

Self-tracking or Not? That is the question. Item Generation for Construct Development

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Abstract. Self-tracking describes the measurement efforts of an individual towards collecting, storing, analyzing, as well as reflecting and acting upon data on personal activities. Technological innovations enhance the current trend for individuals to collect data of private activities such as walking, eating, expenditures, or resource consumption. Yet, despite predictions of such an emerging trend, many users show contradictory behavior (refuse to buy a device, stop using it). Thus, scholars increasingly attempt to explain this contradicting behavior. First approaches from adoption theory and cognitive dissonance theory encompass the concept of attitudes. I aim to enhance empirical research in this context by developing a specific attitude towards self-tracking scale that can be used in surveys with private individuals. In this research-in-progress-paper, we present domain specification and a first set of 65 items derived from 24 explorative interviews.

Keywords: Self-tracking, Quantified Self, Attitudes, Item Generation, Construct Development

1 Introduction

Information systems (IS) find their way into private lives with individuals tracking and analyzing data concerning e.g. sleep patterns, nutrition, expenditures, or physical activity [1]. Research [1–3] and practice [4] recognize the potential of self-tracking technology to become a major emergent trend and mainstream technology. For example, market research institutes predict that 160-245 million wearables will be sold in 2019 [5] and already between 2014-2015 their adoption has already doubled [6]. Yet, research [1, 7] and practice [6] acknowledge many barriers at different stages of self-tracking which encompass design and functionality issues or the motivation and attitude of individuals that leads to contradicting behavior (purchase refusal, discontinuance). In this sense, research investigates several theoretical explanations and models (such as cognitive dissonance or adoption models) for contradicting reactions to computer mediated self-tracking activities that also contain the established concept of attitudes [2, 3]. Considering the factors that lead to contradicting behavior, the price appears to be the most important factor. Then, other factors follow that can be described as attitude (tracking device helps to be more productive, no utility is seen, usage is unforeseen, etc. [6]).

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For this reason, I take on and extend the first attempt from Baumgart [8], who try to explain contradictory reactions from self-tracking users with cognitive dissonance theory. However, we focus on one basic component that has been used efficiently in psychology and IS research for years to understand human behavior: the concept of attitudes. Due to the fact, that existing IS models and theories originate from a largely organizational and professional context [9], they need to be updated because in the private context – where still a majority of self-tracking appliances are used – other factors determine human behavior [10]. As the major data collection instrument in IS relies on surveys [11], I want to build an attitude scale from scratch and therefore, ask the following questions for this research-in-progress (1) and the overall attitude development project (2):

- (1) What are the unique attitudes that individuals share who (a) use and (b) who do not use self-tracking devices and applications?
- (2) How can we measure these attitudes in a reliable and valid way?

For full disclosure, please be aware that the work at hand is the second article reporting on the status of our overall project, already presented in [12].

2 Theoretical Background

Self-tracking describes the measurement efforts of an individual towards collecting, storing, analyzing, as well as reflecting and acting upon data on personal activities [1]. Examples encompass nutrition, fitness, or expenditure tracking. In literature, synonyms such as quantified self, lifelogging, self-experimentation, self-monitoring, and self-measurement are being used. Individuals have been self-tracking personal data with - manual techniques (e.g., with paper and pen, weight scale) for more than decades [13]. Now, with the trend of digitalization and miniaturization, self-tracking is enhanced by technology-based devices which ease the tracking process, such as pedometers (www.Fitbit.com) or energy consumption trackers (www.amphiro.com).

One major issue within research is to understand self-tracking behavior for different domains. Interesting topics in IS research concern adoption or continuous usage of self-tracking devices for health, fitness, and well-being [2]. This is very restrictive to one domain of application although many other interesting domains exist (such as finances, resource consumption, etc. [14]). Additionally, IS adoption research, in particular, aims for a more quantitative measurement. The advancement from an interpretivist to a positivist paradigm is a natural step within science and reflects maturity [15]. Yet, as for now, scholars engaged into the adoption and continuous usage of self-tracking technologies only started to revisit and adapt current IS theories (theory of planned behavior) and models (discontinuance model) predominantly in a conceptual and interpretivist manner [3, 8, 10] (interviews, content analysis of presentations, observations, etc.).

At this point, scholars have enhanced and sometimes tested a short range of methods and theories to better understand self-tracking behavior. Baumgart [8], for example, used cognitive dissonance theory to explain the experienced controversial reactions to self-tracking devices. She shows that individuals often experience cognitive dissonance

when they find out that they do not reach their goals. One of three possible ways to reduce this dissonance consists of changing attitudes (as an environmental cognitive element). Baumgart [8] calls for more quantitative studies to test their model. An attitude scale could support such research efforts to engage into quantitative testing. For that reason, we intend to focus on attitudes within our research.

For understanding behavior in social psychology, attitudes are a central phenomenon. Attitudes are defined as “an individual’s positive or negative feelings (evaluative affect) about performing the target behavior” [16] and originate from social psychology. The concept of attitudes has influenced explanatory theories of behavior in many disciplines for decades [17]. Amongst others, IS adoption research applies the concept of attitudes to explain IS usage and adoption [17, 18] and scholars call for more reconsideration of the attitude construct in research.

Existing attitude scales are often used for individuals already using a well-understood and defined technology. However, the phenomenon isn’t that clear to individuals. Some are already self-tracking when stepping on a scale each morning, but they might not be aware of that while answering a survey on self-tracking. Thus, we aim to develop a specific attitude construct (e.g. towards the Internet or knowledge sharing [19, 20]).

For those reasons, we will develop a measurement construct from scratch for investigating the attitudes towards self-tracking (no matter if technologically or manually). The following section summarizes the construct development method that structures our overall project. In specific, we focus on domain specification and item generation as first steps for the construct development.

3 Methodology

The construct development process is based on the major phases from Smith et al. [21]. The first stage encompasses: domain specification, item sample generation, content validity assessment, and model specification - a more detailed description can be found in [12]. For this paper, the first two steps will be presented. Transcripts from explorative interviews and a literature review serve as a basis.

Lewis et al. and MacKenzie et al. [22, 23] describe the **domain specification** on different levels. Lewis et al. [27] suggest working on (1) the premise (purpose and/or importance), (2) the conceptual definition, and (3) a list of dimensions. MacKenzie et al. [28] only focus on the conceptual definition and describe four major factors that are subject of the construct conceptualization: (a) Examination of “the focal construct in prior research or by practitioners”, (b) specification of “the nature of the construct’s conceptual domain”, (c) specification of “the conceptual theme of the construct”, and (d) definition of “the construct in unambiguous terms”. Both definitions and descriptions will be used for my domain specification.

Then, **item generation** follows. For example, literature reviews and interviews help to formulate and gather a first set of items. Such qualitative data is analyzed by content analysis. Such a technique “uses a set of procedures to make valid inferences from text” (Weber 1990). It encompasses document selection (newspapers, transcripts, etc.) and

sampling, (text) encoding/categorization, interpretation, and quantitative/qualitative analysis. Succeeding to select the sources for a content analysis, coding is a focal step of content analysis. It also includes interpreting textual content and allocating a specific code to the text passage.

As a next step, we derive items from 213 pages of written transcripts from 24 explorative interviews. Further information on the interviewees and the interview selection can be found in [12]. Three individuals independently reviewed the transcripts and each conducted one content analysis iteration for all interviews. Two iterations were based on a paper-pen method and another one via computer assisted analysis with MAXQDA 12 (software was not available before). The transcripts were coded according to several categories: text passages and statements concerning the interviewee's as well as a third person's (1) positive feelings and opinions on self-tracking activities, (2) negative feelings and opinions on self-tracking activities, and (3) activities and experiences with self-tracking. The results of two iterations were manually merged and possible statements were formulated – either the formulation of the participant or slight adaptations from the researchers were used. All possible statements were collected in an Excel file (608 statements in total). I categorized the statements according to different topics (such as security, control, goal, or number affinity). For each topic, I counted the number of statements and flagged them as relevant when per topic more than seven statements existed (75% of the topics had more than seven items and this should cover the most important aspects). Thus, I selected those statements and topics (30% of all possible statements) and carefully chose two until four statements per category for the final list (e.g. duplicates were deleted). Then, the third iteration served as validation of the final item list. Due to the different sources of the coded material no interrater reliability is calculated – however, the merging process of the first two iterations revealed a high level of accordance (in the case of disagreements, both researchers discussed the inclusion or exclusion of a text passage in order to find consensus). The next section presents our results for domain specification and item generation originating from interviews.

4 Results

For construct conceptualization, we first elaborate on (1) the premise. The purpose of the construct consists of measuring attitudes (positive and negative feelings, thoughts, opinions, or behaviors) toward self-tracking. The attitude construct may enhance IS research on self-tracking and therefore help to understand why some people are more prone to use self-tracking devices than others. The construct can also be used in different circumstances such as adoption and continuance research.

Concerning the (2) construct conceptualization, (a) a literature review did not disclose specific construct definitions. Scholars considered only other constructs (e.g. motivation, intention, perceived usefulness, self-control). For that reason, our first set of items only originates from explorative interviews. (b) Then, our construct represents the following type of property: positive and negative feelings about self-tracking (self-measurement, storage, reflection, analysis, acting). These feelings are measured on an

individual level. (c) The necessary and sufficient attributes encompass the three major components of attitudes: affective, cognitive, and conative ones [24]. They also describe the multiple dimensions of the construct. In addition, we suppose that the construct is stable over a certain time but they can be changed and influenced externally and internally [24]. Furthermore, the construct can be used in different situations and is not limited to a specific self-tracking application domain). (d) Finally, we suggest defining the construct with the following definition: *The attitude towards self-tracking is a pre-disposition to respond (affectively, cognitively, or in a conative way) in a favorable or unfavorable way to actions or objects implying one or more of the following self-tracking components: self-measurement, data collection/storage, analysis, reflection, and behavioral change concerning private activities.* (3) The dimensions will be elaborated through factor analysis at a later step in time.

ID	category	Item	ID	category	Item
1		I measure things (my weight, well-being, gas consumption, expenditures) regularly.	33		Self-tracking helps me to achieve my goals.
2	habit	I do self-tracking in other domains of life.	34		I am interested in getting feedback on my behavior.
3		Self-tracking is like a ritual.	35		I like self-tracking because it makes my performance more tangible for myself.
4		Being precise is fun.	36		Self-tracking helps to control things better.
5		Self-tracking is enjoyable.	37		It is easier for me to fulfill my goals with facts and numbers on my performance (quantification)
6	hedonic	Self-tracking delimits fun.	38		I like to achieve goals.
7		I have fun taking measurements.	39		Goal setting and checking pushes me.
8		I have fun with my own data.	40		Goal setting helps me to improve.
9		I am interested in self-tracking.	41		Self-tracking helps me to increase my performance.
10	interest	Self-tracking is interesting.	42		I like to see my progress.
11		I am interested in facts about my personal activities.	43	self-optimization	I like self-tracking because i can share my data on
12		Self-tracking is extremely useful for medical problems.	44		I do not like self-tracking because I do not want to be
13	medical	Measurements do not treat a sick person, it's people.	45		Self-tracking makes bad concious.
14		I have no health problems so I do not need self-tracking.	46		It is unpleasant to find out things about my private life.
15	motivation	I have no motivation to self-track.	47		I like to measure/note things such that I do not forget anything.
16		Self-tracking motivates me to change things (healthier lifestyle, more activities, mindfulness)	48		Self-tracking helps to remember.
17		I do not need self-tracking.	49		Self-tracking helps for self-observation.
18		Self-tracking leads to zero insights	50		Self-tracking helps me to learn more details about my behavior.
19	need	Self-tracking does not provide me anything.	51		Self-tracking helps me to be reflective about my life/activities.
20		Self-tracking has many advantages.	52		Self-tracking helps me to find out what I can do to feel better.
21		I do not want to be recorded all the time because I want my privacy.	53		I do not need self-tracking to find out, what I can do to feel better.
22	privacy & security	I do not want to share any data about my private life.	54		Health and well-being cannot be controlled.
23		I cannot allow myself to gather data on specific topics.	55		I like to talk about my data.
24		I do not like self-tracking because all data can be missused.	56	social	I like self-tracking because i can share my data on performance then more easily.
25		Self-tracking data is sensible.	57		I like to compare my performance with others.
26		I like to engage into measuring things.	58		I do not need self-tracking because I do not want to compare myself with others.
27		Some things are not measurable.	59	technical	I like self-tracking devices
28	quantification	I am interested in collecting data.	60		Self-tracking and automatic feedback is comfortable.
29		I like numbers	61		I have always liked to create excel sheets about different
30	affinity	I have a high affinity towards numbers.	62		The easier it is to engage into self-tracking, the more I do it.
31		Numbers are interesting.	63	time	I do not have time for tracking.
32		Graphs and statistics do not satisfy me.	64		Self-tracking is time-consuming.
			65		I want to spend my time on other things than self-tracking.

Figure 1. Collection of possible items for the attitude towards self-tracking scale

Figure 1 shows the final list of items as selected with our qualitative analysis method. The selected statements were regrouped into eleven major categories describing the

content of the statements. Most statements describe attitudes towards self-tracking in the context of self-optimization. Then, quantification affinity, hedonic, social, technical, interest-related, medical, motivational, and need-related items follow. Rather negative attitudes involve statements about privacy and security as well as the time (effort). Further research consists of content validation, purification of the set of items, and final statistical validation.

5 Discussion and Conclusion

In this paper, our interviews contribute to qualitative insights on the self-tracking phenomenon [25]. Furthermore, we refine the explanatory perspective from other scholars by focusing on attitudes and hopefully help to enhance their models [2, 8]. We expect the overall project to contribute to quantitative research on the use of such self-tracking devices [2, 3, 10]. Practice can profit by better understanding potential users and better support the mass distribution of such devices.

We tried to minimize the limitation of subjectivity by increasing transparency (transcribing the interviews) and objectivity (analyzing the interviews in three iterations). We are aware that several biases might influence the results especially the interviewees responses (social desirability, self-presentation, or participation bias). Furthermore, the interview sample is rather small and not representative. However, after a certain number of interviews there were no more extensive new insights for item generation.

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