Striving with Online Addiction with a Self-Control Chrome Extension

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***Abstract*—In this paper, we examine a problem of addictive IT services and discuss existing tools for human self-control and self-assessment. Current web technologies support simple on-demand access to various media streaming services. Despite evident positive factors of such entertainment product delivery methods (no downloading is required, media content is accessible anywhere), there are concerns about their addictiveness. As a response to this problem there are time-management tools helping the users to set their short- and long-term goals and to follow them. One significant drawback of existing tools is their focus on blocking access to a service rather than on cooperating with a user by attempting to switch users' attention away from an addictive product. We discuss possible scenarios for such a commitment tool implemented as a Google Chrome browser extension for managing time spent on TV-series online streaming services.**

I. Introduction

One of evident problems of IT addiction is that many technologies are developed so as to be addictive [1]. The main focus of this work is not a highly discussed concern of social impact of technology addiction (when people spend much time on social media, online services, or repeatedly checking emails and websites). Instead we address such possible negative implications as reducing or interrupting user concentration for more important tasks [2], [3].

Creating interfaces that are dynamically adjusted to the user behavior is one of trends in the current agenda of human-computer interaction (HCI) and ambient intelligence systems. However, such an adjustment (primarily targeting better and easier access to information services) might sometimes provoke a type of addictive behavior. In contrast to current design trends, convenient tools and interfaces (designed as effort- and time-saving artifacts) may hide the benefits of tools that seem to be inconvenient and old-fashioned: ambient interfaces should not only provide convenience, but also prevent deterioration of user abilities [4].

Let us take an example of online video streaming services (like online cinemas, TV-series streaming sites, or YouTube). In the past, people enjoyed watching TV series with fewer risks to have a threat of losing the grip of their own lives. Comparing to modern times (when video content is available on a TV company website at almost any time from almost any place and on almost any device), imperfectness of older technology had some reasonable advantages. A TV fan was able to watch a favorite movie only at the exact time it was scheduled. When a show is over, it is over: there is no other choice but to stop watching and to switch to some other activity.

The ways we watch TV nowadays changed dramatically with the introduction of web activities moving the users away from a "regular" TV to other media-based solutions. As noted by Vignaroli et al., "TV-Web convergence is much more than placing a Web browser into a TV set or putting TV content into a Web media player" [5]. Specifically, a technology of online video streaming yet gives individuals much more features, but triggers a harmful impact. An individual seems to control completely the process, but in fact one might lose control over other important activities: being embraced by the watching process, one can no longer make rational tradeoffs in time. Short term (present) preference satisfaction dominates the longer-term preferences. Hence, a loss of ability to make a rational choice over a set of user's initial preferences or plans. While proactive services are designed with an idea of being unobtrusive and naturally integrated with the user identity and context [6], there are situations when user behavior becomes depending more on the momentary reasons than on the pre-thought-out plans.

Our hypothesis is that poor information about the possible harmfulness of an addictive activity leads to greater effects of potential addiction. Therefore, an idea of emerging self-control and self-assessment tools is to struggle with such addictive behavior symptoms without completely locking access to a potentially addictive service, but with a behavioral control procedure for rational human decisions at each decision making point in time, and for forcing the users to commit to the plan they chose initially. A possible solution is to implement a mechanism keeping users away from service consumption for some reasonable time in order to separate the decision moment from the consumption time.

II. Related Work

There is a few of tools developed for managing personal preferences while accessing websites. Here we briefly review

some of these tools.

1) *SelfControl* application [7] uses a straightforward approach of blocking access to the resources considered addictive. A user selects the desired (or rather undesired) websites and sets a blocking time period. This approach corresponds to the filtering-based self-control [8]. Despite its highly restrictive nature, the application is very popular. Having in mind that there is a few similar applications available on the market, we can conclude that such types of solutions really respond to the needs of those users who are anxious about their excessive web addiction.

2) Developers of *Freedom* application [9] started with an idea of a tool helping to break the most harmful habits. On the basis of user defined schedule, the application supports such features as block list assignments for any type of smart devices, adding websites and apps to the custom lists, using some pre-defined blocks, or blocking Internet access entirely.

3) *Forest* project [10] uses quite a different approach, being a kind of investment model implementation. Instead of blocking access, the application helps the user to stay away from the smart devices while doing some work. The solution is available as an application for different mobile platforms and as a Firefox extension. In the beginning the user sets the desired cut-off time, and the application blocks the screen with an image of a just planted tree. Then the tree is growing, but it will be killed as soon as the user unblocks the screen. A very promising feature is an image of a forest of trees providing application usage statistics. Thus, the users are able to analyze how successful were their attempts to concentrate on the work. This way, the approach primarily appeals to user own responsibility. There is one problem which is not resolved by this approach: the work activities may require access to a smart device or to a browser, so it could not be used as a solution for redirecting user attention from a particular online activity, it can only restrict all of them.

We recognize the need to switch user attention away from the addictive activity by reminding them of their own goals, and we also make use of people's tendency to stick to the activity that they have invested into. So rather than limiting people, we aim to let them learn how to overcome the limitations of addictive services and go back to their long-term interests.

III. TV Series Streaming Self-Control Chrome Extension

There is a number of popular video-on-demand services like Netflix, Twitch, YouTube and HBO that support unlimited online streaming. We implemented two simple prototypes aiming at reducing time spent on uncontrollable watch of TV series.

In our prototypes, we make an effort to implement two self-control models. The first one (called here a *hard self-control*) requires the user to set a time limit before using the streaming service. As soon as the time is over, all open tabs are killed in a browser (we use Google Chrome in the current implementation). The second one (*soft self-control*) counts the number of times that a user successfully overcomes own addiction and asks whether the user is going to beat the achieved record. Despite the different ways to strive with online addiction used in these scenarios, we expect that both would help the users in their behavior self-control. So the primary goal of our experiments is to find out which method helps people control their behavior better: either strict blocking, or losing their successful "investment" (hi-score).

A. Hard Self-Control Scenario

When the extension window is opened for the first time, the desired time limit has to be set manually. During the subsequent website visits the extension automatically suggests a time limit to be set(see Figure 1).

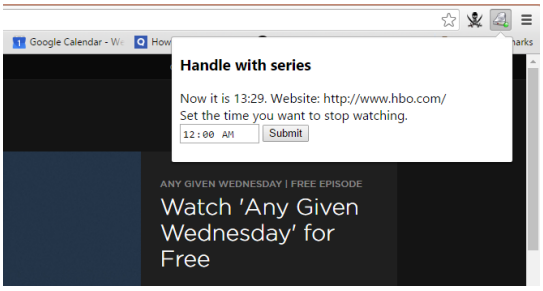

Fig. 1. Setting the stop watching time

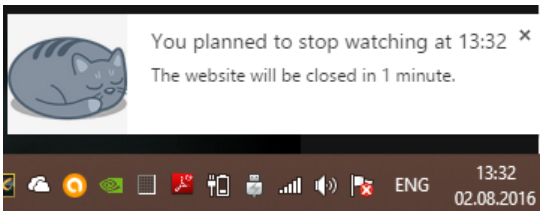

Fig. 2. Time limit reach notification (hard self-control)

Fig. 3. Countdown before closing the web page

As soon as the time is up, the user gets a notification (Figure 2) that the tabs corresponding to the streaming web site will be closed in 1 minute (Figure 3). Then the tabs automatically close, and the web site page cannot be opened for one hour (this parameter is adjustable, but the access blocking time should be large enough to allow the user to switch to other activities).

B. Soft Self-Control Scenario

Since the hard self-control scenario could be considered too restrictive, users might decide to stop using the extension. Therefore, we propose a softer self-control model: it is still based on time limitations, but when the time is over, the users decide what to do themselves. In this scenario the notification window looks differently (Figure 4).

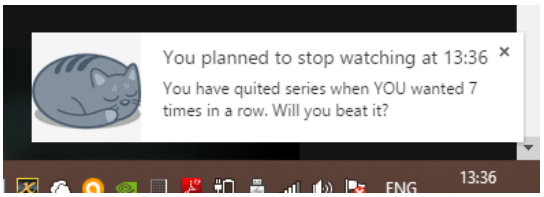

Fig. 4. Time limit reach notification (soft self-control)

The time limit is set similarly to the hard self-control scenario, but this time the user gets a notification about the achieved progress (how many times in a row the user succeeded to close the streaming series tab according to the initial plans). The notification also initiates a timer (set to one minute) that annuls user's progress if the tab is not closed (Figure 5)

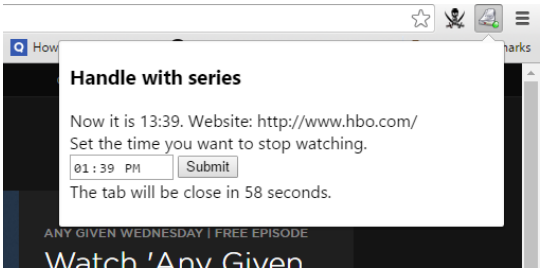

Fig. 5. Loosing progress countdown

While this scenario might seem as a very marginal change comparing to the hard self-control model, it opens a variety of options for subsequent gamification of the self-control process. Gamification, defined in [11] as "the use of game design elements in non-game contexts", is a widely discussed method in education, personalized health, productivity management and other types of activity that highly depend on high people commitment and motivations. Gamification techniques try to increase human motivation by relying on reputation and reward systems (points, badges, levels). In particular, gamification was already suggested as a possible way to address digital addiction [12].

C. Implementation remarks

We use *JavaScript* [1] to implement the *Google Chrome* [2] extension. For connecting HTML, *JavaScript* and *Google Chrome API* [3], *jQuery* library [4] is used: it allows us to store data and work with the Chromium driver. *Python 2* [5] is used for testing. Our extension uses a chromium API, tests use *py.test* [6] framework. *JavaScript* tracking code [7] is used for exploring statistics collected in *Google Analytics* [8].

D. Evaluation Strategy

Proper evaluation of the developed extension is not yet complete, so here we will only outline the strategy we are following.

Since we have to investigate whether our assumptions are true, we have to consider both scenarios of self-control (hard and soft scenario). To compare them we need to obtain some estimates of the following values:

1) How many users installed and deleted the browser extension?
2) How often they turned it off (to continue watching)?
3) How many of them do continue using the browser extension after extended period of time?

Installation statistics is easy to obtain directly from the *Chrome Web Store* [9].

Turn offs show how many people are prone to change their commitment to end watching. If a user disables the extension (but does not delete it from Google Chrome completely) and turns it on again after a while, it probably means that the user is watching online TV during such periods.

A **user loyalty** statistics may not be accurate enough. Since the users have to explicitly activate the Chrome extension (i.e., start the timer manually) each time they watch online TV, we never know exactly which activities take place when the extension is not activated. Users might time-control certain websites by themselves (without the help of a browser extension), so we never know exactly whether a user was watching online TV with the timer switched off. In order to get more accurate information there are two possible options:

1) To store sites ever blocked by a user and open the popup "Start timer"window when the user visits them again.
2) To distribute the browser extension with a list of the most popular streaming web sites and to open the "Start timer"window every time the user visits any site found in the list, thus limiting evaluation process with a number of pre-selected websites.

In the present research we follow the first option: the users are asked explicitly, but, in principle, there is nothing preventing to combine both options. Information we need is available from Google Analytics. Table I shows the sources of different statistics and where the statistics are stored.

The *analytics.js* [10] is a *JavaScript* library we use for analyzing how users interact with the extension. To do so, "JavaScript tracking snippet" will be added to the browser extension code. Adding such snippets to the extension allows

[1]https://www.javascript.com/
[2]https://www.google.com/chrome/
[3]https://developer.chrome.com/extensions/api_index
[4]https://jquery.com/
[5]https://www.python.org/download/releases/2.7.2/
[6]http://pytest.org/latest/
[7]https://developer.chrome.com/extensions/tut_analytics
[8]https://analytics.google.com/analytics/web/
[9]https://chrome.google.com/webstore/category/extensions?hl=en
[10]https://developers.google.com/analytics/devguides/collection/analyticsjs/

TABLE I
EVALUATION STATISTICS SOURCES AND STORAGE PLACES

	Installations	***Turn off***	***User loyalty***
Source	Chrome Web Store	Tracking code	Tracking code
Storage	Chrome Web Store	Google Analytics	Google Analytics

sending snapshots of the visited pages to the analytics system. With *Google Analytics* we could get reports containing the following data:

- total time a user spends using the extension;
- time spent on each page;
- the order of extension pages visits;
- the list of internal links clicked.

Embedding such a "spy" component would let us know how users control a watching schedule. In its turn, it allows to know how often users relied on the addiction control extension, and whether this extension was really helpful or not.

IV. CONCLUSIONS

The problem of human inability to control their time while consuming addictive goods or services is traditionally studied in psychology, economics and social sciences. In our paper we make an effort to complement the analysis of the problem from information technology and web engineering perspectives. There is a number of existing solutions, but the problem is far from being completely resolved. In our study we emphasize two approaches implementing two scenarios of TV streaming service consumer self-control. The first approach blocks the access to the addictive sites according to previously pre-set user intentions, while the second exploits human tendency nature to take care of a previously made investment and reluctance to break promises, so, in a sense, this approach is more self-assessment centered.

Soft self-control is also can be considered as the first step towards gamification of online time-management applications. Despite its growing popularity, typical gamified projects are still designed in a superficial way, and are often criticized by the problem domain experts [13]. Therefore, this approach is very promising, and needs further in-depth investigation.

From the perspective of social sciences, technical feasibility of a product is much easier to evaluate comparing to social acceptability, safety and meaningfulness. The latter aspects are more uncertain: the way people accept and use a new technology in their everyday life appears to be often unexpected or paradoxical [6]. That is why software tools aimed at improving user self-assessment, self-control and social responsibility play an important role within the context of ambient intelligent services.

There is also a significant problem of self-control tools evaluation. A possibility to study whether a self-control solution is really able to remedy addictions is limited by one constraint: the users being aware that they are "managed", might (intentionally or unintentionally) start tampering with the system and distort statistical observations.

There are also attention-worthy marketing and user interface issues, not examined in this work.

Particularly, a very interesting approach was recently introduced in [14]: the authors describe a mechanism for personal task management based on guided scripting. By creating simple scripts with the help of suggested building blocks the users are able to define their desired behavior. There are two basic personalization modes that could be suitable for our extension. First one is adding a new feature to the (self-control) system invoked by interacting with an interface element. The second one is modifying the effect of an existing user interaction by adding new behaviors to it or changing its current behavior. The second mode is considered as a possible implementation of the idea of self-disclosing system [15]. We think that the prototype described in our work may also be classified as an implementation of such a self-disclosing mechanism.

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