed, and this might lead to a change in behavior. The concise duration of this evaluation of three days could favor a behavior change based on the knowledge of being observed and the data being recorded. A study with a longer duration would be needed to thwart this effect.

Custom Timer

Looking at the Session Data Table, the custom timer option does not appear to have been needed in this preliminary evaluation. This could hint towards the process of changing into the options and setting the custom timer there to be too cumbersome. It is also possible that it be sufficient to extend the custom timer options with some more, longer session durations, wherewith the custom timer functionality could be removed from the tool.

Brain-dump Functionality

An idea could also be to test out a brain-dump functionality at session end or at break time. Then the tool suggests a break, or a closed session elapsed, the user might still have some thoughts or ideas to work on, so before doing any break activity, the user might appreciate having a text field to enter those thoughts, which can after break-activity be revisited by the user, either before or at the start of a new focus session.

Chapter 6

Conclusion

After establishing a set of concepts to support knowledge workers by reducing interruptions and context switches, we demonstrated through the development of the PersonalAnalytics-FocusSession prototype, that these theoretical concepts are implementable and usable in practice.

The subsequent preliminary evaluation validated that the tool works for different participants and their respective environments. Although the sample size of the preliminary evaluation with three participants was small, and generalizations based on this data needs to be taken cautiously, still, the information gathered allowed us to gain relevant insights.

In the interviews, the participants noted the closed focus session being helpful and motivating, giving a time-based goal to stay focused on a specific task for the active session's remaining time, therefore influencing focus duration. The participants stated the window flagger concept to be helpful, motivating them to move away from the potentially distracting application opened. Since none of the participants used the expectation management, further research is required to evaluate this concept's usefulness. The participants showed diverse results, which individuality leads to the idea that different profiles could be created according to accommodate different needs. Another finding was that the prototype seems to lack visibility and goal-setting functionality specifically.

Overall, the participants deemed the PersonalAnalytics-FocusSession prototype useful, and none took the offer to deinstall it. Participant 3 explicitly asking to be able to continue the usage of the program for exam preparations.

As a summary of contributions, we established a specific set of concepts to support knowledge workers to focus on a specific task: focus sessions, notification suppression, window flagger, expectation management, and the focus session summary to direct the workers' attention after a focus session.

We proved that these are not just theoretical concepts but can be implemented and used in practice by developing the PersonalAnalytics-FocusSession prototype.

In the consecutive preliminary evaluation, we found exciting areas to research and focus on in subsequent research or studies, like integrating different profiles to address users' different needs.

Chapter 7

Appendix

7.1 Preliminary Evaluation Documents

The Participant Instructions given to the participants in advance to the evaluation start meeting are displayed with Figures 7.1, 7.2 and 7.3 on the following pages. Figures 7.4, 7.5 and 7.6 show the consent form given to the participants, which they signed and returned to us.

Software Evolution and Architecture Lab

University of Zürich
Department of Informatics
Binzmühlestrasse 14
CH-8050 Zürich

Contact Person:
Prof. Dr. Thomas
Fritz Tel: +41 44 635
67 32 fritz@ifi.uzh.ch

A preliminary evaluation of PersonalAnalytics-FocusSession

Principal Investigator
Philip Hofmann, Master Student at the Department of Informatics, University of Zurich (philip.hofmann@uzh.ch)
Supervision
André Meyer, Postdoc at the Department of Informatics, University of Zurich (ameyer@ifi.uzh.ch)
Prof. Dr. Thomas Fritz, Department of Informatics, University of Zurich (fritz@ifi.uzh.ch)

Evaluation Information

First and foremost, we thank you for participating in this preliminary evaluation. This evaluation is meant to give us early insights into how well FocusSession works, if the approach chosen could have the desired effect, and if further research in this research might be valuable. The next paragraph will explain more about FocusSession.

We knowledge workers often focus on a specific task at hand but get interrupted by external influences like inquiries from co-workers through incoming messages. Sometimes we also distract ourselves by curiosity, communicating with others, researching a peculiar thing not directly necessary for finishing the task, losing time in potentially distracting applications or on websites.

The FocusSession tool we developed aims to support knowledge workers in these circumstances. It **will support you in working on a specific task, more focused, less distracted**.

The basic concept behind FocusSession is units we call "focused work sessions". You can use them whenever you want to focus on a specific task that you need to get done with no or as little as possible interruptions and distractions.

The basic concept of FocusSession is the use of “focused work sessions”. You can make use of them to focus on a specific task that you need to get done with as little as possible interruptions and distractions. During the evaluation phase, you can start these sessions by right-clicking on the task tray icon and selecting to either start an open focus session or a closed focus session. A closed focus session runs for a predefined period of time, while an open focus session runs until you decide to stop it. During such a session, the tool can support your commitment of working focused on your respective task by suppressing distracting notifications, display a summary of where you missed how many messages, flag distracting applications and replying to received messages, thereby informing the

Figure 7.1: Preliminary Evaluation Participant Instructions Page 1

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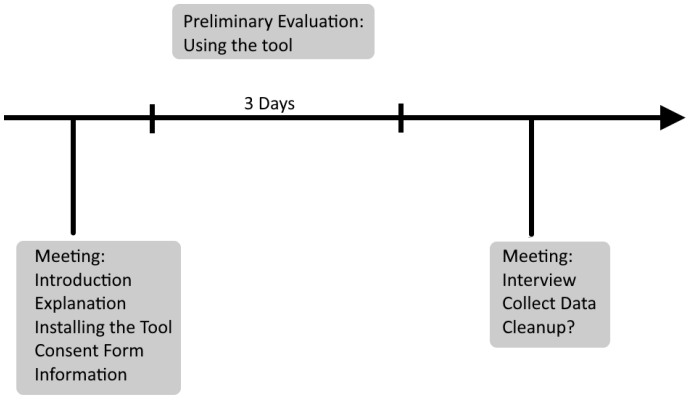
sender that you are currently focusing on a task and managing their expectations. In the current state, Microsoft Outlook and Slack are integrated as supported communication channels to observe for received messages, but more email-providers and communication applications can be integrated into the FocusSession tool in the future.

In summary, the FocusSession tool aims to support you to better focus on a task with the following features:

- FocusSession **helps you commit working on assigned tasks for a fixed or flexible time period** with active focus sessions.
- During a session, the tool will **support you being less distracted by suppressing notifications**.
- Also during a session, the tool will **increase your self-awareness of the usage of applications** by **flagging potentially distracting applications**.
- Additionally, the tool **manages the expectations of those sending you messages**, concerning when they can expect a response from you earliest, **by sending automatic message replies**.
- Conveniently, at the ending of a session, **the tool gives you information on where you missed how many messages**. This gives you the information if you need to check certain communication applications, or if you can continue working on your task with another focus session right away. You do not need to manually check your communication programs.

Evaluation Procedure



We start with an introductory **meeting**, where we explain the whole purpose of this evaluation and answer questions. **You will sign a consent form**, stating that we will collect data like for example your usage of FocusSession. We will **install PersonalAnalytics – FocusSession version** and will **guide you through the usage and functionality of FocusSession**. There will also be **questions about your demographic data** like education and age.

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Figure 7.2: Preliminary Evaluation Participant Instructions Page 2

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You will then have the opportunity to **use the tool for three consecutive days**. We ask you to **run three to four sessions per day**, preferably more.

After those three days, we will have another **meeting**, where **I will ask you questions** about the usage of the tool, and ask you to **send me data gathered by the tool** about its usage. If desired, I will help you uninstall the tool and clean up the data.

Both those meeting should be around 30 minutes. Please note that you have no obligation to participate and you may decide to terminate your participation at any time.

Privacy of Your Data

- Identifiable data will only be stored for 90 days before either being de-identified or deleted. Until you share the data with the research team, data collected by the PersonalAnalytics tool will initially be stored on your local machine only.
- You will be identified by pseudonyms in any internal or academic research publication or presentation. Your data will be used and seen only by researchers directly involved with this project.
- Data-transfer: At the end of the evaluation we will ask you to share the collected data with us.
- Please find all details in the **consent form**.

Uninstalling PersonalAnalytics and Access to Your Data

This section only applies to you if you agree to install PersonalAnalytics-FocusSession

- In case of **issues**, please send us an email with a short description of the issue and we will support you. Please locate and attach the "errors.log" file that can be found when you right click on the system tray icon and click "open tracked data" (the path is: "C:\Users\[Username]\AppData\Roaming\PersonalAnalytics".
- In case of troubles, you can uninstall PersonalAnalytics any time through the usual "repair or remove programs" option on Windows (http://windows.microsoft.com/en-us/windows-10/repair-or-removeprograms).

In case you have any questions, please contact Philip Hofmann (philip.hofmann@uzh.ch).

Figure 7.3: Preliminary Evaluation Participant Instructions Page 3

Software Evolution and Architecture Lab

University of Zürich
Department of Informatics
Binzmühlestrasse 14
CH-8050 Zürich

Contact Person:
Prof. Dr. Thomas Fritz
Tel: +41 44 635 67 32
fritz@ifi.uzh.ch

Consent Form "A preliminary evaluation of PersonalAnalytics-FocusSession"

Principal Investigator
Philip Hofmann, Master Student at the Department of Informatics, University of Zurich (philip.hofmann@uzh.ch)
Supervision
André Meyer, Postdoc at the Department of Informatics, University of Zurich (ameyer@ifi.uzh.ch)
Prof. Dr. Thomas Fritz, Department of Informatics, University of Zurich (fritz@ifi.uzh.ch)

Purpose
The FocusSession tool we developed aims to support knowledge workers in these circumstances. It will support you in working on a specific task, more focused, less distracted. This preliminary evaluation is meant to give us early insights into how well FocusSession works, if the approach chosen could have the desired effect, and if further research in this research might be valuable.

Preliminary Evaluation Procedure
Overall, the evaluation spans across three to four days and consists of the following three steps:

1. An introduction, in which you will be asked questions on demographics, that will take no more than 15 minutes. At the end of the introduction, we will ask you to **install and run our tool called PersonalAnalytics-FocusSession on your computer**. PersonalAnalytics-FocusSession is a monitoring and productivity tool that we've built that runs in the background and tracks your interaction with the computer, including program usage (e.g. "Visual Studio" or "Chrome"), the window titles of your programs (e.g. "Document 1 – Microsoft Word", "Project 1 – Github – Google Chrome"), your mouse and keyboard input (no keylogging!), and (optionally) meeting and email information. Also timestamps on active focus session use, together with relevant settings and windowFlagging. All collected data is stored locally. Therefor you are be able to review the data collected. You will share this data with us at the end of the evaluation.

2. During three consecutive days, we ask you to continue your work, using the functionality provided by PersonalAnalytics-FocusSession. Use focus work sessions to support you in your work, three to four per day, but feel free to make use of more sessions as it will give us additional data to work with.

3. To wrap-up the evaluation, we will **interview** you about your learnings, experience and suggestions for future tool support. In the interview, we will also ask you to send the data collected to us. The interview will take no longer than 30-45 minutes.

Benefits and Risks
By participating in this preliminary evaluation, you will be able to get to know the PersonalAnalytics-FocusSession tool, which might increase your productive time use as a productivity tool. You might learn more about your work behavior, gain more awareness of potentially distracting applications used, gain insight into the habit of working in focused time sessions. Since FocusSession is built ontop of PersonalAnalytics, which is a monitoring tool, you will have the chance to learn more about your work habits and behavior at work, how you can deal with unproductive times/habits, and **increase your satisfaction and productivity**. In the long term, you may benefit from better productivity tools, because the results of this evaluation will be used to

Figure 7.4: Preliminary Evaluation Consent Form Page 1

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inform the design of software to better reflect on productivity and identify and achieve goals that increase your productivity.

The main risk is the loss of time required to participate in the evaluation. We estimate the total amount of time required to participate in the preliminary evaluation to be around 1 hour, consisting of the Introduction and the concluding interview. We are mitigating this risk by allowing you to determine a suitable time for the evaluation participation as well as the final interview. Furthermore, you are free to withdraw from participation at any point during the evaluation, without the need to provide a reason.

Personal Information

During the project, we will collect personal information about you such as your name, email, gender, and age. Some of the data collected by PersonalAnalytics-FocusSession may contain personal information (e.g., the window titles of active applications). For our research, we will only use your anonymized data and no identifying information will be shared outside of the research group without your explicit permission. The identifiable data will only be stored for 1 year before either being de-identified or deleted.

Data, Storage & Confidentiality

The **computer interaction data** that PersonalAnalytics-FocusSession captures is saved locally on your computer. Since it is stored locally, you can review all data collected at any time. You will share this data with us at the end of the evaluation. The **final interview** audio recording will be transcribed by one of the researchers. After the transcriptions, the audio recording will be deleted.

You will be identified by pseudonyms in any internal or academic research publication or presentation. Your data will be used and seen only by researchers directly involved with this project.

Uses of the Evaluation Data

The results of this evaluation will appear in the master thesis belonging to this evaluation. It might potentially appear in both internal and external academic research presentations and publications, such as academic journals and conference proceedings.

Contact for Information about the Evaluation

If you have any questions or desire further information with respect to the evaluation, you may contact Philip Hofmann (philip.hofmann@uzh.ch).

Figure 7.5: Preliminary Evaluation Consent Form Page 2

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Consent for Evaluation Participation

Your participation in this preliminary evaluation, is entirely voluntary. You are free to withdraw your participation at any point during the evaluation, without needing to provide any reason. Any information you contribute up to your withdrawal will be retained and used in this evaluation, unless you request otherwise.

With your signature on this form you confirm the following statements:

- An researcher explained the evaluation and the listed conditions to me. I had the opportunity to ask questions. I understood the answers and accept them.
- I am at least 18 years old.
- I had enough time to make the decision to participate and I agree to the participation.

In no way does this waive your legal rights or release the researchers or involved institutions from their legal or professional responsibilities.

_____

Participant's name

_____ _____

Location, Date Participant's signature

Figure 7.6: Preliminary Evaluation Consent Form Page 3

7.2 Transcripts

Participant 1

Interviewer About the general usage, can you tell me about how you were using FocusSession?

Participant So I usually used the open focus session, I would start it when I would begin with some specific task that I needed to get done, maybe it was a documentation or some configuration for a customer, and I would start it ... where ... it was interesting ... I mean I didn't feel like suddenly I was focussing better when I was just working on tasks but where it did help me is that I would notice if I started switching between applications and it would warn me about certain applications and I would realize 'oh wait a moment, I am doing something else than what I should be, or what I was planning on doing', so I guess that was kind of the intended purpose of it. What I did find myself do .. or what happened to me a few times is that I would forget that I had the focus session active, and it would just kind of run until I maybe switched back to some, and I would maybe have already switched tasks or done something else, and then sometimes it would show up again if I switched to something that the focus session considered a distracting app, but by this point maybe this was something that I needed to be doing ... so ... I don't know, it was sometimes helpful but sometimes when I forgot about it, it was, I just kind of went on and it wasn't doing much for me, so it was kind of, I noticed both types of ways where it was actually really helpful reminded me 'oh wait I should get back on task' and sometimes it was just in the way.

Interviewer When running a focus session, sometimes you forgot about it?

Participant Correct. One time I was running a focus session in the afternoon, it was at a customers place, and then when I left, I just closed my laptop, I didn't shut down my laptop, so the focus session was running all night in the background, so when I turned on my laptop, or opened my laptop in the morning, it was like 'your focus session has been sixteen hours and forty minutes', you'll find that in (laughs) the review. So there I forgot about it, I was working on task but also discussing with the customer so I wasn't always working on the computer ... and then when I left I forgot about it (laughs).

Interviewer Have you ever used a closed session or did you always use open sessions?

Participant I used the closed session twice, once for a short period where I just wanted to write an email and once for like 10 minutes and then another one for an hour where I knew I had only an hour because then it would be lunch break, so I figured I'll try the closed session there, I just worked all the way till the end of that hour, it was also ... the good thing about the closed session I think was that it gave me like a little goal, so I knew okay ... because towards the end I was like okay, I have 10 more minutes, I could now just, I don't know, read something on the internet, but then I realized, wait I have my focus session still on, or if I just, ... I can still do this or this small task, so it was actually kind of motivating having like the goal okay I will be focussing until then, and then I would tell myself okay and after that then I'll go do whatever the thing I wanted to do was.

Interviewer Concerning that, when you hover over the icon, it shows you how long the session has been running, have you ever used that?

Participant I did use it a few times, I would look at it, what I found very helpful in general one in reminding me to use the focus sessions and two in reminding me that I was actually in a focus session, both things, just reminding me of the tool was the little mini-surveys that would pop up, ... they would remind me 'oh wait I have this tool I can use it', because, I mean, sometimes I would be working and I could have made it a focus session because I was already working focusedly again, but then the pop-up would show up and I'm like 'oh yeah, I have this tool and I could activate it now', so I thought that was very helpful.

Interviewer So more visibility and reminder functions are helpful.

Participant Yeah

Interviewer Another question, do you think the tool helped reduce disruptions or interruptions?

Participant ... I am not sure (laughs). It helped me ... sometimes it helped me when I was really just kind of, ... say maybe I was getting bored with a task and I would start drifting off into looking at chats or whatever, and then it would remind me 'oh wait a second, get back on task', but other times ... I mean ... if I was determined to ignore it I easily ignored it, I would just like click things away, so I had sessions where, though I wouldn't say that every time I opened a chat app or something it would ask me 'is this relevant for your task?' and then I would always say no, but then I would just keep using that, and other times it would motivate me to move away from that app, so I guess it could help, or it helped me when I wanted it to help me, but it was very easy to ignore, but maybe that is also good because you don't want it to be annoying, so ... What it didn't help me with was getting distracted by emails and stuff, though the email app wasn't in there, my working method .. the way I work is too dependent on email and on reacting usually very quickly to email, so ... there were maybe sometimes I should ignore it I found that I couldn't ignore mails so I would react usually very quickly to emails and it would interrupt certain other workflows sometimes.

Interviewer You say in your case like with communication interruptions like email it didn't help because your workflow is too dependent on it?

Participant Yes, and my nature. I couldn't stop myself .. (laughs) .. like if I saw that something was there I needed to engage with it. I think sometimes it would have been good to have ignored it so I could finish some tasks but my nature wouldn't allow me to do it or I didn't really want to ... so it's both, sometimes it was important for .. just to know what I needed to do for my workflow but sometimes it was my nature of not wanting to ignore it so I wouldn't. And then sometimes I would realize that because of the email I would drift away from the task that I had set myself and I would be doing something completely different maybe answering an email or working on something that was mentioned in the email ... would be work-related but off-topic from what my initial intention was.

Interviewer Is responding to these emails internally motivated, like you think emails should be responded fast or is it expectations from your coworkers to get an answer fast from you?

Participant No its internally motivated usually because, ... there is no ... not that that I've realized, if people want a quick answer, we have an internal .. we have skype for business for chatting, so that is what we would use or we would call, we have an easy phone call culture because we work so dezentralized, so its, we'll usually make a quick phone call or chat message if we want quick answers, mails are not necessarily supposed to be a quick way of answering but its internally motivatied on my part like once i get that information its usually something that is important for some taks or some project that im working on ans I want to either get that done or .. its important that I figure something out, and I have a strong motivation to always have an empty inbox .. so like I sort all my email that I have figured out, I sort it into different folders and so its my goal to always have zero unread emails in my inbox (laughs), so there is that internal motivation, i dont want it there because it feels like something in the back on my head bothering me, if I dont work on it.10:23

Interviewer From what you have said, I think the window flagger was the feature that helped you the most?

Participant Mhm

Interviewer What do you think about the tool's functionality in general, and is there maybe a feature that you think would have helped?

Participant Well ... one thing that I did notice, the window flagger thing where it asks is this relevant for your task ... sometimes it felt too binary for me because I would be like, especially like the email app, I left it on the list of apps where it should ask me .. but sometimes it felt like I

would have liked a third button where it says like 'yes this is important for my task for the next 5 or 10 minutes' so it would ask me again later on because maybe I just needed to do this one thing but then I didn't want to use that app again and so I found myself sometimes just saying 'no' because I wanted to get that reminder the next time I went into the app because I knew I just needed to do this one small thing and I thought would have been nice maybe to say for the next 10 minutes or something like that ... it felt too binary ... and ... I don't know ... I never went back into the settings to adjust which apps it would remind me with or ask me about and which ones it wouldn't. I don't know why because there was, like skype I should have taken out because skype is a tool that I am always using for work, but I don't know if the settings were too convoluted for me, or I don't know why I didn't, couldn't change it ...

Interviewer Thank you. For closing remarks, do you have any other feedback on the study or tool that you would like to share?

Participant I think I like the tool, I think it has potential .. one area that I would find interesting to explore maybe for you or for the future if this tool would be developed further is a learning algorithm in it, I don't know if that's something you thought about ... so it learns my habits, especially which apps that I use frequently that I would like, add apps or remove apps from the flagging list, I would find that to be a useful tool because then I don't have to manually think about it it would just like, maybe after a few days, it would say 'hey we noticed that you used this app a lot during your focus sessions is this something that you use for work' or something like that and I could then add it ... I don't know ... and of course, I think more integrations would be ... I would have liked to have tried the mail integration or the chat integration, but my tools weren't once that you could integrate so more integrations I think would always be interesting

Interviewer Do you think it would have made a difference if you had the options to show how many messages you have missed and maybe use an automatic reply function for communication messages?

Participant Mmh .. I wouldn't have used an automatic reply for email because there is no expectation for an immediate response and I think it would have been more confusing for the other person ... possibly in a chat, that would have been ... interesting, I might have tried using that for say if I .. I wouldn't use it every day but it would be something that I could use in, say when I have a customer installation day where I have to focus on that customer, that installation for half a day or a day, and I don't want any distractions then that would be something I would see myself using, yes.

Interviewer Thank you so much for the interview. Thank you for participating.

Participant You're welcome. Thank you for giving me the chance, it was interesting.

Participant 2

Interviewer My first question is, can you tell me about how you were using FocusSession, like what did go well, and were there any problems?

Participant A few times I used, well I varied between using the open focus session and the closed one. I would use the open focus session if I just had a day ahead and just needed to work on something, and if I only had a few minutes or an hour, for example, I would use the closed one. But I noticed that if I used the open one, I would be less motivated to stay concentrated. So after a while, I would, because you don't have the time constraint that much, so I just would dwindle off, and I noticed that having a closed focus session was more helpful in that way, to really concentrate until the time is up, and then take a break.

Interviewer When you said you had a session active, during that time, were you consciously aware that there was an active session running?

Participant Yes, especially if it was a closed one, then I was quite aware of it. I think when it was an open one, after a while, I might forget, and then suddenly remember again.

Interviewer When you had such a session running, through the hover icon, you can check for information of like how long the session has been running already, have you ever used that functionality?

Participant You are breaking off, I can't quite hear you ...

[participant could not hear the interviewer, the interview continues after we resolved this technical issue]

Interviewer Concerning the hover icon information, where it shows how long a session has been running, have you ever used that?

Participant Yes, I would regularly go hover over the icon to see how long I've been at it, or how long I've still to go if it was a closed focus session.

Interviewer And you said, a closed session was motivating for you to keep on?

Participant Yes, It was more motivating, yea

Interviewer What do you feel is a good timeframe for you to focus on a specific session, like did you use similar timeframes for your tasks?

Participant The one I used now and again was the one-hour timeframe, I think I would have liked to use because I at first didn't find the function for two hours, I would have liked to use one and a half hours for example or maybe even two hours as a time frame, but i think, the bigger ones work better for me yea. I think if they are too short, I guess I felt it wasn't worth it. Because I think also my tasks that I have been working on are just something that takes a while to get into before you get work done, so it would take like 10 minutes for me to start thinking about it to really start being able to get work done, and so at least an hour would be effective

Interviewer Then a question about interruptions, do you feel like the tool helped reduce interruptions/disruptions?

Participant Yes I think it somewhat did, I mean, especially just going on youtube, for example, you would have the message there just reminding you that this is a dodgy website and asking you whether or not its part of your task. What I noticed also is I think also the thought that all of the windows are being recorded, that probably also helped not to open random windows, you know, so you don't want to have cat videos showing up in data, its a bit embarrassing you know, so I don't know, maybe you'll even have some websites in there you'll be asking yourself what in the world is going on there, I think that's also part of the motivation to stay concentrated on a task

Interviewer You mentioned window flagger functionality, did you feel that was useful? Did the window popping up help you stay focussed and not go into specific applications?

Participant Yea I think it helped a bit it just gives you one last reminder, you really sure you want to let yourself be distracted here? So I'd say it was a help, of course, it didn't stop me all the way, if I really wanted to be distracted I just go for it, but I think, the good thing about the thing is you have to be honest to yourself because you have to answer the question is this really part of your task, and so, I would just click no, because it really wasn't, but sometimes I would just stay there and watch something even tho it wasn't really part of what I was trying to concentrate on, so its a help even if it was just a bit of a nudge in the conscious

Interviewer Then another question about communication apps, did you use email or communication apps during such sessions?

Participant Sometimes yes I did, but I tried to only do it if I had a certain email that I had to go look for my task, something to look up, but also I would try to close them down cause usually maybe you know how it is like usually when you open up an email app you just leave it open forever and with the window tracking in mind I would try to close all windows that I didn't need at that very moment which would then help with not going back on it whenever you see it so I think that helped a bit too.

Interviewer Do you feel like your use of communication applications like email, that the tool actually helped you reduce to stay in such applications during a session?

Participant I think because there is also the function that would actually tie into your windows

account right?, the windows email, and since I used Gmail so it only gives me the usual window tracker notice, and so I guess, yea I stopped me, it helped me do it a bit less but not all the way. Does that answer the question? Maybe I didn't quite hear some of the question maybe

Interviewer Yea, it did answer the question. My question was also if, compared to your normal behavior, if during sessions you were less in email applications or more aware of email applications?

Participant I think because windows would not tell me when I get new emails, so I wouldn't get distracted by new emails anyway unless I have the tab open, and the window tracker helped me to remember to just close down the tabs when I was done looking for an email that I needed and then I would be less disturbed by it.

Interviewer Then in general, if you feel like the tool had an impact on your productivity or your work? If the tool had an impact, what was that impact?

Participant I think, as I said, the bigger impact was when I used the closed focus session, but even so it was good to have a reminder, I think also it helps to, you know, once you turn on the focus session, its like official saying its time to work, and then also if you turn it off again, it makes a clear difference between while working and while just hanging out. I think that helps as well. Otherwise, I think part of the effect was just also because it was part of this study, to know what I'm doing will be kind off seen also, its basically like the Heisenberg effect, ... , its a bit of adding there too.

Interviewer Then I ask in general, do you feel like the tool, in general, could be useful, also if you don't feel observed by me? Do you think the tool would be helpful in focussing on tasks?

Participant I think so. I think, it kinda also depends on what your task looks like. I think it was especially designed for people who are often interrupted by emails that dont really have anything to do with what they are supposed to be doing, right, and, of course if they have an email that they can tie into that, even better ... for me, my tasks have lots to do with research now and again, so I would have to go just research things on the web and so actually I notices a lot of websites werent getting flagged that I had to just, for example i mean jstar for example, maybe you know jstar, i had to go on there and that didnt get flagged at all so that was nice i think, but yea, i think it did help me be a bit more productive, i think, even, i would imagine, what would be maybe even cooler if there would be some expansion on the different times you could choose, and then even if you could, you know if you could customize it all, for exmpale, going an hour, and then, it sais, you know, 10 minutes break, for example, and then it starts again, you know, if you could, if there were more customizable options in that sense, thats how i would see it maybe be even more effective. But I guess it also depends on how you work, what your workflow is, and how easily distractible you are.

Interviewer Concerning the tool's functionality, if you feel there are any features missing? So you mentioned a break like a programmable break would be nice?

Participant Yea, if you could have an open focus session that would go say sixty minutes and then have a ten-minute break or so and you could like customize that, at least for me, I think that would have been helpful, or at least help a bit more, I think that would be a pretty cool feature. ... I think there would be a lot of, maybe looking into more of, like work sociology right, looking at how long people are good at focussing, what kind of breaks are good, and so like looking at that, and maybe go with some of these theories would make it even more effective.

Interviewer Then, those were most of the questions I had, my last question is, do you .. if you have any other feedback on the study or tool that you would like to share?

Participant let's see .. it was just the custom button didn't seem to work as I expected it to work, but now that I tried the settings that worked but its still, I guess custom is a bit misleading if you can't make more or a different timeframe. Otherwise, I think its a well-made program, its good to have like the hover function to see how long you still have to go, yea and of course if you have the office365 tracker in there that might have been even more effective for people who use

that, yea I'm trying to think what other feedback I could give you

Interviewer For the custom, you would like to have more options?

Participant I think that would be quite interesting yea if you could have more customization options. That including making room for a break, you know people who, I'm sure there are app on the phone that people use for that, but yeah that might be, and then you could have maybe during that break like the emails it tells you what kind of emails that came in, if you have that, you know, that office Microsoft email plugin in there, yea I could imagine if you had more customization options, that could be quite effective.

Interviewer Well that's it for the interview, thank you for participating

Participant Your welcome, no worries.

Participant 3

Interviewer My first question is about the general usage of FocusSession. Could you tell me about how you were using FocusSession? What did go well, were there any problems?

Participant There were not really any problems, it worked really well. I just used the closed or open focus session when I needed to focus on my learning that I have to do for my exams. It always went well. With the closed focus session, it was perfectly telling me when it was over and I could take a break. And the open focus session was also working perfectly. Also, all the messages that you get if you open another program if you really need to use it during your focus session. Was everything great.

Interviewer You said you made use of the session functionality. Can you remember how many sessions you ran per day in average?

Participant In average ... it differs quite much because some days I just use an open session because I have time to learn for hours and hours and I don't want to get interrupted even by the message that a closed session is over, so I just keep it open to just focus for some hours, and then we just have like two or three open sessions a day, but then I had, for example, two days ago, I just had time when I needed to do some things during the day, where I had some appointments, and so I could just learn like 20 or 30 minutes in between, and so I had like 6 or 7 closed sessions during the day, all over the place, from early morning till evening. But like the average from all days were like 5, 6 maybe sessions that I had in average, but it can differ very much from like one or two to like seven to eight.

Interviewer How did you decide to run a closed or open session? You said it was dependant on the timeframe you had available, and also that the closed session would feel disruptive?

Participant Yes exactly, well just that you have the message that comes up that you are finished with your closed session again. But it's perfect that you can use it, that you don't have to look at the time all the time during the learning, that you don't have to look at the watch like every five minutes because you have an appointment or something, that you can have the closed session that tells you when the time is over, and so we can focus during the whole time really well. And the open session is really when you just want to learn for, well it was for me like this, I just wanted to learn for some hours, and then I just open an open focus session, that was like, how I made the difference if I would take an open or a closed focus session yea, was just the timeframe.

Interviewer When you had an active session running, were you consciously aware that there was a session running, or did you sometimes forget about it?

Participant No, I was aware of it, like all the time, like almost all the time yea. Because it was just stuck in my mind, that's why it was more helping, because I just knew that I had it open, and I really need to focus and do my work and my learning.

Interviewer If you had a closed session running, there is also the option to cancel it. Do you remember, did you ever cancel a closed session, and if yes ...

Participant No, I never canceled a closed session, because I always really knew that I have enough time if I took a closed session.

Interviewer A question about the hover information. When you hover over the icon, it shows you how much time is still remaining. Did you ever use that hover information, did you look at the time sometimes?

Participant Yea once. Once I looked on the time to see how much time I had left because I wanted to stop learning, I had enough for the day, but it was like I need to do some, so I was just finishing it. But mostly, like I said before, it was just relieving to not always have to look at the time and not miss any appointments because I knew I would get a message if the time is over and I wasn't always like, focussing from one point to another because I didn't have to check the time all the time.

Interviewer When you used the tool, did you have like a preference timeframe? Do you feel like there is a timeframe that works best for you, or do you think that is always dependant on the task that you are doing?

Participant I think it is dependant on the task that you have to do, on what you have to do if you have to work or to learn or to focus on anything else, and it is also very individual, because I am very good at learning, or I learn very well in the morning, or early afternoons, around lunchtime or later when it comes to the evening, I am really bad at it, but you have people that are very good at it, so .. but for me, it was early morning, like nine o clock to eleven o clock, and then early afternoon from three to like five pm.

Interviewer A question about disruptions, do you feel like FocusSession helped reduce disruptions when you used it?

Participant Yea, like I had that little thing before I said, it helped me mostly because I knew that it was active. So that's very funny, that in my time of learning and using it right now because it just helped me focus even better and more because I knew, I should. It was always reminding me of 'I really need to' and it wasn't really that I opened up other programs and it was telling me 'do you really need to use it' or 'please keep concentrating', it was just that I knew I had it on and I made it on so I had to focus, and it was just always a reminder for myself to 'you need to focus, learn right now. Do it now, and don't stop it and lose your focus on the things that you do'.

Interviewer Okay, so you would say the tool had an impact on your focus and productivity ...

Participant Yea I would really say so

Interviewer .. did it improve your focus during a focus session? Did it help you?

Participant Yes, well just in that way that I said before that I just could better focus because I knew, I wanted to, and that the program would just like .. fought me, so to say, if I wanted to do something else. So it would just really help me to focus on my studies, and to keep learning for my exams.

Interviewer So you felt a commitment when you used the sessions.

Participant Exactly yea, that's a good description, commitment is the right word for that. It was just the awareness that the program was on, that I used it, that I focussed more.

Interviewer Can I ask about communication applications, did you use like email programs or messaging apps or something on your computer during such sessions?

Participant No, fortunately not. Fortunately, I can just learn by myself, but you have many people that need to have something up like that, that they require to work, but for me just studying I could do it by myself so I was perfectly fine

Interviewer Then a quick question about the window flagging, when you were using sessions, did ever a message pop up about an application being potentially distracting? And if yes, did it have an influence on you?

Participant No, I can't remember having anything like that, it was always going perfectly, quiet, it was going great for me to just study.

Interviewer Just a general question about the tool's functionality, what do you think about the tool's functionality? Are there any features missing, things that you would have liked to have?

Participant Not anything that comes to my mind right now. Like I said, for me, it worked perfectly well and was a great tool to use for me because I am always very easily distracted.

Interviewer A question about the closed focus sessions, the available timeframes there, did you feel like they were sufficient choices?

Participant Yea, for me it was perfect to just have like twenty or thirty minutes or forty minutes because you have a time where you can concentrate really well as a human being but then you need some breaks in between, and I think up to an hour is really good, but sometimes like I said I always if I needed more or I did more, I was just going for an open focus session even though you can't focus over all that time that great, just when you need to if I wanted to study longer in a row I just used the open focus session because then I didn't have use for a closed session, and even if you needed one exact time for an appointment or something you can do your custom closed session the time that you need then, but for my usage, it was great to have those, I used always twenty to forty minutes, those were the once I used most.

Interviewer If I remember correctly we didn't use any email functionality in your case?

Participant Yes.

Interviewer At the end of your session, there was always a summary popping up, repeating the time that you focussed on, and how long you were focussing for the week. What do you think about that summary?

Participant For me, it was very motivating. Sometimes when you just are doing your work or studying or whatever you do, you lose the grip of time and you can't remember, you don't really feel like it was that much time that passed by, or maybe it felt like a lot or anything, but in the end, you can always be proud of what you did and see what you did, so it was great for me to see well yea, I did some work, I did some studying, I did something, I really had some time that I just focussed on my studies, and that I improved, and that I could do something, so for me, it was really motivating to see ah I did some, two hours or fifteen minutes or anything, or how much I did during the week or even in a month. So I found this quite helping yea because it gave me motivation, also helpful after your studies because then you are mostly the least motivated. When you just study you are like down, but this helped me look at the bright side and see how much I did and that was great.

Interviewer Then we would come to the closing of the interview. My last question is if you have any other feedback or thoughts that you wanted to share concerning this study

Participant No I don't really have anything else to say

Interviewer Then I thank you for participating

Participant Was a pleasure

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