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Investigating respondent multitasking in web surveys using paradata

Anže Sendelbah*, Vasja Vehovar, Ana Slavec, Andraž Petrovčič

Faculty of Social Sciences, University of Ljubljana, Kardeljeva ploščad 5, 1000 Ljubljana, Slovenia

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ABSTRACT

Computers play an important role in everyday multitasking. Within this context, we focus on respondent multitasking (RM) in web surveys. RM occurs when users engage in other activities while responding to a web survey questionnaire. The conceptual framework is built on existing literature on multitasking, integrating knowledge from both cognitive psychology and survey methodology. Our main contribution is a new approach for measuring RM in web surveys, which involves an innovative use of the different types of paradata defined as non-reactive electronic tracks concerning respondents' process of answering the web questionnaire. In addition to using questionnaire page completion time as a measure of RM, we introduce 'focus-out' events that indicate when respondents have left the window containing the web questionnaire (e.g., to chat, email, browse) and then returned. The approach was tested in an empirical study using a web survey on a student sample ($n = 267$). The results indicate that 60% of respondents have multitasked at least once. In addition, they reveal that item nonresponse as an indicator of response quality is associated with RM, while non-differentiation is not. Although this study confirms that a paradata-based approach is a feasible means of measuring RM, future research on this topic is warranted.

1. Introduction

The concept of multitasking refers to sequential or concurrent combinations of activities. In this paper, we focus on *respondent multitasking* (RM) where responding to a questionnaire is the *primary activity*. *Secondary activities* or distractions are any other activities performed by respondents at any moment between the start and the end of this primary activity.

Despite concerns expressed in previous survey methodology research (e.g., Holbrook, Green, & Krosnick, 2003; Lavrakas, Shuttles, Steeh, & Fienberg, 2007; Lynn & Kaminska, 2012) that respondents' secondary activities can affect their response process and the quality of the responses given, the problem has rarely been addressed in the literature. This is particularly true for the technical and methodological aspects of measuring RM, which have typically been investigated using self-reports: by asking respondents at the end of a questionnaire whether or not they were engaged in any secondary activities while responding (e.g., Kennedy, 2010; Lavrakas, Tompson, Benford, & Fleury, 2010; Zwarun & Hall, 2014). However, researchers have shown that self-reports about multitasking behaviour (e.g., Iqbal & Horvitz, 2007; Lottridge, Marschner, Wang, Romanovsky, & Nass, 2012) are not always reliable as people tend to over- or under-estimate the amount of time spent on activities. For example, some respondents might not report any secondary activities due to social desirability bias or they might simply fail to account for all instances of secondary activities. Different authors have highlighted the need for more studies that use electronic tracking to measure media and/or multitasking behaviour in order to compare and validate self-reported and non-reactive RM data (e.g., Greenberg et al., 2005; Möller, Kranz, Schmid, Roalter, & Diewald, 2013; Wallis, 2010).

Therefore, the present study aims to fill the gap in the literature on RM in web surveys by both conceptually and empirically exploring the potential of *paradata* for measuring RM. Following the approach of Couper (2000b), the concept of paradata refers to non-reactive tracks concerning the process of surveying, such as interviewer observations, contact attempt records, and electronic traces. Within the context of web surveys, we predominantly talk about *direct paradata*, which is generated by respondent interaction with the survey instrument and is automatically collected at the respondent level by the survey platform (Callegaro, Lozar Manfreda, & Vehovar, 2015). In the context of research on RM, paradata can provide more reliable results than self-reports. Such data can also decrease the respondents' burden as there is no need

* Corresponding author.
E-mail addresses: anze.sendelbah@fdv.uni-lj.si (A. Sendelbah), vasja.vehovar@fdv.uni-lj.si (V. Vehovar), ana.slavec@fdv.uni-lj.si (A. Slavec), andraz.petrovcic@fdv.uni-lj.si (A. Petrovčič).

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to include additional questions about RM at the end of questionnaires.

This study introduces a theoretically informed elaboration of new RM indicators that can describe and indicate possible RM behaviours. Specifically, based on the integration of an overview of existing interdisciplinary research on multitasking, media multitasking, RM, and response quality (RQ), we have developed a methodological framework for investigating RM in web surveys using paradata. Drawing on this framework as well as the available paradata, we have developed RM indicators related to two different types of navigational paradata events: long response times and switches away from the browser window or tab that contains the web questionnaire. Although such a methodological framework represents a first attempt at an integrative conceptualisation of RM in web surveys, its development might be relevant on at least two levels. On one hand, we believe research on this multifaceted and complex behaviour requires a thorough theoretical discussion and conceptualisation. On the other hand, a broader understanding of RM and RQ will allow us to properly discuss the limitations of our paradata-based approach.

In addition, the empirical part of this paper presents a proof of concept study on the feasibility of using a paradata-based approach for measuring RM in web surveys by employing it on a survey of incoming and outgoing exchange students at the University of Ljubljana during the 2012/2013 academic year. While the main focus of the empirical study was finding support for proof of concept, we also use our survey data to illustrate the descriptive characteristics related to the occurrence of the multitasking. Accordingly, in addition to investigating the relationship of RM with RQ, we also report the prevalence rates of RM in our web survey.

The structure of this paper is as follows. In Section 2, we first present the concept of multitasking, mainly based on threaded cognition theory. This is followed by an overview of empirical evidence on the prevalence of multitasking on personal computers in general and of RM in particular. We then expand on the RM taxonomy. In Section 3, we provide an overview of the theoretical and empirical literature dealing with the relationship between RM and RQ. Next, we introduce our paradata-based approach in Section 4. After presenting the research questions (Section 5), methods (Section 6) and results of the empirical study (Section 7), we provide a discussion of our findings along with identifying the advantages and limitations of our approach (Section 8).

2. Background on multitasking, media multitasking and respondent multitasking

2.1. Multitasking

Multitasking research has a long history in the cognitive sciences (Meyer & Kieras, 1997). The literature presents different, often incompatible or even contrasting, definitions of this phenomenon, as well as various theories on how our cognitive system copes with multitasking situations. Recently, several authors have proposed different cognitive architectures to explain our ability to multitask, including Executive-Process/Interactive Control (EPIC) (Meyer & Kieras, 1997), Multiple Resource Model (Wickens, 2008), and Threaded Cognition (Salvucci & Taatgen, 2011). Following the studies of Wang et al. (2012), Van Cauwenberge, Schaap, and van Roy (2014) and Courage, Bakhtiar, Fitzpatrick, Kenny, and Brandeau (2015), it is suggested that the latter presents the most applicable and holistic conceptualisation of multitasking and the role of our cognitive system, as the other theories are usually only concerned with our cognitive ability to multitask.

Salvucci and Taatgen (2011) define multitasking on a continuum where one extreme represents *concurrent multitasking*, where tasks are performed simultaneously or with very short interruptions, while the other extreme represents *sequential multitasking*, where the time between *task switches* can be expressed in seconds, minutes or even hours. A core component of the threaded cognition theory is the adoption of ACT-R (Adaptive Control of Thought-Rational) cognitive architecture (Anderson, 2007) to explain the role and limitations of the human processing resources involved in multitasking behaviour. ACT-R architecture describes the interaction between different cognitive resources and their limitations in terms of processing different complex processes.

Salvucci and Taatgen (2011) use this architecture to model different activities and to predict conflicts that can arise during multitasking. For example, each resource can process a limited amount of different activities. If two activities require the same cognitive resource, they cannot access it at the same time and so one of the activities is temporarily suspended. Such conflicts may cause delays in execution, while the recall of suspended activities requires additional cognitive processing. Moreover, longer suspension periods and/or more complex activities increase the amount of cognitive resources required when switching between activities.

Other authors generally agree that our capability to multitask is limited by the capabilities of our cognitive system (e.g., Meyer & Kieras, 1997; Wickens, 2008). They also agree that multitasking is typically associated with longer completion times and an inferior performance quality in goal-oriented activities. In addition to numerous experiments on multitasking in cognitive laboratories (Meyer & Kieras, 1997), this has also been confirmed in applied research. For example, studies have reported that an increased tendency to multitask with various media content in everyday life is associated with worse GPA scores or other measures of academic success (e.g., Fried, 2008; Junco & Cotten, 2012; Kirschner & Karpinski, 2010). However, empirical findings also show that multitasking does not always impair performance or that it can even improve performance under certain conditions (e.g., Adler & Benbunan-Fich, 2012; Ie, Haller, Langer, & Courvoisier, 2012; Tran, Carrillo, & Subrahmanyam, 2013). Moreover, different types of activities can have different implications for performance (e.g., Kennedy, 2010; Wood et al., 2012).

In addition to considering whether activities require the same cognitive resources, Salvucci and Taatgen (2011) discuss other factors that influence our ability to multitask. Increased knowledge of specific activities can mitigate the negative effects in multitasking situations that involve such activities. In the survey research context, for instance, a person who is used to responding to questionnaires might be more capable of combining such an activity with other activities. Another difference between individuals can arise from differences in cognitive system capabilities due to age, visual acuity, motor capabilities and/or other reasons (Salvucci & Taatgen, 2011).

Relevant theoretical insight into multitasking in the modern media environment is also offered by communication theories (see Yeykelis, Cummings, & Reeves, 2014 for an overview). Compared to cognitive science literature, this research stream outlines the role of motivational systems in the different stages of multitasking behaviour. For example, Wang and Tchernev (2012) have applied the uses and gratification theory to explain how implicit emotional needs and subsequent emotional gratifications (such as feeling entertained or relaxed) drive habitual multitasking behaviour. Another important insight is offered by the Limited Capacity Model of Motivated Mediated Message Processing (LC4MP), which states that the allocation of cognitive resources partially depends on an individual's motivation (Lang et al., 2005).

To conclude, threaded cognition and other relevant theories