Digital Epiphanies: how self-knowledge can change habits and our attitudes towards them

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People often have an inaccurate perception of their habits, for example, how long they spend doing various activities and how their behaviour compares to that of other people. The resulting inaccurate comparisons can lead to increased stress levels that can impact health and well-being. Personal informatics systems measure and display information about personal behaviours and can facilitate reflection and increase self-knowledge. We provide empirical evidence to show that accurate self-knowledge can result in 'digital epiphanies' that lead to changes in attitude and behaviour.

Digital epiphanies. Email. Social networking. Self-reflection. Personal Informatics

1. INTRODUCTION

With the widespread use of smartphones and other mobile technologies, email and social network sites (SNS) can now be accessed anytime from anywhere. This mobile connectivity has led to the development of new ways of working and socialising. For example, many people can now work from home, and/or benefit from flexible work patterns that successfully fit around caring responsibilities. Others keep in touch with extensive peer groups and are alerted about any SNS updates even when on the move. However, in addition to these benefits, there are some negative consequences of using these communication technologies, in particular increased stress levels that can impact on health and well-being.

In this paper, we describe several ways in which habits associated with the use of digital communications technologies can act as stressors. They can result in people having an inaccurate perception of the amount of time that they devote to work and non-work activities. Furthermore, these technologies can mislead people about how their habits compare to other people's behaviour. Our thesis is that accurate self-knowledge is power and that using personal informatics (PI) tools, that help people to collect personally relevant information about their behaviour (Li, Dey & Forlizzi, 2010), can result in 'digital epiphanies' where people gain insights into their own and other people's habits that can potentially lead to beneficial attitude and behaviour changes.

We support our arguments with empirical findings from two studies, one an auto-ethnographic study of a PI tool that tracks hours worked and the other an investigation of university students' SNS usage.

2. NEGATIVE IMPACTS OF DIGITAL COMMUNICATION TECHNOLOGIES

There are a number of ways that digital communication habits can increase work-related stress. Both email and SNS systems often incorporate notifications which can result in interrupted work patterns (Krasnova, Spiekermann, Koroleva & Hildebrand, 2010). A consequence of frequent interruptions is that people *overestimate the time spent* on these activities. Levine, Waite and Bowman (2007) demonstrated that the resulting frequent task-switching behaviour makes it more difficult to concentrate, and this impacts on people's ability to accurately assess the time spent on an activity. In addition, multitasking can result in activities being broken up into segments (Oulasvirta, Rattenbury, Ma & Raita, 2012) and this segmentation can increase retrospective estimation of activity duration (Block, 1992). Being unable to accurately assess the amount of time spent on email and SNS can lead to the sense that too much time is being spent on these activities and too little on 'real work' or as quality time with loved ones, and this perception can be a stressor.

Another potential source of stress is that digital technologies encourage *social comparison* (Cropanzano, Rupp & Byrne, 2003), which can lead to the user feeling inferior. For example, social network feeds can suggest that everyone else is having a better time than the viewer. Similarly, email can project the idea that everyone else is being more productive. In both cases, these can be

the result of an inaccurate comparison due to an inaccurate perception of the social norm.

In the next section we explain how PI tools could be used to reduce this stress by encouraging accurate perception of one's own behaviour, the behaviour of others, and self-reflection.

3. PERSONAL INFORMATICS TOOLS, SELF-REFLECTION AND SELF-KNOWLEDGE

PI tools *"help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge"* (Li, Dey & Forlizzi, 2010) by supporting the identification, collection, and representation of data with a view to enabling the user to reflect on their current behaviour. Such data can include measures that are recorded automatically, such as the time spent on a task, in addition to things such as hand written journals, photos or video recordings. Furthermore, such technologies can communicate information about how the behaviour of the user compares to that of the community, e.g. by telling the user how their own measurements compare to the average, and thereby convey the social norm for a particular behaviour, or by describing where in the distribution the user falls. Such tools can therefore provide people with the ability to accurately compare their behaviour to that of others.

The idea of using technology to trigger and support reflection has been gaining momentum in recent years. Fleck and Fizpatrick (2010) outline a number of ways in which technology has and can be used to do this, including: recording experiences and other data; prompting people to explain and justify these recordings and to share and discuss these with other people; and allowing them to see more than they can alone, either by encouraging looking from another perspective or by recording and revealing things that are invisible to normal human perception.

Thinking about and evaluating personal data can result in new insights into personal habits and help identify things that could be done differently in the future. For this reason, self-reflection has been employed and cultivated for many years within some professions, such as teaching and nursing, in order to facilitate people learning from experience and improving their practice. Hixon and Swann (1993) demonstrated in a series of lab experiments the conditions under which self-reflection is effective at generating self-insights: first, the information that is being reflected on should be *salient* and *unambiguous*; second, considering *what* one is and does is more likely to lead to insights than considering *why* that is the case; third, too much self-reflection can be as ineffective as too little self-reflection in some situations.

We argue that accurate self-knowledge can ameliorate at least some of the stress caused by digital habits. However, not all self-reflection leads to accurate self-knowledge or is motivated by self-improvement. Sedikides and Strube (1997) identify three other ways that people are motivated to engage in self-reflection: first, self-enhancement to elevate their self-esteem by increasing the positivity of their self-conception; second, self-verification to increase their sense of control by maintaining consistency between their self-conception and new information; and third, self-assessment to maintain an accurate self-conception, regardless of whether it is positive or negative. Importantly, none of these motives involve improving perceived deficiencies. Furthermore, the first two motivations do not result in accurate self-knowledge. When focused on self-enhancement, people tend to remember and judge information in a way that presents themselves in the best possible light and sometimes deceive themselves in order to enhance their sense of self. For purposes of self-verification people tend to remember and interpret information in a way that sustains their existing self-beliefs, often avoiding or discrediting disconfirming evidence. Sedikides and Strube (1997) show that people are motivated to seek out accurate knowledge about themselves when they are uncertain about an ability or some aspect of themselves. Furthermore, accurate self-knowledge is typically only used for self-improvement when a person feels inadequate or deficient in some way.

In the next section we describe how using PI tools can lead to digital epiphanies that can result in attitude change and reduce stress. We then describe how the accurate self-knowledge resulting from digital epiphanies can ameliorate at least some of the stress resulting from digital communication habits.

4. DIGITAL EPIPHANIES

An epiphany is a striking realisation about something. Famous, although perhaps apocryphal, examples being Archimedes' insight into how to measure the density of objects as he was getting into the bath and Newton's realisation that falling objects, whether an apple or the moon, are influenced by the same gravitational force. Our focus is on facilitating 'digital epiphanies', where 'digital' refers to two aspects of the experience. First, these involve people having an insight about one of their digital behaviours, for example, the amount of time they spend on Facebook or how much time they spend on their computer each day. Second, the realization about this personal habit is the result of using a digital PI tool like RescueTime (https://www.rescuetime.com/), which provides an objective measure of how much time is actively spent using different software, or a Fitbit

(http://www.fitbit.com/uk), a device which tracks physical activity levels.

We have identified two types of digital epiphany that can result from using PI tools: an *acceptance epiphany* and a *change epiphany.* An acceptance epiphany results in an attitude change and involves the following steps. Initially, a person considers one of their behaviours to be undesirable, which can have negative consequences, such as stress. However, using a personal informatics system provides:

• knowledge about the behaviour, leading to:

• a realisation that this behaviour is not undesirable, usually by reference to a social norm, which results in:

• a conscious decision to accept the behaviour and perceive it more positively, which can lead to benefits such as lowered stress levels.

A change epiphany results in a conscious decision to change behaviour. It is where a person initially considers a behaviour to be acceptable but using a personal informatics system provides:

• knowledge about the behaviour, leading to:

• a realisation that this behaviour is not desirable, usually by reference to a social norm, which results in:

• a conscious decision to try to behave differently, which can lead to benefits such as lowered stress levels.

In both types of digital epiphany self-knowledge results in a change in the way a person perceives a personal behaviour: either a previously acceptable behaviour is considered undesirable, which might lead to a person deciding to behave differently, or a previously undesirable behaviour is perceived as acceptable and a person learns to live with it. When designing tools that facilitate digital epiphanies, it is not necessary to know whether the acquired knowledge will lead to change or acceptance: the design goal is to facilitate accurate self-reflection.

We now describe two studies where we used technology to encourage people to reflect on their digital habits so that they could gain more accurate knowledge about the amount of time they spent on either a work or social activity and thereby reduce the stress that they currently experienced.

6. REDUCING STRESS THROUGH SELF-KNOWLEDGE

6.1 An auto-ethnography of work habits

Examples of both types of digital epiphany come from an auto-ethnographic study carried out by AC using an iPhone App called HoursTracker

(http://hourstrackerapp.com/). Two years ago, AC felt overwhelmed by the size of her task list, and the number of tasks on which she was failing to meet the deadline. She hypothesised that perhaps this was as a result of not putting in enough hours on work activities. Simply reflecting on whether she worked a sufficient number of hours was not good enough to answer this question as she often followed an irregular work pattern rather than a set 9-to-5 day. She therefore decided to use HoursTracker to record all the time she spent on work activities. She learnt that although her time working varied considerably (from 30 hours some weeks to over 40 hours other weeks), the average was around 37 hours per week. This was comparable to her contracted hours and she therefore considered herself to be working hard enough. As a result she experienced an acceptance epiphany and concluded that the reason her task list was getting longer was simply that there was just too much to do! As a result of this attitude change she experienced a reduction in stress.

More recently, prompted by an enquiry into how many hours a week she works now, AC decided again to measure the number of hours she was working. This time she was rather surprised to discover that she regularly works around 50 hours a week. Although the long working hours of academic staff are frequently acknowledged (e.g. http://www.timeshighereducation.co.uk/features/work-and-other-labours-of-love/2004285.article) so is the fact that productivity tends to fall when people work more than 40 hours per week. As a consequence of comparing the number of hours worked to what she perceived to be desirable, AC experienced a change epiphany. Motivated by a wish to ensure that she spends an adequate amount of time on family activities, she is now trying to change her behaviour in order to feel a greater sense of control over the amount of time she spends working.

6.2 A study of social habits

Our second digital epiphany example comes from a study of students and their social networking habits. Students are the primary user group of social networking sites, with 50% using them more than once per day (Sheldon, 2008). Although 95% report that using Facebook has a positive effect on their social lives, 80% also report that it has a negative impact on their academic studies (Pempek, Yermolayeva & Calvert, 2009). The 16 university student participants loaded RescueTime on their laptops and smart phones which provided an unambiguous and objective measurement of their social network usage. We did not explicitly ask participants to use RescueTime or reflect on their usage, but each day participants were telephoned at random times between noon and

midnight and asked to estimate the time they had spent on SNS since they had woken up. We expected that initially they would be uncertain about the accuracy of their estimate which would motivate them to use RescueTime in order to gain accurate knowledge. At the beginning and end of the two week study we measured: first, participants' attitude to social networks, asking them to rate on a 7 point Likert scale their satisfaction with their social network usage; second, the extent to which they found social networks stressful, also on a 7 point Likert scale; third, their time management skills using the Time Management Behavior Scale (TMBS) (http://psycnet.apa.org/journals/edu/82/4/760/); and fourth, their perceived level of stress using the Perceived Stress Scale (http://www.ncsu.edu/assessment/resources/percei ved_stress_scale.pdf).

Initially, all the participants overestimated their average 53 minutes daily usage by an average of almost 40 minutes. By the end of the study, participants' estimations were, on average, only five minutes different from their actual usage. Participants' perceived control over time, which is one of the four subscales within the TMBS, significantly increased over the two week study. More generally, the participants experienced an acceptance epiphany because, although their attitudes to SNS as a stressor significantly decreased, and their satisfaction with their SNS usage significantly increased, the amount of time they spent social networking did not change.

7. GENERAL DISCUSSION AND FUTURE WORK

Digital technologies enable us to combine work and social activities in new ways. Whilst there are many benefits, an unintended side effect of these more flexible patterns of activity is that we are less aware of our own habits and how they compare to those of others. Through two examples we have demonstrated how PI tools can facilitate digital epiphanies which can result in people gaining a new perspective on their own behaviour, resulting in reduced stress levels.

Future work will explore the importance of having accurate perceptions of the behaviour of other people and the role that this may play in acceptance and change epiphanies.

8. ACKNOWLEDGEMENTS

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