VALIDATING THE TECHNOLOGY-ASSISTED SUPPLEMENTAL WORK SCALE (TASW)

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Abstract

The traditional advantage of using Information Communication Technologies (ICTs) to enhance work flexibility also has a drawback of enabling academics to continue working even after regular working hours. This phenomenon has been referred to as technology-assisted supplemental work (TASW). Although TASW enhances academics' work productively, they also have a negative impact on their family-life. The impact TASW has on academics and on higher education institutions can be understood by measuring the phenomenon properly by using a reliable and valid scale. The aim of this study is too validate a newly developed TASW scale by Fenner and Renn (2010). This study adopted a quantitative research approach and used an online survey to gather data. The sample included academic from a higher education in South Africa (*n* = 216). The results indicate that the TASW is a valid and reliable measure of technology among the sample of South African academics.

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1 Introduction

In today's information society, the use of Information Communication Technologies (ICTs) such as cell phones, personal digital assistants (PDAs), laptops and BlackBerries have become an inevitable part of most professions (Porter & Kakabadse, 2006; Selwyn, 2003). In fact, ICTs have created a new techno-culture that has transformed the ways in which individuals live and work (Burke & Ed, 2006; Gendreau, 2007; O'Driscoll, Brough, Timms & Sawang, 2010; Selwyn, 2003). For example, Wajcman and Rose (2011), attest that traditional communication methods in early days such as face-to-face meetings and the telephone were used in order to communicate with one another. Today, however, modern ICTs have reshaped the ways in which individuals communicate. For example, instant messaging, internet chat rooms, text messaging and emails have become a popular form of communication (Taylor, Fieldman & Altman, 2008; Wajcman & Rose, 2011). Richardson and Benbunan-Fich (2011) as well as Tarafdar, Tu, Ragu-Nathan and Ragu-Nathan (2007) explain that these ICTs enable individuals to be constantly connected 24/7 for both social- and work-related purposes.

Indeed, the popularity of, and dependency on, these ICTs has empowered individuals to make new choices with regard to where and when to work and communicate with each other (Harmer, Pauleen & Schroeder, 2008). This is evident in today's society as individuals are no longer constrained by the boundaries of time and space as they were previously

in the past (Duxbury, Towers, Higgins & Thomas, 2007; Kaufman-Scarborough, 2006). Richardson and Benbunan-Fich (2011), explain that formerly, individuals had to have access to a desktop computer with internet access in order to communicate via email from a location other than the office. Work was restricted by the boundaries of time and space. Today however, this has changed as contemporary ICTs have facilitated a 24/7 connectivity that enables individuals to work from anywhere and at anytime (Harmer et al., 2008; Ojala, 2011; Tremblay & Genin, 2008). For instance, individuals can work from home or while travelling (Ojala, 2011). People therefore do not have to work from a traditional office and are free to work at anytime (Towers, Duxbury & Thomas, 2005). This has resulted in the development of other forms of work practices such as telecommuting and technology-assisted supplemental work (TASW).

It is argued that the practice of working from home is not a new phenomenon (Harpaz, 2002; Tremblay & Genin, 2008). What is regarded as 'new' according to Tremblay and Genin (2008, p. 740), are the emerging options that enable individuals to work from home, whilst being connected to the workplace via ICTs. ICTs such as smart phones, laptops and Personal Digital Assistants (PDAs) enable individuals, including academics, to engage in work-related activities after hours at home, during evenings and weekends (Boswell & Olson-Buchanan, 2007; Duxbury, Higgins & Thomas, 1996; Fenner & Renn, 2004; Richardson & Benbunan-Fich, 2011; Venkatesh & Vitalari, 1992). This has been referred to as

Technology-Assisted Supplemental Work (TASW) (Fenner & Renn, 2004). For example, an academic engages in TASW, when they use ICTs to respond to emails during evenings and/or on weekends. Accordingly, an advantage of using ICTs is that they empower individuals with more control and flexibility, which enables them to balance their work and family demands (Araújo, 2008; Currie & Eveline, 2010; Rafnsdóttir & Heijstra, 2011). However, using ICTs to work after regular hours also has a negative impact on individuals' well-being and work-life balance (Batt & Valcour, 2003; Chesley, 2005). For example, TASW blurs the boundaries between work and family life and consequently creates work-life conflict (WLC) (Batt & Valcour, 2003; Boswell & Olson-Buchanan, 2007; Fenner & Renn, 2010; Fenner & Renn, 2004; Kinman & Jones, 2008; Kotecha, Ukpere & Geldenhuys, 2014; Messersmith, 2007; Skinner & Pocock, 2008). In particular, Kotecha et al. (2014) revealed that academics experience time- and strain-based WLC from engaging in TASW. Hence, ICTs have a positive and negative impact on organisations and employees. However, in order to understand the impact that TASW has on organisations and employees, it is important to measure it properly by using a reliable and valid scale.

The phenomenon of TASW is an emerging field of research that has not been studied extensively, neither globally nor in South Africa. There are therefore limited scales that have been developed and used to measure the use of ICTs for work-related purposes "after hours" (Boswell & Olson-Buchanan, 2007; Fenner & Renn, 2010; Richardson & Benbunan-Fich, 2011). In particular, Fenner and Renn (2010) developed a new TASW scale. Fenner and Renn (2010) consulted with experts in the fields of Organisational Behaviour and Information Technology as well as senior management in developing the statements of the TASW scale. They all agreed on the TASW definition and the items that had been developed to measure the phenomenon. The researchers conducted an exploratory factor analysis to identify the factor structure of the six items. This analysis revealed that the six items loaded on two factors. There was one item that loaded on the second factor, which they removed and conducted a confirmatory factor analysis with the five items that loaded on the one factor. The results showed that the loadings on the single factor were all significant. The five-item scale was reported as reliable with a Cronbach's coefficient alpha value of .88 (Fenner & Renn, 2010). However, they recommended researchers to continue to test the psychometric properties of their scale. Furthermore, they also suggested that their TASW scale be assessed on other populations (Fenner & Renn, 2010). This study builds on the research by Fenner and Renn (2010), with the research aim of validating the newly developed TASW. It is anticipated that this research will further add value to the existing knowledge of Fenner and Renn's (2010) TASW scale.

2 Literature review

2.1 The phenomenon of technology-assisted supplemental work

ICTs have transformed the nature of work practices for many individuals. Indeed, ICTs enable academics to work from home and at any time that is of convenience to them (Tremblay & Genin, 2008). However, the same ICTs also enable academics to extend their working day to evenings and weekends (Richardson & Benbunan-Fich, 2011). The use of ICTs to work "after hours" has been coined differently by different researchers. For example, Richardson and Benbunan-Fich (2011, p. 2) refer to 'work connectivity behaviour after-hours' (WCBA), which they define as an "organisational member's use of portable wireless enabled devices (laptop or handheld) to engage with work or work-related colleagues during non-working time". Boswell and Olson-Buchanan (2007) refer to the use of 'communication technologies (CTs) after hours' while Fenner and Renn (2004) use the term 'technology-assisted supplemental work' (TASW). This research uses the term coined by Fenner and Renn (2004). Fenner and Renn (2004, p. 179) define TASW as "the performance of role prescribed job tasks by full-time employees with the aid of advanced information and telecommunications technology at home or when away from home while on holiday". Accordingly, TASW is a work practice that is often performed by professionals and/or white collar workers, who work after regular working hours, such as early mornings before work, during evenings or when on holiday (Fenner & Renn, 2010; Ojala, 2011; Richardson & Benbunan-Fich, 2011). An example of TASW is when an academic engages in work-related activities during evenings and/or on weekends. This is contrary to that of the concept of telecommuting, whereby an individual specifically works away from the traditional office, at home or a client's office, during regular working hours, with the aid of ICTs (Duxbury et al., 1996; Fenner & Renn, 2004; Garrett & Danziger, 2007). Thus, telecommuters (who may not necessarily be full-time employees) do not work extra hours as opposed to individuals who engage in TASW.

2.2 Implications of TASW

The use of ICTs to engage in supplemental work practices has various implications on individuals' work-life. For example, individuals experience stress, family dissatisfaction and WLC from using ICTs (Batt & Valcour, 2003; Chesley, 2005; Kaufman-Scarborough, 2006). Studies reveal that using ICTs to work after hours creates WLC (Boswell & Olson-Buchanan, 2007; Fenner & Renn, 2010; Fenner & Renn, 2004; Kinman & Jones, 2008; Kotecha et al., 2014; Messersmith, 2007). The reason for this, as explained by Boswell and Olson-Buchanan (2007), is that, as individuals devote more time to work at home,

it becomes extremely difficult to fulfil the role requirements and demands in the non-work domain. For example, family priorities and responsibilities may be neglected by individuals who engage TASW (Fenner & Renn, 2010). As individuals continue to dedicate more of their time to supplemental work practices, it becomes extremely important to investigate the phenomenon of TASW by using a reliable and valid scale.

3 Exploratory Factor Analysis

According to Pallant (2009), Exploratory Factor Analysis (EFA) is used during the initial stages of research to explore the interrelationships among a set of variables. EFA is essentially a variable reduction method that is used to identify the underlying factor structure of a set of variables (Child, 1990 as cited in Suhr, 2006, p. 2). This is useful in identifying the factor structure that pertains in South African context. Suhr (2006) outlines the following goals of EFA: firstly, EFA enables researchers to determine the number of underlying factors for a set of variables; secondly, it provides researchers with the opportunity to explore the interrelationships among variables; and thirdly, EFA enables researchers to define each of the underlying factors.

3.1 Method

3.1.1 Research approach

This study used a quantitative research approach to validate the newly developed TASW scale. A cross-sectional survey design was adopted and data was gathered utilizing an online link.

3.1.2 Research Design

3.1.2.1 Participants

A purposive and convenience sample of 216 full-time academic staff from a higher education institution in South Africa was used for this study. The sample comprised of 130 female participants (60.2%) and 85 male participants (39.4%). The age of the participants varied from between 25 to 40 years (45.8%) and from 41 to 66 years (49.8%). The majority of participants are White (62.7%), followed by African Black (22.1%). Furthermore, the sample mainly included married participants (67.8%) followed by single participants (19.7%). Additionally, 62.0% of participants in this sample have children, while 29.9% of participants have other dependents other than their own child and/or children. This sample is mainly dominated by participants whose home language in English (44.8%), followed by Afrikaans (38.4%), Nguni (7.9%), Sotho (7.4%) and Venda/Tsonga (1.5%). With regards to educational qualifications, most participants have a master's qualification (48.4%) followed by a doctoral degree (44.6%), honours degree (4.6%), bachelor's degree (1.4%),

certificate/diploma (.5%) and, matric (.5%). Further, the majority of participants have a lecturer designation (45.2%) followed by a senior lecturer (28.1%), associate professor (10.5%), professor (9.0%), head of department (5.7%) and, a researcher (1.0%).

With regards to working after hours, the majority of participants (36.4%) indicated that they spend between 3 and 4 hours per day engaging in work activities after hours, followed by 30.3% of participants who spend between 1 and 2 hours per day. A small proportion of participants (14.0%) spend 7 or more hours working at home, while 13.5% spend between 5 and 6 hours per day working after regular working hours at home. It should be noted that only 5.8% of participants spend less than an hour on work-related activities after hours using ICTs. In this sample, 87.9% of participants are provided with a laptop or a similar ICT device for work-related purposes. Lastly, the majority of participants (91.7%) mainly use their laptops to engage in TASW followed by their smartphones (48.8%), Tablet (41.2%) and their desktop computer (20.4%).

3.1.3 Research procedure

Permission was first obtained from the Ethics Committee and from the higher education institution before conducting this research. The first page of the online survey included an explanatory statement, which explained the purpose of the study and also emphasised that participation in the online survey was voluntary and to be completed anonymously. Furthermore, participants were assured that all the responses obtained from the online survey would be kept confidential and would only be used for research purposes. A pilot study was first conducted before formally distributing it to academic staff at the higher education institution. This was done to assess the reliability and validity of the online survey. The online survey was then launched after addressing the recommended changes from the pilot study. Following the pilot study, an email was sent out to all academic staff inviting them to participate in the research study. The email content briefly explained the rationale of the study and emphasised the anonymity and confidentiality of their responses. The email included the URL link to the web-based survey, which directed respondents to the online survey. The data was collected over a period of two weeks. Additionally, a reminder email was also sent a week after the initial email. Once academic staff completed the survey, their responses were anonymously and automatically recorded on the system.

3.1.4 Measuring battery

Biographical data was obtained by means of the biographical questionnaire unique to the purposes of this study. Biographical data include age, gender, race, language, number of children and education. A newly developed TASW scale, by Fenner and Renn (2010), was used to determine whether academic staff in a

higher education institution in South Africa use ICTs to work after regular working hours. The scale consists of six items which were rated on a five-point Likert scale, ranging from (1) 'never' to (5) 'always' (Fenner & Renn, 2010). An example of an item in this scale includes: "I perform job-related tasks at home, at night, or on weekends, using my cell phone, pager, BlackBerry or computer" (Fenner & Renn, 2010, p. 70). The TASW obtained a reliability of .88 (Fenner & Renn, 2010).

3.1.5 Statistical analysis

Statistical analyses were carried out using the R Core programme (R 3.0.1), specifically using the psych and lavaan packages (R Core Team, 2013). Data was screened for out-of-range responses, typos, and statistical outliers. Descriptive statistics were obtained for all questionnaire items, and the data was analysed in terms of mean, standard deviation, skewness, and kurtosis. All means and standard deviations were judged as falling within the normal limits, and all

skewness (< 2) and kurtosis (< 4) coefficients fell within the normative range.

Exploratory Factor Analysis (EFA) is a statistical method that is used to uncover the underlying structure of a scale (Norris & Luc, 2009). Data was extracted using the unweighted least squares method (MinRes). When compared to extraction methods such as maximum likelihood, MinRes would make less assumptions about the data with less estimation difficulties (de Bruin, 2012). No rotation was used in terms of oblique or orthogonal since the scale consisted of only one factor which was not needed to correlate or uncorrelated with another factor.

Eigenvalues > 1, parallel analysis, scree tests is used when determining the factor structure for a scale. Investigating eigenvalues are one of the most common methods used to determine factor structures in EFA (de Bruin, 2006). This method is most often referred to as the Kaiser criterion. It uses unreduced inter-correlation matrix. Factors are extracted according to the how many eigenvalues are greater than one (Fabrigar, Wegener, MacCallum, & Strahan, 1999).

Figure 1. Parallel Analysis Scree Plots
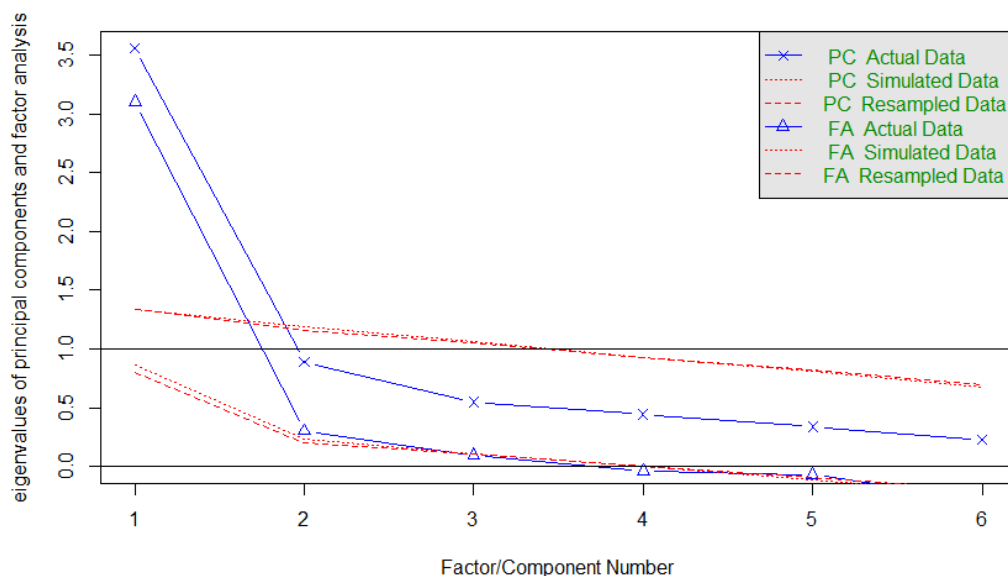
There is no single criterion to assess suitability for models, therefore multiple model fit indices should be considered. The Root Mean Square Error of Approximation (RMSEA), the Tucker Lewis Index (TLI), SRMR and inspection of the residual matrix was taken into account when factors were considered. The X^2 and RMSEA are absolute fit indices. An insignificant X^2 would result in a perfect model fit, whereas the recommended cut-off for the RMSEA of between 0.3 and 0.8 for acceptable fit desired (de Bruin, 2006). The TLI are incremental fit and values higher than 0.90 is desired. The SRMR is a function summary of the average size of the residuals depicted in the residual matrix. Hu and Bentler (1999) recommend that SRMR values of < .08 are indicative of acceptable fit, whilst values of < .05 are indicative

of excellent fit. A cut-off point of .08 was adopted within the current study.

Reliability relates to the replicability or consistency with which an instrument measures a given construct (Field, 2005). As such, test items or sub-scales should be designed to consistently reflect the construct under examination across time and space.

3.2 Results

The Scree plot and parallel analysis on the six item TASW are reported below. This is followed by the item correlations matrix, model fit indices and the factor loadings for the one factor model of the TASW scale.

Scree plot and parallel analysis suggests that two factors be extracted for the TASW scale. This resulted in the extraction of a two factor model. Similar to Fenner and Renn (2010), the two factor model was problematic since item six were the only item that loaded on the second factor as well as having a factor loading of 0.99. Further, the model fit indices ($X^2 = 307.12$, $df = 4$, RMSR = 0.04, TLI = 0.86, RMSEA = 0.16) indicated the date does not fit two factor model best.

Item six, similar to the results of Fenner and Renn, (2010) has been removed. A one factor model was extracted, while the portion variance that was explained by the one factor model was 54%. Table 1 reports the inter-item correlations of the five item, one factor model, followed by the model fit statistics and standardised pattern matrix is reported.

Table 1. Item Correlations for the TASW

	Item 1	Item 2	Item 3	Item 4
Item 1	-	-	-	-
Item 2	-0.281	-	-	-
Item 3	0.601	-0.404	-	-
Item 4	0.379	-0.317	0.601	-
Item 5	0.589	-0.301	0.724	0.573

The inter-item correlation coefficients indicate that the items for the TASW scale correlate with each other. Correlations ranged between 0.30 and 0.72. The Kaiser-Meyer-Olkin as well as Barlett's test of sphericity was investigated. A KMO value of 0.80, which is above the 0.60 (Kaiser, 1972) was found in this study. Further, the Barlett's test of sphericity reached statistical significance. This is in support of the factorability of the correlation matrix reported above.

Table 2. Model Fit Statistics

Model fit	
X^2	234.50
df	5
p	0.00
TLI	0.93
RMSEA	0.10
SRMR	0.05
90% confidence intervals	0.038; 0.002

Table 2 shows the model fit statistics for the TASW. When considering the chi-square, the hypothesis of perfect fit is not supported. Additionally, close fit could be established with the low ration between the X^2 (234.50; p < 0.001) and the df (5), the TLI (0.93), SRMR (0.05) and the RMSEA (0.10). Upon inspection, the RMSEA is above the recommended cut-off, however it showed improvement from the initial two factor model. The remaining fit statistics are below the recommended cut-off points (as explained in the statistical analysis section). Furthermore, the model fit statistics were less acceptable with the inclusion of Item 6 which yielded a factor loading of 0.99, hence it was removed to improve the one factor model. The factor loading is reported in table 3 below.

Table 3. Standardised Factor Loadings for the TASW

Item	Factor 1	H^2	α
Item 1	0.74	0.55	0.787
Item 2	0.49	0.24	0.853
Item 3	0.76	0.58	0.761
Item 4	0.79	0.63	0.781
Item 5	0.80	0.69	0.765

Table 3 indicated the factor loading as well as the communalities of each item. The cut-off point for the portion variance that is explained by each item is 0.40. Item 2 explain only 24% of the common variance in the scale. However, it was kept in since the factor loading of 0.49 is above the recommended factor coefficient cut-off point of 0.30. The rest of the item factor loadings ranged between 0.74 and 0.80 with common variance ranging between 0.55 and 0.69. The reliability coefficients ranged between 0.761 and 0.853 which is above the recommended cut-off point of 0.70.

4 Discussion

The objective of this study was to investigate the reliability and validity of the Technology-Assisted Supplemental Work scale (TASW). Exploratory factor analysis (EFA) was used to investigate the underlying factor structure of the TASW as set out by Fenner and Renn (2010). The results were in line with that of Fenner and Fenn (2010). The results indicate that the TASW scale is a valid and reliable measure of TASW among South African academics. Thus, the TASW scale can be used in the South African context to reliably and validly measure individuals' use of ICTs after hours to engage in work-related activities.

As aforementioned, TASW is an emerging field of research that has not been investigated extensively globally or locally. The phenomenon of using ICTs after hours for work-related purposes has been coined differently and has therefore also been measured differently (Boswell & Olson-Buchanan, 2007; Duxbury et al., 1996; Fenner & Renn, 2004; Richardson & Benbunan-Fich, 2011; Venkatesh & Vitalari, 1992). Boswell and Olson-Buchanan (2007), for example, developed a scale to measure individuals' use of communication technologies after hours by adapting a scale developed by Batt and Valcour (2003). This scale required respondents to rate the frequency to which they use a range of communication technologies to engage in work-related activities after hours. Accordingly, this scale measures the various communication technologies that enable individuals to work after hours and also provides an overall index score of using communication technologies after hours (Boswell & Olson-Buchanan, 2007). Similarly, Richardson and Benbunan-Fich (2011) developed a new scale to measure Work-Connectivity Behaviour After-Hours (WCBA) by adjusting the communication technology scale used by Boswell and Olson-Buchanan (2007). It should be noted that respective scales used in both studies had Cronbach's alpha values of above .70 and are therefore within the range of an acceptable reliability score (Nunnally, 1978 as cited in Bernardi, 1994, p. 767). To the researchers' knowledge, the current study is one of the fewer studies that have further tested the reliability and validity of Fenner and Renn's (2010) TASW scale. Hence, this research further contributes to the existing field of TASW as it investigated the reliability and validity of Fenner and Renn's (2010) newly developed TASW scale. In addition, the TASW scale was tested on academic staff in a South African context. This is an important contribution as Fenner and Renn (2010) highly recommended that their TASW scale be assessed by considering other populations.

ICTs are traditionally known to enhance work flexibility. However, recent studies have argued that ICTs are also nonetheless enabling individuals, including academics to extend their working hours (Fenner & Renn, 2010; Boswell & Olson-Buchanan, 2007; Kotecha et al., 2014; Richardson & Benbunan-Fich, 2011). The use of ICTs to engage in supplemental work practices after hours has various consequences in an individual's work-life. These consequences have been reported to be similar regardless of the type of scale used to measure the use of ICTs to work after hours. Specifically, studies have found a positive relationship between TASW and work-life conflict (Boswell & Olson-Buchanan, 2007; Fenner & Renn, 2010; Fenner & Renn, 2004; Kotecha et al., 2014). Accordingly, individuals who engage in TASW experience higher levels of work-life conflict as a result of not being able to fulfil the demands in their non-work domain (Boswell & Olson-Buchanan, 2007). Furthermore, engaging in TASW has also been associated with increased levels of stress and family dissatisfaction (Batt & Valcour, 2003; Chesley, 2005; Kaufman-Scarborough, 2006).

5 Conclusion

ICTs have transformed the nature of work practices for many individuals. Indeed, ICTs enable academics to work from home and at any time that is of convenience to them. However, organisations and their employees also need to understand the implications and consequences of engaging in supplemental work practices by using ICTs. Hence, a reliable and valid scale that measures TASW is therefore extremely fundamental. A valid and reliable scale will enable organisations to measure the extent to which their staff engage in TASW. This will also create awareness of TASW and the severe impact that it has on individuals' work-life. Where necessary, a reliable and valid scale will also enable organisations to develop policies that would limit their employees from engaging in supplemental work practices. It is therefore important to use a reliable and valid scale that will truly reflect the impact that ICTs have on academics' work practices.

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