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Mobile diaries – Benchmark against metered measurements: An empirical investigation

Mitchell J. Lovett [a], Renana Peres [b,*]

[a] Simon Business School, University of Rochester, United States
[b] School of Business Administration, Hebrew University of Jerusalem, Jerusalem 91905, Israel

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ABSTRACT

Researchers seeking to study the relationships between consumers' communications, attitudes, and behaviors could benefit from monitoring consumers over time, across multiple locations and channels, and in a way that reflects consumers' subjective perceptions. Diaries on smartphones (mobile diaries) can be used as a research tool for such purposes. A mobile diary is a self-report instrument whereby people use their mobile handset to repeatedly report experiences of interest. Mobile diaries are increasingly used in psychology, geography, medicine, and commercial marketing. Yet they have rarely been used for quantitative marketing research, and were not benchmarked against best-practice metrics in marketing.

In this study, we aim to set the ground for using mobile diaries in quantitative marketing research. We first lay out the theoretical infrastructure for the usage of mobile diaries, and describe possible respondent reporting concerns, including concerns related to non-reporting, reporting over time, and concerns stemming from individual-level heterogeneity.

We demonstrate the potential of mobile diaries, as well as the importance of the various concerns, using a benchmark test case in the context of primetime TV viewing. Our benchmark uses a sample of respondents with both mobile diary viewing reports and Nielsen People Meter (NPM) records. Our analysis reveals that averaging across all conditions, 47.4%–64.7% of the NPM records are reported by the diary. The major sources for mismatch are random time periods without alarms, short viewings, and periodic reporting inactivity (pulsing). Concerns such as a decrease in reporting rates over time (e.g., fatigue), smartphone ownership, and demographic variation across individuals have relatively small effects on reporting likelihood. Analyzing the cases in which diary reports do not have a matching NPM record, we find many of them can be attributed to out-of-home viewing and viewing on non-metered devices. This finding demonstrates how mobile diaries can complement metered measurements. Overall, aggregate diary-based ratings have a 0.90 correlation with NPM ratings.

We discuss implications for designing and using mobile diary studies in marketing.

1. Introduction

Studying consumers' beliefs, attitudes, considerations and decisions is a challenging task. While forming beliefs and attitudes, evaluating products and services, and making purchase decisions, consumers are exposed to numerous experiences and influences that occur over time, across multiple locations and channels, and are processed from the consumers' subjective perspective. For

* Corresponding author.
E-mail addresses: mitch.lovett@simon.rochester.edu (M.J. Lovett), peresren@huji.ac.il (R. Peres).

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example, prior to purchase, consumers may conduct intensive research on choice alternatives over multiple channels (Verhoef, Neslin, & Vroomen, 2007). The exact choice sets they face depend on the context and on the search process and are often not observed (Ben Akiva and Boccara, 1995). After purchase, they may use the product in various locations, contexts, and ways (Lin & Chang, 2012). The decision to stop using a product or service evolves during multiple service encounters, product-usage experiences, and online and offline communications with peers (Kumar, Bhagwat, & Zhang, 2015; Nitzan & Libai, 2011). This complexity of the influences and interactions is intensified as consumers face an ever-increasing range of communications, purchase opportunities, and consumption outlets.

Studying consumers' behaviors and decisions often requires individual-level information of four types. First, information is needed across the *multiple locations* where search and experience encounters occur. Second, information needs to cover *multiple platforms*—consumers search and communicate online and offline, through face-to-face interactions and telephone conversations, as well as via social media platforms. In addition, they might search one platform (e.g., the offline store), but purchase in a different platform (e.g., the online website). Third, one might want to monitor *multiple behaviors* performed by the same individual, such as purchasing and communicating with other people. Fourth, information is needed on the consumer's *subjective assessment*, namely, her interpretation or perception of what she sees and experiences as well as her emotions and attitudes. All these types of information would ideally be monitored at the individual level, over time, and as close to the occurrence of the experiences as possible. Current marketing research methods, although including techniques such as web data mining (Netzer, Feldman, Goldenberg, & Fresko, 2012), location tracking (Shoval & Isaacson, 2007), emotion tracking (Vizard, 2016), web-browsing tracking (Bucklin & Sismeiro, 2009), and audience measurement tools (Napoli, 2012), still cannot provide the full range of data on these four types of individual-level information.

How can these information-needs be met today? The method of data collection we focus on in this study is diaries collected via smartphones, which we refer to as mobile diaries. Diaries are tools used to collect repeated self-reports about experiences (Bolger, Davis, & Rafaeli, 2003). Originally, diaries were kept using paper and pencil; however, the abundance and popularity of smartphones (Nielsen, 2014), as well as their deep embeddedness in people's lives (Smith, 2015; Stadd, 2013), make them an especially useful platform for such diaries. Also, because the incidence of mobile phone ownership is so high, respondents might prefer them to pen-and-paper diaries (Hensel, Fortenberry, Harezlak, & Craig, 2012).

In fact, mobile diaries are growing in popularity and are already widely used. Scholarly research is now using mobile diaries in a variety of domains including psychology, geography, health, and medicine. For example, they are used in studies on physical exercise (Heinonen, Luoto, Lindfors, & Nygård, 2012), sexual encounters (Hensel et al., 2012), and alcohol consumption (Collins, Kashdan, & Gollnisch, 2003), as well as in research on family dynamics (Rönkä, Malinen, Kinnunen, Tolvanen, & Lämsä, 2010), mood (Matthews, Doherty, Sharry, & Fitzpatrick, 2008), and mental symptoms such as anxiety or stress (Proudfoot et al., 2010). In psychology, diaries are an important measurement tool (called an experience sampling method [ESM]), particularly for research emphasizing the subjective perception of human experience (see Hektner, Schmidt, & Csikszentmihalyi, 2007, for a comprehensive review).[1] All these studies use diaries, designed in the form of a short survey, which respondents fill out one or more times during the day, or when an event of interest happens.

Scholarly marketing research has not widely adopted mobile diaries. Although practitioners are embracing mobile phones as a research platform (ESOMAR, 2012), and some companies now specialize in mobile diary research (e.g., OnDevice Research), quantitative academic marketing research has not. Marketing research once commonly used traditional paper-and-pencil diaries to document purchases (Wind & Lerner, 1979; Kahn, Kalwani, & Morrison, 1986; see Sudman & Ferber, 2011 for a review), and some recent works still used them to study time usage (Nonis, Philhours, and Hudson, 2006), word-of-mouth communication (Lovett, Peres, & Shachar, 2013), reactions to text messages (Patterson, 2005), responding to marketing activity (Heilman, Bowman, & Wright, 2000), and brand loyalty (Knox and Walker, 2001). However, quantitative marketing scholars have since largely eschewed diaries, replacing them with measurement systems less reliant on self-reports (e.g., NPM, browsing data, retailer transaction data, and scanner data). Scholarly research in marketing using diaries is now mostly qualitative (Elliott & Jankel-Elliott, 2003; Hart, Kerrigan, & Lehn, 2015; Patterson, 2005), using ethnographic, open-ended diaries.

We believe that due to their success as a research tool in other research domains and in marketing practice, and in light of the information needs described above, mobile diaries could serve a meaningful role in quantitative marketing research. The goal of this paper is to explore, theoretically and empirically, the potential and the challenges of using mobile diaries in a quantitative marketing research context.

We first integrate insights from the literature on self-reports to lay out the theoretical foundations for defining mobile diaries and identifying possible respondent reporting concerns. We identify three theoretical types of concerns. The first type relates to single-event concerns, namely failing to report an event, including responses to alarms, self-initiation, and reporting correctly. Second are time-related concerns, including decreases in the reporting rate over time (fatigue) and periodic reporting inactivity (pulsing). The third type of reporting concerns – heterogeneity-related concerns, comes from heterogeneity across individuals, including demographic differences and smartphone ownership.

We then conduct an empirical benchmark of mobile diary data against a widely accepted industry standard in order to demonstrate the potential of mobile diaries and explore the prevalence of various respondent reporting concerns. To the best of our knowledge, this study is the first attempt to rigorously evaluate *mobile* diaries in comparison to a benchmark of data from a widely accepted monitoring tool. Previous benchmark studies comparing diaries against non-self-report data, generally utilized pen-and-

[1] Initially, ESM used pagers to remind respondents to complete paper-and-pencil questionnaires, but it is gradually moving to using mobile phones as the collection device (e.g. Hofmann & Patel, 2015; Smith & Hofmann, 2016).

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