Towards an embodied view of flow

Abstract. Flow is a psychological construct that has been used to describe states of optimal experience and intrinsic motivation. Several models have been proposed that attempt to adapt flow from the original psychology conceptualisation to computing studies. While it is understandable that the notion of flow as well as its major features would have to be adapted and possibly modified to suit the computing context, frequently, however, those adaptations have been made in an ad-hoc manner; there is no overall agreement on how the flow concept should be conceptualised; and often different studies conceptualise flow in very different ways. We claim that those adaptations have been made without a careful consideration of the original concept and that frequently they are the product of conceptual misunderstandings. We propose a view of flow for computing studies based on notions of phenomenology and embodied interaction and analyse the major characteristics of this concept from this embodied view.

Keywords: Flow, Human-Computer Interaction, Embodied Interaction.

1 Introduction

The concept of flow has been used to describe psychological states of optimal experience that are characterised by a deep concentration in the task at hand and have been associated with intrinsic motivation, skills promotion and academic excellence [1]. In computing, a number of studies of video gaming, e-shopping, web marketing and e-learning, among others areas, have reported their environments as conducive to flow and promoting positive attitudes and outcomes for users [2-4]. However, there has not been a consensus on a uniform way to conceptualise, model, operationalise and measure flow in those studies [2]. Models of flow, for example, do not agree on which characteristics of flow to include, and how they can be defined, categorised or related among them.

According to Finneran and Zhang [2], the discrepancies of those models indicate underlying problems in the conceptualisation of flow. Rather than trying to evaluate, refine, integrate or create new models of flow, what we propose in this paper is to go back and revise the way in which this concept has been adapted to the computing area. The paper has four sections. The second section briefly describes the way the concept of flow and its characteristics have been understood and adapted in computing studies and highlights inconsistencies and possible misunderstandings. The third section proposes a view of flow that addresses those inconsistencies and misunderstandings and revisits some of the characteristics of flow in terms of that view. Finally, the fourth section presents some conclusions.

2 Conceptual inconsistencies and gaps in studies of flow

Computing studies of flow have defined it in a number of different ways: as engagement and immersion in an activity [4], as absorption in a virtual space and the fading away of the physical world [5], as a playful and exploratory experience [6], and as an experience which is undertaken for its own sake [7], among other definitions. Although Csikszentmihalyi has warned against reifying flow [8], the ambiguity of the concept of flow has created a situation in which research in the area might be studying altogether different phenomena. Identifying at least a central characteristic that could be used to better model and operationalise flow would be particularly useful for future research in the area.

Computing studies of flow have adopted a set of nine characteristics associated with this construct: a balance between challenges and skills, clear goals, immediate feedback, intense concentration, merging of action and awareness, loss of self-consciousness, a sense of control, time distortion and experiencing the activity as intrinsically rewarding [7, 9-11]. Models of flow have incorporated those characteristics and tried to establish causality links among them. However there is no agreement as to what characteristics to take into account or what their dependencies are [2, 4].

Also, frequently it is unclear whether different studies understand the characteristics in the same way. Two examples that are relevant to our main discussion have to do with the definition of the challenges-skills balance and of intense concentration. The challenges-skills balance has been understood as the match between the person's skill and the challenges associated with the task. However there is disagreement on whether it refers to the potential challenge of learning and mastering the use of a digital system or of a task related with some aspect of reality other than the digital system per se [2]. Additionally, psychology research has suggested that challenges and skills might be multimodal in the sense that they are associated with the cognitive, physical and emotional parts of the person [12]. However studies and models of flow in computing have not taken this into account.

The other characteristic, intense concentration, has been defined as a narrow attention that focuses entirely in the interaction with the digital system, to the degree that users screen out irrelevant thoughts and perceptions and loose awareness of everyday life [9,13]. However this understanding is at odds with characterisations of this feature in psychology studies of flow where frequently it has been described as the opposite, an attention characterised by an expansive type of awareness [14].

Finally, studies of flow in computing have focused mainly on desktop interaction, forgetting about movement interaction, a relatively recent but promising area that includes research in tangible user interfaces, ubiquitous computing and product design [15]. The following section presents a view of flow that addresses this as well as the other issues mentioned above.

3 A view based on phenomenology and embodiment

The main reference of our approach is the embodied interaction framework of Dorish [16]. From this framework, and in general from its foundations, embodiment and phenomenology, we take four points as central for our embodied view of flow. The first is attention; a central issue for phenomenology is to be able to turn one's attention to the lived experience instead of being just inattentively immersed in it. The second is the importance of the context, the world in which people think, act and live. The third are the notions of present-at-hand and ready-to-hand; whether when performing a task, the user is directly concerned with the digital system or with any other aspect of reality. Finally the fourth is the importance of the body; within the phenomenological tradition, Maurice Merlau-Ponty [17] gives special importance to the body as the entity that makes the act of experiencing possible and to the bodily skills and knowledge that enable us to act on and experience the world. The relevance of these points for our view is described below.

Captive, effortful and effortless attention

While not attempting to provide a precise definition, we would like to highlight the fact that computing studies of flow have largely ignored a central characteristic of this construct: effortless attention. Flow has been defined as a state of deep concentration that is perceived as effortless. People perceive this experience as their attention being effortlessly carried by a current, hence the analogy with flow [18]. Under ordinary circumstances, subjective attentional effort in a task is proportional to the demands of the task, until there comes a point in which no increase in effort is possible (see figure 1a) [19]. In contrast to this effortful attention scenario, there are occasions in which paradoxically, at some point in the execution of the task, one is concentrated so thoroughly in the activity that suddenly attention seems effortless. At these moments, increased demands can be met with a sustained level of efficacy but without an increase in the perceived attentional effort (although the real level of attention is high. See figure 1b).

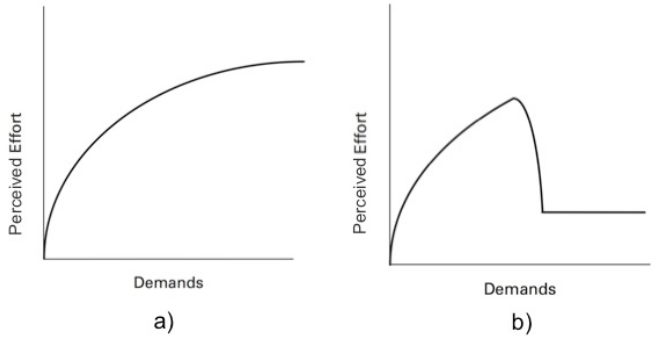

Fig. 1. Effort vs. demands in a) effortful and b) effortless attention. From Bruya (2010).

Effortful attention has been defined as people focusing and maintaining attention on specific stimuli intentionally [20]. Most of the time, however, attention is captured

by external stimuli: smells, noises and images of the external world, for example. People pay attention to these stimuli without spending any effort. This captive type of attention has a passive quality to it; the person is not in control of which stimuli are attended to. In contrast, effortful attention has a more active quality to it; some effort is required to keep such focus. The fact that effortless attention occurs in contexts that should demand an effortful type of attention makes it difficult to imagine that recreational, non-goal oriented online activities like browsing aimlessly on the web [21] could promote states of flow.

The expansive type of awareness reported in the psychological flow literature could also be strongly associated with the effortless nature of attention in flow episodes. Being able to register an unusual amount of context detail means that the detail does not act as a distractor anymore. Ordinarily, attention is effortful because the tendency to attend to constant external distractors must be overridden in order to keep an intentional focus on the chosen stimuli. In flow episodes, what is usually considered as external distractors can instead be regarded as part of the activity; they do not distract anymore but are included in the experience.

In practical terms, studies and models of flow should discriminate between captive, effortful and effortless attention.

The importance of context

The view of flow we propose is in line with the emphasis of the embodied interaction framework of taking technology to the world of people. This stance contrasts with other approaches such as virtual reality, where people are the visitors in the world of computers. Our embodied view of flow instead suggests that it is digital applications that are drawn into the world of the user. We believe this is a more appropriate view because it is more in tune with the concept of effortless attention and the expansive awareness it can bring; and also because it is more suited to movement interaction research. In practical terms this view would lead to question the widely held assumption that when in flow, users are so absorbed in the task that they loose awareness of everyday life [9].

In flow with or through the system

Another important point of our embodied view of flow is related to whether the task promoting the flow experience is directly concerned with the digital system or with any other aspect of reality. In terms of an example, the task might have to do with, say, learning to use a graphics editing application or with using such an application to retouch a photograph. In the first case users will probably be concerned with analysing and reflecting about the system, while in the second they will want to achieve a task that ultimately is not about the system but that will be accomplished through the use of the graphics editing application. This differentiation is known as *present-at-hand* or *ready-to-hand* in the phenomenological terminology of Heideger [22]. When *present-at-hand*, the digital system becomes the focus of the users' attention, and depending of the task, they will explore it, learn it or analyse it, for example. When *ready-to-hand*, the system becomes a tool and, if a good quality tool, it disappears from the users' immediate concerns.

Studies of flow often are not clear about this difference; as a result they have interpreted the characteristics of flow in different ways (the challenges for example)

and therefore operationalised it in dissimilar forms. According to our view of flow, studies should make clear whether the task is of a *present-at-hand* or a *ready-to-hand* nature.

We are not the first ones to notice this difference in the focus of the task; the Person-Artifact-Task (PAT) model of flow antecedents had already gone some way in clearing this confusion [23]. However in this model the task and the artifact are considered as alternatives for the users' focus of attention. This is not strictly speaking correct as users will always be engaged on a task, what is important is to clarify whether the task is of a present-at-hand or a ready-to-hand nature.

A wholesome view of interaction

In our view of flow, the body plays a central role. However the importance of the body does not lie on itself as a separate element, but "in the harmonious focusing of physical and psychic energy" [14]. Of course not all activities require full-body engagement, but the body has a critical role for any type of perception and action [17], even for using computers. Paraphrasing Bayliss [24], human-computer interaction has always consisted of embodied action, traditionally of small movements of the hands on the keyboard and mouse but embodied action nevertheless. Also, taking the body into account has a clear benefit for flow studies in movement interaction. In practical terms, studies and models of flow should take into account that the challenges and skills are multimodal composites, with physical, emotional and cognitive components.

4 Conclusion

We have presented a view of flow that attempts to characterise this state at a conceptual level. This view is based on notions of embodied interaction and addresses some of the conceptual inconsistencies and misunderstandings in the area of computing studies of flow. The view stresses the importance of four main points: effortless attention, the importance of the context where interaction takes place, whether the task is directly concerned with the digital system or with any other aspect of reality, and the body and its role in the interaction with the system. The proposed view needs to be further elaborated into models of flow. Although at the moment the view has a conceptual scope only, we believe it can make the models and operationalisation of flow more coherent and straightforward. These are obvious ways to take the research on the proposed view forward.

References

1. Nakamura, J. and M. Csikszentmihalyi, The concept of flow, in Handbook of positive psychology, C.R. Snyder and S.J. Lopez, Editors. 2002, Oxford University Press: Oxford, UK. p. 89-105.

2. Finneran, C.M. and P. Zhang, Flow in Computer-Mediated Environments: Promises and Challenges. Communications of the Association for Information Systems, 2005. 15(4): p. 82–101.
3. Voiskounsky, A.E., Flow Experience in Cyberspace: Current Studies and Perspectives, in Psychological Aspects of Cyberspace: Theory, Research, Applications, A. Barak, Editor 2008, Cambridge University Press: New York. p. 70-101.
4. Hoffman, D.L. and T.P. Novak, Flow Online: Lessons Learned and Future Prospects. Journal of Interactive Marketing, 2009. 23(1): p. 23-34.
5. Chen, V.H.-H., et al., Communicative behaviors and flow experience in tabletop gaming, in Proceedings of the International Conference on Advances in Computer Enterntainment Technology2009, ACM: Athens, Greece. p. 281-286.
6. Webster, J., L.K. Trevino, and L. Ryan, The dimensionality and correlates of flow in human-computer interactions. Computers in Human Behavior, 1993. 9(4): p. 411-426
7. Cowley, B., et al., Toward an understanding of flow in video games. Computers in Entertainment, 2008. 6(2): p. 1-27.
8. Csikszentmihalyi, M., A response to the Kimiecik & Stein and Jackson papers. Journal of Applied Sport Psychology, 1992. 4: p. 181-183.
9. Sweetser, P. and P. Wyeth, GameFlow: a model for evaluating player enjoyment in games. Computers in Entertainment, 2005. 3(3): p. 3-3.
10. Pace, S., A grounded theory of the flow experiences of web users. International Journal of Human-Computer Studies, 2004. 60(3): p. 327-363.
11. Voiskounsky, A.E., O.V. Mitina, and A.A. Avetisova, Playing online games: Flow experience. Psychnology Journal, 2004. 2(3): p. 259–281.
12. G.D.Ellis, J.E. Voelkl, and C. Morris, Measurement and Analysis Issues with Explanation of Variance in Daily Experiences Using the Flow Model. Journal of Leisure Research, 1994. 26(4): p. 337-356.
13. Hoffman, T.P. and D.L. Novak, Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations. Journal of Marketing, 1996. 60: p. 50-68.
14. Jackson, S.A. and M. Csikszentmihalyi, Flow in Sports1999, Champaign, IL.: Human Kinetics.
15. Larssen, A.T., et al., Introduction to the special issue on movement-based interaction. Personal Ubiquitous Computing, 2007. 11(8): p. 607-608.
16. Dourish, P., Where the Action Is: The Foundations of Embodied Interaction2001: The MIT Press.
17. Merleau-Ponty, M., Phenomenology of Perception1962, London: Routledge.
18. Csikszentmihalyi, M. and J. Nakamura, Effortless Attention in Everyday Life: A Systematic Phenomenology, in Effortless Attention, B. Bruya, Editor 2010, The MIT Press: Boston.
19. Bruya, B., Introduction: Toward a Theory of Attention That Includes Effortless Attention, in Effortless Attention: A New Perspective in the Cognitive Science of Attention and Action, B. Bruya, Editor 2010, MIT Press.
20. Schmeichel, B.J. and R.F. Baumeister, Effortful attention control, in Effortless attention: A new perspective in the cognitive science of attention and action, B. Bruya, Editor 2010, MIT Press: Cambridge, MA. p. 29-50.
21. Novak, T.P., D.L. Hoffman, and A. Duhachek, The Influence of Goal-Directed and Experiential Activities on Online Flow Experiences. Journal of Consumer Psychology, 2003. 13(1-2): p. 3-16.
22. Cerbone, D.R., Understanding Phenomenology2006, Cheham: Acumen.
23. Finneran, C.M. and P. Zhang, A Person-Artefact-Task (PAT) Model of Flow Antecedents in Computer-Mediated Environments. International Journal of Human-Computer Studies, 2003. 59(4): p. 475-496.
24. Bayliss, P. Notes towards a sense of embodied gameplay. in 2007 Digital Games Research Association Conference. 2007. Tokyo.