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IN THE MOOD TO INNOVATE:  
A MULTILEVEL STUDY ON THE INTERACTION OF  
ENTREPRENEURS' INNOVATIVE WORK BEHAVIOUR  
AND AFFECT

A dissertation presented in partial fulfilment of the requirements for the degree of  
Master of Business Studies  
in  
Management

Massey University  
Wellington, New Zealand

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2016

*Dedicated to Annabelle and Julián.*

Affect is a hot topic in entrepreneurial research. However, extant literature is lagging behind in its use of affective theory and methodology, and furthermore, attention resides in isolated topics of inquiry, rendering the field stunted and disjointed. The purpose of this research is to adopt burgeoning affective theoretical perspectives to anticipate daily fluctuation in entrepreneurs' innovative behaviour. The circumplex model of affect is utilised in this research to challenge the rhetoric that all spectrum of pleasant moods lead to beneficial work behaviour. Though multilevel modelling based on 3360 data points nested within 160 entrepreneurs (21 surveys per participant, completed over two weeks), support is found for the proposition that pleasant moods do not necessarily result in productive behaviour. Specifically, activation (the energising dimension of affect) has greater influence on propelling entrepreneurs' innovative behaviour than valence (affect's pleasant or unpleasant nature), such that high activation unpleasant and pleasant affect (worried, anxious, inspired, enthusiastic) predicts innovative work behaviour, while low activation pleasant affect (calm, relaxed) does not.

The affect-behaviour relationship is examined from several perspectives resulting in a feedback model between high activation moods and innovative work behaviour engagement. Engagement in innovative work behaviour positively correlated to entrepreneurs' experience of high activation unpleasant affect, and negatively related to high and low activation pleasant affect. Thus although innovative work behaviour benefits from high activation pleasant moods, engagement essentially decreases them.

Affective dispositions correlated with daily affective experiences also, as such entrepreneurs with low levels of trait negative affect experienced more pleasant moods during the day and visa versa. Findings confirmed the hypothesis that the quality of previous night's sleep both moderates the link between affect and innovative work behaviour, plus predisposes entrepreneurs to pleasant or conversely unpleasant affective daily experiences – illustrating the importance of sleep in affective research. Additionally innovative work behaviour was predicted via “the affective shift model”, which was adapted to include the influence of activation. The results further attest to the relevance of temporal dynamics of affect perspectives in entrepreneurial research. Specifically, the model demonstrated that innovative work behaviour ensued when high activation unpleasant affect was followed by high activation pleasant affect, or simply with an increase in the level of high activation affect, of either valence between morning and afternoon. Empirical, theoretical, and practical implications of the findings are discussed.

## ACKNOWLEDGEMENTS

To the hundreds of entrepreneurs who participated in this research, thank you so much for your contributions. To Start-up Chile and Michael Leatherbee, I am indebted to you. Thank you so much for the invaluable assistance in data collection. Thank you for providing access and RVA points to the entrepreneurs in your programme. I am most appreciative. Thank you to Beatriz Millan, Michelle Tobar, and your students at La Universidad de Concepcion for your help and kindness with data collection.

To Martina Battisti, thank you for supervising this thesis. Thank you for the freedom and support you have given me along the way. I am inspired by your consistency and work ethic, and most appreciative for your insights and attention to detail. I count myself very fortunate to have had the honour of working with you throughout these years. Marco van Gelderen and Jarrod Harr, thank you for your feedback on earlier versions of this work. Ronald Bledlow, thank you for your comments in December, regarding the affective shift model. Stephen Zhang, thank you for your mentorship. To John Woolf, thank you for showing me the joy of academia, decades of support, and for proofreading this thesis!

Thank you to Fabio Gutiérrez and GUT3 for the translation help. Pedro Parraguez Ruiz, Silvia Bonoli, Raul Angulo, Cat MacGregor, Maddy Conway, Christa Ellis, Carolina Santis, Julie Treweek and Hayley Treweek for your friendship, love and encouragement. Grandma Wyatt and Sacha Williamson, for your endless love. Nan Coburn, for being a role model of a modern woman! Robert and Lorraine, thank you for your investment in my life.

Most notably, thank you to Álvaro. Thank you for accompanying and encouraging me on this journey; the countless times you checked my Spanish; enduring four months of my multilevel modelling diagrams; being my biggest supporter; challenging gender roles; all the lunchtime conversations; your love and support, and so much more. Thank you.

Finally, I would like to acknowledge the contribution a handful of authors<sup>1</sup> have made to the literature. Their recent work has roused a fresh affective dialogue in workplace research, which has made this work both possible, and mostly enjoyable.

---

<sup>1</sup> Ronald Bledlow, Michael Frese, Michael Gielnik, Hector Madrid, Neal Ashkanasy, Robert Baron, Peter Warr, Maw-Der Foo, Marilyn Uy, Matthijs Baas, Carsten De Dreu, and Bernard Nijstad

*I do not think there is any thrill that can go through the human heart like that felt by the inventor as he sees some creation of the brain unfolding to success... such emotions make a man forget food, sleep, friends, love, everything.*

*– Nikola Tesla (O'Shei, 2008, p. 5)*

*Sometimes I am happy and sometimes not. I am after all a human being, you know. And I am glad that we are sometimes happy and sometimes not. You get your wisdom working by having different emotions.*

*– Yoko Ono (Ono, 2012)*

*Entrepreneurship generates substantial emotions because it is an extreme context in terms of time pressures, uncertainty, and the extent of personal consequences tied up in the fate of the firm.*

*– (Cardon, Foo, Shepherd, & Wiklund, 2012, p. 7)*

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# 1 INTRODUCTION

Affect (moods and emotions) has a significant and prevalent influence on cognition, decision-making, and goal directed effort. In symphony, numerous authors (Ashby, Isen, & Turken, 1999; Baas, De Dreu, & Nijstad, 2008; De Dreu, Nijstad, & Baas, 2011; Fredrickson & Branigan, 2005; Lyubomirsky, King, & Diener, 2005; Nijstad, De Dreu, Rietzschel, & Baas, 2010) have recently concluded that pleasant affect rouses cognitive flexibility, engendering greater creative fluency. Thus the predominant postulation in organisational research, is that pleasant affect engenders workplace success (Fredrickson & Branigan, 2005; Judge & Kammeyer-Mueller, 2008; Kaplan, Bradley, Luchman, & Haynes, 2009; Staw, Sutton, & Pelled, 1994). A more critical group of thinkers however, have recently adopted a fine-grained perspective to the grouping of affect, and challenged the premise of categorising affect into pleasant and unpleasant sets only (Baas et al., 2008; Madrid Cabezas & Patterson, 2014; Warr, Bindl, Parker, & Inceoglu, 2014; Yik, Russell, & Steiger, 2011). This school of thought has highlighted the inconsistencies in the influence of pleasant affect on cognition and behaviour, when a full range of pleasant affective states are examined. In other words, although an affective state of elation may engender greater fluency in idea generation tasks, calmness, although also classified as a pleasant affective state, does not.

Progressive research has made reference to these inconsistencies and further classified pleasant and unpleasant affect into additional subgroupings (Foo, Uy, & Murnieks, 2015; Lerner & Keltner, 2000). The circumplex model of affect is one such model which delineates affect into valence and arousal dimensions, which has found wide ranging empirical and theoretical support (Yik et al., 2011; Yik & Russell, 2004). Such a perspective has provoked a wave of astute discoveries on the nature of affect's influence on behaviour (eg., Warr et al., 2014). Some occupational researchers have since applied these theories to organisational behaviours and identified a wide range of workplace benefits from workers' experience of high activation pleasant affect. With the exception of only a handful of studies in fact (eg.,

Breugst & Shepherd, 2015; George & Zhou, 2002; Kooij-de Bode, van Knippenberg, & van Ginkel, 2009), the vast majority of research has concentrated almost entirely on the positive influence of high activation pleasant affect only (cf., Elfenbein, 2007). Therefore, the first two undertakings of this thesis is to advance the dialogue on the influence of affective states on entrepreneurial workplace behaviours, by delimitating affect according to valence and arousal subgroupings (the circumplex model of affect), and furthermore include an exploration on the role of unpleasant affective states for workplace outcomes also.

An alternative response to the reported inconsistencies of pleasant affect driven outcomes, which additionally challenges the imbalance in the literature on the exclusive emphasis of pleasant affect, concurrently birthed the affective shift model (Bledow, Schmitt, Frese, & Kühnel, 2011). The model seeks to attribute the interplay of pleasant and unpleasant affect to enhanced outcomes. Interestingly however, the model does not ordinarily delineate between additional affective dimensions – such as those highlighted by the circumplex model of affect. Therefore the third mission of this thesis is to integrate these two models, and establish a notion of affective change whereby affect is delineated by valence and arousal.

Affect is a particularly pertinent topic for workplace research, as affect is constantly present, and this presence permeates cognition, thought-action responses, and behaviour (Baas et al., 2008). “Human beings appear to be a remarkably moody species. Almost everything we think and do is coloured by the fluctuating mood states that accompany us”, summarised Forgas (Forgas, 2014, p. 169). In workplace settings, occupational researchers have specifically identified that pleasant affect is associated with proactivity (Bindl & Parker, 2010), a range of citizenship behaviours (Warr et al., 2014), work engagement (Ouweneel, Le Blanc, Schaufeli, & van Wijhe, 2012) and performance (Shockley, Ispas, Rossi, & Levine, 2012), among other productive behaviours (Barsade & Gibson, 2007). Therefore there is little question if workers’ affective experiences play a role in organisational outcomes.

Despite the established importance of innovation for both firms and countries alike, exploring what role affect places on inhibiting or encouraging innovation has but all been excluded. As Amabile *et al* concluded, in 2005 there were “no studies investigating the relationship between affect and innovation...” (Amabile, Barsade, Mueller, & Staw, 2005, p. 398). In the eleven years since their statement, there has been significant progress on affective influences in organisational research, yet still very little to remedy the paucity of research on the subtopic of organisational innovation or innovative work behaviours specifically. The only study in organisational literature exploring the role of innovation at the individual level of

performance as it relates to affect (2014), measured affect just once each week, and examined high activation pleasant affect exclusively. Therefore the forth aim of this thesis is to extend the affective discourse to innovative work behaviour.

In entrepreneurship there is an oft-cited need for innovation and improvisation (Nair & Weber, 2015), yet little is known about daily engagement in entrepreneurial innovative work (Cardon et al., 2012). Figuratively adding fuel to the fire - entrepreneurship is particularly charged with emotion. The divide between the entrepreneur, and the business is often blurry (Williamson, Lewis, & Massey, 2011), resulting in an emotional “roller coaster ride” for entrepreneurs as a firm inevitably faces challenges (Nair & Weber, 2015). The esteem and financial survival of the entrepreneur(s) tends to be intertwined into the firm. Thus emotions are particularly salient as an entrepreneur and their team (Breugst & Shepherd, 2015) are personally responsible for the ultimate success or failure of the business. Entrepreneurs at the helm of the venture have a further emotional journey, the attempt to establish and maintain market share often for a purpose more complex than to simply provide an income – but to transform an idea or a dream into a reality. Cardon, Zietsma, Saporito, Matherne and Davis (2005) share the following metaphor which poignantly illustrates the underlying personal and emotional component embedded in entrepreneurship:

*We compare a parent to an entrepreneur. In order for a child to be born, someone must carry and bear the child, just as an entrepreneur must be present to bring forth a new organization. (Cardon et al., 2005, p. 28).*

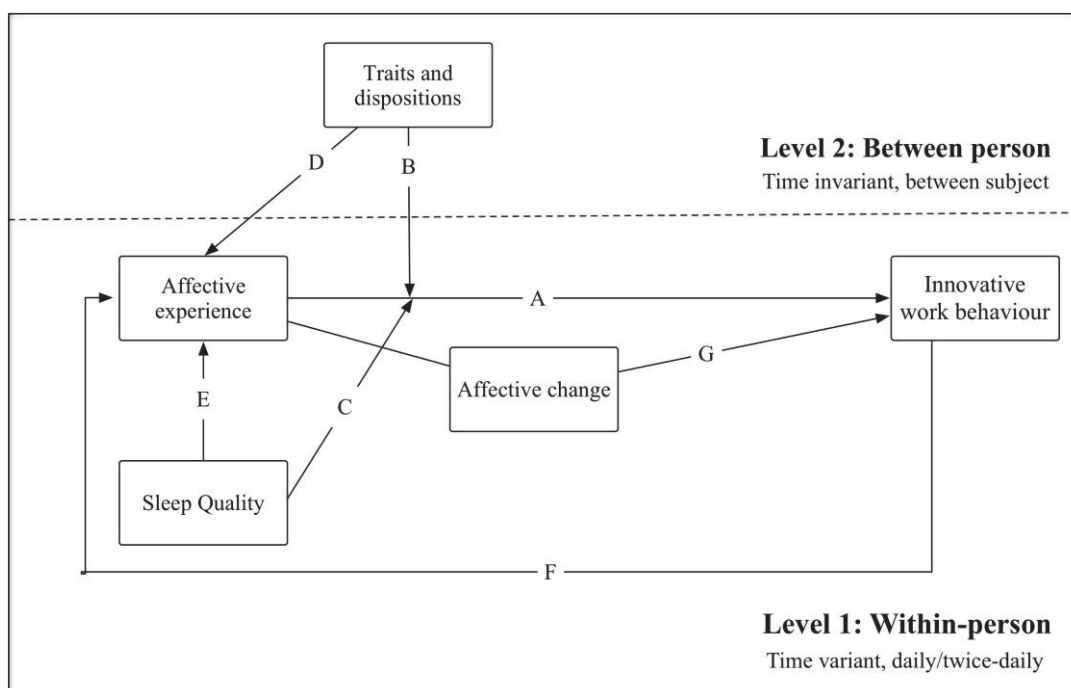
Baron and Tang’s (2011) article is one of the only empirical studies linking affect to innovation (firm level innovation) in the entrepreneurial context to date. The results of the studies confirmed the relationship between positive dispositional affect and creativity, which has already been well established in extant research (cf., Baas et al., 2008). They then went on to demonstrate that creativity is positively related to the radicalness of innovations, a relationship which is moderated by environmental dynamism, as measured by fluctuations in industry sales over the five year period. Thus suggesting that affective dispositions (also called pleasant or negative trait affect) are linked to the generation of a firm’s radical innovations, particularly when firms are in a period of environmental dynamism. Although the paper shed some light on the importance of affect in examining innovation, and has been a pioneering article in raising awareness of affective research in the entrepreneurial context, it left many questions unanswered, failed to explore fluctuations in affect (state affect), for preference of affective dispositions (traits), and did not examine a direct link between affect

and innovative work behaviour. Therefore the fifth aim of this thesis is to examine the connection between daily fluctuations in innovative work behaviour and affect in individual entrepreneurs, in accordance with Fisher’s call for research on “real time affect at work” (Fisher, 2002b).

The directional relationship of affect and behaviour was recently challenged by Gielnik et al. (2014). The authors presented an argument and evidence to suggest behaviour predicted affect, specifically that effort predicted passion. This perspective is supported by feedback theory (Baumeister, Vohs, DeWall, & Zhang, 2007), which views emotions as innately embedded in action tendencies. Yet despite the growth in interest on affect in the workplace, little has been done to explore the reciprocal role between affect and behaviour, as well as behaviour and affect. Therefore the final aim of this thesis is to explore the directional relationship between affect and innovative work behaviour, to explore if and how innovative work behaviour indeed predicts affective experiences.

This research, which primarily aims to advance the dialogue of affect in entrepreneurship, is reflected in the conceptual overview presented in Figure 1. The overview model was adapted from the basic principles of Affect Events Theory (Weiss & Beal, 2005). Each path is reflected in the propositions of this thesis, underpinned by the five specific research aims discussed throughout this introduction.

**Figure 1: Conceptual Overview**





The remainder of this thesis is organised into seven subsequent chapters. Firstly, chapter two critically reviews the literature, while progressively developing the hypotheses of the thesis. Next the methodology for data collection and analysis is explored. The results are then presented in chapter four. Chapter five then discusses the research, before potential limitations of this research are acknowledged. Finally, chapter six returns to the aims of this thesis, and specifically addresses how the research fulfilled the intended aims presented throughout this introductory chapter. Appendices then references are included at the end of the document.

## 2 LITERATURE REVIEW

In this chapter salient literature is explored, and pertinent theories examined, leading to the development of 32 hypotheses. The chapter commences with a dialogue on key definitional controversies of affect and innovative work behaviour. Section two then explores the literature surrounding the prediction of behaviour via affect, and reviews possible between-person and within-person moderators of the affect–innovative work behaviour relationship. Specifically, section two begins with a critical discussion on the theory surrounding affect as a predictor of behaviour. Theories and key literature are then explored as they relate to innovative work behaviour, leading to the development of propositions for the direct effects between affect and innovative work behaviour. The possible moderating effect of affective dispositions, openness to experience, personal initiative and sleep quality, are then explored. The section concludes with the critical review of the affective shift model. An integrated theory of the affective shift model, and circumplex model of affect is presented (named the “affective change model”). Section three then reviews the literature which places affect as an outcome variable to affective dispositions, traits, sleep quality, and innovative work behaviour.

### 2.1 Definitional matters

#### 2.1.1 Defining innovative work behaviour

Academic discourse on innovation predominantly resides the firm or country level - namely viewing innovation in terms of a businesses’ or nation’s outputs (OECD, 2005). While at the individual level, the predominant view of innovation is as a personality trait or stable tendency – “innovativeness” (Goldsmith & Foxall, 2003; Midgley & Dowling, 1978). This thesis joins with work from personal proactivity (Bindl & Parker, 2010; Parker, Williams, & Turner, 2006) and personal creativity (Drazin, Glynn, & Kazanjian, 1999) research however, and views innovation from a process standpoint (Omri, 2015). The perspective that

innovation at the individual level of analysis is dynamic and can vary from day to day, morning to afternoon, moment to moment, is adopted in this thesis. That although stable tendencies and traits do have a role to play in this process (discussed in the following section), individual innovation is influenced by momentary conditions also. This thesis therefore takes on the call (George & Zhou, 2007) of identifying innovation in its moments of creation, providing an alternative lens for examining how innovation unfolds in the work lives of entrepreneurs.

Innovative work behaviour, individual innovation and proactive work behaviour are similar concepts, which are united in their conceptualisation of innovation as a process, as opposed to an outcome. This perspective affords the benefit of exploring how innovation emerges and the examination of the affective conditions that may encourage it. This does not suggest however, that all innovative work behaviour will result in innovation outcomes at a firm level, but does provide insights into how the process unfolds. The link between innovative behaviour and performance is supported nonetheless, noted by a range of authors from organisational psychology who furthermore use the terms innovative work behaviour and innovative “performance” interchangeably (such as Janssen, 2000; Madrid Cabezas, Lopez, Leiva, & Huffman, 2015). Moreover Omri (2015) has recently identified a link between innovative behaviour by owner-managers, with firm-level innovative outputs and performance in small and medium sized enterprises (SMEs).

Innovative work behaviour is conceptualised as the combination of key innovation processes, namely: idea generation, idea exploration, idea championing, and idea implementation (De Jong & Den Hartog, 2010). The four components that are encompassed in the concept of innovative work behaviour tend to be profoundly intertwined. Consequently few measures are accurately able to divide innovative work behaviour between idea generation, idea exploration, idea championing, and idea implementation components (De Jong & Den Hartog, 2010; Janssen, 2003; S. G. Scott & Bruce, 1994). Empirical research consequently tends to conceptualise innovative work behaviour’s dimensions in unison (Madrid Cabezas et al., 2014; Perry-Smith & Mannucci, 2015).

A central component in the innovative work behaviour tasks associated with the identification of opportunities and generation of solutions, is creativity (Amabile, 1988; De Jong & Den Hartog, 2010). Creativity is primarily a cognitive activity (Basadur, 2004), and thus is related to affect through cognitive variation pathways (Amabile et al., 2005). Yet, creativity is only one element of innovative work behaviour. Innovative work behaviour also includes the

application of ideas – which are achieved through behavioural practices (De Jong & Den Hartog, 2010). Hence innovative work behaviour includes both cognitive and behavioural elements, exploited for the realisation of creative ideas (Shane, 1994).

### 2.1.2 Defining affect

Affect is defined as subjective short and long lasting feelings, that are both powerful and weak in intensity (To, Tse, & Ashkanasy, 2015). In other words affect is an overarching term, broadly encapsulating mood and emotion (Frijda, 1986). Vague definitions or the utilisation of these terms interchangeably is particularly prevalent on the topic within the fields of organisational behaviour and entrepreneurship (e.g. Cardon, Foo, Shepherd, & Wiklund, 2012). Therefore an important first step undertaken in this thesis, is to briefly “untangle” these terms.

Emotions, moods and affective dispositions are conceptualized as kinds of subcategories of affect. Trait affect, also known as dispositional affect (Kaplan et al., 2009), is an individual’s disposition to experience certain emotions (Watson & Clark, 1984). Discrete emotions on the other hand are said to be directed at specific stimulus, and short-term in nature. Some suggest that their true activation form only lasts up to a few seconds or minutes (Frijda, 1986). Conversely moods are less intense in nature, and their precise stimulus is not as obvious to determine. Although an emotion arises as a response to a specific event, moods can be present due to stimulus, experience or even general internal processes and can last a number of hours or days (Watson, 2000). The exact nature and duration of moods and emotions however, is constantly debated in psychological research (cf., Verduyn, Delaveau, Rotge, Fossati, & Van Mechelen, 2015).

In organisational literature it is generally held that it is impractical to measure discrete emotions in every-day life as a full experience of an emotion is not common, and on the occasions when they are experienced, they only endure for a short duration of time (Watson, 2000). Watson (2000) suggests the following thought experiment; to consider the number of minutes in which a full discrete emotion of fear, disgust, or joy was experienced today as a guide. For this reason he concludes “...mood offers a much better conceptual framework for everyday affective experience than does emotion; indeed, models that emphasize the importance of basic, discrete emotions ultimately are ill-suited to the study of such experience” (Watson, 2000, p. 12). Therefore the study of affective states – what one is feeling in a given moment, is better aligned to exploring mood as opposed to emotion in

organisational settings. Using the term “affect” therefore becomes particularly useful in mood and emotion research, as it overcomes definitional issues by including all affective experiences of both short and longer time frames (Watson, 2000).

Further adding to the complexity of affect as a construct, the dimensions with which to categorise mood and emotion is also widely debated. At least<sup>2</sup> two dimensions for categorising affect is widely agreed upon (Yik et al., 2011) however; valence and arousal.

Valence refers to the hedonic tone of affect, from pleasant to unpleasant, whereas arousal is conceptualised as the level of energy and motivation associated with an affective state. Notwithstanding, the large majority (Foo et al., 2015; Harmon-Jones & Gable, 2008; Lerner & Keltner, 2000) of affective research from organisational psychology to entrepreneurship, have operationalized affect as a uni-dimensional construct (Hirshleifer & Shumway, 2003; Hu & Kaplan, 2014; Ouweneel et al., 2012), with pleasant affective states (e.g., enthusiastic, calm) at one end of a spectrum, and unpleasant affective states at the other (e.g., angry, sad). Consequently the link between affect and behaviour within a work setting has been plagued with inconsistencies. This thesis therefore responds to recent calls for entrepreneurial affective research (Cardon et al., 2012; Foo et al., 2015; Shepherd, 2015) to draw on a multi-dimensional conceptualisation of affect, and multidisciplinary advancements in mood and emotion research.

## 2.2 Predicting innovative work behaviour via affective states

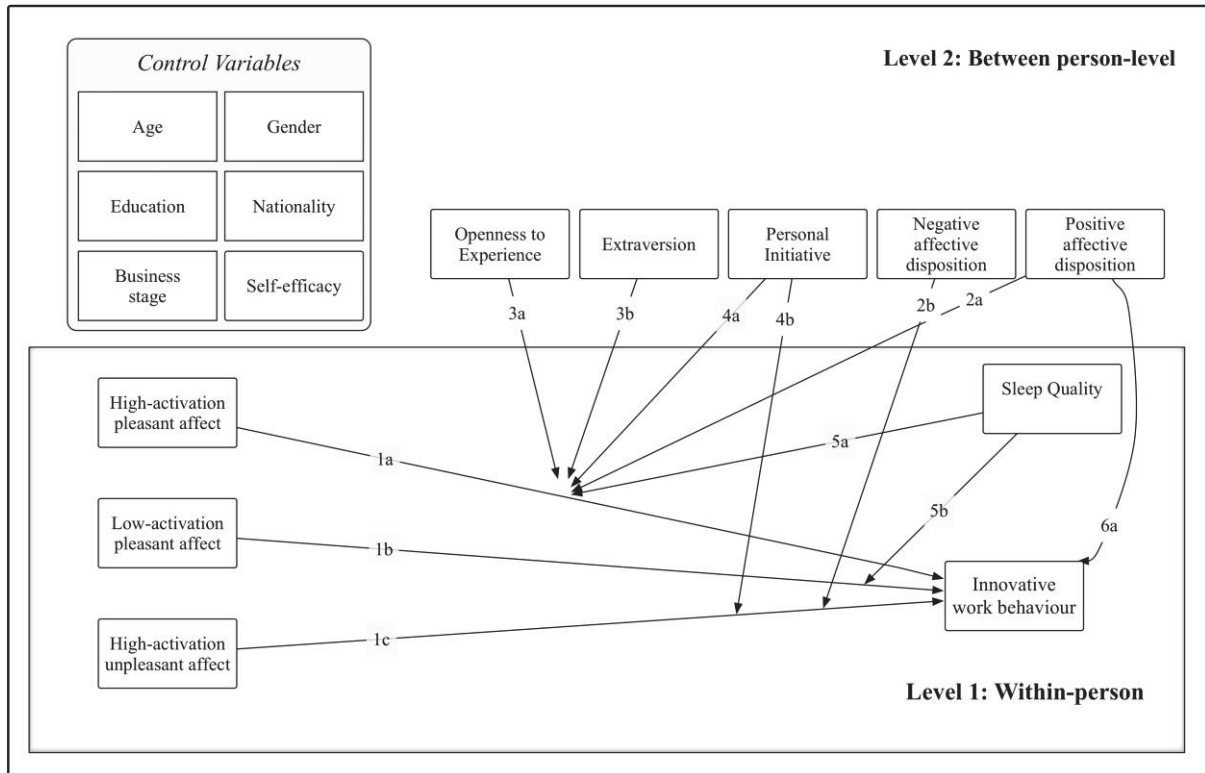
The present section discusses the influence of affect – delineated by valence and activation, on innovative work behaviour. The section begins with a review of high activation pleasant affect’s influence on behaviour, followed by high activation unpleasant affect, then low activation pleasant affect. Next three key constructs which are expected to moderate the relationship between affect and innovative work behaviour are considered; trait affect, two personality traits and sleep quality. Hypotheses are presented throughout the section.

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<sup>2</sup> Strength of engagement (Higgins, 1999, 2006) and regulatory focus (Baas et al., 2008) are useful delineators also, yet beyond the scope of this thesis.

Figure 2 provides a conceptual overview of the hypotheses proposed within this section, visually distinguishing between person level variables at the top, and between person constructs within the lower box.

**Figure 2: Conceptual model of direct and indirect effects on innovative work behaviour**



### 2.2.1 High activation pleasant affect

Pleasant affect is extensively (cf., Fredrickson, 2008) considered to broaden cognitive processes, influence thought action repositories, and build personal resources (Fredrickson, 2001). This concept, coined broaden and build theory, conversely speaks to the narrowing affect that unpleasant affect has on cognitive processes (Fredrickson, 2001). The premise of the theory is that thought processes are primed to deal with situations in the most efficient way. Negative situations require rapid action, and thus are associated with momentary narrowed thought-action repertoire to focus on the specific decision at hand (Fredrickson, 2001). Contrariwise, a pleasant affective state high in joy for example, would lead to flexible thinking (Fredrickson, 2001) – and thus underscores the link between pleasant affect and creativity. Although the broaden and build theory has received some criticism (Gable & Harmon-Jones, 2010; Harmon-Jones & Gable, 2008) it has been widely adopted in psychology and organisational research (Fredrickson & Branigan, 2005; Friedman & Förster, 2010, 2011; Harmon-Jones, Gable, & Price, 2011).

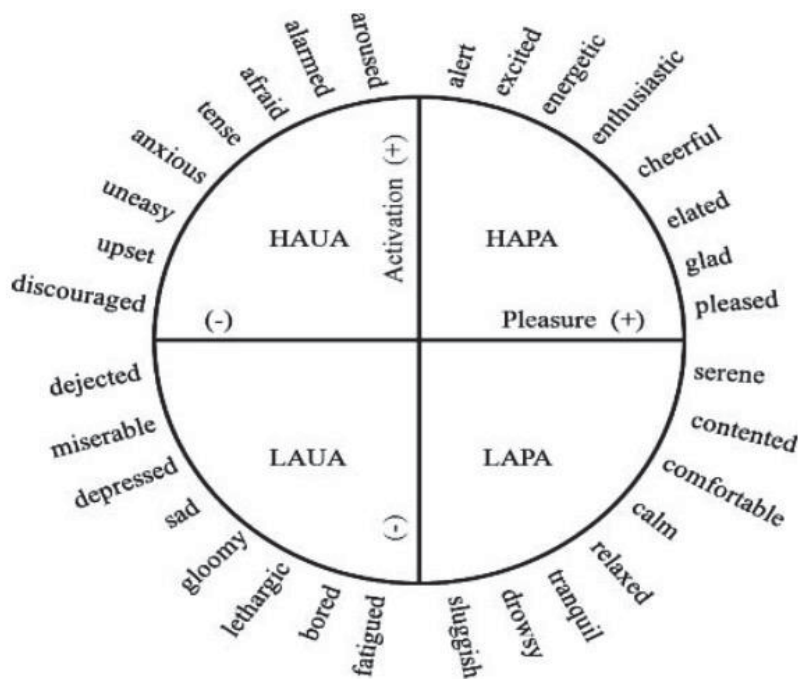
Numerous alternative models have been proposed to explain the connection between valence and thinking style in conjunction with broaden and build theory. For example, global-local processing model holds that pleasant affect is associated with global, abstract thinking, whereas unpleasant affect leads to detailed and local thinking styles (Förster & Dannenberg, 2010). Or in the case of cognitive tuning model (Friedman & Förster, 2010), pleasant affect purportedly suggests that a given situation presents few risks, therefore no further cognitive effort is required. Unpleasant affect however, indicates an issue, requiring greater cognitive effort. In summary however, a similar fundamental framework underpins each of these theories. Individuals think differently when in pleasant or unpleasant affective states, not because of the content of their thoughts, but the styles of their thoughts themselves while experiencing these moods and emotions (Hunsinger, Isbell, & Clore, 2012). Pleasant affect leads to big picture thinking, while unpleasant affect is connected with fine detailed thought processes (for reviews, see Clore & Hunsinger, 2007; Schwarz & Clore, 2007). Adopting this perspective, it is not surprising therefore that pleasant mood states have tended to be positively correlated with creativity (Davis, 2009), and novel approaches towards problem solving (Ashby et al., 1999).

Beyond some consistent correlations between pleasant affect and some types of creativity, the wider affective literature however, has been afflicted with inconsistencies, driven by the oversimplification of affect to pleasant or unpleasant poles (Baas et al., 2008). More recently,

multidimensional perspectives have helped explain many of the discrepancies in the singular dimensional literature, using arousal to delineate between emotions of the same valence and explain incongruities.

Drawing on the circumplex framework (Yik et al., 2011), both valence (horizontal axis) and arousal (vertical axis) can be conceptualised as interlinked and interrelated dimensions. Warr et al found a better fit for the circumplex framework than other models of affect, across 13 work behaviours. The figure below by Warr et al, adapted from earlier similar models of affect, illustrates high activation unpleasant affect (HAUA), high activation pleasant affect (HAPA), low activation unpleasant affect (LAUA) and low activation pleasant affect (LAPA).

**Figure 3: Circumplex model of affect (Warr et al., 2014, p. 343)**



Retrospectively delineating affective research into activation and valence (pleasure) dimensions demonstrates that high activation pleasant affect has almost exclusively been the focus the past decade's research effort. Warr et al., (2014) noted that the specific pleasant moods utilised in most studies which posit the advantages of "pleasant affect", were using *high* activation moods exclusively (e.g., excited, inspired).

In entrepreneurship research for example, a (high activation) pleasant affective state has been related to greater risk-taking propensity, higher levels of problem solving abilities, and greater levels of energy and motivation (cf., Isen, 2001). Furthermore, pleasant affect has



been associated with thorough and efficient thinking, and may even result in more effective (less defensive) negotiations (Isen, 2001). Grichnik, Smeja and Welppe (2010) conducted an online study with 40 highly innovative German companies to attempt to understand the influence of emotions on entrepreneurial evaluations. Participants were measured for levels of trait affect, then induced into an emotion of fear or joy via a seven minute video, and asked to make a decision based on a hypothetical entrepreneurial scenario. The researchers found partial support for their hypothesis that entrepreneurs induced into a “pleasant emotional state” would evaluate new business opportunities more positively than individuals who have not been induced into a pleasant emotional state. Notwithstanding, in these cases the affective state that was examined in the research, also happens to be a high activation mood.

A recent paper by Madrid, Patterson, Birdi, Leiva, and Kausel (2014) specifically utilising the circumplex model of affect, supported the hypothesis by Warr et al. (2014) that high activation pleasant affect predicts workplace behaviour. The authors measured workers’ moods<sup>3</sup> once a week over a ten-week time frame with 92 employed MBA students to identify the link between mood and innovative work behaviour. Their findings revealed that high activation pleasant mood had a significant and direct relationship with innovative work behaviour. Although the testing of other mood states were not mentioned in the study, the article is particularly pertinent, as it is one of the only workplace studies exploring innovative work behaviour from a multidimensional perspective of affect.

Lab studies have attributed the link between high activation pleasant affect and enhanced creativity and thinking processes due to the influence of increased noradrenalin, dopamine, and memory function (Baas et al., 2008). Neuropsychological theory for example suggests that high activation pleasant affect leads to increased dopamine levels in the frontal cortical

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<sup>3</sup> The authors’ measurement of mood may be considered controversial, as many theorists hold that a particular mood-state can last a number of hours or up to a number of days (not as much as a week as measured in this study). Although bandwidth-fidelity theory suggests that in some specific contexts such as the five-factor model, (measure for the big five personality traits via the utilisation of fewer questions) there is a rationale for using broader measurements, the literature is unanimous that in situation specific contexts, particularly those variable in nature - greater insight can be gained from a narrow measure (Hogan & Roberts, 1998). Thus given the context of innovative behaviour which is highly fragmented in nature (Binnewies & Wörnlein, 2011), an argument may be made that a more timely measure of mood may provide greater insight into this relationship as opposed to weekly mood.

areas, which facilitates the selection of cognitive perspective and leads to cognitive flexibility (Ashby et al., 1999).

Given this range of findings from organisational psychology, neuroscience and entrepreneurship literatures, some implications can be made regarding the influence of high activation pleasant affect on innovative work behaviour in entrepreneurs. Specifically, it is proposed in this thesis that innovative work behaviour will be promoted by high activation pleasant affect via three pathways. The first way in which high activation pleasant affect is expected to influence innovative work behaviour is through the “build” function of pleasant affect, which is expected to assist with states of motivation, and capabilities (Fredrickson, 2001). The ability to engage in regulation behaviour is also shown to be positively influenced by high activation pleasant affect (Martin, Ward, Achee, & Wyer, 1993), which may prove useful in sustaining behaviour. Thirdly, the cognitive “broadening” mechanism (Fredrickson, 2001), brought about by pleasant affect is expected to benefit innovative work behaviour. Broadening of cognitive processes is anticipated to be particularly beneficial to idea generation activities (Janssen, 2003), a perspective supported by recent creativity research (cf., Baas et al., 2008). Penultimately, high activation affect has an energising role (Russell, 2003), which may help to sustain daily innovative work behaviour in environments of uncertainty. High activation pleasant affect has been shown to assist individuals dealing with setbacks (Martin et al., 1993), which may be particularly advantageous for entrepreneurs engaged in idea promotion activities for example. Finally, high activation pleasant affect correlates with goal setting behaviour (Isen & Reeve, 2005) which may also prove useful for idea realisation activities.

Therefore moods classified as pleasantly valenced with a high activation function are expected to relate positively to innovative work behaviour, leading to the first hypothesis:

*Hypothesis 1a: High activation pleasant affect will positively predict entrepreneurs' innovative work behaviour*

### 2.2.2 Low activation pleasant affect

Despite the oft cited notion that “pleasant affect”, when conceptualised broadly, has a positive influence on innovative behaviour, for example George and Brief (1992, p. 316) stated “workers in pleasant mood states are more likely to be creative and innovative”, it is

the argument of this thesis that such conclusions only pertain to *high activation* pleasant moods and emotions. As mentioned earlier, previous studies focused on “pleasant” affect tended to favour only moods which are classified as high activation moods (Warr et al., 2014). Therefore conclusions regarding pleasant affect cannot necessarily be applied to all range of pleasant moods and emotions. From a circumplex model of affect perspective, traditional studies on “pleasant affect” following Warr et al.’s (2014) argument, would predominantly be positioned exclusively on the upper right quadrant of the model. Yet due to the relatively recent nature of an activation perspective in workplace research (Lerner & Keltner, 2000), few empirical studies have specifically sought to explore the relationship between low activation pleasant affect and innovative behaviour.

Baas, De Dreu and Nijstad (2008) however, undertook an analysis of 25 years of affective-creativity research, re-examining the specific predictive role of activation. The authors (2008) found creativity to be enhanced by high activation pleasant mood states, but not low activation states<sup>4</sup>. Furthermore Higgins (2006) illustrated that low activation affect is associated with inactivity, and Russell (2003) related low activation moods with low energy.

Therefore due to the failure of low activation pleasant affect to benefit creativity and thus idea generation activities, as well as its failure to energise and therefore providing no obvious affective impetus to execute ideas, the following hypothesis is proposed:

*Hypothesis 1b: Low activation pleasant affect will not predict entrepreneurs’ innovative work behaviour*

### 2.2.3 High activation unpleasant affect

Although high activation unpleasant affect is associated with narrowed cognitive pathways and “thought-action repertoires” (Fredrickson & Branigan, 2005, p. 313; Fredrickson, 2008), and correlates with some negative behaviours, such as counterproductive work behaviour and withdrawal (Kaplan et al., 2009), paradoxically there is evidence to suggest that high

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<sup>4</sup> Innovative work behaviour is involved with the application of creative ideas, and thus conclusions from creativity research cannot merely be generalised to all aspects of innovative behaviour (Amabile, 1988), it is expected that the fundamental cognitive and thought-action responses positively influencing creativity will consequently have some relation to innovative work behaviour. (De Dreu et al., 2008)

activation unpleasant moods can also positively influence behaviour (Baas et al., 2008; Kooij-de Bode et al., 2009).

George and Zhou (2002) for example explored the impact of unpleasant affect on the creativity of 67 workers in a large organisation, via questionnaires and supervisor ratings. The authors found that unpleasant affect can have the benefit of signalling that the current conditions are not adequate and therefore additional effort is required. This can become an avenue for producing more creative and useful ideas through greater effort (George & Zhou, 2002).

Anderson, De Dreu and Nijstad later built on George and Zhou's findings to help develop a conceptual model of distress-related innovation (Anderson, De Dreu, & Nijstad, 2004), they proposed that unpleasant mood states in conjunction with job dissatisfaction and role conflict can act as (distress) drivers for innovation. Consistent with Janssen, Van de Vliert and West's statement, "generating creative ideas is often triggered by work-related problems, incongruities, and discontinuities which employees are confronted with at work" (2004, p. 130). Therefore unpleasant affect when high in activation may also be a useful driver of innovative behaviour.

The notion that individuals rely upon emotions as a source of information in making choices and judgements is encapsulated in the affect-as-information model (Clore, 1992). The shortcoming of utilising affect as a source of information seemingly arises when emotions aroused from one event impact a decision in something unrelated – incidental affect (Lerner & Keltner, 2000). Consistent with this theory, in entrepreneurial research Welpe et al., (2012) found emotions to influence judgements about affectively unrelated exploitation opportunities. Therefore, although unpleasant affect may have the benefit of suggesting the need for change (George & Zhou, 2002) or innovation (Anderson et al., 2004), the spill over of unpleasant affect may influence unrelated judgements and decisions also.

Similarly cognitive tuning theory offers an alternative explanation for George and Zhou (2002), and Anderson, De Dreu and Nijstad's (2004) findings. The theory suggests that information is processed differently in pleasant as opposed to unpleasant, mood states (Clore, Schwarz, & Conway, 1994). According to the authors, pleasant affect indicates satisfaction therefore no modification is needed, whereas unpleasant affect implies the presence of a problem, which necessitates change (Clore et al., 1994). This perspective is consistent with the conclusions of a range of studies (Kaufmann & Vosburg, 1997). For example Fredrickson

and Branigan (2005) and Kuhl (2001), have illustrated a cognitive link between unpleasant affect and detail oriented thinking.

Furthermore, high activation unpleasant affect has been associated with increased perseverance. Forgas (2013) for example reported that individuals in unpleasant mood states demonstrated greater perseverance on tasks in his lab studies. Respondents in unpleasant moods spent more time on a problem, made more attempts at answering questions, and in the end demonstrated a larger portion of correct answers compared to individuals in pleasant affective moods. A meta-analysis by Baas et al. (2008) also found high activation mood states to be conducive to the production of creative outputs, due to increased perseverance.

Therefore, it is expected that high activation unpleasant affect will be positively related to innovative work behaviour, via four pathways. Firstly as a signal for needed change (George & Zhou, 2002), or stress-related innovation (Anderson et al., 2004), supported by cognitive tuning theory (Clore et al., 1994) and the affect-as-information model (Clore, 1992). Secondly by way of improved detail oriented thinking (Fredrickson & Branigan, 2005; Kuhl, 2001), which is expected to assist in refining ideas and processing information. Thirdly, high activation unpleasant affect is expected to positively relate to innovative work behaviour via increased persistence (Baas et al., 2008; Forgas, 2013). Finally, as discussed in the case of high activation pleasant affect, the influence of the high activation affect function is expected to play an energising role (Russell, 2003) on behaviour, inciting effort and action. Therefore the following hypothesis is proposed:

*Hypothesis 1c: High activation unpleasant affect will positively predict entrepreneurs' innovative work behaviour*

#### 2.2.4 Moderators to the affect-innovative work behaviour relationship

The following section explores prominent constructs, which are widely acknowledged to moderate an affect-behaviour relationship.

##### 2.2.4.1 Affective dispositions

An individual's predisposition towards the experience of certain moods and emotions are expected to influence the relationship between affect and innovative work behaviour. For example, positive dispositional affect has been associated with numerous workplace outcomes, such as higher supervisor evaluations (Cropanzano, James, & Konovsky, 1993;

Staw et al., 1994), better performance (Staw & Barsade, 1993) and satisfaction (Diener, Nickerson, Lucas, & Sandvik, 2002). In the entrepreneurship literature, positive (negative) dispositional affect has been linked to the making of a broad (narrow) set of workplace goals, as well as entrepreneurs' general satisfaction (Delgado-García, Rodríguez-Escudero, & Martín-Cruz, 2012). Further Arora, Haynie, and Laurence (2013) found positive (negative) dispositional affect to be positively (negatively) related to changes in entrepreneur's perceived self-efficacy (Arora et al., 2013). The link between self-efficacy, goal motivation and satisfaction has long been supported in the organisational psychology literature (Ilies & Judge, 2002).

In summary, positive dispositional affect tends to be associated with positive outcomes, while the reverse is true for negative dispositional affect. For example Brief et al (1995) demonstrated that positive events were more likely to result in job satisfaction for individuals low in negative trait affect, as opposed to individuals high in negative trait affect. Even Baron and Tang (2011) found evidence of a link between entrepreneurial dispositional pleasant affect and creativity, which has positive implications for entrepreneurial innovative activities. Therefore there is evidence to argue that trait affect may influence the strength of the relationship between daily affective experiences and innovative behaviour. This leads to the formation of the following hypotheses:

*Hypothesis 2a: Positive dispositional affect will moderate the strength of the relationship between entrepreneurs' high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in positive dispositional affect, than entrepreneurs low in positive dispositional affect*

*Hypothesis 2b: Negative dispositional affect will moderate the strength of the relationship between entrepreneurs' high activation unpleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in negative dispositional affect, than entrepreneurs low in negative dispositional affect*

Two interesting articles on dispositional affect and entrepreneurial outcomes however, provided a different view. Foo (2011) found that individuals with dispositions of anger and happiness had a preference for entrepreneurial opportunities with greater value and higher risk. Thus raising the question whether other dimensions (in this case risk taking propensity of emotions according to the appraisal tendency framework) of affective dispositions should be considered. Although this is an interesting perspective – particularly for opportunity

evaluations, at this stage exploring emotions through various dimensions, such as motivation or regulatory focus, is reserved for short-term affect, not usually dispositional affect. Baron et al. (2012), provided an alternative perspective to viewing dispositional affect and entrepreneurial outcomes. In contrary to an established body of research praising positive dispositional affect for leading to positive outcomes, the authors argue that this relationship is curvilinear for entrepreneurs – a positive relationship, until an inflection point when it then becomes negative. Based on a thorough review of the literature, the authors propose that this curvilinear relationship exists between an entrepreneur's level of dispositional pleasant affect and the following activities, product innovation, self-regulation, task motivation, accuracy or perceptions and effectiveness in cognitive tasks (Baron et al., 2012). Therefore the following hypothesis is proposed to test Baron, Hmieleski and Henry's (2012) proposition as it relates to innovative work behaviour.

*Hypothesis 6a: The relationship between positive dispositional affect and entrepreneurs' innovative work behaviour will be curvilinear in nature, such that innovative work behaviour increases with high activation pleasant affect until an inflection point, when the relationship then becomes negative*

#### 2.2.4.2 Personality traits

The role of the personality traits openness to experience and extraversion influencing the relationship between affect and innovation, has some support in the literature also. Intrinsic motivation towards novelty is thought by some to be the key factor behind the link between openness to experience and creativity (McCrae, 1987). Openness to experience was found by King, Walker and Broyles to moderate the relationship between creative ability and (creative) accomplishments (King, Walker, & Broyles, 1996), and as discussed earlier, Madrid et al., (2014) discovered that openness to experience moderated the relationship between high activated pleasant moods and workers' innovative behaviour, when measured weekly. Stock, von Hippel and Schnarr (2014) explored the relationship between innovation success and personality traits with a questionnaires of 546 individuals. They found that individuals who score high on openness to experience are more likely to have new product ideas (creativity). Furthermore Judge and Zapata reported better job performance in innovative tasks by individuals high in openness to experience (Judge & Zapata, 2014).

Research by Madrid et al., (2014) also found support for the theory that a personality can moderate the relationship between mood and innovative behaviour. The relationship between



high activation pleasant mood and innovative behaviour was stronger for people high in openness to experience, specifically, openness accounted for 20 per cent of the slope variance between high activation pleasant mood and innovative behaviour. Although they did not report measuring the link between innovative work behaviour, affect and other personality traits, earlier studies have also suggested a weaker link between extraversion and innovation. For example, Kwang and Rodrigues' (2002) study on "adaptors" and "innovators" showed a close link between extraversion and openness to experience, although it should be noted that "innovators" were measured via static creative style measures (Kirton Adaption-Innovation Inventory), as opposed to innovative behaviours in the workplace. Extraversion has produced contradictory results leading Patterson to the suggestion that it is a context specific relationship (Patterson, 2002). Nonetheless, the accumulation of these findings provides sufficient evidence to suggest a moderating role of these two personality variables on the relationship between high activation pleasant affect and innovative work behaviour.

*Hypothesis 3a: Openness to experience will moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in openness to experience than for entrepreneurs low in openness to experience*

*Hypothesis 3b: Extraversion will moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in extraversion than for entrepreneurs low in extraversion*

#### 2.2.4.3 Personal Initiative

Personal initiative and innovative behaviour are closely related, as they are both associated with, "productive, creative and active strategies and overcoming problems as they occur" (Frese, Fay, Hilburger, Leng, & Tag, 1997, p. 141). The key attributes that personal initiative is composed of, such as pro-activeness and persistence, may be potential drivers of innovative behaviour. Rooks, Serwanga and Frese (2014) found that in developing countries entrepreneurs high in personal initiative were innovative in two ways: planning and through the development of their social networks. Studies which have explored the relationship with personal initiative and outcomes in entrepreneurship thus far, have found a strong positive relationship with both performance (Krauss, Frese, Friedrich, & Unger, 2005) and when directed towards developing personal networks, success (Z. Zhao, Frese, & Giardini, 2010).



While in larger firms, personal initiative has been linked to innovative behaviours, such as idea generation activities (Daniels, Wimalasiri, Cheyne, & Story, 2011). Rank and Frese (2008) even suggest that personal initiative may act as a moderator to innovative tasks.

Given these findings, there is reason to expect personal initiative to moderate the strength of the relationship between affect and innovative work behaviour in entrepreneurs also. Thus the higher the level of personal initiative, the more likely an entrepreneur is to act in response to affect to initiate changes, specifically in this context resulting in innovative behaviours. It is proposed in the present thesis that this moderating affect of personal initiative relates both to high activation positive, and unpleasant affect, in accordance with Affect as Information Theory discussed earlier. This is expressed through the following two hypotheses:

*Hypothesis 4a: Personal initiative will moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in personal initiative, than for entrepreneurs low in personal initiative*

*Hypothesis 4b. Personal initiative will moderate the strength of the relationship between high activation unpleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in personal initiative, than for entrepreneurs low in personal initiative*

#### 2.2.4.4 Sleep quality and innovative behaviour

In organisational research a small number of organisational-based studies have identified the role of imperfect sleep as a contributor to negative workplace outcomes, including satisfaction (B. A. Scott & Judge, 2006), affect (Sonnetag, Binnewies, & Mojza, 2008), stress (Wagner, Barnes, & Scott, 2014), unethical conduct (Barnes, Schaubroeck, Huth, & Ghumman, 2011) workplace deviance (Christian & Ellis, 2011), hostility, (B. A. Scott & Judge, 2006; Welsh, Ellis, Christian, & Mai, 2014), and procrastination (Kühnel, Bledow, & Feuerhahn, 2016), among other topics such as motivation.

Famously Muraven and Baumeister (2000) likened self-control to a muscle, in that to grow both exercise and rest are required. Kühnel, Bledow and Feuerhahn (2016) recently furthered this notion, and tested the influence of sleep at recovering self-regulatory abilities, just as the body recovers muscles during sleep. Their experience sampling methodology (ESM) study completed over five days with 154 subjects revealed that as expected, sleep quality reduced the levels of workplace procrastination. These results attest to the influence that quality of

sleep has on regulatory resources – a link which has been previously theorized (Baumeister et al., 2000).

Formerly, studies exploring the role of sleep on outcomes examined sleep deprivation or sleep quantity. More recently however, a small but growing number of workplace studies have been exploring the role of sleep quality. The reason for this is twofold. Firstly, sleep deprivation is not a daily occurrence in the majority of work, and thus not particularly relevant for most occupational research, and secondly, sleep duration effects vary significantly between subjects (Hirshkowitz et al., 2015). Moreover, recent workplace research measuring naturally occurring sleep quality and quantity, have found sleep quality to be a greater predictor of behaviour. Bledow and Feuerhahn (2016) for example, found low sleep quality to predict procrastination behaviour, whereas sleep duration did not. Similarly, research by Barnes, Lucianetti, Bhave and Christian (2015) found sleep quality, but not quantity, to indirectly influence leader abusive supervisory behaviour. Notwithstanding however, sleep quality and sleep quantity are viewed to have similar effects on behaviour (Barnes, 2012).

Although lab research on sleep quality is sparse, sleep researchers have alluded to the role of sleep quality on assisting subject's recovery (Y. Harrison & Horne, 2000). More generally bad sleep and sleep deprivation has been found to detrimentally effect cognition, resulting in impaired attention, low alertness and distorted risk analyses (Buysse et al., 2007), as well as a variety of lapses in attention (Lim & Dinges, 2010). Therefore in pleasant affective states where cognition is broadened, leading to idea generation and divergent thinking, sleep quality is expected to assist in directing cognition and attention to tasks associated with the generation of innovations – where attention may otherwise drift. Thus the following hypotheses are proposed:

*Hypothesis 5a: Sleep quality will moderate the relationship between high activation pleasant affect and innovative work behaviour, that is to say the relationship will be stronger for entrepreneurs with high previous night sleep quality, than for entrepreneurs with low previous night sleep quality*

*Hypothesis 5b: Sleep quality will moderate the relationship between low activation pleasant affect and innovative work behaviour, that is to say the relationship will be stronger for entrepreneurs with high previous night sleep quality, than for entrepreneurs with low previous night sleep quality*

### 2.3 Predicting innovative work behaviour via change in affect

The importance of a dynamic perspective in affective research is another development that has been gaining traction in the past decade. The notion that emotions do not occur in isolation of other emotions has been reflected in a growing number of studies. For example, concepts such as the “affective shift” (Bledow et al., 2011) model propose that outcomes can be better understood while observing the sequence of emotion. Others have provided persuasive arguments for the conceptualisation of emotions as they are experienced in unison (dual-tuning and emotional ambivalence discussed next). The majority of these theories are primarily centred on affective valence, and do not take into account the recent rise in the literature looking beyond valence into activation however. Although empirical analyses of these theories are lacking in the entrepreneurship and organisational psychology literatures, findings from studies that have sought to test such theories, have been persuasive.

George (2011) among others have identified the importance of examining the interactive role of various emotions. She posits that differing emotions can be felt in tandem, and thus should not be analysed in isolation as events tend to trigger multiple emotions in a given moment. It may be expected that an entrepreneur who receives a large business-to-business order of their product may experience both pride (a pleasant high activation emotion) from new customer’s faith, as well as anxiety (an unpleasant high activation emotion) due to the huge commitment that fulfilling such an order would require. In this hypothetical scenario the two emotions of differing valence could be felt in unison. The importance of experiencing more than one emotion is echoed in studies on emotional ambivalence – the feeling of both unpleasant and pleasant emotions in unison (Fong, 2006). Laboratory experiments by Fong (2006) demonstrated higher ratings in Remote Associate Tasks (a creative activity) by those

experiencing emotional ambivalence. Although other research (eg. Amabile et al., 2005) has not found support for a link between creativity and dual-tuning/emotional ambivalence.

Extending her work on broaden and build theory discussed earlier, Fredrickson and Losada (2005) also explored the interplay of positive and unpleasant emotions. The pair discovered from tracking the daily affect of participants throughout a month, that the mean ratio of positive to unpleasant affect for individuals with flourishing mental health was 2:9. Since, the exact positive to negative ratio has been shown to vary according to the specific context, but stands as an important principle in affective research. Frederickson (2008), summarising recent research in a range of contexts (eg., marriage and well being), suggested that ratios close to 5:1 tend to be associated with thriving (happy stable marriages) whereas 1:1 can be destructive (on a cascade towards divorce). Rego, Sousa and Marques (2012) applied the theory to their research on optimism as a predictor of creativity and found the positivity ratio to play a possible mediating role in the process. Notably, their results from examining 595 employees' self-reports of positive/negative affect in relation to supervisor ratings of creativity, suggested that the relationship between positivity ratio and creativity is curvilinear (Rego et al., 2012)..

Bledow, Rosing and Frese (2013) utilised the Personality-Systems-Interaction (PSI) theory, to further theorise about the interplay of negative and pleasant emotions. PSI specifically refers to the high-level intuitive system that is important for decision-making, which has implications for self-regulation and affect (for a detailed review see Kuhl, 2000). The authors argue that the development of new and useful ideas requires a range of affective experiences, including emotions of negative valence such as frustration. In practice it seems intuitive that an entrepreneur's experience of frustration, may provide motivation for the generation of innovative ideas to transform their service offering – which broaden and build theory (Fredrickson & Branigan, 2005) would suggest pleasant emotions would help produce. The authors adopt Kuhl's (2001) theoretical framework, which suggests that unpleasant affect is useful for its enrichment of systematic thought. An affective shift as presented by Bledow, Rosing and Frese (2013) is achieved through the experience of increased pleasant affect and decreased unpleasant affect between two periods of observation. Therefore the affective shift model utilises modern perspectives on both positive and unpleasant affect to explore behaviour (eg., "dual tuning" suggested by George, 2011).

This line of research suggests that a superior prediction of behaviours may be gained from considering the *sequence* of affect as opposed to affect states in isolation. It has been

suggested that an “affective shift” has a greater impact on both engagement and creativity, than either pleasant or unpleasant affect measured in isolation (Frese & Gielnik, 2014). The premise of the affective shift model brings to mind the “moody artist” or “mad genius”, and in fact there is substantial evidence linking psychopathology, and professionals in creative professions (Ludwig, 1992), as well as creative acts (Ma, 2009). Authors of a phenomenological study on bipolar disorder and creativity by for example, concluded that shifting affective states “fuelled the creative process by offering them flexibility of thought and contrasting perspectives to generate original ideas” (Taylor, Fletcher, & Lobban, 2015, p. 663).

Utilising the affective shift model, Bledow, Schmitt, Frese and Kühnel (2011) conducted an experience sampling methodology twice per day over nine days with 55 German computer scientists. The results confirmed their expectation that in accordance with the affective shift hypothesis, unpleasant moods/events experienced at 11am, that were followed by a pleasant mood (as measured reflectively at 3pm), was positively related to work engagement at 3pm (Bledow et al., 2011). Therefore in accordance with the role of affect in priming cognition and behaviour discussed previously, unpleasant affect may provide an informative role, priming analytical resources (Kuhl, 2001), then pleasant affect may enable creative generation of solutions (Baas et al., 2008). This line of reasoning provides the basis to propose the following hypothesis:

*Hypothesis 7a: High activation pleasant affect will moderate the relationship between high activation unpleasant affect in the morning and innovative work behaviour in the afternoon, such that the relationship will be stronger at high levels of high activation pleasant affect, than at low levels of high activation pleasant affect*

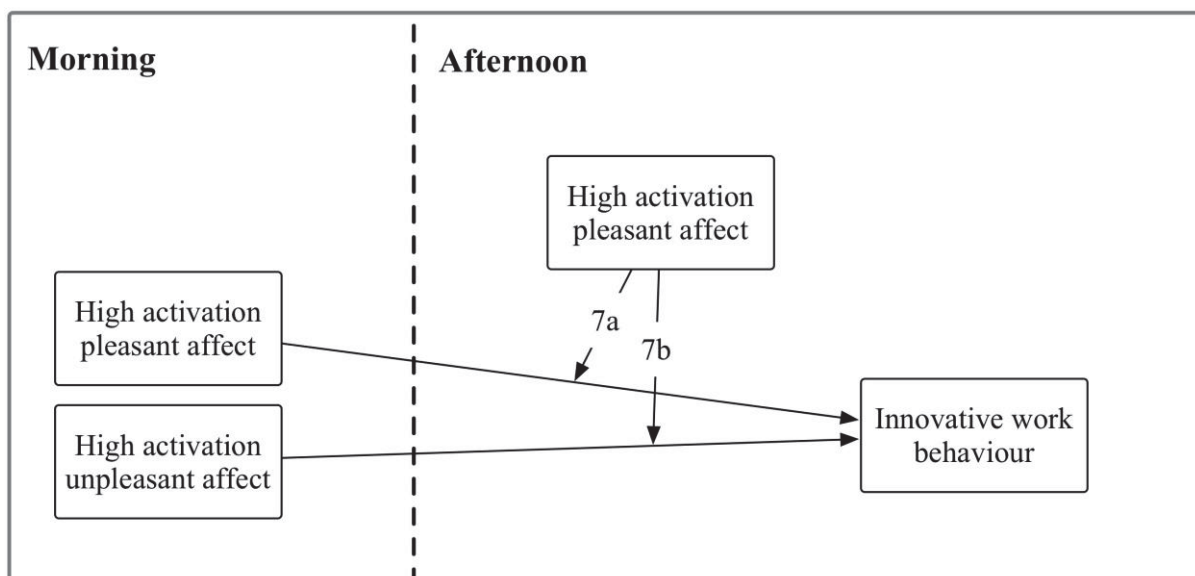
Throughout research on the affective shift model, the activation dimension of positive and unpleasant affect has mostly been overlooked. For example Bledow et al., (2011) measured pleasant affect as a culmination of five pleasant affective states, four of which would be classified as high activation pleasant affect. Negative mood, on the other hand, comprised of three low activation unpleasant, and three high activation unpleasant affective states. The role that activation or arousal played in the theoretical model was not discussed. Therefore from an activation perspective, it may be argued that the activation dimension from the majority of pleasant affective states measured, may have been the trigger of the increased creativity observed. Postulating the importance of activation in the model, low activation pleasant

affect, followed by high activation unpleasant may sceptically be argued by some to provide a similar outcome. Thus the following hypothesis is proposed to test the activation function of the model.

*Hypothesis 7b. High activation pleasant affect will moderate the relationship between low activation pleasant affect in the morning and innovative work behaviour in the afternoon, such that the relationship will be stronger at high levels of low activation pleasant affect, than at low levels of low activation pleasant affect*

A model based on these propositions is illustrated in Figure 4. The left side of the diagram reflects morning affective states, while the right side shows afternoon innovative work behaviour, and the proposed moderating role of afternoon high activation pleasant affect.

**Figure 4: Conceptual model of affective shift effects on innovative work behaviour**



Notwithstanding however, given the proposed influence of high activation, and not low activation affect in positively influencing innovative work behaviour discussed in the previous section, a transformation of the affective shift model to an arousal perspective, within the circumplex model of affect may be merited. Although the affective shift model posits the value of change in affective valence, the present author argues that change in level of high activation pleasant affect and high activation unpleasant affect may be a superior influencer for the engagement in innovative work behaviour.

Drawing on the literature reviewed earlier on the influences of high activation pleasant affect on behaviour, it is expected that thought-action repertoires will be broadened, and personal resources “built” (Fredrickson, 2001), cognition will be more flexible (Baas et al., 2008; De Dreu, Baas, & Nijstad, 2008; Lyubomirsky, King, et al., 2005) and risk-taking propensity will be increased (Bindl & Parker, 2010) by high activation pleasant affect. I propose that afternoons with improved levels of high activation pleasant affect when compared to the morning, would be associated with higher innovative work behaviour therefore, leading to the following hypothesis:

*Hypothesis 8a: An increase in high activation pleasant affect between the morning and afternoon will be positively related to innovative work behaviour*

Yet, as low activation pleasant affect is an enjoyable affective state, individuals are likely to pursue affect-sustaining strategies – resulting in surface processing as to avoid interfering with their current state (Wegener & Petty, 1994). Thus low activation pleasant affect leads to surface cognitive processing, and inaction (Higgins, 2006; Russell, 2003). Therefore increased low activation pleasant affect is not expected to provide a benefit to entrepreneurs’ engagement in innovative work behaviour, suggesting the following condition:

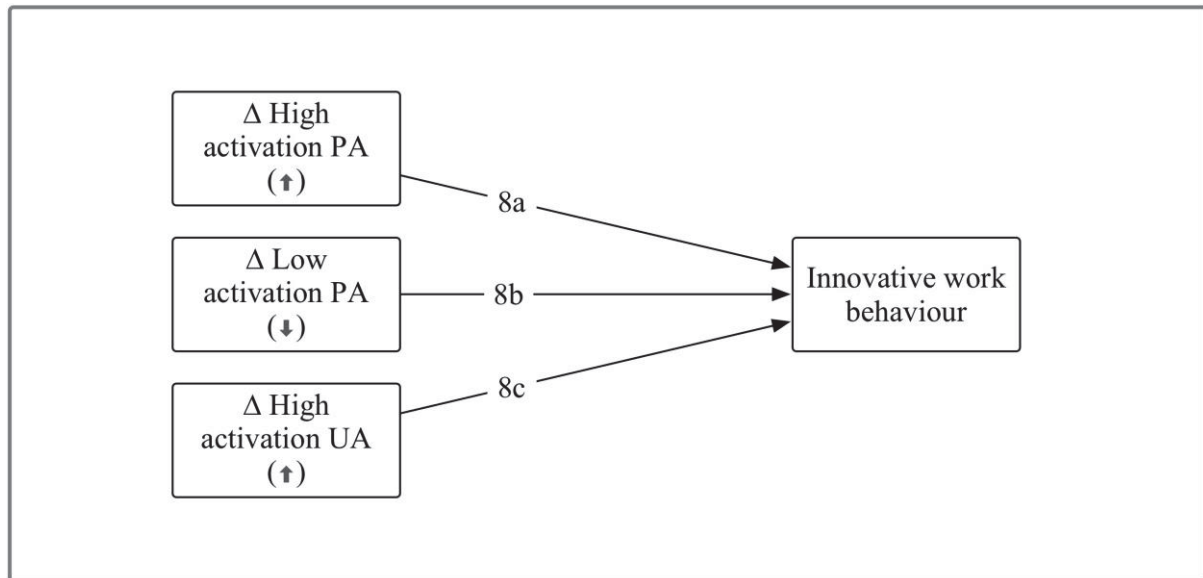
*Hypothesis 8b: A decrease in low activation pleasant affect between the morning and afternoon will be positively related to innovative work behaviour*

High activation unpleasant affect on the other hand plays an energising (Russell, 2003) role on behaviour. Furthermore, individuals experiencing unpleasant affect, are expected to attempt to escape their mood (Cialdini et al., 1987), by engaging in deep cognitive processing (Wegener & Petty, 1994) and seeking out mood-changing tasks (Wegener & Petty, 1994). Therefore increased high activation unpleasant affect in the afternoon may enhance these effects, resulting in innovative work behaviour. These conclusions lead to the next proposition:

*Hypothesis 8c: An increase in high activation unpleasant affect between the morning and afternoon will be positively related to innovative work behaviour*

A conceptual model representing these propositions is illustrated in Figure 5. The delta symbol “ $\Delta$ ” signifies change in a given affective state, while the arrows suggest an increase or decrease in the level of affect from morning to afternoon, resulting in innovative work behaviour denoted on the right side of the diagram.



**Figure 5: Conceptual model of affective change effects on innovative work behaviour**

The question remains however, if the contribution of the affective change model proposed and devised in this research is superior to static affective states measured in isolation (eg., hypotheses from section two). Although some researchers have postulated the importance of a dynamic perspective of affect for more accurate predictions of behaviour, such a perspective has not been tested in regards to innovative work behaviour. Therefore it is proposed that a dynamic perspective of affect, particularly as it relates to affective change from morning to afternoon, will better anticipate entrepreneurs' innovative work behaviour:

*Hypothesis 9a: Change in affect will be a better predictor of innovative work behaviour in the afternoon, than affect in the morning*

## 2.4 Predicting affect

When examining affect it is important to consider the stable individual variability of experiencing moods and undertaking behaviours. Dispositional affect or *trait* affect, is “the stable tendency to experience pleasant moods and emotions” (Baron et al., 2012, p. 310). Trait negative affectivity predisposes individuals to unpleasant emotions and moods, whereas people with positive trait affectivity will be inclined to experience more pleasant moods and emotions. Personality traits or the Big Five Factor Model on the other hand are broad dimensions for categorising personality, which have also been found to have an influence on affective experiences and behaviours. These consist of openness to experience - which reflects creativity and intellectual curiosity, and extraversion – sociability, among others.



These personality and affective traits are longstanding in nature, therefore should generally exhibit similar dispositions in different contents and at varying times (Watson, 2000).

#### 2.4.1 Traits as antecedences to affect

Personality and affective dispositions have been found to influence the likelihood of experiencing particular affective states. This section will explore the literature pertaining to which traits are likely to have a significant impact on affective experience.

##### 2.4.1.1 Affective dispositions

Dispositional affect (also called trait affect, “the stable tendency to experience pleasant moods and emotions” (Baron et al., 2012, p. 310) has been empirically tested to impact upon both the likelihood to experience certain emotions, as well as the interpretations of events (Baas, 2010; Baron et al., 2012; Baron, Tang, & Hmielecki, 2011; Barsade & Gibson, 2007; Chan & Park, 2013; Delgado-García et al., 2012; Galliani & Vianello, 2012; Rego et al., 2012; Tran, 2004). People high in positive dispositional affect tend to interpret events in a more positive way, leading to a greater likelihood to experience pleasant emotions, and vice versa with negative dispositional affect. Watson and Clark for example suggest that those high in dispositional negative affect “will tend to report more negative affect across time and regardless of the situation” (Watson & Clark, 1984, p. 465). Individuals high in negative affect tend to experience anxiety, guilt and fear, while people high in positive affect are more likely to experience pleasant emotions such as joy and enthusiasm.

Fisher (2002a) explored the antecedents and consequences of affect at work via 50 self-reports with 124 employed adults and found further evidence to suggest positive dispositional affect predicts positive affective reactions, and negative dispositional affect predicts negative affective reactions. As Lyubomirsky et al. summarise in their meta-analysis on positive affect, “... a happy disposition is likely to be a cause of pleasant emotions” (Lyubomirsky, King, et al., 2005, p. 820). This is a persuasive finding reflected across a variety of emotion studies (for an example see Lyubomirsky, King, et al., 2005).

Therefore in agreement with this body of literature, it is proposed that a positive affective disposition will lead to the experience of more pleasant and fewer unpleasant moods, whereas a negative affective disposition will have the opposite effect.

*Hypothesis 10a. Entrepreneurs' positive dispositional affect will be positively related to the experience of high activation pleasant affect*

*Hypothesis 10b. Entrepreneurs' positive dispositional affect will be positively related to the experience of low activation pleasant affect*

*Hypothesis 10c. Entrepreneurs' positive dispositional affect will be negatively related to the experience of high activation unpleasant affect*

*Hypothesis 11a. Entrepreneurs' negative dispositional affect will be negatively related to the experience of high activation pleasant affect*

*Hypothesis 11b. Entrepreneurs' negative dispositional affect will be negatively related to the experience of low activation pleasant affect*

*Hypothesis 11c. Entrepreneurs' negative dispositional affect will be positively related to the experience of high activation unpleasant affect*

#### 2.4.1.2 Personality traits

Although personality traits are not widely known for their link with affect, the literature exploring this topic reflects little doubt that personality is related to general positive and negative affect in trait extraversion and to a lesser extent, neuroticism. Letzring and Adamcik's (2015) recent examination of the relationship between specific traits and affect, found evidence that concurs with the vast body of research suggesting that extraversion is linked with positive affect. Evidence for such a relation has been proven numerous times over (Ilies & Judge, 2002; Judge, Heller, & Mount, 2002; Larsen & Ketelaar, 1991; Watson & Clark, 1992 to name a few).

The affective association of other personality traits however, have produced mild and varying results. Watson and Clark (1992) for example found a link between conscientiousness and positive affect – but suggest that it is probably due to the role of attentiveness in the measure. Letzring and Adamcik's (2015) study revealed a similar result, and further only found a moderate link between pleasant affect and openness to experience also. The association with agreeableness to affect is the most confused of all. Some have merely found a link between (low) agreeableness to the emotion of hostility (Watson & Clark, 1992), while others discovered a negative relationship to negative affect (yet stronger than the relationship to

**Figure 6: Personality traits and associated affect**

<i>Five factor Model</i>	<i>Affective associations</i>	<i>Link with specific emotions</i>
Extraversion	Pleasant affect (strong)	Many pleasant emotions.
Neuroticism	Negative affect (mild)	Many unpleasant emotions.
Openness to Experience	Pleasant affect – only a moderate relationship.	Inspired, interested & determined.
Agreeableness	Varied results – slight link to negative affect.	Less hostile & irrational.
Conscientiousness	Pleasant affect – possibly due to attentiveness	Attentive, determined, alert & active

pleasant affect), specifically, to emotions related with reducing hostility and irritability (Letzring & Adamcik, 2015). A summary of the findings are illustrated in the table above.

In summary, extraversion tends to lead to a strong affective reactions when exposed to positive events (Larsen & Ketelaar, 1991). The influence of other personality traits on predicting affective experiences however, are inconsistent. Therefore it is proposed that extraversion will predict pleasant affect in entrepreneurs:

*Hypothesis 12a: Extraversion will be positively related to the experience of high activation pleasant affect in entrepreneurs*

*Hypothesis 12b: Extraversion will be positively related to the experience of low activation pleasant affect in entrepreneurs*

#### 2.4.2 Sleep quality

The link between sleep quality and self-regulation reviewed earlier (Wagner et al., 2014), is expected to also influence affective experiences during a work day. Sleep has been found to influence affective experiences at work in a range of contexts (Sonnentag et al., 2008; Wagner et al., 2014). For example sleep has been associated with anger and fatigue (Lavidor,

Weller, & Babkoff, 2003; Pilcher & Ott, 1998), as well as a lack of emotion control and impaired decision-making (Miller & Cohen, 2001). Furthermore, Wagner et al (2014) reported a link between insomnia and emotion regulation, cognition and performance. Generally therefore, sleep is associated with pleasant affective experiences and the reverse for poor sleep.

Therefore in accordance with the notion that sleep restores self-regulation abilities (Baumeister et al., 2000), and thereto affective regulation resources, the present author proposes that low sleep quality will relate to subsequent unpleasant affect, and good sleep quality will be associated with subsequent pleasant affect:

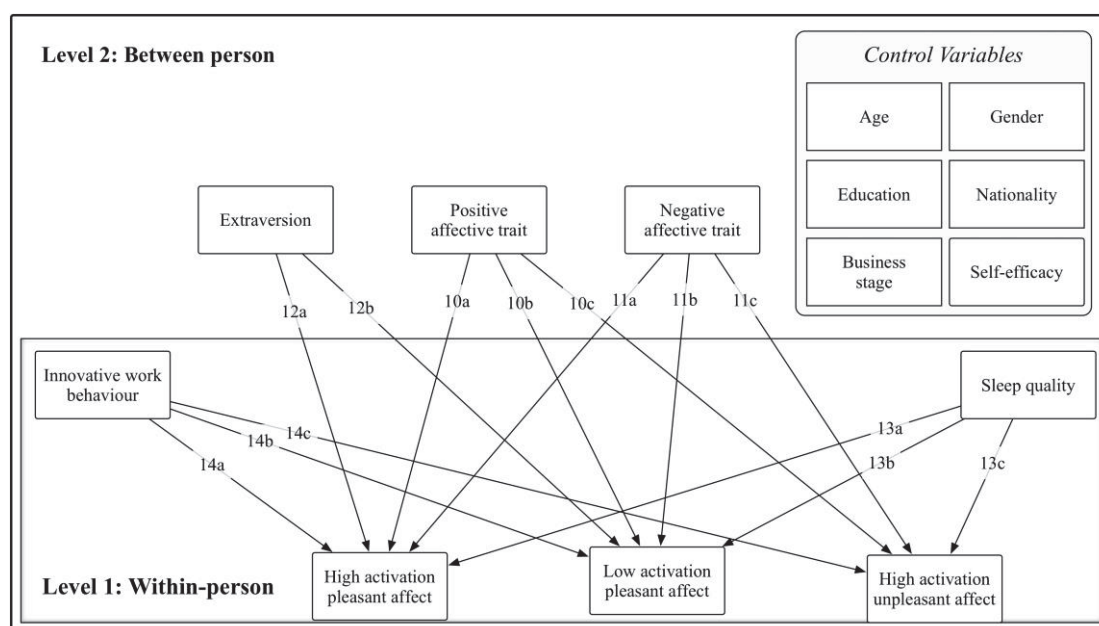
*Hypothesis 13a: Sleep quality will be positively related to high activation pleasant affect*

*Hypothesis 13b: Sleep quality will be positively related to low activation pleasant affect*

*Hypothesis 13c: Sleep quality will be negatively related to high activation unpleasant affect*

A visual representation of these hypotheses is reflected in Figure 7. The conceptual model differentiates between within-person constructs in the lower box, and between person constructs towards the top of the diagram.

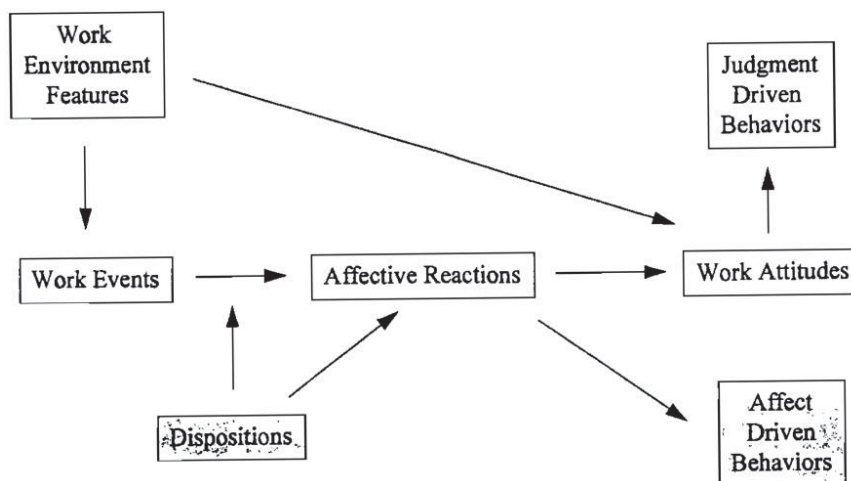
**Figure 7: Conceptual model of direct and indirect effects on mood**



### 2.4.3 Innovative work behaviour

Weiss and Cropanzano's (1996) famous article which is celebrated for helping to bring emotion-organisational behaviour research back to the academic forefront (Ashkanasy & Humphrey, 2011), postulated a paradigm for understanding affect in organisations. Affective Events Theory (AET) views work events "as proximal causes of affective reactions" (Weiss & Cropanzano, 1996, p. 1). Thereby work events arouse affective states, which in turn impact upon outcomes in the workplace. A range of studies have gone-on to find that affect does indeed relate to emotional reactions at work (c.f. C. D. Fisher, 2000; Grandey, Tam, & Brauburger, 2002). Figure 8 illustrates the affective events theory model, from Weiss and Cropanzano (1996, p. 12)

**Figure 8: Affective events theory: Macro structure (Weiss & Cropanzano, 1996, p. 12).**



Challenging the AET however, in this section it is argued that the traditional AET diagram should be conceptualised cyclically, where by affect not only acts as a predictor to, but also an outcome of, behaviour. In other words, as affect influences innovative work behaviour, so innovative work behaviour influences affect.

Feedback theory in the social psychology literature (Baumeister et al., 2007) extends the classical understanding of emotion and behaviours (that fear leads to "flight" etc.), and instead adopts the view that behaviour arises as a quest for affective outcomes. For example Baumeister, Vohs, DeWall, and Zhang (2007) explain that the link between unhappiness and alcoholism does not specifically suggest that unhappiness makes the taste of alcohol more appealing, but that the consumption of alcohol is an attempt to experience improved emotions. The authors conclude "in that view, emotion is the result, not the cause, of behaviour." Contrary to the event-emotion-behaviour causal chain suggested in the model of

AET, this perspective puts emotions as the antecedent and the consequence of behaviour, due to emotion-regulation and mood repair (Cialdini et al., 1987) strategies.

In entrepreneurship a handful of studies illustrate the role of affect as an outcome of behaviour. For example Gielnik and colleagues found that despite the vast literature positing that passion induces effort, there is evidence to conclude that effort dives passion (Gielnik, Spitzmuller, Schmitt, Klemann, & Frese, 2015b). Further, Kato and Wiklund's (2011) examination of 2000 blog entries demonstrated that entrepreneurs seek out affirmative feedback, as a method of inducing positive affect. Therefore there is grounds to argue that the engagement in certain behaviours in entrepreneurship may arise as a means of influencing affect.

Psychological research has demonstrated that the engagement in "creative tasks" is associated with reducing depressive moods across a range of contexts (Bell & Robbins, 2007; Gussak, 2006). Furthermore, Bujacz reported that the autonomy gained from engagement in creative tasks, leads to a slight increase in pleasant affect. Yet further research has provided inconsistent results on the role of creative engagement on affect, leading Akbari Chermahini and Hommel (2011) to suggest that an affective outcome depends on the specific type of creative task undertaken. Their research conducted in accordance with their "reciprocity hypothesis", provided evidence to suggest that convergent thinking leads to unpleasant affective experiences, while, divergent thinking relates to pleasant affective experiences.

Gurteen however, said that "creativity is about divergent thinking. Innovation is about convergent thinking" (1998, p. 6). Therefore consistent with reciprocity hypothesis (Akbari Chermahini & Hommel, 2011), and the predominant thinking mechanism utilised in innovative activities (Gurteen, 1998), there is evidence to expect innovative work behaviour to trigger unpleasant affective outcomes.

Furthermore, researchers have identified that individuals in a state of "flow" experience high mental load and stress, indicated via reduced heart rate variability and cortisol readings (Keller, Bless, Blomann, & Kleinböhl, 2011). Flow is deemed relatively relevant to a discussion on innovative work behaviour, as it is defined as a state of "energetic focus, and creative concentration" (Csikszentmihalyi, 1975, p. 3), which is related to creativity and invention (Csikszentmihalyi, 1997). The link between engagement in a challenging task and unpleasant affective outcomes, is consistent with Tugade and Fredrickson's (2004) finding

that when a task is highly challenging, individuals will experience anxiety and frustration (high activation unpleasant affect).

Therefore, as innovative work behaviour is predominantly a convergent thinking task (Gurteen, 1998) it is likely to lead to unpleasant affective experiences (Akbari Chermahini & Hommel, 2011), and secondly as innovative work behaviour is challenging by definition, unpleasant affective reactions are expected via task challenge also. Thus leading to the following hypothesis:

*Hypothesis 14a: Engaging in innovative work behaviour in the morning will relate negatively to high activation pleasant affect in the afternoon*

*Hypothesis 14b: Engaging in innovative work behaviour in the morning will relate negatively to low activation pleasant affect in the afternoon*

*Hypothesis 14c: Engaging in innovative work behaviour in the morning will relate positively to high activation unpleasant affect in the afternoon*

# 3 METHODOLOGY

The following chapter details the methodological approach taken to explore the hypotheses of this research. Participants were recruited from a business accelerator and this author's professional network. Respondents completed a baseline survey (stage A), then responded to two survey notifications via a specialised smartphone experience sampling application each day, over the course of two weeks (stage B). In stage B of data collection, participants answered questions related to their current affective state, and recent innovative work behaviour, twice per day. Sleep quality was reported each morning. Data collection steps are illustrated in Figure 9, p. 39).

Data was thus collected via 21 surveys per participant, resulting in 3360 data points nested within 160 entrepreneurs. Affect was measured twice per day, innovative work behaviour was measured in the morning and afternoon<sup>5</sup>, and sleep quality was measured in the morning, for two weeks. Three strategies within a multilevel modelling framework were used to test the hypotheses. Ethical considerations and provisions were made before undertaking this research, and post-positivist philosophical assumptions are presumed in research design.

This chapter is organised as follows: firstly the philosophical assumptions underpinning this research are explored, and ethical considerations are presented (p. 37). Choice in an experience sampling methodology is presented next, followed by an exploration of the data collection procedures utilised (p. 38). The sample is then described before the measures and scales are presented and discussed (p. 44). Finally the analytical strategy is outlined, and the approach to data analysis for each of the hypotheses is detailed (p. 52). The chapter concludes with a summary (p. 58).

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<sup>5</sup> Innovative work behaviour was only measured in the afternoon with the first 39 participants in the sample. More details on data collection is presented on page 43.



### 3.1 Philosophical Assumptions

*There is at least one philosophical problem in which all thinking men are interested: the problem of understanding the world in which we live; and thus ourselves (who are part of that world) and our knowledge of it. All science is cosmology, I believe, and for me the interest of philosophy, no less than of science, lies solely in its bold attempt to add to our knowledge of the world, and to the theory of our knowledge of the world*

– (Popper, 1963, pp. 183–4)

This research accepts the assumptions of post-positivism. The following section briefly identifies the key ways in which the ideas presented in this thesis are a product of this philosophical standpoint taken.

The choice in research design and analytical strategy presented next is riddled with ontological and epistemological assumptions. The use of the very survey design suggests that this author asserts the existence of reality and assumes it measurable (Suppe, 1977). Further it implies the author subscribes in some manner to the concepts of objectivity and generalizability. Yet in divergence with a purely positivist perspective, the present author empathises with critical realism – in viewing knowledge as imperfect. Thus a given theory cannot be “proven”, but can only fail to be rejected (falsificationism) (Popper, 1959). Therefore at best, as discussed by Popper, “every scientific statement must remain tentative forever” (1959, p. 280). Maintaining this standpoint, the discussion and literature review chapters reflect this author’s attempt to integrate empirical data with theory, in order to derive meaning as defined in post-positivism. This is also illustrated through the attempts to eliminate alternative explanations (through the use of control variables), and to explain contradictory results where appropriate.

As the philosophical assumptions made underpin both the perspectives on the nature of reality, and of knowledge, ideas and information transmitted in this work need to be considered in light of these perspectives taken

### 3.2 Ethical considerations

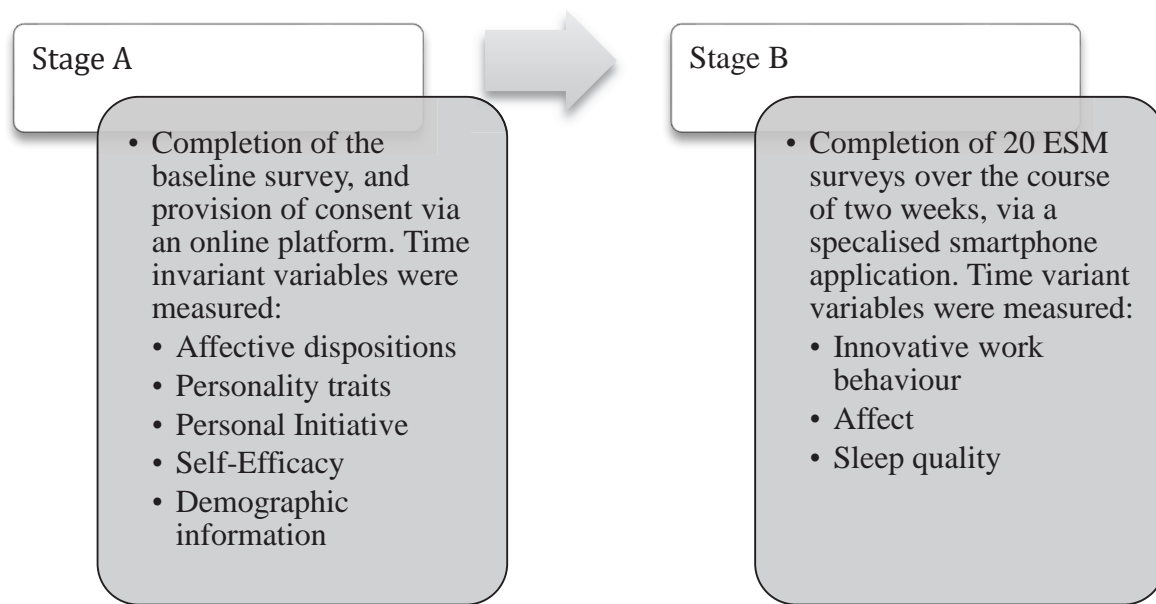
Ethical considerations were made in the design, implementation and now in the data storage related to this research. The University’s Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants was explored at depth, and the research was designed in accordance with good ethical practice. The researcher has made all attempts to

minimise risk of harm to participants in the study, while maintaining privacy and confidentiality. The research also adhered to informed and voluntary consent. Participants received detailed instructions about the research prior to enrolment, and were able to withdraw from the study at any point. No potential conflicts of interest were identified. The research has been peer reviewed and consequently judged to be low risk. A low risk notification, meeting the requirements and guidelines of a low risk notification was filed, and received by the Massey University Human Ethics Committee March 12 2015.

### 3.3 Procedure

Data was collected in two stages (A and B), as illustrated in Figure 9. Stage A collected time invariant data via a baseline survey; Stage B gathered data twice per day for ten working days via ESM surveys – resulting in a total of 21 surveys per subject. This section provides further detail on these data collection methods, and rationale behind the study design.

In stage A of data collection, consent was obtained, and time invariant variables: dispositions and demographic information, were measured via an online platform. At the completion of the baseline survey (stage A) participants were provided with a unique username and password for downloading, installing and signing-into a smartphone application with which stage B data could be collected. A unique identifier was embedded into all surveys in order to match data to a single participant for later data analysis. Instructions for installing and utilising the application were presented at the completion of the baseline survey, and a visual guide on using the software was provided to participants on the website of this research: [innovativeme.info](http://innovativeme.info). The ESM smartphone application (MetricWire) with which stage B data was collected, pushed notifications to respondents, collected data in real time, and was optimised for easy and fast survey completion from a mobile. ESM surveys are discussed in more detail the following subsection.

**Figure 9: Data collection stages**

In stage B of data collection, morning and afternoon surveys were used to measure affect, innovative work behaviour, and previous nights' sleep quality. Subjects completed their participation in stage B of data collection when 20 surveys were collected conforming to the criteria discussed next. Surveys needed to be completed within three hours of survey notification, and two surveys were required within the same day for a total of ten working days, for inclusion in the data set. Ten working days constitutes two weeks, which has been suggested by Reis and Wheeler (1991) as a good indication of individuals' routine lives. Furthermore ten working days is a common duration for modern ESM studies in top tier management journals (Kammeyer-Mueller, Simon, & Judge, 2016). With permission, respondents were contacted if three or more days had passed without participation in stage B of the study.

In accordance with the work schedules indicated by a random section of ten respondents prior to participation in the ESM surveys, notifications were triggered around the hours of 11am and 4pm, although this varied slightly from day to day to allow for variability. Completion of surveys in response to notifications is defined as signal-based ESM, which differs from event based ESM where participants complete surveys around the occurrence of particular events of interest. A time based sampling method was selected over an event-based design, due to its suitability at capturing on-going behaviours and affect (cf. Shiffman, Stone, & Hufford, 2008). Earlier work has suggested that ESM surveys be designed for completion in under two

minutes and returned within three hours of signalling (Foo, Uy, & Baron, 2009; Judge & Ilies, 2004; Uy, Foo, & Ilies, 2015). The research design conformed to these standards.

The adoption of the specialised ESM mobile application for data collection used in stage B of the research, was not without its limitations. Only entrepreneurs who had a smart phone, Internet (Wi-Fi or 3G/4G), and relatively recent versions of Android (Google) or iOS (Apple) operating systems were able to partake in the study. As these two operating systems constitute an estimated 97 per cent of the smart phone market share (IDT, 2015) however, this was not expected to be a significant issue. Five entrepreneurs upon completing the baseline survey (stage A) however, communicated smartphone incompatibility issues with the application, and thus were unable to partake in stage B. Further, ten respondents who had begun stage B, experienced a loss, robbery or failure of their smartphones. In these cases, with the participants' permission, this researcher either called or emailed the respondents during the normal notification period, twice per day until the remainder of the surveys in stage B were completed. The comparison of data collected via the application with that which was collected via a personal email or phone-call with t-test analyses revealed no significant difference in responses.

### 3.3.1 Experience sampling methodology

The following subsection discusses the rationale for an experience sampling methodology (ESM), in conjunction with pertinent strengths and weaknesses of ESM for this research.

The hypotheses presented in the previous chapter call for an ecologically valid methodology that captures variance in affect and innovative work behaviour from an entrepreneurial sample. ESM captures the unfolding of events through within-person assessments at different points in time (Uy, Foo, & Aguinis, 2009). This is a relatively new methodology in entrepreneurship research, only sparingly utilised over the past ten years (Uy et al., 2009). An experience sampling method excels in measuring dynamic person-centred interactions in real world settings (Ohly, Sonnentag, Niessen, & Zapf, 2010).

When used with specialised smartphone devices, ESM collects data in real time in an entrepreneur's natural work environment. A review article of experience sampling methodology by Uy et al. (2009), promotes the use of electronic based ESM data collection measures moving forward. The research encapsulated in this thesis follow these authors' examples (Foo et al., 2009; Uy, Foo, & Song, 2013; Uy & Foo, 2010). The research also heeds to recommendations for using electronic and mobile-based data collection methods for

an entrepreneurial sample (Uy et al., 2009), who rarely spend the entirety of the day at their desks.

Experience sampling methodologies in psychological and organisational research tend to collect data two-to-five times a day, at random intervals, over a two to three week period with around 100-200 respondents (Chandler, 2012; Fisher, 2000; Weiss, Nicholas, & Daus, 1999), although this can vary considerably depending on the topic of analysis and the individuals under study. In the case of entrepreneurial studies, smaller datasets and fewer sampling periods are commonly utilised (Uy et al., 2009), possibly due to the difficulties in both identifying, and then recruiting and maintaining entrepreneurs in such a demanding type of study. Considering the very nature of entrepreneurship, where individuals function autonomously and are personally liable for the “bottom-line,” such reluctances for research engagement during productive hours are not unexpected.

### 3.3.2 Translation

All surveys were provided in English and Spanish – the native languages of the majority of respondents. The survey, website, and all correspondence was translated into Spanish by this author - an advanced second-language Spanish speaker, and reviewed by a native Spanish speaker. Where possible, measures which had received previous translation were utilised. Bilingual speakers then reviewed and blind-back translated the survey items in accordance with the protocols suggested by Brislin (1970). Finally a professional translator was utilised to evaluate the translation of the surveys, for final assurance of accuracy. The translator suggested alternative terms for the translation of five affective items (despondent, jittery, afraid, distressed, and scared). These items underwent additional blind double-back translation and discussion with four bilingual native Spanish speakers from a Chilean context, to ascertain the most appropriate translation for the sample. The importance of providing translations for the specific regions, particularly with Spanish due to the considerable variability in language use across regions, is a point that other researcher have highlighted previously (cf. Renau, Oberst, Gosling, Rusiñol, & Chamarro, 2013).

### 3.4 Sample

One hundred and sixty entrepreneurs completed the study. This consisted of 39 entrepreneurs from this author’s professional network, and 121 entrepreneurs from a seed accelerator. No statistically significant difference in the responses was detected between the groups.

Similar data collection protocols were followed for each sampling group, with one exception. In addition to the measurement of innovative work behaviour via the afternoon surveys, the final 121 entrepreneurs had innovative work behaviour measures included in their morning surveys also. The rationale underpinning the addition of innovative work behaviour measures in the morning surveys, was based on the need for greater statistical power to explore the interaction effects between innovative work behaviour and affect. Therefore, the larger ( $n = 160$ ) sample size is used in all analyses relating to afternoon innovative work behaviour, and the smaller ( $n = 121$ ) sample is employed for analyses relating to within day innovative work behaviour and level two interactions. Sample sizes are noted throughout the results section to reflect when the entire sample of 160 participants, or partial sample of 121 participants, are utilised.

### 3.4.1 Recruitment

Participants were recruited via three approaches. Firstly, thirty-one participants were recruited from this author's wider professional network. Entrepreneurs received an email detailing the research and inviting their participation. Secondly, eight participants were recruited from an entrepreneurship course at Universidad de Concepción, in Chile. These participants were provided with a profile of their own results as an exchange for their involvement. Finally 121 participants were recruited via Start-up Chile, a publically funded and operated seed accelerator<sup>6</sup> controlled through Chile's economic development agency. The programme provides CLP 20,000,000 (NZD 43,200) equity-free capital, mentorship, office-space and a temporary visa to entrepreneurs from around the world, under the condition that those accepted engage with the local community during their tenure in the programme. Engagement with the community is monitored through "return value agenda" (RVA) points, which each team is required to accumulate throughout their 24 weeks in the programme. Dissemination of knowledge and experience through writing, talks and mentorship endows RVA points. Start-up Chile supported this research by awarding 250 RVA points to entrepreneurs who participated in the study.

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<sup>6</sup> A seed accelerator is defined by Cohen and Hochberg as "a fixed-term, cohort-based program, including mentorship and educational components, that culminates in a public pitch event or demo-day" (2014, p. 4).

Entrepreneurs were provided with a detailed information sheet and had the opportunity to ask further questions. Respondents from the seed accelerator were expected to complete both the baseline survey and ESM surveys to benefit fully from the RVA points offered for their involvement.

#### 3.4.1.1 Participation rates

Information about the study was sent to 2500 entrepreneurs, 366 acknowledged receipt of the invitation and indicated interest in participating. Finally, two hundred entrepreneurs downloaded the smartphone application and began the ESM surveys. Forty were removed due to incomplete participation of the 20 ESM surveys, indicating an ESM participation rate of 80 per cent. A high ESM participation rate of 80 per cent was primarily achieved through real-time collection of data, which allowed same-day follow-up for any missed surveys. The ESM sample size of 160 participants is above average for an entrepreneurial sample (Uy et al., 2009). Therefore there are no apparent issues with the participation rate nor sample size in this study.

Scherbaum and Ferreter (2008), in their exploration of statistical power in multilevel models, illustrate that a minimum sample size of 30 level-two groups is acceptable in the literature. While others advocate for the use of samples bigger than 50, to avoid biased standard error estimates (Maas & Hox, 2005). In entrepreneurial studies, as few as 27 participants for an experience sampling methodology has been suggested as adequate (Uy et al., 2009), and around 50 appear to be the norm (e.g., Foo et al., 2009; Gielnik, Spitzmuller, Schmitt, Klemann, & Frese, 2014). Further, a review of multilevel studies published in the *Journal of Applied Psychology* over a ten year range revealed that the median sample size in multilevel models was 51 level two groups (Mathieu, Aguinis, Culpepper, & Chen, 2012). Therefore a sample size of 121 level-two groups (entrepreneurs) is significantly above average, and is among the largest ESM studies in entrepreneurship that this author identified (eg., Uy et al., 2015; Uy & Foo, 2010).

#### 3.4.2 Profile

The sample consisted predominantly of male (77%) entrepreneurs with an average age of 28 years old, in high-growth early stage start-ups. The majority were university educated in technical degrees, with more than five years entrepreneurial experience. The sample consisted of respondents born in Chile (39.5%) or else-where in South America (21.9%), Europe (13.9%), Australia/New Zealand (9.4%), Asia (8.1%) and North America (7.6%).



Twenty five per cent of respondents had no previous entrepreneurial experience, sixty-one per cent had founded one to two previous start-ups, while the rest (13.5%) had experience starting three or more previous enterprises. The sample was highly educated, thirty-five per cent reported achievement of postgraduate qualifications.

Half the respondents' firms were in the concept (18.8%) or working prototype in development (35%) stage. The other half had a functional product with users (25%), or were in scaling stage (21.3%).

### 3.5 Measures

*“...no matter how profound the theoretical formulations, how sophisticated the design, and how elegant the analytic techniques are, they cannot compensate for poor measures...appropriate measurement with valid and reliable measures is the foundation of scientific research and progress in science”*

– Slavec (2012, p. 48).

The quote above is found in a review article on the state of entrepreneurship research. It highlights the current impetus in entrepreneurship research in particular, for rigorous and validated measures. In light of this, particular attention has been paid to the measures utilised in the design of this study. A thorough review of current measures was undertaken, and for sake of space is included as a table in the appendices. The final measures utilised in the study are presented throughout the following section. The Cronbach Alpha coefficient for each scale is presented, contrasted against similar research, and discussed. An overview of the measures used in Stage A and Stage B can be found in Appendix 3 (p. 110) and Appendix 4 (p. 113).

#### 3.5.1 Measures: Stage A

##### 3.5.1.1 Affective dispositions

In the baseline survey (stage A), respondents were asked to what extent they generally experience ten positive and ten unpleasant emotions on a sliding scale, coded 0 = very slightly or not at all, to 10 = extremely, from the Positive and Negative Affect Schedule (PANAS) by Watson and Clark (1994). This measure had been previously translated for use in Latin America, and has been found to have good validity and reliability across a range of



cultural contexts (eg. de Carvalho et al., 2013). The Cronbach's alpha coefficient for the positive affect scale ( $\alpha = 0.89$ ), and negative affect scale ( $\alpha = 0.83$ ) are closely comparable to scores reported by Watson, Clark and Tellegen (1988) of 0.88 and 0.87 respectively.

### 3.5.1.2 Personality traits (TIPI – 10 item measure)

Personality traits, openness to experience ( $\alpha = 0.55$ ), and extraversion ( $\alpha = 0.74$ ), were measured with Gosling, Rentfrow and Swann's Ten-Item Personality Inventory (TIPI) (2003). Respondents were asked "To what extent do you agree or disagree with these statements? I see myself as..." 1. extroverted, enthusiastic... 6. reserved, quiet (reverse scored)... (0 = disagree strongly, to 10 = agree strongly). As Cronbach's alpha is an index for internal consistency measuring the mean correlation between items, it tends to produce higher scores for scales with multiple items. Therefore as TIPI has just two items per scale, it commonly reports lower Cronbach Alpha estimates – the creators of the measure however, argue that this is not to suggest that the measure lacks reliability. Test-retest correlations have provided suitable validation of reliability in previous studies (cf. Gosling et al., 2003). The Cronbach's alpha scores in the study broadly conform to those reported in earlier studies. Gosling et al., reported score of 0.45 for openness to experience, and 0.68 for extraversion,

### 3.5.1.3 Personal Initiative

Personal initiative was measured with Frese, Fay, Hilburger, Leng and Tag's (1997) seven item scale, which includes statements such as "whenever something goes wrong, I search for a solution immediately" and "I take initiative immediately even when others don't". Respondents were asked to indicate the way in which they behave this way in general (0 never, 10 a great deal). Although this measure of personal initiative is widely used, the conceptualization of personal initiative as a disposition may be viewed, by some, as controversial. For example Parker and Collins (2010) suggest that the level of initiative taken may be context dependent. Following the example of Glaser et al. (2015) this research recognises the potential weakness of the over-emphasis on personal initiative as a proxy for behaviour, and thus explores the influence of personal initiative exclusively within the context of measured innovative work behaviour. The Cronbach's alpha for this scale was 0.87, a score closely matched to earlier work, such as Wang and Li (2015) ( $\alpha = 0.91$ ) and Glaser et al., (2015) ( $\alpha = 0.86$ ).

#### 3.5.1.4 Control Variables

Adjustments were made in the analysis of the data to control for some possible confounding factors. Taking such steps reduces the potential for epiphenomenal or spurious associations, and therefore provides a clearer perspective for the attribution of variables to a given outcome (A. F. Hayes, 2013). When affective dispositions were not measured as independent variables in hypothesis testing, they were included in regressions as control variables in accordance with recent research (cf. Madrid Cabezas et al., 2014). A description of further control variables and alpha coefficients where appropriate are presented in the following section.

##### *3.5.1.4.1 Demographic variables*

Respondent demographic variables age, gender, nationality, and highest level of education information were controlled for in the analyses, as well as the contextual variable - stage of the entrepreneurs' firms. Demographic variables were dummy coded for multilevel modelling (Singer, 1998), with the exception of age which was treated as a continuous variable. Demographic variables were measured with one item each in the baseline survey (stage A). Interestingly, some articles exploring the link between occupational behaviour and affect have not reported the use of demographic control variables (e.g., To, Fisher, & Ashkanasy, 2015). However, as there are known links between both topics of this study (affect and behaviour) and many demographic factors, for example affective experiences and gender, or nationality and affect (which are discussed next), the inclusion of demographic control variables is viewed as an important strategy to reduce the potential for confounding effects and accurate interpretations in this study. Further justification for the utilisation of gender, nationality and education as control variables in this research are presented next.

##### *3.5.1.4.1.1 Gender*

Men and women have been found to differ in the level of intensity and expressiveness of affect (Brody & Smith-Lovin, 1995). Although a gender difference is not always detected (eg., Timmermans, Mechelen, & Nezlek, 2009), moods tend to be experienced in a more intense manner in some conditions for women – such as interpersonal situations due to the propensity for emotion contagion (being influenced by the moods and emotions of others) (Doherty, 1997). Robinson and Clore (2002) also reviewed stereotypes (some with theoretical support, others not) and concluded that women are more emotional than men in the literature. Further, women are more impacted upon by social interaction, and have affective trait differences to their male counterparts, such that women experience higher levels of empathy

(Robinson & Clore, 2002). For further discussion on gender in this context see Croson and Gneezy (2009).

#### *3.5.1.4.1.2 Culture*

Culture and nationality has also been linked with the experience of emotions (Eid & Diener, 2001) and affective behaviour (Briley, Morris, & Simonson, 2000). Although most people across cultures experience a similar ratio of positive to negative affect, the intensity and frequency can differ (Oishi, Diener, Napa Scollon, & Biswas-Diener, 2004). For example, in a cross-cultural study by Eid and Diener (2001), Chinese participants reported experiencing fewer and less intense affective states than other cultures. Perceptions towards particular moods and emotions can also vary cultures. Additional results of the study showed that Chinese participants highly value the constructive nature of unpleasant emotions, in contrast to “Americans” who preference high activation pleasant affect.

Further, the interpretation of others’ emotions is treated differently across cultures. Individualistic cultures view the emotion expressions of others as predominantly removed from themselves, whereas collectivist cultures are more likely to expect their relationship or behaviour with the person to be responsible for causing their peer’s affective experience (Elfenbein & Ambady, 2003; Mesquita, 2001). One could expect therefore that work environment which involves frequent interactions with others will cause a greater frequency and intensity of affective experience for individuals from collectivist cultures, both positively and negatively.

Additionally, research has suggested that the interpretation of outputs, such as creative outputs, are thought to be impacted by cultural background (De Dreu, 2010). Therefore two managers from different cultures reviewing identical innovative ideas may have a significantly different affective response and assessment from the same material. The importance of controlling for nationality also extends to the exploration of personality according to Nezlek, Schütz, Schröder-Abé, and Smith’s (2011). A study by Grandey, Fisk and Steiner (2005) showed that in regards to the relationship between nationality and workplace behaviour, French compared to U.S. customer service employees differed in their level of emotion surface acting – suggesting that the level of expressed emotion can differ also.

These articles illustrate the potential influence of culture on the reporting and experience of affect and innovative work behaviour. Although nationality tends to be used as a proxy for

sub-cultural grouping in most of the articles mentioned above (e.g., Eid & Diener, 2001), the terms are not synonymous. As culture is a difficult variable to measure briefly however, it is commonplace for distinctions between nations to be used to represent cultural groupings as illustrated in these articles. In accordance with this literature, and for purposes of brevity, nationality was measured in the research through a one-item measure. Nationality has been included in all analyses as a control variable in an attempt to hold constant the potential influence of culture in light of the aforementioned literature.

#### *3.5.1.4.1.3 Education*

Unger, Rauch, Frese and Rosenbusch (2011) conducted an exploration on three decades of human capital-success studies in entrepreneurship. The results of their meta-analytical review suggested that human capital is a particularly pertinent independent variable across a range of success factors for young firms. Therefore given the age of the firms in the two samples, it is logical to control for potential confounding factors brought about from human capital. These include education, age, and self-efficacy. Further rationale for the inclusion of self-efficacy as a control variable is discussed next.

#### *3.5.1.4.2 Self-efficacy*

There is an established link between self-efficacy and constructs closely related to innovative work behaviour, such as proactive work behaviour (Parker et al., 2006), providing a rationale for its inclusion as a control variable. Self-efficacy is the perception of one's capability to perform certain tasks, and thus is closely related with what tasks individuals choose to undertake. For example, a high level of self-efficacy has been positively related to the selection of challenging tasks and goals (Locke & Latham, 2002), and persistence (Lent, Brown, & Larkin, 1987) – both important factors for innovative behaviour. Not surprisingly therefore, self-efficacy (in some cases specifically, role breadth self-efficacy, self-efficacy related to proactive, interpersonal activities), has been linked with opportunity recognition and idea realisation (Axtell et al., 2000; Parker et al., 2006; Parker, 1998) as well as personal initiative (Frese, Garst, & Fay, 2007).

The past ten years has seen the rise in self-efficacy measures specifically for use within an entrepreneurial context. Originally created to determine the differences between entrepreneurs and non-entrepreneurs or help predict the likelihood of start-up, it has since been more rapidly adopted as a control or interacting variable in a range of entrepreneurial

studies (Cf. Abbott, 2010; Angie, Connelly, Waples, & Kligyte, 2011; Arora et al., 2013; Barakat, Boddington, & Vyakarnam, 2014; Foo et al., 2015).

The entrepreneurship literature is still somewhat divided between the use of entrepreneurial self-efficacy and general self-efficacy measures however. In their recent review article Frese and Gielnik (2014) argue in favour of more specific constructs of self-efficacy, for their greater predictive powers when compared with general self-efficacy. Yet this perspective has not gained complete acceptance. For example, Uy, Foo and Ilies (2015) when exploring effort intensity of entrepreneurs in early stage start-ups, opted for a general self-efficacy scale explaining that “venture creation requires capabilities in various fields” (p. 7). Markman, Baron and Balkin (2005) adopted a similar argument for using the general self-efficacy scale developed by Chen et al., (2001).

Yet researchers in favour of the use of context specific self-efficacy measures are numerous. There is additional argument to delineate even further to the specific dimensions related to the topic under study (cf., C. C. Chen, Greene, & Crick, 1998; Drnovsek, Slavec, & Cardon, 2014; McGee, Peterson, Mueller, & Sequeira, 2009). Therefore the inclusion of an innovation related self-efficacy dimension was explored in a pilot study with 10 participants. The data suggested minimal variation across the entrepreneurial group, illustrating the minimal added value of the dimension. Further, as the baseline survey (and self-efficacy questions specifically) received criticism from respondents for its length, the innovation dimension of self-efficacy was excluded in the main study in preference for an entrepreneurial self-efficacy measure.

The most widely utilised entrepreneurial self-efficacy measure in entrepreneurship, and even in affect-entrepreneurship research (Eg. Arora et al., 2013), is a four item measure developed by Zhao et al. (2005). Respondents were asked their level of confidence at successfully identifying new business opportunities, creating new products, thinking creatively, and commercializing an idea or developing something new (1 = no confidence, to 5 = complete confidence). The scale has good inter-item correlation, and a comparable alpha coefficient ( $\alpha = 0.75$ ) to what was reported by the creators of the measure ( $\alpha = 0.78$ ).

#### *3.5.1.4.3 Mood*

When exploring the role of unpleasant mood on goal orientation To *et al.*, (2015) held pleasant mood constant in all analyses. This trend has been noted in a range of affect-behaviour research (cf. George & Zhou, 2007; Madrid Cabezas et al., 2014). Therefore

consistent with this precedent, where appropriate, negative (positive) mood has been used as a covariate when exploring main effects of positive (negative) mood.

### 3.5.2 Measures: Stage B

#### 3.5.2.1 State affect

Warr et al.'s (2014) Multi Affect Indicator was utilised to measure the three affective states pertaining to this research: High activated unpleasant affect (anxious, tense), high activated pleasant affect (enthusiastic, inspired), and low activated pleasant affect (relaxed, calm). The dimension of low activated unpleasant affect was not relevant to the hypotheses and was therefore not measured to allow for a quick response time needed of an ESM. The utilisation of just one or two items for each construct is typical in ESM designs (cf. Fisher & To, 2012), due to the repetitive nature of the surveys and the short-time frame in which respondents are reporting (To, Fisher, et al., 2015). Twice per day participants were instructed via the ESM application to "indicate the extent which [they] feel this way right now... on a five point Likert scale 1 representing very slightly or not at all, and 5 extremely. The Cronbach's alpha coefficients indicate good reliability for these scales, with scores of 0.88, 0.76, 0.81 for high activation pleasant affect, low activation pleasant affect and high activation unpleasant affect respectively. This compares well with the alpha coefficients reported by Warr et al., (2014) which range between 0.79-0.90, 0.75-0.86, and 0.80-0.87 across six studies.

Numerous issues have been identified in the self-reporting of affective experiences (Dasborough, Sinclair, Russell-Bennett, & Tombs, 2008). Self-reports, although common place, are used at the cost of greater objectivity and comparability. The main failing of self-reports in the context of affective research is that it assumes individuals are able of appraising their emotions accurately in the moment of the experience (Dasborough et al., 2008; Frijda, 1986). This concerns concepts such as "emotional awareness" (2008, p. 201) as well as memory bias. The second being that it relies on the individual's unfiltered sharing of their affective experience. Issues surrounding the concealment of appraised affect may be of particular cause for concern within contexts where affect is stigmatised (Warr et al., 2014), such as in the military forces. It is not expected that an entrepreneurial context would stigmatise affect at levels greater than general workplaces, but it still possible that some responses will be the result of filtering and may demonstrate some social desirability bias.

Notwithstanding, the use of self-reported measures of behaviour and affect is not without its merits. Particularly in organisational research, the mere use of self-reported ESM surveys



conducted via smartphones is hailed as “innovative” (Rodrigues, Kaiseler, & Queirós, 2015, p. 204), as it reduces memory recall issues and smartphone applications tend to be mobile-optimized, making prompt responses possible in daily-life research. Furthermore, the ability to collect multiple data across the same day, and then for multiple days in the week, exceed the typical cross-sectional single survey approaches.

### 3.5.2.2 Innovative behaviour

Self-reported innovative work behaviour was utilised in this research. The rationale behind this, briefly discussed next, is that the collection of data via objective sources, or external reports, is controversial in an entrepreneurial, and short-time unit of analysis, context. Objective business performance measures, although useful for analysing gross outputs such as sales (Warr et al., 2014), are difficult to use within short time frames. Further, subjectively measuring increments in innovation within a timescale of half a day is difficult to assess. “External ratings” as opposed to self-reports was not a viable for this research either, as entrepreneurs generally do not have supervisors, and may (Harper, 2008) work alone. Additionally, the likelihood of colleagues or supervisors accurately reporting innovative work behaviour is questionable (See Janssen, 2000, p. 292 for a discussion) thus self-reported innovative work behaviour is considered a satisfactory measure in workplace research.

Innovative work behaviour was measured with five of De Jong and Den Hartog’s (2010) ten item innovative work behaviour measure. Only five items were used to allow for rapid responses required of a high-frequency experience sampling methodology (Fisher & To, 2012) as discussed previously. Every second item of De Jong and Den Hartog’s measure was utilising – which results in each dimension of innovative work behaviour being included in the research. Questions were slightly adapted to reflect short time periods. Items included: “during the past few hours, to what extent have you... Searched out new working methods, techniques or instruments.... Generated original solutions for problems... Wondered how things can be improved... Attempted to convince people to support an innovative idea.... Put effort in the development of new things” (1 = none, to 5 = a great deal). Cronbach’s alpha coefficients between the five items were high 0.88, this was slightly higher than the scores reported by De Jong and Den Hartog (2010) which ranged from 0.60 to 0.74 across studies. Interestingly although the authors sought to divide the dimensions of innovative work behaviour between activities relating to idea generation, idea exploration, idea championing and idea implementation, they (among others (cf. Janssen, 2000)) found that the scale’s performance was superior when combined as opposed to divided between the aforementioned

dimensions (De Jong & Den Hartog, 2010). Therefore during this research there has been no attempt to divide the items by dimensions, for reasons of measure reliability.

### 3.5.2.3 Sleep quality

The Pittsburgh Sleep Diary (Monk et al., 1994) item “how do you evaluate this night’s sleep?” (1 = very poor, to 5 = excellent) was utilised to measure sleep quality each morning via the ESM application. This measure of sleep quality has demonstrated validity as a single item and been utilised widely (Hahn, Binnewies, Sonnentag, & Mojza, 2011; Park & Sprung, 2015; Sonnentag et al., 2008).

## 3.6 Analytical strategy

The following section explores the analytical strategy undertaken in this research, but firstly justification for the use of a multilevel modelling strategy is explored. Next the use of controversial multilevel formulas are discussed, before the specific strategies adopted in the testing of hypotheses is detailed and potential common method bias issues acknowledged.

### 3.6.1 Multilevel analysis

*Given the hierarchical structure of the ESM data with multiple responses nested within individuals, multilevel modelling is an appropriate statistical methodology to analyse the data – (Uy et al., 2009, p. 45)*

Data gathered via experience sampling methodologies have a fundamental multilevel structure, as demonstrated in a plethora of previous studies (Ohly et al., 2010). This is due to the inherent nested structure of the data; observations (level one) are nested within individuals (level two). Failure to adopt a nested structure with such a dataset would lead to the inflation of level two findings - increasing the likelihood of type I errors, and level one relationships would show less significance, increasing the probably of type II errors (Bliese, 2002). To manage these hierarchical dependencies, a multilevel structure is applied to all analyses. Such an analytical approach is also known, among other terms<sup>7</sup>, as Bayesian hierarchical modeling, hierarchical linear modeling, and linear mixed modeling (Garson,

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<sup>7</sup> Further terms include “random effects models or random coefficient models, covariance components models or variance components models, and mixed models



2013a). For the purposes of consistency, the term *multilevel modelling* is utilised throughout the remainder of this thesis.

To distinguish between level one and level two effects, level one variables are group-mean centred, and where appropriate, level two variables are grand-mean centred. Multilevel modelling software HLM 7 (Raudenbush et al., 2011) was used in all analyses, and cross-referenced against regressions undertaken in MLwiN (Rasbash, Charlton, Browne, Healy, & Cameron, 2005). To allow for the time dependency of the construct under analysis, dependent variables have been lagged, and a time index variable employed, where appropriate.

The first phase in the analytical strategy is to check that multilevel modelling is justified. A chi-square test ( $\chi^2$ ) suggests that the variance in the respective slopes and intercept with innovative work behaviour as the outcome variable, differ significantly from zero ( $\chi^2(112) = 1038.19, p < .001$ ), indicating that a multilevel model is both necessary and appropriate with this sample (Woltman, Feldstain, Mackay, & Rocchi, 2012). Exploring the role of multilevel variance further, the intraclass correlation coefficient (ICC), is calculated<sup>8</sup> from the variance components in the null model (See Raudenbush & Bryk, 2002, p. 71 for equations).

The ratio of between-person variance to total variance of residuals with innovative work behaviour as an outcome variable suggests an ICC of .37, indicating that 37% of the variance in innovative work behaviour is at the person level, while 63% is at the daily level (Garson, 2013b; Woltman et al., 2012). Affect as an outcome variable renders an ICC value of .62 to .70, suggesting that the majority of the variance in affective experiences change between people – also providing justification for the exploration of traits as explanatory variables in these analyses. Similarly afternoon innovative work behaviour as the outcome variable in study two, produces an ICC of .33, indicating that 67% of the variability in afternoon innovative work behaviour in this sample is within subject. The only set of analyses that produces small ICC values is affective change as an outcome variable. The ICC value (.01 to .09) in these analyses is caused by the calculation method of the dependent variable, discussed later in this section. For these few null models that produced a small ICC value, a single level regression was undertaken, and similar results identified.

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<sup>8</sup>  $ICC = \frac{\tau}{\tau + \sigma^2}$  (Woltman et al., 2012, p. 63). Where  $\sigma^2$  refers to level-1 within group variance component, and  $\tau$  is the level-2 between group or intercept variance component.

Therefore there is support for a multilevel modelling strategy in this research. Firstly there is significant support from a theoretical perspective, as multilevel modelling is recognised as best practice with nested data produced from an ESM (Ohly et al., 2010; Uy et al., 2009). Further, there is statistical support for the use of multilevel modelling in most null models utilised in this research (Woltman et al., 2012).

A bottom-up approach to multilevel model fitting is applied in the analyses, following recommendations from prominent articles (Bliese, 2002; Hox, 2010; Raudenbush & Bryk, 2002). That is to say that a null model<sup>9</sup> is implemented first, and additional parameters are added sequentially. The sequential strategy employed in the analyses follows the specific recommendations outlined by Woltman et al., (2012).

### 3.6.1.1 Hypothesis testing

The research questions presented in this thesis call on a diverse range of outcome variables, and a variety of statistical techniques. Therefore a detailed description of the analytical strategies utilised to satisfy the statistical challenges presented from each of the hypotheses are presented next. Table numbers, hypothesis numbers, and relevant page numbers are cited to assist the reader with possible cross-referencing.

#### *3.6.1.1.1 Direct effects on half-daily innovative work behaviour*

Direct and indirect effects on twice-daily innovative work behaviour as an outcome variable is explored first. As a preliminary step, a null model is entered comprising of lower-level explanatory variables with fixed slopes - controlling for age, gender, nationality, level of education, self-efficacy, trait pleasant affect and trait negative affect. Next direct effects of level one variables (which relate to Hypothesis 1a, Hypothesis 1b, and Hypothesis 1c) and level two variables (Hypothesis 2a and Hypothesis 2b) are entered, and random versus fixed effects explored.

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<sup>9</sup> Hereto “null model” refers to a baseline model, which contains control variables and no other predictors (Garson, 2013a). The Null model will act as a comparison model for computing pseudo R<sup>2</sup> values, and examining model fit.

### 3.6.1.1.2 Interaction effects on half-daily innovative work behaviour

Between-level interaction effects are analysed next, pertaining to Hypothesis 5a and 5b. Firstly a product term is created through the multiplication of sleep quality with high activation pleasant affect, and low activation pleasant affect respectively, and entered into the multilevel model as covariates – illustrated on Table 2 (p. 64).

Regarding the analysis of cross-level interaction effects (pertaining to Hypothesis 3a to Hypothesis 4b) the presence of significant slope variation, a prerequisite condition for the analysis, is tested first (Hox, 2010; Snijders & Bosker, 1999). Testing what effects should be permitted to vary across Level 2 units, reduces the likelihood of needlessly overcomplicating a model (LaHuis & Ferguson, 2009). Evaluation of the significance of the variance components were conducted in a sequential manner using three tests outlined next (Garson, 2013c; Hox, 2010; Raudenbush & Bryk, 2002).

Firstly, a chi-square test, which overlaps with Wald test estimates, indicates that high activation pleasant affect does not have significant slope variation ( $\chi^2(2) = 4.10, p 0.126$ ). The variance components of low activation pleasant affect ( $\chi^2(2) = 11.79, p 0.003$ ) and to a lesser extent, high activation unpleasant affect ( $\chi^2(2) = 6.94, p 0.03$ ) however, are significant. Next, a one tailed (Snijders & Bosker, 1999) likelihood-ratio test indicated that low activation pleasant affect (deviance $\Delta(2) = 11.79, p = 0.005$ ), high activation unpleasant affect (deviance $\Delta(2) = 6.95, p = 0.01$ ) and high activation pleasant affect (deviance $\Delta(2) = 4.11, p >0.01$ ) had significant slope variation. Yet an adjusted mixture distribution calculation suggested by Snijders and Bosker (2012, p. 99), found similar results to the chi-square test, with insignificant variance in the high activation pleasant affect slope (mixture  $p = 0.19$ ), while low activation pleasant affect (mixture  $p$ -value = 0.005) and high activation unpleasant affect (mixture  $p$ -value = 0.05) variance respectively had statistical significance. Notably the variance component for the low activation pleasant affect slope is significant across all three tests, despite a clear lack of significance in the regression slope – a condition explained by Hox (2010). The chi-square test and adjusted test, both indicate a lack of significance in the level 2 units of the high activation pleasant affect slope. Therefore, the results of these tests indicate that cross-level interaction effects are highly unlikely, although arguably not impossible (LaHuis & Ferguson, 2009). Notwithstanding, to decisively rule-out the presence of cross-level moderating effects, interaction effects were tested in a further step.

The final step in analysing cross-level interactions is to entering level two moderating variables as covariates to the corresponding level-one intercepts. Within-level and cross-level interactions are presented in the final model, of Table 2 (p. 64).

#### *3.6.1.1.3 Curvilinear relationship between trait affect and innovative work behaviour*

To explore the presence of a curvilinear relationship between positive dispositional affect and entrepreneurs' innovative work behaviour (Hypothesis 6a), a quadratic function is required. A variable acting as the quadratic function is calculated by squaring trait affect. After creating a null model, the quadratic function is added to the multilevel model with trait affect, in order to test for a nonlinear effect. Results of this analysis with a corresponding null model are presented in Table 3 (p. 65).

#### *3.6.1.1.4 Direct effects on half-daily affect*

Next the direct effects on affect as an outcome variable are explored by following similar steps taken in Table 2. With high activation pleasant affect, low activation pleasant affect (Table 4, p. 70) and high activation unpleasant affect (Table 5, p. 71) respectively analysed as dependent variables. A null model is calculated first before trait affect, extraversion and sleep quality are entered as predictor variables. Outcomes of these analyses are used to explore direct effects hypothesised via b Hypothesis 10a to Hypothesis 13c.

#### *3.6.1.1.5 Direct effects on changes in affect*

The direct effects on changes in affect as an outcome variable are analysed next. Hypothesis 14a to Hypothesis 14c are concerned with the influence of innovative work behaviour on the experience of all three categories of affect explored in this research. That is to say, the role that innovative work behaviour has on subsequent affect. Therefore morning affect is held constant, to determine the influence that engagement in innovative work behaviour has on afternoon affective experiences. The outcome variable is created by calculating the change in each category of affect, between morning and evening, before innovative work behaviour is entered into the final multilevel model. The outcome of these analyses are presented in Table 6 (p. 72).

#### *3.6.1.1.6 Affective shift effects on innovative work behaviour*

Hypothesis 7a to Hypothesis 9a are concerned with the influence that changes in affect (an affective shift) have on afternoon innovative work behaviour. The sample measuring innovative work behaviour in the afternoon is different than the sample used throughout the

rest of this research, and therefore is referred to as Study Two (Table 7, p. 74). Bledow, Rosing and Frese (2013, p. 438) detail three different techniques for hypotheses related to an affective shift, including “raw score change, residual change and higher-order interactions”. Three techniques were therefore undertaken to analyse the influence of change in affect on innovative work behaviour. First a set of raw score models were calculated by taking afternoon ( $T_2$ ) scores and misusing morning ( $T_1$ ) values. The second, and arguably more rigorous approach, is to use residual change scores.  $T_1$  and  $T_2$  scores are entered as covariates into the multilevel model (Bledow et al., 2013). Therefore the effect of treating the two variables as covariates holds  $T_1$  scores constant, and thus illustrates the difference in affect. Raw score and residual change scores were broadly comparable as expected. As residual change effects were slightly more conservative however, residual change scores were used to test Hypothesis 8a to Hypothesis 9a. Further, higher order relations were explored through interaction effects pertaining to Hypothesis 7a and 7b. The calculation of interaction terms followed the same protocol discussed earlier. Residual change values and interactions are presented in one table (Table 8, p. 75).

### 3.6.1.1.7 $R^2$ calculation rationale

$R^2$  values are included in all analyses, although it should be noted that multilevel models lack the ability to formulate a value comparable to general OLS regression’s  $R^2$  value (Hox, 2010). Therefore the  $R^2$  values presented in the following chapter cannot be directly compared to standard OLS regression (Holden, Kelley, & Agarwal, 2008), but rather are a “proportional reduction in residual variance between two nested models” (Holden et al., 2008, p. 798). Further, there is controversy in how to calculate  $R^2$  in multilevel modelling. Most commonly Kreft and De Leeuw (1998) and Singer’s (1998) formula<sup>10</sup> is used (eg., Woltman et al., 2012). Although Snidjers and Bosker have argued for the use of their more

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<sup>10</sup>  $R^2$  is calculated according to the method proposed by Kreft and De Leeuw and Singer (1998; 1998), and interpreted as follows:  $R_1^2 = \frac{\sigma^2_{null} - \sigma^2_{rest}}{\sigma^2_{null}}$ ;  $R_2^2 = \frac{\tau_{null} - \tau_{rest}}{\tau_{null}}$ . Where  $R_1^2$  refers to level-1  $R^2$ ,  $R_2^2$  refers to level-2  $R^2$ ;  $\sigma^2$  is level-1 within group variance component (error);  $\tau$  is the level-2 between group or intercept variance component; *null* refers to the null model; *rest* refers to the restricted model

rigorous formulas<sup>11</sup> (1999, pp. 102–103). All four sets of  $R^2$  values were calculated for every model. The results revealed that the adoption of Snijders and Bosker's formulas lead to more conservative estimates of  $R^2$ . Therefore their Snijders and Bosker protocol for calculating  $R^2$  is used in the analyses, and where significant difference between the  $R^2$  estimates exist, the alternative value from the utilisation of Kreft and De Leeuw (1998) and Singer's (1998) formula is noted below the respective tables.

### 3.6.2 Common method bias

Common method bias, a form of measurement error, refers to the variance created by way of data measurement technique (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Williams & McGonagle, 2015). Avoiding common method variance is not entirely possible in much workplace research however. As discussed earlier, in the case of innovative work behaviour and affect, there are few ex-ante remedies, as self-reports and ESMs are currently the most reliable form of data collection presently available for much social-science research. As a ex-post remedy suggested by Podsakoff et al., (2003), Harman's single factor test was conducted through confirmatory factor analysis (CFA). As a second step in addressing common method issues, traits and dispositions are included as control variables in the analyses– to reduce potential collinearity effects. Common method bias therefore is acknowledged as a potential source of multicollinearity in this research – like most research in the social sciences (Podsakoff et al., 2003). Common method issues are considered by some to be “overstated” (Warr et al., 2014, p. 359) however. Although common method issues may bias conclusions in this research therefore, social science scholars tend to agree (Lance, Dawson, Birkelbach, & Hoffman, 2010) that it is not deemed significant enough to necessarily abrogate the results, yet should be acknowledged in rigorous post-positivist research.

## 3.7 Conclusion

In conclusion, data was collected in two stages (A and B). Stage A collected time invariant data via a baseline survey. Time invariant data included a 20 item affective dispositions

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<sup>11</sup>  $R^2$  is also calculated according to the method proposed by Snijders and Bosker (1999), and interpreted as follows:  $R_1^2 = 1 - \frac{\sigma_{rest}^2 + \tau_{rest}}{\sigma_{null}^2 + \tau_{null}}$ ;  $R_2^2 = 1 - \frac{(\sigma_{rest}^2/n) + \tau_{rest}}{(\sigma_{null}^2/n) + \tau_{null}}$ . Where  $n$  represents group size, and the annotations presented earlier apply (Snijders & Bosker, 1999).

PANAS measure (Watson & Clark, 1994), a 10 item personality trait measure (2003), a seven item personal initiative measure (1997), a four item entrepreneurial self-efficacy measure (2005), and one item demographic variables. Later a case for the use of gender, nationality, business stage, age, and entrepreneurial self-efficacy as control variables was presented. Stage B gathered data twice per day via a specialised smartphone experience sampling application, for ten working days – resulting in a total of 21 surveys per subject. Affective items, high activation pleasant affect, low activation pleasant affect and high activation unpleasant affect, were each measured with three respective items from the Multi Affect Indicator (2014). Five items were used to measure innovative work behaviour (2010). A single item from the Pittsburgh Sleep Diary was utilised to measure sleep quality each morning (Monk et al., 1994). All surveys were translated into Spanish, and provided in either language, depending on the participants' nationality, and followed blind double-back translation protocols (Brislin, 1970). A similar data collection procedure was used across both studies, with the principle difference being that study one measured innovative work behaviour in both the morning and afternoon, while study two measured innovative work behaviour only in the afternoon, and was comprised of a larger sample. Study one consisted of 121 entrepreneurs and 2400 data points, while study two comprised of 160 entrepreneurs, 3200 affective data points, and 1600 innovative work behaviour data points. Potential common method bias issues were acknowledged, a post-positivist framework identified, ethical considerations presented, and the nested nature of the data discussed. Finally the analytical strategy was justified, and details on the sequential approach to multilevel modelling using HLM 7 software was presented. Clarification was given on the strategy used for calculating  $R^2$  values, the intraclass correlation coefficients, within-level and cross-level interactions, the quadratic functions, and the affective shifts, to allow for replicability of the results in future work.



# 4 RESULTS

The following chapter presents the results of the research. The chapter begins with an exploration of correlates of focal variables from study one in Table 1, before moving on to present five tables illustrating 18 multilevel models. The first table explores direct and interactive effects on innovative work behaviour, followed by the testing of a curvilinear relationship between trait affect and innovative work behaviour. Estimates of affective change effects on innovative work behaviour are examined before the direct effects on three affective categories are illustrated. Next, the correlates of study two are presented in Table 7, and the affective shift hypotheses tested in three multilevel models. Interactive effects are plotted where appropriate throughout the chapter, and important statistics are summarised in-text for the hypotheses. The chapter concludes with an overview of the results. Appendix 5 includes a summary of the findings.

## 4.1 Partial sample

As detailed on page 42, innovative work behaviour was measured via the morning and afternoon surveys with the final 121 participants, whereas it was otherwise measured exclusively in the morning with the first 39 participants. Therefore hypotheses relating to twice-daily innovative work behaviour and cross level interactions exclude the first 39 participants. Statistics of, and hypotheses tested via, the partial sample (121 entrepreneurs), are presented first.

### 4.1.1 Descriptive statistics

Means, standard deviations, reliabilities and between plus within-person correlations are presented in Table 1. Table 1 shows that innovative work behaviour strongly and significantly correlated with high activation pleasant affect at both the within subject and between subject levels. High activation unpleasant affect however, correlated significantly with innovative work behaviour at the within-person, but not the between-person level. Low



activation pleasant affect as expected did not relate significantly with innovative work behaviour, both between and within person. As expected, all time invariant trait variables included in the analyses, with the exception of negative trait affect, had a statistically significant direct correlation with innovative work behaviour when examined without covariates. Higher levels of self-efficacy, personal initiative, openness to experience and positive trait affect were all associated with higher average levels of daily innovative work behaviour at the  $p < 0.001$  level of significance. As a correlation matrix does not account for the multilevel nature of the data, nor the influence of control variables however, the significance of the relationship between the level two variables and innovative work behaviour is inflated when compared to what the multilevel models later demonstrate (Garson, 2013a).

As would be expected, sleep quality had significant (at the  $p < 0.01$  level) correlations with all affective dimensions in the directions anticipated. Further exploration also revealed that entrepreneurs with firms in the scaling or concept stage reported higher average quality of sleep when compared to entrepreneurs with a working prototype in development or a functional product with users.

There were few notable significant relations between affect and demographic variables. Interestingly however, further analysis of the data revealed that Chilean entrepreneurs were slightly more likely to report high activation unpleasant affect throughout the two weeks of monitoring, as were entrepreneurs with undergraduate as opposed to postgraduate education. Yet entrepreneurs with undergraduate education had higher levels of personal initiative. Women were less likely to experience low activation pleasant affect, and had significantly lower self-ratings for self-efficacy when compared to men in the sample.

**Table 1: Means, standard deviations, Chronbach's alphas and between or within-person correlations between focal variables**

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
Day-level												
1. Innovative work behaviour (lagged)	3.31	.62	(.88)	.11**	.05*	.03	.12**					
2. High activation pleasant affect	3.48	.58	.70**	(.88)	-.16**	.34**	.31**					
3. High activation unpleasant affect	2.21	.68	.11	.01	(.81)	-.26**	-.10**					
4. Low activation pleasant affect	3.08	.59	.05	.32**	-.25**	(.76)	.19**					
5. Sleep quality	3.58	.63	.42**	.63**	-.04	.15	–					
Person-level												
6. Positive trait affect	7.34	1.26	.38**	.28**	.12	-.04	.25**	(.89)				
7. Negative trait affect	3.27	1.38	-.18	-.29**	.25**	-.30**	-.28**	.02	(.83)			
8. Openness to Experience	7.53	1.58	.37**	.29**	-.03	.02	.18*	.37**	-.20*	(.55)		
9. Extraversion	6.00	2.11	.23*	.12	-.09	-.09	.11	.38**	-.13	.36**	(.75)	
10. Personal Initiative	7.51	1.29	.47**	.39**	.14	-.11	.38**	.63**	-.09	.42**	.32**	(.88)

Note: Correlations above the diagonal reflect within-subject relationships, constructed by person-centring day level variable around respondents' means. Variables one to five (level 1) were assessed in stage B of data collection – twice-daily ESM surveys (n = 2420). Correlations below the diagonal reflect between-person relationships, where day level variables are aggregate scores. Variables six to 16 (time-invariant) were constructed from stage A of data collection (n = 121). Reliability estimates where appropriate are shown in parentheses ( $\alpha$ ). Correlations are significant at \* $p < 0.05$ ; \*\* $p < 0.01$ .

#### 4.1.1 Dependent variable: Twice-daily innovative work behaviour

##### 4.1.1.1 Direct effects on innovative work behaviour

Hypothesis 1a stated that high activation pleasant affect would be positively correlated with innovative work. Table 2, Model 2, fitted lower-level explanatory variables with fixed slopes, while controlling for age, gender, nationality, level of education, self-efficacy, trait pleasant affect and trait negative affect. Under these conditions, results indicate a significant and direct relationship between innovative work behaviour and high activation pleasant affect ( $b = 0.08$ ,  $t(2174) = 3.69$ ,  $SE = 0.02$ ,  $p < 0.001$ ). Therefore Hypothesis 1a was supported.

Hypothesis 1b proposed that low activation pleasant affect would not be positively correlated with innovative work behaviour. After controlling for some possible confounding effects, Table 2, Model 2 indicates that there was not a significant relationship between low activation pleasant affect and innovative work behaviour ( $b = 0.001$ ,  $t(2174) = 0.092$ ,  $SE = 0.02$ ,  $p = 0.927$ ). Thus Hypothesis 1b was supported.

Hypothesis 1c stated that high activation unpleasant affect would be positively correlated with innovative work behaviour. After controlling for eight possible confounding factors, results in Table 2, Model 2 show that a direct relationship between innovative work behaviour and high activation unpleasant affect is statistically significant ( $b = 0.07$ ,  $t(2174) = 3.31$ ,  $SE = 0.02$ ,  $p < 0.001$ ). Hypothesis 1c was supported.

**Table 2: Multilevel model of direct and interactive effects on innovative work behaviour**

	Model 1	Model 2	Model 3	Model 4
Estimates:	Null model	Variance components	Random coefficients	Interaction
Intercept	3.73 (.18)**	3.68 (.17)**	3.69 (.17)**	3.70 (.17)**
Level-1 variables				
HAPA		.08 (.02)**	.09 (.02)**	.08 (.02)**
LAPA		.0 (.02)	0 (.02)	.01 (.02)
HAUA		.07 (.02)**	.06 (.02)*	.06 (.02)*
Sleep Quality		.09 (.02)**	.08(.019)**	.08 (.02)**
R <sup>2</sup> <sub>Level-1</sub>		.16	.17	.18
Level-2 variables				
Age	0 (.01)	0 (.01)	0 (.01)	0 (.01)
Gender	-.44 (.14)**	-.37 (.13)*	-.37 (.13)*	-.37 (.13)*
Nationality	.16 (.1)	.11 (.1)	.11 (.1)	.11 (.1)
Education	-.22 (.11)*	-.28 (.1)*	-.3 (.1)*	-.29 (.1)*
Self-efficacy	.12 (.04)*	.05 (.05)	.05 (.05)	.05 (.05)
Trait positive affect	.14 (.04)**	.05 (.05)	.04 (.05)	.04 (.05)
Trait negative affect	-.07 (.04)†	-.05 (.04)	-.05 (.04)	-.05 (.04)
Business stage	-.01 (.05)	0 (.05)	.01 (.05)	0 (.05)
Openness		.05 (.04)	.05 (.03)	.05 (.03)
Extraversion		-.01 (.02)	0 (.02)	0 (.02)
Personal initiative		.16 (.05)**	.16 (.05)*	.17 (.05)*
R <sup>2</sup> <sub>Level-2</sub>		-.62	-.57	-.57
Interaction terms				
Trait PA x HAPA				-.01 (.02)
Openness x HAPA				0 (.02)
Extraversion x HAPA				.01 (.01)
Personal initiative x HAPA				0 (.02)
Trait NA x LAPA				-.02 (.02)
Personal initiative x LAPA				-.02 (.02)
Sleep quality x HAPA				-.07 (.02)*
Sleep quality x LAPA				.05 (.02)*
Model comparison	39.98952 (8)**	69.11750 (7)**	17.94486(5)*	13.99039(8)*
Deviance	5642.05	5572.93	5554.98	5540.99

Note: Correlations are significant at †p≤.10; \*p<0.05; \*\*p<0.01. Standard errors are in parentheses. HAPA = high activation pleasant affect, LAPA = low activation pleasant affect, HAUA = high activation pleasant affect. Trait PA = Trait positive affect, Trait NA = Trait negative affect. Time variant affect was subject-mean centred, time invariant variables were grand mean centred where appropriate, n = 2420 observations, nested within 121 subjects. ICC=.37.

**Table 3: Curvilinear regression with trait affect as the independent variable and innovative work behaviour as the dependent variable**

Estimates	Model 1 Null model	Model 2 Curvilinear model
Intercept	3.73 (.18)**	3.58 (.3)**
Age	0 (.01)	0 (.01)
Gender	-.44 (.14)**	-.43 (.14)*
Nationality	.16 (.1)	.16 (.1)
Education	-.22 (.11)*	-.21 (.11)*
Business stage	-.01 (.05)	-.01 (.05)
Self-efficacy	.12 (.04)*	.11 (.04)*
Trait positive affect	.14 (.04)**	-.49 (.26)†
Trait negative affect	-.07 (.04)†	.11 (.15)
Trait positive affect <sup>2</sup>		.05 (.02)*
Trait negative affect <sup>2</sup>		-.03 (.02)
R <sup>2</sup> <sub>Level-2</sub>		.29
Model comparison		5.89 (2)†
Deviance	5642.05	5636.16

Note: Trait positive/negative affect<sup>2</sup> = quadratic function. Correlations are significant at † $p < 0.10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ . Standard errors are in parentheses. Time variant affect was subject-mean centred, time invariant variables were grand mean centred where appropriate,  $n = 2420$  observations, nested within 121 subjects.  $R^2_{\text{Level-2}}$  calculated via the alternate formula (Kreft & De Leeuw, 1998; Singer, 1998) produces a slightly higher value, of .34.  $R^2_{\text{Level-1}}$  is not presented in the table as level-1 direct effects were not being explored in these analyses, and therefore is redundant.  $\text{ICC} = .37$ .

Hypothesis 6a stated that the relationship between entrepreneurs' level of trait positive affect and innovative behaviour would be curvilinear in nature, such that the relationship would be positive, until an inflection point when it then becomes negative. Table 3 modelled a nonlinear effect of trait positive affect, which explored the magnitude of the association between trait positive affect and innovative work behaviour. The output of Model 2 demonstrates that although Model 2 did not fit as poorly as Model 1, the comparison between the models in light of the added parameters is only of marginal improvement ( $\chi^2(2) = 5.89, p = 0.051$ ). Further, the intercept of trait positive affect in Model 2 is negative, and the quadratic function is positive – suggesting that in fact the nature of the relationship is not an inverted U shape as expected. Therefore Hypothesis 6a was rejected.

#### 4.1.1.2 Cross-level interaction effects on innovative work behaviour

As demonstrated in Table 2 in, Model 4, no statistically significant interaction effect was detected between affect and person-level variables towards innovative work behaviour. The variance components of high activation pleasant affect discussed on page 55 may provide some explanation for this. Hypothesis 2a to Hypothesis 4b were rejected due to a lack of statistical significance. More details regarding the parameters of these rejections are briefly presented next.

Hypothesis 2a, which stated that positive trait affect would moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, was not supported ( $b = -0.01$ ,  $t(1928) = -0.44$ ,  $SE = 0.02$ ,  $p 0.662$ ).

Hypothesis 2b proposed that negative trait affect would moderate the strength of the relationship between high activation unpleasant affect and innovative work behaviour, but no significant interaction was found ( $b = -0.02$ ,  $t(118) = -1.15$ ,  $SE = 0.02$ ,  $p 0.254$ ).

Hypothesis 3a which stated that openness to experience would moderate the strength of the relationship between high activation affect and innovative work behaviour was rejected ( $b = 0$ ,  $t(1928) = -0.01$ ,  $SE = 0.02$ ,  $p 0.995$ ).

Hypothesis 3b suggested that extraversion would moderate the strength of the relationship between high activation affect and innovative work behaviour, yet no significant moderating effect was identified ( $b = 0.01$ ,  $t(1928) = 0.73$ ,  $SE = 0.01$ ,  $p 0.466$ ).

Hypothesis 4a stated that personal initiative would moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour. No significant interaction was detected ( $b = 0$ ,  $t(1928) = 0.13$ ,  $SE = 0.02$ ,  $p 0.899$ ).

Hypothesis 4b stated that personal initiative would moderate the strength of the relationship between high activation unpleasant affect and innovative work behaviour. There was no support for this hypothesis ( $b = -0.02$ ,  $t(118) = -1.25$ ,  $SE = 0.02$ ,  $p 0.213$ ). Hypothesis 4b was therefore rejected. In summary, no cross-level interaction effects had statistical significance in this model.

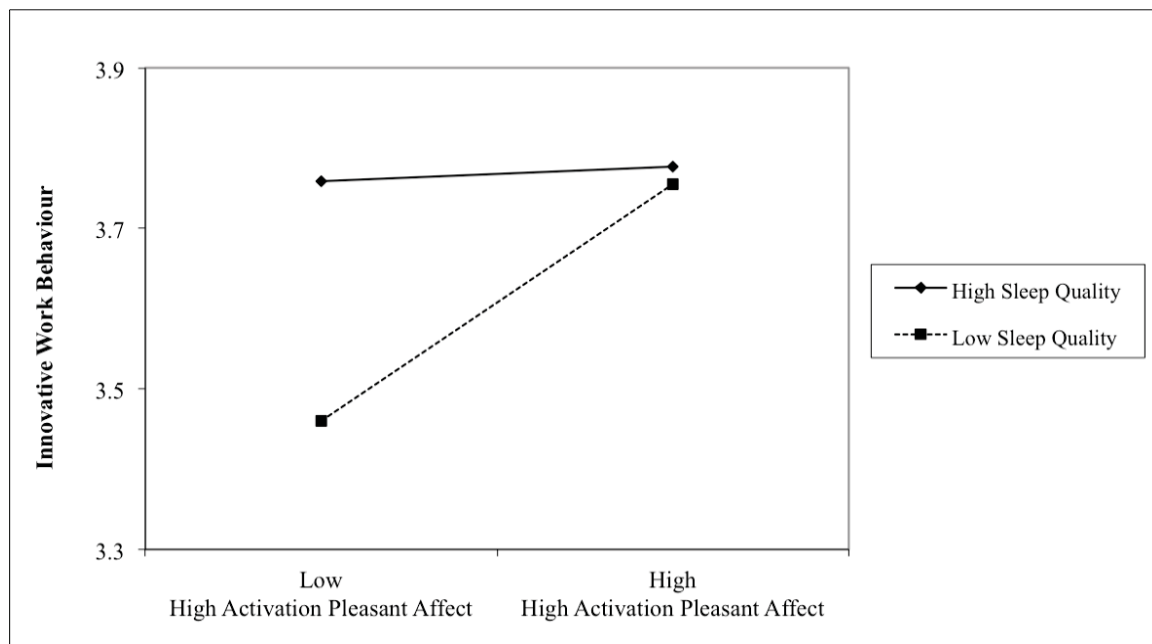
#### 4.1.1.3 Within-level interaction effects on innovative work behaviour

Significant interaction effects at a level-one level unit of analysis however, were identified.

Hypothesis 5a suggested that sleep quality would moderate the relationship between high activation pleasant affect and innovative work behaviour. The results in Table 2, Model 4

indicate a significant moderating relationship ( $b = -0.07$ ,  $t(1928) = -2.94$ ,  $SE = 0.02$ ,  $p 0.003$ ). Therefore Hypothesis 5a was supported. Graphical representation illustrating the nature of the interaction is presented in **Figure 10**. The plot suggests that the association between high activation pleasant affect and innovative work behaviour is weaker when previous night's sleep quality is low, in the condition of low high activation pleasant affect.

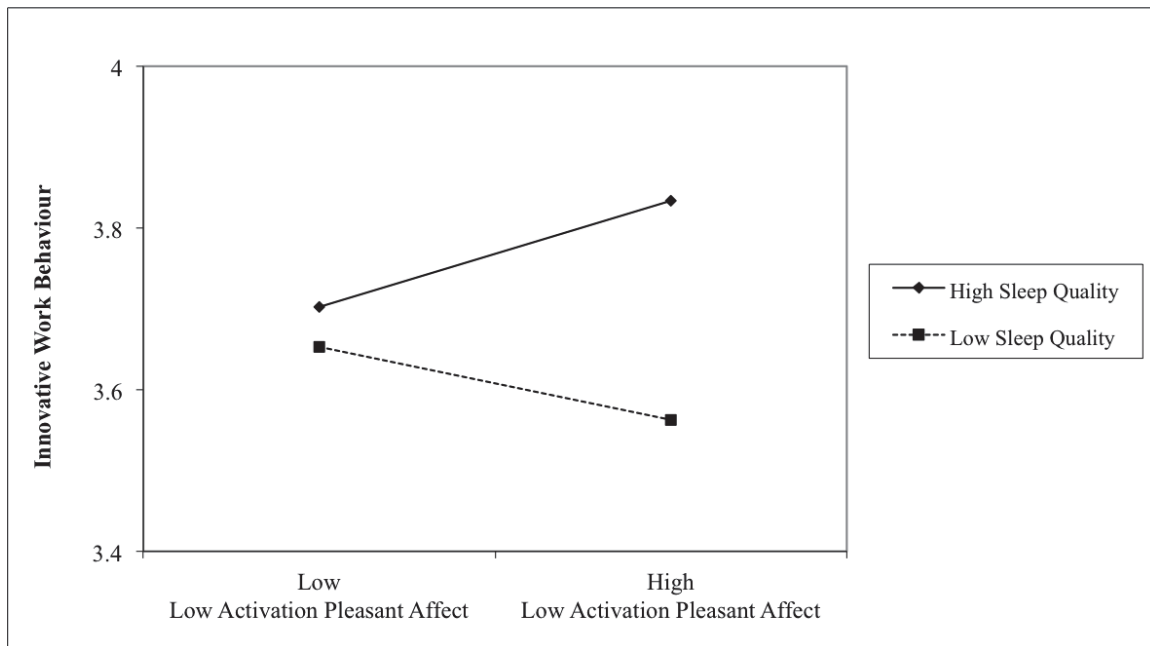
**Figure 10: Interactive effects between high activation pleasant affect and sleep quality on innovative work behaviour**



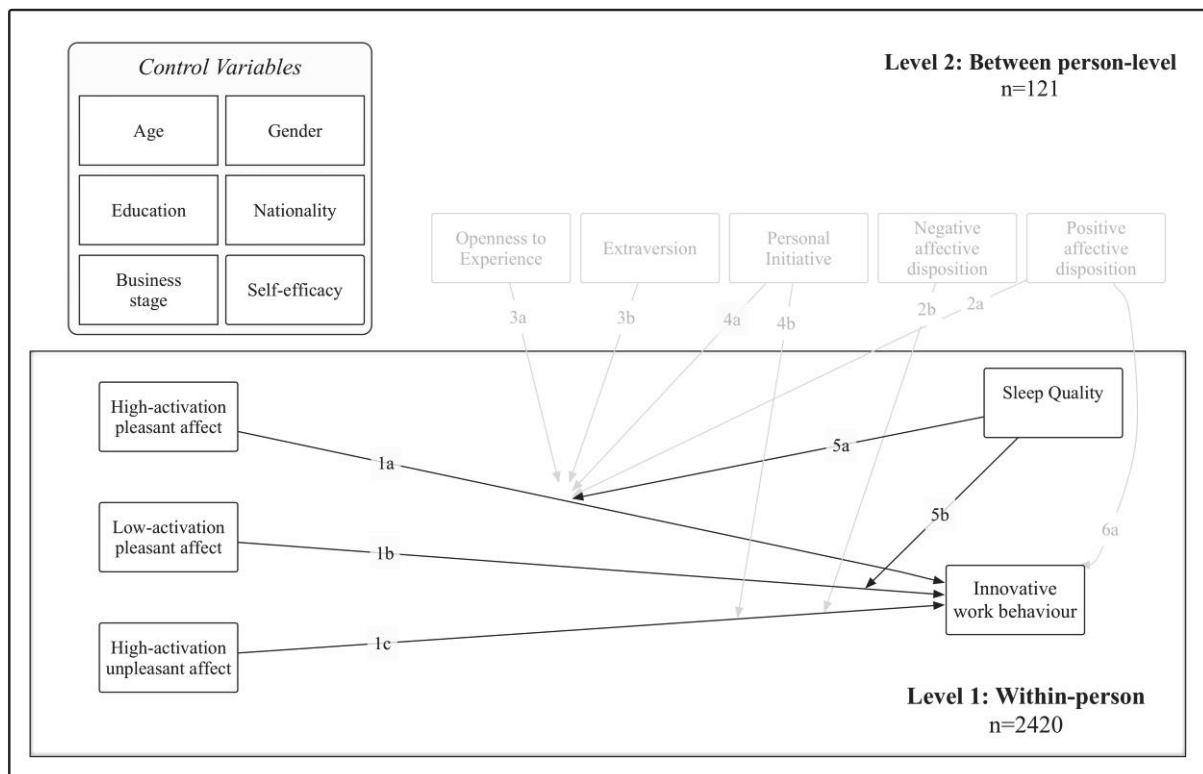
Hypothesis 5b stated that sleep quality would moderate the relationship between low activation pleasant affect and innovative work behaviour. Model 4 (Table 2) indicates that this interaction was statistically significant ( $b = 0.05$ ,  $t(1928) = 2.48$ ,  $SE = 0.02$ ,  $p 0.013$ ). Therefore Hypothesis 5b was supported. The plotted interaction in Figure 11, demonstrates that the association between high levels of low activation pleasant affect and innovative work behaviour is stronger when sleep quality is high.

In summary therefore, none of level-two variables analysed related to innovative work behaviour. All relationships at the level-one hierarchy however, were found to the hypotheses in this section. A conceptual overview of these results are presented in Figure 12.

**Figure 11: Interactive effects between low activation pleasant affect and sleep quality on innovative work behaviour**



**Figure 12: Conceptual overview of direct and indirect effects on twice-daily innovative work behaviour results**





## 4.1.2 Dependent variable: Affect

### 4.1.2.1 Direct effects on pleasant affect

Table 4 illustrates the effects of positive trait affect, negative trait affect, extraversion and sleep quality on high activation pleasant affect (Model 2) and low activation pleasant affect (Model 4). While Table 5 demonstrates their effects on high activation unpleasant affect. Null models appear to the left of each full model.

There was no support for the hypotheses linking extraversion to the affective dimensions measured. Hypothesis 12a, which stated that extraversion would be positively related to high activation pleasant affect ( $b = -0.02$ ,  $t(111) = -0.63$ ,  $SE = 0.02$ ,  $p 0.528$ ), and Hypothesis 12b which stated that extraversion would be positively related to low activation pleasant affect ( $b = -0.03$ ,  $t(111) = -1.03$ ,  $SE = 0.03$ ,  $p 0.306$ ) were therefore rejected.

Regarding the role of positive trait affect, support was found for Hypothesis 10a, which stated that trait positive affect would be positively related to high activation pleasant affect ( $b = 0.1$ ,  $t(111) = 2.25$ ,  $SE = 0.04$ ,  $p 0.027$ ). Hypothesis 10b, which suggested that trait positive affect would be positively related to low activation pleasant affect ( $b = 0.03$ ,  $t(111) = 0.76$ ,  $SE = 0.05$ ,  $p 0.449$ ) and Hypothesis 10c, which suggested that trait positive affect would be negatively related to high activation unpleasant affect ( $b = 0.07$ ,  $t(111) = 1.4$ ,  $SE = 0.05$ ,  $p 0.164$ ) however, were not significant. Therefore Hypothesis 10a was supported, and Hypothesis 10b and Hypothesis 10c were rejected.

**Table 4: Direct effects on high and low activation pleasant affect**

Predictors	Model 1	Model 2	Model 3	Model 4
	High activation pleasant affect	High activation pleasant affect	Low activation pleasant affect	Low activation pleasant affect
Intercept	3.82 (.18)**	3.76 (.17)**	2.74 (.19)**	2.74 (.18)**
Age	.01 (.01)	0 (.01)	-.01 (.01)†	-.02 (.01)†
Gender	-.2 (.14)	-.18 (.13)	.36 (.15)*	.34 (.14)*
Nationality	.08 (.11)	.07 (.1)	-.09 (.11)	-.08 (.1)
Education	-.23 (.11)*	-.18 (.1)†	.08 (.11)	.13 (.11)
Business stage	-.06 (.05)	-.04 (.05)	.02 (.05)	.02 (.05)
Self-efficacy	.13 (.04)*	.08 (.04)†	-.04 (.04)	-.06 (.05)
Positive trait affect		.1 (.04)*		.03 (.05)
Negative trait affect		-.12 (.04)*		-.16 (.04)**
Extraversion		-.02 (.02)		-.03 (.03)
Sleep quality		.26 (.02)**		.17 (.02)**
$R^2_{\text{Level-1}}$		.09		.06
$R^2_{\text{Level-2}}$		.09		.03
Model comparison		237.43 (4)**		102.78 (4)**
Deviance	603.63	5793.21	6281.45	6178.67

Note: Correlations are significant at . † $p \leq .10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ . Standard errors are in parentheses. Time variant affect was subject-mean centred, time invariant variables were grand mean centred where appropriate,  $n = 2420$  observations, nested within 121 subjects.  $R^2_{\text{Level-1}}$  calculated via the alternate formula (Kreft & De Leeuw, 1998; Singer, 1998) produces a higher value, of .14. Low activation pleasant affect ICC=.70; High activation pleasant affect ICC=.71.

#### 4.1.2.2 Direct effects on NA

Trait negative affect was found to relate significantly to high activation pleasant affect ( $b = -0.12$ ,  $t(111) = -3.24$ ,  $SE = 0.04$ ,  $p = 0.002$ ), low activation pleasant affect ( $b = -0.16$ ,  $t(111) = -4.3$ ,  $SE = 0.04$ ,  $p < 0.001$ ) and high activation unpleasant affect ( $b = 0.13$ ,  $t(111) = 3.03$ ,  $SE = 0.04$ ,  $p = 0.003$ ). Therefore Hypothesis 11a, 11b and 11c were supported.

Sleep quality was also found to relate strongly to high activation unpleasant affect ( $b = 0.26$ ,  $t(2298) = 15.33$ ,  $SE = 0.02$ ,  $p < 0.001$ ), low activation pleasant affect ( $b = 0.17$ ,  $t(2298) = 9.32$ ,  $SE = 0.02$ ,  $p < 0.001$ ) and high activation unpleasant affect ( $b = -0.09$ ,  $t(2298) = -4.89$ ,  $SE = 0.02$ ,  $p < 0.001$ ). Therefore Hypothesis 13a, Hypothesis 13b, and Hypothesis 13c were supported.

**Table 5: Direct effects on high activation unpleasant affect**

Predictors	Model 1	Model 2
	High activation unpleasant affect	High activation unpleasant affect
Intercept	2.28 (.21)**	2.24 (.2)**
Age	0 (.01)	.01 (.01)
Gender	-.11 (.16)	-.09 (.16)
Nationality	-.34 (.12)*	-.35 (.12)*
Education	.34 (.13)*	.28 (.12)*
Business stage	0 (.06)	.03 (.06)
Self efficacy	.05 (.05)	.05 (.05)
Trait PA		.07 (.05)
Trait NA		.13 (.04)*
Extraversion		-.04 (.03)
Sleep quality		-.09 (.02)**
$R^2_{\text{Level-1}}$		.05
$R^2_{\text{Level-2}}$		.02
Model comparison		36.76 (4)**
Deviance	5986.32	5949.56

Note: Correlations are significant at . † $p \leq .10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ . Standard errors are in parentheses. Trait PA = Trait positive affect, Trait NA = Trait negative affect. Time variant affect was subject-mean centred, time invariant variables were grand mean centred where appropriate,  $n = 2420$  observations, nested within 121 subjects.  $R^2_{\text{Level-1}}$  calculated via the alternate formula (Kreft & De Leeuw, 1998; Singer, 1998) produces a slightly higher value, of .11. ICC=0.62

#### 4.1.2.3 Effects of innovative work behaviour on affect

Table 6 presents the outcome of analyses exploring the influence of innovative work behaviour on subsequent time variant affect. Outcome variables reflect the difference between morning affect, which is used as a baseline measure, and afternoon affect. Therefore Models 2, 4 and 6 below illustrate the influence of innovative work behaviour in changing subjects' affective state in the afternoon.

Hypothesis 14a stated that engaging in innovative work behaviour in the morning would relate negatively to high activation pleasant affect in the afternoon. Model 2, Table 6, illustrates that net high activation pleasant affect related strongly with innovative work behaviour, at the  $p < 0.001$  level of significance ( $b = -0.2$ ,  $t(1088) = -5.46$ ,  $SE = 0.04$ ). Therefore Hypothesis 14a was supported.

Hypothesis 14b proposed that engaging in innovative work behaviour in the morning would relate negatively to low activation pleasant affect in the afternoon. The results (Model 4,

Table 6) indicate a strong relation at the  $p = 0.057$  level of significance ( $b = -0.08$ ,  $t(1088) = -1.91$ ,  $SE = 0.04$ ). Therefore Hypothesis 14b was supported.

Hypothesis 14c suggested that engaging in innovative work behaviour in the morning would relate positively to high activation unpleasant affect in the afternoon. Model 6, Table 6 shows a strong relationship at the  $p 0.004$  level of significance ( $b = 0.11$ ,  $t(1088) = 2.9$ ,  $SE = 0.04$ ) therefore Hypothesis 14c was also supported.

Therefore all hypotheses predicting the influence of innovative work behaviour on subsequent affective experiences were supported.

**Table 6: Direct effects of innovative work behaviour on change in affect**

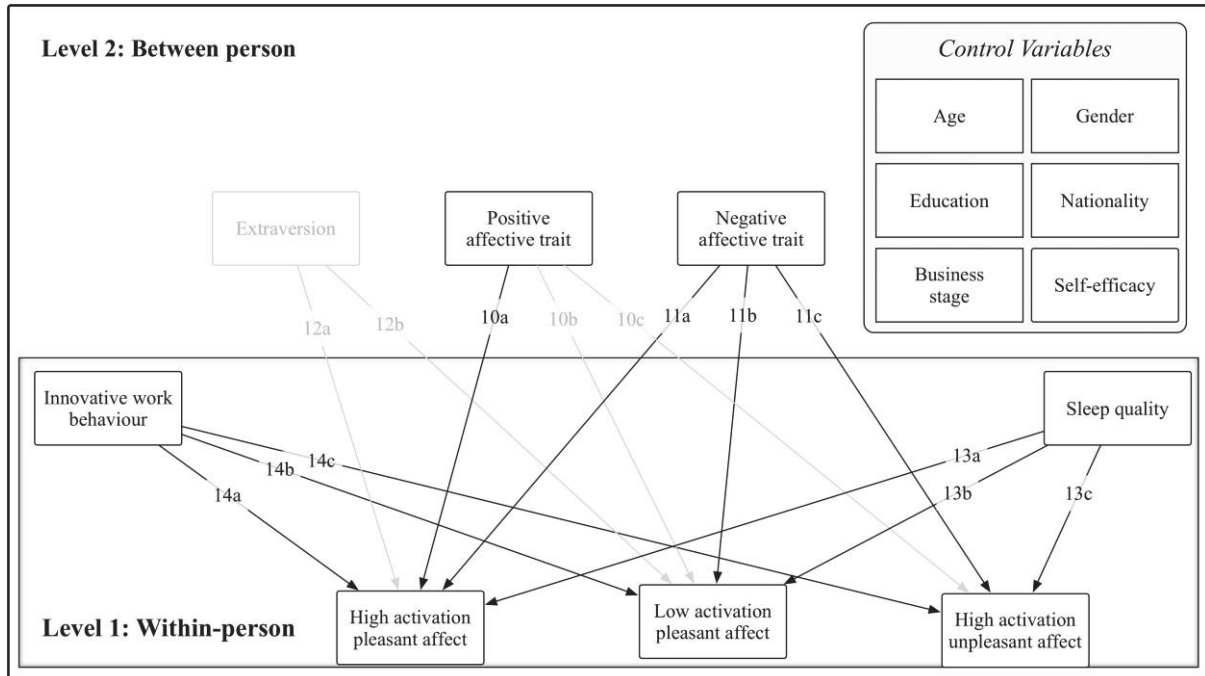
Estimates	High activation PA		Low activation PA		High activation UA	
	Model 1 Null	Model 2 Full	Model 3 Null	Model 4 Full	Model 5 Null	Model 6 Full
Intercept	.34 (.2)†	.16 (.2)	-.19 (.17)	-.2 (.2)	.45 (.17)*	.37 (.18)*
IWB		-.2 (.04)**		-.08 (.04)†		.11 (.04)*
$R^2_{\text{Level-1}}$		.27		.08		.22
Age	0 (.01)	0 (.01)	0 (0)	0 (.01)	-.01 (0)†	-.01 (0)*
Gender	-.07 (.09)	-.08 (.09)	.07 (.08)	.12 (.09)	-.04 (.08)	-.04 (.08)
Nationality	.09 (.08)	.03 (.07)	-.03 (.07)	.07 (.07)	-.11 (.07)†	-.08 (.06)
Education	-.18 (.09)*	-.07 (.07)	-.08 (.07)	-.08 (.07)	0 (.07)	.05 (.06)
Business stage	-.08 (.04)*	-.04 (.03)	.01 (.03)	.04 (.03)	-.03 (.03)	-.01 (.03)
Self efficacy	.06 (.03)†	.06 (.03)*	-.01 (.03)	-.02 (.03)	.01 (.03)	-.01 (.03)
Trait PA	-.05 (.04)	-.05 (.03)†	-.01 (.03)	-.02 (.03)	-.03 (.03)	-.03 (.03)
Trait NA	.04 (.03)	0 (.02)	.01 (.02)	0 (.02)	-.05 (.02)†	-.06 (.02)*
$R^2_{\text{Level-2}}$		.47		0.19		0.36
Comparison		1465 (1)**		1243 (1)**		1408 (1)**
Deviance	4797	3332	4927	3684	4779	3370

Note: IWB = innovative work behaviour. Correlations are significant at . † $p \leq .10$ ; \* $p < 0.05$ ; \*\* $p < 0.01$ . Standard errors are in parentheses. Time variant affect was subject-mean centred, time invariant variables were grand mean centred where appropriate,  $n = 1210$  days (2420 observations; twice per day for ten days), nested within 121 subjects. High activation PA  $R^2_{\text{Level-2}}$  calculated via the alternate formula (Kreft & De Leeuw, 1998; Singer, 1998) produces a higher value, of .73. ICC=0.09; Low activation PA ICC=.01; High activation unpleasant affect ICC=0.2.

Therefore in summary, there was no relationship between extraversion and the affective constructs measured. Further positive trait affect had a significant relation with high activation pleasant affect only. All other hypotheses relating to negative trait affect, sleep

quality and innovative work behaviour related with affect as expected. A conceptual overview of the results presented in this section is illustrated in Figure 13.

**Figure 13: Conceptual overview of affect as a dependent variable results**



## 4.2 Full sample (n = 160)

### 4.2.1 Descriptive statistics

Means, standard deviations, reliabilities and between plus within-person correlations are presented in Table 8. The results show that there is significant between person correlations with morning and afternoon innovative work behaviour, and high activation pleasant affect. At the within-person level there are significant correlations between afternoon innovative work behaviour and morning high and low activation pleasant affect, and afternoon high activation unpleasant affect.

**Table 7: Means, standard deviations, and between or within-person correlations between focal variables**

Estimations	M	SD	1	2	3	4	5	6	7	8
1. Innovative work behaviour T <sub>1</sub>	3.29	0.64	–	.513**	.514**	.384**	.086**	0.04	0.04	.120**
2. Innovative work behaviour T <sub>2</sub>	3.31	0.63	.842**	–	.296**	.528**	.081**	.073**	-0.04	.063*
3. HAPA T <sub>1</sub>	3.35	0.67	.650**	.495**	–	.413**	.187**	.076**	-.131**	-.058*
4. HAPA T <sub>2</sub>	3.36	0.7	.594**	.670**	.739**	–	.173**	.256**	-.117**	-.054*
5. LAPA T <sub>1</sub>	3.18	0.63	0.02	0.06	0.14	.260**	–	.397**	-.315**	-.123**
6. LAPA T <sub>2</sub>	3.14	0.7	0.02	0.11	0.12	.306**	.824**	–	-.179**	-.284**
7. HAUA T <sub>1</sub>	2.19	0.68	0.11	-0.02	-0.11	-0.15	-.355**	-.296**	–	.446**
8. HAUA T <sub>2</sub>	2.26	0.69	0.16	0.06	-0.06	-0.08	-.265**	-.261**	.829**	–

Note: HAPA = high activation pleasant affect; LAPA = low activation pleasant affect; HAUA = high activation unpleasant affect. T<sub>1</sub> = Morning, T<sub>2</sub> = Afternoon. Correlations above the diagonal reflect within-subject relationships, constructed by person-centring day level variable around respondents' means. Variables were assessed through twice-daily ESM surveys (n = 1600). Correlations below the diagonal reflect between-person relationships, where day level variables are aggregate scores. Correlations are significant at . †p≤.10; \*p<0.05; \*\*p<0.01.

## 4.2.2 Dependent variable: Afternoon innovative work behaviour (affective shift)

### 4.2.2.1 Affective change effects on innovative work behaviour

Table 8 models affective change, with innovative work behaviour as an outcome variable. Model 1 is a null model, where only control variables are present – which later models can be compared. Model 2 introduces the role of morning high activation pleasant affect and morning low activation pleasant affect on afternoon innovative work behaviour. In the third step (Model 3), high activation pleasant affect is introduced as a moderating variable between morning high activation unpleasant affect, morning low activation pleasant affect and with afternoon innovative work behaviour respectively.

**Table 8: Estimates of affective change effects on innovative work behaviour**

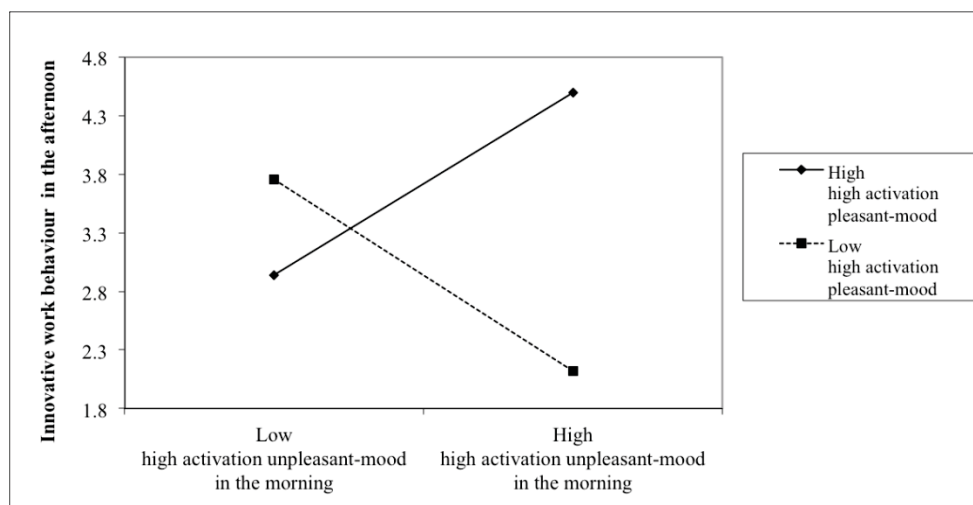
Estimates	Model 1	Model 2	Model 3
Intercept	3.32 (.25)**	3.32 (.25)**	3.33 (.25)**
Gender	-.07 (.12)	-.08 (.12)	-.07 (.12)
Age	0 (.01)	0 (.01)	0 (.01)
Education	-.09 (.11)	-.09 (.11)	-.08 (.11)
Business stage	.05 (.05)	.05 (.05)	.05 (.05)
Nationality	.18 (.1)†	.18 (.1)†	.18 (.1)†
Self-efficacy	.09 (.04)*	.08 (.04)*	.08 (.04)†
Positive affective trait	.09 (.04)*	.09 (.04)*	.09 (.04)*
Negative affective trait	-.07 (.04)†	-.07 (.04)†	-.07 (.04)†
HAPA T <sub>1</sub>		.07 (.02)*	.07 (.02)*
LAPA T <sub>1</sub>		.03 (.02)	.03 (.02)
HAUA T <sub>1</sub>		-.02 (.02)	-.02 (.02)
HAPA T <sub>2</sub>		.38 (.02)**	.37 (.02)**
LAPA T <sub>2</sub>		-.03 (.02)	-.03 (.02)
HAPA T <sub>2</sub>		.07 (.02)*	.07 (.02)*
HAUA T <sub>1</sub> x HAPA T <sub>2</sub>			.07 (.03)*
HAUA T <sub>1</sub> x LAPA T <sub>2</sub>			.03 (.03)
R <sup>2</sup> <sub>Level-1</sub>		0.11	0.11
Model comparison	20.56 (8)*	327.05 (6)**	360.59 (5)**
Deviance	3954.32	3627.27	3615.99

Note: HAPA = high activation pleasant affect; LAPA = low activation pleasant affect; HAUA = high activation unpleasant affect. Time variant affect was subject-mean centred, time invariant variables were grand mean centred where appropriate, n = 3600 observations nested within 160 subjects. T<sub>1</sub> = morning, T<sub>2</sub> = afternoon. †p≤.10; \*p<.05; \*\*p<.01. R<sup>2</sup><sub>Level-1</sub> calculated via the alternate formula (Kreft & De Leeuw, 1998; Singer, 1998) produces a higher value, of .18 and .19 respectively. ICC=0.33

Hypothesis 8a, Hypothesis 8b and Hypothesis 9a proposed that change in affect between the morning and afternoon would relate to innovative work behaviour. Following precedents set by Bledow, Rosing and Frese (2013, p. 438), three different techniques were used to test these hypotheses, as detailed on page 56.

Hypothesis 7a stated that high activation pleasant affect would moderate the relationship between high activation unpleasant affect in the morning and innovative work behaviour in the afternoon ( $b = 0.11$ ,  $t(1084) = 3.25$ ,  $SE = 0.03$ ,  $p 0.001$ ). As demonstrated in Table 8, Model 3, a highly significant moderating effect was found. The nature of this interaction is plotted in **Figure 14**. The plot illustrates that low activation pleasant affect in the morning, followed by high activation pleasant affect is associated with higher levels of afternoon innovative work behaviour, in conditions of high levels of high activation pleasant affect. Therefore Hypothesis 7a was supported

**Figure 14: Estimates of interaction effects between morning high activation unpleasant affect and high activation pleasant affect on afternoon innovative work behaviour**



Hypothesis 7b stated that high activation pleasant affect would moderate the relationship between low activation pleasant affect in the morning and innovative work behaviour in the afternoon ( $b = -0.04$ ,  $t(1084) = -1.43$ ,  $SE = 0.03$ ,  $p 0.153$ ). There was no support for this hypothesis. Therefore Hypothesis 7b was rejected.

Hypothesis 8a stated that an increase in high activation pleasant affect between the morning and afternoon would be positively related to innovative work behaviour. Model 3 estimates a



significant effect from change in high activation pleasant affect ( $b = 0.17$ ,  $t(1086) = 7.14$ ,  $SE = 0.02$ ,  $p < 0.001$ ). Therefore Hypothesis 8a was supported.

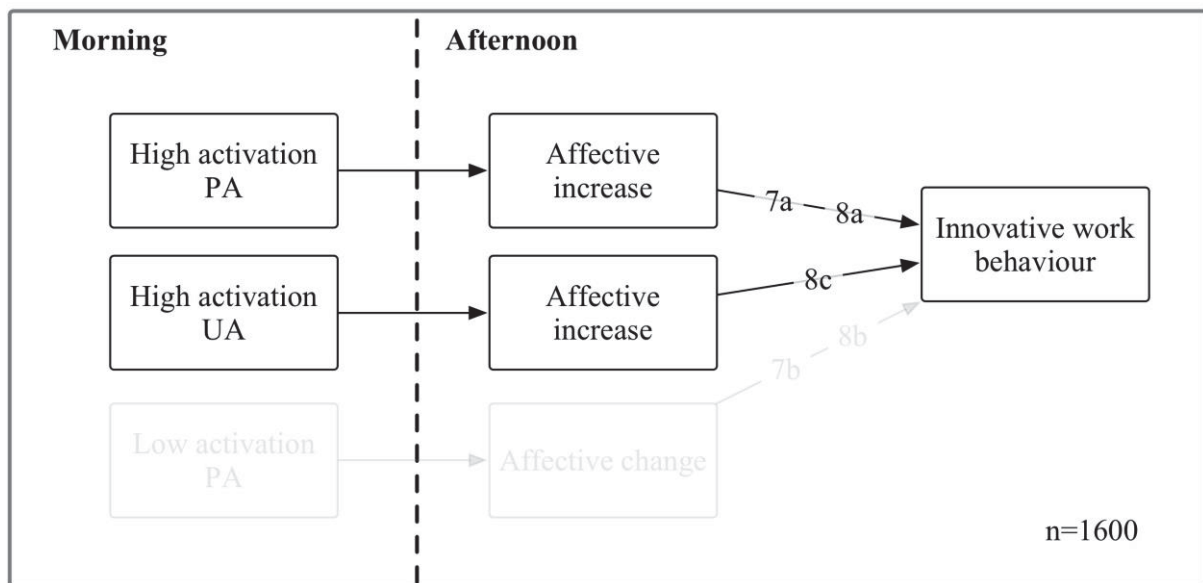
Hypothesis 8b stated that a decrease in low activation pleasant affect between the morning and afternoon would be positively related to innovative work behaviour. There was no support for this hypothesis however, ( $b = 0.03$ ,  $t(1086) = 1.09$ ,  $SE = 0.02$ ,  $p = 0.274$ ). Therefore Hypothesis 8b was rejected.

Hypothesis 8c proposed that an increase in high activation pleasant affect between the morning and afternoon would be positively related to innovative work behaviour. There was support for this hypothesis at the  $p = 0.035$  level of significance ( $b = -0.05$ ,  $t(1086) = -2.12$ ,  $SE = 0.02$ ). Therefore Hypothesis 8c was supported.

Hypothesis 9a proposed that change in affect would be a better predictor of innovative work behaviour in the afternoon, than affect in the morning. Model 2 demonstrates the link between static affect and afternoon innovative work behaviour. Although both Model 2 ( $\chi^2 = 279.31(3)$ ,  $p = < 0.001$ ) and Model 3 ( $\chi^2 = 50.55(3)$ ,  $p = < 0.001$ ) fit well compared to the null model, results of chi-square tests comparing Model 2 and 3 are inconclusive ( $\chi^2 = 228.76(0)$ ,  $p = > .500$ ). Model 2 did not have poorer fit, nor better fit than Model 2. Further the  $R^2$  values are comparable. Therefore Hypothesis 9a is inconclusive.

In summary therefore, only shifts in the level of high activation affect was related to innovative work behaviour, as illustrated in Figure 15. Please note, although measured, level two variables are not illustrated in the Figure 15.

**Figure 15: Conceptual overview of affective change effects on innovative work behaviour results**



### 4.3 Conclusion

In conclusion, the majority of the hypotheses in this thesis were supported. As demonstrated in Table 2 (p. 64), all three categories of time-invariant affect that were measured, had direct and significant correlations with innovative work behaviour as hypothesised Hypothesis 1a, b, and c). Further, the results suggested that sleep quality acted as a moderator between high activation pleasant affect and innovative work behaviour (Hypothesis 5a and Hypothesis 5b). No cross-level (between person) moderation was found however, (Hypothesis 2a to Hypothesis 4b). Further, the relationship between trait positive affect and innovative work behaviour was not curvilinear in nature as had been expected (Hypothesis 6a, Table 3, p. 65).

Next, the direct and indirect effects on time variant affect as an outcome variable were explored (Table 4 and Table 5, p. 70). After holding control variables constant, negative trait affect was found to correlate with all three time variant affective dimensions (Hypothesis 11a, 11b, and 11c). Positive trait affect also had a positive relationship with high activation pleasant affect (Hypothesis 10a). There was no support for the hypotheses relating extraversion and daily affective experiences (Hypothesis 12aHypothesis and Hypothesis 12bHypothesis ), nor positive trait affect with low activation pleasant affect or high activation unpleasant affect (Hypothesis 10b and Hypothesis 10c).

Finally, the influence of an affective shift on afternoon innovative work behaviour was presented in Table 8 (p. 75). Results indicated that high activation pleasant affect acted as a moderator between morning high activation unpleasant affect and innovative work behaviour in the afternoon, supporting Hypothesis 7a. The results also suggested that an increase in high activation pleasant affect (Hypothesis 8a) and high activation unpleasant affect (Hypothesis 8c) between the morning and afternoon, was positively related to innovative work behaviour. It is inconclusive however, whether this change in affect between morning and afternoon, was a better predictor of innovative work behaviour than simply high activation pleasant affect in the afternoon measured with no reference to change (Hypothesis 9a).

A summary of the results are available in Appendix 5.

# 5 DISCUSSION

Throughout the present thesis the author has distinguished between valence or hedonic tone and the activation function of affect, to identify a link between a particular spectrum of affective experiences and engagement in innovative work behaviour. The results revealed that despite the prominence of research exploring valence as an antecedent to behaviour, it plays an inferior role to activation. Broadly, the results demonstrated that high activation moods influence innovative work behaviour, and engaging in innovative work behaviour effects subsequent high activation moods. The following chapter goes on to discuss the findings in greater nuance, beginning with a dialogue on the direct, indirect, and dynamic influencers of innovative work behaviour. The results relating to the direct effects on affect are then discussed. Finally, the results are integrated to illustrate a feedback model between innovative work behaviour and affect, presented in Figure 16.

## 5.1 Antecedents to innovative work behaviour

### 5.1.1 High activation affect precedes innovative work behaviour

The results confirm the postulation that high activation and not low activation moods experienced within a workday would predict subsequent daily innovative work behaviour. In support of Hypothesis 1a and Hypothesis 1c, the results revealed that when an entrepreneur experiences high activation pleasant (enthusiastic, inspired) or unpleasant affect (anxious, tense), they were likely to engage in innovative work behaviour in the subsequent time period. While low activation moods, defined as relaxed, calm, did not necessarily relate to innovative work behaviour engagement – in support of Hypothesis 1b.

In accordance with work by De Dreu and colleagues these findings suggest that innovative work behaviour is achieved through a “dual pathway” (De Dreu et al., 2008; De Dreu, 2010).

The present author suggests therefore, in accord with De Dreu et al's., recent work on creativity, that innovative work behaviour is encouraged by cognitive flexibility obtained from high activation pleasant affect, or from persistence endowed via high activation unpleasant affect. Madrid Cabezas et al. (2014) found support for the link between high activation pleasant affect and innovative work behaviour in their research with an employed MBA sample (2014). Although the researchers measured mood and innovative work behaviour just once per week, and with an "employee" sample, the comparability of the results to the research presented in this thesis is encouraging for the generalizability of conclusions on mood and engagement in innovative work behaviour in the future.

The research in this thesis is one of the first, to my knowledge, also attributing high activation unpleasant affect to innovative work behaviour in both the wider organisational literature and in entrepreneurship. Arguments presented earlier suggest that high activation unpleasant affect is linked to persistence and a problem solving impetus (De Dreu et al., 2008) – concepts which this author proposes are important for innovative work behaviour. While unpleasant affect can have an undoing effect, thus relate to destructive behaviours, high activation unpleasant affect can also provide energy, useful for workplace activities (Warr et al., 2014).

With only few exceptions (De Dreu et al., 2008; Nijstad et al., 2010; Warr et al., 2014), relating high activation unpleasant affect with positive workplace outcomes, such as innovative work behaviour in this research, is a novel conclusion. This joins with recent work (cf. Lindebaum & Geddes, 2015) which goes against the trend in organisational research of attributing unpleasant moods and emotions to destructive and counterproductive behaviours.

As the field of positive psychology has progressed, pleasant affect almost exclusively has been linked to a range of positive outcomes, in personal and professional domains of life (Diener et al., 2002; Fredrickson & Losada, 2005; Fredrickson, 2008; Seligman, Steen, Park, & Peterson, 2005). Lyubomirsky, King and Diener (2005, p. 803) even proposed that pleasant affect "engenders success" across most areas of life. Some have begun questioning if there are boundary conditions in the link between pleasant affect and personal and professional "flourishing" however. In their review titled the "dark side" of happiness, Gruber, Mauss, and Tamir (2011) question if happiness is always beneficial. The results of this thesis provide evidence to support Gruber, Mauss, and Tamir's line of reasoning, as high activation unpleasant affect was found to be beneficial to engagement in innovative work behaviour, while low activation pleasant affect was not.

Therefore the results suggest that behaving more innovatively is not triggered just by feeling inspired and enthusiastic (high activation pleasant affect), but tense and anxious feelings (high activation unpleasant affect) also have a strong positive influence on innovative work behaviour in entrepreneurs. Further, counter to traditional wisdom which aligns unpleasant affect with unproductive outcomes and positive outcomes with pleasant affect, delineation of affect according to arousal shows that low activation pleasant affect (relaxed/calm states) had a weak negative relation to innovative work behaviour. Thus pleasant emotions are not necessarily useful for encouraging the engagement in innovative work behaviour unless they are of high activation.

The research presented in this thesis has gone beyond the exploration of pleasant affect only and provides an interesting caveat to the rhetoric in much academic and popular literature which is captivated by happiness, and the benefits it endows to human cognition, relationships, and careers. The results indicate that in entrepreneurship, there may be times where high activation unpleasant affect can aid in the attainment of productive ends also. Pleasant emotions are not the only “beneficial” emotions, and in fact entrepreneurs experiencing anxiety and tension may engage in more innovative work behaviour than the often sought after emotions of calm and at ease (low activation pleasant affect). The role of entrepreneurial passion pushing entrepreneurs to “overcome obstacles and remain engaged” (Cardon, Wincent, Singh, & Drnovsek, 2009, p. 512) may provide an additional lens for which to conceptualise why high activation unpleasant affect has a strong and significant influence on innovative work behaviour in entrepreneurship, when it does not always in “employee” samples (eg., Madrid Cabezas et al., 2014).

Notwithstanding, this research has explored the link between unpleasant affect and engagement in innovative work behaviour measured in the short-term – not specifically the effectiveness nor value of the behaviour. The negative correlation between some high activation unpleasant moods (namely anger) and problem-solving difficulties via self-control, established in the literature therefore cannot be overlooked (eg., Knapp & Clark, 1991). Tice et al., (2001) for example found that individuals experiencing “distress” have difficulty delaying gratification. According to the authors, individuals seek-out quick routes for down-regulating unpleasant mood as a mood regulation strategy (Tice et al., 2001). The implication of this relationship in light of the results presented in this research is two-fold; firstly entrepreneurs may be more likely to engage in innovative work behaviour as a route for improving their affective state (which are later argued to be ineffective), and secondly; they

may engage in such behaviour at the expense of more pressing or important tasks. Therefore although the results of this research provide overwhelming support for the link between innovative work behaviour and high activation unpleasant affect, further research is required to relate this short-term relationship, with long-term outcomes.

#### 5.1.1.1 High sleep quality moderates the relationship between affect and innovative work behaviour

Sleep quality was found to moderate the relationship between low activation pleasant affect (relaxed, calm) and high activation pleasant affect respectively, with innovative work behaviour – in accordance with Hypothesis 5a and Hypothesis 5b. Specifically, as hypothesised, the relationship was stronger when previous night's sleep quality was high, and weaker when sleep quality was low. This is a particularly interesting finding for low activation pleasant affect, which otherwise has a negative relationship with innovative work behaviour. This result concurs with sleep-task research which has found sleepiness to be associated with the engagement in tasks deemed less challenging (Engle-friedman & Riela, 2004). Further, across a range of studies, an individual's ability to perform effectively is severely affected by sleep (For a review see; Engle-Friedman, 2014), as is the ability to recover from emotions (Sonntag et al., 2008). Thus the results of this research suggest that affect and sleep are useful variables in workplace research, particularly for understanding an entrepreneur's propensity to engage in innovative work behaviour. Even when entrepreneurs are experiencing pleasant affective mood states, engagement in innovative work behaviour will be lower if sleep quality is low.

#### 5.1.1.2 Person-level differences do little to influence the relationship between affect and innovative work behaviour

The individual differences measured did not significantly influence the strength of the relationship between affect and innovative work behaviour. In other words, there was no evidence to suggest that dispositions (positive or negative affective dispositions) and traits (extrovert, openness to experience, personal initiative) moderate the relationship between innovative work behaviour and affect. Therefore there was no support for Hypothesis 2a to Hypothesis 4b. Despite the impetus on entrepreneurs' traits and personalities on business outcomes, the results demonstrated that innovative work behaviour only tends to differ 37 per cent between people. Thus the majority of variance in innovative work behaviour occurs at the within-person level – further affirming the use of a bi-daily experience sampling methodology in this research. In other words, innovative work behaviour is predominantly

affected by daily level factors, as opposed to between person differences. This result suggests that there is significant scope to explore the influence of variables which vary daily, such as those explored in this research (sleep and affect), to further understand entrepreneurs' engagement in innovative work behaviour.

### 5.1.2 The sequence of affect is useful for predicting innovative work behaviour

The sequence of moods during the day was found to predict later engagement in innovative work behaviour. Guided by the affective shift model (Bledow et al., 2011), the results suggested that engagement in innovative work behaviour was related to switching to high activation pleasant affect (enthusiasm/inspiration) from unpleasant affect (tension/anxiety). Further, it was identified that an increase in the level of high activation pleasant affect, or rise in high activation unpleasant affect related to innovative work behaviour also – a concept termed “affective divergence” in this text. A discussion relating to these findings follows.

In accordance with the affective shift model, testing of Hypothesis 7a demonstrated that high activation pleasant affect has a moderating effect on the relationship between high activation unpleasant affect in the morning and innovative work behaviour in the afternoon, such that the relationship was positive when pleasant affect was high and negative when pleasant affect was low. In accordance with Bledow et al. (2013, 2011), and the propositions of PSI theory (Kuhl, 2001), unpleasant affect affords an individual access to analytical resources, with which a situation can be objectively assessed. While a subsequent experience of pleasant affect allows for the creative application of the information processed (Kuhl, 2001). For example, an entrepreneur in a mobile application start-up receives yet another bad review on their recently released application. The tense entrepreneur reads through all the comments posted by the application's users, and develops a thorough understanding of the issues. Later, experiencing high activation pleasant affect she draws upon her earlier analysis to base the subsequent generation of ideas. The findings of the present research suggest that the entrepreneur in this example would very likely engage in innovative work behaviour through the “generation of original solutions for problems” (De Jong & Den Hartog, 2010) that afternoon, if she experienced high levels of high activation pleasant affect, but not *low* levels of high activation pleasant affect or even high levels of *low activation* pleasant affect. Therefore high activation unpleasant affect followed by high activation pleasant affect can be a particularly useful sequence of affect for engagement in innovative work behaviour – it is



expected that this trend is particularly relevant for innovative work behaviour tasks related to creativity (in accordance with work reported by Bledow et al., 2013).

Further hypothesis testing also revealed an alternative perspective to the affective shift model (Bledow et al., 2013, 2011). The affective shift model delineates by one affective dimension (pleasant and unpleasant) only. As discussed previously, a down-regulation of “negative affect” and increase in pleasant affect, has been viewed as driver of work engagement or creativity (Bledow et al., 2013, 2011). In this research however, the present author also argued for, and demonstrated that, increase in high activation affect (as opposed to change in valence) of pleasant or unpleasant valence is paramount for predicting later engagement in innovative work behaviour, from an affective dynamics perspective. Thus for clarity this change in affect is more generally termed “affective divergence” here, as it is not necessarily a “shift” to moods of a different valence as underpinned by the affective shift model, but rather the departure in the level of a given mood from time 1, to time 2.

In support of Hypothesis 8a, an increase in high activation pleasant affect from time-one to time-two had a positive relation with innovative work behaviour. Integrating established theory to assist in interpreting these results, it is understood that high pleasant affect provides an enhanced “broaden-and-build” thought-action repertoire (Fredrickson, 2001) conducive to innovative work behaviour. High pleasant affect also offers greater cognitive flexibility which is associated with idea generation and problem solving (Baas et al., 2008; De Dreu et al., 2008; Lyubomirsky, King, et al., 2005). Further, an increase in high activation pleasant affect may influence risk-taking propensity, which may be useful for activities related to engagement in innovative work behaviour (Bindl & Parker, 2010). This author argues however, that although it was not detected in this research, in accordance with arguments made by De Dreu et al., (2008), an increase of high activation pleasant affect to an extreme condition may have detrimental effects on innovative work behaviour.

Furthermore, as illustrated by broaden and build theory, pleasant affect has more benefits to individuals, than simply nice feelings. Fredrickson, Mancuso, Branigan and Tugade’s (2000) research on the sequence of negative (anxiety) affect followed by pleasant affect (amusement, contentment) for example, found that pleasant affect helped down-regulate the cardiovascular effects of lingering unpleasant affect may provide one explanation (beyond hedonism) as to why individuals seek out pleasant affect (Fredrickson et al., 2000). Notably however, the link between pleasant affect and innovative work behaviour in the present research was only observed with high activation pleasant affect, not low activation pleasant affect. Hypothesis

8b and Hypothesis 7b which predicted the nature of low activation pleasant affect's influence on innovative work behaviour was statistically insignificant, and therefore rejected. The contrast between the observed impact of high activation pleasant affect and low activation pleasant affect in the results, illustrates the fundamental contribution that the activation dimension of affect plays on driving innovative work behaviour, likely through the energising role of high activation moods (Russell, 2003). Thus increase in high (not necessarily low) activation pleasant affect, appears to be beneficial to encourage innovative work behaviour, with the expected caveat of extreme high activation pleasant affect as later discussed.

Conversely the research in this thesis revealed a third and somewhat contradictory finding in relation to the affective shift model previously mentioned. Hypothesis 8c which proposed that an increase in high activation unpleasant affect would also engender innovative work behaviour was supported. Unlike creativity and work engagement, the present author argues that innovative work behaviour is a multifaceted concept, and thus calls on differing processes for varying tasks. Therefore within the framework of PSI theory (Kuhl, 2001), some innovative work behaviour activities do not benefit from creativity and cognitive flexibility, but rather from improved analytical thinking.

Further, drawing upon mood repair and feedback-response strategies, the present author suggests that increase in high activation unpleasant affect is particularly motivating given that innovative work behaviour is associated with initiating or enacting change. As Schumpeter's (1942) famous work on "creative destruction" proposed, "progress" and innovation by their very nature are disruptive at many levels. Therefore the present author argues that the third pathway for engagement in innovative work behaviour via an increase in high activation unpleasant affect, is associated with *increased* motivation to enact change. Although high activation pleasant affect may be useful for cognitive flexibility in the idea generation phase of innovative work behaviour - similarly to creativity, for the evaluation of ideas, cognitive narrowing gained from unpleasant affect is expected to be a useful mechanism also- but only when moods are high activation to aid in motivation (Perry-Smith & Mannucci, 2015).

Although there is little work exploring the influence of *increasing* high activation pleasant affect or unpleasant affect on subsequent cognition and behaviour, the results in conjunction with work on the affective shift model, provide an interesting antecedent for an affective divergence model, which further theories can be built. Affective divergence provides a thought-provoking lens for viewing the mood-behaviour interaction, as such the perspective suggests that the larger the divergence in mood from one point to the next (up to an expected

inflection point), the greater the likelihood of innovative work behaviour. However, it was inconclusive whether an affective divergence model was a better predictor of innovative work behaviour than high activation pleasant affect or high activation unpleasant affect at time two in isolation (Hypothesis 9a). Further research is needed to explore the conditions in which an affective divergence model of innovative work behaviour predicts behaviour better than high activation affect in time-two only.

## 5.2 Antecedents to affect

The results identified three factors that could assist in driving affective experiences. Firstly, the results demonstrated that affective traits relate to bi-daily affective experiences, as such positive trait affect positively related to high activation pleasant affect, while negative trait affect positively correlated to high activation unpleasant affect and negatively to high and low activation pleasant affect. Secondly, sleep quality was a strong predictor of affective experiences, good quality of sleep was associated with experiencing high and low activation pleasant affect the next day, while bad sleep quality tended to lead to high activation unpleasant affect the following day. Finally, engaging in innovative work behaviour related negatively to high and low activation pleasant affect, and positively to high activation unpleasant affect. The implications of these results are discussed throughout the following subsections.

### 5.2.1 Affective traits often predict affect

Hypothesis 10a to Hypothesis 11c, related to the role of affective dispositions in influencing bi-daily affect. An affective trait (or disposition) is a personality variable related to the propensity for reacting to emotional stimuli and experiencing either pleasant or unpleasant moods and emotions, thus unsurprisingly negative trait affect related negatively to bi-daily high and low activation pleasant affect (Hypothesis 11a and 11b) and positively to high activation unpleasant affect (Hypothesis 11c). Conversely, positive trait affect correlated positively with bi-daily high activation pleasant affect (Hypothesis 10a), but interestingly there was no statistical significance to support Hypothesis 10b nor Hypothesis 10c which predicted a positive relation with low activation pleasant affect and a negative relation with high activation unpleasant affect. This may suggest that the positive trait affect measure, has a bias towards high activation pleasant affect at the expense of low activation pleasant affect. These results provide a vehicle for comparing affective-innovation research, which have tended to use affective *traits* as a proxy for affect. For example Baron and Tang's (2011)

research which has been widely referenced, only used the 10 positive affective items from the same 20-item measure adopted in this research, for which to draw their conclusions on the link between entrepreneurial innovations in and “positive affect”. Yet the results illustrated in the present research provide some evidence to suggest that their measure of “positive affect” may be biased towards high activation pleasant affect exclusively, a trend that is echoed throughout the workplace-affect literature (Warr et al., 2014).

### 5.2.2 Sleep quality predicts affect

Sleep quality positively related to high and low activation pleasant affect, and negatively to high activation unpleasant affect, supporting Hypothesis 13a to Hypothesis 13c. This finding concurs with established theory on the effects of sleep on physiological responses and mood (cf., Mullins, Cortina, & Drake, 2014), illustrating the importance of considering sleep in mood related research. As illustrated throughout this chapter, sleep quality has been linked to the relationship on, and between, affect and innovative work behaviour in numerous ways – providing some insight into the importance of good sleep quality for entrepreneurs.

### 5.2.3 Innovative work behaviour and affect

There is a well-established causal connection from affect to behaviours, but in this research it was also argued that there is a reverse relationship. Hypothesis 14a and Hypothesis 14b were supported, suggesting that engaging in innovative work behaviour negatively relates to subsequent high and low activation pleasant affect. Further, innovative work behaviour related positively to high activation unpleasant affect (Hypothesis 14c). Therefore in contrast to earlier propositions, innovative work behaviour was operationalized as the independent variable and affect as the dependent variable.

The analysis revealed that innovative work behaviour in the morning is significantly negatively correlated with subsequent high activation pleasant affect (inspired/enthusiastic) and weakly negatively correlated with subsequent low activation pleasant affect (calm/relaxed). This speaks to the short-term unpleasant and energising role of engaging in innovative work behaviour. Janssen et al. (2004, p. 130) offers an explanation as to how striving to innovate may be a cause of unpleasant affect experiences: “innovation derives from risky work behaviours that may lead to unintended costs for the innovators involved despite their intention to produce anticipated benefit”. Such “costs” may be tangible setbacks, or merely a negative perception of progress. While researchers have argued that exertion of

effort leads to progress, which results in pleasant affect (van Woerkom, Oerlemans, & Bakker, 2015), the present author has argued that in a short-time frame, the iterative (Barnett, 1953) and challenging nature of engaging in innovative work behaviour may have the opposite effect.

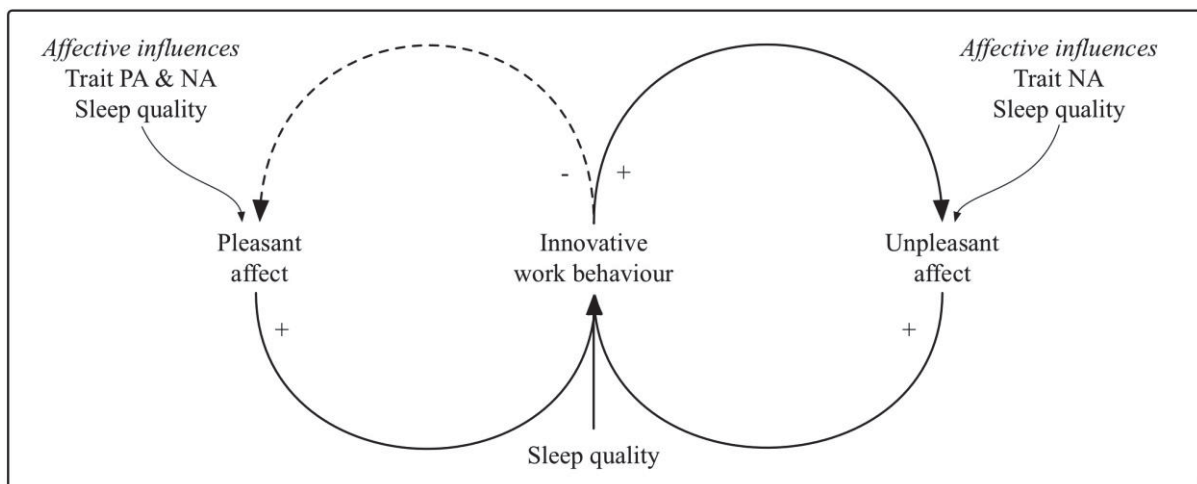
The results supported this line of reasoning that innovative work behaviour may leave entrepreneurs less enthusiastic in the short-term. Wrobel (2013) identified that while frustration can be motivational, it generally leads to short-term unpleasant affect in most individuals. Bursel and Picard's (2004), affective computing study on flow and task performance also identified that frustration tends to harm short-term drive. These findings are theoretically supported by the propositions presented by Akbari Chermahini and Hommel (2012). The authors demonstrated that convergent thinking tasks lead to decreased pleasant affect, while the reverse effect is found in divergent thinking activities (Akbari Chermahini & Hommel, 2011). Although innovative work behaviour involves idea generation activities (divergent thinking), activities relying on convergent thinking are also expected to be prominent for entrepreneurial innovative work behaviour (i.e. idea evaluation activities). (Perry-Smith & Mannucci, 2015). Thomas Edison is famously quoted saying in regards to invention, "I see a worthwhile need to be met and I make trial after trial until it comes. What it boils down to is one per cent inspiration and ninety-nine per cent perspiration". Much like Thomas Edison's view of invention therefore, the present author argues that the role of inspiration (idea generation) plays a minor role to that of perspiration in the process of enacting daily innovative work behaviour. Thereby convergent thinking is the dominant activity, providing some insight into the prevalence of high activation unpleasant affect following daily innovative work behaviour.

### 5.3 Spiral of declining affective valence

Most interestingly, conceptualising the results of this research as a sum of its components highlights that the link between high activation affect and innovative work behaviour has a feedback effect of declining affective valence. That is to say, the relationship is not circular, but rather a spiral. High levels of high activation pleasant affect relate to high engagement in innovative work behaviour, but innovative work behaviour engagement corresponds with a reduction in high activation pleasant affect, and increase in high activation unpleasant affect. High levels of high activation unpleasant affect then relate to engagement in innovative work behaviour, which consequently is associated with an increase in the levels of high activation

unpleasant affect, and so on and so forth. In other words regarding high activation affect only, engaging in innovative work behaviour is related to an increase in unpleasant affect and a reduction in pleasant affect – a trend which is then perpetuated as unpleasant affect is associated with sequential engagement in innovative work behaviour. The dynamics of this system are illustrated in Figure 16.

**Figure 16: Causal loop diagram of daily innovative work behaviour and high activation affect**



On the right side of the diagram, the high activation pleasant affect system is a closed self-propelling loop, thus with each iteration a positive<sup>12</sup> loop gain would be expected. The plus (+) symbol illustrates that innovative work behaviour increases as a function of high activation unpleasant affect and high activation pleasant affect respectively, and that high activation unpleasant affect increases with innovative work behaviour.

On the left however, the loop is not closed under the conditions detected. Therefore the role of affective influences becomes most salient for the continuation of engagement in innovative work behaviour by way of high activation pleasant affect. The minus symbol (-) illustrates that high activation pleasant affect decreases as a function of innovative work behaviour. The dotted line on this path is implemented to reinforce that the left loop is not closed.

<sup>12</sup> The term positive is used in the technical systems dynamic modelling sense (eg., increase), forego no value attribution is intended with the use of the term in this particular context.



Although such a loop of increasing unpleasant affect may seem destructive, the present author argues for the consideration of six points in parallel to these findings. Firstly, the link between affect and innovative work behaviour is not presented here as a form of reductionism. There are a multitude of factors influencing both the motivation and propensity for innovative work behaviour, as well as affect – beyond those tested and illustrated. Indisputably affect is not the sole cause of innovative work behaviour, nor innovative work behaviour the sole influencer on affect. There are a range of situational and person-level factors that have not been included in this model, which undoubtedly influence both key variables.

Secondly, entrepreneurs function in complex environments where affective reactions arise from a range of stimulus – beyond sleep quality and affect as depicted in Figure 16. These include interpersonal factors for example (Breugst & Shepherd, 2015) – which is proven to be a particularly salient form of affective influence (Vijayalakshmi & Bhattacharyya, 2012). Therefore it is doubtful that the loop could continue without interruption.

Thirdly, Figure 16 illustrates that it was most *common* for innovative work behaviour to lead to an increase in high activation unpleasant affect, and decrease in high activation pleasant affect in the research undertaken. As Gielnik et al (2014, p. 1013) suggests citing the work of Lichtenstein et al., (2007) however, engaging in innovative work behaviour “is not a steady chain of events ...but repeated cycles of successes and setbacks”. Thus the setbacks are likely better represented in this research. Further exploration is needed to untangle these outcomes and identify the interplay of affect and innovative work behaviour during successes.

Further, a decade of research on resilience in the affective (Fredrickson, 2001; Verduyn et al., 2015) and entrepreneurial (Hayward, Forster, Sarasvathy, & Fredrickson, 2010; Krueger, 2008) literatures would suggest that individuals will differ in how they recover from setbacks, separating the entrepreneurs who perpetuate the high activation unpleasant affect loop, with those who are able to down regulate unpleasant affect and up regulate high activation pleasant affect. The effectiveness in which individuals returned to their baseline levels of affect following an anxiety-inducing event, was significantly influenced by their dispositional psychological resilience in Fredrickson’s research (Fredrickson, 2001; Tugade & Fredrickson, 2004) for example. In entrepreneurship, resilience is theoretically responsible for the efficacy in which some entrepreneurs recover from venture failure (Hayward et al., 2010). This is an important caveat to consider.

Fifthly, an increase in daily high activation unpleasant affect, and decrease in high activation pleasant affect does not necessarily suggest that an entrepreneur will be less satisfied or unhappy over a long time span. Worry, anxiety and stress (high activation unpleasant affect) for example has been related strongly to perceived meaningfulness, while happiness has only a weak association with such meaning (Baumeister, Vohs, Aaker, & Garbinsky, 2013), illustrating the difference between gratification and pleasure. As the lay words of Emperor Caesar Marcus Aurelius Antoninus Augustus suggested “The happiness and unhappiness of the rational, social animal depends not on what he feels but on what he does; just as his virtue and vice consist not in feeling but in doing” (Meditations, IX, 16).

Thus innovative work behaviour is not necessarily destructive, but like most productive paths, the journey is difficult. The results of this research join in concert with articles cautioning propositions positing the pursuit of pleasant affect only. The rise of positive psychology has birthed the notion that to flourish in practically all areas of life, pleasant affect is best. Yet, multiple studies have established a negative relationship between the pursuit of pleasant affect and its attainment, due to evaluative outcomes (such as disappointment). The more importance an individual places on pleasant affect, and the greater it is desired, the bigger the disappointment when it is not achieved (Mauss, Tamir, Anderson, & Savino, 2011). Thus, entrepreneurs may experience adverse consequences from the quest of pleasant affect, leading to less involvement in innovative work behaviour, and heightened levels of unpleasant affect (possibly of low activation) when unpleasant affect is inevitably increased, and pleasant affect is decreased.

Further, positive perceptions of unpleasant affect have been found to correlate with enhanced performance under such conditions (Crum, Salovey, & Achor, 2013). Research by Crum, Salovey, and Achor (2013) found that perceiving stress as enriching (as opposed to debilitating) was related to a superior utilisation of stress – suggesting individuals may perform better under stress when they view it as beneficial. Acceptance of unpleasant affect, as opposed to pursuit of pleasant affect, tends to relate positively to personal and professional outcomes across a range of settings (S. C. Hayes, Villatte, Levin, & Hildebrandt, 2011; Hofmann, Heering, Sawyer, & Asnaani, 2009; Ruiz, 2010; Shallcross, Troy, Boland, & Mauss, 2010). It must be noted that the pursuit of pleasant affect is not always futile however. Interventions or education aimed at the down regulation of unpleasant affect (Gross & John, 2003; Troy, Wilhelm, Shallcross, & Mauss, 2010), or engagement in activities which arouse



pleasant affect (Lyubomirsky, Sheldon, & Schkade, 2005) tend to result in a positive association between the pursuit and attainment of pleasant affect.

# 6 CONCLUSIONS AND RECOMMENDATIONS

Chapter one presented five aims for this thesis. First this section seeks to revisit those aims, and provide a critical discussion on their fulfilment. Practitioner points are then listed. Thirdly the limitations of this research are addressed, and finally the chapter concludes with recommendations for future research.

## 6.1 Conclusions

### 6.1.1 Application of affective theory to innovative work behaviour as it naturally occurs in the field of entrepreneurship

This research bridged three fields to provide an affective perspective to the naturally unfolding innovative work behaviour of entrepreneurs at a twice-daily unit of analysis. To date this is the only known daily study in entrepreneurship to explore innovative work behaviour, as it relates to affect. Additionally, only one article (Madrid Cabezas et al., 2014) has published in the wider organisational fields, linking innovative work behaviour in a workplace setting from a circumplex model of affect perspective (Yik et al., 2011). Of which, the research explored affect at weekly intervals, used an employee sample, and only reported on high activation pleasant affect. Moreover, the present research adopted contemporary data analysis techniques via multilevel modelling, based on data from sample sizes, meeting or surpassing most ESM studies in top tier management journals. Likewise, modern data collection tools were employed, which utilised a specialised smartphone application in response to methodological suggestions (Fisher & To, 2012).

Therefore fulfilling the aims stated at the beginning of this thesis, to extend the affective discourse to innovative work behaviour, and examine the connection between real time innovative work behaviour.

### 6.1.2 Incorporation of affective valence and activation, plus the examination of unpleasant affect

The findings provided direct support for the circumplex model of affect (Yik et al., 2011), whereby the delineation of affective activation and valence resulted in the identification of significant relationships, which would have otherwise been concealed. These findings further confirm recent assertions (Foo et al., 2015; Warr et al., 2014) as to the nature of affect, and its use in anticipating workplace behaviour.

Specifically, the findings made two notable contributions that illustrate why the conceptualisation of affect benefits from the inclusion of its activation function. Firstly, despite the prevalence of conclusions on “pleasant affect”, the findings demonstrated irrevocably that not all range of pleasant moods have the same influence on behaviour. There was no statistically significant correlation between low activation pleasant affect and innovative work behaviour. High activation pleasant affect on the other hand had a moderate positive and significant correlation with innovative work behaviour. Yet both low and high activation pleasant affect are categorised under the same single category of “pleasant affect” in much extant literature. Consequently demonstrating that failure to delineate beyond pleasant versus unpleasant affect is prone to overstating the role of low activation pleasant affect as an antecedent to behaviour.

Moreover, despite the overrepresentation of pleasant affective research, and stigmatising of unpleasant affect in the literature, high activation unpleasant affect had a positive influence on innovative work behaviour. Thus, although extant research has related innovative work behaviour with high activation pleasant affect exclusively (Madrid Cabezas et al., 2014), the findings of this research indicated the high activation unpleasant affect was a stronger predictor of behaviour.

Therefore concluding two aims of this research, to incorporate an affective valence and activation perspective, and to explore an infrequently researched aspect of affective research, unpleasant affect.

### 6.1.3 Model of affective divergence

The findings were consistent with the essential assumption that the sequence of affect could be examined to model innovative work behaviour. The affective shift model (Bledow et al., 2011), was incorporated in the present thesis. The model identifies affect as it functions in sequence, yet conceptualises it in a singular dimensional manner (either pleasant or

unpleasant), with the circumplex model of affect (Yik et al., 2011), which regards affect as multi-dimensional (consisting of valence and activation elements), yet neglects the unfolding of affect in succession.

In addition to switching to high activation pleasant affect from unpleasant affect, the findings indicated that an increase in the level of high activation pleasant affect, or rise in high activation unpleasant affect related to innovative work behaviour. The present author termed this concept “affective divergence” in this research, as innovative work behaviour in the afternoon was predicted by the level of deviation in a high activation mood between the two sampling frames.

Therefore the aim to integrate the two disjointed perspectives, to create a unified model of affective divergence was realised.

#### 6.1.4 The feedback loop between innovative work behaviour and affect

The findings demonstrated evidence of a feedback loop between innovative work behaviour and affect. Thus, although affect related to subsequent innovative work behaviour, innovative work behaviour also correlated with subsequent affect. Specifically, innovative work behaviour in the morning was negatively correlated with high and low activation pleasant affect, and positively related to high activation unpleasant affect. Therefore the loop between innovative work behaviour and affect had a feedback effect of declining affective valence.

This finding adds an interesting perspective to Affective Events Theory, which views work events “as proximal causes of affective reactions” (Weiss & Cropanzano, 1996, p. 1). A feedback loop between innovative work behaviour (work events) and affect however, provides evidence to suggest the presence of a reverse causal relationship also.

Therefore, the aim to explore if and how innovative work behaviour predicts affective experiences was fulfilled.

## 6.2 Practitioner points

This research has some interesting implications for entrepreneurs seeking to engage in innovative work behaviour.

In contrast to the majority of advice directed at entrepreneurs (Baron et al., 2012), the research suggested that both high activation pleasant and *unpleasant* affect may be useful for driving innovative work behaviour. The findings of this thesis imply therefore, that rationally

allocating time and resources according to these affective states may prove to be a useful tool for enhanced personal innovative work behaviour performance. According to extant research, high activation unpleasant affect fuels narrow and decisive thinking (cf., Kuhl, 2001), and therefore is most beneficial for activities related to decision-making and analysis, whereas high activation pleasant affect leads to cognitive flexibility, which assists idea generation and creative activities (Baas et al., 2008). Low activation pleasant affect on the other hand does not necessarily have a highly energising effect (Russell, 2003), nor does it push individuals to exert greater effort (Melton, 1995), which may justify why it negatively influences innovative work behaviour across a range of innovation stages. Therefore calm pleasant moods may be better spent on other activities.

Earlier research has revealed that the desire for pleasant affective experiences can paradoxically lead to disappointment (Mauss et al., 2011). As the findings of this research suggest that high activation unpleasant affect can actually be useful for innovative work behaviour, entrepreneurs may use this knowledge to ease some pressure to experience pleasant affective states. Furthermore, awareness of the benefits of unpleasant affective states has been linked to enriched work performance (Crum et al., 2013). Thus, entrepreneurs aware of the benefits that can be gained from high activation unpleasant affect may prove beneficial via easing the pressure of pleasant affective experiences, and thereby decreasing disappointment (Mauss et al., 2011), and by enriching performance for individuals in states of high activation unpleasant affect in accordance with the findings by Crum et al. (2013).

Moreover, the present thesis revealed the importance of good sleep quality for entrepreneurs. The benefits of sleep quality in fact were two fold in this research. When sleep quality was high, entrepreneurs were more likely to experience increased pleasant affect (both high and low activation pleasant affect) and decreased high activation unpleasant affect in their work. Secondly entrepreneurs with high previous nights' sleep quality have greater effectiveness in engaging in innovative work behaviour in states of both high and low activation pleasant affect. Therefore, both innovative work behaviour and mood may be aided by sleep quality, which in addition to sleep's known effects on performance (Engle-Friedman, 2014) advocate that sleep high quality should be a prominent priority for entrepreneurs.

The research suggested that engagement in innovative work behaviour increases high activation unpleasant affect and decreases high and low activation pleasant affect. Therefore it may be common for entrepreneurs to feel tenser, and less inspired after engaging in innovative work behaviour. Yet psychology research suggests that short-term affective

“unhappiness”, may prove to yield longer term and greater meaningfulness from life (Baumeister et al., 2013). Therefore, feeling worse after engaging in innovative work behaviour does not necessarily mean that it will cause psychological harm, but may in fact lead to greater life fulfilment.

Therefore, regarding the contribution of this research to practice, a summary of practitioner recommendations are, that: innovative work behaviour may benefit from the manipulation of one’s affective state to either high activation pleasant affect (enthusiastic, inspired) or high activation unpleasant affect (tense, worried), or alternatively; entrepreneurs may find attempts to engage in innovative work behaviour more effective during times when they happen to be experiencing high activation moods, furthermore; as there is evidence to suggest that disappointment of striving for pleasant affective experiences may paradoxically result in the stimulation of unpleasant affect (Mauss et al., 2011), and that awareness of the benefits of unpleasant affective states may have an enhancing effect on work performance (Crum et al., 2013), entrepreneurs may profit from being mindful of high activation unpleasant affect’s benefits on their innovative work behaviour, not to mention the gains to their analytical thinking abilities, according to a range of research (cf., Kuhl, 2001), additionally; although this research identified that engagement in innovative work behaviour may stimulate unpleasant affective reactions, extant literature (Baumeister et al., 2013) suggests that short-term unhappiness can relate to greater fulfilment, moreover; sleep quality may help entrepreneurs achieve or maintain pleasant affective states, and lastly; entrepreneurs are likely to be more effective at ultimately engaging in innovative work behaviour, as well as performing better in a range of tasks according to work by Engle-Friedman (2014), by having high quality sleep.

This research extends the conversation on the influences of affect in the workplace, and suggests therefore that affect, sleep quality, and acknowledgement of the benefits of high activation unpleasant affective experiences, can be used as tools to drive innovative work behaviour in entrepreneurship.

### 6.3 Limitations

Certainly, this study is not without limitations. It must be noted that this research has explored correlation, which thus precludes certain causative conclusions. As the hypotheses of this work have largely been based on, and concur with, the advances in controlled affective lab studies however, there is a reasonable expectation that a causal relationship exists

between affect and innovative work behaviour in the manner recorded. Further, the research design collected affective and innovative work behaviour snapshots twice per day for two weeks, and employed a lagged and time dependency procedure in data analysis to explore the unfolding of events. Thus, the research draws on an established causative relationship, and employs time capturing techniques, which may give some confidence to a causal interpretation of the data.

Regarding generalizability, the sampling procedure did not draw on the population of entrepreneurs, but rather made use of samples of convenience. Therefore there is a limited ability to generalise the findings presented in this thesis to all entrepreneurs, beyond that which is speculative in nature.

The link between affect and innovative work behaviour is not presented here as a form of reductionism. This thesis needs to be considered in context. There are a multitude of factors influencing both the motivation and propensity for innovative work behaviour. Undoubtedly affect is not the sole cause of innovative work behaviour. The affect-innovation link presented in this thesis is merely an alternative viewpoint, in a vast literature, which posits situational and personality-type constructs as drivers to innovative work behaviour.

There are potential weaknesses involved with the use of self-reported measures of affect, namely pertaining to the interruption of participants from the course of their work, subjects' "emotional awareness" (Dasborough et al., 2008, p. 201) and in some cases, the concealment of appraised affect (Warr et al., 2014). Nevertheless, self-reported measures are the standard approach to data collection in this field (Uy et al., 2009). This research additionally adopted "innovative" (Rodrigues et al., 2015, p. 204) experience sampling techniques and mobile technologies to avoid some of the known issues (Fisher & To, 2012) surrounding self-reported data collection.

## 6.4 Future research

Over the past decade the exploration of emotions in entrepreneurship has only begun to attract concerted interest (Cardon et al., 2012; Foo, 2011). To further compliment the progress made in entrepreneurship research, key journals have been calling for further integration of cognitive and psychological perspectives, in alignment with the themes presented in this thesis (Shepherd, 2015).

The need for cross-disciplinary research is evident from the stunted progress in innovative work behaviour research. For example, innovative work behaviour is closely related to individual innovation and proactive behaviour with overlap in the idea generation dimension of the construct with creativity. Yet between, and even more disappointingly, sometimes within, the three fields of organisational behaviour, entrepreneurship and applied psychology, advancements outside of an isolated research topics is rarely acknowledged. This is illustrated in disproportional number of management articles treating affect as one-dimensional for example, despite the gross criticism such a perspective receives in psychology (Cf., Foo et al., 2015). Although affective research received some attention in management research a decade ago, organisational researchers greatly lag behind psychology research with methodological and theoretical advancements. Future research would benefit greatly from a cross disciplinary perspective.

Promotion/prevention and approach/avoidance motivation's have been shown to provide useful insight on affect driven behaviour (Eg. Brockner, Higgins, & Low, 2004). For example there is strong evidence to suggest that promotion focused individuals are more likely to make decision-errors, compared to prevention focused individuals who search out "vigilant decision strategies" to reduce risks (Higgins et al., 2001). Furthermore, regulatory focus perspectives suggest that people in calm mood states are more likely to make vigilant decision strategies, while happy mood states (promotion focus) are more likely to make risky decisions. The results of a survey with 201 entrepreneurs suggested that a promotion focus was positively associated with venture performance in industries with high environmental dynamism for example (Hmieleski & Baron, 2009). On the topic of heuristics, Pham and Avnet (2009) found that individuals rely upon affect as a heuristic of decision-making when they're with a promotion focus more so then with a prevention focus. Exploring workplace events related to technology change and emotional salience, Stam and Stanton (2010) found that change was more likely to be accepted when there was a promotion focus. Therefore according to Brockner and Higgins (2001) an individual's adoption of either a promotion or prevention focus will play an important role in regulating emotions which should be considered in organisational research. "Promotion-focused people's emotions vary along a cheerful-dejected dimension, whereas prevention-focused people's emotions vary along a quiescent-agitated dimension" (Brockner & Higgins, 2001, p. 35). The inclusion of promotion-prevention/approach-avoidance motivation perspectives was beyond the scope of



this research, but would be a useful concept to incorporate in future research, to better understand the link between affect and innovative work behaviour.

Another area for future research is the link between innovative work behaviour and output. Although there is an obvious link between innovative work behaviour and innovation output, the conversion of innovative work behaviour to annual innovation outputs would be an interesting area of exploration in entrepreneurship. In person level research in organisational psychology, behaviour is generally treated as synonymous with personal performance due to the inherent within person perspective. For example Scott and Bruce (1994) among others (Madrid Cabezas et al., 2015) use the terms innovative behaviour and innovative performance as interchangeable. The exploration of such a link in entrepreneurship studies may provide the additional benefit of encouraging more researchers to explore entrepreneurial phenomena from a daily level of analysis (Duran, Kammerlander, van Essen, & Zellweger, 2015).

Further exploration on the benefits of innovative work behaviour engagement is also needed for a range of person and firm level outcomes. Although engaging in innovative behaviour may be linked to the competitive advantage of a firm, not much is known about the downstream effects of such behaviours on the entrepreneurs personal life or wellbeing. For example some creative behaviours during the day (by employees) may have detrimental impacts on spouse relations (S. H. Harrison & Wagner, 2015). Further, future research should explore how affective experiences can spill-over between personal and professional domains in entrepreneurship. As Wood and Michaelides (2015) explain, interesting work may illicit positive high activated emotions, which can create “interference” as workers allocate greater enthusiasm to work related activities, and less to personal-life.

A further suggestion for future research is the tailoring of data collection times around the schedule of each entrepreneur. For example, an entrepreneur with a prior commitment, such as engagement in training will report low levels of innovative work behaviour in response to their innovative work behaviour survey recorded in that timeframe, regardless of mood and desire to engage in innovative work behaviour – which may be a source of noise in this research. Further, some entrepreneurs have irregular work hours or work periods (Williamson et al., 2011), many working outside of “working hours”, such as late at night or on the weekends. These times, mostly free of meetings and errands, may provide more flexibility on what entrepreneurs focus their efforts. Future studies could therefore differentiate between when an entrepreneur has the ability for innovative work behaviour and does or does not act

on it, from when such behaviour simply is not feasible, and further may consider collecting data outside of normal work hours.

Another area which is greatly in need of research to extend the ideas presented in this thesis, is the relationship between affect and innovative work behaviour in context. For example, does the link between affect and innovative work behaviour differ according to the type of innovation being attempted, how does it vary according to the stage of innovation, and the stage of the business? Additional questions include how does the link between innovative work behaviour and affect vary according to industry dynamics?

Further questions that arise from this thesis, are concerned with the consideration of additional factors influencing the affective-innovative work behaviour relationship. For example, what is the role of group behaviour, and interactions, for innovative performance? Breugst and Shepherd (2015), for example, recently found social interactions to be a significant driver of unpleasant affective experience in entrepreneurship. Exploring how *the spiral of declining affective valence* unfolds in a group setting would be particularly interesting for future research.

Conversely, the exploration of passion in entrepreneurship has made a notable impact on entrepreneurial literature. In fact the various articles on the topic by Cardon and colleagues have received over 500 citations to date - a notable number in entrepreneurship. Entrepreneurial passion is defined as “consciously accessible intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful and salient to the self-identity of the entrepreneur” (Cardon et al., 2009, p. 517). In management, Kammeyer-Mueller et al., (2016) found that the meaning that one gives to work has consequences on affective outcomes. Extrinsically motivated nurses in their study experienced greater “emotional exhaustion”, than their intrinsically motivated peers (Kammeyer-Mueller et al., 2016). Similarly the question could be asked in this context, how does innovative work behaviour influence subsequent affective experiences in entrepreneurs who differ in entrepreneurial passion? What role does entrepreneurial passion play in moderating the link between affect and innovative work behaviour? How does passion relate to affective recovery? Reconciling burgeoning affective research with an entrepreneurial passion perspective would thus likely be a topic of fruitful exploration.

Furthermore, the specific role of identity in the affect-innovative work behaviour relationship would be beneficial to academic discourse in entrepreneurship. Cardon, Gregoire, Stevens

and Patel (2013) suggest that entrepreneurs are bound to vary in how much they engage in particular activities, based on what they identify more strongly with. Therefore it would be expected that entrepreneurs whose identity is based on innovation, would be more likely to engage in related innovative behaviours. How that relationship interplays with affect would be an exciting topic simultaneously extending two “hot” topics in entrepreneurship.

How the innovative work behaviour – affect relationship varies according to differing cognitive styles is another area needing further work. For example, Carnabuci and Dioszegi suggest that individuals with an “adaptor” thinking style, are more effective at utilising information and resources for implementing solutions (Carnabuci & Dioszegi, 2015). Similarly, high confidence is known to be associated with greater levels of pleasant affect (Hayward et al., 2010). Future research would benefit from the incorporation of such cognitive profiles and theories to better understand the relationship between affect and innovative work behaviour, and identify the cause of between-person variance.

Further analysis is needed to identify if there are boundary conditions to the benefits gained from high activation pleasant affect and high activation unpleasant affect, as similarly suggested by De Dreu et al. (2008). Extremely high levels of high activation pleasant affect and unpleasant affect are thought to have an undoing effect on cognition (Rolls, 2014). Inducing intense levels of activation in a laboratory setting, or using an event signalling methodology in workplace settings to capture occasions where such high levels of activation occur, would provide a useful lens for examining these boundary conditions. Research on this topic would be valuable for advancing our understanding on high activation affect, and when it is and is *not* beneficial for innovative work behaviour, and wider positive organisational outcomes.

In conclusion, affect in entrepreneurship is an exciting topic which is only in its infancy. Unanswered questions greatly outweigh our understanding, and as concluded by Cardon et al., (2012, p. 2) “we have barely begun to uncover the most interesting questions concerning entrepreneurial emotion, much less to develop theories to address... them”.

# 7 APPENDICES

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## APPENDIX 1: AN OVERVIEW OF INNOVATIVE WORK BEHAVIOUR MEASURES

<i>Study</i>	<i>Measure</i>
Scott and Bruce (1998)	<p>Searched out new technologies, processes, techniques, and/or product ideas;</p> <p>Generated creative ideas;</p> <p>Promoted and championed ideas to others; and</p> <p>Was innovative in general</p>
Scott and Bruce (1994)	<p>Searched out new technologies, processes, techniques, and/or product ideas.</p> <p>Generated creative ideas.</p> <p>Promoted and championed ideas to others.</p> <p>Investigated and secured funds needed to implement new ideas.</p> <p>Developed adequate plans and schedules for the implementation of new ideas.</p> <p>Was innovative.</p>
De Jong and Den Hartog, 2008, 2010	<p>(Idea generation)</p> <p>searched out new working methods, techniques or instruments</p> <p>found new approaches to execute tasks</p> <p>generated original solutions for problems</p> <p>(Opportunity exploration)</p> <p>paid attention to issues that are not part of your daily work</p> <p>wondered how things can be improved</p> <p>(Championing)</p> <p>made important team members enthusiastic for innovative ideas</p> <p>attempted to convince people to support an innovative idea</p> <p>(Application)</p> <p>systematically introduced innovative ideas into work practices</p> <p>contributed to the implementation of new ideas</p> <p>put effort in the development of new things</p>
Kleysen and Street (2001)	<p>(Opportunity exploration)</p> <p>Looked for opportunities to improve an existing process, technology, product, service or work relationship</p> <p>Recognized opportunities to make a positive difference in your work, department, organization, or with customers</p> <p>Paid attention to non-routine issues in your work, department, organization or the market place</p>

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Janssen (2000)	(Generativity)
	Generated ideas or solutions to address problems
	Defined problems more broadly in order to gain greater insight into them
	(Formative investigation)
	Experimented with new ideas and solutions
	Tested-out ideas or solutions to address unmet needs
	Evaluated the strengths and weaknesses of new ideas
	(Championing)
	Tried to persuade others of the importance of a new idea or solution
	Pushed ideas forward so that they have a chance to become implemented
	Took the risk to support new ideas
	(Application)
	Implemented changes that seem to be beneficial
	Worked the bugs out of new approaches when applying them to an existing process, technology, product or service
	Incorporated new ideas for improving an existing process, technology, product or service into daily routines
	(Idea generation)
	Created new ideas for difficult issues
	Searched out new working methods, techniques, or instruments
	Generated original solutions for problems
	(idea promotion)
Mobilized support for innovative ideas	
*Acquired approval for innovative ideas	
Made important organizational members enthusiastic for innovative ideas	
(idea realization)	
Transformed innovative ideas into useful applications	
Introduced innovative ideas into the work environment in a systematic way	
Evaluated the utility of innovative ideas	

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## APPENDIX 2: AN OVERVIEW OF ENTREPRENEURIAL SELF-EFFICACY MEASURES

<i>Study</i>	<i>Measure</i>
Zhao, Seibert, & Hills (2005, p. 1268)	<p>successfully identifying new business opportunities</p> <p>creating new products</p> <p>thinking creatively</p> <p>commercializing an idea or new development</p>
Tominc and Rebernik (2007, p. 245)	Do you have the knowledge, skills and experience required to start a new business?
De Noble, Jung and Ehrlich (1999)	<p>Developing new product and market opportunities</p> <p>I can see new market opportunities for new products and services.</p> <p>I can discover new ways to improve existing products.</p> <p>I can identify new areas for potential growth.</p> <p>I can design products that solve current problems.</p> <p>I can create products that fulfill customers' unmet needs.</p> <p>I can bring product concepts to market in a timely manner</p> <p>I can determine what the business will look like</p> <p>Building an innovative environment</p> <p>I can create a working environment that lets people be more their own boss.</p> <p>I can develop a working environment that encourages people to try out something new.</p> <p>I can encourage people to take initiatives and responsibilities for their ideas and decisions, regardless of outcome.</p> <p>I can form partner or alliance relationship with others.</p> <p>Initiating investor relationships</p> <p>I can develop and maintain favorable relationships with potential investors.</p> <p>I can develop relationships with key people who are connected to capital sources.</p> <p>I can identify potential sources of funding for investment</p> <p>Defining core purpose</p> <p>I can articulate vision and values of the organization</p> <p>I can inspire others to embrace vision and values of the company.</p>

	<p>I can formulate a set of actions in pursuit of opportunities.</p> <p>Coping with unexpected challenges</p> <p>I can work productively under continuous stress, pressure and conflict.</p> <p>I can tolerate unexpected changes in business conditions</p> <p>I can persist in the face of adversity</p> <p>Developing critical human resources</p> <p>I can recruit and train key employees.</p> <p>I can develop contingency plans to backfill key technical staff</p> <p>I can identify and build management teams</p>
<p>Chen, Greene and Crick (1998, p. 305)</p>	<p>Innovation</p> <p>New venturing and new ideas</p> <p>New products and services</p> <p>New markets and geographic territories</p> <p>New methods of production, marketing and management</p> <p>Marketing</p> <p>Set and meet market share goals</p> <p>Set and meet sales goals</p> <p>Set and attain profit goals</p> <p>Establish position in product market</p> <p>Conduct market analysis</p> <p>Expand business</p> <p>Management</p> <p>Reduce risk and uncertainty</p> <p>Strategic planning and develop information system</p> <p>Manage time by setting goals</p> <p>Establish and achieve goals and objectives</p> <p>Define organizational roles, responsibilities, and policies</p> <p>Risk-taking</p> <p>Take calculated risks</p> <p>Make decisions under uncertainty and risk</p> <p>Take responsibility for ideas and decisions</p> <p>Work under pressure and conflict</p> <p>Financial control</p> <p>Perform financial analysis</p> <p>Develop financial system and internal controls</p>



<p>Barakat, Boddington, and Vyakarnam (2014)</p>	<p>Control cost</p> <p>Innovation</p> <p>Apply new and practical ideas.</p> <p>Apply a fresh approach to problems.</p> <p>Financial Value:</p> <p>Know how much to place the proper financial value on a start-up company.</p> <p>Estimate the number of people who are likely to buy a new product or service.</p> <p>Attitude to Risk</p> <p>It would kill my career if I helped form a new business that failed.</p> <p>Starting a company is too much like betting against the odds.</p> <p>Teamwork</p> <p>I find it easy to balance different ideas within a team.</p> <p>I find it easy to solve problems within a team</p> <p>Product development:</p> <p>Lead a technical team developing a new product to a successful result.</p> <p>Hear a product concept based on a technology and have a rough idea if it is practical.</p> <p>Startup processes</p> <p>Understand what it takes to start your own enterprise.</p> <p>Understand the language of new venture creation.</p> <p>Leadership:</p> <p>Find an approach that resolves a group conflict and gets your own team moving forward on a task</p> <p>Motivate others to work long hours and to meet a deadline.</p> <p>Creativity</p> <p>Generate ideas revolutionary to the field you are in.</p> <p>Generate novel but operable work-related ideas.</p> <p>Appetite for starting up</p> <p>At least once I will have to take a chance and start my own company.</p> <p>If I see an opportunity to start a company, I'll take it.</p>
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## APPENDIX 3: MEASURES USED IN BASELINE SURVEY (STAGE A)

### *Demographic information*

Standard demographic questions included age, firm stage, gender, nationality, and education.

### *Dispositional/trait affect*<sup>13</sup>

Indicate to what extent you generally feel this way, that is, how you feel on average...

Lea cada una y marque en la cuadrícula cómo se ha venido sintiendo usted generalmente a lo largo de su vida, según la siguiente escala...

0. Very slightly or not at all, 10. Extremely

0. Muy ligeramente o nada, 10. Extremadamente

1. Interested	1. Interesado/a
2. Distressed	2. Afligido/a
3. Excited	3. Estimulado/a
4. Upset	4. Disgustado/a; molesto/a
5. Strong	5. Fuerte
6. Guilty	6. Culpable
7. Scared	7. Asustado/a
8. Hostile	8. Hostil
9. Enthusiastic	9. Entusiasmado/a
10. Proud	10. Orgullosa/a
11. Irritable	11. Irritable
12. Alert	12. Alerta/desperto
13. Ashamed	13. Avergonzado/a
14. Inspired	14. Inspirado/a
15. Nervous	15. Nervioso/a
16. Determined	16. Decidido/a
17. Attentive	17. Atento/a
18. Jittery	18. Nervioso/a

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<sup>13</sup> Adapted from the Positive and Negative Affect Schedule (Watson et al., 1988).

19. Active

19. Activo/a

20. Afraid

20. Temeroso/a

***Personality*<sup>14</sup>**

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Aquí figuran una serie de rasgos de personalidad que pueden o no referirse a usted. Por favor, escriba un número al lado de cada par de expresiones para indicar en qué medida está de acuerdo o en desacuerdo con ellas. Valore el grado en que cada par de rasgos corresponde a su persona, aunque una pueda corresponder en más grado que otra.

0. Disagree strongly, 10. Agree Strongly

0. Muy en desacuerdo, 10. Muy de acuerdo

I see myself as...

Me veo a mí mismo/a como a una persona...

1. Extraverted, enthusiastic.

1. Extrovertida, entusiasta.

2. Critical, quarrelsome.

2. Crítica, discutidora.

3. Dependable, self-disciplined.

3. Fiable, auto-disciplinada.

4. Anxious, easily upset.

4. Ansiosa, fácilmente alterable.

5. Open to new experiences, complex.

5. Abierta a nuevas experiencias, polifacética.

6. Reserved, quiet.

6. Reservada, callada.

7. Sympathetic, warm.

7. Comprensiva, amable.

8. Disorganized, careless.

8. Desorganizada, descuidada.

9. Calm, emotionally stable.

9. Serena, emocionalmente estable.

10. Conventional, uncreative

10. Tradicional, poco imaginativa.

***Personal Initiative*<sup>15</sup>**

Indicate the frequency in which you behave this way in general...

Indique la frecuencia en la que se comporta de esta manera, en general...

0. Never, 10. A great deal

0. Nunca, 10. Muchas veces

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<sup>14</sup> Adapted from the Ten- Item Personality Inventory (TIPI) (Gosling et al., 2003)

<sup>15</sup> Adapted from Frese, Fay, Hilburger, Leng and Tag's (1997) Personal Initiative measure.

- |   |  |
|---|--|
| 1. I actively attack problems   | 1. Abordo activamente problemas  |
| 2. Whenever something goes wrong, I search for a solution immediately | 2. Cada vez que algo sale mal, busco una solución inmediatamente             |
| 3. Whenever there is a chance to get actively involved, I take It     | 3. Siempre que hay una oportunidad de involucrarse activamente, la aprovecho |
| 4. I take initiative immediately even when others don't               | 4. Tomo la iniciativa de inmediato, incluso cuando otros no lo hacen         |
| 5. I use opportunities quickly in order to attain my goals            | 5. Aprovecho las oportunidades rápidamente para alcanzar mis metas           |
| 6. Usually I do more than I am asked to do                            | 6. Por lo general hago más de lo que se me pide hacer                        |
| 7. I am particularly good at realizing Ideas                          | 7. Soy particularmente bueno/a en concretar Ideas                            |

### *Self-efficacy*<sup>16</sup>

How capable do you believe you are in performing each of the following tasks?

0. Strongly disagree, 10. Strongly agree

I can....

1. successfully identify new business opportunities
2. create new products
3. think creatively
4. commercialize an idea or develop something new

¿Qué tan capaz cree ser en la realización de cada una de las siguientes tareas?

0. Muy en desacuerdo, 10. Muy de acuerdo

Yo puedo ....

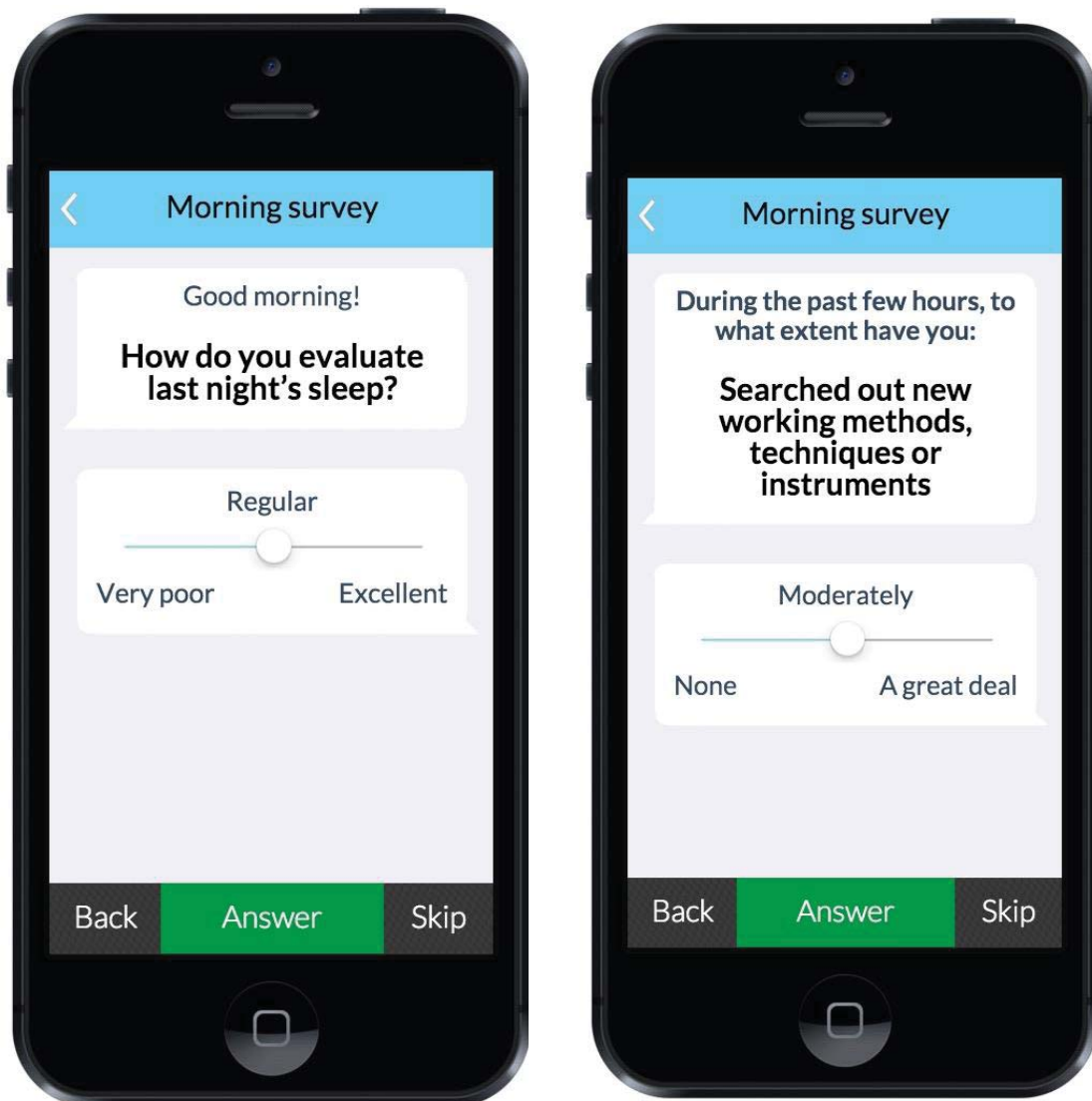
1. identificar con éxito las nuevas oportunidades de negocio
2. crear nuevos productos
3. pensar de forma creativa
4. comercializar una idea o desarrollar algo nuevo

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<sup>16</sup> Adapted from Zhao, Seibert and Hills (2005) entrepreneurial self-efficacy measure.

## APPENDIX 4: MEASURES USED IN ESM SURVEYS (STAGE B)

ESM surveys were completed on respondents' smartphones via a specialised ESM application, MetricWire. Each question was presented separately on a new screen. Examples of how the questions were displayed are presented in the screen shots below.



***State affect***<sup>17</sup>

Indicate to what extent you feel this way right now, that is, at the present moment.

1. Very slightly or not at all, 2. A little, 3. Moderately, 4. Quite a bit, 5. Extremely

Indique en qué medida se siente así en el momento actual.

1. Muy poco o nada, 2. Un poco, 3. Moderadamente, 4. Regularmente, 5. Extremadamente

***High activation pleasant affect***

Enthusiastic

Inspired

Entusiasmo

Inspiración

***High activation unpleasant affect***

Anxious

Tense

Angustia

Tension

***Low activation pleasant affect***

Relaxed

Calm

Relajo

Calma

***Innovative work behaviour***<sup>18</sup>

During the past few hours, to what extent have you.....

1. None, 2. A little, 3. Moderately, 4. Quite a bit, 5. A great deal

1. searched out new working methods, techniques or instruments
2. generated original solutions for problems
3. wondered how things can be improved
4. attempted to convince people to support an innovative idea

Durante las últimas horas, en qué medida ha....

1. Nunca, 2. Casi nunca, 3. Poco, 4. Mucho, 5. Bastante

1. buscado nuevos métodos, técnicas o instrumentos de trabajo
2. generado soluciones originales a los problemas
3. pensado cómo se pueden mejorar las cosas
4. tratado de convencer a la gente para apoyar una idea innovadora

<sup>17</sup> Adapted from the Multi-Affect Indicator (Warr, Bindl, Parker, & Inceoglu, 2014).

<sup>18</sup> Adapted from De Jong and Den Hartog's (2010) innovative work behaviour measure.

5. put effort in the development of new things

5. invertido esfuerzo en el desarrollo de nuevas cosas

*Sleep quality*<sup>19</sup>

How do you evaluate this night's sleep?

Evalúe cómo durmió anoche.

1. Very poor, 2. Poor, 3. Regular, 4. Good, 5. Excellent.

1. Muy mal, 2, Mal, 3. Regular, 4. Bien, 5. Muy bien.

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<sup>19</sup> Adapted from the Pittsburgh Sleep Diary (Monk et al., 1994).

## APPENDIX 5: SUMMARY OF RESULTS AND OVERVIEW OF HYPOTHESES

<i>Hypothesis</i>	<i>Supported</i>	<i>Table</i>
Hypothesis 1a: High activation pleasant affect will positively predict entrepreneurs' innovative work behaviour.	Yes	Table 2: Multilevel model of direct and interactive effects on innovative work behaviour, p. 64.
Hypothesis 1b: Low activation pleasant affect will not predict entrepreneurs' innovative work behaviour.	Yes	
Hypothesis 1c: High activation unpleasant affect will positively predict entrepreneurs' innovative work behaviour.	Yes	
Hypothesis 2a: Positive dispositional affect will moderate the strength of the relationship between entrepreneurs' high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in positive dispositional affect, than entrepreneurs low in positive dispositional affect.	No	
Hypothesis 2b: Negative dispositional affect will moderate the strength of the relationship between entrepreneurs' high activation unpleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in negative dispositional affect, than entrepreneurs low in negative dispositional affect.	No	
Hypothesis 3a: Openness to experience will moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in openness to experience than for entrepreneurs low in openness to experience.	No	
Hypothesis 3b: Hypothesis 8. Extraversion will moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in extraversion than for entrepreneurs low in extraversion.	No	
Hypothesis 4a: Personal initiative will moderate the strength of the relationship between high activation pleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs	No	



<p>high in personal initiative, than for entrepreneurs low in personal initiative.</p> <p>Hypothesis 4b: Personal initiative will moderate the strength of the relationship between high activation unpleasant affect and innovative work behaviour, such that the relationship will be stronger for entrepreneurs high in personal initiative, than for entrepreneurs low in personal initiative.</p> <p>Hypothesis 5a: Sleep quality will moderate the relationship between high activation pleasant affect and innovative work behaviour, that is to say the relationship will be stronger for entrepreneurs with high previous night sleep quality, than for entrepreneurs with low previous night sleep quality.</p> <p>Hypothesis 5b: Sleep quality will moderate the relationship between low activation pleasant affect and innovative work behaviour, that is to say the relationship will be stronger for entrepreneurs with high previous night sleep quality, than for entrepreneurs with low previous night sleep quality.</p> <p>Hypothesis 6a: The relationship between positive dispositional affect and entrepreneurs' innovative work behaviour will be curvilinear in nature, such that innovative work behaviour increases with high activation pleasant affect until an inflection point, when the relationship then becomes negative.</p>	<p>No</p> <p>Yes <b>Figure 10</b></p> <p>Yes <b>Figure 11</b></p> <p>No</p> <p>Table 3: Curvilinear regression with trait affect as the independent variable and innovative work behaviour as the dependent variable, p. 65.</p>
<p>Hypothesis 7a: High activation pleasant affect will moderate the relationship between high activation unpleasant affect in the morning and innovative work behaviour in the afternoon, such that the relationship will be stronger at high levels of high activation pleasant affect.</p> <p>Hypothesis 7b: High activation pleasant affect will moderate the relationship between low activation pleasant affect in the morning and innovative work behaviour in the afternoon, such that the relationship will be stronger at high levels of low activation pleasant affect, than at low levels of low activation pleasant affect.</p>	<p>Yes <b>Figure 14</b></p> <p>No</p> <p>Table 8: Estimates of affective change effects on innovative work behaviour, p. 75.</p>

Hypothesis 8a: An increase in high activation pleasant affect between the morning and afternoon will be positively related to innovative work behaviour.	Yes
Hypothesis 8b: A decrease in low activation pleasant affect between the morning and afternoon will be positively related to innovative work behaviour.	No
Hypothesis 8c: An increase in high activation unpleasant affect between the morning and afternoon will be positively related to innovative work behaviour.	Yes
Hypothesis 9a: Change in affect will be a better predictor of innovative work behaviour in the afternoon, than affect in the morning.	No
Hypothesis 10a: Entrepreneurs' positive dispositional affect will be positively related to the experience of high activation.	Yes
Hypothesis 10b: Entrepreneurs' positive dispositional affect will be positively related to the experience of low activation.	No
Hypothesis 11a: Entrepreneurs' negative dispositional affect will be negatively related to the experience of high activation.	Yes
Hypothesis 11b: Entrepreneurs' negative dispositional affect will be negatively related to the experience of low activation.	Yes
Hypothesis 12a: Extraversion will be positively related to the experience of high activation pleasant affect in entrepreneurs.	No
Hypothesis 12b: Extraversion will be positively related to the experience of low activation pleasant affect in entrepreneurs.	No
Hypothesis 13a: Sleep quality will be positively related to high activation.	Yes

Table 4: Direct effects on high and low activation pleasant affect, p. 70.

Hypothesis 13b: Sleep quality will be positively related to low activation.	Yes	
Hypothesis 10c: Entrepreneurs' positive dispositional affect will be negatively related to the experience of high activation.	No	Table 5: Direct effects on high activation unpleasant affect, p. 71.
Hypothesis 11c: Entrepreneurs' negative dispositional affect will be positively related to the experience of high activation.	Yes	
Hypothesis 13c: Sleep quality will be negatively related to high activation.	Yes	
Hypothesis 14a: Engaging in innovative work behaviour in the morning will relate negatively to high activation pleasant affect in the afternoon.	Yes	Table 6: Direct effects of innovative work behaviour on change in affect, p. 72.
Hypothesis 14b: Engaging in innovative work behaviour in the morning will relate negatively to low activation pleasant affect in the afternoon.	Yes	
Hypothesis 14c: Engaging in innovative work behaviour in the morning will relate positively to high activation unpleasant affect in the afternoon.	Yes	

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