The Role of Core Affect Dynamics on Work Task Engagement

A thesis submitted in fulfillment of the requirements for the degree of

Doctor of Philosophy

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Declaration

I certify that, except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Joel Michael Haire

1/02/2018
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<th>Description</th>
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<tbody>
<tr>
<td>ASM</td>
<td>Affective Shift Model</td>
</tr>
<tr>
<td>CFI</td>
<td>Comparative Fit Index</td>
</tr>
<tr>
<td>COR</td>
<td>Conservation of Resources</td>
</tr>
<tr>
<td>DEM</td>
<td>Dynamic Engagement Model</td>
</tr>
<tr>
<td>EEG</td>
<td>Electroencephalographic</td>
</tr>
<tr>
<td>EPM</td>
<td>Episodic Process Model</td>
</tr>
<tr>
<td>MBI</td>
<td>Maslach Burnout Inventory</td>
</tr>
<tr>
<td>NA</td>
<td>Negative Affect (Activation)</td>
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<tr>
<td>PA</td>
<td>Positive Affect (Activation)</td>
</tr>
<tr>
<td>PAD</td>
<td>Pleasant–Unpleasant, Aroused–Sleepy, and Dominance-Submissiveness</td>
</tr>
<tr>
<td>PANAS</td>
<td>Positive and Negative Affect Schedule</td>
</tr>
<tr>
<td>PEM</td>
<td>Performance and Emotions Model</td>
</tr>
<tr>
<td>PPLVGCM</td>
<td>Parallel Process Latent Variable Growth Curve Model</td>
</tr>
<tr>
<td>RMSEA</td>
<td>Root Mean Square Error of Approximation</td>
</tr>
<tr>
<td>SCAS</td>
<td>Swedish Core Affect Scales</td>
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<tr>
<td>SEM</td>
<td>Structural Equation Modeling</td>
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<tr>
<td>SMVM</td>
<td>Shirom-Melamed Vigor Measure</td>
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<tr>
<td>TAG</td>
<td>The Affect Grid</td>
</tr>
<tr>
<td>TEA</td>
<td>Task Engagement Affect</td>
</tr>
<tr>
<td>TLI</td>
<td>Tucker–Lewis Index</td>
</tr>
<tr>
<td>TUT</td>
<td>Task-unrelated Thoughts</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
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<tr>
<td>UWES</td>
<td>Utrecht Work Engagement Scale</td>
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## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>AFFECT TERMS</td>
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<tr>
<td>Affect</td>
<td>A family of subjective experiences relating to feelings and representing a taxonomy (Lord, Klimoski, &amp; Kanfer, 2002). Subjective feelings include emotions, moods, anxiety, stress, and depression.</td>
</tr>
<tr>
<td>Affective experience</td>
<td>An observed or reported occurrence of any affect as either a transitory state (e.g., emotion) or trait (e.g., neuroticism).</td>
</tr>
<tr>
<td>Affective state</td>
<td>A transitory occurrence of affect where the period of transition may be seconds, minutes, hours, days, or weeks.</td>
</tr>
<tr>
<td>Affective trait</td>
<td>A stable lifelong predisposition to stay in a location in the core affect space away from the neutral position (where the dimensions intersect). For example, individuals whose affective states tend to be consistently in the deactivated unpleasant quadrant in the long term may diagnose as depressed (Kuppens, Oravecz, &amp; Tuerlinckx, 2010).</td>
</tr>
<tr>
<td>Core affect</td>
<td>A state consisting of the combination of the elementary, consciously accessible feelings of activation (arousal) and hedonic tone (pleasure) (Feldman Barrett &amp; Russell, 2015).</td>
</tr>
<tr>
<td>Core affect activation</td>
<td>An individual’s subjective sense of his or her level of mobilized energy, ranging from no activation (extreme sleepiness) to hyper-activation (alert readiness). Bipolar in structure. Synonyms from the literature include arousal, energy, tension, and activity (Russell, &amp; Barrett, 1999). Activation changes occur in a single dimension over time.</td>
</tr>
<tr>
<td>Core affect hedonic tone</td>
<td>An individual’s subjective sense of the degree of pleasantness the individual appraises, based on how well the individual is moving toward their goal. Bipolar in structure. Synonyms from the literature include valence, pleasure–displeasure, utility, good–bad mood, pleasure–pain, approach–avoidance, rewarding–punishing, appetitive–aversive, and positive–negative (Russell, &amp; Feldman Barrett, 1999). Hedonic tone changes occur in a single dimension over time.</td>
</tr>
<tr>
<td>Core affect space</td>
<td>A two-dimensional Cartesian space created by using activation and hedonic tone as orthogonal dimensions. The two-dimensional space creates an area in which emotions, moods, stress, and anxiety are placed according to the status of the core affect associated with the episode, trait, or state of the affective state. Also referred to as the core affect grid (Russell, Weiss, &amp; Mendelsohn, 1989).</td>
</tr>
<tr>
<td>Core affect trajectory</td>
<td>The movements over time of an individual’s core affect state within the two-dimensional core affect space. The movements involve amplitude (intensity) changes and qualia (dirctional) changes as the individual’s core affect shifts over time.</td>
</tr>
<tr>
<td>Flow</td>
<td>A short-term episodic peak experience during which individuals narrow their attention to focus on specific stimuli, involving little conscious control over their actions (Csikszentmihalyi, 1997).</td>
</tr>
<tr>
<td>Positive activation (PA) affect states</td>
<td>Affective states classified as activated positively and found in the activated pleasant quadrant of the core affect space (second positive affect) (Previsely known as Positive affect)</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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<td>quadrant). Also identified as positive affect (or PA) (Russell &amp; Barrett, 1999).</td>
<td>An area of psychology attempting to understand and foster factors that allow individuals to flourish (Fredrickson, 2004).</td>
</tr>
<tr>
<td>Negative activation (NA) affect states-Previously known as negative affect</td>
<td>Affective states classified as activated negatively and found in the first quadrant of the core affect space. Also identified as negative affect (or NA) (Russell &amp; Barrett, 1999).</td>
</tr>
<tr>
<td>Personal resources</td>
<td>Broadly speaking, these are time and energy applied to neuro-physiological demands and physical movement (Hobfoll, 1999).</td>
</tr>
<tr>
<td>Employee engagement</td>
<td>The degree to which employees passionately, persistently, and vigorously associate with their employer, their job, and their profession (Z. S. Byrne, 2015; Schaufeli &amp; Salanova, 2011).</td>
</tr>
<tr>
<td>Employee work task engagement</td>
<td>Work task engagement is the application level of cognitive, affective, and physical resources by an individual at work (as distinct from play, games, and relaxation). Work task engagement requires performing a distinct set of measurable and independent sequential or parallel mental or physical activities that effectively and efficiently produce distinct outcomes (Fredricks, Blumenfeld, &amp; Paris, 2004; Thompson, 2014). Work task engagement is characterized broadly by vigor, dedication, and absorption while undertaking a task (Schaufeli &amp; Salanova, 2011; Schaufeli, Salanova, González-Romá, &amp; Bakker, 2002). Work task engagement is a bipolar construct ranging from minimal engagement to full engagement. Minimal engagement is a mechanistic routine operational interaction. Full engagement indicates full immersion with full commitment of all resources to the interaction (Halbesleben, 2011). Closely related constructs include attention, focus, and commitment.</td>
</tr>
<tr>
<td>Disengagement</td>
<td>Allocating no resources to an engaged entity. No engagement of resource allocation to the interaction at any level (O’Brien &amp; Toms, 2008, p. 950).</td>
</tr>
<tr>
<td>Individual engagement</td>
<td>The level of personal resources committed to deal with an artifact, objective, feeling, idea, activity, role, other person, or social entity.</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>The effort that occurs in the absence of external contingencies or free choice persistence (Deci &amp; Ryan, 1999). Job engagement is positively related to, yet distinct from, intrinsic motivation.</td>
</tr>
<tr>
<td>Job engagement</td>
<td>The simultaneous employment and expression of a person’s preferred self in task behaviors that promote connections to work and to others’ personal presence (physical, cognitive, and emotional) and active, full performances (Kahn, 1990).</td>
</tr>
<tr>
<td>Job involvement</td>
<td>The degree to which employees perceive their job performance to be consistent with their central characteristics of their self-concept (Vroom, 1964).</td>
</tr>
<tr>
<td>Job satisfaction</td>
<td>The attitude of employees toward their job. A positive appraisal of one’s job is associated with pleasant feelings about one’s overall experience with the job (Locke, 1976).</td>
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<td>Term</td>
<td>Definition</td>
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<td>Organizational citizenship behavior</td>
<td>Discretionary behavior that is not recognized by the formal role and reward system that promotes the effective and efficient functioning of the organization (Spector &amp; Fox, 2002).</td>
</tr>
<tr>
<td>User engagement—technology</td>
<td>Quality of user experience in interacting with technology, characterized by attributes of challenge, positive affect, endurance aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity, and perceived user control (O’Brien &amp; Toms, 2008, p. 938).</td>
</tr>
<tr>
<td>Student engagement</td>
<td>Students’ expenditure of time and effort on activities empirically linked to desired university outcomes. This term also includes the engagement of the university with the student to encourage the student’s engagement (Kuh, 2009).</td>
</tr>
<tr>
<td>Student work task engagement</td>
<td>A meta-construct that incorporates emotional engagement, cognitive engagement, and behavioral engagement (Fredricks et al., 2004).</td>
</tr>
<tr>
<td>Workplace engagement</td>
<td>An encompassing term for all forms of engagement by an employee in a workplace. This term incorporates work, job, employee, organizational, and work task engagement.</td>
</tr>
<tr>
<td>Work engagement</td>
<td>The degree to which an employee approaches his or her work with a positive, persistent, pervasive, non-focused, fulfilling, work-related state of mind, characterized by vigor, dedication, and absorption (Schaufeli, Bakker, &amp; Salanova, 2006; Schaufeli et al., 2002).</td>
</tr>
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</table>
Abstract

Work task engagement is an essential precursor to task outcomes and a contributor to overall performance during employment. Practitioners and researchers in psychology (specifically education) and information sciences have devoted attention to work task engagement; however, within the organizational science discipline, the attention has been scant. Researchers have focused attention on the broader and longer-duration constructions of work engagement and job engagement as an enduring, static phenomenon. However, recently, investigators in organizational science have reaffirmed work and job engagement as dynamic constructs and the result of a principal contribution by work task engagement. Little research exists on the mechanics of this dynamism. Thus, this thesis aims to contribute to our understanding of the mechanics of work task engagement dynamism in order to understand the ebbs and flows in in relation to the broader, more enduring constructions.

A component of emotions, moods, anxiety, stress, identified as core affect, task feedback, and task challenge (difficulty) are related to work task engagement. These variables are identified in the literature as influential in work task engagement, while core affect, task feedback, and task challenge are also prone to ebbs and flows. This thesis proposed six hypotheses associating these constructs. A quasi-experiment tested this thesis, with 314 participants, who were asked to perform an on-line computer mediated task consisting of a series of activities, one of which required watching a randomly assigned brief affect evocative video clip. The participants reported their core affect states and the system provided feedback at appropriate stages. During the last activity, this feedback was a quantitative score.

The findings supported all hypotheses. That is, positively increasing activation and positively increasing hedonic tone (positively increasing core affect) led to
increasing work task engagement. Task feedback was confirmed as associated with work task engagement, but through activation and hedonic tone (core affect). Task challenge was positively associated with work task engagement. Importantly, task challenge was negatively associated with task feedback. As challenge increased, feedback became more negative. This situation created a dampening effect. As task challenge increased, work task engagement increased; however, offset against this direct challenge increase was the greater likelihood of negative feedback, which negatively affected increased activation and hedonic tone (core affect), thereby reducing work task engagement.

The implications of this study for organizational science research on engagement in the workplace include identification of work engagement and job engagement as dynamic constructs under the influence of the dynamism of work task engagement. Researchers in the future should be cognizant that engagement models need to be developed at the work, job and task level that better encompass this dynamism. In addition, a result of affective changes within employees while engaging in work tasks, management, teachers, and software developers must take care in delivering feedback and in the level of challenge they design into tasks. For example, attempting to improve work task engagement by increasing the task challenge could be offset by the negative influence of poorer performance and hence less positive feedback on activation and hedonic tone. In turn, this negative influence on activation and hedonic tone leads to less work task engagement.
Chapter 1

Introduction

Overview

This chapter introduces the thesis aim and briefly discusses the current research and theoretical background associated with the objective. This chapter then presents a narrative, starting with broad coverage of employees’ engagement with their workplace, before narrowing the focus to the more specific context of work task engagement. The chapter then introduces the antecedents to work task engagement identified in the domains of psychology and information sciences, alongside the research hypotheses and a hypothetical, theoretical model. Chapter 1 concludes with a brief description of the structure of the thesis and its contributions to practice and research.

You will never plow a field if you only turn it over in your mind.

—Irish proverb

1.1 Thesis aim

The aim of this research is to add to the body of knowledge regarding the influence of affect state dynamics on work task engagement—a form of engagement found in all workspaces, including employment, education, and information system contexts. Affect states fluctuate and are experienced as different feelings or shifts in the intensity of feelings (Watson, 2000) at any given moment of time. This research’s principle focus is the ways these fluctuations in affect states influence the work task engagement of individuals while undertaking computer-based work activities.
1.2 Thesis context

Work task engagements by individuals are a subset of engagement forms that occur in locations (workspaces) where individuals perform non-leisure tasks. A critical workspace is an individual’s workplace where individuals play the role of employees. In these roles, employees make moment-by-moment decisions to engage or not engage in a range of possible actions. If the decision is to engage, associated decisions are the appropriate resources and the level of each resource to engage. The answers to these questions drive employees’ performance (Kahn, 1990), health (Z. S. Byrne, 2015) and wellbeing (Kahn, 1990). Higher engagement leads to higher productivity and wellbeing—a fully engaged employee is a productive, happy employee. An employee who is less than fully engaged is at best unproductive and at worst unhappy, unhealthy, (Kahn, 1990) and sometimes dangerous (such as flight traffic controllers or surgeons).

Employers benefit from employees’ engagement. Every day, employers are dependent on the application of employees’ resources. The efficiency and effectiveness of employer enterprises depend on employees allocating the maximum level of appropriate resources to their tasks, jobs, work, and enterprises (Byrne, 2015). Workplace engaged employees give enterprises competitive advantage (Rich, Lepine, & Crawford, 2010). Engaged employees are more stable, have a lower inclination to turnover (Rich et al., 2010), and are likely to exhibit organizational citizenship behavior (Babcock-Roberson & Strickland, 2010), while disengaged employees are more likely to exhibit counterproductive work behaviors (Sulea et al., 2012). The result of workplace engagement is a contribution to financial performance, such as returns to shareholders (Harter, Schmidt, & Hayes, 2002). In addition, engagement levels are contagious (Byrne, 2015)—highly engaged employees create a climate that contributes to increased
engagement, while disengaged or declining engagement employees create a climate of disengagement.

Despite the identified importance of engagement, there is room for improvement in existing engagement levels. In the United States (US), lack of workplace engagement costs enterprises US$350 billion per year. Meanwhile, internationally, 87% of workers in 142 countries are disengaged (Harter et al., 2002). Research undertaken by practitioners and consultants (Saks, 2006) has appeared in the practitioner-consultant literature. These practitioners have established workplace engagement as an antecedent to work performance and behavior beyond contractual demands, such as enterprise supporting behavior at work (Gruman & Saks, 2011) and organizational citizenship behavior (Spector & Fox, 2002). Given the critical role attributed to employee engagement in the workplace, it is unsurprising that this topic has received attention in the academic literature.

1.2.1 From confusion to dynamism

There is confusion and a lack of clarity around the construct of engagement in various work areas. The constructions of engagement with educational institutions and learning, engagement with information systems, and engagement with the workplace are all conflicted. The lack of clarity is related to the use of common words that appear in everyday usage. The term “engagement” in everyday use is vague, with broad application. “Engagement” is a word capable of being associated with individuals in many contexts. Individuals can engage with roles, objects, ideas, animals, and other individuals. Confusion commences when the engaged entities lack definitional precision. This lack of definitional precision leads to multiple forms of engagement. Researchers

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1 See Russell and Barrett (1999) for an exposition of the problems encountered in using everyday terms (such as “emotion”) in academia, and the tendency of this practice to cause confusion.
consider these different forms of engagement in parallel, as overlapping in meaning, or as isolated in different research domains and disciplines.

Within organizational science, different perspectives exist. Many employees in the broader context of work decide on the entities with which or whom they will engage (such as social clubs, their jobs, their fellow workers, broad social activities, and contractual activities—such as specific work tasks). Additionally, employees decide which resources (such as physical or cognitive) they will engage and the level of resources they will apply. These options create diversity in the forms of engagement. Thus, researchers have generated conceptualizations and definitions that lack generalizability and clarity. Phrases in the academic and professional literature referring to the engagement of employees at work include work engagement (e.g., Schaufeli & Salanova, 2011), employee engagement, organizational engagement (e.g., Rich et al., 2010), and job engagement (e.g., Kahn, 1990). Within the literature, these phrases are treated as sometimes separate, sometimes overlapping, and sometimes interchangeable constructs (Z. S. Byrne, 2015).

Schaufeli and Salanova (2011) argued for a separation between employee engagement and work engagement, proposing employee engagement as a broader construct than work engagement, because employee engagement incorporates the extra-work roles associated with professional relationships and engagement with the organization, while work engagement is a narrow relationship with the work. This view was shared by Shuck and Wollard (2010) and Saks (2006), who treated employee engagement as an all-encompassing construct that is synonymous with engagement in all aspects of the workplace. Other researchers have referred to engagement as important for organizations (Bakker & Bal, 2010) and rely on context to indicate the engaging entity (e.g., the employee and organization) and the engaged entity (e.g., colleagues, groups,
work activities, work roles, or the organization). These constructs are not detailed specifications regarding the object of engagement, the duration of engagement, or the dynamics of engagement, although all agree that the employee is the engaging agent (e.g., Edwards, 2009; Matthews, Warm et al., 2010). This breadth of possible application has allowed researchers—since Kahn’s (1990) initial conceptualization—to treat engagement according to the theoretical perspectives of the researcher and any theory under investigation (De Lacy, 2016). This lack of focus has led to “a sparse, and diverse, theoretical and empirically demonstrated nomological net” (Macey & Schneider, 2008, p. 10).

Despite this confusing mix of engagement applications, definitions, and operationalizations, two broad interpretations are apparent in the organizational science literature (De Lacy, 2016). The first interpretation defines work engagement as a positive motivational-emotional approach by employees at work (Schaufeli, Martínez, Marques Pinto, Salanova, & Bakker, 2002). The second interpretation defines job engagement as the commitment of the self to the employee work role (Kahn, 1990). However, recently, researchers identified that employees can be engaged in the workplace while undertaking counterproductive activities for the enterprise (Halbesleben, 2011). As a result, these definitions have been narrowed to emphasize the requirement of a movement toward organizational goals. Thus, engagement at work is the commitment of the self in a role leading toward organizational goals, or a positive motivational-emotional state associated with the achievement of organizational goals (Macey, Schneider, Barbera, & Young, 2009).

Apart from debates regarding the appropriate conceptualization of engagement in the workplace, two other debates are apparent in the literature. The first involves the
existence of engagement with the workplace as a static or dynamic construct. Macey and Schneider (2008) stated:

Time frames are rarely if ever explicitly referred to in perspectives related to engagement like those we have described here, and the previous literature referred to seems to implicitly assume a relatively durable engagement state. Thus we, unfortunately, do not have either the appropriate conceptual boundaries or adequate operationalization of these boundaries. (p. 13)

Kahn (1990) initially identified the dynamism of employees’ engagement in their job at work, and there is an emerging interest (Binnewies & Sonnentag, 2013) in Kahn’s (1990) characterization of job engagement as ebbing and flowing during the work day. Sonnentag, Dormann, and Demerouti (2010) suggested that, to understand the full phenomenological experience, researchers need to focus on engagement as a state characterized by momentary and transient experiences. The dynamic perspective is contrary to the positive motivational-emotional interpretation of engagement in the workplace as an enduring, persistent, and pervasive state (Schaufeli et al., 2006).

Associated with this dynamic conceptualization of engagement are transient affect states. For example, Binnewies and Fetzer (2015, p. 246) suggested that “when examining affective states as antecedents of work engagement, we refer to predictors of dynamic work engagement” (p. 246). They went on to identify a form of engagement that they termed “state work engagement.” Despite this mention by Binnewies and Fetzer (2015), there is a lack of research on how dynamic antecedents, such as affect states, influence forms of engagement in the workplace. Among the researchers who have conceptualized employees’ engagement in the workplace as broad, enduring, and static, the identified antecedents include feedback, rewards, job control, job participation, job
security, and supervisor support (Bakker, Albrecht, & Leiter, 2011). The job demands-resources model of burnout (Demerouti, Nacheiner, & Schaufeli, 2001) incorporates the same antecedents. The antecedents proposed in this model are enduring, inclusive organizational-level constructs, and—apart from feedback and perhaps supervisory support—are not subject to short-term fluctuations. Thus, few contributions exist from this perspective regarding the antecedents to a dynamic construction of workplace engagement.

From a more dynamic perspective, Kahn (1992) proposed three antecedents to job engagement: personal meaning, psychological safety, and personal availability. Personal meaning and psychological safety are related to the organization culture and represent more static antecedent conceptualizations. The meaning employees obtain from their work and an environment in which they feel safe are unlikely to fluctuate on a daily basis. Therefore, these antecedents are not likely causation agents in hourly and daily ebbs and flows in employees’ engagement with their workplace. However, the antecedent of personal availability relates to the physical, cognitive, and affective resources individuals have available for work roles, and these can become stretched and renewed during the day, depending on work demands (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009). The movement in resource availability may lead to engagement ebbs and flows within employees in the workplace. Despite the identification of this more volatile antecedent proposed by Kahn (1990), engagement by employees at work as a dynamic construct has lacked attention and is underdeveloped.

Additionally, a component of these long-duration assessments of engagement is shorter-term work task engagements contributing to job, work, and employee engagements. The association between narrower and shorter-duration work tasks and transient affect states is more identifiable in short durations than when averaging the
transient affect states over long durations and then considering associations with work, job, or employee engagement (Sonnentag et al., 2010).

**1.3 Work task engagement**

Researchers have identified employee work task engagement as a neglected yet important area for future research in the organizational science domain dealing with employees’ engagement with the workplace (J. Phillips, 2008; Sonnentag, 2017). Schaufeli and Salanova (2014) stated that:

*We would like to go one step beyond and propose that in addition to habitual work engagement and day-level work engagement—which both focus on work, albeit from a different time perspective—we need to conceptualize task engagement as well. In other words, the object of engagement may be the job in general (habitual work engagement), the particular work-day (day-level work engagement), or the task at hand (task engagement). Jobs consist of several tasks, and employees might feel more engaged while performing some tasks rather than other tasks. Hence, the study of task engagement would allow a more fine-grained analysis of the specific tasks that constitute jobs.* (p. 42)

Thus, employees’ engagement with their tasks at work contributes to their workplace engagement. Work task engagements partially construct workplace engagement. Any effort to improve workplace engagements and hence performance involves some consideration of employees’ work task engagement. Sonnentag (2017) stated:

*The description of vigor, dedication, and absorption as core components of work engagement implicitly draws on task-related processes ... only dedication characterized by a sense of significance enthusiasm,*
inspiration, pride, and challenge refers to affective and cognitive processes that might also occur when not being busy with task. (p. 14)

Sonnentag (2017) here suggested an association between the broader-level conceptualizations of engagement of employees with the workplace and the more specific work task engagement. M. S. Christian, Garza, and Slaughter (2011) identified a linkage between the higher-level work engagement, task characteristics, and task performance. Rich et al. (2010) identified an association between job engagement and task performance. Bakker and Demerouti (2017) identified the reconstruction of tasks as a strategy to increase or improve overall work engagement. Thus, within the organizational sciences, work task engagement inherits some importance because of a contribution to and association with the higher-level and longer-duration (e.g., job, work, and employee) forms of employees’ engagement with the workplace.

In addition to organizational science, work task engagement is a research topic in the education and computer science disciplines. In education and computer science the objectives of tasks are different—learning and computer interaction—yet the personal resources and the various forms they take (such as time and energy applied to the task activities to achieve the task objectives) are still measured as work task engagement. Although these studies focus on understanding the role of work task engagement in learning and computer interaction, the education and computer science interest is further evidence of the importance of the construct.

1.3.1 Defining work task engagement

As with the more encompassing forms of engagement in the workplace, while agreement exists on the importance and contribution of work task engagement, different perspectives, definitions, theories, and operationalizations exist and are conflicting and contended (Fredricks et al., 2004). Investigators have referred to and measured work task
engagement as individuals’ reward level, absorption, and persistence in a work task (Tops & Boksem, 2010); the attention-holding characteristics of a work task (Chapman, 2003; Pintrich & de Groot, 1990); individuals’ energy allocated to a work task (Brehm, Wright, Solomon, Silka, & Greenberg, 1983; Gendolla, 1999); individuals’ fully absorbed state in a work task (commonly called “flow”) (Csikszentmihalyi, 1997); individuals’ mental involvement in a work task (Urh & Pejović, 2016); and work task preference (Goswami & Urminsky, 2017). These examples indicate the diversity that exists; however, consensus is emerging from two definitional perspectives.

First, some researchers consider the level of application of resources as indicative of work task engagement (Bakker, 2011). These definitions define work task engagement around the vigor, dedication, and absorption manifest among individuals performing the task. For example, Sonnentag (2017) focused on the intensity of applying the resources of vigor, dedication, and absorption. Vigor is the level of energy committed to the task, dedication is the level of personal sacrifice to complete the task, and absorption is the focus of attention on the task. Researchers with the second perspective identify the personal task resources (e.g., Fredricks et al., 2004) required to be committed to work tasks. Use of the complete set of resources constitutes work task engagement. Researchers with this perspective—usually education-based researchers—define work task engagement as the commitment of behavioral, cognitive, and affective resources to learning work tasks. In a concession to the application-level-based conceptualizations, the resource class theorists occasionally refine their definitions to include some level of resource application. For example, level of persistent on task behavior, level of attention to instructions, and level of cooperative obedience are manifestations of behavioral engagement (Fredricks et al., 2004). Cognitive engagement pertains to thinking effort (Jimerson, Campos, & Greif, 2003), investment in understanding (Fredricks et al., 2004),
and sustained involvement in a task (J. Phillips, 2008). Affective engagement incorporates responses such as boredom, happiness, anxiety, and sadness (Fredricks et al., 2004). Behavioral resources are applied with vigor, affective resources are applied with dedication, and cognitive resources are fully absorbed.

A synthesis of these views suggests the following work task engagement definition. Work task engagement is the application level of cognitive, affective, and physical resources of an individual at work (Fredricks et al., 2004) performing a distinct set of measurable and independent, sequential or parallel, mental and physical activities that effectively and efficiently produce a distinct management-prescribed and desired output (Thompson, 2014), measured as the degrees of vigor, dedication, and absorption (Schaufeli, Martínez et al., 2002) exhibited by the engaging agent in the work task. The proposed definition excludes a positivity bias evident in other definitions and allows for detrimental outcomes from work task engagement. There is no guarantee that full work task engagement will produce acceptable outcomes for any stakeholders in the completion of the task. For example, concerning employees, Sonnentag (2001) identified the role of work task activities after hours and their negative effect on situational wellbeing. Removing the positive bias ensures that the proposed definition allows for possible undesirable effects on one or more stakeholders in the task being considered (Halbesleben, 2011).

1.4 Work task engagement characteristics: Affect stimulation, task challenge, and task feedback

Managers and practitioners require identification of influences on work task engagement. Mills, Fleck, and Kozikowski (2013) stated that:

*Managers can most effectively increase subordinates’ engagement by increasing their perceived levels of task significance for various work*
activities, enhancing the quality and quantity of feedback, allowing increased decision-making autonomy, offering on-the-job skill variety, and by ensuring, to the degree possible, that subordinates are surrounded by a work environment that is socially supportive. (p. 157)

Researchers require improved understanding and knowledge of the associations in the nomological net of work task engagement. Researchers have identified task characteristics and affect phenomena (O’Brien & Toms, 2008) as classes of constructs involved in the work task engagement nomological web. Task characteristics include the difficulty or challenge in the task, and feedback. Within-person affective phenomena include affective resource levels, affective states, affective management, and affective state changes. These antecedents are now discussed in detail, commencing with the role of affect at work, and then more specifically the concept of affect in work task engagement.

1.4.1 Work task engagement and affect

1.4.1.1 Affect at work

Affective events theory (Weiss & Cropanzano, 1996) introduced the topic of affective events at work and their influence on workplace behavior. Fisher and Ashkanasy (2000) further developed the role of affective events at work and identified an association between affective responses, affective stimuli, and employee behavior. The identification is unsurprising. Affective experiences stimulate and guide individuals’ thoughts and behaviors (Panksepp, 2012). Affective responses can be beneficial or destructive for both or either the employee and employer. Cohn, Fredrickson, Brown, Mikels, and Conway (2009) and Fredrickson and Losada (2005) identified that a pleasantly activated affect state causes many satisfactory outcomes for enterprises and employees. Pleasant activation increases responsible work behavior (Isen & Reeve,
2005), while unpleasant activation increases counterproductive work behavior (Spector & Fox, 2002). Underlying affective events theory is the dynamic nature of within-person affect over time (Hulin & Judge, 2003; Weiss & Cropanzano, 1996). Affective events at work—whether comments from peers or management, or activities within tasks that induce affect—often lead to increased application to work or withdrawal from work (Dalal, Lam, Weiss, Welch, & Hulin, 2009). Affective states related to work tasks can shift, and the outcomes of these shifts on task engagement and work performance can influence work task engagement.

1.4.1.2 Work task engagement and affective resources

Beal, Weiss, Barros, and MacDermid (2005) proposed a disconnection between the transient state-like characteristic of affect and the more traditional static conceptions of performance at work. This reference to performance can be extended to include the traditional static conceptions of employee engagement in the workplace as an antecedent to performance is engagement. Work task engagement interacts with the transient nature of affect in three ways:

1. Association with specific affective states (e.g., pleasant activation states compared with unpleasant activation states). Affective states are a critical antecedent to student task engagement (Fredrickson & Branigan, 2005; Pekrun, Elliot, & Maier, 2009). Examples include vigor at work (Armon & Shirom, 2011), persistence, and engagement (Bledow, Schmitt, Frese, & Kühnel, 2011). Unpleasant activation affect states appear to impede task engagement (Tyson, Linnenbrink-Garcia, & Hill, 2009). Paulitzki, Risko, Oakman, and Stolz (2008) found that high anxiety is detrimental to work task engagement. Some evidence exists to suggest that unpleasant activation affect states may enhance performance, at least initially, by laying the foundation
for enhanced task engagement at a later time. Thus, unpleasant activation can indicate a requirement to engage to complete a task (Bledow et al., 2011).

2. Association with affective state change management (e.g., a shift from unpleasant activation to pleasant deactivation). Russell (2003a) identified that influences of shifts in affect place demands on central executive regulation resources, thereby creating a drain that limits resource availability for work task engagement. Affective state shifts influence work task engagement (Sansone & Thoman, 2005). Affect states (e.g., moods and emotions) vary substantially within individuals during work (Fisher, Minbashian, Beckmann, & Wood, 2013).

3. Association with available affective resource levels (exhausted–renewed–resilient) (Cameron, Ungar, & Liebenberg, 2007; Hobfoll, 1989). Resources are limited and can be reduced over time because of task demands and distractions. Employees need to find a way to replenish their energy on a regular basis (Fritz, Lam, & Spreitzer, 2011; Meijman & Mulder, 1998).

4. Affective states draining energy through the activation of cognition and physical behavior: “Affective experiences create cognitive [resource] demand and influence resource allocation” (Beal et al., 2005, p. 1059).

Three of the above interactions are associated with two theories of affect: the broaden and build theory (Fredrickson, 2004) and the conservation of resources (COR) theory (Hobfoll, 1989). Both theoretical approaches are concerned with the creation, application, and depletion of affective resources in affective states. Positive states improve the availability of physical and mental resources (Fredrickson & Branigan, 2005) for application to work tasks, and, the more resources available, the less stressed the individual and the higher the application to work tasks: “As positive affective states
increase people’s resources, they should be associated with increased dynamic performance and work engagement” (Binnewies & Fetzer, 2015, p. 247).

Fisher and Noble (2004), O’Brien and Toms (2008), Bledow et al., (2011), and Beal et al., (2005), identify affect shifts as influential within work tasks. However, these theories and associated research have some limitations regarding affect and work task engagement. Some studies did not identify work task engagement and instead related affect shifts to performance, thereby omitting the effects of work task engagement (e.g., Beal et al., 2005). Some used a simple surrogate, such as effort or persistence, in place of the more complex phenomenon of work task engagement (e.g., Fisher & Noble, 2004). Some did not use between-measure timespans consistent with the possible frequency of shifts in affect, such as minutes (e.g., Seo & Ilies, 2009), and instead applied longer durations, such as weeks and months, by averaging out the short-term fluctuations. Others employed a limited conceptualization of affect states, such as positive and negative affect (Watson, Wiese, Vaidya, & Tellegen, 1999), which disregards deactivated affect states, such as boredom (e.g., Bledow et al., 2011; Fisher & Noble, 2004).

The situation represents a gap in the literature. There are no extant models or research covering the association between work task engagement and the full range of affective state shifts over short periods. Despite the potential contribution to enterprise operations through workplace engagement and its importance in practice, not to mention cross-discipline contributions, work task engagement has received scant attention from organizational scientists. A search of EBSCO’s Business Source-Complete at 3.00 pm on November 5, 2017 for the period 2010 to 2017 for theoretical and research papers containing the phrase “task engagement” only elicited 10 responses. At the same time and date and for the same period, a search of the phrase “employee engagement” elicited
317 responses. In education, only 15 were identified using the Eric database. No articles existed on within-task, within-person core affect dynamic and work task engagement.

1.4.1.3 Core affect

One cause of the literature gap mentioned above is the difficulty in identifying and measuring affective states over short periods because of the intermittency of emotions and longer-term durations of moods. However, a recently proposed conceptualization from the affective science domain offers a solution. Core affect (Russell & Barrett, 1999) is a conceptualization that incorporates the dimensions of activation (e.g., activated–deactivated) and hedonic tone (unpleasant–pleasant). These two dimensions are orthogonal and, when combined, create an affective state space (Figure 1.1). Researchers have debated the orthogonality (independence) of the two dimensions between and within individuals. Discrete affective experiences are characterized by combinations of different levels of hedonic tone and activation on their respective dimensions. Between individuals, discrete affective experiences are located within a range of a point in the space. For example, anger is characterized by high activation and high unpleasantness, happiness or elation is characterized by high activation and high pleasantness, and boredom is characterized by low activation and high unpleasantness.

Core affect is a universal component of all affective experiences and is always accessible to the individual: “At any point in time, core affect is a blend of pleasure and activation” (Russell & Barrett, 1999, p. 809). Core affect can change rapidly or slowly under the influence of external and internal stimuli. Core affect shifts underpin changes in emotion, moods, stress, confidence, and anxiety. Change is an essential component of core affect’s conceptualization. Thus, core affect is an ongoing underlying and universal measure of affective states and changes with these affective state changes. The
association between all affect states and core affect offers the opportunity to measure affect state changes on a minute-by-minute basis.

![Diagram of core affect space]

**Figure 1.1.** The underlying core affect space. Source: Russell & Barrett, 1999.

### 1.4.2 Task characteristics and work task engagement

Work task engagement is associated in the literature with two crucial task characteristics: task challenge and task feedback. Task challenge has received little attention in the organizational sciences, but much attention in the education and information sciences literature. This attention has led to the conclusion that task challenge should lead to increased effort (engagement) (Fisher & Noble, 2004). Task difficulties and impasses (Fulmer & Tulis, 2013)—the outcomes of task challenge—have been identified as leading to increased engagement. O’Brien and Toms (2008) also identified task challenge to have increasing engagement for work tasks and computer games.

The organizational literature discusses feedback as influential at the work and job level of engagement by researchers (Demerouti et al., 2001; Saks, 2006), but not at the work task level. However, again, in education and information sciences, some attention has been devoted to the importance of feedback in engagement with computer tasks and
student effort. Feedback is an essential component in stimulating and maintaining engagement (O’Brien & Toms, 2008).

1.5 The thesis problem questions

The thesis problem question considers the literature gaps around the dynamics of affect and the influence of the task characteristics of challenge and feedback on work task engagement. No research is apparent in the organizational science literature linking the antecedents of affect shifts, feedback (Rathel, Drasgow, Brown, & Marshall, 2014), and task challenge with work task engagement. Work task engagement may be effected by minute-by-minute core affect changes within individuals, and deserves further study (Beal et al., 2005). Recently, a conceptualization of core affect has presented a measure of minute-by-minute changes in an underlying element of all affective states, which allows tracking of affective state shifts.

The research questions arising from reviews of these constructs and their relationships are:

RQ1. How are within-task core affect activation changes associated with work task engagement within the context of task challenge and feedback?

RQ2. How are within-task core affect hedonic tone changes associated with work-task engagement within the context of task challenge and feedback?

RQ3. How do activation and hedonic tone interact in the context of task challenge and feedback?

1.6 Contributions of the research

This thesis contributes information on work task engagement applicable in the organizational behavior discipline, education discipline, and information science domain. However, work task engagements receive primary attention. The results associate core affect, positive feedback, and task challenge in employee and student work
tasks. Combining core affect, mentioned previously, with the positive psychology wellbeing paradigm and specifically the broaden and build theory of Fredrickson (2004) confirms the importance of PA inputs into task structure during the task design process to achieve higher work task engagement outcomes.

Further, the thesis extends the affective science dynamic theory of core affect to incorporate associations with work task engagement. The findings confirm the independence of activation and hedonic tone, as proposed by constructionists; the positive behavioral outcomes of increasing PA states through increases in activation and hedonic tone; and the theories associated with identifying personal resource application (Bakker & Schaufeli, 2008). Additionally, this research extends and refines challenge-support theory (Mariani, 1997) from the education discipline, where high challenge is associated with high task engagement, and identifies the requirement for positive feedback if performance falters. Suggests task challenge when associated with positive or negative feedback is linked to reducing engagement (O’Brien & Toms, 2008) by limiting activation and hedonic tone when mediating negative feedback. This research also confirms the importance of feedback in stimulating affect at work, as identified by Fisher and Ashkanasy (2000), who elaborated on the work of Weiss and Cropanzano (1996).

Increased knowledge of computer-based experimentation and the application in practice of the core affect grid enhances the literature. In addition, the methodology involved developing a scale to measure work task engagement by using a refined version of the existing Utrecht Work Engagement Scale (UWES) (Schaufeli & Bakker, 2003). This thesis adds to the limited body of knowledge surrounding the transient nature of affective states and relationships with more stable longer-term constructs, such as work task engagement. The results from testing the model add to knowledge and understanding
of within-task and within-individual affective state changes, and their interaction with and influence on work task engagement. Core affect’s activation trajectories and hedonic tone trajectories, feedback during the task, overall rating of the task challenge, and work task engagement are related and tested.

Current practices in education and management can be improved using the findings. This study confirms the critical role of affect for teachers and work managers in task management to ensure higher levels of performance and productivity from employers. Moreover, this study tests and confirms a method for measuring affect experiences on an ongoing basis with minimum interference in tasks. The findings indicate that practitioners need to be sensitive to the association between feedback and task challenge. Task challenge can increase engagement; however, too high a challenge may cause negative feedback, which can reduce work task engagement. If managers or teachers need to increase task challenge, then more positive feedback needs to be given by the supervisor, or the employee’s or student’s self-efficacy needs to be raised to prevent negative self-feedback.

1.7 Thesis outline

The subsequent chapters are structured as follows. Chapter 2, the literature review, comprises an analysis and synthesis of the seminal research on task and work engagement, and draws on literature from education and psychology. This chapter also reviews practitioner literature, to a lesser extent, and then moves on to consider affective experiences at work and the key debates in this area. It then considers the current debates in affective sciences and the emergence of core affect as a universal construct inherent in all affective experiences. This section culminates in the establishment of testable hypotheses regarding construct relationships. The chapter is structured to the broad constructs of engagement, tasks, and affect in the starting sections. This chapter covers
task feedback and task challenge. Finally, the chapter addresses the associations between all four constructs.

Chapter 3 describes the methodology and the online application that delivered the training, tasks, and core affect grid (Russell et al., 1989) identifying the states of the participants during the task activities. It details the task, including a short decision-making activity, reviewing a short movie clip, and goal setting for another short decision-making activity. The computer gives feedback on progress during the activities. This chapter also explains the methodologies for data security and the application testing process before the implementation. The measurement scales are justified using definitions of task engagement and core affect.

Chapter 4 presents a detailed report of the analyses of between- and within-subject statistics, testing the hypothesized model using Mplus (Muthen & Muthen, 1998-2012). The focus is on within-person core affect shifts and the associated task engagement.

Chapter 5 concludes the thesis with an in-depth discussion of the present findings and identification of the thesis contributions. This chapter also presents a final conceptual framework of dynamic affect and its role in task engagement. Tests of the hypotheses and the supporting model are assessed, and their significance is summarized. The implications for theory, research, and practice are discussed. Finally, the limitations of the present study are identified, and a conclusion to the thesis is presented.
Chapter 2

Literature Review

Overview

This review draws on research from three disciplines—organizational behavior, education, and psychology—and examines the literature on engagement, task engagement, affect, task feedback, and task challenge. Initially addressed is a broad overview of engagement phenomena, which leads to a more detailed consideration of work task engagement. Following this, affect is broadly considered, before a more in-depth consideration of the construct of core affect. Task challenge and task feedback are reviewed, and, finally, a proposal is made for an overarching model that synthesizes the extant theories and research.

2.1 Engagement by individuals: A macro-level analysis

2.1.1 The importance of engagement by individuals

Engagement by individuals with some entity is a common topic in the academic and consultant literature. In a review of all EBSCO databases at 3.00 pm on December 15, 2016, a search for peer-reviewed articles containing the word “engagement” in the title delivered 48,805 articles, with duplicates deleted. To put this into perspective, on the same day, a search was completed for all articles with the word “motivation” in the title, and this delivered a similar number of 48,850. Despite the level of researcher and practitioner attention, or perhaps because of the different perspectives involved, there is confusion and diversity of conceptualizations in this field of research. Thus, from the literature and general usage of the term “engagement” in human affairs,
this section seeks to identify some common themes to develop an understanding beyond
the appearance of engagement by individuals.

Everyday connotations of engagement include involvement, commitment, passion, enthusiasm, absorption, focused effort, and energy (Schaufeli & Bakker, 2010). Engagement is ubiquitous in human interactions—everywhere, individuals interact with products, other individuals, ideas, activities, social institutions, machines, other sensate beings, and brands. These interactions presume some level of engagement. Workers are either engaged to some level or are disengaged in their interactions within their workplaces. Couples are engaged in sharing resources, such as time and energy, before betrothal as a preliminary form of commitment, while engaged customers buy brands, support brands, and use brands with greater or lower levels of enthusiasm.

Within these interactions, engagement by individuals is a measure of the level and scope of resources they commit to interacting with external entities. Engaging individuals make an initial decision to avoid or interact with an entity, and then determine the personal resources they will use, and the extent to which they will use these resources in the interaction. Engaging individuals continue to monitor the commitment throughout the interaction, and will vary their application of resources as the moment requires, given internal and external stimuli and their immediately available resources (Beal et al., 2005; O’Brien & Toms, 2008). Eventually, because of exhaustion of personal resources, task completion, or interruption, the individual will withdraw resources and perhaps, finally, decide to stop engaging and cease the interaction (disengage).

Individuals engage either with all their resources or some portion thereof. Full engagement represents full application of their available resources, while low engagement represents a primary application that is mechanistic, routine, and almost habitual (O’Brien & Toms, 2008). An individual’s engagement is similar to a light switch
with a dimmer. The light switch may be on or off; however, if the switch is on, the dimmer can be used to increase or decrease the luminosity. Engagement is either present or not present (disengaged), on or off; however, even when “on,” engagement can vary in intensity.

The challenge of developing general theories and constructions for researchers is the diversity of the entities with which individuals engage. For example, engagement forms involve different objects of engagement in different environments for different durations through the application of different combinations of resources. The environment of engagement may be work, school, or home. The object of engagement may be a task, job, business enterprise, school activity, or lesson. Engagement requires the application of some level of different combinations of personal resources, such as mental or physical resources, and different durations of engagement, ranging from seconds to years. The forms of engagement are numerous; thus, engagement relies on specific contextualization and clear engaged object identification for interpretation.

Engagement is a complex, multifaceted meta-construct (Fredricks et al., 2004) that is capable of being viewed from many perspectives. However, different perspectives lead to confusion and difficulty in interpreting meaning. Ainley (2012) stated:

*Engagement and the associated verb to engage have a range of meanings that go far beyond the educational domain ... However, whether used as a verb to engage or the noun engagement to convey meaning unambiguously, the term requires further specification of the activity that is occupying the subjects time and attention ... However, the reference needs to be explicit to avoid the vagueness and over inclusiveness that can come with terms like engagement.* (p. 304)
Z. S. Byrne (2015) suggested that much of the research effort to date on engagement has been expended in understanding how engagement appears, rather than attempting to understand its genesis, operation, and contribution.

Following Ainley (2012), this section now considers conceptualizations of engagement in psychology and information sciences. The construction of engagement from these two academic domains is related and examined to develop and clarify the construct for this thesis. Examination of the research and theories from psychology focusing on organizational science, education, and information science suggests a hierarchical association between forms of engagement in academia. De Lacy (2016) proposed an engagement hierarchy applicable for the construction of engagement within organizational science. Figure 2.1 presents a hierarchy of work related engagement conceptualizations as utilized in this thesis. Figure 2.1 extends De Lacy’s hierarchy to include conceptualizations from education and information science. In addition, the hierarchy proposed in this thesis is divided into three horizontal levels: a macro-, meso-, and micro-level to allow for detailed conceptualizations to more general conceptualizations to be classified at their respective levels of detail.

At the macro-level, this figure encompasses all engagements by an individual. The meso-level, shown in the middle of the figure, is subdivided into three broad areas based on the engaged objects studied in psychology and information sciences. These engaged objects are employers, teaching institutions, and computer systems. Moving to the micro-level, each of the three broadly engaged objects (e.g., work, school, and systems) are further focused on the engaged object of work tasks. Finally, these engagement forms are further detailed as engagement with computer-based work tasks.
Figure 2.1. Hierarchy of individual human engagements—from workspace to tasks.

2.1.1 Engagement by individuals acting as employees, computer users, and students in their workspace

The two research domains of psychology and information sciences, indicated in Figure 2.1, attend to the micro- and meso-level engagements of a specific form. The psychology domain is further broken down into organizational science and education. The information technology domain attends to user engagement with information technology systems. Within this domain, primary research attention has been devoted to engagement with software interfaces and hardware. From within the domain of psychology, the disciplines of organizational science and education center on engagement at work and engagement at school or university. Within the education discipline, the university, school administration, and university school activities have been researched as the objects of engagement. Within the band of activities are work tasks at school. Within organizational science, employee, job, work, and (rarely) work task engagement have been studied.
The ubiquity of engagement has seen cross-domain and cross-discipline fertilization at the meso-level. For example, engagement researchers from education and information technology share and apply Csikszentmihalyi’s (1997) conceptualization of flow. Schaufeli, Martínez et al. (2002) from the organizational sciences adapted the UWES to research students’ university engagement. Researchers have borrowed and applied engagement methodologies and research across research disciplines at the meso-level.

Within each domain and the disciplines of psychology, organizational sciences, and education, there is an apparent focus on different levels of engagement. Researchers have attended to broadly scoped entities, such as work and jobs, in addition to more narrowly scoped entities, such as tasks. Some researchers have attempted to combine the two levels. Cullinane, Bosak, Flood, and Demerouti (2017) considered skill use by employees to redesign tasks to enhance work engagement. Schaufeli and Salanova (2011) mentioned the potential of micro-level task engagement to influence work engagement at the meso-level. An increasing focus on the lower-level, more detailed forms of engagement has led researchers to comment on the narrowing of engagement conceptualizations (De Lacy, 2016; Dunlop, 2015). The diversity of research because of the variety of entities engaged has led to theories or models that do not generalize beyond the piece of research (O’Brien & Toms, 2008). In commenting on the proliferation of meanings, Macey and Schneider (2008) stated that “this has led to a sparse and diverse theoretical and empirically demonstrated nomological web” (p. 10).
2.2 Engagement by employees in their workplace: A meso-level analysis

2.2.1 Importance of full engagement by employees in their workplace

The primary coverage of this thesis is employee engagement in the workplace, with a focus on work task engagement. This encapsulation is the left-hand branch of Figure 2.1. This section details the importance of and previous studies on workplace engagement. A high level of employee engagement with the workplace is beneficial to both employee and employer. Higher levels of engagement have been linked to improved wellbeing and physical and mental health (Wrzesniewski, Rozin, & Bennett, 2002). Gallup, a US-based consulting company, noted that feelings of disengagement among employees were associated with deleterious effects on their physical and mental health (Harter et al., 2002). Gallup also reported that US businesses lose an estimated US$3 billion dollars every year because of disengaged employees at work (Harter, Schmidt, Agrawal, Plowman, & Blue, 2016).

Practitioners proselytize the positive contributions of workplace engagement to employee performance. MacLeod and Clarke (2009, p. 12) stated:

*Many company leaders described to us the “light-bulb moment” when an understanding of the full potential significance of employee engagement dawned. Tesco Chief Executive Terry Leahy has recorded his reaction when he realized that the company knew more about its customers than it did about its employees, and how the company then set about understanding what the workforce wanted, what motivated them at work and what workplace approaches would best build on those understandings, working in partnership with the retail workers’ union USDAW [Union of Shop, Distributive, and Allied Workers]. As Tim*
Besley, leading economist and member of the Monetary Policy Committee put it, “there is an increasing understanding that people are the source of productive gain, which can give you a competitive advantage.” (p. 12)

However, engagement in the workplace may be misdirected, such as in workplace bullying (e.g., Trépanier, Fernet, & Austin, 2013); sabotage; or excessive, obsessive work task engagement, referred to as “workaholism” (Shimazu, Schaufeli, Kamiyama, & Kawakami, 2015), and its closely related construct of burnout-driven disengagement (e.g., van Beek, Hu, Schaufeli, Taris, & Schreurs, 2012). These examples represent the dark side of workplace engagement, which has costs for the employee, enterprise, and community (Halbesleben, 2011). For all the previously mentioned reasons, considerable attention has been devoted to engagement in the workplace by organizational science researchers focusing on meso-level constructions.

At the meso-level, debate has occurred in the literature over the similarity and overlap of workplace engagement conceptualizations with job satisfaction and job involvement, and this debate is ongoing. Some researchers argue that workplace engagement differs from conceptualizations of personal fulfillment and irritations at work. Job satisfaction and job involvement are psychological evaluations of the hassles, frustrations, and attractiveness of work, while engagement is related to activity at work (Kahn, 1990; Maslach, Schaufeli, & Leiter, 2001; Rich, 2006) and is a broader conceptualization than attitudes or involvement. Alternatively, Newman, Joseph, and Hulin (2010) argued that work engagement should be conceptualized as part of a proposed overarching attitude to work, based on a strong association ($r = 0.77$) between work task engagement and the overarching attitude.

Additionally, researchers have interpreted workplace engagement differently, depending on their theoretical perspective. The terms “employee engagement,” “job
engagement,” “role engagement,” and “work engagement” have been used, yet lack clarity and distinction, which renders the situation unclear in terms of the scope of behavior. For example, Schaufeli and Bakker (2010) attempted to distinguish their conceptualization of work engagement from job engagement (Kahn, 1990), claiming that work engagement narrowly refers to actions at work, while job engagement broadly refers to actions at work and behavior toward the organization.

Different theoretical perspectives with different definitions and constructions of engagement leave the situation confused and conflicted. Engagement as a construct lacks clarity, yet further research in the workplace has only added to the confusion and conflict. The following subsections consider two conflicting constructions of engagement in the workplace at the meso-level.

2.2.2 Role theory perspective on workplace engagement: Job engagement

Apart from human resources consultants—who have developed various workplace engagement surveys that focus on antecedent work contexts, rather than the engaged state of the employee (Rich, 2006), and sometimes treat the employer as the engaging agent—there exist two conceptual foundations on meso-level workplace engagement. These are the role theory perspective (commonly called “job engagement”) and the burnout perspective (commonly called “work engagement”).

Goffman (1961) suggested that employees vary in the intensity of embracing their work roles. This insight was acknowledged and further extended by Kahn (1990), who defined job engagement as:

\[ \text{The simultaneous employment of and expression of a person's } \text{"preferred self" in task behaviors that promote connections to work and to other's personal presence (physical, cognitive, and emotional) and active, full performances.} \text{ (p. 700)} \]
In addition, Kahn (1990) proposed a structure of three dimensions: physical, emotional, and cognitive dimensions. This three-dimensional structure was confirmed by Rich (2006). Figure 2.2 presents a model of job engagement linking antecedents and job engagement, as proposed by role theorists. In addition to identifying engagement in work roles, Kahn (1990) also identified three antecedents to job engagement: the meaningfulness the employee derives from the job, the degree of safety offered to the employee, and the employee’s available resources. These antecedents are shown in the two left columns in Figure 2.2. This list of antecedents was operationalized and confirmed by May, Gilson, and Harter (2004) and Rich et al. (2010).

In a thesis drawing on and synthesizing the work of Kahn (1990) and Csikszentmihalyi (1997), De Lacy (2016) equated job engagement with peak performance. Here, job engagement is treated as a synonym for peak performance; however, a peak performance conceptualization disregards the continuum inherent in the meaning of engagement, running from low to high. De Lacy (2016) examined the engagement characteristics, engagement antecedents, and engagement consequences of an engagement episode. Also from the job engagement school, Rich et al. (2010) held a subtly different perspective on engagement by considering the direct linkages between job engagement and work task performance.
2.2.3 Burnout perspective on workplace engagement: Work engagement

Since the job role conceptualization was proposed, other researchers in the organizational science domain have added further knowledge and confusion to the area by taking a different perspective based on their interest in burnout at work (e.g., Maslach & Leiter, 1997). The burnout perspective of workplace engagement evolved from studies of employee exhaustion and withdrawal. Maslach and Leiter (1997) identified work engagement as a decrease in burnout, stating that “energy turns into exhaustion, involvement turns into cynicism, and efficacy turns into ineffectiveness” (p. 24). Thus, work engagement declines until burnout occurs, indicated by exhaustion, cynicism, and loss of efficacy. Work engagement is identified as the antithesis of burnout, and consists of energy, involvement, and efficacy. By implication, work engagement is assessed by the opposite pattern of scores on the Maslach Burnout Inventory (MBI) scale (Maslach, Jackson, & Leiter, 1981). Unfavorable scores are indicative of burnout, whereas favorable scores are indicative of engagement. By reconceptualizing burnout as an
erosion of work engagement, the entire range of employee wellbeing is covered by the MBI, ranging from the positive pole (work engagement) to the negative pole (burnout).

Later, while still supporting the antithetical association between burnout and work engagement, Schaufeli, Salanova et al. (2002) argued that the use of the MBI scale is inappropriate. Thus, in a semantic shift, work engagement was still held as the positive antithesis of work burnout, but not a bipolar opposite, as burnout theorists claim. Through this subtle shift in the conceptualization and operationalization of work engagement, these researchers proposed the UWES (Schaufeli, Salanova et al., 2002) as an independent measure of work engagement. Three dimensions of work engagement were identified: vigor, dedication, and absorption. Schaufeli, Taris, and van Rhenen (2008) identified this “changing focus in burnout research from an exclusively negative approach [burnout] to the erosion of a positive psychological state [engagement]” (p. 215) and associated this emergence with the influence of positive psychology. This breakaway group of researchers defined work engagement differently. For example, Schaufeli, Salanova et al. (2002) defined work engagement as “a positive, fulfilling work-related state of mind that is characterized by vigor, dedication, and absorption” (p. 74).

In addition to proposing a different definition, these researchers proposed the job demands-resources model, shown in Figure 2.3. This model identifies the role of available resources, shown on the far left, and their moderation by task and job demands, as applied to the job. Resources are divided into two groups: job resources and personal resources. Job resources are shown are enterprise-level constructs, while personal resources appear to be a mixture of stable, enduring, almost personality resources.
Figure 2.3. Job demands-resources model of work engagement. Source: Bakker, 2011.

Bakker and Bal (2010) undertook research considering work engagement with 54 young Dutch teachers, and identified that job resources (consisting of coaching, interaction with supervisors, autonomy, and self-development opportunities) were positively associated with job engagement, and that job engagement was positively associated with performance. The data collection involved an end-of-week diary report. A further study (Llorens, Bakker, Schaufeli, & Salanova, 2007) with 110 Spanish students identified the mediating role of efficacy beliefs in the association between resources and workplace engagement.

2.2.4 Fluctuations in work and job engagement, and their causation

Kahn (1990) described job engagement as episodic phenomena that ebb and flow throughout the day, while the literature has called for definitions of work and job engagement as dynamic constructs. To date, work and job engagement have been conceptualized as enduring phenomena and measured over long durations of an hour or more. At the conclusion of their study of 54 Dutch teachers, Bakker and Bal (2010) identified a lack of research into intra-individual fluctuations in engagement, and
suggested that improved understanding of within-person fluctuations over short periods would lead to coaching and tailored job design. In addition, although researchers have identified the dynamism of workplace engagement, no apparent theories or research appear in academic publications attempting to explain the causation of the fluctuations in workplace engagements at the meso-level.

This situation is not apparent at the micro-level. Some theories and models linking causal variables and work task engagement have appeared in the literature of education, organizational science, and information sciences. The next section considers this micro-level and the related form of work task engagement.

2.3 Engagement by individuals in their tasks: A micro-level analysis

2.3.1 Research on work task engagement

*Every day, my daddy told me the same thing: Once a task is just begun, never leave it till it’s done. Be the labor great or small, do it well or not at all.*

—Smithsonian Magazine, Quincy Jones (2008)

*Every block of stone has a statue inside it, and it is the task of the sculptor to discover it.*

—Michelangelo (1475–1564)

Researchers in organizational science have devoted little attention to work task engagement a comprehensive list of examples include Bujacz, Bernhard-Oettel, Rigotti, & Lindfors, 2017; McBride, Merullo, Johnson, Banderet, & Robinson, 2007; J. Phillips, 2008; Warm, Parasuraman, & Matthews, 2008. Lack of interest in work task engagement by organizational science researchers is not mirrored in education. Researchers in education have shown interest for three decades in learning about work task engagement.
Work task engagement is a construct of significant and consistent interest (Fredricks et al., 2004; Halin, Marsh, Hellman, Hellström, & Sörqvist, 2014). Researchers within the information sciences domain attend to user experiences with computer tasks and the outcome of these experiences.

The research on work task engagement from within these research domains and their respective disciplines has examined engagement with a variety of tasks involving mental resources, physical resources and combinations of mental and physical resources. Mental resource application to tasks include memorizing (e.g., Gendolla, 1999; Smallwood, Obonsawin, & Heim, 2003), attending (e.g., Matthews et al., 2002; Smallwood et al., 2004), decision making (e.g., Cheyne, Solman, Carriere, & Smilek, 2009) and puzzle solving (e.g., L. H. Phillips, Bull, Adams, & Fraser, 2002), and stimulus discrimination (e.g., Gendolla & Krüsken, 2001; Hopstaken, Linden, Bakker, & Kompier, 2015; Smallwood et al., 2004) and detection (e.g., Donald & Donald, 2015), idea generation and reading (e.g., Guthrie et al., 2004). Physical resource applications include gun firing (e.g., McBride et al., 2007) and oddball tasks (Lu, Jaquess, Hatfield, Zhou, & Li, 2017).

More complex combinatorial tasks include researching work task engagement in using a foreign language (e.g., Platt & Brooks, 2002), creating posters (e.g., Vera, Le Blanc, Taris, & Salanova, 2014), playing computer games (e.g., Lynch, Patten, & Hennessy, 2013; Tikuisis, Vartanian, & Mandel, 2014) and writing tasks (e.g., Spaulding, 1995). Thus, from across the disciplines research contributions have generated findings on work task engagement in a diversity of specific tasks.

This research review has established that work tasks have been examined in diverse forms in the literature. Across the domains and their respective disciplines, the research findings are focused on the task form in work task engagement, thereby
neglecting the engagement side of the conceptualization. The research undertaken to date relates to narrower constructions of engagement, such as attention (e.g., Matthews, Reinerman-Jones et al., 2010) and effort (e.g., Fisher & Noble, 2004), with a focus on the task form. Researchers have ignored work task engagement as a general construct, and focused on specific and narrow constructs, yet work task engagement is practiced by the same individuals, regardless of the context.

2.4 Engagement by individuals in work tasks

2.4.1 Importance of employees’ full work task engagement

In the employment context, tasks are an essential component of work life. Life-threatening tasks, such as those managed by surgeons and air traffic controllers, demand full work engagement; however, employees are sometimes less than fully engaged in their work tasks by not committing all their personal resources some of the time (Kahn, 1990). At other times, employees may be fully engaged in personal tasks that do not support the enterprise.

Tasks represent a basic unit of analysis in work, process, and project planning, and tasks performance is identified as contributing to effective and efficient task outcomes. Tasks are clustered to become essential aspects of jobs (Ilgen & Hollenbeck, 1991). Thus, tasks are the building blocks of a job. As such, work task engagements are vital because they act as the foundation of the meso-level engagement constructs of work and job engagement. M. S. Christian et al. (2011) noted that workplace engagement involves high levels of personal investment in the work tasks performed on a job. Vera et al. (2014) linked task engagement to work engagement, stating that “task engagement is a form of work engagement, but which is focused on the specific task at hand” (p. 134).

The scant research attention previously devoted to work task engagement is now changing. Researchers are beginning to consider work task engagement a principal
construct (e.g., Schaufeli & Salanova, 2011; Strauser, O’Sullivan, & Wong, 2012). Some researchers have identified the need to conceptualize work task engagement, and the need for further research and examination of engagement at the task level in the management and organizational behavior domain:

We would like to go one-step beyond and propose that in addition to habitual work engagement and day-level work engagement—which both focus on work, albeit from a different time perspective—we need to conceptualize task engagement as well (Schaufeli, & Salanova, 2011, p. 42).

2.4.2 Importance of students’ full work task engagement

Work task engaged students select tasks at the border of their competencies, and exert intense effort and concentration in learning-based work tasks, showing positive emotions during activities, including enthusiasm, optimism, curiosity, and interest (Chapman, 2003). Work task engaged students expend mental effort, are actively responsive, and exhibit positive attitudes toward work tasks (Chapman, 2003). Education researchers commenced research and discussion about student engagement two decades ago, and continue to research the topic of students’ engagement with tasks. Early examples are Newmann, Wehlage, and Lamborne (1992) and Lambourn, Brown, Mounts, and Steinberg (1992). Agreement now exists about the contribution of student work task engagement to students’ task performance (Fredricks et al., 2004). Reduced engagement is associated with alienation from school and university, and is a precursor to dropping out (Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2014). In education, whatever the form of the learning tasks, the contribution of work task engagement to performance is positive.
2.4.3 Importance of users’ full work task engagement in computer systems

The attention paid to work task engagement in education is reflected in the information sciences. The desirability of engagement in computer-mediated activities (Herrington, Oliver, & Reeves, 2003) is identified in the information sciences literature. Within this domain, considerable attention has been devoted to user experiences to achieve increased user engagement in software applications, including games, spreadsheets, and word processors (Hassenzahl & Tractinsky, 2006). Many work tasks completed by employees and students are mediated by technology, particularly computer technology. Computer technology creates engagement challenges for the users and creators of the hardware and software. O’Brien and Toms (2008) stated:

In the past few decades, human-computer interaction studies have emphasized the need to move beyond usability to understand and design for more engaging experiences ... A web interface that is boring, a multimedia presentation that does not captivate users’ attention or an online forum that fails to engender a sense of community are quickly dismissed with a simple mouse click. Failing to engage users equates with no sale on an electronic commerce site and no transmission of information from a website: people go elsewhere to perform their tasks and communicate with colleagues and friends. (p. 938)

2.5 Work task engagement: Toward a definition

Task performance influences affective states and changes in these states. In turn, these response states and changes have negative or positive influences on task performance. The performance–affect cycle creates a virtuous or vicious cycle within a task, as different task demands lead to different patterns of core affect state changes (Matthews et al., 2002).
The diversity of tasks and their multifaceted manifestations create challenges for researchers in producing operationalizations and conceptualizations that encompass this diversity. The diversity has led to a focus on specific task forms, such as attentional or memory tasks, without the development of generalizable theories. Research on tasks is abundant, yet unrelated. This diversity also creates challenges when used in conjunction with other constructs within workspace engagement.

Tasks are complex, multifaceted phenomena. These facets include discreteness, duration, novelty, choice, difficulty, and complexity (Mitchell & Carbone, 2011). Tasks vary in the context in which they occur (home, work, school, or play) and in duration (seconds, minutes, or hours). Tasks also vary in the resources required to complete them (physical, mental, or technological) and in their objectives. Moreover, task outcomes vary in their number of constituent activities (from one to many) and the number of people required to complete the task. This situational diversity creates definitional diversity, depending on the theoretical perspective of the researcher.

Table 2.1 provides examples of some of the more pertinent definitions associated with work task engagement, organized by organizational science, information sciences, and education. An examination of the table and consideration of extant research indicates that definitions vary based on the number of characteristics identified (ranging from single to multifaceted) and the subjective or empirical nature of these characteristics. Single-characteristic interpretations with empirical manifestations include obedience (Athens, Vollmer, & St Peter Pipkin, 2007), persistence, activated physiological responses, use of social and technological assets (Caulfield, 2010; Reichle, Johnson, Monn, & Harris, 2010), posture, gaze, and effort (Fairclough, Ewing, & Roberts, 2009). These forms of definition have limitations because they do not encompass internal resource application to a task. For example, a person appearing to read efficiently may
not be thinking about the content, or a person writing can be worried about other concerns.

Single-characteristic definitions with subjective manifestations include task-unrelated/related thought (Giambra, 1995; Smallwood et al., 2003; Smallwood et al., 2004), tune outs and zone outs (Schooler, 2004; Smallwood, Fishman, & Schooler, 2007), “mind pops” (Kvavilashvili & Mandler, 2004), engrossment, vigilance, focus (Cheyne, Carriere, & Smilek, 2006; Kane et al., 2007; Reason & Lucas, 1984; Reichle et al., 2010; Seli, Jonker, Cheyne, Cortes, & Smilek, 2015; Smallwood & Schooler, 2006; Wegner, 1997), interest, arousal-motivation (Liem & Martin, 2012), and enjoyment-pleasure (Roberts & Penn, 2009).

Multiple-characteristic subjective definitions include energetic arousal, task motivation, and concentration (Matthews, Warm, Reinerman-Jones, Langheim, Washburn, & Tripp, 2010, p. 189); application of high levels of effort, persistence, dedication, and absorption (Salanova & Schaufeli, 2011); cognition, and emotion (Fairclough et al., 2009), engrossment, quitting feelings, and boredom (Said, 2004). Saks and Gruman (2014) considered that:

When one speaks about employee engagement it is important to be clear about what type of engagement one is concerned about. If work or job engagement involves a willingness to dedicate physical, cognitive, and emotional resources to one’s work, then we can similarly refer to other forms of engagement as a willingness to dedicate physical cognitive and emotional resources to a specific task (i.e., task engagement). (p. 172)

The evidence from this review identifies that the definitions relating to work task engagement are numerous and driven by theoretical perspectives that deliver little agreement regarding the characteristics of engagement, and lack clarity in the engaged
The engaged object (work tasks) is apparently left unmentioned and ambiguous in extant definitions, with the emphasis on a definition of engagement with little concern for the engaging entity or the engaged entity. The lack of specificity is consistent with meso-level conceptualization, where the engaged objects of job, employee, and work are not defined. This lack of precision creates confusion. For this reason, the definition proposed in the thesis incorporates a definition of the engaged object: work task.

This thesis adopts a broad-based definition of work task engagement. Drawing on Fredricks et al.’s (2004) definition and Thompson’s (2014) definition of a task, and in line with Schaufler, Martínez et al. (2002), the definition is: the application level of cognitive, affective, and physical resources of an individual at work (Fredricks et al., 2004) performing a distinct set of measurable and independent, sequential or parallel, mental and physical activities that effectively and efficiently produce a distinct management-prescribed and desired output (Thompson, 2014), measured as the degrees of vigor, dedication, and absorption (Schaufler, Martínez et al., 2002) exhibited by the engaging agent in the work task.

However, it should be noted that the operationalization of this definition could involve assessment of different dimensions, given the activity combination within the task and the resources required to undertake the task. Different tasks will require different resources and different levels of resources.
Table 2.1

<table>
<thead>
<tr>
<th>Study</th>
<th>Definition of Task Engagement</th>
<th>Participants</th>
<th>Setting Duration and Task Numbers</th>
<th>Operationalization Analysis</th>
<th>Strengths/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee Task Engagement</td>
<td>A form of work engagement</td>
<td>Spanish students</td>
<td>A three-task study</td>
<td>Reworded version of the UWES used for measurement, and multilevel modeling used for the analysis</td>
<td>Identified the existence of task engagement shifts over short periods, and the beneficial association between self-efficacy and task engagement.</td>
</tr>
<tr>
<td>Vera et al. (2014)</td>
<td>focused on the specific task</td>
<td>($n = 372$)</td>
<td>over four hours in a laboratory setting</td>
<td></td>
<td><strong>Limitations</strong></td>
</tr>
<tr>
<td></td>
<td>(p. 134)</td>
<td></td>
<td></td>
<td></td>
<td>Did not specifically identify task engagement, but related work engagement to task engagement by the degree of focus on a specific task.</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Strengths</strong></td>
</tr>
<tr>
<td>Computer-mediated Task</td>
<td>Engrossment level, boredom</td>
<td>Students</td>
<td>Playing <em>The Sims</em> computer game</td>
<td>Self-reports of boredom, quitting feelings, and engrossment</td>
<td>Identified the role of goals and feedback in engagement.</td>
</tr>
<tr>
<td>Engagement</td>
<td>level, and quitting tendency</td>
<td>($n = 16$)</td>
<td></td>
<td></td>
<td><strong>Limitations</strong></td>
</tr>
<tr>
<td>Study</td>
<td>Definition of Task Engagement</td>
<td>Participants</td>
<td>Setting Duration and Task Numbers</td>
<td>Operationalization Analysis</td>
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</tbody>
</table>
| Hart and De Angeli (2012)     | Interaction with websites     | Randomly selected computer users ($n = 40$)                                 | Two activities reviewing websites | Positive and Negative Affect Schedule (NA/PA states) item/flow/hedonic tone | Strengths
Identified affect state changes after interacting with websites
The identified changes in affect states were partially associated with aesthetics ratings (hedonic tone), which increased interactivity
Limitations
No engagement (flow) affects captured, possibly because of prior questioning masking this aspect |

**Student Task Engagement**

<table>
<thead>
<tr>
<th>Study</th>
<th>Definition of Task Engagement</th>
<th>Participants</th>
<th>Setting Duration and Task Numbers</th>
<th>Operationalization Analysis</th>
<th>Strengths/Limitations</th>
</tr>
</thead>
</table>
| Redfield and Roenker (1981)   | Proportion of time allocated for task completion | Students in five randomly selected Grade 5 classes across three schools ($n = 134$) | Divided into three groups by reading comprehension ranking; treated with drills, comprehension structuring tasks | Recall of reading and time at task | Strengths
Identified that task engagement as time spent on a task is difficult to consider without taking into account the individual’s ability
Limitations
Time spent on a task is not a sufficiently broad measure of task engagement |
<table>
<thead>
<tr>
<th>Study</th>
<th>Definition of Task Engagement</th>
<th>Participants</th>
<th>Setting Duration and Task Numbers</th>
<th>Operationalization Analysis</th>
<th>Strengths/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthews et al. (2010)</td>
<td>High energetic arousal, task motivation, and concentration (p. 189)</td>
<td>Psychology students $(n = 294)$</td>
<td></td>
<td>Measured cerebral blood flow and subjectively reported engagement using the Dundee Engagement Stress State Questionnaire relating to mood state and cognitive state</td>
<td>Identified task engagement with vigilance and the role of high workloads on the decrement of vigilance</td>
</tr>
<tr>
<td>Strauser et al. (2012)</td>
<td>A positive, fulfilling, effective motivational state of work related to wellbeing, which is the opposite of burnout and is characterized by vigor, dedication, and absorption (Bakker et al., 2008)</td>
<td>Students $(n = 65)$ (57% female)</td>
<td>A cross-sectional study searching for a significant, positive relationship between work personality, academic engagement, and academic effort in a group of undergraduate college students Also attempted to determine which agenda moderates academic engagement and work personality in predicting academic effort</td>
<td>Concluded that the construct of engagement made a meaningful contribution to predicting academic effort for both men and women, and was particularly salient for women</td>
<td>Work engagement is more stable than work-related emotions, which are subject to daily stresses Found a positive relationship between work personality, engagement, and academic effort Consisted of only 65 students; thus, had limited sample size and lacked generalizability because of using students only Used cross-sectional methodology, which limited any conclusions relating to a causal link between variables</td>
</tr>
<tr>
<td>Study</td>
<td>Definition of Task Engagement</td>
<td>Participants</td>
<td>Setting Duration and Task Numbers</td>
<td>Operationalization Analysis</td>
<td>Strengths/Limitations</td>
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</tbody>
</table>
| Rathel et al. (2014)         | Student task engagement is an orientation toward the entity or person, including following directions, looking toward the speaker, and working on assigned tasks (p. 221) | Students ($n = 5$)               | Multiple tasks                    | Feedback on performance given and subsequent task engagement behaviors observed                  | Strengths: Positive feedback led to improved engagement  
Limitations: Small sample |
| Halin et al. (2014)          | A subjective state that is a complex of concentration, motivation, and energetic arousal (p. 70) | Students in two experiments ($n = 31$ and $n = 29$) | Four proofreading tasks           | Subjective rating on difficulty  
Number of errors                                                                                   | Strengths: Experiments identified the role of task difficulty in shielding interference  
Limitations: Small number of students |
| Behaviorally Challenged Task Engagement | Interest and enjoyment in performing tasks (p. 58)                                        | Adults diagnosed with schizophrenia ($n = 30$) | One task                         | Wisconsin Card Sorting Test                                                                     | Strengths: Identified the potential mediating role of task engagement  
Limitations: Small sample size; dealing with exceptional people |
<table>
<thead>
<tr>
<th>Study</th>
<th>Definition of Task Engagement</th>
<th>Participants</th>
<th>Setting Duration and Task Numbers</th>
<th>Operationalization Analysis</th>
<th>Strengths/Limitations</th>
</tr>
</thead>
</table>
| Reichle et al. (2010)             | Manipulating materials by their intended use or showing work to instructors or peers without leaving the table; defined by example | Pre-school students with autism ($n = 2$) | Reinforcement procedures to increase task engagement                   |                             | Strengths
Experimental
Limitations
Not generalizable to non-autistic people
Small numbers in experiment                               |
| Allday, Bush, Ticknor, and Walker (2011) | Actively participating in the designated activity by: (a) being oriented toward the teacher during task, (b) having the necessary materials, (c) following teacher directions, and (d) listening through verbal (e.g., asking questions) and non-verbal (e.g., nodding head or eye contact) means (p. 394) | Disruptive students in Grades 8 to 12 ($n = 3$) | Classroom with an intervention of personal greeting to each student    | Observed activities for five seconds after the cue to begin work | Strengths
Teacher greeting at the door reduced time needed to begin appropriate tasks
Limitations
Very small sample
No evaluation of changes in teacher behavior post-introduction |
| Beattie and Davies (2010)          | Number of ball throws at a designated target level before quitting; defined by example          | Rugby players ($n = 64$)               | Ten passes through holes of decreasing size/time at the task           | Number of ball throws at any one level before quitting is the measure of task engagement Efficacy measured by confidence | Strengths
Identified that low self-efficacy decreases engagement, while high self-efficacy leads to greater engagement
Limitations
Self-efficacy not isolated from ability                      |
2.6 Work task engagement: Structure and operationalization

Work task engagement has been proposed as single-dimensional (e.g., Smallwood et al., 2004) or multidimensional, consisting of two (Donald & Donald, 2015) or three dimensions (Schaufeli & Salanova, 2011). Single-dimensional approaches refer to single resource allocations, such as attention devoted to a task, time allocated, or mood shifts. Multidimensional proponents suggest two or more personal resources and the levels of allocation of these resources, such as the proposals of dedication, absorption, and vigor (Schaufeli, Martínez et al., 2002); cognitive, behavioral and affective aspects (J. Phillips, 2008); and physical, cognitive, and affective levels (Rich et al., 2010). There is no agreement regarding the number and identification of the dimensions. Different researchers across and within disciplines adopt different perspectives and appear to take lateral positions, thereby contributing to obfuscation. However, there is convergence in the literature regarding the similarity between physical and vigor, dedication and affect, and absorption and cognition.

Consistent with this convergence, this thesis adopts the three-dimensional structure of Schaufeli, Martínez et al. (2002), as these dimensions represent not only an identification of resources, but also include the level of usage of affect resources, cognitive resources, and physical resources consumed during the task. Therefore, the manifestation and operationalization of task engagement is the extent of dedication, absorption, and vigor evident in performing a task. In this context, vigor refers to high levels of energy and mental resilience; dedication involves experiencing significance, enthusiasm, and challenge in a task; and absorption involves being focused, engrossed, and happy in the task—in line with Bakker and Demerouti (2008).

In addition to definitional diversity, the diversity of task forms in the workspace challenges researchers to develop and test generalizable theories and models of work task
engagement. For example, computer tasks will not involve vigor, while laboring tasks may not require significant cognitive effort. Some tasks may be one-off and require limited dedication or have limited affective input, while others may be so routine as to discourage absorption. A computer programmer or air traffic controller may have minimal requirement for physical input and maximum requirement for inputs of affective and cognitive resources. In contrast, a gardener may require the opposite. Any operationalization would need the flexibility to cope with this diversity of task forms.

2.6.1 Work task engagement: A few theoretical models from education, information sciences, and organizational sciences

This section considers the pertinent structural models on general work task engagement from organizational science, education, and information sciences. These models do not cover affect and its influence on work task engagement. However, they do consistently identify the importance of feedback and challenge in work task engagement. Dynamic models incorporating affect are covered in a later section.

2.6.1.1 Work task engagement of students

Fredricks (2011) proposed a model of student work task engagement suggesting a three-resource construction of student task engagement, as shown in Figure 2.4. The three dimensions proposed are behavior, cognition, and affect (Figure 2.4). Antecedents to this construction of task engagement include external context characteristics: peers, teachers/staff, supportive structures, and task characteristics. This model identifies the importance of feedback in a process (consistent feedback), within-task variety, and task challenge as essential factors in establishing and increasing or maintaining work task engagement. However, the model does not mention the reactions of the student within the task and the likely effect of these task reactions at the engagement level.
2.6.1.2 Work task engagement of employees

J. Phillips (2008) proposed a model of cognitive task engagement with mediation and moderation relationships identified. Focusing on the application of cognitive resources to the task, the model identified five antecedents: task characteristics, task capacity factors, task motivation factors, excess cognitive capacity, and cognitive and physical interventions. Task capacity, cognitive capacity, and task motivation are personal attributes, whereas task characteristics are associated with the task itself. Cognitive and physical interventions occur during the task process and involve off-task distractions. Research testing this model indicates that unused cognitive capacity decreases cognitive task engagement. Therefore, simplifying or automating a task may lead to feelings of boredom stemming from underused cognitive capacity, thereby leading to low cognitive task engagement.
Figure 2.5. Work task engagement using cognitive resources. Source: J. Phillips, 2008.

This structural model identifies dynamism in the shifting resource capacity of cognition. Although not directly discussing task challenge, J. Phillips (2008) did mention task complexity. Task complexity is associated with task challenge because easy and repetitive tasks are identified as creating less engaging outcomes. However, the model has a very narrow focus on cognitive resources, disregarding physical and affective resources.

2.6.1.3 Work task engagement of computer users

Said (2004) proposed a multimedia-based model (Figure 2.6) as an aid to improve engagement in the design of multimedia. This model was based on children’s level of interaction with a game, and identifies the importance of goals and feedback. Children who set higher goals for themselves were often more engaged, and feedback interacted with goals to enhance engagement. The effect of feedback on task engagement was enhanced when given immediately, rather than being delayed.
Said’s model is dynamic, with a reciprocal loop to allow for shifts in engagement with computer-mediated tasks. The model identifies feedback, constraints, creativity, and goals as essential elements in this dynamism. However, this theory disregards other critical elements, such as task challenge.

2.6.2 Integrating the research from education, organizational science, and information sciences

These models do not represent all the research and theories in the literature of education, organizational sciences, and information sciences contributing to understandings of work task engagement. Figure 2.7 classifies and introduces more of the extant research on engagement by considering antecedents, separated into within-task and before-engagement constructs, engagement constructions, and outcomes of work identified constructs into the proposed associations each construct has with work
task engagement. The figure includes both meso- and micro-level research. The research at the meso-level is bound structurally with the micro-level. The constructs used in the current and past research are divided into six broad areas, consistent with terminology from the literature. These six broad areas—reading from left to right in Figure 2.7—are task characteristics, engager’s personal characteristics, the external context of the task, within-task processes, work task engagement, and associated work task outcomes.

Task characteristics encompass task difficulty or challenge; variety in the task; task activity choices; autonomy in the task; the rote, exploratory, or creative attributes of the task; task length; the volitional nature of the task; the deadlines associated with the task; and the resource demands of the task. The personal characteristics contributing to task engagement encompass goals, tolerance for reward delay, level of self-efficacy, interest in the task, perceived task relevance, age, individual ability, the availability of personal resources (e.g., time, mental, and physical resources), perceived value, task attractiveness or unattractiveness, coping style, mastery orientation, perceived psychological safety, meaningfulness of the task (Patrick, Hisley, & Kempler, 2000), social support with the task (Hallberg & Schaufeli, 2006), leadership type (Macey & Schneider, 2008), communication, reward and recognition (Saks, 2006), and participant care.

Within-task events are associated with engagement. Participants complete cognitive appraisals of the task challenge, and process feedback and performance related to the nature of the task. Participants can experience emotional episodes or mood shifts ranging from boredom to excitement. Emotion, mood shifts, and cognition require regulation, thereby reducing the available task resources and ultimately the task engagement. Within-task events are less stable and subject to change as the task progresses. Importantly for this thesis, within-task attributes include affect shifts and
Figure 2.7. Important variables associated with work task engagement.
feedback—identified in the rectangle labeled “task engagement” in Figure 2.7. Task engagement incorporates the previously mentioned dimensions of dedication, vigor, and absorption. Narrower conceptualizations and operationalizations of task engagement are identified under the headings of “dedication,” “absorption,” and “vigor” within this rectangle, and include studies using the measurement of enjoyment levels (dedication), boredom levels (dedication), class attendance (vigor), and task-unrelated thought levels (absorption, time at the task, and concentration levels). The final area in the figure covers the outcomes of task engagement, which Rich et al. (2010) identified as superior task outcomes.

2.1 Task engagement, task feedback, and task difficulty

Two constructs consistently associated with work task engagement in the literature are feedback and challenge. Feedback has been found to have a positive effect on task engagement (Shantz, Alfes, Truss, & Soane, 2013). However, this finding is problematic because some research has found that negative feedback sometimes reduces work task engagement and other times increases work task engagement. The form of feedback is vital in encouraging work task engagement. The simplest and most common form of feedback is outcome feedback (knowledge of results) or binary information, delivered as simple correct or incorrect responses, given at stages during task performance. Binary (right/wrong) feedback is most useful for short tasks. Said (2004) reported that immediate feedback and simple yes/no responses appear to be the most appropriate response in short-duration tasks.

Feedback is related to affective experience, as feedback evokes affect. Carver and Scheier (1998) identified dynamic NA feedback systems that monitor and manage movement toward desired goals and away from repulsion goals. The rate of movement toward the goal is evaluated based on feedback, and the result is an affective experience.
If the movement meets the expectations of movement toward the goal, the person is affect free. Feedback that goal expectations are not being met produces negative activation affect experiences. Feedback on better-than-goal performance produces experiences of pleasant activation affect states. This view argues that people who are exceeding their goals and gaining confirming feedback have positive feelings, which leads to a reduction in subsequent effort. Gendolla (1999) and Silvestrini and Gendolla (2011) identified an association between effort applied to tasks (measured as a cardiovascular response) and task difficulty. They found that task difficulty was associated with higher effort expenditure. Other researchers have confirmed this association (e.g., Burns & Dean, 2005; Gickling & Armstrong, 1978; Treptow, Burns, & McComas, 2007).

2.1.1 Task engagement and affect

If I feel depressed, I will sing. If I feel sad, I will laugh. If I feel ill, I will double my labour. If I feel fear, I will plunge ahead. If I feel inferior, I will wear new garments. If I feel uncertain, I will raise my voice. If I feel poverty, I will think of wealth to come. If I feel incompetent, I will think of past success. If I feel insignificant, I will remember my goals. Today I will be the master of my emotions.

—The Greatest Salesman in the World, Og Mandino (1985. p. 80)

The advantage of the emotions is that they lead us astray.

—The Picture of Dorian Grey, Oscar Wilde (2008, p. 41)

In addition to feedback and challenge, implicitly and explicitly, a common and pervasive theme is the association of affect with work task engagement. Affect has been mentioned as a dimension in the conceptualization of task engagement (Bakker, 2011; Fredricks, 2011); as an antecedent (O’Brien & Toms, 2008); or as having a strong association with some antecedent, such as feedback (Sansone, 1986) or self-efficacy
(Salonova, 2011). Gasper (2004) identified the influence of affect states on work task engagement when identifying that the greater the relevance of the affect state to the task, the greater the influence of affect on task performance.

These studies identified the importance of affect states and affect state changes during task engagement. However, no research is apparent linking the four constructs of affect state shifts, task feedback, task challenge, and work task engagement. Of these constructs, task feedback and task challenge have received some attention. However, the area of affect has considerable coverage in the literature (Russell, 2003a), and the dynamic shifts attached to manifestations of the phenomenon are associated with work task engagement. Characteristics of computer tasks elicit affective responses—and subsequently movement in core affect—by their demands or content before, after, and during task completion. Computer tasks and their constituent activities may be viewed by the person undertaking the task as disgusting, difficult, and frustrating. Thinking about undertaking tasks and task activities can make an individual happy or sad, while completing a particularly difficult task can fill an individual with joy. Mathews and Zeidner (2003) suggested that an overload of capacity to manage task demands could elicit affective responses. Completing computer tasks and their required activities can create affective shifts, and the aggregation of these can create core affect trajectories over time (Bindarwish & Tenenbaum, 2006).

A broad range of processes and outcomes relate to computer tasks and their influence on affective states. These include information-processing approaches (Bless & Fiedler, 2012), specific types of cognitive and judgmental strategies (Damasio, 2000; Isen, Daubman, & Nowicki, 1987; Patrick et al., 2000), leadership type (Macey & Schneider, 2008), communication, reward and recognition (Saks, 2006), and participant care.
2.1.2 Affect and core affect

A plethora of affective experiences creates conceptual and methodological difficulties for researchers. Investigators have examined many emotions and near emotions in the literature: anger, fear, happiness, sadness, disgust, jealousy, grief, love, envy, shame (Strongman, 1996), and boredom (Vodanovich, 2003). Researchers classify mood forms as good or bad, such as wellbeing or depression (Waraich, Goldner, Somers, & Hsu, 2004), and positive or negative (Sutton & Wheatley, 2003). Stress, worry, and anxiety are other examples (Mathews et al., 1992).

The dynamic nature of affect—represented by the random, transitory, and spasmodic appearances of emotions and moods—renders research in this field challenging. In ethnographic research involving affect experience shifts, such as emotion change or mood change, it is daunting to wait for the appearance of the change within any individual. The randomness of occurrence of specific affect states limits research to artificial stimuli in a laboratory context, with the objective of eliciting specific mood or emotion states.

Nevertheless, while the challenge of affect diversity and affect dynamism remains, the conceptualization of core affect, a recent development, offers a methodology to deal with diversity and fleeting appearances. Core affect is an element of a system that produces affective experiences. The entire affect system creates, maintains, and suppresses (where necessary) affective states, such as mood, emotional episodes, and stress, and affective traits, such as temperament and attitude (Barrett & Bliss-Moreau, 2009).

Two neurophysiological subsystems generate core affect (Russell, 2003a). These subsystems question stimuli to form a first cognitive free assessment of the situational gain or pain, and then contribute to the determination of threats or opportunities, and
guide responses by instigating reflex responses, perceptions, motivation, cognition, and planned behavior (Barrett, & Bliss-Moreau, 2009). Hedonic tone and activation coalesce to create the single neurophysiological state that allows individuals to identify activation or hedonic tone, but not to feel activation in isolation from hedonic tone. The ongoing neurophysiological state of core affect is consciously accessible as a pure, non-reflective feeling that is an integral blend of values on two dimensions: hedonic tone (pleasure–displeasure) and activation (sleepy–aroused) (Russell, 2003b; Russell, & Barrett, 1999). Core affect is an autonomic, primitive, omnipresent, and momentary state that is a component of all moods, emotional episodes, and other affective phenomena, such as temperament and attitudes (Russell & Barrett, 1999). Figure 2.8 shows the contribution of core affect as the universal component of affective experiences. These affective experiences include affective states and affective traits.

Additionally, and importantly for behaviors influenced by core affect states, core affect is dynamic. Core affect continuously ebbs and flows, millisecond by millisecond (Russell, 2009), under the influence of the activation and hedonic tone subsystems, and is experienced as a constant stream of transient changes in continuous neurophysiological states. When linked through time, these transient states are described as core affect trajectories (Kuppens, Van Mechelen, Nezleck, Dossche, & Timmermans, 2007).

Figure 2.8. Core affect as a single universal component of affective phenomena.
2.1.2.1 The core affect space

Figure 2.9 presents the core affect space. The dimensions of hedonic tone and activation are placed orthogonally, thereby creating a two-dimensional plane. The vertical axis represents activation, and the horizontal axis represents hedonic tone. These two axes divide the plane into four quadrants. Around the intersection of the two axes is neutral affect, shown as a grey box. This grey box represents a neutral space. The linear distance of any point from this center—representing the intensity of the core affect at this point (Brehm, 1999; Reisenzein, 1994) and the direction of this displacement—represent the qualia mix of pleasantness and activation in the core affect state. Around the perimeter of these quadrants are shown examples of specific affective experience states described in everyday terms.

A point within the plane indicates a participant’s core affect state at a point in time. The core affect space relates all possible core affect states. The core affect space does not locate specific affective experiences at specific locations—because the labeling of moods and emotions is subjective, and variation between individuals will occur—but provides a spatial area where specific moods and emotions are likely to occur. As stated by Russell and Barrett (1999):

*The resulting space thus includes many states (such as fatigue, sleepiness, and placidity) that are not emotions, but it provides a descriptive map of core affect at any point in time.* (p. 809)
Figure 2.9. Core affect space. Source: adapted from Russell et al., 1989.

Ontological debates around core affect have focused on core affects existence as a single phenomenon or multiple phenomena, and core affect dimensionality as a singular phenomenon consisting of one, two, or three dimensions. In the debate around the singular existence of core affect, the two principal protagonists are Panksepp (2012) and Russell (2012). Panksepp (2012) argued that there are multiple core affects, each associated uniquely with one of some multiple neural processes. Panksepp (2012) stated that “right now the postulation of core affect is a working hypothesis” (p. 65). In contrast, Russell (2012) argued for the existence of one ubiquitous and universal core affect. All affective phenomena (experiences and dispositions) are assumed to arise from universal, imbricated, and neurophysiological systems, and core affect is the only universal subsystem component of these affective phenomena systems. Evidence for the existence of core affect comes from the biological sciences (Wilson-Mendenhall, Barrett, & Barsalou, 2013). Biological correlates are found for both dimensions of core affect. Other sources of evidence for core affect derive from introspective reports, analysis of affective experiences, and research around emotion, behavior, biology, and linguistics. According to Russell (2003b):
Much evidence points to the entity-less dimensions of pleasure–displeasure (pleasure or valence) and activation—the activation (arousal or energy) as primitive, universal and ubiquitous. The combination of these two dimensions—here called core affect—is the first primitive of the proposed framework. (p. 148)

Different assumptions inform the perspectives held by protagonists. Panksepp (2012) focused on brain functioning at the biological level (neurons and hormones), while Russell (2012) concentrated on mind outputs (subjective experience). As noted by Panksepp (2012), “there are distinct levels of emotional-affective processing in the Mind-Brain … Russell’s work started from the bottom mine from the top” (p. 68). The debate also encapsulates the structure of affective experiences (moods and emotions), the structure of core affect, and core affect’s relationship with the structure of affective experiences.

In addition, a debate has occurred on the adequacy of two-dimensional or three-dimensional conceptualizations of core affect. Some researchers suggest the need for a three-dimensional model, as the fit of the two-dimensional model is regarded as weak (Schimmack & Grob, 2000). Latinjak (2012) proposed a three-dimensional model with time as the third dimension, thereby enabling discrimination between emotional episodes, such as fear and anger. Other broad dimensions proposed in the literature include potency (Osgood, 1969), dominance (Russell & Mehrabian, 1977), aggressiveness (Bush, 1973), need for affiliation (Markus & Kitayama, 1991), and locus of causation (Russell & Mehrabian, 1977). However, Russell and Barrett (1999) argued that conceptualizations incorporating any more than two dimensions introduce elements such as cognitive appraisal and labelling into an independent primitive output of the
affect system, and suggested that these additional dimensions belong to “the event that elicits the reaction and therefore as being outside of the realm of core affect” (p. 812).

The use of the core affect space as a tool for discriminating between specific moods and emotional episodes is challenged because different moods and emotional episodes are co-located in the core affect space; therefore, the location fails to discriminate, and subsequently misses qualitative differences in affective experiences. In answer to this criticism, Russell and Barrett (1999) stated:

*We now believe this dimensional structure represents and is limited to the core affect involved ... More importantly, qualitatively different [affective events] can appear as if the same when only this dimensional structure is considered: Examples of fear, anger, embarrassment, and disgust could share identical core affect and therefore fall in identical places in the circumplex structure.* (p. 807)

### 2.1.3 Core affect: Relationship with other two-dimensional models of affect

Two other two-dimensional models for classifying and measuring affective experience are proposed in the literature. Watson, Clark, and Tellegen (1988) and Watson and Tellegen (1985) identified and developed the frequently applied dimensions of PA and NA in the Positive and Negative Affect Schedule (PANAS). Meanwhile, J. F. Thayer and Miller (1988) proposed a model based on the dimensions of energy and tension. Russell and Barrett (1999) pointed out that these models relate to core affect by straightforward adaptations of the axes. Research and its associated classifications and operationalization under one conceptualization can be translated into another conceptualization. For example, for research using the PANAS scale of Watson et al. (1988), a measure of moderate PA could be translated into the core affect space in Quadrant 2: activated and pleasurable. These rotations and dimensional relationships
appear in Figure 2.10. The solid blue lines show the core affect dimensions, while the dotted red lines show the associated dimensions (after rotation) and their relationship with the blue dimensions of core affect. These diagrams, like the Rosetta Stone, allow translation among constructs. For example, NA states are interpreted as high activation and high displeasure in the core affect space, called Quadrant 1. Likewise, PA states are interpreted as high activation and high pleasure. However, the widely used PANAS scale is limited in its capture of all affective experiences. Russell and Feldman Barrett (1999) observed that PANAS only identified high activation states of pleasantness or unpleasantness. They stated that:

*The names attached to the PANAS scales, negative affect (NA) and positive affect (PA), do not measure all pleasant and unpleasant affective states but rather measure only high activation states. Researchers using those scales might assume that they are sampling the affective domain broadly, but this is not so ... Second, researchers should decide in advance which parts of the space they need to measure and select scales accordingly.* (Russell & Feldman Barrett, 1999, p. 12)
Figure 2.10. Three two-dimensional models of affect and their relationships. Source: adapted from Russell & Barrett, 1999.

Watson et al. (1999) now refer to PA and NA as positive and negative activation not the more all encompassing positive and negative affect. Figure 2.11 indicates this name change in respect to core affect. The affective experiences identified in the core affect Quadrants 1 and 2 are included in PANAS. However, the PANAS conceptualization is silent regarding the states of Quadrants 3 and 4. Thus, PANAS does not include affective experiences, such as boredom and reverie.
2.1.4 Core affect: The activation dimension (deactivated–activated)

Activation is defined as a sensation of energy mobilization … Activation is dynamic, moves to a diurnal ebb and flow, and varies with intake of stimulant and depressant drugs, with one’s own physical activity, and with the events of the day. (Russell & Barrett, 1999, p. 809)

The construct of activation can be substituted with other words implying the same meaning. Thus, activation has been named arousal, energy, tension, or activity across the literature (Russell & Barrett, 1999). Proposed proof for the independent existence of activation is the identification of neural correlates in the limbic system and thalamus. The thalamus relays sensory stimuli to the medulla, where, researchers hypothesize, neural representations of the significance of stimuli reside (Colibazzi et al., 2010; Posner, Russell, & Peterson, 2005).

A discussion in the literature involving activation relates to the distinctiveness of core affect and engagement. Macey and Schneider (2008) proposed that a partial
conceptual overlap exists between affect states and engagement. In partial agreement, Binnewies and Fetzer (2015) identified vigor (which is closely associated with activation) as a shared dimension of engagement and affect states. However, these researchers still proposed that engagement and affect states are different constructs, and that affect states belong as antecedents to engagement because engagement contains not only vigor, but also a motivational and behavioral component, and vigor is only one component of the affect experience. In addition, vigor is a more encompassing term than activation, and activation relates to affective activation, rather than physical activation.

### 2.1.5 Core affect: The hedonic tone dimension (unpleasant–pleasant)

Hedonic tone refers to individuals’ pleasant or unpleasant feelings. Researchers consider hedonic tone the single most crucial dimension of affective experiences (Feldman Barrett & Russell, 1998). Debates on feelings have been ongoing for many years, particularly concerning hedonic tone as a component of feelings (Russell & Barrett, 1999). Over time, theorists have described emotion as some form of pleasure or displeasure. All known human languages have words to communicate pleasure or displeasure (Wierzbicka, 1992), and the pleasure–displeasure dimension appears consistent across the emotional lexicons of all language groups (Russell, 1991).

In contrast, the term “valence” has found many uses and constructions in emotion theory, including the pleasant–unpleasant bipolar continuum; psychology; and the sciences generally:

*Hence, what we call pleasure–displeasure has been negative activation affect named differently—valence, hedonic tone, utility, good–bad mood, pleasure–pain, approach–avoidance, rewarding–punishing, appetitive–aversive, positive–negative—but the similarity is clear.* (Russell & Barrett, 1999, p. 809)
Colombetti (2005) identified two problems with the use of the term valence. First is the problem of conflation, which involves switching back and forth between the valence signs of emotion and the valence signs of different aspects of emotion. Within the psychological domain, an emotion is referred to as a positive or negative emotion, and a racing heart is associated with an emotion labeled positive or negative based on its physical effect. Second is the problem of dichotomization into mutually exclusive negative or positive poles, which implies that a mixture of feelings is impossible. The use of positive and negative poles is consistent with the use of the term in the physical sciences: positive and negative charges on an atom. Colombetti also suggested that the first problem highlights a lack of clarity and agreement when referring to valence, and that the solution should be more explicit. The second problem “calls into question the utility of the current notion of valence as a descriptive and explanatory tool of emotion theory” (Colombetti, 2005, p. 114). Given these limitations, and despite a general adoption of valence as a synonym, this thesis employs “hedonic tone” as a unidimensional construct comprising pleasant and unpleasant poles, rather than the term “valence.”

2.1.6 Core affect: The relationship between activation and hedonic tone

Activation and hedonic tone are independent dimensions (Russell, 2003a). For example, Kuppens, Tuerlinckx, Russell, and Barrett (2013) found that hedonic tone and activation are independent constructs, and biophysical evidence suggests independence. Different neural structures have been found to correlate with activation and hedonic tone. The mesolimbic dopamine system is associated with reward-pleasure processing, and the limbic-thalamus systems are related to hedonic tone. Colibazzi et al. (2010) concluded: “our findings provide biological plausibility for the existence of distinct neural systems
that underlie the affective dimensions of valence [hedonic tone] and arousal [activation]" (p. 387).

2.1.7 Measurement of core affect

Core affect can be measured rapidly using the core affect grid (Russell et al., 1989), which imposes relatively little cognitive disturbance, distraction, or disruption on the flow of activities in a task. The core affect grid enables the collection of ecologically valid data across a wide range of circumstances, and respondents can record their core affect states in the moment without having to rely on memory (Stone et al., 1998). Core affect neither assumes nor requires the presence or identification of a specific mood or emotion as a precursor to measurement. Core affect is independent of the problems associated with the subjective interpretation required in naming a specific emotion by individuals, and thus minimizes attribution and misattribution errors (Wyer, Clore, & Isbell, 1999). Also, without the occurrence of any of these events, core affect is still present and can be measured. Movement in core affect may have work consequences without being tied to a specific emotion. Core affect can be tracked continuously without waiting for intermittent emotions, and represents a universal unit of analysis for the scientific exploration of affective experiences (Russell & Barrett, 1999). Additionally, core affect is quickly accessible with minimum interference in ongoing activities that is usually experienced with long item scales.

Seo, Bartunek, and Barrett (2010) proposed a four-item, five-point Likert scale for hedonic tone (happy, satisfied, enthusiastic, and relaxed) and a four-item, five-point Likert scale for activation (aroused, surprised, interested, and nervous), where operationalization was achieved by averaging the four item scores for each dimension. Warr, Bindl, Parker, and Inceoglu (2014) proposed a multi-affect indicator to measure core affect based on the quadrants of the core affect space. This indicator offered four
independent scales to assess affect states by quadrant location. However, the Seo et al. (2010) and Warr et al. (2014) multi-item scales are more suitable for cross-sectional studies, rather than for rapidly repeated measures of core affect, where measurement interruptions of longer duration may distract the participants’ involvement in non-measurement activities.

2.2 Work task engagement and core affect

Figure 2.12 presents a model proposed by Schaufeli and Salanova (2007), which indicates that work engagement, as the opposite of burnout, is associated with the second quadrant core affect states. However, this conceptualization is silent regarding fluctuations in core affect. Core affect states and state changes influence ongoing cognitive processes of expectancy, motivation, and progress judgments during work tasks (Seo et al., 2010).

Figure 2.12. A taxonomy of employee wellbeing using core affect dimensions. Source: Schaufeli & Salanova, 2007.

Although not directly linked to forms of work space engagement a body of research (Fisher & Ashkanasy, 2000) is extant linking moods (good or bad) and emotion
episodes, such as boredom, anger, and happiness, in addition to anxiety and stress, with task behaviors closely associated with work task engagement, such as persistence and effort, as well as task outcomes that act as an indicator of the level of engagement with the task. These will now be reviewed by association with the core affect space.

2.2.1 Research related to core affect and work task engagement

Fortunately, the core affect space presents a tool for the classification of existing cross-sectional affect state research. This is achieved by relating the antecedent affect state studied with the affect state’s related core affect quadrant, thereby classifying these static affect states into four groups represented by each core affect quadrant. Some cross-sectional research has been undertaken linking actual core affect states with work task engagement or surrogate work task engagement (e.g., Seo et al., 2010). Figure 2.13 presents a summary of the existing research classified by quadrant, indicating the relationship of the affect state with work task engagement or a surrogate for work task engagement. A number of the more essential findings shown in Figure 2.13 are now discussed in detail.

Helton and Russell (2011) explored the effect of emotion-eliciting pictures on vigilance performance. They found that, overall, vigilance performance was lower for participants presented with unpleasant activating (Q1) stimuli than for participants presented with a neutral picture. In a repeated-measure study among students considering the association between four emotions and persistence, Fulmer and Tulis (2013) found that emotions belonging to pleasant activation states (enjoyment, Q2) at the start, and increasing unpleasant activation states (anxiety, Q1) are associated with persistence. The researchers suggested that low to moderate levels of unpleasantness and activation may contribute to continuous engagement and persistence during challenging tasks.
Figure 2.13. Research linking engagement in the workspace and affect, categorized into core affect quadrants.
Additionally, unpleasant deactivated states (boredom, Q4) are associated with lack of persistence. Based on their findings, Fulmer and Tulis (2013) recommended “that a more differentiated view on the role of affect concerning its intensity and quality is considered when dealing with students” (p. 44).

Warr et al. (2014) considered the influence on forms of work behavior of affective experiences categorized by the core affect space quadrants by using a reflective questionnaire, with respondents identifying the previous day and previous week affective states based on four questions for each quadrant. The findings associated pleasant activated states found in quadrant 2 of the core affect space with positive discretionary behaviors and negatively associated with negative behaviors. On the other hand, pleasant deactivated states associated with quadrant 3 of the core affect space were linked with less discretionary positive behaviors. Unpleasant deactivated states of the type found in quadrant 4 of the core affect space were associated positively with negative behaviors and negatively with positive behaviors. Activated unpleasantness (Q1) was not associated with discretionary or non-discretionary positive behaviors. However, activated unpleasant quadrant states were associated positively with effort withdrawal by participants.

Using attentional blink tasks, Jefferies, Smilek, Eich, and Enns (2008) found that participants’ core affect state classified by quadrant was associated with task performance. Low activation and unpleasant hedonic tone states (Q4) were associated with the highest performance. High activation and unpleasant states (Q1) produced the lowest levels of performance. Q3 (low activation and pleasant) and Q2 states (high activation and pleasant) were found to be associated with intermediate levels of performance.
Seo et al. (2010) undertook a study to contribute to understandings of the crucial role of emotion in work motivation by testing a conceptual model that predicted the effects of core affect on effort and persistence at work. They found that the level of hedonic tone was positively related to effort and persistence, and the level of activation was related directly and positively to the effort. In a study of call center operations, Bledow et al. (2011) found that workday mood operates as an affective primer “that relates to how workers see work events, how they feel about subsequent event, and how this [affect experience] relates to performance” (p. 959).

The apparent engagement levels associated with each core affect quadrant are mixed. High and low engagement findings occur in all quadrants. A critical determinant of the association between core affect and engagement are task characteristics, and, of these, feedback and challenge are frequently mentioned. Complex, challenging tasks appear to be completed with greater task engagement when some level of unpleasantness exists, whereas simple, creative, routine tasks show higher engagement in the context of some level of pleasantness. In addition, core affect’s association with task engagement is related to the relevance of the task to the participant (Jefferies et al., 2008) and the task relevance of the stimuli (Flood, Näswall, & Helton, 2015).

Much of this previous research has three limitations. The first limitation is the lack of direct measurement of the concept of engagement, with surrogates (such as performance) and excessively narrow conceptualizations (such as effort and persistence) acting as substitutes. The second limitation is that much research has been undertaken using the popular PANAS conceptualization and operationalization and—as explained in a previous section—this limits the affective states to the first and second quadrants only. PANAS leads
to limited research applicable to the third and fourth quadrants. Studies using positive activation and negative activation conceptualizations do not cover all affect states, such as boredom and daydreaming, and subsequently neglect the influence of these states on engagement. Finally, the third limitation of previous research is that it generally treats affect states as enduring and static.

2.3 Work task engagement and the dynamics of core affect

*I do not want to be at the mercy of my emotions. I want to use them, to enjoy them, and to dominate them.*

—*The Picture of Dorian Gray*, Oscar Wilde (2008, p. 105)

A primary characteristic of affective experiences is unfolding change. Core affect is not assumed to be stable, but volatile. Core affect moves through its constituting two-dimensional space, reflecting how individuals feel throughout everyday life (Timmermans, Van Mechelen, & Kuppens, 2010). Binnewies and Fetzer (2012) identified that affective states are transient experiences that exhibit different patterns of change over time. These fluctuations are caused by responses to activities or experiences within tasks and events external to the task, such as interruptions. Tulis and Fulmer (2013) identified that fluctuation in positive and negative emotional states is particularly likely to occur during a challenge as students face difficulties and impasses. As each affect state changes, it follows that core affect changes.

The patterns of change can be linear, non-linear, or piecewise. Trajectories may not rise or fall indefinitely; however, trajectories are sustainable at one level over extended periods. Limited research has examined the continual instantaneous ebbs and flows of core affect and their moment-by-moment influence on more stable traits, such as task
engagement, over extended periods of hours, days, or a week. Research is required to understand the effect of shifts in affect episodes over the duration of a task, and the influence of these shifts on task engagement.

Sansone and Thoman (2005) stated that “fluctuations in affect are not noise in the task process, but rather dynamic trajectory patterns that characterize the phenomenon of feelings during learning and engagement” (p. 508). COR theory (Hobfoll, 1989) suggests that some of these trajectories deplete individuals’ engagement resources. Fetterman, Bresin, and Robinson (2013) provided further evidence of the influence of resource depleting affect changes on work task engagement. By exposing individuals to an activating-unpleasant task stimulus, they found that participants attended to aversive stimuli, thereby drawing attentional resources away from the task. The challenge is identifying the differences between individuals, variability of affective intensity, rate of regulation, and degree of synchronicity between affective components (Kuppens, 2010).

Movement along the dimensions of activation and hedonic tone creates core affect trajectories. Each of these dimensions receive individual attention in the literature, and the following section discusses this individual attention and related theorizing and research.

2.3.1 Activation shifts and engagement

Activation levels influence the nature and level of resources available for task engagement (J. Phillips, 2008). Activation, rather than the task, becomes the focus when activation is too high or too low. Resources are withdrawn or shut down during low activation. Considering set point theory (see Fujita & Diener, 2005), resources and effort will be allocated to bringing activation up to a desirable level, thereby rendering them unavailable for task engagement (Merlo, 2015). During high activation, affective effort and
resources are consumed to regulate overloading (Fujita & Diener, 2005), and the high level of activation becomes the focus, thereby possibly leading to off-task, yet on-activation, ruminations and appraisals. Maximum resources are available at moderate levels of activation. Commonly cited cognitive effects of the activation response include changes to attention, memory, decision speed, and learning (Mendl, 1999).

### 2.3.2 Hedonic tone shifts and engagement

Two conflicting sets of theories attempt to explain the effect of hedonic tone on task engagement. The first set suggests that increasingly pleasant core affect states increase task engagement. The second set has a more nuanced view; whereby unpleasant core affect states may influence higher task engagement. Under the first set of theories—such as broaden and build theory (Fredrickson, 2004)—pleasant (happy) states broaden individuals’ thought and action repertoire, thereby increasing available resources to apply to tasks. Affect regulation involves moving an individual to more pleasant core affect states (Parkinson & Totterdell, 1999). When individuals feel unpleasant, affective resources will be removed from the task, thereby causing disengagement, and will be applied to moving toward a more pleasant state. When individuals feel pleasant, regulatory resources will be applied to the task, thereby increasing engagement. Surprisingly, Flood et al. (2015) did not find evidence of any effect of the pleasant or unpleasant content of a stimulus on task performance. The findings by these researchers suggest that the influence of hedonic tone interacts with task characteristics and individual characteristics.

The second set of theories indicates that pleasant feelings are associated with task disengagement. Mild increases in positive mood promote cognitive flexibility, but at the cost of distractibility (Dreisbach & Goschke, 2004). Conjecturing about causation and genesis of
positive (pleasant) mood flexibility–distractibility antagonism, Dreisbach and Goschke (2004) stated that “positive affect serves as an appraisal signal indicating the absence of danger or obstacles in the pursuit of current goals, thereby promoting less focused, explorative modes of thought and behavior” (p. 351). In addition, they found that presentations of PA pictures had dramatic effects on the distractibility from a previously task-relevant stimulus category. Positive activation states encourage searching and innovation, whereas negative activation states (unpleasant) and unpleasant situations encourage avoidance of errors and subsequently stimulate a focused analytical mode of processing (task engagement) (Fiedler, 2001).

Attentional biases relate to difficulty in disengaging from threatening information (Fox, 2004). Yuan et al. (2011) proposed that, to try to stay on task, pleasant stimuli cause intensified brain activity related to cognitive control, which is not apparent in unpleasant states. Further evidence in support of task engagement as a pathological state is the occurrence of generalized anxiety disorder. Blackmore (2011) identified that the difficulty of people with this disorder (an activated unpleasant affect state) in disengaging from threatening information and worrying about this information can lead to their inability to engage in tasks aside from rumination. Threatening and unpleasant stimuli prompt the decision to ignore or to disengage from current activities and focus on the threat or unpleasant feelings, with disruption to task engagement. Yuan et al. (2011) found that pleasant mood and the execution of cognitive control were associated. Simple tasks were completed more rapidly in a pleasant mood condition than in a neutral to unpleasant mood condition. Yuan et al. hypothesized that the faster speed of task completion in a simple task
was due to the pleasant mood reducing the need for cognitive control. In more complex tasks, responses were slower.

### 2.3.3 Regulating core affect movements and work task engagement

Core affect continuously ebbs and flows, millisecond by millisecond, under the influence of two regulatory subsystems. Individuals try to maximize pleasure and minimize displeasure, and thus regulate toward the pleasure pole. Individuals also aim to moderate activation levels, fluctuating between raising and lowering activation (Russell, 2009). Affective experiences are continuously regulated to meet hedonistic and instrumental drives (Tamir, 2009). Affect (core affect) shifts are related to task engagement through cognition and affect regulation (Matthews & Zeidner, 2003). Affective experiences can overwhelm an individual (Goleman, 1995) and regulating this response may change individuals’ performance in tasks (Koole & Rothermund, 2011). Affect regulation resources are required to stay on task. A requirement for regulation depletes these resources. Individuals work to build and broaden these resources (Fredrickson, 2004; Hobfoll, 1989). Discussion has occurred in the literature around the resource-depleting effects of emotions (Grandey, 2000; Trougakos, Beal, Green, & Weiss, 2008), and Yiend (2010) stated that:

*Emotional material both positive and negative, biases attentional resource deployment, producing an exacerbated attentional (“emotional”) blink ...*

*This suggests that attentional resources are preferentially deployed towards emotional information, and therefore that attention to emotion is not “automatic” in the sense of being capacity free. (p. 252)*

Beal, Trougakos, Weiss, and Dalal (2013) evaluated the emotion regulation strategy of surface acting and the way in which surface acting depleted the resources of customer
service staff. Volatile and significant movements in the trajectories of individuals indicated less resource depletion through not regulating their customer engagement affective experiences.

Affect states and state changes occur within tasks and influence work task engagement (Russell, 2003a). To understand task engagement, researchers have identified the need to improve understandings of the patterns of change in affect experiences (e.g., Boker & Nesselroade, 2002; Davidson, Scherer, & Goldsmith, 2003; Kuppens et al., 2010; Scherer, 2000). Research on work engagement indicates that personal resources are predictors of work engagement (Bakker, Demerouti, & Schaufeli, 2005). Beal et al. (2013) found that effortful regulation of emotion can have both direct and indirect influences on energy expenditure (engagement), and that an unpredictable and excessive requirement for emotion regulation led to absenteeism in affect-volatile customer service staff. In addition, Beal et al. reported that some individuals exhibit more volatile core affect responses than do others, and report higher exhaustion and disengagement. COR theory (Hobfoll, 1989) suggests that individuals strive to increase and defend their resources. If resources deplete, individuals experience stress. A significant amount of resources and the ability to allocate these resources is the key to peaks in dynamic performance (Beal et al., 2005).

2.4 Principal frameworks: Dynamic models linking affect, engagement, and performance at work

Beal et al. (2005, p. 1054) suggested that insufficient attention had been devoted to and inadequate understanding exists of the association between affect and performance. Beal et al. (2005) proposed that the cause is “the transient, state-like nature of affect and the more traditional static conceptions of performance” (p. 1054). Only four apparent models exist
covering the volatility of affect and the contribution of this volatility to task performance. The first model, the episodic process model (EPM), was proposed by Beal et al. (2005) as an initial contribution to the area. The second model, the affective shift model (ASM), proposed by Bledow et al. (2011), considers the downshift of negative activation (NA) and the upshift of positive activation (PA), and the association of this shift to work engagement. The third model, the dynamic engagement model (DEM) (O’Brien & Toms, 2008), was based on a process conceptualization—similar to the EPM, but broader in its capture of antecedents and internal within-task variables. The fourth model, the correlates of performance model (Fisher & Noble, 2004), considers, among other factors, the association between task effort and affect. The next section discusses these models in detail to form the basis of this thesis’s research model.

2.4.1 The episodic process model

The EPM draws on behavioral ecology theory (Barker, 1968), goal theory (Locke, & Latham 1990), affect regulation theory (Muraven, & Baumeister, 2000), and affect appraisal theory (Smith, & Kirby, 2009) from within the psychology literature. The EPM proposes an association between task-relevant emotion, task attention pull, and task focus, and gives “a dynamic account of work engagement by examining links between external affective events and internal mood states” (Beal et al., 2005, p. 1246). The EPM (Figure 2.14) uses a timing unit called a performance episode. The establishment of the episode reduces the period over which affect shifts average from days to hours. Measurement at the completion of the episode captures the affect state. The establishment of this time-related construct better associates within-person fluctuations over shorter periods, and reduces the reliance on averaging levels over longer durations. Thus, the performance episode is the
context for relating transient affective states and work performance. The model indicates the mechanism through which resources switch from on-task attention to off-task attention and focuses on the cognitive resource level and the allocation of cognitive resources under the influence of affect movements.

![Figure 2.14. Episodic process model. Source: Beal et al., 2005.](image)

Affect state changes are elicited by task activities, external intrusions, internal thoughts, and physiological changes during the duration of a task (Beal et al., 2005). Thus, an affective state is assumed to have a duration of two hours. This duration is consistent with the performance episode, which is also two hours. The affect state has two effects on the task focus. The first is to pull the focus onto the task. For example, pleasant activated states, such as enjoyment, pull attention to the task. Task characteristics—such as goal achievement, intrinsic interest, achievement levels, and deadlines—influence the task pull. The second effect is to distract from the task by using cognitive resources for rumination,
activation control, and affective appraisal activities during unpleasant activation episodes requiring regulating resources. Regulation of cognitive resources is used to maintain focus on the task in the light of these distractions. Individuals bring resources to tasks through skills, knowledge, and cognitive abilities. However, people vary in the level of resources they have available and the amount they wish to contribute to a task. Thus, self-regulation of attention is required to maintain application of resources on the work task.

Finally, the proponents of this model report that “high levels of enjoyment possibly reduce one’s attentional field as much as anger or anxiety but not sadness which is a low activation emotion” (Beal et al., 2005, p. 1061). Not regulating an emotional experience may have an immediate cognitive consequence for performance; however, as discussed later, no regulation may help preserve regulatory resources, which also are essential for successful performance. No apparent tests of this model exist.

2.4.2 The affective shift model

Figure 2.15 shows the ASM of Bledow et al. (2011), who identified work engagement not as an enduring trait-like phenomenon, but as a dynamic motivational state that ebbs and flows under the influence of different tasks and non-work-related events at work. Building on self-regulation theories and specifically personality systems interaction (PSI) theory (Kuhl, 2000) from within psychology and applying these theories in a workplace context. ASM is proposed to explain the shifts of affect within work and the resultant workplace engagement.

Bledow et al. (2011) acknowledged that:

*the dynamic mechanisms by which work engagement emerges are, however, not well understood. Investigating these mechanisms holds the potential for*
an improved psychological understanding of work engagement and may show pathways to facilitate work engagement. (p. 1246)

Figure 2.15. The affective shift model. Source: Bledow et al., 2011.

Proposing the ASM to test their assertion, Bledow et al. (2011) linked initial unpleasant activation (NA) states with an increase in the pleasant activated state (PA), coupled with a decline in the unpleasant activation (NA) state and subsequent work engagement. Figure 2.15 presents the model. To test the model, these researchers undertook a study to “develop a dynamic account of work engagement by examining links between external affective events and internal mood states” (Bledow et al., 2011, p. 1246) for task engagement. Model testing was undertaken using experience sampling methodology. The identified variables of affective events, mood, and level of work engagement were measured twice each day. Research results within the PANAS conceptualization confirmed that work engagement is tied to unpleasant activated states moving to pleasant activated states. This model relies entirely on the conceptualization of PA and NA. In their conclusion, Bledow et al. (2011) identified the need for further research devoting attention to smaller timeframes than used in their study: “A further avenue for research is to examine the process of an affective shift in more detail ... As an affective shift can occur in different time frames” (p. 1255).
2.4.3 The dynamic engagement model

The DEM in Figure 2.16 was proposed to evaluate user experiences with video games, education, online shopping, and web searching, and to determine user engagement during these activities. Based on an extensive multi-discipline research covering engagement conceptualizations (e.g., flow theory [(Csikszentmihaly, 1990), play theory (Stephenson 1967), aesthetic theory (Beardsley, 1982), informational interaction (Toms, 2002)), and in-depth interviews, O’Brien and Toms (2008) identified that engagement is a three-step process with a feedback loop. The stages of the process begin with an initial stage of contact or point of engagement, and then a period of engagement, followed by disengagement. As would be expected with general computer tasks, such as web browsing, participants could leave and return later, thereby causing re-engagement with the task. Three classes of essential attributes appear in the figure for each of these phases.
Figure 2.16. Dynamic engagement model and its attributes. Source: adapted from O’Brien & Toms, 2008.

O’Brien and Toms (2008) described engagement as “the quality of user experiences with technology that is characterized by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control in time, awareness, motivation, interest and affect” (p. 23). This model contributes to understandings of the dynamic nature of task engagement and, importantly, introduces the role played by changing task characteristics during the task (such as affect) and their influences on overall task engagement. O’Brien and Toms (2008) stated:

We have confirmed and expounded a conceptual model that views engagement as a process in which computer users initiate and sustain engagement, disengage with the application or task, and potentially re-engage several times during a single interaction with an application. The process is defined by the presence of multiple attributes that vary in intensity depending on a combination of user and system attributes that emerge during the interaction. (p. 27)

The research was undertaken as in-depth interviews of 17 participants who were selected purposively based on their usage of some applications involving web browsing, web shopping video games, and online education. Based on the interviews, the researchers concluded that engagement with computers was a process consisting of three stages: engaging, disengaging, and re-engaging (Figure 2.16). During the period of engagement, they identified pleasure, challenge, and feedback as influential variables in the engagement state.
2.4.4 The performance and emotions model

The fourth model, the performance and emotions model (PEM), shown in Figure 2.17, elaborates the variables and their relationships linking performance and emotions during a working day. The model draws upon theories of motivation (e.g., Locke, & Latham, 1990) and job design (e.g., Hackman, & Oldham, 1980).

In the experiment, participants were alerted by a watch alarm that rang five random times each day. The respondents then filled out a one-page questionnaire reporting on their activities and feelings at the time of the alarm. The alarms rang at different times each day, with at least a gap of one hour between the alarms. The participants responded as soon as possible after the alarm, yet up to 20 minutes were allowed. One hundred and fourteen respondents gave 3,525 responses.

The model considered the role of task skill, task interest, task effort, and task performance, and these factors’ association with PA and NA. However, the model and methodology had limitations in identifying dynamic associations between these variables and affect. During one task, over the course of an hour, affect can shift. Affect is a moment-by-moment proposition. Thus, the participants may have been changing from PA to NA and back again, and held these states with varying intensity during the period between measurements. This study employed a simple measure of effort to identify task engagement, using a five-point scale with anchors of (low effort, wasting time) and (high effort, trying hard).
Figure 2.17. Performance and emotions. Source: Fisher & Noble, 2004.

2.5 Limitations in the models

Table 2.2 summarizes the antecedents of task variables, durations between measurement, scale of measurement, task engagement measure, and performance or outcome measure. Each of the models and their associated research identified essential components in the dynamic of affect and its influence on engagement or some measure of performance that can be assumed was preceded by an unmeasured work task engagement. However, each model has limitations in contributing to the development of a general theory of relating affect shifts to work task engagement.

The EPM has never been tested—possibly because the performance episode is so generally defined that operationalization is difficult. The ASM and PEM use the PANAS or derivatives thereof—previous sections of this thesis identified the limitations of the PANAS. For example, boredom—an emotion strongly associated with task performance—is neglected in the PANAS scale. The DEM summarizes the findings of only 17 in-depth interviews undertaken an unknown period after the task finished. Some models (such as EPM and PEM) use narrow definitions of engagement, such as effort measured using a
single-item scale, and the participants’ focus for which no scale was apparent. The DEM uses the broad definition of task engagement as “threads of experience,” which is so broad as to deny operationalization, except for in-depth interviews.

The most critical research gap derives from the interval of the repeated measures, with hourly being the shortest duration mentioned. However, given that affective shifts occur over minutes, there appears to be a need to understand affect shifts of this duration and their role in work task engagement. By focusing on approximately five-minute intervals between measurements, this thesis addresses this gap.
## Table 2.2

**Antecedents and Within-task Variables Associated with Dynamic Models**

<table>
<thead>
<tr>
<th>Model/ Researchers</th>
<th>Antecedents</th>
<th>Within-task Variables</th>
<th>Duration of Repeat Measures</th>
<th>Affect Measure</th>
<th>Task Engagement Measure</th>
<th>Outcome Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPM (Beal et al., 2005)</td>
<td>Regulatory resources Prior moods and emotions</td>
<td>Self-regulation of attention Task attention pull Off-task attentional demands Moods and emotions</td>
<td>Approximately two hourly using Ecological Assessment Measure and concept of performance episode</td>
<td>None specified</td>
<td>Cognitive on-task resources</td>
<td>Performance</td>
</tr>
<tr>
<td>ASM (Bledow et al., 2011)</td>
<td>Gender Age Education Position title Employment period NA (unpleasant activation at start)</td>
<td>Affect shift During day Positive events Negative events</td>
<td>Twice daily Experience sampling design</td>
<td>PANAS</td>
<td>Work engagement UWES</td>
<td>NA</td>
</tr>
<tr>
<td>DEM (O’Brien &amp; Toms, 2008)</td>
<td>Aesthetic Novelty Interest resonance Specific or experiential goal</td>
<td>Maintenance of engagement Aesthetic and sensory appeal Choices Interactivity interventions Novelty shifts Challenge shifts Feedback Interest, awareness, and attention movement within task Distractions Disengagement Barriers to use Challenge—too high/low Affect state Frustration/boredom—enjoyment, satisfaction fun Resource exhaustion (time energy) Interruptions</td>
<td>No repeated measures were involved-depth interviews were undertaken well after task completion</td>
<td>NA</td>
<td>Threads of experience Sensual—emotional—spatial—temporal themes</td>
<td>NA</td>
</tr>
<tr>
<td>PEM</td>
<td>Task effort Task skill</td>
<td>Ten times per day as a maximum, with a one-hour</td>
<td>Job emotions scale (Fisher, 2000)</td>
<td>Effort—single item</td>
<td>Self-rated four-item</td>
<td>NA</td>
</tr>
<tr>
<td>Model/Researchers</td>
<td>Antecedents</td>
<td>Within-task Variables</td>
<td>Duration of Repeat Measures</td>
<td>Affect Measure</td>
<td>Task Engagement Measure</td>
<td>Outcome Measure</td>
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<tr>
<td>(Fisher &amp; Noble, 2004)</td>
<td>Task interest</td>
<td>maximum gap</td>
<td></td>
<td>Experience sampling method</td>
<td></td>
<td>scale of performance</td>
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<td></td>
<td>Task challenge</td>
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<td>Task performance</td>
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</table>
2.6 Gaps in the literature

This review has identified the critical nature of work task engagement’s contribution to the efficient and effective completion of tasks. Also covered by the review, is work task engagement’s contribution to the broader constructs of engagement in workplaces, encompassing job, work, students, and computer user engagement. Then work task engagement and its dynamic nature was considered.

The research literature has gaps, and previous researchers have suggested further pathways for research. These gaps and suggestions relate to the dynamics of affective state changes and the interactions of some task characteristics and their combined effect on work task engagement. The involved variables include core affect fluctuations, task feedback, task challenge, and work task engagement. Task feedback is an essential variable in influencing engagement. Task feedback is mentioned explicitly in the DEM and implicitly in the PEM and EPM because feedback conveys information on progress toward goals, and thus performance information. Additionally, feedback is associated with the assessment of task challenge. Lower performance leads to lower feedback and subsequently higher perceptions of task difficulty. Task difficulty is associated with task engagement explicitly in the DEM and explicitly in the PEM.

2.7 Hypotheses development

2.7.1 Work task engagement and core affect–activation dimension

The dimension or element activation, at the level of subjective experience, refers to a sense if mobilization of energy on a continuum from sleep at one end to frenetic agitation and action at the other. (Russell & Barrett, 1999, p. 809)
In psychology and related social science disciplines, different terms have been used to refer to this continuum: “For example, arousal, energy, tension, and activity are commonly used as a substitute for activation” (Russell & Barrett, 1999, p. 809). The use of multiple terms for the same construct has created confusion in the literature. To ensure the meanings are evident in this thesis, when previous research uses another term, yet the term refers to activation, the original term is substituted with the term “activation.”

Regulation and mobilization to meet within–work task affective contingencies require activation–energization or deactivation–de-energization of central executive resources and affective resources. Hanoch and Vitouch (2004) reported that high activation states correspond to high engagement and need not deteriorate with increasing levels of activation. Additionally, Matthews et al. (2002) identified a high loading of activation (energy) on work task engagement. The conclusion drawn from this led to the first hypothesis:

**H1: An increasing level of activation is associated with an increasing level of work task engagement.**

### 2.7.2 Work task engagement and core affect–hedonic tone dimension

Feeling pleasant and unpleasant represents how well an individual is coping with their environment (Russell & Barrett, 1999). Interest in pleasure–displeasure in human existence is apparent in Western thought from the pre-Socratic era to the present (Russell & Barrett, 1999). Researchers use different analogous terms in the literature, such as “valence, hedonic tone, utility, good-bad, pleasure-pain, approach-avoidance, rewarding-punishing, appetitive-aversive, positive-negative—but the similarity is clear” (Russell & Barrett, 1999, p. 809). The meaning of hedonic tone in this thesis refers to the pleasure–displeasure
continuum, where the subject reports feeling somewhere between pleasant and unpleasant. The use of this meaning distinguishes hedonic tone from similar expressions, such as positive–negative and valence, both of which are used exhaustively in other disciplines, such as science. Consistent with the approach used for activation, to ensure the meanings are precise, when previous research uses other terms, yet the terms refer to hedonic tone, the original term is substituted with the term “hedonic tone” in this thesis.

Findings of researchers concerning hedonic tone’s influence on work task engagement is debated in the literature. Schwarz and Clore (1983) proposed the affect-as-information model. This framework associates salient positive and negative feeling stimuli and engagement. Drawing on this framework, Schwarz and Clore (1996) counterintuitively hypothesized that pleasant feelings stimulate a loss of focus and disengagement. This conceptualization aligns with the Carver and Scheier (1990) control process model, which suggests that pleasant feelings can contribute to individuals withdrawing physical and attentional resources from tasks. However, more recently, E. Linnenbrink and Pintrich (2003) concluded that:

_in general, these findings suggest that pleasant affect does not undermine behavioral engagement, and may even enhance it, especially when it is activated-pleasant affect. Unpleasant affect, however, seems to undermine behavioral engagement regardless of activation level._ (p. 115)

When considering students’ persistence on a task, E. Linnenbrink and Pintrich (2003) found that pleasantness is positively associated with engagement, while unpleasantness is negatively associated with engagement. One explanation for this discrepancy may be in the form and nature of the work task. Work tasks can be described on a characteristic spectrum
ranging from creative to analytical—at one end are analytical tasks that require a concentrated narrow focus and are process driven, while at the other end are creative tasks that require a broad attentional scope, lateral thought, free associations, and heuristic dependence (E. A. Linnenbrink, 2007). Unpleasant stimuli and their evoked states are more distracting in an analytical task than in a creative task. However, the weight of evidence suggests that pleasant hedonic tone increases task approach behavior (Fredrickson, 2004), facilitates creativity, enhances problem solving (Den Hartog & Belschak, 2007), and increases the availability of resources in task engagement (Salanova & Schaufeli, 2008).

The affect evocative potential of activities varies within tasks. Some activities within tasks will invoke pleasant responses, while others will invoke unpleasant reactions. However, a trend toward increasing pleasantness or a high level of pleasantness throughout the task will increase work task engagement. Thus:

\[ H2: \text{An increasing level of hedonic tone (pleasantness) is associated with an increasing level of work task engagement}. \]

2.7.3 Work task engagement and task feedback

Feedback is conceptualized as progress information regarding aspects of one’s performance or understanding. Hattie and Timperley (2007) distinguished between instruction and feedback by describing a continuum where one pole is feedback and the other is instruction. Individuals increase their effort when confronted with feedback when the intended goal is to attain the highest score they can, and progress feedback is given, rather than them merely being told to try harder or work more (Hattie & Timperley, 2007). Deci, Koestner, and Ryan (1999) found that positive feedback increases the likelihood that participants will return to or persist in an activity.
According to D. L. Butler and Winne (1995), task feedback stimulates positive affect (PA) when performance exceeds expectations, neutral affect when meeting expectations, and negative affect (NA) when not meeting expectations. Positive task feedback enhances enjoyment (high hedonic tone, high activation) (Sansone, 1986). Thus, as feedback becomes more positive, two things occur. First, activation increases, and, second, the hedonic tone becomes more pleasant. Participant states will move toward the second quadrant of the core affect plane, which increases work task engagement, as people at work who receive high levels of positive feedback tend to be more engaged (M. Christian & Slaughter, 2007). Sonnentag (2017) identified feedback as a task feature predicting work engagement. Based on this review, the following hypotheses were proposed:

\[ H_3: \text{A higher level of positive feedback is associated with a higher positive rate of activation change.} \]

\[ H_4: \text{A higher level of positive feedback is associated with a higher positive rate of hedonic tone (pleasantness) change.} \]

2.7.4 Work task engagement and task challenge

Task challenge is related to work task engagement in the literature, yet the literature presents no theories or empirical research evidence identifying task challenge as an affective stimulus. In a study reviewing the association between task difficulty and task engagement, Gendolla (1999) stated that “CV [task engagement] adjustments observed here were not meditated by emotional response [affective state shift]” (p. 61). Task challenge is a construct measured over the duration of a task, and is subsequently more likely to be directly related to task engagement. Silvia et al. (2016, p. 58) reported that subjects without psychological problems had a moderate engagement at lower difficulty levels—consistent with easy tasks
requiring little effort—yet showed their highest engagement at the most challenging level. This finding led to the following hypothesis:

\[ H5: A \text{ higher reported level of task challenge is positively associated with a higher level of work task engagement.} \]

2.7.5 Interaction between task challenge and task feedback characteristics, and association with work task engagement

Providing feedback in the form of progress marks to students using correct–incorrect responses indicated (in a performance-based context) that students associate evaluative perceptions of a task as challenging or not difficult, rather than determining self-competence based on “I am bright” or “I am stupid” evaluations (R. Butler, 1987; Hattie & Timperley, 2007). Thus, feedback given as performance evaluations will be associated with task difficulty. However, higher task challenge will be associated with lower scores and thus more negative feedback. Thus, lower score task feedback will be associated with higher task difficulty. This association led to the hypothesis:

\[ H6: \text{Task feedback is negatively associated with task challenge.} \]

2.8 A theoretical model linking the hypotheses

Based on a synthesis of extant research and conceptual frameworks in the field of interest, this study propose a hypothesized model (Figure 2.18). This model is referred to as the Task Engagement Affect (TEA) model and positions six proposed hypotheses of association between the primary constructs: core affect activation, core affect hedonic tone, task feedback, task difficulty, and work task engagement. As shown in Figure 2.18, affect is treated as an influential variable in work task engagement, where within-person affect fluctuations are measured over time (e.g., minutes). This research employed a repeated-
measures quasi-experimental design using a computer-mediated task. This use was acceptable because considerable work today is completed in home offices on computers. The computer delivery allowed the instantaneous capture of affect states between activities. The activities were chosen for their affect elicitation likelihood and similarity to the type of tasks encountered at work, and acted as affective interventions. This choice ensured that affective shifts occurred while staying close to the type of tasks performed during a normal work day. These activities included goal setting, decision making, reviewing a video, and receiving feedback.

Figure 2.18. Hypothetical dynamic conceptual model of task, core affect, and work task engagement.
Chapter 3

Method

Overview

This chapter locates this thesis in the positivist paradigm; describes the research design and the measurement instruments, including their reliability and validity; and outlines the experimental process, data screening, and data analysis procedures.

3.1 Research paradigm

Paradigms are essential in directing (Mackenzie & Knipe, 2006; Neuman, 2012; Saunders, Lewis, & Thornhill, 2009) and setting the context for evaluating research (Weaver & Olson, 2006). A paradigm is chosen by considering the research purpose and research questions (Berry & Otley, 2004; Saunders et al., 2009; Yin, 2012). The assumptions common to the appropriate paradigm then determine the method and analysis. Broadly defined, paradigms are a worldview based on a set of interpretive assumptions, a way of thinking, a model, a pattern, an exemplar, or an example (Simpson & Weiner, 1989). More specifically, the term “paradigm” represents the set of practices that define a research approach during a particular period (Kuhn, 2012). It is a theoretical perspective (Taylor, Roberts, Kermode, & Shahwan-Akl, 2006) or collection of assumptions, concepts, and propositions that focus thinking and research (Bogdan & Biklen, 2007).

A considerable number of research paradigms have been identified in the literature (Mackenzie & Knipe, 2006). Table 3.1 indicates four of the most common paradigms, listed in the table column headings: positivist, interpretive, transformative-critical, and pragmatic. The rows indicate dimensions used to distinguish paradigms identified in the literature,
including the purpose of the research, ontology, epistemology, axiology, methodology, research topics, evaluative processes, and types of outcomes. This research falls in the positivist domain, as shown in the second column in Table 3.1. The questions to be answered required identifying causality (Babbie, 2004) in a systematic manner, using a process of enquiry, investigation, and experimentation (Sekaran & Bougie, 2010).
### Table 3.1

**Research Paradigms**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Positivist (Logical and Empirical)</th>
<th>Interpretivist (Constructivist)</th>
<th>Transformative-critical Realism</th>
<th>Pragmatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research purpose with examples of different perspectives possible for research around this topic</td>
<td>To understand and predict causal-deterministic relationships, e.g., <em>How does affect influence engagement?</em></td>
<td>To understand the world of human experience, e.g., <em>How do different participants experience affect and engagement?</em></td>
<td>To research for an action outcome in the social context of power and politics, e.g., <em>How can affective communications be used to engage politically marginalized communities?</em></td>
<td>To solve research problems to assist decision making in dealing with problems of existence, e.g., <em>How can we use affective communication to improve engagement in work?</em></td>
</tr>
<tr>
<td>Ontology (Nature of reality)</td>
<td>A single truth and objective reality exists and is knowable</td>
<td>No single truth exists; there are multiple truths There are no objective realities, only multiple subjective realities The subjective realities can be identified</td>
<td>Any truth is determined by power</td>
<td>Any truth is determined by usefulness</td>
</tr>
<tr>
<td>Epistemology (How do we know what we know? Nature of the relationship between researcher and researched)</td>
<td>Empirical/rational Emphasize quantitative measurement Evidence: rational or empirical</td>
<td>Reflective Emphasize qualitative meanings—phenomenology Evidence: verbal, descriptive, and contextual</td>
<td>Mixed</td>
<td>Mixed</td>
</tr>
<tr>
<td>Axiology (Roles of values in research and the researcher’s stance)</td>
<td>Value free and etic Research is undertaken in a value-free way; the researcher is independent of the data and maintains an objective stance</td>
<td>Value bound and emic Research is value bound; the researcher is part of what is being researched—the researcher cannot be separated and so will be subjective</td>
<td>Value laden and etic Research is value laden; the researcher is biased by worldviews, cultural experiences, and upbringing</td>
<td>Value bound, etic, and emic Values play a large role in interpreting the results; the researcher adopts both objective and subjective points of view</td>
</tr>
<tr>
<td>Methodological (Process of research)</td>
<td>Experiments Quasi-experiments Tests, scales</td>
<td>In-depth interviews Focus groups Observation Diaries</td>
<td>Cross-sectional survey</td>
<td>Mixed or multi-method design</td>
</tr>
<tr>
<td>Methodology (Data collection and analysis)</td>
<td>Research topics</td>
<td>Evaluation</td>
<td>Outcomes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concept relationships</td>
<td>Validity, parsimony-reductionist, and generality</td>
<td>Test theories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human experience</td>
<td>Identification of diversity Uniqueness</td>
<td>Create theories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social inequities</td>
<td>Change</td>
<td>Create interventions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Business/individual problems</td>
<td>Usefulness</td>
<td>Solve problems</td>
<td></td>
</tr>
</tbody>
</table>

3.2 Design

The adopted design for this thesis is quasi-experimental, involving activity change-repeated measures. This design is sometimes referred to as an interrupted time series analysis. The design objective is to stimulate—by presenting a sequence of activities for completion—changes in core affect states, measured through shifts in activation and hedonic tone. These states are recorded for everyone at the completion of task-event intervals to produce core affect trajectories for each. These trajectories are then related to reported job engagement. This thesis adopts the position that hypotheses are probable because causation between the independent and dependent variables in a realistic work setting can only be identified as probable (Blunch, 2008). Repeated measures and randomization of one activity to create affective responses that are similar in range to real-world job experiences are used to improve the probability of identification of causation. These two issues are now discussed in detail as they have been incorporated into the present research design.

3.3 Repeated measures of core affect

The design is tied to studies in disciplines such as neuroscience, where events are “typically related to the modulation of brain oscillations time-locked to an event” (Gross, 2014). In this experiment, core affect oscillations along the dimensions of arousal and hedonic tone are time locked to events. Therefore, under the influence of event sequences, core affect is evanescent, thereby requiring repeated measures to capture the dynamic change. Different task events may evoke different states of core affect in employees. When continual task changes stimulate excessive core affect shifts, employees might refer to themselves as being on an “emotional rollercoaster.” To ensure the range of core affect trajectories was representative of the range experienced by employees in the real world, this
design incorporates, as one of the tasks, the viewing of an affective elicitation video selected randomly from a collection. Each elicitation video evokes a different emotion. The outcome is between- and within-individual variation in the pattern of core affect trajectories. This variation enables determination of the effect of a range of trajectories, thereby allowing an in-depth understanding of the nature of the form of relationship between the independent and dependent variables. The design involves applying several levels (forms) of an independent variable (affect) by a random allocation to participants to determine the effect of the independent variables over a range of values (forms) and to ensure an adequate coverage of values (Robson, 2002). Further details of this design are specified in the procedure section of this chapter. The following section describes the participants, measures, and procedures.

### 3.3.1 Participants

As shown in Table 3.2, 314 individuals participated in this study, the majority of whom were 15 to 35 years of age (50.1%) and female (54.5%). University-educated participants represented 69.1% of the sample, and 65.9% of the sample identified as first-language English speakers. The participant sample extended well beyond university students. It should be noted the sample was collected to increase diversity and thus the generalisability of the results across the working person and student populations.
Table 3.2

Characteristics of Participants

<table>
<thead>
<tr>
<th>Demographics</th>
<th>% (n = 314)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>15–25</td>
<td>46.6</td>
</tr>
<tr>
<td>26–35</td>
<td>32.5</td>
</tr>
<tr>
<td>36–45</td>
<td>11.6</td>
</tr>
<tr>
<td>46 +</td>
<td>9.3</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>45.5</td>
</tr>
<tr>
<td>Female</td>
<td>54.5</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>PhD</td>
<td>8.6</td>
</tr>
<tr>
<td>Masters</td>
<td>19.1</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>41.4</td>
</tr>
<tr>
<td>TAFE—vocational</td>
<td>14.0</td>
</tr>
<tr>
<td>High school</td>
<td>13.7</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>3.2</td>
</tr>
<tr>
<td>First language</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>65.9</td>
</tr>
<tr>
<td>Mandarin</td>
<td>5.7</td>
</tr>
<tr>
<td>Spanish</td>
<td>2.9</td>
</tr>
<tr>
<td>Thai</td>
<td>2.2</td>
</tr>
<tr>
<td>Other*</td>
<td>23.3</td>
</tr>
</tbody>
</table>

* Note: “Other” included Hindi, German, Italian, Bahasa, Vietnamese, and Cantonese.

3.3.2 Measures

This thesis used two measurement instruments: the affect grid (TAG) to measure affective responses (Russell et al., 1989) and a modified version of the UWES (Schaufeli & Bakker, 2003) to assess subjective engagement levels (Table 3.3). TAG and UWES are described below, including their associated levels of reliability and validity.
Table 3.3

Variables and Scales

<table>
<thead>
<tr>
<th>Variable</th>
<th>Negative Activation</th>
<th>Affect States</th>
<th>Research Question</th>
<th>Scale in Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: task</td>
<td></td>
<td></td>
<td></td>
<td>Modified UWES</td>
</tr>
<tr>
<td>engagement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent variable: (affect)</td>
<td></td>
<td>Trajectory</td>
<td></td>
<td>TAG (Time 1, Time 2, Time 3, Time 4)</td>
</tr>
<tr>
<td>arousal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent variable: (affect)</td>
<td></td>
<td>Trajectory</td>
<td></td>
<td>TAG (Time 1, Time 2, Time 3, Time 4)</td>
</tr>
<tr>
<td>hedonic tone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3.3 Engagement scales

Almost 25 years ago, Kahn (1990), a seminal writer in the job engagement area, stated: “I defined personal engagement as the harnessing of organization members’ selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performance” (p. 694). Later, Schaufeli, Salanova et al. (2002) defined work engagement as “a positive, fulfilling work-related state of mind that is characterized by vigor, dedication and absorption” (p. 74), referring to work engagement as the opposite of burnout. The opposite of burnout or an individual’s self-expression at work are two conceptualizations of work engagement that are the basis for a dichotomy in the measurement of the phenomenon: those users of Kahn’s self-expression perspective and those users of Schaufeli’s perspective.

When proposing the UWES, Schaufeli and Bakker (2003) noted a lack of engagement measurement. At the same time that they proposed their UWES scale, based on the same theoretical perspective of burnout, Shirom (2003) proposed the Shirom-Melamed vigor measure (SMVM) scale of vigor at work. Since then, other engagement scales have been developed based on the Kahn conceptualization. These scales are listed in Appendix
3.4 and include the job engagement scale (Rich et al., 2010; Shirom, 2003) and the May et al. (2004) scale. The job engagement scale was developed too late for inclusion in the present research. As a result of the SMVM’s focus on vigor—the physical aspect of work—it was considered inappropriate for this research, given the lack of physical effort involved in computer work. Meanwhile, the May Gilson and Harter scale was too comprehensive and incorporated certain areas (such as co-worker norms and supervisor relationships) that were not relevant to this research. Therefore, a modified version of the UWES was employed.

The UWES items were modified to ensure item relevance to engagement in tasks across short time intervals and tasks undertaken by computer. The modified scale consisted of seven items (Table 3.4) each measured on a seven-point scale, ranging from “never” to “always.” The items were summated into a single measure. This summation approach is consistent with the view of some previous researchers, who identified that UWES scores are more valid when measured as a one-dimensional composite (see Schaufeli & Bakker, 2004). A reliability estimate for the modified scale was calculated, and the value was $\alpha = 0.78$ (M. Christian & Slaughter, 2007; Sonnentag et al., 2010).

Table 3.4

*Adapted UWES Items for Task Engagement Measurement*

| UWES 1. Time seemed to pass quickly while doing the tasks |
| UWES 2. I was enthusiastic about doing these tasks |
| UWES 3. Doing these tasks filled me with energy |
| UWES 4. I would do these tasks again if given the opportunity |
| UWES 5. I felt happy when doing the tasks |
| UWES 6. I forgot everything around me when doing the tasks |
| UWES 7. I felt immersed in the tasks |
The validity of the UWES items has been established in many studies. For example, divergent validity has been tested using the relationship between burnout and engagement. Schaufeli, Salanova et al. (2002) reported that the MBI (Maslach et al., 1981) scales were significantly and negatively correlated ($r = -0.47$ and $r = -0.62$). This was confirmed by Schaufeli and Salanova (2007), who found negative correlations on four different samples ($r = -0.58$, $-0.46$, $-0.62$, $-0.20$). After reviewing studies from 10 countries, Schaufeli et al. (2006) found no significant correlations with gender or age, while similar findings in other studies (Avery, McKay, & Wilson, 2007) supported the discriminant validity of the UWES (Viljevac, Cooper-Thomas, & Saks, 2012). Viljevac et al. (2012) used the antecedents to engagement of person–job fit and person–organization fit, and noted evidence of predictive validity.

### 3.3.4 The affect grid

Construction-structural theorists of affect have undertaken an extended debate regarding the nature of affect. Wundt (1924) first proposed affect as a subjectively constructed phenomenon. Russell and Mehrabian (1977) proposed a three-dimensional structure, identifying the dimensions of pleasant–unpleasant, aroused–sleepy, and dominance–submissiveness (PAD). Later, Russell (1980) refined the PAD by proposing the two-dimensional structure of the circumplex model of emotions, based on the dimensions of pleasant–unpleasant (hedonic tone) and aroused–sleepy, and excluding the dominance–submissiveness dimension.

Construction-structural theorists have spawned some affect measurement scales. Moods are regarded as non-specific and lend themselves to dimensional measurement. In contrast, emotions are specific with unique labels (e.g., fear and happiness), and
measurement of emotions appears controversial. Researchers measure emotions in two ways: as discrete emotional entities, using instruments such as MAACXL-R (Zuckerman & Lubin, 1965) and DES-IV (Izard, Libero, Putnam, & Haynes, 1993), and as dimensional scales. The discrete list instruments require responses to a plethora of items. MAACXL-R and DES-IV require completion of 132 items and 36 items, respectively.

Table 3.5 shows nine scales derived from structural theories. Four of these scales are based on two dimensions (Larsen & Diener, 1985; Russell et al., 1989; R. E. Thayer, 1989; Västfjäll & Gärling, 2007; Watson et al., 1988) and three are based on three dimensions (Matthews, Jones, & Chamberlain, 1990; Schimmack & Grob, 2000; Sjöberg, Svensson, & Persson, 1979). There is no agreement on appropriate dimensions—their number, polarity (unipolar–bipolar), and relationships between measures (correlated or orthogonal). Proponents of two-dimensional scales have, in disagreement, proposed dimensions of arousal, energetic arousal, tense arousal, hedonic tone (valence: peasant–unpleasant), PA, and NA. However, in agreement, they have stated that the dimensions are independent and subsequently orthogonal. Proponents of three-dimensional scales have, in disagreement, identified the dimensions of pleasant–unpleasant (valence or hedonic tone), calmness, energetic arousal, arousal–non-arousal, dominance–submissiveness, relaxed–tense, and awake–tired. They have treated the three dimensions as interdependent, except for the PAD scale, where the dimensions are regarded as independent. The dimensions in both models are present in individuals at all times, although they are sometimes neutral.
Table 3.5

Constructionist-dimensional Theories and Associated Measurement Scales

<table>
<thead>
<tr>
<th>Proponents</th>
<th>Affect Dimensions</th>
<th>Associated Scale</th>
<th>Scale Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mehrabian and Russell (1974)</td>
<td>3-PAD Pleasure–displeasure</td>
<td>PADS (1)</td>
<td>18 items (six for each dimension)</td>
</tr>
<tr>
<td></td>
<td>Arousal–non-arousal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dominance–submissiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mehrabian (1978)</td>
<td>3-PAD—Revision 1</td>
<td>PADS (2)</td>
<td>24-item pleasure scale/eight-item arousal scale/15-item dominance scale</td>
</tr>
<tr>
<td>Larsen and Diener (1985)</td>
<td>2-HE Hedonic level</td>
<td>The PANAS Scale</td>
<td>20 items (10 for each dimension) Fully summated scores for each dimension</td>
</tr>
<tr>
<td>Watson and Tellegen (1985)</td>
<td>2-PANA PA NA (uncorrelated)</td>
<td>TAG</td>
<td>Single-item scale of pleasure and arousal</td>
</tr>
<tr>
<td></td>
<td>(uncorrelated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. E. Thayer (1989)</td>
<td>2-TE Arousal Energetic arousal</td>
<td>ETA scale</td>
<td></td>
</tr>
<tr>
<td>Matthews, Jones, and Chamberlain (1990)</td>
<td>3-VCE Valence Calmness Energetic arousal (substantially correlated)</td>
<td>University of Wales Institute of Science &amp; Technology (UWIST)</td>
<td>Adjectival checklist</td>
</tr>
<tr>
<td>Wilhelm and Schoebei (2007)</td>
<td>3-VCE</td>
<td>SMS</td>
<td>Six-item, seven-step scales</td>
</tr>
</tbody>
</table>

Table 3.5 continues…
The two-dimensional scales are commonly used in the research literature and are supported by neurobiological evidence. Wilson-Mendenhall et al. (2013) identified neural evidence for their use. Subjective ratings using measures of the two dimensions of pleasant–unpleasant and aroused–sleepy correlated with brain activity both within and across emotion categories. Hedonic tone correlates with medial orbitofrontal cortex activity, and arousal correlates with left amygdala activity across a range of emotions. Two measurement scales are based on two-dimensional structures using hedonic tone (sometimes called “valence” or “pleasant–unpleasant”) and arousal—the multi-item Swedish core affect scales (SCAS) (Västfjäll & Gärling, 2007) and the single response two-factor scale, TAG (Russell et al., 1989).

Single-item or multi-item scales are used to measure the discrete dimensions in the TAG and SCAS. The two dimensions are:

- arousal—a subjective measure of the state of physiological and psychological activation or readiness for action (Reber, Allen, & Reber, 2009)
- hedonic tone—a subjective evaluation of a pleasant–unpleasant state attributable to experience (Reber et al., 2009).

Multi-item arousal scales are usually applied to measure a specific context of arousal. For example, there are scales to assess sexual arousal (Althof, Perelman, & Rosen, 2011; Chambless & Lifshitz, 1984), sleep arousal (Nicassio, Mendlowitz, Fussell, & Petras, 1985), and spousal conflict arousal (Seymour & Lessne, 1984). The multi-item measurement of
hedonic tone is usually undertaken with the Snaith-Hamilton pleasure scale (Snaith et al., 1995).

The most popular and most widely employed of these scales is TAG, which was developed as a way to rapidly measure subjective affect states and affective dispositions using the dimensions of pleasure–displeasure and arousal–sleepiness (Russell et al., 1989). Subjectively recording the continual and rapid change in core affect states requires simple and rapid measurement instruments to record changes in participants’ states when confronted with changing task-stimulated emotions. TAG has been employed to record affective responses to stimuli, including:

- music (Dubé, Chebat, & Morin, 1995; Husain, Thompson, & Schellenberg, 2002; Wheeler, Sokhadze, Baruth, Behrens, & Quinn, 2011)
- weather (Keller et al., 2005)
- product services (Kahneman, 2000; Morin, Dubé, & Chebat, 2007)
- product categories (Holbrook & Gardner, 1993)
- internet sites (Menon & Kahn, 2002)
- software interfaces (Colomo-Palacios, Casado-Lumberas, Soto-Acosta, & García-Crespo, 2011)
- faces (Aviezer et al., 2008; Johnson & Fredrickson, 2005)
- art (De Petrillo & Winner, 2005)
- city skylines (Heath, Smith, & Lim, 2000)
- play environments (Mandryk, Atkins, & Inkpen, 2006).

TAG has been used to identify the relationships between subjective affect and neural correlates (Klemm, Lutes, Hendrix, & Warrenburg, 1992; Morita et al., 2008); to determine
affective influences on behavior (Deaver, Miltenberger, Smyth, & Meidinger, 2003; Ekkekakis, Hall, VanLanduyt, & Petruzzello, 2000; Golden, Tenenbaum, & Kamata, 2004; Palfai & Ostafin, 2003) and memory (Eich, 1995; Eich & Macaulay, 2000); and to determine gender differences in affective responses and evaluation of affect theories, including those concerned with affect appraisal and affect regulation (Strain & D’Mello, 2011). An EBSCO Boolean search on October 14, 2017 revealed 409 research and theory articles employing TAG. The less-used SCAS had four reports over the same period.

TAG is an undisguised single-item scale for participants to interpret and report subjective feelings. This scale is related to Mehrabian’s (1980) temperament scale (PADS) involving three dimensions: pleasant–unpleasant (hedonic tone, valence), arousal, and dominance. Participants consider two dimensions simultaneously (arousal and hedonic tone) and are invited to locate their response in the grid. Arousal and hedonic tone are represented as the axes of the grid, as shown in Figure 3.1. Each dimension is bipolar and independent of each other. The vertical axis is the scoring scale for arousal, which ranges from high arousal to low arousal, where zero represents not aroused or sleepy, four represents neutrally aroused (as one would expect in a normal situation), and eight represents highly aroused. The horizontal axis is the scoring scale for hedonic tone (unpleasant–pleasant, valence) and ranges from feeling pleasant to unpleasant, where zero represents unpleasant, four represents a neutrally pleasant/everyday feeling, and eight represents pleasant.

The descriptors “stressed,” “excited,” “depressed,” and “relaxed” are placed in the grid to remind respondents of the feeling covered in each quadrant. In the center of the grid (4, 4) is an area representing “neutral everyday feelings.” Participants require training in using the grid to report their feelings. This training is undertaken by describing the center of
the grid (Figure 3.1) as being a neutral everyday position in regard to arousal and feeling pleasant or unpleasant. The right half of the grid represents pleasant states, and the left half represents unpleasant states. The top half represents higher arousal states and the bottom half represents lower arousal states. The participants receive examples of high arousal, moderate arousal, and moderately aroused slightly pleasant states.

TAG is designed to capture single instances of subjective affect states. Russell et al. (1989) identified that:

the affect grid may prove to be the instrument of choice when subjects are called to make affective judgements in rapid succession or to make a large number of judgments, especially when those judgements are to be aggregated. Indeed, appropriately implemented on a computer, the Affect Grid should prove capable of assessing the continuous flux of affective responses to drama, music, personal interaction, and the like. (p. 499)

Russell et al. justified using affect and arousal as two key dimensions by emphasizing that both are seminal and central to emotional theory. The two-dimensional nature of affect is well established in the literature (Lang et al., 1998; R. E. Thayer, 1989). Multi-item scales of affect—such as the PANAS (Watson et al., 1988) and the differential emotions scale (Izard, Dougherty, Bloxom, & Kotch, 1974)—take time to complete. In contrast, TAG can be completed very quickly with minimal distraction and interference in the event flow. Frequent access to emotion states can alter the response (Rottenberg, Ray, & Gross, 2007). TAG also allows for recording a neutral affect state. Watson and Clark (1997) stated that:

the problem is that emotions occur as fleeting and highly intense episodes, whereas the bulk of waking life [including working life] is spent in longer
lasting, low-to-medium intensity states. Consequently, most of everyday life is spent in mood states that do not correspond to classic emotions.

Figure 3.1. The affect grid.

Given that TAG is a single-item scale, it cannot be tested for construct reliability using analysis of internal validity. However, Russell (1989) tested for interrater reliability by randomly assigning participants into one of two groups. The responses for the groups were then correlated, and Table 3.6 displays these correlations. The correlation coefficients ranged from $r = 0.81$ to $r = 0.99$. 

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Table 3.6

The Affect Grid Reliability Tests

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russell et al. (1989)</td>
<td>20 students/emotional words</td>
<td>Arousal: $r = 0.97$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleasure $r = 0.98$</td>
</tr>
<tr>
<td></td>
<td>25 students/emotional facial expressions</td>
<td>Arousal: $r = 0.97$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleasure $r = 0.99$</td>
</tr>
<tr>
<td></td>
<td>Nine students/emotional facial expressions</td>
<td>Arousal: $r = 0.81$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleasure $r = 0.85$</td>
</tr>
</tbody>
</table>

TAG shows adequate interrater reliability and sound convergent validity with other affect scales, such as PANAS (Watson et al., 1988). TAG demonstrates good discriminant and convergent validity (Table 3.7) when each dimension (arousal and hedonic tone) is independently tested (Russell et al., 1989). Using the same participants Russell et al. (1989), compared the results of the stimulus responses with other measures of affect taken at the same time, including single-item pleasure and arousal scales, circular scales (both direct and indirect), multidimensional scales, and unidimensional scales. The results indicated adequate levels of convergent and discriminant validity.

Tests of TAG’s concurrent validity suggest that this scale is a valid measure of pleasure and arousal, demonstrating moderate levels of correlation with scales designed to assess specific facets of emotional experience, such as depression, PA, and NA. Killgore (1998) stated that:

*overall, the greatest value of the affect grid appears to be its brevity and ease of administration. It provides a moderately valid measure of the general*
affective state and might be used in situations when more time-consuming measures would not be appropriate or feasible. (p. 642)

By implementing TAG training as one of the experiment tasks, participants can be trained in the use of TAG. Thus, the current study incorporated the training steps specified by Russell et al. (1989) into the web application, as shown on the screen grabs of each webpage in Appendix 3.7.
Table 3.7

The Affect Grid Validity Tests

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Concurrent Validity</th>
<th>Convergent Validity</th>
<th>Discriminant Validity</th>
<th>Criterion Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russell et al. (1989)</td>
<td>Sample $n = 20$ students/emotional words, Part 1</td>
<td>Single item</td>
<td>Single item</td>
<td>Single item</td>
<td>Single item</td>
</tr>
<tr>
<td></td>
<td>Correlations among four scales of pleasure and arousal—similar</td>
<td></td>
<td>Pleasure scale $r = 0.95$</td>
<td>Pleasure $r = 0.12$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 20$ students/emotional words, Part 2</td>
<td></td>
<td>Arousal scale $r = 0.95$</td>
<td>Arousal $r = 0.03$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inter-correlations among four scales of pleasure and arousal—not similar</td>
<td>Single item</td>
<td>Circular scale</td>
<td>Circular scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 20$ students/emotional facial expressions</td>
<td>Direct circular scale</td>
<td>pleasure scale $r = 0.95$</td>
<td>Direct circular scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 25$ students/emotional facial expressions</td>
<td></td>
<td>Arousal $r = 0.91$</td>
<td>Arousal $r = 0.16$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td>Multidimensional scaling</td>
<td>Pleasure $r = 0.95$</td>
<td>Multidimensional scaling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td></td>
<td>Arousal $r = 0.91$</td>
<td>Arousal $r = 0.01$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td>Unidimensional scaling</td>
<td>Pleasure $r = 0.96$</td>
<td>Unidimensional scaling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td></td>
<td>Arousal $r = 0.93$</td>
<td>Arousal $r = 0.01$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td>Single item</td>
<td>Pleasure $r = 0.96$</td>
<td>Pleasure $r = -0.02$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td></td>
<td>Arousal $r = 0.95$</td>
<td>Arousal $r = 0.07$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td>Single item</td>
<td>Mehrabian and Russell scale</td>
<td>Mehrabian and Russell scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td></td>
<td>Pleasure $r = 0.85$</td>
<td>Pleasure $r = 0.15$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$n = 9$ students/emotional facial expressions</td>
<td></td>
<td>Arousal $r = 0.82$</td>
<td>Arousal $r = 0.11$</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Sample</td>
<td>Concurrent Validity</td>
<td>Convergent Validity</td>
<td>Discriminant Validity</td>
<td>Criterion Validity</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------</td>
<td>---------------------</td>
<td>--------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td>$n = 162$ students/current mood</td>
<td>–</td>
<td>Mehrabian and Russell scale</td>
<td>Mehrabian and Russell scale</td>
<td>PA $r = 0.54$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pleasure $r = 0.77$</td>
<td>Pleasure $r = 0.23$</td>
<td>NA $r = -0.45$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arousal $r = 0.88$</td>
<td>Arousal $r = 0.26$</td>
<td></td>
</tr>
<tr>
<td>Killgore (1998)</td>
<td>$n = 284$ students/mood</td>
<td>Profile of mood states</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleasure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tension $r = -0.51$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depression $r = -0.54$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anger $r = -0.45$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vigor $r = 0.43$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fatigue $r = -0.46$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confusion $r = -0.47$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total mood disturbance $r = -0.59$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tension $r = NS$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depression $r = NS$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anger $r = NS$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vigor $r = NS$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fatigue $r = -0.29$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Confusion $r = -0.15$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total mood disturbance $r = -0.21$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beck depression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>inventory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pleasure $r = -0.49$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal $r = -0.17$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.7 continues…
<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Concurrent Validity</th>
<th>Convergent Validity</th>
<th>Discriminant Validity</th>
<th>Criterion Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA</td>
<td>Pleasure $r = 0.43$</td>
<td>Arousal $r = 0.39$</td>
<td>NA</td>
<td>Pleasure $r = -0.56$</td>
<td>Arousal NS</td>
</tr>
</tbody>
</table>
3.3.5 Procedure

The participants comprised 314 respondents to a call to academic and professional staff and students of Swinburne and Monash Universities via the internal mail and email systems using the ‘we need your help’ brochure shown in Appendix 3.6. Ethics approval was obtained on April 22, 2009 from the Standing Committee on Ethics in Research Involving Humans at Monash University (Appendix 3.0). All participants spoke English and participation in the study was voluntary. The participants had access to a reliable internet connection and a quiet location where concentrated and uninterrupted work could occur.

The participants were directed to a specific website consisting of 41 webpages linked sequentially. They were presented with a neutral grey background with a minimum use of color. Before proceeding with the research activities, the participants provided their email addresses, which were stored and acted as a control to prevent any participant completing the experiment twice. Each email was checked against the database to ensure this email address had not been used before. If the email had been used before, the participant was not allowed further access to the webpages containing the tasks. This last procedure was implemented to prevent learning effects on the tasks and task responses.

The email addresses were stored and randomized in a different database to the results to ensure the experimental results could not be matched to a specific participant. Once they had moved onto the research activities, the participants were introduced to the experiment requirements. The job to be completed consisted of six sequential tasks, plus four core affect state recording tasks, as shown in Figure 3.2. Measures of the participants’ affective states were subjectively reported at A1, HT1; A2, HT2; A3, HT3; and A4, HT4. The participants had to complete 12 activities over the period of the job. Table 3.8 summarizes the activities
undertaken by participants. It was not possible to move back to prior tasks once each page was completed.

Figure 3.2. The experiment procedure.

Table 3.8 shows the program modules, task sequencing, time at which the core affect state was recorded, and brief descriptions of each activity. The task stimuli are listed under activity sequences 1 to 10 (Table 3.8). The activities required data entry, video viewing, two puzzle question sets presented in multiple-choice format, and the recording of affect states. The videos chosen for Task 5 were based on reviewing a database of films developed by Rottenberg et al. (2007) and Schaefer, Nils, Sanchez, and Philippot (2010). The selection was made based on the highest rated clip for each emotion and the availability in Australia of the clip’s source movie.
Table 3.8

Activities Undertaken by Participants

<table>
<thead>
<tr>
<th>Program Module</th>
<th>Activity Sequence #</th>
<th>Measurement Event #</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td>Demographic data collected, relating to age and language spoken</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
<td>Participants complete a short training program and practice using TAG</td>
</tr>
<tr>
<td>3</td>
<td>Time 1</td>
<td></td>
<td>Initial core affect state reported using TAG (A1, HT1)</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td></td>
<td>Participants complete a short untimed five puzzle questions task; the results are passed back to participants</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
<td>Participants view an affect stimulating video that is randomly selected from a range of 18 possibilities (Table 3.9); each video arouses a different, but specific, affect state</td>
</tr>
<tr>
<td>6</td>
<td>Time 2</td>
<td></td>
<td>Participants record their post-video affect state using TAG</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td></td>
<td>Participants set goals for a future puzzle test, based on test scores obtained for Activity 4</td>
</tr>
<tr>
<td>8</td>
<td>Time 3</td>
<td></td>
<td>Participants complete TAG for the third time</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td></td>
<td>Participants undertake a longer and increasingly difficult 10-question series of puzzles that require time-limited responses</td>
</tr>
<tr>
<td>10</td>
<td>Time 4</td>
<td></td>
<td>Participants complete TAG for the final time</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td></td>
<td>Participants complete the modified UWES</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>Participants are thanked and logged out of the system</td>
</tr>
</tbody>
</table>

3.3.6 Task stimuli

Table 3.9 displays the video clips used in this study, as well as the emotion they elicit. Fear was represented four times, while anger was represented twice, sadness twice, surprise twice, amusement once, disgust once, and tenderness once. The questions for Tests 1 and 2 are shown in Appendix 3.7 as contained in the application screen grabs. These clips were not being used to test for specific affective responses on engagement, but to ensure there were a wide variety of responses to represent the real world. Ethical considerations limited the clip selection.
Table 3.9

Video Clips Used as Task Requirement and Affect Elicitation

<table>
<thead>
<tr>
<th>Video</th>
<th>Affect</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>When Harry Met Sally</em></td>
<td>Amusement (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>Bodyguard</em></td>
<td>Anger (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>Cry Freedom</em></td>
<td>Anger (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>Capricorn</em></td>
<td>Surprise (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>The Champ</em></td>
<td>Sadness (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>The Shining 1</em></td>
<td>Fear (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>Silence of the Lambs</em></td>
<td>Fear (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>Alaska’s Denali</em></td>
<td>Neutral (Coan &amp; Allen, 2007)</td>
</tr>
<tr>
<td><em>Misery</em></td>
<td>Arousal (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>The Dead Poets’ Society</em></td>
<td>PA (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>Forrest Gump</em></td>
<td>Tenderness (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>American History X</em></td>
<td>NA (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>Schindler’s List</em></td>
<td>Anger (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>The Shining 2</em></td>
<td>Fear (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>Trainspotting</em></td>
<td>Disgust (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>City of Angels</em></td>
<td>Sadness (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>The Blair Witch Project</em></td>
<td>Fear (Schaefer et al., 2010)</td>
</tr>
<tr>
<td><em>Sea of Love</em></td>
<td>Surprise (Coan &amp; Allen, 2007)</td>
</tr>
</tbody>
</table>

3.3.7 Software development

The software was developed as a BASIC language application and tested for operation on a single computer. The software was then modified to run as a web application using Microsoft Visual C++ and HTML. To ensure an adequate number of completed responses, the time required to complete all the tasks was limited to 20 minutes.

Pre-testing was undertaken to ensure the data security of the experiment. The application was tested for post-back accuracy, operating stability, and browser integration across Mozilla Firefox, Internet Explorer, and Google Chrome. Data entry was tested for
field constraint accuracy. A principal objective was to ensure that each participant’s responses posted back from the source IP address and were stored correctly using a cart identification system, based on retail carts, which was opaque to the participants. A live run was undertaken using 20 friends of the researcher, and their data were stored in a temporary database and checked for accuracy. No significant modifications to the application program were required.

3.3.8 Statistical procedures

Any participants who had not completed the entire set of tasks were deleted. Data screening was performed using multivariate outlier identification. All included participants were within the acceptable range of skewness and kurtosis.

3.3.9 Data analysis

At the completion of four months, data were transferred from the access database on the server to a Microsoft Excel spreadsheet, where they were converted to a comma-separated values (CSV) format for uploading into Mplus. The data were analyzed using a Parallel Process Latent Variable Growth Curve Model (PPLVGCM) and Mplus (Muthen & Muthen, 1998-2012). PPLVGCM is used to capture inter-individual differences in intra-individual affect trajectories and to test the validity of a linear model against non-linear models (Duncan, Duncan, & Strycker, 2010). Mplus offers some advantages over other analytical software packages, including the ability to deal with individually varying observation times and Monte Carlo processes for power estimation (Duncan et al., 2010). SPSS was used to develop graphs of the response patterns.
Chapter 4

Analysis

Overview

This chapter describes data preparation and analysis. The measurement model based on the previous theoretical model is presented and analyzed using structural equation modeling. The model is briefly reviewed, and the use of the structural equation modeling framework is justified. Sample size acceptability, data screening, scale acceptability, and model fit are assessed; the hypotheses are tested; and, finally, the additional findings are identified.

This research applied the structural equation modeling (SEM) framework (Muthén & Curran, 1997) to the hypothesized parallel process latent growth curve model to test individual changes over time in two or more variables. Although other methodologies are available, such as multilevel modelling and random coefficients (e.g., Bryk & Raudenbush, 1987; Longford, 1993), the SEM framework was chosen because it allows modeling of various growth trajectories shapes, and covariates can be regressed on latent growth trajectories. In addition, it accounts for both within- and between-person variance. Drawing on the work of Willett and Sayer (1996), B. M. Byrne (2012) added additional attributes to the list of SEM advantages in latent growth curve modelling. These attributes include the ability of the method to accommodate up to 30 waves of longitudinal data, deal with linear and non-linear data, and handle irregularly spaced intervals. B. M. Byrne (2012) also identified that latent growth curve models not only allow for the estimation of residual
variances in measurement, but also for the autocorrelation and fluctuations in measurement across time—unlike ordinary least squares regression.

Figure 4.1 presents the tested model showing standardized results. In this figure, measured variables are represented by rectangles, and latent variables are represented by ovals. The absence of a connecting line implies a lack of hypothesized direct effect. This hypothesized PPLVGCM includes four latent growth parameters, the slope parameter (representing the participant’s rate of change over the duration of the experiment), and the intercept (representing the participant’s baseline or initial state) (B. M. Byrne, 2010) for activation and hedonic tone. Four measurement waves at approximately five-minute intervals were used to test this thesis. These time variables were measured using the core affect grid. Feedback and task challenge were measured using single-item scales. The model was estimated by robust maximum likelihood procedures.

4.1 Sample size acceptability

The sample size is an essential consideration in the selection of SEM as an analytical tool (Jackson, 2003). The estimation and interpretation of SEM results depend on sample size (Hair, Black, Babben, Anderson, & Tatham, 2006). There is no definitive measure of sample size, and this may need to be increased if a model suffers from specification errors or departs from normality. The selected estimation process is also important. For example, maximum likelihood requires a minimum sample size of 100 to 150; however, when the sample size increases above 400 to 500, difference sensitivity is too high, and all goodness-of-fit tests subsequently indicate poor fit (Hair et al., 2006). The 314 participants involved in this thesis fell within the agreed range of most statisticians (e.g., Hoyle, 1995; Kelloway,
Figure 4.1. Task Engagement Affect model test results.

\[ \chi^2(29, \, N=314, \, ) = 49.27, \, p < 0.01\]

RMSEA = 0.05

CFI = 0.95

TLI = 0.92

n = 314

#All standardized Parameters
2015; Kline, 2015), given that maximum likelihood was used. There were no specification errors, and there were no major departures from normality (see Appendix 3.8).

### 4.2 Data screening

Three hundred and thirty-six participants responded. Two incomplete responses due to ISP failure were removed from the analysis. Data were examined for normality and multivariate linearity. Twenty participants were eliminated due to $Z = < -3$ or Mahalanobis $< 0.001$. These participants had clicked through the tasks using the scale’s high values or low values (e.g., all 0 or all 8 for activation and hedonic tone, with limited variation). Consistent responses on the extremes of the scale were considered unlikely with the type of stimuli presented; thus, these outliers were assumed to represent misunderstanding during the training in the use of the scale.

### 4.3 Scale acceptability

Five of the six measurement variables—task challenge, task feedback, activation, and hedonic tone—were single-item scales. One of these was a time-invariant measure: task challenge. Task challenge was assessed on a seven-point scale, while feedback was assessed as the total number of positive reports through the decision activity. Task engagement was measured by a summated seven-item scale and evaluated for reliability using Cronbach’s alpha. It was found to have acceptable levels of reliability ($Cronbach’s \alpha = 0.811$). Validity was assumed based on the frequent and broad application by researchers of the UWES and the work task parent scale from which the work task engagement scale was derived.
4.4 Analysis of slopes

The baseline core affect for the participants across the group was approximately neutral. The mean for the intercept for activation was 4.032 and for hedonic tone was 4.627—slightly above neutral (4) for both activation and hedonic tone (Table 4.1). There was no evidence of a direct effect apparent of the intercept of activation on the slope of hedonic tone, or the intercept of hedonic tone on the slope of activation. Residual variances were high at Time 2 for activation ($s^2 = 2.281$) and hedonic tone ($s^2 = 4.401$). At this time, the participants viewed videos that appeared to have had a differing influence on the affect they experienced.

The results in Table 4.1 indicate that the change in participant activation over the time of the task showed a steady increase from $mu = 4.032$ to $mu = 5.210$, with minimal fluctuation. However, the growth in hedonic tone had greater volatility, with fluctuation declining rapidly from the baseline at Time 2 with the video viewing task; climbing again with goal setting, yet not quite returning to the baseline; and then declining again with the decision question tasks. However, the minimal peak-to-trough change for activation (1.1072) and hedonic tone (1.729) suggested that changes in slopes across both constructs were likely to be low. The variance increase in hedonic tone during Time 1 to Time 2 was a result of random allocation of movie clips to each participant.
### Table 4.1

*Estimated Sample Statistics*

<table>
<thead>
<tr>
<th>Trajectory Means</th>
<th>Activation Time 1</th>
<th>Activation Time 2</th>
<th>Activation Time 3</th>
<th>Activation Time 4</th>
<th>Hedonic tone Time 1</th>
<th>Hedonic tone Time 2</th>
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<th>Activation Time 3</th>
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<th>Activation Time 3</th>
<th>Activation Time 4</th>
<th>Hedonic tone Time 1</th>
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### 4.5 The structural model

Figure 4.1 shows the PPLVGC, consisting of two latent variables: activation and hedonic tone. The factor loadings for each period reflect time intervals between measurements and the growth trajectory shape. The intercept represents the baseline at Time 0, and the slope represents the linear trajectory across the three time periods.

The model was over-identified \((df = 29)\). Model fit was evaluated with the chi-square statistic, comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA). The model was evaluated against the following benchmarks: RMSEA < 0.05, standardized root mean square residual < 0.05, CFI > 0.90, and TLI > 0.90. The model fitted the data. Figure 4.1 shows RMSEA = 0.05 (rounded up from 0.047), CFI = 0.95, and TLI = 0.92. The hypothesized associations for the model were all significant,
except the association between the growth trajectories of hedonic tone and activation, which
was insignificant.

Each of the research hypotheses is now examined in their numeric sequence. Unless
otherwise indicated, all figures are standardized values.

**H1: An increasing level of activation is associated with an increasing level of work task engagement**

Hypothesis 1 was fully supported ($r^2 = 0.66, p < 0.01$). A one-unit increase in
activation was associated with a 0.66 increase in work task engagement.

**H2: An increasing level of hedonic tone (pleasantness) is associated with an increasing level of work task engagement**

Hypothesis 2 was fully supported ($r^2 = 0.36, p < 0.01$). A one-unit increase in
activation was associated with a 0.36 increase in work task engagement.

**H3: A higher level of positive feedback is associated with a higher positive rate of activation change**

Hypothesis 3 was fully supported ($r^2 = 0.2, p < .05$).

**H4: A higher level of positive feedback is associated with a higher positive rate of hedonic tone (pleasantness) change**

Hypothesis 4 was fully supported ($r^2 = 0.31, p < .01$).

**H5: A higher reported level of task challenge is positively associated with a higher level of work task engagement**

Hypothesis 5 was fully supported ($r^2 = 0.50, p < 0.01$).

**H6: Task feedback is negatively associated with task challenge**

Hypothesis 6 was fully supported ($r = -0.20, p < 0.01$).
4.5.1 Feedback and associations with activation and hedonic tone

Feedback influences work task engagement indirectly by altering the change rate of activation and hedonic tone. The model confirmed that feedback influences both activation ($r^2 = 0.20, p < 0.05$) and hedonic tone ($r^2 = 0.31, p < 0.01$). Thus, positive feedback positively increases the rate of change of activation and hedonic tone, and subsequently increases work task engagement. This result suggested an exponential/parabolic association of task challenge with work task engagement. However, this was not apparent over the limited number of observations in the experiment.

The significant residual variances of hedonic tone slope ($\mu = 0.905, p < 0.01$) and activation slope ($\mu = 0.853, p < 0.01$) indicated inter-individual differences in hedonic tone and activation differences in the individual trajectories of hedonic tone and activation across the activities constituting tasks.
Chapter 5

Discussion

Overview

This chapter presents a summary of the thesis, and reviews the key findings based on their similarities and dissimilarities with extant research and theories. This chapter also discusses the imitations of the thesis and identifies essential contributions. The thesis concludes with an assessment of future implications.

The dynamic mechanisms by which work engagement emerges are, however,

not well understood. (Bledow et al., 2011, p. 1246)

Overall, a literature review identified a gap in understandings of the short-term dynamic mechanisms involved in work task engagement, including the affective experiences within tasks of individuals (e.g., moods, emotions, stress, and anxiety), task challenges, and task feedback. As a small step to help fill this void, this thesis examined the extent to which within-task core affect activation trajectories, within-task core affect hedonic tone trajectories, and their associations with within-task feedback and task challenge are related to the level of engagement in a multi-activity computer-mediated work task.

Based on extant research and related theories (e.g., Bledow et al., 2011; Fisher & Noble, 2004), this research developed and proposed a dynamic framework, titled the TEA model, linking core affect, task feedback, task challenge, and work task engagement (Figure 5.1). As shown above, the model incorporates two linear latent growth factors: within-task activation trajectory and within-task hedonic tone trajectory. These latent variables—
activation and hedonic tone—represent the dimensional structure of core affect (Russell & Barrett, 1999).

Figure 5.1. Hypothesized theoretical Task Engagement Affect model with related hypotheses.

This research treated work task engagement as the dependent variable and the two linear latent trajectories associated with work task engagement. Additional work task engagement constructs identified in the literature are task challenge and task feedback. The task challenge variable influences work task engagement directly, and the task feedback variable is mediated by the two latent trajectories. The relationship indicates that the slope of the trajectories is increased by the level of positive feedback through the task, and these trajectories are associated with work task engagement. The higher the positive feedback, the greater the growth trajectory, and the greater the work task engagement level. Conversely, the lower the positive feedback, the lower the linear growth trajectory, and the lower the work task engagement.
The two trajectories were tracked with measurements of activation (low–high) and hedonic tone (unpleasant–pleasant) at four time points while participants undertook activities designed to stimulate cognition and affect when completing a task. During the activities, the participants were fed information about their progress. At the completion of the task, their engagement level and responses to task challenge levels were recorded. Analysis of the responses was completed using an SEM platform and a parallel process latent variable growth curve structure (Cheong, MacKinnon, & Khoo, 2003). The results indicated full support for the model structure and hypothesized relationships. The existence of within-task activation trajectories and hedonic tone trajectories stimulated by task activities were associated with different work task engagement levels, thereby identifying that work task engagement is dynamically associated with core affect activation and core affect hedonic tone.

Additionally, testing of the TEA model confirmed that affect states can and do change within tasks of around 20-minute duration, depending on the constituent activities involved in the task. Responses varied across the four time points, and different trajectories for both activation and hedonic tone were apparent. Associating static enduring affect states over durations even as short as four hours as indicative of work task and workplace engagement misses the inherent dynamism of affect, and subsequently the essential dynamism of work task engagement. An individual’s activation and hedonic tone are volatile in this thesis experiment.

Kahn (1990), noted that individuals are constantly changing their level of commitment during their workdays in response to momentary ebbs and flows.
Kahn (1992) sought to identify explanatory variables for these shifts; however, for the most part, the variables identified were organizational-level variables. Affect is apparently a significant component of any ebb and flow within work tasks, and, by inheritance from work task engagements during the day, workplace engagement must shift during the day. It needs to be noted that organizational-level antecedents to workspace engagement are relevant to work task engagement, as are individuals’ dynamic and idiosyncratic affective responses in work tasks because of their hierarchical relationship.

The TEA confirms and conflicts with the associations proposed by some extant models developed to explain the dynamics of affect and work task engagement (e.g., Beal et al., 2005; Bledow et al., 2011; Fisher & Noble, 2004; O’Brien & Toms, 2008). The first of these models is the EPM (Beal et al., 2005). The underlying premise of this model is that affective state occurrences or shifts create a drain of on-task resources to deal with responses to off-task affective stimuli. This premise suggests that high levels of activation and high pleasant or high unpleasant hedonic tone by draining on-task resources will lead to lower work task engagement. Thus, increases in activation and shifts in hedonic tone will not be associated with increasing levels of engagement, as change will drain resources. This concept is not supported by this thesis. However, in this thesis, the average activation and hedonic tone movements within individuals were small; thus, the test of the TEA model may not have identified shifts or movements significant enough to cause resource depletion. In addition, Beal et al., (2005), Bledow et al., (2011), Fisher & Noble, (2004), and O’Brien & Toms, (2008) did not consider the on-task influences of affect. Rewarding performance and associated feedback could lead to a higher effort.
Additionally, in the EPM, the proposed time episode durations were in hours, rather than minutes and seconds. Significant emotional shifts may occur over seconds and minutes. Thus, aggregating data over four-hour performance episodes misses within-participant shifts of less than four hours. To address this limitation, Beal et al. (2005) suggested the collection of brief questionnaires at multiple times throughout the day using ecological momentary assessment (Shiffman, Stone, & Hufford, 2008) to capture possible shifts and states of affective experiences.

The second model extended by the TEA model—the ASM of Bledow et al. (2011)—is supported partially by the TEA model. The ASM suggests that an increase in engagement will only occur after a negative activated affect state if a shift occurs to a more positive activated affect state. Bledow et al. (2011) tested the ASM model and found support for these association. These ASM research findings support the TEA model findings as in the shift from a negative state (mood) to a more positive state (mood) activation, hedonic tone and activation will increase, thereby increasing work task engagement. However, in testing their model, the ASM researchers used the PANAS affect scale completed at the same time as the engagement scale (UWES), and requiring reflection over the period of the previous three hours. As with the EPM, this period could see considerable shifts in affect states, and required participants to average or stabilize their shifts over the three hours.

The TEA model results partially support the model proposed by O’Brien and Toms (2008). The DEM findings suggested that feedback and challenge are essential contributors to computer-mediated task engagement levels. O’Brien and Toms (2008) stated that “Feedback was shown to be an essential component for inciting and maintaining engagement” (p. 26) across all four forms of computer task interactions (games, education,
shopping, and web browsing). Their research indicated the crucial role of affect in the task interactions in engaging participants to use the computer-based applications over time. However, their sample size was relatively small \( (n = 17) \) and used semi-structured interviews, which can lead to selected interpretations of events (McCarthy & Wright, 2004).

In the final model, PEM, Fisher and Noble (2004) examined performance correlates and emotions when working, and found that task effort is moderately and positively associated with task challenge (task difficulty), while having a weak, almost negligible, association with PA and no association with NA. The PEM finding is consistent with the lack of association of core affect activation and core affect hedonic tone changes and work task challenge found in the TEA model. Fisher and Noble (2004) reported that PA and NA are both significantly associated with effort in the task. Again, this association is consistent with the role of core affect activation and core affect hedonic tone being found to be positively associated with work task engagement. Task performance, construed as feedback, was positively associated with PA and NA, and this finding aligns with the TEA model. However, the PEM gave no consideration to task engagement, but used task effort as a surrogate. This approach bypasses the complex multidimensional nature of work task engagement. Another limitation of the PEM was that measurements were taken at least an hour apart. The TEA model suggests that changes in affective states can occur within this period.

### 5.1 Considered hypotheses

Consideration of the relationships between the constructs in the TEA model identified six hypotheses. The results supported all hypothesized associations. This section discusses the findings in support of the hypotheses.
5.1.1 Hypotheses 1 and 2

- **H1**: An increasing level of activation is associated with an increasing level of work task engagement.

- **H2**: An increasing level of hedonic tone (pleasantness) is associated with an increasing level of work task engagement.

Shifts in hedonic tone and activation influence work task engagement levels reported at task completion. In this study, the association between activation and work task engagement was positive and significant, thereby indicating that increasing levels of activation throughout a task lead to higher levels of work task engagement. Experimental evidence suggests an association between work task engagement and cardiovascular arousal (Maier, Waldstein, & Synowski, 2003) and this relationship was confirmed, with an increasing core affect activation level associated with higher reported work task engagement in the TEA model results. Considerable differences in activation shifts within and between participants were apparent. This diversity suggests that responses to similar activities within a task were idiosyncratic, and that an understanding of individuals’ different responsiveness to activation stimuli requires consideration in the design of tasks. In the context of this thesis, activation increased steadily on average, with limited volatility.

Similarly, the association between hedonic tone and work task engagement was positive and significant, thereby indicating that increasing levels of hedonic tone throughout a task lead to higher levels of work task engagement. Increasingly pleasant (positive) feelings lead to increasing work task engagement. This result supports the findings of some researchers (e.g., Hakanen, Perhoniemi, & Toppinen-Tanner, 2008; Salanova, Schaufeli, Xanthopoulou, & Bakker, 2010) and theories, such as that of Fredrickson (2004), whose
broaden and build theory relates pleasant affective experiences to the workspace and work task engagement. Perhaps the pleasant feelings are rewarding outcomes of the activities in the task. However, considerable differences in hedonic tone shifts within and between participants were apparent. This diversity suggests that hedonic tone responses to similar activities within a task are idiosyncratic, and that an understanding of individual responsiveness to hedonic tone stimuli needs to be considered in the design of tasks. In the context of this thesis, the average hedonic tone exhibited an increasing, yet volatile, trajectory.

Increasing trajectories of activation and hedonic tone and their association with high work task engagement are understandable in terms of COR theory (Hobfoll & Shirom, 2001). COR proposes that changing trajectories (e.g., sawtooth, monotonic rising, and monotonic falling) indicate an individual’s limited use of resources to try to control affective responses and maintain affect equilibrium. Emotional appraisal, emotional rumination, and emotion activation level management are identified by COR as distractors from on-task focus (work task engagement). Appraisal, rumination, and activation of emotions cause the redirection of task resources (cognitive, affective, and physical) to regulate any emotional experiences and maintain focus on the task (Beal et al., 2005). A limited ability or desire to hold core affect activation states at a neutral or stable level and to maintain core affect hedonic tone states at a slightly pleasant level (Russell, 2003a) renders resources available for higher levels of work task engagement.

Additionally, increases in activation have more influence on task engagement than do increases in hedonic tone. Activation increases contribute three times more to work task engagement than hedonic tone. Thus, work task engagement is more sensitive to shifts in
activation than shifts in hedonic tone. This sensitivity bias has implications for practitioners attempting to increase work task engagement, and these will be discussed in the section on practitioner implications later in this chapter.

5.1.2 Hypotheses 3 and 4

- **H3**: A higher level of positive feedback is associated with a higher positive rate of activation change.

- **H4**: A higher level of positive feedback is associated with a higher positive rate of hedonic tone (pleasantness) change.

Within tasks, feedback influences the rate of change of activation and hedonic tone. Feedback is mediated by the rate of change of activation and hedonic tone. Increasing levels of positive feedback increase the slopes of the trajectories of activation and hedonic tone, and vice versa. The mediation of feedback by the affective slope trajectories is consistent with Sansone (1986), who proposed that enjoyment (pleasant hedonic tone and high activation) is enhanced by positive task feedback. Similarly, Carver and Scheier (1990) proposed that the rate of movement toward a goal is evaluated based on feedback, the result of which is experienced as affect.

5.1.3 Hypothesis 5

- **H5**: A higher reported level of task challenge is positively associated with a higher level of work task engagement.

In this thesis, task challenge was significant and associated with work task engagement. However, the feedback given in this thesis was not comprehensive. Feedback only advised the participant of their progress without advice on how to improve their performance (Hattie & Timperley, 2007). Feedback was structured only by providing a
measure of progress. By signaling only performance feedback, the poorest and most challenged performers were given more negative feedback. This challenge performance linkage will be considered later.

In this thesis, task challenge was significant and associated with work task engagement, thereby supporting Hypothesis 5. Task challenge was not associated significantly with the rate of change of core affect activation or the rate of change of core affect hedonic tone. These findings are consistent with Silvia et al. (2016), who found higher levels of engagement with more challenging tasks, and partially support the findings of Gendolla (1999), who identified a curvilinear relationship between task difficulty and task engagement. However, the TEA model suggests a linear association. This variation can be explained because this thesis’s methodology did not include extremely high levels of difficulty in the task activities, and did not include significant ego involvement of participants in the task. The outcomes supported the proposed role of task challenge in indirectly influencing engagement and disengagement, as stated in the model of O’Brien and Toms (2008). That is, increasing task challenge increases work task engagement.

5.1.4 Hypothesis 6

- **H6: Task feedback is associated negatively with task challenge.**

Performance feedback within a task is associated with task challenge and, importantly, higher task challenge leads to more negative feedback. Thus, increasing task challenge acts to increase work task engagement directly, yet reduces work task engagement indirectly by reducing positive feedback, which subsequently reduces the growth slopes of activation and hedonic tone. Thus, reductions in levels of activation and hedonic tone contribute to less work task engagement. However, the relationship between task challenge
and work task engagement was still linear, which fails to support the findings of Gendolla (1999), who reported a non-linear association between task challenge and task engagement.

5.2 Research implications

Given the recent interest emerging from studies of workplace engagement in the construct of work task engagement, there is extensive potential for future research on engagement in the workplace at the task level in the organizational science discipline. This thesis provides a building block for the development of complex dynamic models that explain minute-by-minute internal movements within individuals, and the influence of these movements on work task engagement.

This thesis has focused on a small, yet essential, component of mental activity concerning work-experienced affective events. To extend the foundations laid, future research could devote attention to the addition and testing of further covariates, such as self-efficacy, ego involvement in the task, and interest in the task. The model could be extended to include task efficacy (confidence), participant capability, and task relevance (ego involvement) in the individual, and their relationship to affective responses and work task engagement. Task efficacy (confidence) was identified by E. Linnenbrink and Pintrich (2003) as contributing to work task engagement in the classroom. Further research could include self-efficacy as a direct influence on work task engagement. However, the identification of an individual’s self-efficacy requires knowledge of the intricacies of the tasks to be undertaken. In this thesis, the participants were not made aware of the tasks they would be undertaking until completion.

Another consideration involves a shifting of focus to cognitive dynamics involving on-task and off-task thought levels, and their influence on work task engagement. In a study
on task-unrelated thoughts (TUT), Seli, Cheyne, Xu, Purdon, and Smilek (2015) identified that participants frequently and intentionally engaged in TUT. However, the role of affect in TUT remains unclear. Thus, an extension of the TEA could include the integration of TUT with core affect shifts.

Motivation constructs may also be considered. Poortvliet, Anseel, and Theuwis (2015) recently considered the mastery-approach and mastery-avoidance goals, and their relationship with burnout and engagement at work. Mastery-avoidance goals were found to be related to disengagement, while mastery-approach goals were more likely to be associated with engagement. These researchers tested the role of mastery-approach and mastery-avoidance goals through a cross-sectional study, and identifying the limitations of this methodology recommended more dynamic studies be undertaken. The inclusion of a range of objectives for the tasks—such as mastery and performance objectives, and their influence on work task engagement—would further broaden the TEA model to align better with extant theories.

A further consideration is extending the TEA model by presenting tasks in a manner that encourages participants to identify the potential in the task for realizing their personal goals and objectives upon task completion. For example, the tasks could help develop participant skills, and choices of tasks and activities could be allowed. This approach is consistent with the work of Assor, Kaplan, and Roth (2002), who proposed that choice and relevance are two crucial features of task presentation that encourage task engagement. Relevance would involve satisfaction of desired skill development, and choice would be available in the selection of different tasks or activity combinations.
New technological developments should enable testing of the TEA model in multiple work contexts. For example, a possibility is recording subjective responses using watches, mobile technology, or applications while participants are involved in work (Fisher & Noble, 2004). These types of technology allow numerous recordings over more extended periods, and may enable three- or four-item scale questions contingously with physiological monitoring. In addition, development in mobile (wireless connected) electroencephalographic (EEG) equipment will allow neural confirmation of affective states. In an example of a small study using EEG equipment to attempt to coordinate task engagement data with arousal-hedonic tone data, McMahan, Parberry, and Parsons (2015) stated:

\[\textit{neuro-gaming approaches are emerging that allow for adaptation to fluctuations [trajectories] in engagement, cognition, and arousal [activation]. New advances in brain-computer interfaces (BCI) have allowed researchers an inexpensive alternative to laboratory-based systems; these wireless electroencephalographic (EEG) systems offer user metrics for the determination of task engagement and arousal. (p. 2304)}\]

Poor performance feedback during tasks can stimulate disengagement from work tasks, while positive performance feedback can stimulate work task engagement (Belschak & Den Hartog, 2009). If essential negative feedback is provided, it should be given within as positive a framework as possible. Even when feedback is not provided, the possibility of an individual’s self-evaluation of performance, and subsequently self-feedback, needs to be considered. When the challenge is too high, it appears that individuals will feedback the
results through dampening influences on activation and hedonic tone increases, thereby decreasing the effect of task challenge–induced work task engagement.

If maximized work task engagement is the objective, and a choice exists between high activation and a moderately unpleasant activity or moderately low activation and a highly pleasant task, the findings from this thesis suggest that it would be preferable to select the task that creates the highest activation. Increasing activation at the cost of reducing hedonic tone appears to be a more efficient way of increasing work task engagement.

5.3 Limitations

Some limitations are evident in this research. These relate to sampling and methodology, as discussed in detail in this section. The sample was not representative of the working population, and all data were subjective, based on self-reports. As a result of the use of convenience sampling, the findings of this study were limited to a well-educated group relative to the population; thus, issues relating to response bias may have been present (Etikan, Musa, & Alkassim, 2016), and the findings may differ with a different educational profile. In addition, the age profile does not allow certain applications of the findings to individuals under the age of 18; thus, the contributions of this research to student engagement are limited. Any analysis based on this type of sampling statement can only be made about the sample, and care should be taken in generalizing from the findings. However, the respondent sample did indicate some variety of cultural and educational backgrounds, and a spread of ages from 18 to 70.

The study used self-reports of feelings, task challenge, and work task engagement. Self-reporting assumes that people always recognize and report accurately. Common method bias and individuals constructing responses to suit their theories and perspectives (Fisher &
Noble, 2004) can influence the results. Self-reports of feelings have some support for the assertion that communication of feelings is related to the characteristics of the feelings (Barrett, 2005; Robinson & Clore, 2002). Unfortunately, there are no other options when dealing with affect. Barrett (2005) stated: “there is no known objective, external measures of the subjective, internal events that we experience as anger, sadness, fear and so on” (p. 266). Notwithstanding, self-report data are vulnerable to exaggeration and deliberate falsification.

Researchers have challenged the use of single-item scales in the measurement of self-reported psychological phenomena (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). These scales are identified as psychometrically unacceptable because they do not allow for the computation of an internal reliability statistic, such as Cronbach’s alpha; they are more vulnerable to random measurement errors; and they are more vulnerable to unknown biases in meaning and interpretation (Hoeppner, Kelly, Urbanoski, & Slaymaker, 2011). However, in this instance, the need to control for time and thus survey length within the task; to reduce possible elicitation of non-activity affect, such as boredom; and to reduce interference with the flow of the task prescribed the use of single-scale items. Implementing multi-item scale assessments would have rendered the study unfeasible. In addition, given the international nature of the sampling method, the single-item scales were considered more appropriate in a situation where English language skills would be tested. Moreover, Russell et al. (1989) tested the scale and found strong convergent validity with multi-item scales of activation and hedonic tone. Without the constraint of time and possible interferences in experiment flow, use of a single-item scale could be supplemented by a multi-item scale for activation and hedonic tone (e.g., Västfjäll, Friman, Gäling, & Kleiner, 2002), presented at
the end of the training period for TAG to confirm the validity of TAG single-item scales in a work context.

5.4 Conclusion

The findings of this research challenge the users of cross-sectional, static, and presumed long-duration conceptualizations of both affect and work task engagement. Understanding the nature and processes underlying the dynamics of affect is an important challenge in the study of affective experiences (Kuppens, 2010). This thesis adds to understandings of the dynamic of affect, while improving knowledge of the shifts associated with core affect, and clarifying conceptual issues regarding the structure of core affect. Core affect can change over exceedingly short periods measured in minutes, which challenges a considerable body of research in which affect has been stabilized or averaged over time (Beal et al., 2005). In addition, this thesis confirms the independence of the two dimensions of core affect—activation and hedonic tone—thereby supporting the conceptualization. Asking participants for retrospective assessments of their affective states over even one hour is unsatisfactory. The TEA model forms the basis for experiments based on minute-by-minute assessments of affective states, and leads to a more dynamic understanding of human behavior and performance.

Engagement at any level of organizational behavior, and the performance benefits that accrue, cannot be treated as long-duration trait phenomena because they shift with changes in core affect over short periods. The higher-level manifestations of engagement—employee, job, and work engagement—cannot be treated as stable over days, months, or even years. The findings emanating from this thesis support Kahn’s (1990) conceptualization of engagement’s ebbs and flows over short durations, not only of hours, but also minutes.
Broad contextual changes that support long-term work to aid employee or job engagement (such as supplying more resources or improving supervision) will only contribute to performance if attention is also devoted to micro-level task design. These redesigns should encourage increasing activation and hedonic tone as the task progresses to encourage increasing work task engagement and, from this higher engagement level, higher performance levels. Lack of consideration of the micro-level of work task engagement will doom any effort to improve work, job, or employee engagement. Minute-by-minute and hour-by-hour, affective events within tasks shift work task engagement which in turn shift work and job engagement. Engagement of employees at work needs to be treated as a holistic phenomenon across all levels of the enterprise, from the individuals and their tasks to the factory design and layout—not simply as business-level engagement antecedents.

As with employee engagement, these findings also influence the area of student engagement. The National Survey of Student Engagement recommendation applied across schools, colleges, and universities in the US considers engagement at the institutional level. This focus appears inadequate because students react to affective events in tasks at school, and these reactions can mitigate the effect of all institutional attempts to encourage student engagement in learning. Again, a holistic approach is required because engagement is a phenomenon associated with individuals’ application to the specifics of their tasks and the broader institutional context. Only considering the issue at the institutional level will lead to suboptimal learning outcomes through lack of engagement in learning tasks, regardless of the extent of the engagement orientation at the institutional level.

Finally, this thesis has developed a structure and process to deal with the synthesis of two fundamental constructs drawn from two disciplines, each with contested internal
hierarchies, and each with contested multidimensional structures. An individual’s work task engagement is a fundamental building block of the higher-level constructs of work, job, and employee engagement, and core affect is a fundamental building block of the affective experiences of individuals. Hopefully, with these structures and relationships identified and tested, the synthesis of both at the micro-level will lead to less confusion in the area and lay a sound foundation for further research.
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Appendices

Appendix 3.0 Ethics approval

Human Ethics Certificate of Approval

Date: 22 April 2009
Project Number: CF08/3131: 2008/01531
Project Title: The interaction of emotions, goals and task performance
Chief Investigator: Prof Chamnine Harte
Approved: From 22 April 2009 To 22 April 2014

Terms of approval
1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, and a copy forwarded to SCERH before any data collection can occur at the specified organisation. Failure to provide permission letters to SCERH before data collection commences is in breach of the National Statement on Ethical Conduct in Human Research and the Australian Code for the Responsible Conduct of Research.
2. Approval is only valid while you hold a position at Monash University.
3. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by SCERH.
4. You should notify SCERH immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must contain your project number.
6. Amendments to the approved project (including changes in personnel). Requires the submission of a Request for Amendment form to SCERH and must not begin without written approval from SCERH. Substantial variations may require a new application.
7. Future correspondence: Please quote the project number and project title above in any further correspondence.
8. Annual reports. Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. Final report: A Final Report should be provided at the conclusion of the project. SCERH should be notified if the project is discontinued before the expected date of completion.
10. Monitoring: Projects may be subject to an audit or any other form of monitoring by SCERH at any time.
11. Retention and storage of data: The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

Ben Taiwanese
Professor Ben Carny
Chair, SCERH

cc: Mr Joel Hare
Appendix 3.1 UWES-17

The following 17 statements are about how you feel at work. Please read each statement carefully and decide if you ever feel this way about your job. If you have never had this feeling, cross the “0” (zero) in the space after the statement. If you have had this feeling, indicate how often you felt it by crossing the number (from 1 to 6) that best describes how frequently you feel that way.

<table>
<thead>
<tr>
<th>Never</th>
<th>Almost Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Never</td>
<td>A few times a year or less</td>
<td>Once a month or less</td>
<td>A few times a month</td>
<td>Once a week</td>
<td>A few times a week</td>
<td>Every day</td>
</tr>
</tbody>
</table>

At my work, I feel bursting with energy (V)
I find the work that I do full of meaning and purpose (D)
Time flies when I am working (A)
At my job, I feel strong and vigorous (V)
I am enthusiastic about my job (D)
When I am working, I forget everything else around me (A)
My job inspires me (D)
When I get up in the morning, I feel like going to work (V)
I feel happy when working intensely (A)
I am proud of the work that I do (D)
I am immersed in my work (A)
I can continue working for long periods of time (V)
To me, my job is challenging (D)
I get carried away when I am working (A)
At my job, I am very resilient mentally (V)
It is difficult to detach myself from the job (A)
At my work, I always persevere, even when things do not go well (V)

Note: V = vigor scale; D = dedication scale; A = absorption scale
Items in Italics represent the shortened version of the UWES-17—the UWES-9
## Appendix 3.2 Fit statistics for the UWES-9

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>GFI</th>
<th>AGFI</th>
<th>RMSEA</th>
<th>NFI</th>
<th>NNFI</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-factor model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freely estimated</td>
<td>6,144.52</td>
<td>270</td>
<td>0.89</td>
<td>0.82</td>
<td>0.04</td>
<td>0.91</td>
<td>0.89</td>
<td>0.91</td>
</tr>
<tr>
<td>Constrained factor coefficients</td>
<td>7,333.87</td>
<td>342</td>
<td>0.88</td>
<td>0.84</td>
<td>0.04</td>
<td>0.89</td>
<td>0.89</td>
<td>0.90</td>
</tr>
<tr>
<td>Three-factor model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freely estimated</td>
<td>3,227.29</td>
<td>240</td>
<td>0.95</td>
<td>0.90</td>
<td>0.03</td>
<td>0.95</td>
<td>0.93</td>
<td>0.96</td>
</tr>
<tr>
<td>Constrained factor coefficients</td>
<td>4,180.18</td>
<td>294</td>
<td>0.93</td>
<td>0.89</td>
<td>0.03</td>
<td>0.94</td>
<td>0.93</td>
<td>0.94</td>
</tr>
<tr>
<td>Constrained covariance</td>
<td>3,504.17</td>
<td>267</td>
<td>0.94</td>
<td>0.90</td>
<td>0.03</td>
<td>0.95</td>
<td>0.94</td>
<td>0.95</td>
</tr>
<tr>
<td>Null model</td>
<td>63,064.5</td>
<td>36</td>
<td>0.33</td>
<td>0.16</td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Multiple-group method employed ($N = 14,512$); UWES = Utrecht Work Engagement Scale; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; RMSEA = root mean square error of approximation; NFI = normed fit index; CFI = comparative fit index
Appendix 3.3 UWES-9 reliability (group and time invariance precision)

<table>
<thead>
<tr>
<th>External</th>
<th>Internal Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test–Retest Consistency (Stability Coefficients)</td>
<td>Interrater Consistency</td>
</tr>
<tr>
<td>Item Consistency (Cronbach’s α)</td>
<td>Structural Consistency (Fit Stability)</td>
</tr>
<tr>
<td>Schaufeli and Bakker (2003)</td>
<td>Test/retest of Cronbach’s α indicated stability coefficients were as follows: Australia: vigor = 0.61, dedication = 0.56, and absorption = 0.60. Norway: vigor = 0.71, dedication = 0.66, and absorption = 0.68. For the total scale items, the stability coefficients were 0.64 for Australia and 0.73 for Norway.</td>
</tr>
</tbody>
</table>
### Appendix 3.4 Range of proposed engagement scales

<table>
<thead>
<tr>
<th>Study</th>
<th>Dimensions (Definitional Foundation)</th>
<th>Associated Scale</th>
<th>Scale Structures</th>
</tr>
</thead>
</table>
| Schaufeli and Bakker (2003)  | Vigor, Dedication, Absorption (Schaufeli) | UWES-15          | 15 items  
Three sub-scales  
Vigor (five items)  
Dedication (five items)  
Absorption (five items) |
| Schaufeli and Bakker (2003)  | Vigor, Dedication, Absorption (Schaufeli) | UWES-17          | 17 items  
Three sub-scales  
Vigor (six items)  
Dedication (five items)  
Absorption (six items) |
| Britt, Thomas, and Dawson (2006) | Single dimension (Kahn)             | Four-item scale  | Four-item scale (strongly agree to strongly disagree) |
| May et al. (2004)            | Cognitive, Emotional, Physical (Kahn)      | Summated scale  | Summated scale  
Cognitive (four items)  
Emotional (four items)  
Physical (five items) |
| Shirom (2003)                | Physical strength, Emotional energy, Cognitive liveliness (Kahn) | SMVM-Vigor       | Physical strength (five items)  
Emotional energy (four items)  
Cognitive liveliness (three items) |
| Schaufeli et al. (2006)      | Vigor, Dedication, Absorption (Schaufeli) | UWES-9           | Sub-scales or summated scale  
Vigor (three items)  
Dedication (three items)  
Absorption (three items) |
| Rich et al. (2010)           | Physical, Cognitive, Affective (Kahn)    | JES-18           | Physical (six items)  
Cognitive (six items)  
Affective (six items) |
## Appendix 3.5 Research uses of UWES-17

<table>
<thead>
<tr>
<th>Study</th>
<th>Report</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mauno, Kinnunen, and Ruokolainen (2007)</td>
<td>“Job Demands and Resources as Antecedents of Work Engagement: A Longitudinal Study”</td>
<td>Finland</td>
</tr>
<tr>
<td>Bilgel et al., (2012)</td>
<td>“Work Engagement, Burnout, and Vigor among a Group of Medical Residents in Turkey”</td>
<td>Turkey</td>
</tr>
<tr>
<td>Menguc, Auh, Fisher, and Haddad (2013)</td>
<td>“To Be Engaged or Not to Be Engaged: The Antecedents and Consequences of Service Employee Engagement”</td>
<td>Canada</td>
</tr>
<tr>
<td>Villotti et al., (2014)</td>
<td>“An Analysis of Work Engagement among Workers with Mental Disorders Recently Integrated to Work”</td>
<td>Italy</td>
</tr>
</tbody>
</table>
Appendix 3.6 Participation request

We need your help!

We are currently researching the way individuals interact with computers, and we need volunteers to go online and carry out some tasks. These include watching a video clip, answering some questions, and carrying out a quiz.

It takes about 15 minutes and should be done in a quiet place on a computer with a good broadband connection.

The web address is geeresearch.com.au

The video clip you watch may be R+ rated, so only people over 18 should visit the site.

If could let your friends know and ask them to do it as well, it would be appreciated.

If you require any further details, my telephone number is 92145290, and my email address is jhaire@swin.edu.au.

Thank you in anticipation for your support.
Appendix 3.7 Experiment process by program module

Module 1: Introduction to experiment

Module 2: Introduction to the affect grid and first affect state registration

Module 3: Trial test

Module 4: Emotional state evocation—Video viewing

Module 5: Goal setting

Module 6: Real test

Module 7: Task engagement report
Module 1: Introduction to experiment

Task Performance: Speed & Accuracy

Welcome to the task performance research project

Hi, my name is Joel Hare.
I am completing my PhD at Monash University, Melbourne, Australia.
The aim of the research is to provide insights into approaches that might help individuals improve their work performance.
The time required by participants will be between 10 to 15 minutes.
The steps you will be required to undertake includes:
* Provide some background information on yourself
* Identify and report your initial feelings
* Undertake some trial test questions
* View a film clip
* Report your feelings about the film clip
* Set goals for a test based on your expectations
* Carry out the real test
* Identify and report your feelings again.

You may be asked to view stimuli of photos, music, or movie clips which are violent, erotic, fear evoking or disgusting or repellant.

If you feel distressed in anyway by this project you can seek counselling at Monash University by ringing +61-1300 361 088 where you will be assisted by a trained counsellor.

Please press continue to be involved in the research project or close the page if you wish not to be involved.

Task Performance: Speed & Accuracy

Your consent to participate

NOTE: This consent will be emailed to me and remain with me for my records.

I agree to take part in the Monash University research project accuracy and speed. I have read the Explanatory Statement, a copy of which, together with this Consent Form, will be emailed to me. I will keep this email for my records. I understand that agreeing to take part means that I agree to carry out the tasks asked by the researcher.

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

I understand that any information that the researcher extracts from the task completion data is for use in reports or published findings and will not, under any circumstances, contain names or identifying characteristics of individual participants.

I understand that if I desire, I will be notified of the report of published findings that results from this study.

Please click continue if you have read the above terms and give your consent to being involved in the research.
### Task Performance: Speed & Accuracy

**Are you ready?**

- **Are you in a quiet place?**
- **Do you have 15 minutes free and uninterrupted time? (please turn off your mobile!)**
- **Is your volume control switched on and turned up?**

If you answered no to any of the above questions, please exit now by closing the browser and try again when you are in an appropriate location.

If you are going to proceed, you answered yes to all the above questions. Please provide us with your email address.

Your email address will not be passed on to others and will be deleted from our system on completion of the research. It only enables us to track the number of times the questions are used. If you wish to be emailed the final results of our research, please use the check box. Otherwise, the results will be available on request by phone from 20th March on 020 7903 9290.

**Email:** [Enter email address]

- **I wish to be notified of the results of the project by email** [ ]

---

### Background Information

This set of questions is to give us some background information on you. It is not stored with your email address and as such it does not identify you and cannot be associated with you personally.

**Please be as accurate as possible.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Language</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>2nd Language</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>Religion</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>Gender</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>Level of study completed:</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>Level of study currently being completed:</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>Age</td>
<td>[Please Select]</td>
</tr>
<tr>
<td>Average grade in last year of study:</td>
<td>[Please Select]</td>
</tr>
</tbody>
</table>
Module 2: Introduction to the affect grid and first affect state registration

Task Performance: Speed & Accuracy

Introducing the Affect Grid!

In order for you to complete the tasks in this research, you need to tell us, on occasion, how you are feeling. To enable you to do this quickly and easily we would like to introduce you to a model which can be used, by you, to tell us how you feel.

This model is called the “Affect Grid”. It is best described as a map of feelings and it is shown in the diagram above.
Let's look for a starting point!
The way you generally feel day by day

Here is how to say you are feeling normal at the moment

The centre of the square (marked by the black cross) represents this neutral, normal, everyday feeling.

You select it when you are feeling neither pleasant nor unpleasant and feeling neither very sleepy, nor greatly alert.

But what happens if somebody makes you feel unpleasant or makes you feel pleasant?
How do you report you are feeling pleasant or unpleasant?

Use the left half or the right half of the grid

The right half of the grid represents pleasant feelings. The further to the right, the more pleasant the feelings.

The left half represents unpleasant feelings. The further to the left, the more unpleasant the feelings.

If you suddenly found your feelings changing from pleasant to unpleasant, use the end points of the scale at the extreme ends of the grid.
How do you report if you feel alert and activated or, conversely, feeling not alert but sleepy?

Use the top half and bottom half of the grid

The vertical dimension (top to bottom) of the grid represents the degree of arousal you feel.
Arousal has to do with how wide awake, alert, or activated a person feels— independent of whether the feeling is pleasant or unpleasant.
The top half is for feelings that are above average in arousal. The lower half
Example 1

Highly aroused or activated (frantic excitement) but neither pleasant nor unpleasantly so

Because the “frantic excitement” is neither pleasant nor unpleasant, then it falls in the middle square of the top row.

This is shown in the diagram above by the black cross.

If you are comfortable with this press the continue button for the next example.

Example 2

Mildly excited (surprised) but neither pleasantly nor unpleasantly so

Suppose that you were just surprised. You would probably feel more aroused than usual.

Suppose further that the surprise was neither pleasant nor unpleasant.

Then you would select the radio button in the grid above indicated by the black cross.
Mildly but pleasantly surprised

Suppose, instead, that you were only mildly surprised but that the surprise was a mildly pleasant one.

You might select the radio button as shown in the diagram above and indicated by the black cross.

Now it’s your turn to have a go. Please press continue
Module 3: Trial test

Task Performance: Speed & Accuracy

Thank you for taking the time to understand and use the affect grid.
We would now like you to complete 6 puzzle questions as a task test for us.
When you have answered them you will be given a score After this you will view a short video clip.
Press continue for the puzzles and then the video.

Task Performance: Speed & Accuracy

2 + 3 =

○ 4 ○ 6 ○ 3 ○ 5 ○ 7

Task Performance: Speed & Accuracy

Cat is to fur
AS
Bird is to ...

○ Skin ○ Pelt ○ Hair ○ Scales ○ Feathers

Task Performance: Speed & Accuracy

What number comes next in this series?
2, 4, 16, 256, ?

○ 65,536 ○ 63,123 ○ 16 ○ 64 ○ 32
Task Performance: Speed & Accuracy

Which is the odd shape out?

○ Rectangle  ○ Circle  ○ Triangle  ○ Pentagon

Continue

Task Performance: Speed & Accuracy

Which is the heaviest?

○ A  ○ B  ○ C

Continue
Task Performance: Speed & Accuracy

Which shape replaces the question mark?

A  B  C

Continue

Task Performance: Speed & Accuracy

Thank you for completing this first task test.
You scored 1 out of 6.
You should remember your score. You will need this information later to set a goal for another task test!

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Module 4: Emotional state evocation—Video viewing

Task Performance: Speed & Accuracy

The Video
We would now like you to watch a short movie clip. This will run from 30 seconds to 5 minutes.

WARNING: The material in the movie may be unsuitable for minors. We recommend minors be excluded from the room during the presentation of this clip. The clips come from movies with classifications from G up to R18+ rating. For a description of these ratings see the table below. If you do not wish to be exposed to any of these scenes please close this browser window now.

<table>
<thead>
<tr>
<th>Markings</th>
<th>Classification</th>
<th>Content</th>
<th>Classification description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Very Mild</td>
<td>General</td>
<td></td>
</tr>
<tr>
<td>PG</td>
<td>Mild</td>
<td>Parental guidance recommended</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Moderate</td>
<td>Recommended for mature audiences</td>
<td></td>
</tr>
<tr>
<td>MA15+</td>
<td>Strong</td>
<td>Not suitable for people under 15</td>
<td></td>
</tr>
<tr>
<td>R18+</td>
<td>High</td>
<td>Restricted to 18 and over</td>
<td></td>
</tr>
</tbody>
</table>

If at anytime you feel excess distress and wish to leave the viewing simply press the continue button and the film will terminate immediately.

Could you now please ensure you sound is switched on and turned up.
Please try to watch the movie clip to the end. Thank You
Module 5: Goal setting

Task Performance: Speed & Accuracy

How well do you think you can do in another test of 10 questions?
These questions are similar to those you completed earlier but are timed—you are given 20 seconds to complete each question.

Please use the first drop down box to indicate what you think is the number of correct answers you can achieve.

Base it on your previous puzzle score/experience

Please use the second drop down box to indicate what you think your chance is of achieving this score.

Continue

Task Performance: Speed & Accuracy

How should you go in the test?
You have chosen your target score but based on what others achieved your target score might need to be adjusted.

The target score we want you to achieve, and you should achieve for your ability is 1

You should do your best to achieve this score

You can now move onto undertaking the puzzles. But before you do we would just like to you to tell us again about your current feelings. Please press continue to get to the grid.

Continue
How do you feel now?

Select the button which best expresses how you feel now.

Thank you for what you have done so far.

You are now ready for the final test. Good luck!
Module 6: Real test

Task Performance: Speed & Accuracy

Final Test

Thank you for undertaking this test there are 10 puzzles in this test task to solve. You cannot go back to complete a puzzle. Once you have selected continue the result will be recorded.

You are given 25 seconds to complete each puzzle

You will notice a hint button on the puzzle page.

THE HINT BUTTON SHOULD NOT BE USED, IT WILL BIAS THE TEST RESULTS

In the top right hand corner of the screen you will see a score board which will indicate how you are going against the target

When you are ready for the next puzzle press the continue button.

Continue

Task Performance: Speed & Accuracy

Which is the odd shape out?

[Image showing a diagram with four shapes: a square, an oval, a triangle, and a hexagon.]

Your Score
0
Target
6

Hint
Continue
Task Performance: Speed & Accuracy

Which clock from the bottom row comes next in the top row series: A, B, or C?

A B C

○ A ○ B ○ C

Your Score
0

Target
6

Task Performance: Speed & Accuracy

Which is the heaviest, A, B, C, D or E?

A

B C E

○ A ○ B ○ C ○ D ○ E

Your Score
0

Target
6
Task Performance: Speed & Accuracy

Which is the odd number out?

○ 345  ○ 642  ○ 552  ○ 423  ○ 282

Your Score
0
Target
6

Task Performance: Speed & Accuracy

Which is the odd number out?

○ 1234  ○ 1345  ○ 2345  ○ 6789  ○ 5678

Your Score
2
Target
3

Task Performance: Speed & Accuracy

How many degrees inside the octagon?

○ 1000  ○ 1080  ○ 1090  ○ 1240  ○ 500

Your Score
0
Target
6
Task Performance: Speed & Accuracy

Which number comes next in the series?
12, 7, 21, 16, 48, 43, 129, 7

101 118 124 132 140

Your Score
0
Target
6

Hint

Task Performance: Speed & Accuracy

How do you feel now?

Extremely high arousal
Extremely unpleasant feelings

Extremely pleasant feelings

Extremely low arousal

Task Performance: Speed & Accuracy

Your score for the puzzles was 0 out of 10

Only two more pages until the end! Please keep going.
Module 7: Task engagement report

Task Performance: Speed & Accuracy

Please select the button which best expresses your opinion about this research.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time seemed to pass quickly while doing the tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I forgot everything around me during these tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I found these tasks challenging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I may be proud of my task results</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I would do these tasks again if given the opportunity</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I felt immersed in the tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I felt happy when doing the tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will find it difficult to forget carrying out these tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I can normally concentrate for long periods of time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing these tasks filled me with energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I was enthusiastic about doing these tasks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How often do you undertake quizzes and puzzles?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you ever feel like quitting the research?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you use the hint or answer button during the task?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ I used the hint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ I did not use the hint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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Continue
Task Performance: Speed & Accuracy

Well that's it! We are finished

We appreciate your help in carrying out this research and completing the tasks.

Thanks for your time. Please exit the page

Also our thanks to the following film clip and content providers

- Turner Entertainment Co.
- Simon Film Productions Inc.
- Orion Pictures Corporation
- Universal Studios
- Castle Rock Entertainment
- Universal City Studios
- Twentieth Century Fox
- New Line Home Entertainment
- Warner Bros. Entertainment
- Reader's Digest
# Appendix 3.8 Descriptive Statistics and Correlations

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### Correlations

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**. Correlation is significant at the 0.01 level (2-tailed).**  
*. Correlation is significant at the 0.05 level (2-tailed).
Appendix 3.9 Consent form from within program

NOTE: This consent will be emailed to me and remain with me for my records.

I agree to take part in the Monash University research project accuracy and speed. I have read the Explanatory Statement, a copy of which, together with this Consent Form, will be emailed to me. I will keep this email for my records. I understand that agreeing to take part means that I agree to carry out the tasks asked by the researcher.

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalized or disadvantaged in any way.

I understand that any information that the researcher extracts from the task completion data is for use in reports or published findings and will not, under any circumstances, contain names or identifying characteristics of individual participants.

I understand that, if I desire, I will be notified of the report of published findings that results from this study.

Please click continue if you have read the above terms and give your consent to being involved in the research.