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The 'Polychronicity - Multiple Media Use' (P-MMU) scale: a multi-dimensional scale to measure polychronicity in the context of multiple media use.

Abstract:

Our paper details the development of a new multi-dimensional scale to measure polychronicity, 'the preference for multiple media use' (the P-MMU). Previous measures of polychronicity are predominantly developed for an organisational context, or do not reflect the complexity required for the measurement of the behavioural phenomenon of multiple media use, within the context of Integrated Marketing Communications (IMC). Scale development procedures follow a review of literature and prior qualitative study, uncovering motives for individuals' preference for multiple media use. The nine dimensional P-MMU scale demonstrates stability across two datasets, using a total sample of 317 Digital Natives. In the evolving research area of multiple media use, the P-MMU scale provides an appropriate measure for the study of this phenomenon.

Keywords: Polychronicity; IMC; multiple media use; multitasking; scale development

Contribution:

The P-MMU scale is intended for use among academics; researching in the specific areas of marketing communications, advertising and multiple media use and also practitioners; attempting to improve the efficacy of communication campaigns on behalf of their clients. Our analysis provides evidence to demonstrate that this multi-dimensional measure of polychronicity is reliable and valid. Consistently, the paper contributes the new P-MMU scale and a notable contribution towards an increased understanding of polychronicity, the 'preference for multiple media use'.

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Introduction

For the consumer, an array of internet based media, combined with traditional alternatives such as television, radio, press and cinema, provide a wide range of possibilities for individuals choosing media to watch, read or listen to. For example, in the press medium, an individual wishing to read a newspaper now has a choice of platforms; a traditional paper copy or an electronic version, via a laptop, tablet or mobile. The plethora of media alternatives is perpetually extended through user-generated content in web blogs and social media; including Instagram, YouTube and Facebook. Together with continual technological advancements, the variety presented by the current media environment provides the opportunity for individuals to engage in multiple media use. For example, an individual may choose to listen to a radio while reading a newspaper; or attend to social media alerts whilst watching a television programme and browsing the internet.

Issues related to multiple media use are pertinent to the concept of Integrated Marketing Communications (IMC), which continues to be the subject of considerable interest among academics (for example; Kitchen & Schultz, 1998; Kliatchko, 2008; Laurie & Mortimer, 2011) and practitioners. An ongoing ambition for marketing communications practitioners is to remain in touch with the disparate and dynamic range of media channels available to their clients; since within the broader context of IMC, media advertising remains an important communication option (Keller, 2001) in which effective media synergy is considered an essential element for IMC campaign success (Laurie and Mortimer, 2011). The focus of this study is the phenomenon of multiple media use, which merits attention from a theoretical perspective and for marketing communications practitioners endeavouring to plan effective IMC campaigns.

Multiple media use is recognised as a 'special case' of multitasking (Rosen, Carrier & Cheever, 2013); firmly established as a behavioural concept, wherein multiple task goals are completed in the same time period by engaging in frequent switches between individual tasks (Delbridge, 2000). The topic

of multiple media use is described in the literature as an emerging area of research (Lin, 2009); where its' occurrence is established, combinations of media use are ascertained and switching behaviour is examined (for example; Bardhi et al., 2010; Brasel & Gips, 2011; Carrier et al., 2015; Foehr, 2006; Pilotta & Schultz, 2005; Yeykelis et al., 2014). Extant empirical studies reveal several predominant media combinations: television with internet or newspapers; radio with newspapers; email with texting and instant messaging with music (Carrier et al., 2015; Pilotta et al., 2004; Pilotta and Schultz, 2005). Attention levels between media are found to vary during individuals' multiple media use, advocating foreground and background media (Brasel & Gips, 2011; Pilotta & Schultz, 2005); where rates of switching between media are fast and frequent (Brasel & Gips, 2011; Yeykelis et al., 2014).

Progressing the understanding of this behavioural phenomenon, an evolving body of empirical work examines the precursors of multiple media use; exposing audience characteristics, ownership and availability of media as antecedents (for example, Jeong & Fishbein, 2007; Wang & Tchernev, 2012; Kononova and Chiang, 2015). Several studies determine age as an important audience attribute for multiple media use (for example, Carrier et al., 2009, 2015; Wang & Tchernev, 2012; Kononova & Chiang, 2015). The 'Net Generation' (or 'Digital Natives', Prensky, 2001); born since 1980, are established as the foremost group of multiple media users (Carrier et al., 2009). There is also tentative evidence that gender is also associated with multiple media use, with females revealed as prominent users (Jeong & Fishbein, 2007; Duff et al., 2014). Empirical studies uncover: personal control; efficiency; information; connection and entertainment as antecedents of multiple media use (for example, Bardhi et al., 2010; Duff et al., 2014; Hwang et al., 2014; Kononova & Chiang, 2015). Furthermore, the literature reveals that the behavioural phenomenon of multiple media use is the result of individuals' preference for performing multiple tasks (Srivastava et al., 2016), known as polychronicity (for example, Bluedorn et al., 1999; Konig & Waller, 2010). The importance of polychronicity (the preference for multiple media use) is highlighted in recent work by Robinson (2016) and Kononova and Chiang (2015). Polychronicity and especially its measurement are the focal

interest of this study; as it is questionable whether current measures are appropriate for the specific case of multiple media use. Pursuing this gap in knowledge, this study develops a new multi-dimensional scale to measure polychronicity, 'the preference for multiple media use'; addressing the complex nature of this behavioural phenomenon. Such a measure is valuable for academics, researching in the IMC and consumer media domains; alongside marketing communications practitioners, seeking to improve the effectiveness of clients' campaigns. The following review of the concept of polychronicity considers extant measures, to examine their suitability for the measurement of polychronicity in the context of multiple media use.

The concept of polychronicity

Inspection of definitions of polychronicity in Table 1 reveals disagreement regarding the exact meaning of the concept. Early definitions by Hall (1959; 1983) focus solely on behaviour in the context of culture, while subsequently, the meaning is extended to encompass the notion of value (Hall, 1998). The definitions by Bluedorn et al. (1999) and Palmer and Schoorman (1999) take a different perspective, emphasising the aspect of preference rather than behaviour. In addition to preference, Bluedorn et al. (1999) emphasise belief, while Palmer and Schoorman (1999) highlight the aspect of time tangibility. More recently, definitions of polychronicity consider it to represent the preference for doing several things at a time (Konig & Waller, 2010; Poposki & Ozwald, 2010). The recommendation by Konig and Waller (2010) that 'the term polychronicity should only be used to describe the preference for doing several things at a time, whereas the behavioural aspect of polychronicity should be referred to as multitasking' (p.175) is accepted for this study; as it underlines the connection between polychronicity and multitasking (in the context of multiple media use). While variations are evident with regard to whether polychronicity comprises: individuals or groups, tasks performed simultaneously or within a time frame and whether cognitive tasks should be included or not; all definitions emphasise the multidimensional nature of the concept (as indicated in Table 1).

Table 1: A chronological summary of the definitions of polychronicity

Definition: Polychronicity	Reference	Emphasis
'doing more than one thing at a time' (polychronicity)	Hall (1959)	Behaviour Culture
'a cultural variable involving two different ways of organising activities: monochronically-involvement in events one at a time; and polychronically-involvement in two or more events at the same time'	Hall (1983)	Culture Behaviour
'a polychronic culture is a culture in which people value and hence practice, engaging in several activities and events at the same time'	Hall (1998)	Behaviour and Value
(monochronicity) 'a preference for doing one thing at a time, rather than doing two or more things simultaneously' (polychronicity)	Bluedorn, Kaufman & Lane (1992)	Preference
'the extent to which people in a culture: (1) prefer to be engaged in two or more tasks or events simultaneously; and (2) believe their preference is the best way to do things'	Bluedorn, Kallaith, Strube & Martin (1999)	Culture Preference and Belief
Three components: time use preference; time tangibility and context. Time use preference: 'the extent to which people within a culture prefer to do things one at a time or in coordination. Time tangibility: 'the extent to which time is perceived within a culture as being quantifiable. Context: high and low context cultures (Hall, 1998)	Palmer & Schoorman (1999)	Culture Preference Time
'the preference for doing several things at a time'	Konig & Waller (2010)	Preference
Polychronicity is a non-cognitive variable reflecting 'an individual's preference for shifting attention among ongoing tasks, rather than focussing on one task until completion and then switching to another task'	Poposki & Oswald (2010)	Preference

The measurement of polychronicity.

Table 2 presents a summary of the five scales identified in the literature for the measurement of polychronicity. Acknowledging the contributions of these scales, we consider each scale in turn, under three themes: orientation, generality and content validity; to determine its' suitability for the measurement of polychronicity in the context of multiple media use.

The first documented attempt to measure polychronicity is by Kaufman et al. (1991), who developed and tested the Polychronic Attitude Index (PAI), with the intention of discovering whether individuals are aware of their polychronic time use. The PAI scale items refer to 'activities' and 'doing things' (Table 2), demonstrating that it is firmly rooted in a behavioural conceptualisation of polychronicity. The scale is based on the premise that there is no finite amount of time during a day, since individuals can (if they choose) do more than one thing at a time, thus displaying polychronic behaviour. The PAI aims to 'capture the respondents' general tendencies towards performing more than one activity at a time' (Kaufman et al., 1991, p.395), although the degree of generality is questioned as scale item 3 (referring to 'when I sit down at my desk'; Table 2) implies a work or study context. The four item one dimensional scale follows accepted scale development practice and methodology (for example, DeVellis, 2004; Netemeyer, Bearden & Sharma, 2003). The psychometric properties of the scale are verified by applications across a range of organisational contexts in education and employment (for example, Kaufman et al., 1991). This study represents an important contribution to the early measurement of polychronicity.

Continuing the behavioural emphasis, Kaufman-Scarborough and Lindquist (1999) revisited and revised the PAI, to measure the way consumers' feel about polychronic time use. In response to concerns by contributors to the polychronic debate, about whether the original scale was indeed non-context specific, an item which referred to the situation specific 'at my desk' was removed, thus forming a three item scale, termed the MPAI3. However, the small number of scale items raises concern about the content validity of this measure (and the PAI on which it is based), in view of the

multidimensional nature of polychronicity (for example, Lindquist and Kaufman-Scarborough, 2007). Furthermore, although this scale was intended to provide a 'general' scale for the measurement of polychronicity, Table 2 indicates that the MPAI3 has not been widely adopted. Regarding the suitability of the PAI and MPAI3 measures for the context of multiple media use, it is difficult to see how these scales could be adapted to capture the specific multidimensional aspects of individuals' preference for multiple media use.

Table 2: Extant polychronicity measurement scales.

Polychronicity scale	Items	Emphasis	Applications
The Polychronic Attitude Index (PAI) (Kaufman et al., 1991)	I do not like to juggle several activities at the same time (R) People should not try to do too many things at once (R) When I sit down at my desk, I work on one project at a time (R) I am comfortable doing several things at the same time <i>R=reverse scored; Five point Likert scale</i>	Behaviour	Bluedorn, Kaufman & Lane (1992) Lee, Tan & Hameed (2006)
The MPAI3 (Kaufman-Scarborough and Lindquist, 1999)	I do not like to juggle several activities at the same time (R) People should not try to do too many things at once (R) I am comfortable doing several things at the same time <i>R=reverse scored; Five point Likert scale</i>	Behaviour	Zhang, Ravindra & Goonetilleke (2010); Goonetilleke & Luximan (2010)
The Polychronic-Monochronic Tendency Scale (PMTS) (Lindquist and Kaufman-Scarborough, 2007)	I prefer to do two or more activities at the same time. I typically like do two or more activities at the same time. Doing two or more activities at the same time is the most efficient way to use my time. I am comfortable doing more than one activity at the same time. I like to juggle two or more activities at the same time <i>Seven point Likert scale</i>	Behaviour and preference	Kononova & Chiang (2015)
The Inventory of Polychronic Values (IPV) (Bluedorn et al., 1999)	I would like to juggle several activities at the same time. I would rather complete an entire project every day than complete parts of several projects (R) I believe people should do many things at once. When I work by myself, I usually work on one project at a time. (R) I prefer to do one thing at a time (R) I believe people do their best when they have many tasks to complete. I believe it is best to complete one task before beginning another (R) I believe it is best for people to be given several tasks and assignments to perform. I seldom like to work on more than a single task or assignment at the same time. (R) I would rather complete parts of several projects every day than complete an entire project <i>R=reverse scored; Seven point Likert scale</i>	Preference and Belief	Conte, Rizzuto & Steiner (1999); Palmer & Schoorman (1999); Slocombe & Bluedorn (1999); Conte & Gintoft (2005) adapted use - 6 items; Hecht & Allen (2005) adapted use - 5 items from IPV + 3 additional items; Arndt, Arnold & Landry (2006) adapted use - 4 items; Schell & Conte (2008)
The Multitasking Preference Inventory (MPI) (Poposki and Oswald, 2010)	I prefer to work on several projects in a day, rather than completing one project and then switching to another. I would like to work in a job where I was constantly shifting from one task to another, like a receptionist or an air traffic controller. I lose interest in what I am doing if I have to focus on the same task for long periods of time, without thinking about doing something else. When doing a number of assignments, I like to switch back and forth between them, rather than do one at a time. I like to finish one task completely before focussing on anything else (R) It makes me uncomfortable when I am not able to finish one task completely before focussing on another task. (R) I am much more engaged in what I am doing if I am able to switch between several different tasks. I do not like having to shift my attention between multiple tasks. (R) I would rather switch back and forth between several projects than concentrate my efforts on just one. I would prefer to work in an environment where I can finish one task before starting the next. (R) I don't like when I have to stop in the middle of a task to work on something else. (R) When I have a task to complete, I like to break it up by switching to other tasks intermittently. I prefer not to be interrupted when working on a task (R) <i>R=reverse scored; Five point Likert scale</i>	Preference	Kirchberg, Roe, & Van Eeede (2015); Magen (2017; Rosen, Carrier & Cheever (2013) adapted use 4 items;

Emphasising behaviour and preference, the development of the PMTS is founded on the view that a person inherently possesses a general polychronic-monochronic tendency. Lindquist and Kaufman-Scarborough (2007), motivated by the search for a 'general' measure which 'more thoroughly reflects the multidisciplinary theory underlying polychronic-monochronic tendency' (p.262), revisited and extended the PAI and MPAI3 scales into a five item measure named the Polychronic-Monochronic Tendency Scale (PMTS). The scale attempts to measure the following five aspects: preference to behave; reported behaviour; time efficiency; comfort in behaving and liking of juggling activities. However, as indicated in Table 2, each of the aspects of this measurement scale is operationalised by only one item; for example, preference to behave polychronically is represented by 'I prefer to do two or more activities at the same time', which is of concern. It is doubtful whether a single item can truly account for the content of each of the five stated aspects of the scale. Closer scrutiny of the stages of development of this scale lends support to the above observation, raising further questions, since the generation of fifty items for use in the survey was entirely literature based; whereas supplementary exploratory empirical work to uncover underlying dimensions of such a concept is considered preferable (for example, DeVellis, 2004; Netemeyer et al., 2003). In addition, at the data reduction stage; of the original fifty items (not listed), twenty three are rejected (not reaching the .5 loading benchmark), and of the remaining twenty seven items, only five remain in the resulting PMTS, a sizeable reduction for which no clarification or explanation is given. The generality of the scale cannot be established, because to date the application of the scale has only been verified in one empirical study (Table 2).

In contrast to the behavioural conceptualisation of polychronicity in previous scales, Bluedorn et al. (1999) conceptualise polychronicity as a preference. Their ten item Inventory of Polychronic Values (IPV) is specifically developed to measure polychronicity as a 'dimension of organisational culture' (p. 207). The IPV focuses on the preference to be engaged in two or more tasks or events simultaneously. Scale development and validation follow good practice (for example, DeVellis, 2004; Netemeyer et al., 2003) and the psychometric properties of the IPV are supported for this scale,

which is by far the most extensively applied polychronicity scale measure. However, the IPV is specifically designed for use in the context of organisational culture, where it has been adopted.

Also emphasising the preference to multitask, the most recent attempt to measure individuals' polychronicity, the Multitasking Preference Inventory (MPI) by Poposki and Oswald (2010), makes use of a 14-item scale which meets accepted reliability and validity criteria. The MPI is conceptualised as a non-cognitive variable reflecting 'an individual's preference for shifting attention among ongoing tasks' (Poposki & Oswald, 2010, p.250). The focus on the individual and an affinity to the organisational and educational setting (with multiple mentions of tasks, assignments and projects) is similar to previous scales. The authors establish the psychometric properties of the MPI, which are verified by application; predominantly in organisational contexts.

In conclusion, five extant measures of polychronicity are identified (PAI: Kaufman et al., 1991; MPAI3: Kaufman-Scarborough & Lindquist, 1999; PMTS: Lindquist & Kaufman-Scarborough, 2007; IPV: Bluedorn et al., 1999; MPI: Popowski & Oswald, 2010). However, maintaining the position that the term polychronicity should only be used to refer to the preference to multitask (Konig & Waller, 2010), excludes the PAI, MPAI3 and PMTS, founded on behavioural conceptualisations (Kaufman et al., 1991; Kaufman-Scarborough & Lindquist, 1999; Lindquist & Kaufman-Scarborough, 2007). Furthermore, these scales are also considered deficient in terms of multidimensionality. Other extant measures (IPV: Bluedorn et al., 1999; MPI: Poposki & Oswald, 2010), although based on definitions emphasising preference, are firmly rooted in the context of organisational culture. For example, the unsuitability of these scales is illustrated by the first item of the MPI scale; 'I prefer to work on several projects in a day...' (Table 2); which would be difficult to modify for the specific context of multiple media use. Hence, it is concluded that there is a need to develop a new robust multidimensional scale that applies to individuals' polychronicity, the preference for multiple media use. The development of the 'polychronicity - multiple media use' (P-MMU) scale represents a necessary step towards a comprehensive investigation of the phenomenon.

Scale development

Following accepted practice (for example, Churchill, 1979; DeVellis, 2004; Netemeyer et al., 2003), scale development commenced with an in-depth qualitative investigation; the findings of which are reported in Robinson (2017). In brief, the concept of polychronicity as a preference for multiple media use (MMU) was explored using a combination of triads and in-depth interviews, among a sample of Digital Natives (Prensky, 2001). In line with earlier debate regarding the multifaceted nature of polychronicity ('The concept of polychronicity' section), analysis uncovered eight dimensions. Guided by the literature; the named dimensions and participants' comments, the scale items for each dimension were developed (totalling 56 items listed in Table 4).

Sampling, data collection and measures

We collected data on each of the scale items using a cross-sectional design from an online sample of U.K. Digital Natives (adults born since 1980, Prensky, 2001). The composition of the media multitasking audience is addressed in a study by Carrier, Cheever, Rosen, Benitez and Chang (2009) among three generations: 'Baby Boomers' (born between 1946 -1964), 'Generation X' (born between 1965 -1979) and the 'Net Generation' (born between 1980 - present); endorsing the view that multiple media use is most prevalent among members of the latter group. This finding is also supported by Foehr, (2006); Pilotta & Shultz (2005). The Digital Natives in our sample are individual consumers; the context of the study being multiple media use of media such as television, radio and social media. As such, self-completion data are appropriate among our Digital Native sample, taking place at a personal level.

A total number of N=317 of usable replies was obtained using self-selection sampling from an opt-in panel, to complete the online survey which was conducted by a specialist professional market research firm. Screening questions were included to ensure that all respondents regularly used two or more media at a time, and the sample was monitored for balance in terms of gender (50% Male; 50% Female) and breadth in terms of age (30% 15-19; 30% 20-24; 30% 25-34; 10% 35-36). During the

administration of the survey, the eight dimensions and items within each dimension were randomised and replies were obtained using a 7-point Likert scale; anchored at 1=Strongly Agree and 7=Strongly Disagree.

In addition to the demographic questions, measures were included to assess nomological validity. Consistent with our earlier view of polychronicity as a preference for multiple media use, we obtain information about the daily number of media used by respondents (behaviour). In addition, following a review of extant literature in the area of multiple media use, 'General multitasking' (Konig, Oberacher & Kleinmann, 2010); 'Innovativeness with technology' (Agarwal & Prasad, 1998) and 'Sensation Seeking' (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002) were identified as correlates for concurrent validity. Each of these constructs is operationalised as a four item scale, using a 7-point Likert scale.

Preliminary analysis

To establish confidence in the dimensions of polychronicity uncovered from the preceding qualitative study and review of literature, preliminary analysis was undertaken. Using data from all respondents, we apply three methods to test the proposed dimensionality of 'polychronicity for multiple media use' (P-MMU): (a) common factor analysis employing principle axis factoring (Tabachnick and Fidell, 2007); (b) parallel analysis and (c) Velicer's MAP test (O'Connor, 2000). The results in Table 3 offer support for an eight dimensional configuration and the close to one eigenvalues for the ninth dimension in the EFA and Velicer's Map test indicate possibility for an additional dimension.

Table 3: Eigenvalues for EFA, parallel analysis and Velicer's MAP test

Dimension	EFA (cumulative variance explained = 72.67%)	Parallel analysis	Velicer's MAP test
1	28.367	28.072	27.179
2	3.761	3.610	3.716
3	2.243	2.242	2.392
4	1.805	1.706	1.786
5	1.578	1.576	1.539
6	1.388	1.380	1.490
7	1.167	1.153	1.337
8	1.117	.989	1.159
9	.906	.792	.937
10	.772	.670	.922
11	.670	.627	.743
12	.603	.599	.692

At this juncture, a decision was made to split the sample (randomly) into two; using 165 respondents (Sample 1) for Stage 1 - Development of the P-MMU and 152 respondents (Sample 2) for Stage 2 - Validation of the P-MMU.

Stage 1: Development of the P-MMU

In this stage, we examine the internal coherency of each dimension separately. Exploration of the factor structure involved the use of EFA, using benchmarks from Hair et al. (2010). Analysis leads to the separation of the 'Comfort with MMU' dimension into the following two dimensions; 'Comfort with MMU' and 'Compulsive addictive' (highlighted ** in the top section of Table 4); resulting in a revised nine dimensional configuration. Given the length of the scale, in an attempt to achieve parsimony whilst maintaining sampling adequacy, a decision was made to reduce the number of items (for each of the nine dimensions) to the four with the highest loadings. (Kenny, Kashy & Bolger, 1998; Marsh, Hau, Balla & Grayson, 1998; Hair et al., 2010). The retained items for each of the nine dimensions are highlighted (bold italics) in Table 4.

Table 4: Survey items developed for the eight dimensions of polychronicity.

Dimensions and items
Comfort with MMU
<p><i>Comf1: I feel a constant compulsion to multitask with media.**</i></p> <p><i>Comf2: I feel comfortable when I am media multitasking.</i></p> <p><i>Comf3: Multitasking with media is compulsive.**</i></p> <p>Comf4: Sometimes I don't even realise that I am media multitasking.</p> <p><i>Comf5: For me, multitasking with media is habitual behaviour.</i></p> <p><i>Comf6: Media multitasking is something which comes naturally to me.</i></p> <p><i>Comf7: Media multitasking is addictive.**</i></p> <p><i>Comf8: I'm just good at multitasking with media.</i></p>
Multi-media channel preference
<p><i>Multim1: I like switching back and forth between different media.</i></p> <p><i>Multim2: I like to juggle between media.</i></p> <p>Multim3: I enjoy shifting my attention between media.</p> <p><i>Multim4: I like to do more than one media activity at a time.</i></p> <p><i>Multim5: I like having multiple streams of media stimulation.</i></p> <p>Multim6: I like to use a combination of media.</p> <p>Multim7: I lose interest if I only use one medium</p>
Convenience
<p>Conv1: For me, media multitasking is convenient.</p> <p><i>Conv2: It is easy to navigate between media when I am multitasking.</i></p> <p>Conv3: It is easy to multitask with media when I am on the move.</p> <p><i>Conv4: Media multitasking is effortless with portable devices.</i></p> <p><i>Conv5: Technology nowadays makes media multitasking effortless.</i></p> <p><i>Conv6: It is easy to multitask with media in many different locations.</i></p> <p>Conv7: It is easy for me to multitask with media.</p>
Emotional gratification
<p><i>Emo1: Media multitasking is enjoyable.</i></p> <p>Emo2: When I multitask with media I feel less alone.</p> <p><i>Emo3: Media multitasking makes me feel good.</i></p> <p>Emo4: I multitask with media to relieve boredom.</p> <p><i>Emo5: I multitask with media to relax.</i></p> <p><i>Emo6: Multitasking with media keeps me company.</i></p> <p>Emo7: I multitask with media to entertain myself.</p>
Social benefits
<p><i>Soc1: Multitasking with media gives me a sense of belonging.</i></p> <p>Soc2: When media multitasking, I feel in touch with what my friends are doing.</p> <p><i>Soc3: Media multitasking helps me feel available for my friends and family.</i></p> <p>Soc4: When media multitasking, I feel connected in a virtual world.</p> <p>Soc5: Media multitasking enhances my social experience.</p> <p><i>Soc6: When I multitask with media I feel closer to other people.</i></p> <p><i>Soc7: Media multitasking helps me to feel connected with my friends and family.</i></p>
Effectiveness and efficiency
<p>Eff1: When media multitasking I can do many activities at the same time.</p> <p>Eff2: Flicking between media makes me feel efficient.</p> <p>Eff3: Multitasking with media helps me juggle things.</p> <p><i>Eff4: I can get more done when I multitask with media.</i></p> <p><i>Eff5: Multitasking with media makes me more productive.</i></p> <p><i>Eff6: Media multitasking saves me time.</i></p> <p><i>Eff7: Media multitasking helps me get things done quickly.</i></p>
Information and knowledge
<p><i>Info1: When media multitasking, I can get instant access to information.</i></p> <p>Info2: Media multitasking lets me stay up to date with everything.</p> <p><i>Info3: Media multitasking allows me to see the 'bigger picture.'</i></p> <p><i>Info4: Media multitasking gives me different points of view.</i></p> <p><i>Info5: I multitask with media so that I can gain knowledge.</i></p> <p>Info6: When multitasking with media, I get supplementary information on a topic.</p>
Assimilation
<p><i>Assi1: Media multitasking helps me to filter media content.</i></p> <p>Assi2: Dummy item: Please tick somewhat agree for this statement.</p> <p><i>Assi3: Multitasking with media helps me to make sense of information.</i></p> <p><i>Assi4: Multitasking helps me absorb the media bombarded at me.</i></p> <p><i>Assi5: Media multitasking helps me to manage information.</i></p> <p>Assi6: I multitask with media to cope with the volume of information available nowadays.</p> <p>Assi7: I multitask with media because it allows me to choose media content of interest.</p>

** Three items forming the new dimension: **Compulsive Addictive**

The revised structures in Table 5 exhibit acceptable KMO values, cumulative variance explained and item loadings. Assessment of reliability was carried out using Cronbach's Alpha and Composite Reliability. Table 5 shows that Cronbach's Alphas exceed the .7 benchmark (Hair et al., 2010) for all nine dimensions and the Composite Reliability (CR) indices are all higher than the .7 benchmark (Fornell & Larcker, 1981). Convergent validity is assessed by computing Average Variance Explained (AVE) for each dimension. All dimensions exceeded the benchmark of .5 (Bagozzi & Yi, 1988). Inspection of Table 6 indicates discriminant validity, since the square root of the AVE for each dimension is notably greater than its' bivariate correlation with other dimensions.

Table 5: Reliability and validity analysis for nine dimensions of polychronicity Sample 1 (N=165)

Dimension	KMO ^a	Community ^b	Variance explained Cumulative %	Item loadings ^c	AVE ^d	Composite Reliability ^e	Cronbach's Alpha ^f
Comfort with MMU	.826		72.397		.724	.912	.872
Comf2		.750		.866			
Comf5		.617		.786			
Comf6		.782		.884			
Comf8		.746		.864			
Compulsive addictive	.746		81.605		.816	.930	.885
Comf1		.797		.893			
Comf3		.820		.906			
Comf7		.831		.911			
Multi-media channel preference	.843		77.322		.772	.931	.902
Multim1		.751		.866			
Multim2		.815		.903			
Multim4		.742		.861			
Multim5		.785		.886			
Convenience	.821		72.874		.729	.915	.874
Conv2		.680		.824			
Conv4		.774		.880			
Conv5		.755		.869			
Conv6		.707		.841			
Emotional gratification	.813		75.411		.754	.925	.886
Emo1		.749		.866			
Emo3		.785		.886			
Emo5		.784		.885			
Emo6		.698		.836			
Social benefits	.809		79.911		.799	.941	.915
Soc1		.793		.890			
Soc3		.771		.878			
Soc6		.834		.913			
Soc7		.799		.894			
Effectiveness and efficiency	.857		80.087		.801	.942	.917
Eff4		.815		.903			
Eff5		.812		.901			
Eff6		.797		.893			
Eff7		.780		.883			
Information and knowledge	.848		76.609		.776	.933	.903
Info1		.776		.881			
Info3		.759		.871			
Info4		.764		.874			
Info5		.806		.898			
Assimilation	.847		77.917		.780	.934	.905
Assi1		.774		.880			
Assi3		.770		.878			
Assi4		.806		.898			
Assi5		.767		.876			

Benchmarks: ^a KMO (Kaiser Meyer Olkin): > 0.7 (Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2010) *Multivariate Data Analysis A Global Perspective*. 7th Ed. Pearson Education Inc., New Jersey.)

^b Community - Measures of sampling accuracy (MSA): > 0.5 (Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2010) *Multivariate Data Analysis A Global Perspective*. 7th Ed. Pearson Education Inc., New Jersey.)

^c Item loadings > +/- 0.5; > .8 are considered extremely high (Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2010) *Multivariate Data Analysis A Global Perspective*. 7th Ed. Pearson Education Inc., New Jersey.)

^d Average Variance Explained (AVE): > .5 (Bagozzi, R.P. & Yi, Y. (1988) On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16 (1), 74-94)

^e Composite Reliability (CR): > .7 (Fornell, C. & Larcker, D.F (1981) Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39-50.)

^f Cronbach's Alpha: > .7 (Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E. (2010) *Multivariate Data Analysis A Global Perspective*. 7th Ed. Pearson Education Inc., New Jersey.)

Table 6: Correlations of dimensions Sample 1 (N=165)

	Comfort	Compulsive	Multimedia	Convenience	Emotional	Social	Effectiveness	Information	Assimilation
Comfort	0.851								
Compulsive	0.528	0.903							
Multimedia	0.769	0.454	0.877						
Convenience	0.721	0.397	0.625	0.854					
Emotional	0.631	0.526	0.718	0.548	0.868				
Social	0.455	0.663	0.458	0.373	0.566	0.894			
Effectiveness	0.683	0.396	0.623	0.705	0.582	0.375	0.895		
Information	0.644	0.457	0.589	0.59	0.617	0.564	0.518	0.881	
Assimilation	0.705	0.482	0.675	0.576	0.623	0.553	0.67	0.684	0.883

The **boldfaced** diagonal elements are the square root of AVEs. Off-diagonal elements are the correlations between constructs.

Stage 2: Validation of the P-MMU

We validate the above configuration through Confirmatory Factor Analysis (CFA) to Sample 2 (N=152) with P-MMU modelled as a higher order construct. The relevant indices indicate satisfactory model fit ($\chi^2 = 997.3$, $df = 551$, $p = .000$; RMSEA = .073, SRMR = .055; CFI = .922; TLI = .916; Bentler & Bonett, 1908; Brown & Cudeck, 1993). In addition, the loadings of all scale items and the dimensions of P-MMU are greater than .70 and significant (Table 7). Table 8 shows that the scales meet accepted criteria for reliability (Cronbach's alpha and CR) and convergent validity (AVE). We note that some of the bivariate correlations are high; however on the strength that all MSV (maximum squared shared variance) values are greater than the corresponding AVEs, we are satisfied of discriminant validity. We further test the proposed higher order of P-MMU by testing the higher order against a single factor structure ($\chi^2 = 2173.9$, $df = 560$). The significant difference of the χ^2 values supports the proposed higher order structure ($\Delta\chi^2 = 1176.6$, $\Delta df = 9$, $p < .001$).

Table 7: Confirmatory Factor Analysis (Sample 2, N=152)

	Factor loadings (standardised)	t values
Dimensions and scale items		
Comfort with MMU		
Comf2: I feel comfortable when I am media multitasking.	.921	*
Comf5: For me, multitasking with media is habitual behaviour.	.887	17.79
Comf6: Media multitasking is something which comes naturally to me.	.934	20.77
Comf8: I'm just good at multitasking with media.	.895	18.23
Compulsive addictive		
Comf1: I feel a constant compulsion to multitask with media.	.809	*
Comf3: Multitasking with media is compulsive.	.932	13.02
Comf7: Media multitasking is addictive.	.797	11.01
Multi-media channel preference		
Multim1: I like switching back and forth between different media.	.869	*
Multim2: I like to juggle between media.	.916	16.31
Multim4: I like to do more than one media activity at a time.	.827	13.36
Multim5: I like having multiple streams of media stimulation.	.894	15.52
Convenience		
Conv2: It is easy to navigate between media when I am multitasking.	.856	*
Conv4: Media multitasking is effortless with portable devices.	.927	16.20
Conv5: Technology nowadays makes media multitasking effortless.	.912	15.66
Conv6: It is easy to multitask with media in many different locations.	.760	11.37
Emotional gratification		
Emo1: Media multitasking is enjoyable.	.907	*
Emo3: Media multitasking makes me feel good.	.887	16.369
Emo5: I multitask with media to relax.	.705	10.60
Emo6: Multitasking with media keeps me company.	.816	13.74
Social benefits		
Soc1: Multitasking with media gives me a sense of belonging.	.839	*
Soc3: Media multitasking helps me feel available for my friends and family.	.843	12.69
Soc6: When I multitask with media I feel closer to other people.	.790	11.50
Soc7: Media multitasking helps me to feel connected with my friends and family.	.905	14.18
Effectiveness and efficiency		
Eff4: I can get more done when I multitask with media.	.856	*
Eff5: Multitasking with media makes me more productive.	.954	17.54
Eff6: Media multitasking saves me time.	.901	15.56
Eff7: Media multitasking helps me get things done quickly.	.942	17.09
Information and knowledge		
Info1: When media multitasking, I can get instant access to information.	.854	*
Info3: Media multitasking allows me to see the 'bigger picture'.	.846	13.38
Info4: Media multitasking gives me different points of view.	.865	13.90
Info5: I multitask with media so that I can gain knowledge..	.882	14.41
Assimilation		
Assi1: Media multitasking helps me to filter media content.	.898	*
Assi3: Multitasking with media helps me to make sense of information.	.883	16.31
Assi4: Multitasking helps me absorb the media bombarded at me.	.855	15.16
Assi5: Media multitasking helps me to manage information.	.901	17.11
P-MMU and its dimensions		
Comfort with MMU	.927	*
Compulsive addictive	.705	8.18
Multimedia channel preference	.891	12.19
Convenience	.866	11.52
Emotional gratification	.899	13.02
Social benefits	.767	9.49
Effectiveness and efficiency	.833	11.02
Information and knowledge	.858	11.35
Assimilation	.839	11.73

* Fixed to 1

Table 8: Reliability and validity indices, correlations and descriptives (Sample 2, N=152)

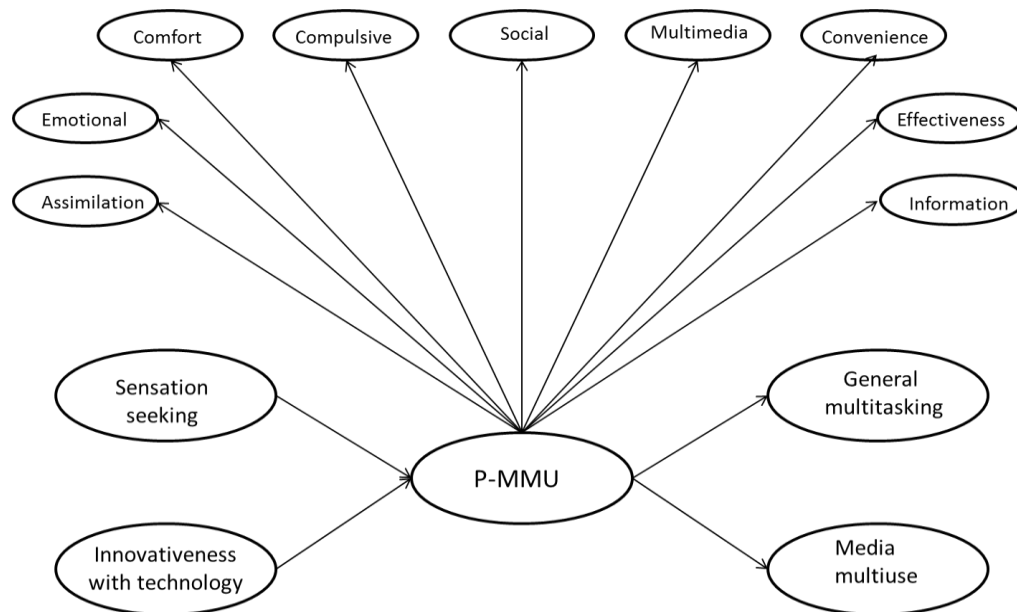
	Cronbach alpha	CR	AVE	MSV	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Comfort with MMU [1]	.949	.923	.750	.729	.866								
Compulsive addictive MMU [2]	.882	.911	.837	.729	.641	.915							
Multimedia channel preference [3]	.929	.930	.769	.686	.811	.599	.877						
Convenience[4]	.921	.900	.693	.681	.803	.599	.772	.832					
Emotional gratification [5]	.895	.909	.714	.558	.789	.622	.801	.779	.845				
Social benefits [6]	.908	.909	.716	.558	.711	.531	.684	.665	.690	.846			
Effectiveness and efficiency [7]	.952	.9553	.836	.664	.772	.576	.742	.721	.658	.639	.914		
Information and knowledge [8]	.920	.920	.743	.717	.764	.510	.681	.705	.688	.626	.717	.862	
Assimilation [9]	.925	.935	.782	.717	.788	.593	.764	.743	.771	.658	.698	.714	.884
Mean					2.59	3.03	2.72	2.62	2.88	3.10	2.70	2.63	2.83
SD					1.04	1.22	1.09	1.08	1.12	1.20	1.21	1.04	1.11

The **boldfaced** diagonal elements are the square root of AVEs. Off-diagonal elements are the correlations between constructs.

Nomological validity

We test for nomological validity, i.e. to establish whether the developed conceptualisation of polychronicity behaves in a theoretically predicted manner, by embedding the P-MMU scale in a set of functional relationships. Throughout this paper we argue that P-MMU is a preference leading to behaviour; therefore we hypothesise that such preference leads (i.e., P-MMU has a positive impact) to both general and media specific multitasking. Accepting that P-MMU is a form or expression of variety seeking, we hypothesise that such preference is the result of a desire for sensation seeking (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002); in other words, sensation seeking is a determinant of P-MMU. Finally, given that multiple media use involves the use of technology, we expect innovativeness with technology (Agarwal & Prasad, 1998) to act as a driver of P-MMU. We test the model in Figure 1 using the entire sample (N = 317).

Figure 1: Structural model



We first test, using CFA, the psychometric properties of the sensation seeking, innovativeness with technology and general multitasking scales (the media use is a count). The information in Table 9 offer support for the adopted operationalisations.

Table 9: Confirmatory factor analysis (N = 317)

Constructs and scale items	Factor loadings (standardised)	t values	CR	AVE
Sensation seeking			.896	.684
I like friends who are exciting and unpredictable.	.763	*		
I like new and exciting experiences even if I have to break the rules.	.826	17.44		
I like doing frightening things.	.877	24.74		
I would like to explore strange places	.839	24.12		
Innovativeness with technology			.923	.753
I like to experiment with new information technologies.	.908	*		
If I heard about a new information technology, I would look forward to ways to experiment with it.	.760	15.17		
In general I am usually eager to try out new technologies.	.902	16.14		
Among my peers, I am usually the first to try out new information technologies.	.892	15.43		
General multitasking			.902	.701
During a typical hour...				
I am occupied with several things simultaneously.	.838	*		
I work on more than one task.	.904	20.08		
I accomplish several tasks simultaneously.	.719	14.42		
I do not work on tasks in a sequential manner.	.874	19.20		

$\chi^2 = 77.2$, $df = 51$, $p = .010$; RMSEA = .040, SRMR = .030; CFI = .990; TLI = .988

Overall, the structural model demonstrates acceptable fit ($\chi^2 = 211.8$, $df = 64$, $p = .000$; RMSEA = .089, SRMR = .039; CFI = .944; TLI = .932). Table 10 shows support for all the hypothesised relationships, i.e. both sensation seeking and innovativeness with technology are significant determinants of P-MMU which in turn has a significant impact on general multitasking and media use.

Table 10: Structural model results (N = 317)

Functional relationships	β	t values
Sensation seeking → P-MMU	.166	2.93**
Innovativeness with technology → P-MMU	.570	9.71***
P-MMU → General multitasking	.6.43	12.71***
P-MMU → Media multitasking	.357	6.23***

* $p < .01$, ** $p < .001$

Discussion

Theoretical implications

While others have attempted to measure individuals' preference to multitask in the consumer context (Kaufman & Lindquist, 1999; Lindquist & Kaufman-Scarborough, 2007); their measures have lacked the necessary breadth and depth of understanding of individuals' underlying motivations for multiple media use required to measure this complex phenomenon. The purpose of this paper is to detail the development of a new scale to measure polychronicity, the preference for multiple media use, to address this gap in knowledge.

In previous work, measures of polychronicity were predominantly developed for an organisational context (for example, Bluedorn et al., 1992, 1999; Popowski & Oswald, 2010). In contrast, the newly developed 'Polychronicity - Multiple Media Use' (P-MMU) scale is applicable in the consumer **media** context. The inclusion of an in-depth qualitative study, to uncover the underlying dimensions of polychronicity, enabled a thorough understanding of the concept in the context of multiple media use, prior to the development of items for this measurement instrument. In the evolving research area of multiple media use, the new scale, tested and developed among Digital Natives, who form the majority of multiple media users, provides an appropriate measure for future researchers in this domain. The P-MMU scale is therefore considered to provide a valuable contribution to measurement in this emergent academic research domain.

The preceding discussion, outlining the stages of scale development, testing and validation, culminates in a multi-faceted, multi-dimensional measure of polychronicity 'the preference for multiple media use'. The nine-dimensional P-MMU scale demonstrates stability across the two datasets (Sample 1 and Sample 2), used in the developmental and validation stages. The analysis provides empirical support for the conceptualised dimensions formed from interrogation of the literature and prior qualitative empirical findings (Robinson, 2017). By uncovering these underlying

dimensions, the scale represents a granular platform for the examination of multiple media use; as opposed to an overall conceptualisation (which can hide differential behaviour of some aspects leading to a confounding effect). Table 11 presents a summary of the dimensions and their associated facets, representing the distinct aspects of the concept of polychronicity in the context of multiple media use, contributing to our understanding of the intricacies of this phenomenon. As illustrated, individuals' preference is associated with the ease of multiple media use. For example, 'comfort with MMU' includes feelings of confidence and comfort in habitual behaviour which comes naturally to them; although 'compulsive' feelings are also acknowledged. 'Multi-media channel preference' emphasises the liking for multiple streams of stimulation, switching back and forth between media. Further, 'convenience' embraces feelings of ease of effortless navigation between portable media in different locations, enabled by technology. Preference for multiple media use is also linked with feelings of personal productivity; 'effectiveness and efficiency' includes elements of time saving and a sense of getting things done more quickly. Gaining instant access to 'information and knowledge' is also considered valuable, enabling different points of view and an ability to see the 'bigger picture', alongside the 'assimilation' aspects of filtering and managing information and media. Affective dimensions of 'emotional gratification', for example enjoyment and relaxation, also feature in the preference for multiple media use, which takes place within a social environment. Correspondingly, 'social benefits' emphasise a sense of belonging and feelings of connection and closeness to others.

Table 11: The P-MMU Scale: dimensions and associated facets.

<p>Comfort with MMU:</p> <ul style="list-style-type: none"> - I feel comfortable when I am media multitasking. - For me, multitasking with media is habitual behaviour. - Media multitasking is something which comes naturally to me. - I'm just good at multitasking with media. 	<p>Compulsive addictive:</p> <ul style="list-style-type: none"> - I feel a constant compulsion to multitask with media. - Multitasking with media is compulsive. - Media multitasking is addictive. 	<p>Multi-media channel preference:</p> <ul style="list-style-type: none"> - I like switching back and forth between different media. - I like to juggle between media. - I like to do more than one media activity at a time. - I like having multiple streams of media stimulation.
<p>Convenience:</p> <ul style="list-style-type: none"> - It is easy to navigate between media when I am multitasking. - Media multitasking is effortless with portable devices. - Technology nowadays makes media multitasking effortless. - It is easy to multitask with media in many different locations. 	<p>Emotional gratification:</p> <ul style="list-style-type: none"> - Media multitasking is enjoyable. - Media multitasking makes me feel good. - I multitask with media to relax. - Multitasking with media keeps me company. 	<p>Social benefits:</p> <ul style="list-style-type: none"> - Multitasking with media gives me a sense of belonging. - Media multitasking helps me feel available for my friends and family. - When I multitask with media I feel closer to other people. - Media multitasking helps me to feel connected with my friends and family.
<p>Effectiveness and efficiency:</p> <ul style="list-style-type: none"> - I can get more done when I multitask with media. - Multitasking with media makes me more productive. - Media multitasking saves me time. - Media multitasking helps me get things done quickly. 	<p>Information and knowledge:</p> <ul style="list-style-type: none"> - When media multitasking, I can get instant access to information. - Media multitasking allows me to see the 'bigger picture'. - Media multitasking gives me different points of view. - I multitask with media so that I can gain knowledge. 	<p>Assimilation:</p> <ul style="list-style-type: none"> - Media multitasking helps me to filter media content. - Multitasking with media helps me to make sense of information. - Multitasking helps me absorb the media bombarded at me. - Media multitasking helps me to manage information.

Managerial implications

This knowledge leads to an increased appreciation of the underlying aspects of individuals' multiple media use behaviour by marketing communications practitioners responsible for deploying their clients' budgets effectively and efficiently. The continuing fragmentation and development of the media landscape, fuelled by ongoing technological developments, has an effect on; advertising, creative and media planners, media brand owners and consumers of media. As shown in Table 11, this multi-faceted, multi-dimensional tool encompasses a unique and extensive insight into individuals' preference for multiple media use, providing a valuable resource for marketing communications practitioners. For example, these findings are constructive in a scenario in which a multi-media consumer advertising campaign is being planned for television, internet and radio. In this setting, in addition to commonly applied demographic, brand and media usage information, an in-depth understanding of the underlying feelings of the media multitasking target audience is advantageous for the effective briefing of creative and media teams. Using the advanced understanding provided by the P-MMU, creative and media practitioners, responsible for producing and placing relevant advertising message combinations, are able to produce creatively relevant and accurately placed messages to their media multitasking target audiences, successively achieving more effective results for their clients. The P-MMU scale is also applicable in future ad hoc practitioner surveys to investigate the preference for multiple media use among individuals in selected target audiences; for example, by marketing communications practitioners researching target audiences at the planning stage of clients' IMC campaigns. Hence, undoubtedly, these findings have the potential to produce a valuable impact for practitioners in this domain.

Limitations and future research directions

Our study represents the first known attempt to develop and validate a multi-dimensional measure of polychronicity in the context of multiple media use. Nevertheless, while the study demonstrates

the application of the P-MMU measure across our two samples, further validation of the measure is necessary. Future studies should replicate the P-MMU scale across different groups; for example 'Digital Immigrants' (adults born before 1980, Prensky, 2001) or in different countries, with different cultures and levels of media and technological development, to provide further verification of the measure. It is acknowledged that our data collection methods relied on an opt-in panel; which, however well administered by a professional market research company, can result in sample bias. In addition, the use of a cross-sectional self-report questionnaire can result in systemic bias, although steps were taken to guard against this possibility; for example, by means of piloting and the randomisation of items and dimensions during the survey.

In reconciling the concepts of polychronicity and multitasking in the context of multiple media use, the prior review of extant literature (Robinson, 2016) argues that these concepts are related; polychronicity is regarded as the preference to behave, while multitasking is referred to as the actual behaviour (Konig & Waller, 2010). Hence, it follows that the preference to behave should precede the behaviour itself, leading to the suggestion of a probable directional relationship between the two concepts. Accordingly, further empirical work is proposed to embed the P-MMU scale into a full model to further investigate this relationship.

To conclude, this paper outlines the development and validation of the P-MMU, a new scale to measure polychronicity in the context multiple media use. The new scale is intended for use among academics; researching in the specific areas of marketing communications, advertising and multiple media use and also practitioners; attempting to improve the efficacy of communication campaigns on behalf of their clients. The preceding analysis provides evidence to demonstrate that this multi-faceted, multi-dimensional measure of polychronicity is reliable and valid across our split sample. Consistently, the paper contributes the new P-MMU scale and a notable step towards an increased understanding of polychronicity, the preference for multiple media use.

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