On Making Engagement Tangible

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Abstract

In this article the complexity of the construct engagement and three theories on this topic are discussed. Csikszentmihalyi's theory of flow is taken as starting point for the measurement of engagement. The measurement of each of its eight aspects is discussed, including its pros and cons. Regrettably, no overarching computational model is available. This article ends with a concise discussion.

Introduction

In Human-Computer Interaction (HCI) and related (multidisciplinary) fields, engagement is often approached as what one could baptize "*a closed gray box*", surrounding an application. The box is mostly closed because the application is often studied in isolation; that is, solely the application and its characteristics are taken into account not all processes surrounding it (e.g., its development and marketing). The box is gray because concepts such as engagement, involvement, and flow are considered as fuzzy concepts, hard to pinpoint. With this article, I aim to satisfy two aims: i) open up the closed box and ii) bring the box from gray to white.

In this article, I will focus on making engagement tangible. In the next section, the concept engagement will be discussed, including three theoretical frameworks. Subsequently, I will discuss how engagement can be measured, using one of the three theoretical frameworks. However, since this is a complex endeavour, I will also present a coarse but pragmatic approach on measuring engagement. I will end this article with a brief discussion.

The concept engagement

Until recently, there was no consensus present on the concept engagement throughout scientific literature. This is why I baptized the box to be gray instead of white. However, in 2008 this already changed with O'Brien and Toms' work with which they answered the question: What is User Engagement? Additionally, they provided a conceptual framework and a definition for user engagement, with a bias towards its relation with technology. In this article, I adopt their definition of engagement, which is: "*a quality of user experience characterized by attributes of challenge, positive affect, endurability, aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity, and perceived user control.*" [1] On the one hand, this definition captures most crucial aspects of today's dominant theoretical framework in a concise manner. On the other hand, this definition requires substantial explanation to enable (true) understanding. However, the concept engagement can also be linked to various (other) theoretical frameworks. Due to reasons of brevity, we will refrain from providing an exhaustive review and mention three.

In 1985, Deci and Ryan introduced their Self-Determination Theory (SDT) [2]. Their theory consists of five mini theories, namely: i) cognitive evaluation theory (i.e., on intrinsic motivation); ii) organismic integration theory (i.e., on various forms of extrinsic motivation); iii) causality orientations theory (i.e., on orientation toward environments and regulation of behavior); iv) basic psychological needs theory (i.e., psychological needs and their relations to psychological health and well-being); and v) goal contents theory (i.e., emerging from the distinctions between intrinsic and extrinsic goals and their impact on motivation and wellness). Together these theories aim to assess people's motivation and/or personality functioning. Although SDT has a high construct

and ecological validity, it is fragile with respect to content validity. That is, what signals (e.g., biosignals, questionnaires, and system usage) represent what aspects of what mini-theory? Therefore, I will not adopt the SDT as theoretical framework.

In 1989, Davis [3] introduced his Technology Acceptance Model (TAM), which he derived from the theory of reasoned action and related to (information) technology. TAM poses that people's intention to become engaged with a system is determined by its perceived usefulness and perceived ease of use. Hereby, TAM assumes that people are free to act after (s)he has formed an intention to it. However, in practice people's acts are limited by various sources, amongst which limited ability, time, environmental or organizational limits, and unconscious habits. The latter issue limits the ecological validity of TAM significantly. Therefore, I have refrained from using TAM as theoretical foundation in this article.

In the same period as the previous two theories were invented, Csikszentmihalyi defined his theory on flow [4]. An optimal engagement is closely related to, or the same as, optimal User eXperience (UX) or flow [4]. When involved in products (e.g., media and games), the underlying goal is to move towards a flow. According to Csikszentmihalyi [4], this requires: i) a concrete task to complete, ii) the ability to concentrate, iii) clear goals, iv) immediate feedback, v) deep but effortless involvement, vi) a sense of control, vii) sense of self disappears but increases unnoticeable during flow, and viii) the internal clock to be influenced. This decomposition illustrates the complexity of the construct flow, which is even further increased by its relation with constructs such as motivation, passion, presence, and engagement, which all hint towards the same phenomenon (i.e., the feeling of optimal UX). Nevertheless, Csikszentmihalyi [4] provided aspects that each by itself can be measured.

Measuring engagement: The eight aspects of flow

The eight aspects of flow (or engagement) as Csikszentmihalyi [4] identified would span up an eight dimensional space. However, although each individual dimension is appealing and (in principle) could be assessed via objective measurement, an integral model of engagement, in particular, in real world settings is beyond reach. Nevertheless, I pose that the theory of Csikszentmihalyi already provides the means to bring the box from gray to white. Therefore, in the remaining article, I will try to open the box and bring if from lab to life [5].

Three of the eight aspects of engagement can be measured rather straightforward, namely: a concrete task, a clear goal, and immediate feedback. Although the level of abstraction people can handle varies considerably among them, in principle, a concrete task to complete can always be defined (e.g., play a game). The goals related to the task at hand can be made as explicit as needed (e.g., reach level *x* of game *y*). Feedback on people's behavior (i.e., on cognitive, affective, or physical level) can be given on several levels (e.g., direct and/or indirect and conscious and/or unconscious), using all possible modalities (e.g., tactile, auditory, and visual). The remaining five aspects of engagement are harder to pin point.

The ability to concentrate is known to have a high variance both within and between people. As Csikszentmihalyi [2] states "*To pursue mental operations to any depth, a person has to learn to concentrate attention. Without focus, consciousness is in a state of chaos.*" (p. 26) So, the ability of concentration can be assessed using tests founded on mental operations (e.g., calculation), with or without distractors. However, as such, it is hard to capture the ability to concentrate in real world practice, as this is not a well-developed research area [6]. Recently, several attempts have been published of measuring the level of involvement of people in real life situations. For example, in 2009 Sohn [7] investigated the impact of magazine and television social comparison processes on people's body perception. For this study, he developed and, subsequently, validated a new scale, based on the Affect, Reason, and Involvement (ARI) model, measuring involvement in the context of body image. One year later, Van den Ende, Hoonhout, and Meesters [8] developed a 25 items questionnaire to measure people's involvement with audio/video content. However, note that these and other questionnaires most likely will heavily depend on the task and context at hand.

Sense of control has been measured in various contexts. For example, in 2002 Dudek, Merecz, and Makowska [9] have done so in the context of occupation. They introduced their Sense of Personal Control at Work (SPCW) questionnaire. In the same year, Jackson and Eklund introduced their Dispositional Flow Scale-2 (DFS-2) for sports, which has been used in various other contexts as well (e.g., gaming) [10]. So, sense of control is approached from various angles and can be assessed using either validated questionnaires or tailored questionnaires to the topic at hand, which can be founded on the existing theoretical frameworks and one or multiple of the related questionnaires. Sense of self can be conveniently assessed using the Sense of Self Scale (SOSS). In addition, several other questionnaires that assess related constructs can be valuable as well; for example, the Self-Concept Clarity Scale (SCCS), the Self-Monitoring Scale (SMS), and the Extended Measure of Ego Identity Status 2 (EOM-EIS II) [11]. However, these questionnaires do not anticipate on a quickly changing level of sense of self, as Csikszentmihalyi [2] describes. So, for the purpose of measuring engagement such questionnaires do have their limitations.

Roughly one century ago, the notion of human's internal clock was noticed. Nevertheless, the theoretical foundation on the internal clock mechanism is still a topic of debate as current models cannot describe all possible states. Further, research on this issue is limited to lab studies and has not been brought to real life [12]. However, even despite these limitations, significant differences both between people and within people (over time) have been observed [12]. Taken together, this makes the internal clock mechanism very hard to operationalize and, hence, to be used to measure engagement in practice.

Discussion

This article sketched the complexity of the construct engagement. Subsequently, it discussed three of the most influential theories on this topic. Next, Csikszentmihalyi's theory of flow [2] was taken as starting point for the operationalization of the measurement of engagement. The measurement of each of the eight aspects of the theory of flow [2] has been discussed, including its pros and cons. Its most important drawback is that although each of the aspects can measured by itself no overarching computational framework is available or presented here. Most likely, such a framework would require a significant additional effort in basic as well as in applied research.

As was indicated in the previous section, founding the measurement of engagement on Csikszentmihalyi's eight aspects is at least labor-intensive if not impossible in real life practice (cf. [5]). In real life contexts, a pragmatic approach would be of high value, even if it can only bring us a coarse approximation of the level of engagement. Such an approximation can be derived from many more angles. Let me mention one: Virtual Reality (VR). In VR settings one distinguishes between immersion and presence, which can be complemented by aspects of UX (e.g., involvement, interest, and emotion) [13]. Although constructs such as UX do not map one-on-one on engagement, such related constructs should be considered as well as the methods explored to measure them.

If anything, studying the construct engagement requires that an interdisciplinary stance is taken, including insights from psychology [4], physiology, information and computer sciences [1], media, organization theory, and marketing. Moreover, both theory and experience from practice have to be embraced and blended, which is rare in practice (cf. [8]). Further, one should realize that engagement is of importance on all possible levels and all possible situations; for example, the engagement of subjects in scientific studies or student with their lectures [6], of consumers with products [7], of (knowledge) workers with their occupation [9], and of athletes with their sport [10]. As such, engagement is omnipresent and central in our lives.

In sum, on the one hand, nowadays engagement is acknowledged for its key importance in daily practice. On the other hand, engagement still has to become more than yet one more buzz word. It has to be defined and operationalized properly. A definition and theoretical framework was adopted. Moreover, it has been outlined how engagement can be measured, including its pros and cons. As such this brief article can perhaps provide a useful springboard for further research.

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References

1. O'Brien, H.L., Toms, E.G. (2008). What is user engagement? A conceptual framework for defining user engagement with technology. *Journal of the American Society for Information Science and Technology* **59**(6), 938-955.
2. Deci, E., Ryan, R. Self-Determination Theory: An approach to human motivation and personality. http://www.selfdeterminationtheory.org/. Accessed on 13 July 2012.
3. Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* **13**(3), 319-340.
4. Csikszentmihalyi, M. (1997). *Finding flow: The psychology of engagement with everyday life*. New York, NY, USA: BasicBooks / HarperCollins Publishers, Inc.
5. Broek, E.L. van den, Janssen, J.H., Westerink, J.H.D.M. (2009). Guidelines for Affective Signal Processing (ASP): From lab to life. In J.F. Cohn, A. Nijholt, M. Pantic (Eds.), *Proceedings of the IEEE International Conference on Affective Computing & Intelligent Interaction* (Amsterdam, The Netherlands, September 10-12), Volume I, 704-709.
6. Alapin, I., Fichten, C.S., Libman, E., Creti, L., Bailes, S., Wright, J. (2000). How is good and poor sleep in older adults and college students related to daytime sleepiness, fatigue, and ability to concentrate? *Journal of Psychosomatic Research* **49**(5), 381-390.
7. Sohn, S.H. (2009). Body image: Impacts of media channels on men's and women's social comparison process, and testing of involvement measurement. *Atlantic Journal of Communication* **17**(1), 19-35.
8. Ende, N. van den, Hoonhout, J., Meesters, L. (2010). Measuring involvement with audio/video content. In T. McEwan, L.M. McKinnon (Eds.), *People and Computer XXIV - Games are a serious business: Proceedings of HCI 2010, The 24th BCS Interaction Specialist Group Conference* (Dundee, UK, September 6-10), 319-327.
9. Dudek, B., Merecz, D., Makowska, Z. (2002). Theoretical assumptions and psychometric characteristics of the sense of control at work questionnaire. *International Journal of Occupational Medicine and Environmental Health* **15**(1), 29-36.
10. Jackson, S.A., THomas, P.R., Marsh, H.W., Smethurst, C.J. (2001). Relationships between flow, self-concept, psychological skills, and performance. *Journal of Applied Sport Psychology* **13**(2), 129-153.
11. Ickes, W., Park, A., Johnson, A. (*in press*). Linking identity status to strength of sense of self: Theory and validation. *Self and Identity*.
12. Hancock, P.A., Szalma, J.L., Oron-Gilad, T. (2005). Time, emotion, and the limits to human information processing. In D. McBride, D. Schmorrow (Eds.), *Quantifying Human Information Processing, Chapter 5*, p. 157-175. Oxford, UK: Lexington Books / Rowman & Littlefield Publishers, Inc.
13. Slater, M. (2003). A note on presence terminology. *Presence-Connect* **3**, 3.