

Understanding e-Learning Acceptance Among Teachers: A Grounded-in-Theory Approach

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Abstract: The ramification of understanding why technology is accepted and used for e-Learning in school education has significant implications for administrators, practitioners and researchers. A key consideration regarding technology acceptance for e-learning is the extent to which usage decisions are informed by affective and cognitive factors. This conceptual paper sets out the process we used to develop a theoretical model based on the technology acceptance model (TAM). The 'attitude' construct of TAM was explored to understand 'why' practicing teachers chose to use technology for e-Learning. The paper presents a conceptual review of selected technology acceptance and social cognitive theories/models. The development of the theoretical model employed a cross-sectional 'grounded-in-theory' methodological approach using TAM as the anchor theory. The adapted TAM (figure 3) offers that the attitude construct is well suited to be moderated by self-efficacy, motivation, benefits and value propositions. The adapted TAM is not arbitrarily suggesting replacing existing and successful approaches to research that use single or multiple theories/models. It seeks to augment researcher's perspectives on research foci of theory testing, confirmation, generation and modification and as such is suitable for studies located in focused contexts.

Keywords: e-Learning, Grounded-in-theory, TAM, Attitude, Self-efficacy, Value

1. Introduction

This paper extends on our conference paper: 'When Tam just won't do' (Sadeck and Cronjé, 2018, pp.383). We motivate for including different moderating constructs and making explicit existing ones to enhance the contextual usability of TAM in focused studies. Our approach was to examine various theories/models on technology adoption and those focused on cognitive and affective constructs to understand why teachers use technology for e-Learning.

"The adoption of an educational innovation is a complex process involving a multitude of variables" (Hall, Dossett and Wallace, 1973, pp.3). Our critique of researchers is that they often attempt to apply theories as in which contradict the contextual nature of their study. Research contextual imperatives and focussed research questions often provide possibilities for adapting theory. Existing technology adoption theories do not explicitly progress beyond the point to 'actual use'. Concomitantly, existing research does not sufficiently describe or indicate patterns of use and practice.

According to Oye, Iahad, and Ab-Rahim (2012) there is little value to be gained unless technology is actually used. We wanted to understand why teachers choose to use technology for educational purposes. To understand what contributes to practitioner's attitudes and eventual use of technology, we looked to what Chigona and Chigona (2010, pp.212) state as "teachers' readiness, confidence, knowledge and ability to evaluate the role of ICT in teaching and learning". The constant revisions to TAM appear to suggest an instability of the core constructs to explain acceptance and usage behaviours. Given our need to understand the relationship between intent and action, the phenomenon of actual use is approached via the attitude construct through relational aspects in the cognitive and affective domains. The grounded in theory approach used in this paper represents our argument for seeking out focused moderating constructs that mediate attitudes-intention-use through rational reasoning.

We focused on, and examined: self-efficacy; motivation; beliefs; attitudes and value, as key foundational beliefs as moderating constructs, drawn from social cognitive and motivational theories alongside technology adoption theories. Our decisions to hone in on two separate sets of theories are based on the following: "If adoption is not present, then it is unlikely that one would see any application or integration" (Sadeck and Cronjé, 2017, pp. 401).

Our rationale for using a grounded-in-theory methodological approach is aligned with, Bagozzi (2007) and Glasser and Strauss (1967): Glasser and Strauss (1967, pp.4) note that some research methodologies advocate "... the opportunistic use of theories that have dubious fit and working capacity." We regard this as clarifying the "de-emphasis on the prior steps of discovering" regarding what constructs, concepts and hypotheses are significant for the research area (Glasser and Strauss, 1967, pp.1). Bagozzi (2007) states that "the problems are...that little theoretical insight is provided into the mechanism, or "the why", behind proposed interaction effects..." He further maintains that "consideration of moderating variables is one way of deepening any model, but introductions of these should be grounded in theory..." (Bagozzi, 2007, pp.244).

2. Context, Problem statement, Rationale, Aims and Methodological approach

2.1 Context

Our conceptualisation of the context comprises dualism, i.e. the research paradigm of ICTs in education and of the implementation of ICTs for e-learning in the Western Cape Province, South Africa (SA).

2.1.1. Research paradigm of ICTs in education:

Implementation of ICTs in SA is embedded in a systemically different context to that in many developed countries. The situation is problematised by the vast divergence between implementation and integration in developed and developing countries (Thomas and Cronjé, 2007, pp.765). Technology related initiatives in SA have primarily focused on technology deployment, models of implementation and emerging technology testing previously undertaken in other countries.

Much of the research is on peculiarities of technology attributes (confirming or proving the use of a new innovation) and why technology is not used. More recently studies focus on: professional development, models of implementation and hybrid models of e-Learning, etc. Research using theories/models generally evolve around theory testing and theory confirmation. There are additionally few studies that focus on the human element in these studies. According to Thomas and Cronjé (2007) research focuses on: "implementation (generally associated with simplicity)". However, what is needed is a focus on "integration (generally associated with complexity)", as this process is what points to actual use of technologies (Thomas and Cronjé, 2007, pp. 765).

2.1.2 Implementation of ICTs for e-learning in the Western Cape, South Africa:

This context is partially underpinned by Abuhmaid (2011, pp.195) who notes that complexities regarding integration of ICTs into education include those associated with the "human side of the integration...and the technological side of it". More appropriately the environmentally contextual realities of the teachers in schools in the Western Cape and SA in general are, at best, described as unequal. This refers to their access to technology; resources; connectivity; technologically sound professional development and technical support.

2.2 Problem statement

We problematise our paper as responding to:

- Diminished attention to attitudes for understanding 'why' technology is used.
- The technologically deterministic nature of technology adoption theories/models that neglect the human element.
- The indiscriminate use of theories/models.

The theories/models employed in research into ICTs in education appear to be used commonly and partially. Researchers tend to take only some constructs from theories/models and sometimes selectively use preferred theories/models (Venkatesh et al., 2003, pp.426). We believe that while the strategies and approaches used, however logical and easy to implement, are not enough to critically engage with understanding why something is happening or not happening. There are, according to Samaradiwakara and Gunawardena (2014), "substantial differences between groups in how they perceive items on technology acceptance" (Samaradiwakara and Gunawardena, 2014, pp.32). This statement, which implies a human element, suggests significant implications for usage predictions, both theoretically and practically. This we believe warns against the danger of exclusive selection of a theory or approach.

We elected to begin with the technology acceptance model (TAM) as an extensively tried and tested model that assist to predict and describe acceptance and use of technology. The TAM model has been the subject of

contention owing to the fact that it is regarded as being technology focused and that a range of moderating constructs are not explicit. According to Bagozzi (2007, pp.244) “Parsimony has also been an Achilles’ heel for TAM.....It is unreasonable to expect that one model, and one so simple, would explain decisions and behaviour fully across a wide range of technologies, adoption situations, and differences in decision making and decision makers”. Cheng-Min (2019, pp.2) summarised disadvantages of TAM based as: “ not providing adequate insight into individuals’ perspectives of novel systems; neglecting its indicators and directly investigating the external variables of perceived ease of use (PEOU) and perceived usefulness (PU); and ignoring the relationship between usage attitude and usage intention”.

We disagree with suggestion of a direct link from perceived usefulness to behavioural intent that bypasses attitude. Furthermore, subsequent iterations of TAM, have completely left out the attitude construct. Our critique is that attitude is a decision making process and as such cannot be bypassed or left out.

2.3 Rational and aims

The aim this paper is to understand how a grounded-in-theory approach using existing adoption and social theories could bring meaning and understanding to why individuals adopt and actually use technology for educational purposes. The rationale for this was to understand why any individual chooses to adopt and use any particular technology. As such our focus was on the attitude construct of TAM. The purpose of this paper is not to produce an account of adoption of any particular theory/model, but rather to explore adoption theories, and describe the process of developing a theoretical model.

2.4 Methodological Approach:

Our methodological approach is premised on a conceptual interpretation of a grounded approach, i.e. to generate and modify inductively from existing theories/models. This is based on the seminal work on grounded theory (GT) of Glasser and Strauss (1967, pp.2-3). They state that the aim of grounded theory is: “to generate or discover a theory” and further defined GT as: “discovery of theory from data systematically obtained from social research.”

We used an inductive approach through an exploration of secondary sources to produce a substantive model for a contextually specific area of study (teaching using technology). Our approach was to examine the suitability of moderating constructs from a range of theories to augment attitudes in TAM. We then propose a lean model, that is implementable and methodologically grounded-in-theory, that can be used in research focused on understanding why people actually use technology.

3. Literature Review: background

3.1 Technology adoption

Adoption refers to the acceptance, implementation and taking on of a new product or innovation. Innovation refers to something new, or more accurately “an idea, practice or object that is perceived as new by an individual” (Rogers, 1995, pp.11). Technology in the context of this paper is taken as a broad term for all “physical hardware/technology, systems, services and products” (Sadeck, 2016, pp.21).

Adoption theories focus on predicting individuals’ choices to accept or reject innovations. Adoption is not a one-time event, but rather a process (Hall, 1974, pp.5-6), which Straub (2009, pp.628) explains as “beliefs and attitudes... over time...may influence decisions”. The adoption trajectory of people will be shaped by their take on the innovation’s perceived benefits, motivations and personal beliefs of being able to implement the innovations.

3.2 Innovation Diffusion Theory (IDT): Adoption - Diffusion

Innovation diffusion theory (IDT) (Rogers, 1995) has been the foundation of many studies on innovations. Rogers (1995, pp.208) proposed five rate of diffusion attributes: relative advantage; compatibility; complexity; trialability and observability. Being inherently innovations focused, they are insufficient as a basis for understanding underlying affective processes. In the adoption decision-making process, attitude formation is a mental activity which is in the affective domain. Adoption, as a personal and internal process is not an issue of the attributes of a technologies, but about the human element and change. Change we believe is the stimulus that activates both physiological and psychological responses in a teacher.

Change brings about a reaction in the form of concerns which, in turn, triggers two control mechanisms: one that mobilises (to carry out an action) and the other that immobilises (not to carry out the action). The concerns-based adoption model (CBAM – Hord et al., 1987) was developed “to describe changes people undergo as they adopt a new program” (Loucks, 1983, pp.1). It provides a “developmental perspective on how an individual’s concerns influence integration (and use) of an innovation” (Straub, 2009, pp.632). The strength of the CBAM lies in the application of affective and cognitive concerns. One limitation of the CBAM is that it contextually presupposes that adoption is present.

3.3 Technology acceptance model (TAM)

TAM (figure 1) posits that, behavioural intentionality (BI) to use, serves as a mediator of actual use. It proposes that attitudes determine BI with perceived usefulness (PU) seen as impacting directly on intention. Perceived ease of use (PEOU) is said to have a direct impact on PU. Cognitive beliefs, PEOU, and PU are said to jointly impact on behavioural attitude (Davis, Bagozzi and Warshaw, 1989, pp.985).

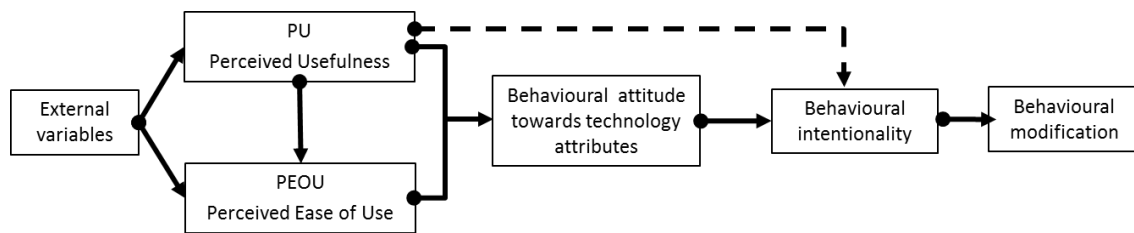


Figure 1: Technology Acceptance Model (TAM) Adapted from Davis, Bagozzi and Warshaw, 1989

The Technology Acceptance Model (TAM) introduced in 1986 by Davis, originated in the Theory of Reasoned Action (TRA) of Ajzen and Fishbein (1980). According to Bagozzi (2007) a key asset of TAM is that it links intention as an influencer for usage.

TRA postulates that a person’s behaviour is informed by behavioural intent (BI) and this gives meaning to attitudes toward the behaviour. It contends that people would use technology if they perceive positive benefits associated with its use. Intentions according to Ajzen (1991, pp.181), “are assumed to capture the motivational factors that influence behaviour”. Bandura (2001, pp.6) further states that intentionality is “a representation of a future course of action to be performed”. A further strength of TRA is that it suggests that an intention (mental process) transforms a thought into a physical action. However it must be noted that intention does not mean that an action will be performed.

The theory of planned behaviour (TPB) was proposed by Ajzen (1985) and is a derivative of TRA. TPB adds a third concept, i.e. perceived behavioural control (PBC). TPB holds that attitudes, subjective norms, and PBC are direct determinants of intentions, which in turn influence behaviour. PBC according to Ajzen (1991, pp.183) refers to people’s perception of the ease, difficulty, or capability to perform behaviours. PBC shows a natural relational link to Bandura’s (1982) self-efficacy concept. Intentions to use, in TAM, are strengthened by two cognitive influencing factors, i.e. PEOU and PU, via attitude. These attributes of TAM have contributed significantly to its usefulness in explaining user acceptance.

However, TAM, TRA and TPB do not adequately explaining factors that could influence or mediating adoption and use. The original TAM (Davis, Bagozzi and Warshaw, 1989, pp.985) shows a direct link from PU to BI – this however does not consider that, by bypassing attitude, which is a decision making process, the model is rendered flawed. Furthermore, according to Lee, Cheung and Chen (2005, pp.1102), PEOU does not have any considerable direct effect on the attitude construct. Park (2009, pp.159) further concludes that “neither perceived usefulness nor perceived ease of use had a significant direct effect on behavioural intention...”

Park’s (2009) study has shown, as have others (Venkatesh and Davis, 1996; Grandon, Alshare and Kwan, 2005; Ndubisi, 2006), that “some TAM concepts had a direct and indirect effect” (Park, 2009, pp.159). The need for adaptations and extensions to TAM (Bagozzi, 2007, pp.244), have not gone unnoticed and subsequent iterations resulted in TAM 2, TAM 3 and UTAUT.

Conspicuous by its absence in TAM 2, TAM 3 and UTAUT is the attitude construct This resulted from studies which maintained that attitude only ‘partly’ mediates PU. We argue that attitude is a mental attribute that

informs decision-making and as such cannot be left out of any adoption model even if it is considered to 'partially' mediate.

What was a relatively simple model (original TAM) to follow and use is now rendered complex in both application and theoretical rigour. Venkatesh and Bala (2008, pp.274), believe that TAM 2 lacks "actionable guidance [for] practitioners". The anchor and adjustment determinants in TAM 3 are equally scant in guiding users specifically because of the absence of the attitude construct.

The UTAUT model (Venkatesh et al., 2003) explains substantial variance in BI and usage behaviour. Dwivedi et al. (2019, pp.721) believe that in UTAUT, "there may not be any variation in the moderator for the adoption and use context". We find the suggestion of UTAUT that facilitating conditions leads directly to use as hugely problematic. We believe that use is predicated on intention and this we note are absent in the association between BI and assistive environments. The various iterations of TAM contain a range of independent variables for predicting intentions but fewer for explicitly explaining behaviours. This we maintain is limiting as behaviour is influenced by attitudes which are based on beliefs.

3.4 Theoretical underpinning

3.4.1 Beliefs and Attitudes

In the debate on the implementation and integration ICTs into schools, "beliefs and attitudes of teachers towards ICT in teaching and learning have always been regarded as a central criteria" (Eickelmann and Vennermann, 2017, pp.733). Furthermore school workplace behaviours are driven by attitudes and beliefs and these ultimately effect change processes (Pajares, 1992; Richardson, 1994-b). Both attitudes and beliefs, we believed, exist differently in the psychological-self.

Beliefs are considered to be formed by affective, evaluative and social elements and as such, they are not believed to be "founded on rationality but on feelings and experiences...making them consistent and long lasting" (cited in Solis, 2015, pp.248). Drawing on the work of Pajares (1992), Solis (2015, pp.248) states that beliefs "...have an influence on a person, mainly on the generation of thought, opinions, aptitudes and attitudes." The attitude outcomes of beliefs are categorised by Ajzen and Fishbein (2005, pp.7) as: "general attitudes toward physical objects" and "attitudes toward performing specific behaviors". This suggests that, decisions about 'if' and 'how' to use technology, is influenced by one's beliefs. We hypothesise that beliefs become evident in what a person says and, in their actions/behaviour.

We believe that attitudes and beliefs are not mutually exclusive. Prestridge (2012, pp.450) maintains that even though "beliefs are not easily changed, it does not mean that they cannot be changed". The question we considered is: how does the attitude construct in TAM moderate the intent-to-action continuum? There is a general argumentative base that deals with known contradictions between intentions and action.

Ajzen and Fishbein (2005, pp.20-21) offer that it is the "qualities of the attitude itself...that may moderate the strength of the attitude-[intent]-behaviour relation". Attitude formation plays out differently, i.e. people who hold the same general attitude can act out differently. Thus we believe that the attitude construct of TAM lacks direct moderators in the cognitive and affective domains.

Richardson (1996) notes that "beliefs are thought to drive actions; however, experiences and reflection on actions, may lead to changes in, and/or additions to beliefs." Ajzen and Fishbein (2005, pp.21) based on the work of Fazio and Zanna (1981), state that "attitudes based on direct experience are more predictive of subsequent behaviour than are attitudes based on second-hand information". These beliefs, according to Straub (2009, pp.641), are uniquely constructed by individuals, and that these beliefs are malleable. This leads us to argue that attitudes and beliefs can vary over time and that there is a reciprocal push-pull of a range of cognitive and affective moderators.

Our exploration of the attitude construct in TAM does not sufficiently justify its direct resulting in BI without understanding the factors that shape attitudes. We felt it necessary to explore the expectancy-value relationship. This was to understand the cognitive and affective processes that determine and shape decisions to act or not to act.

At this point we paused to recount the process thus far. We started with TAM and found that it did not explicitly advance our understand of why individuals adopt and use technology. To understand this we engaged with attitudes and beliefs to validate its role in decision making. We began to engaged in an exploration of social cognitive theory (SCT) and motivational theory (MM) to understand how beliefs and attitudes are shaped.

3.4.2 Social Cognitive Theory (SCT)

According to Bandura (1989), "In social cognitive theory, people are neither driven by inner forces nor automatically shaped and controlled by the environment...they function as contributors to their own motivation, behaviour, and development within a network of reciprocally interacting influences (Bandura, 1989, pp.8). Behaviour is determined by the influence of various factors that shape the inner self of a person - such influences include situational factors, societal norms, personality and cognitive factors. In this section we limit our discussions to self-efficacy, motivation, expectancy and value through the PU and PEOU constructs of TAM. Perceived usefulness (PU) directly simplifies usability value and could be explored through a benefit-expectancy-value relationship. Perceived ease of use (PEOU) attempts to simplify competency and could be explored through a competency-belief-motivation relationship.

Holden and Karsh (2010) maintain that the use of ICTs must have a value proposition associated with it, i.e. it "must be perceived as useful". Their study highlights sharply "that, regardless of how useful and easy to use...steps will need to be taken to ensure that end users feel confident in their ability to use it (self-efficacy)" (Holden and Karsh, 2010, pp.166).

3.4.3 Self-efficacy

Bandura (1996, pp.5516) defines self-efficacy as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives". These beliefs are known to exert an influence on what people decide to do and the effort they are prepared to put into it. Self-efficacy beliefs are associated with the affective domain and determine how people feel, think and motivate themselves.

Both self-efficacy and perceived behavioural control (PBC) are focused on beliefs: self-efficacy as an internal trait and PBC as external. Self-efficacy as a control belief exerts influence over internal factors (peoples' beliefs of their ability to carry out the action) and situational factors such as PCB (peoples' beliefs of being able to control time, resources, etc.). However, PBC is a belief, and should not be confused with actual control, i.e. where people are actually able to exert influence on situational factors, i.e. under their volitional control (controllability).

Perceived behavioural control (PCB) and actual control are more predictors of actual behaviour than self-efficacy is. If people believe they have the ability to perform the action and are in control of the situational factors, then the probability of the action being performed is high.

3.4.4 Motivational Model (MM)

The range of motivation theories underpin many studies (with adaptations) for specific contexts such as, to understand new technology adaption and use. Motivational factors orientate us in understanding mediating variables of attitudes and beliefs.

The two core constructs are: extrinsic and intrinsic motivation. Intrinsic motivation is "the desire to do or achieve something because one truly wants to and takes pleasure or sees value in doing so" (Usher and Kobe, 2012, pp.3). Extrinsic motivation is this same desire, however not for itself but for the purpose of a result, external reason or instrumental value (Pintrich, 2003, pp.673). We believe that these two subtly different motivators ultimately determine specifically valued behaviours.

According to Usher and Kobe (2012, pp.3), in the "self-efficacy theory [of Bandura], PEOU influences intrinsic motivation". We believe that this reasonably suggest that self-efficacy beliefs have a reciprocating moderating effect on motivation. It is then very likely that positively motivated persons could to develop a robust sense of self-efficacy and PCB beliefs and vice versa. This iteratively suggests that motivation could also serve to alter beliefs and attitudes – equally to motivate or demotivate over time.

We asked ourselves how else could attitudes and intentions be moderated to tell us why people actually use technology. There are contradictions and variations in correlating what people believe and say and what they intend and actually do. We were particularly interested in understanding why in spite of variances people

actually do use technology. This prompted us to look deeper into the processes of motivation. We did this through an exploration of the valence, instrumentality, expectancy theory (VIE).

3.4.5 Valence, Instrumentality, Expectancy theory (VIE)

One of the process theories of motivation is Vroom's (1964) Valence, Instrumentality, Expectancy theory (VIE) (Van Eerde and Thierry, 1996, pp.575; Parijat and Bagga, 2014, pp.3). Valence, encompasses intrinsic value which is the sense of personal accomplishment and satisfaction, i.e. "possible affective orientations toward outcomes, and it is interpreted as the importance, attractiveness, desirability, or anticipated satisfaction with outcomes" (Van Eerde and Thierry, 1996, pp.576). It concerns emotional orientations which people hold when considering what to do, based on how valuable or meaningful the desired outcome is.

Instrumentality refers to the perceived link between expectancy and the eventual outcome (second-order outcome). Will an action be followed by an outcome (first-order outcome) and will this outcome in turn provide the desired outcome (second-order outcome) (Van Eerde and Thierry, 1996, pp.576). Expectancy is reported by Van Eerde and Thierry (1996, pp.576) as "a subjective probability of an action or effort leading to an outcome or performance".

The valence construct can be linked to expectancy–benefits–value relationships and personal concerns of the CBAM. A person's behaviour is influenced by beliefs that their actions will produce a result, and that this is actually achievable (Parijat and Bagga, 2014, pp.2). The expectancy construct can be linked to self-efficacy, PBC, and to external concerns of impact.

Two assumptions associated with the VIE theory are thus critical to this paper:

1. Conscious decision: "An individual's behaviour is a result of conscious choice" [cognitive and affective decisions] (Lunenburg, 2011, pp.1-2), meaning that people are at free to decide what to do based on their inner beliefs.
2. Value proposition: "People will choose among alternatives so as to optimise outcomes for them personally" (Lunenburg, 2011, pp.1-2). This means that people will decide on actions if it gives them the gratification they wish for.

We could hypothesise that if valence is positive and, expectancy and instrumentality are high, then there could be motivation to carry out the action. The discussion on expectancy by Gellerstedt, Babaheidari and Svensson (2018, pp.14) notes that if teachers perceive gains, they will be likely users and those who do not are less likely to be users of technology. This is aligned with our belief that it is unlikely that a teacher will willingly or mandatorily use a technology if there is nothing in it for him/her, i.e. no benefit or value proposition.

4. Discussions:

The attitude construct appears to be underplayed in many theories relating to adoption and use. Bagozzi (2007, pp.245) identified a gap when he stated that there is an "absence of a sound theory and method for identifying the determinants of PU and PEOU". The implications of social cognitive and adoption theories suggest, according to Bandura (1986, cited in Straub, 2009, pp.642), that "just as the context can influence the beliefs and emotional response, emotions may influence beliefs, context, and culture".

The relationship between attitude and behaviour is indicated by the intentions that individuals make to action behaviours that they perceive positively. There has been considerable debate about the 'attitude' constructs as a predictor of behaviour. The base assumption has been that the intention to do the action will be positively aligned if, people assume a positive outcome for their behaviour, their attitudes will be equally positive. We agree that this concept is true, but equally offer that attitudes could determine a negative intent irrespective of the positivity of the outcome. We maintain, given the findings in a vast body of literature on psychological attributes, that attitudes are significant as an affective component that shapes decisions [intent]. We thus believe that the attitude construct must be retained and mediated as a construct that precedes intention-use.

Noticeably absent from the theories are any explicit construct on value propositions and benefits. Our contention is that benefits and value propositions have a very direct influence of intention and subsequent use. This is based on the fact that if the value proposed is good or not good, then the intention is accordingly moderated by this feeling.

We expect that limitations will be ever-present in any theory. These limitations will pose low-to-significant risk in any research involving the human element. Two of the limitations noted by Samaradiwakara and Gunawardena (2014, pp.28) that are particularly relevant in our context are:

- Confusion about beliefs and attitudes. They both have a reciprocal relationship and influence one another in varying degrees of intensity.
- Assumptions that an intention to perform a behaviour will inevitably result in the behaviour being performed. However actual use (intention enactment) will only materialise if the individual is free to perform the action.

We find that TAM in its native iteration was not perfectly suited for the context of this paper. We conceptualised a theoretical model which is an adapted TAM. The theoretical model suggested, focuses on moderators for the attitude construct, towards understanding the cognitive and affective influences on intention based on attitudes.

5. Development of the theoretical framework

5.1 Stage 1:

The main moderating constructs from the range of theories used were mapped onto a matrix (see table 1). We commenced with listing relevant individual personal factors as we deemed these to be suggestive of the affective-self. Thereafter the correlating and reciprocal concepts from the various theories were mapped and highlighted against the individual personal factors.

Table 1: Matrix of constructs and moderators - theories and models

Individual Factors	IDT	TAM	TRA	TPB	CBAM	VIE/MM	SCT
Beliefs	Seeking information	Perceived usefulness	Attitudes	Attitudes	Concerns: self/task/impacts	Motivation: extrinsic/ intrinsic	Beliefs
Norms: personal/subjective	Forming an attitude	Perceived ease of use	Norms: Subjective	Norms: Subjective	Domains: personal/external	Valence	Attitudes
Motivation	Choices	Variables: external	Behavioural intent	Perceived behavioural control	Seeking information	Expectancy	Motivation: extrinsic/ intrinsic
Perceptions	Use	Attitudes	Behaviour	Actual behavioural control	Outcome: expectancy	Instrumentality	Self-efficacy
Expectancy	Reinforcement	Behavioural intent		Self-efficacy	Behavioural intent	Behavioural intent	Perceptions
Self-efficacy	Relative advantage	Behaviour		Behavioural intent	Behaviour	Behaviour	Various (social) learning
Locus of control	Compatibility			Behaviour		Outcome: value laden	Outcome: value laden
Attitudes	Complexity					Effort	Verbal persuasion
Confidence	Observability					Self-efficacy	Emotional state
Needs						Outcome: expectancy	Hierarchy of needs

5.2 Stage 2:

A schematic outline (figure 2) was developed from the matrix (table 1) to show the relational links and dependencies among the moderating constructs. We prefaced the schematic with the adoption process (Rogers, 1995). We selected this as it accurately resembles what people naturally do when making decisions, especially when encountering something new.

We engaged in backward mapping from the assumption that technology is actually used. We offer that an action will not materialise without a conscious decision (intent). Any decisions taken by an individual is based on an attitude towards that action. Attitudes are primarily informed by beliefs.

The next process was to draw out, from the matrix, the aspects that could have contributed to the beliefs and attitudes. For this we used the PU and PEOU constructs of TAM and the motivation and self-efficacy constructs from SCT; MM; VIE; CBAM. Each construct was then further decomposed and then linked based on the following reasoning:

- Usability indicates the simplicity or relatively ease it would be to operate or use the technology – although a technology is considered simple to use, the user’s feeling about his/her capability to do this is based on the person’s self-efficacy beliefs and confidence – if these beliefs are positive, it could in turn be a motivating factor to consider using it. This represents a usability-self efficacy-motivation-belief-attitude relationship.

- Usefulness of a technology is based on what it can do (its intended function). However this may or may not be what an individual needs from it. As such an individual searches for the offer of usefulness of the technology against his/her needs and desires. Should the offer be substantial for the individual, for his/her job and/or his/her learners, then the probability exists that the individual will be motivated by the offer. This is not a guarantee as noted in the literature review in this paper. We believe that should the offer carry a value proposition that substantially satisfies an individual's desire to be efficient, effective, acknowledged, then the individual's beliefs of usefulness of the technology becomes positive. The probability now exists that the individual will be further motivated by the offer.
- Motivation could be either intrinsic or extrinsic and in effect is the expectancy of an individual of the results of his/her decision to act. Motivation is linked to all those aspects that lead an individual to believe that there is something good or valuable to gain from engaging in an action. Individuals are motivated by their beliefs (based on knowledge and or experience) of what they can do, and can accomplish, as well as by the attractiveness and value from engaging in an action.
- Self-efficacy is a belief based on ones feelings that are informed by knowledge and experience. Should individuals believe that they are capable, and there are no distractors to them carrying out an action, then the person is more likely to have positive beliefs about his/her abilities to do something. High self-efficacy beliefs additionally serve as motivating factors.

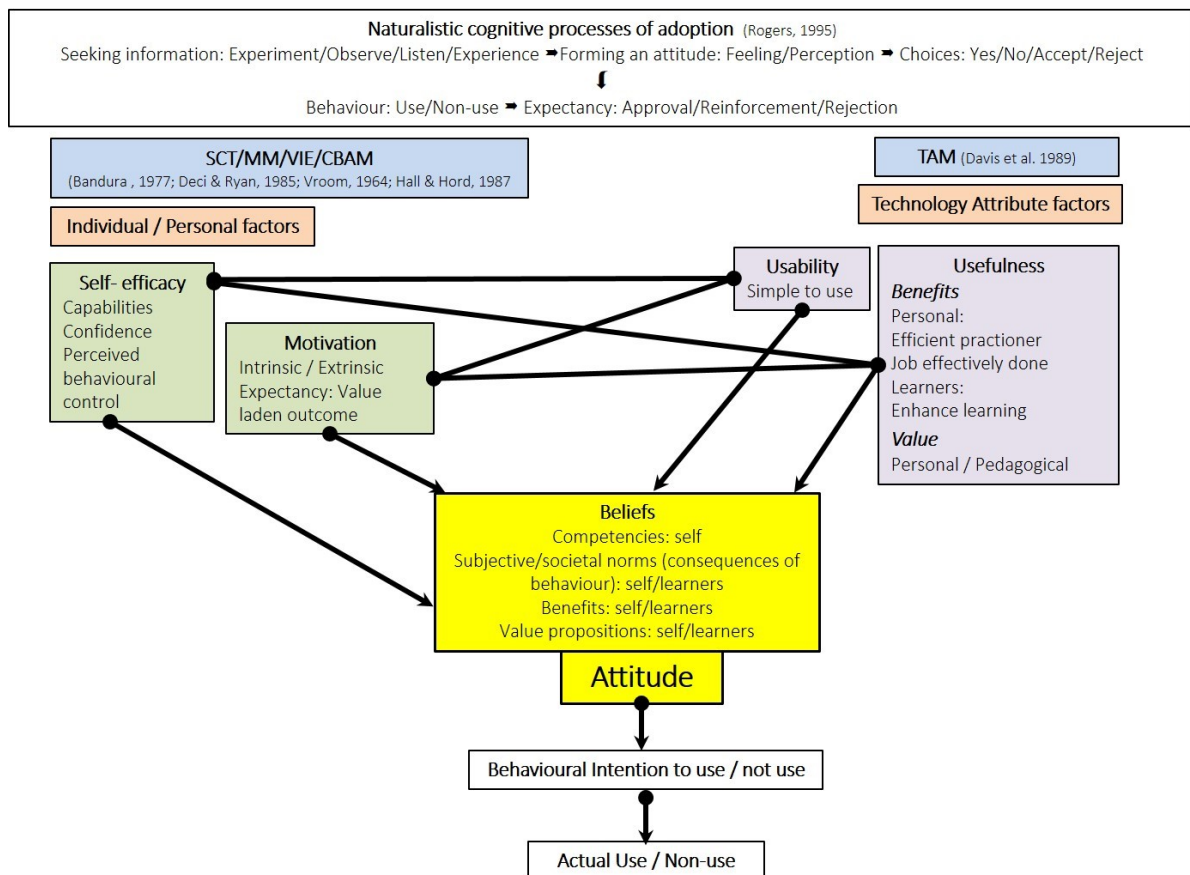


Figure 2: Schematic of moderating constructs

5.3 Stage 3:

In the final stage of the process, the core constructs were set out from the anchor theory (TAM). From the schematic the suggested new moderating constructs were mapped to the relational TAM constructs aligned to the rationale discussed in stage 2 of the process. The resulting outcome was an adapted TAM appropriate as a theoretical model. See figure 3.

6. Adapted TAM

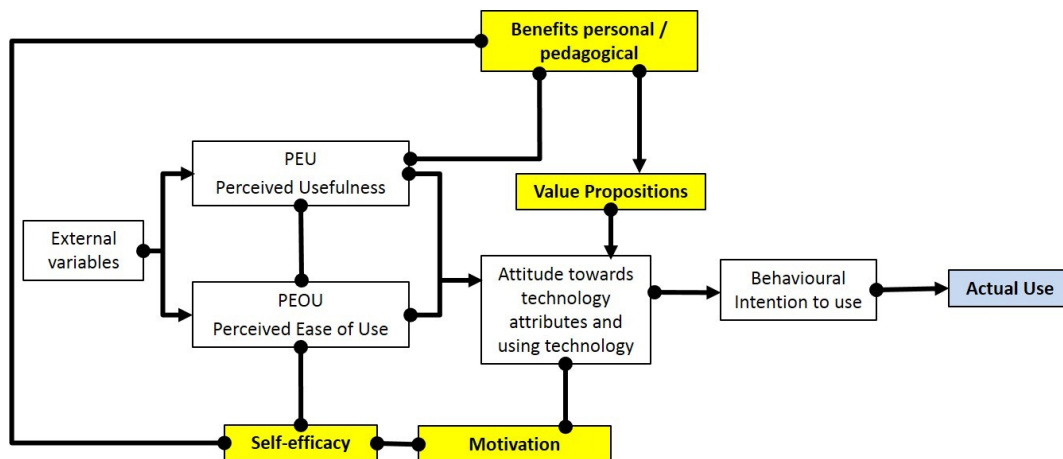


Figure 3: Adapted TAM

According to Lee, Cheung and Chen (2005, pp.1097), “the decision to use technology is determined partly on a rational calculation of the benefits”. They state that behaviour is motivated by “perceived values and benefits derived” from the utility value and affordances of a technology (Lee, Cheung and Chen, 2005, pp.1097). The affective and cognitive domains within people, work in tandem in decision making. Attitudes are effectively shaped by motivation and attitudes themselves could have an influence on a person’s motivation iteratively. One can carry out an action because of a belief that it is valuable and, when the action is completed, it could result in internal satisfaction or external praise. This in turn can further stimulate motivation to sustain such actions.

Attitude is the degree to which a person has a favourable or unfavourable disposition towards adopting or rejecting an innovation (Ajzen, 1991, pp.188). As a mental process it incorporates the cognitive (assumes the use of existing knowledge to understand and make decisions), and affective (based on feelings and not on using knowledge to evoke feelings to make decisions) domains. In developing attitudes, people mentally contemplate options of how it can be applied before deciding whether to try it out. This constitutes the formulation of a behavioural intent (BI) that could lead to actual use. Technologies in themselves have an instrumental value of usefulness (Sadeck 2016, pp.213). It is when an individual interprets this attribute as having benefits for their context (in our case a teaching/learning context), then this technical attributes begin to transform into pedagogical usefulness, which in turn emerge as possible benefits for the user. These benefits are informed by attitudes towards the usefulness of the technology and the possible pedagogical benefits it offers.

We further analysed the literature to explicate how benefits could result in a positive intention to use. We linked our decisions to the literature search and the work of Holden and Karsh (2010, pp.166) who maintain that “...the use of ICTs...must have a value proposition associated with it”. The general acceptance that a favourable attitude results in action is challenged by a favourable attitude and external factors that counter the freedom of an individual to perform an action. Furthermore, a favourable attitude must be based on something tangible, such as, there must be something about usefulness that is compelling. Benefit to be gained from the usefulness of a technology and the concomitant value proposition is potentially the connection between intention and use (Lee, Cheung and Chen. 2005, pp.1097). The attributes of innovations may be attractive, the resources could be available, the skill set could be present, but it is ultimately a person’s wants, feelings, beliefs, motivation, attitudes and needs that ultimately prompt decisions to act (intent) and possible action. The decision about an intention to use or not use is informed by attitude and beliefs that are moderated by self-efficacy beliefs, motivation, perceived benefits and value propositions offered by the technology to the individual.

7. Conclusions

Existing theories, have over time alluded to the moderating constructs we highlighted in this paper. There are numerous seminal papers, additional research papers and adaptations to theories/models, regarding technology adoption, that have been produced since the 1980s. While this adds to the richness in the field, the relative complexity that has emerged leaves some researchers perplexed. As such we argue that a grounded-in theory approach is well suited as a means of understanding the research need in a systematic way.

We submit that we have made explicit the self-efficacy and motivation constructs. We clarified the benefits construct and we added value propositions as an additional construct for a contextual understanding of actual use. The adapted TAM proposed in this paper offers:

- Self-efficacy beliefs impact confidence through feelings that can be a motivating factor.
- Benefits from technology affordances (usefulness) could influence a person's motivation. The utility value and benefits to be gained from the use of the technology could further provide value propositions as additional motivation.
- Value propositions are based on the notion that a person will be motivated to act if he/she believes that there will result in a good output (expectancy), and this output will earn him/her the desired rewards (instrumentality), and that the value of the rewards is highly positive (valence). An individual is thus likely to use a technology based on the value he/she attaches to the outcome of the use of a technology.

Theories, models and frameworks are not mutually exclusive. Exploring related theories symbiotically promotes insight into the phenomenon and further deepens the rigour in research undertakings. The dynamic nature of technologies and peoples' adoption trajectories argues for mechanisms that promote valid exploration of adoption and use of technologies.

The focus of this study was on why people adopted and used technologies. Having examined TAM and its overlaps with other theories, an adaptation to TAM was conceptualised through the inclusion of moderating constructs, i.e. value propositions; motivation; benefits and self-efficacy. We offer that the adapted TAM proposed in this paper hedges the changes of success for technology acceptance and use research studies in appropriate contexts. We further maintain that it will be useful for researchers seeking to understand the 'why' question in research.

8. Contributions:

Our contributions are framed primarily by our grounded-in-theory approach which argues that it is unlikely that any single theory is the panacea to researching complex issues. We argue that people's actual use of technology follows intentions reasonably informed by their beliefs and attitudes. There are implications for both practice and research using the adapted TAM: Research – guidance on the process of a grounded-in-theory approach, and Practice – application of the adapted TAM to understand why technology is used. We believe that researchers could test the adapted TAM in both qualitative and quantitative studies to further refine its practical and theoretical value.

Our grounded-in-theory approach is explorative in a specific context, suggesting that it should not be interpreted as confirmative proof as an alternative to existing theories/models. According to Taylor and Todd (1995) models should be appraised in terms of the number of predictors and how they contribute to understanding a phenomena. We believe that a limitation of the suggested adapted TAM is its conception in a school e-learning educational context. It has not been tested in context outside of education

References

- Abuhmaid, A., 2011. ICT Training Courses for Teacher Professional Development in Jordan. *The Turkish Online Journal of Educational Technology*, 10(4), pp.195-210
- Ajzen, I., 1991. The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50(2), pp.179-211. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.317.9673&rep=rep1&type=pdf> [Accessed 16 August 2020]
- Ajzen, I. and Fishbein, M., 2005. The Influence of Attitudes on Behavior. In D. Albarracín, B.T. Johnson and M.P. Zanna, eds. *The handbook of attitudes*, pp.173–221. Lawrence Erlbaum Associates Publishers. Available at: <https://www.researchgate.net/publication/325114583> [Accessed 16 August 2020]
- Ajzen, I. and Fishbein, M., 1980. *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice Hall.
- Bagozzi, R.P., 2007. The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, 8(4), pp.244-254. Available at: <http://www.sietmanagement.fr/wp-content/uploads/2016/04/2007-bagozzi-jinfosystems.pdf> [Accessed 16 August 2020]
- Bandura, A., 1986. *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A., 1989. Social cognitive theory. In Vasta, R., ed. *Annals of child development. Vol 6. Six theories of child development*, pp.1-60. Greenwich, CT: JAI Press. Available at: <https://www.uky.edu/~eushe2/Bandura/Bandura1989ACD.pdf> [Accessed 16 August 2020]
- Bandura, A., 1982. Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), pp.122-147.

- Bandura, A., 1996. Social cognitive theory of human development. In T. Husén and T.N. Postlethwaite, eds. *International encyclopaedia of education*. 2nd ed. Oxford: Pergamon Press, pp.5513–5518.
- Bandura, A., 2001. Social cognitive theory: an agentic perspective. *Annual Review of Psychology*, 5(2), pp.1-26.
- Cheng-Min, C., 2019. Factors Determining the Behavioural Intention to Use Mobile Learning: An Application and Extension of the UTAUT Model. *Frontiers in Psychology*, 10(1652). DOI=10.3389/fpsyg.2019.01652
- Chigona, A. and Chigona, W., 2010. Capability approach on pedagogical use of ICT in schools. *The Journal for Transdisciplinary Research in Southern Africa*, 6(1), pp.209-224. DOI: <https://doi.org/10.4102/td.v6i1.117>
- Davis, F.D., Bagozzi, R.P. and Warshaw, P.R., 1989. User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), pp.982-1003. DOI. 10.1287/mnsc.35.8.982.
- Dwivedi, Y.K., Rana, N.P., Jeyaraj, A., Clement, M. and Williams, M. D., 2019. Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Information Systems Frontiers* 21, pp.719-734). <https://doi.org/10.1007/s10796-017-9774-y>
- Eickelmann, B. and Vennermann, M., 2017. 'Teachers' attitudes and beliefs regarding ICT in teaching and learning in European countries. *European Educational Research Journal*, 16(6), pp.733–61.
- Gellerstedt M., Babaheidari S.M. and Svensson, L., 2018. A first step towards a model for teachers' adoption of ICT pedagogy in schools. *Heliyon*, 4(9). DOI: 10.1016/j.heliyon.2018.e00786
- Glaser, B.G. and Strauss, A.L., 1967. The Discovery of Grounded Theory. Strategies for Qualitative Research. Available at: http://www.sxf.uevora.pt/wp-content/uploads/2013/03/Glaser_1967.pdf [Accessed 16 August 2020]
- Grandon, E., Alshare, O. and Kwan, O., 2005. Factors influencing student intention to adopt online classes: a cross-cultural study. *Journal of Computing Sciences in Colleges*, 20(4), pp.46-56.
- Hall, G.E., 1974. *The Concerns-Based Adoption Model: a developmental conceptualization of the adoption process within educational institutions*. Austin, TX :Research and Development Center for Teacher Education.
- Hall, G.E., Dossett, W.F. and Wallace, R.C., 1973. A developmental conceptualization of the adoption process within educational institutions. Austin, TX :Research and Development Center for Teacher Education.
- Holden R.J. and Karsh B.T., 2010. The technology acceptance model: its past and its future in health care. *Journal of Biomedical Informatics*, 43(1), pp.159-172. DOI:10.1016/j.jbi.2009.07.002
- Hord, S.M., Rutherford, W.L., Huling-Austin, L. and Hall, G.E., 1987. *Taking charge of change*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Lee, M.K.O., Cheung, C.M.K. and Chen, Z., 2005. Acceptance of Internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information and Management*, 42(8), pp.1095-1104. DOI:10.1016/j.im.2003.10.007.
- Loucks, S.F., 1983. *The concerns-based adoption model*. University of North Carolina, Chapel Hill, NC: Chapel Hill Technical Assistance Development System
- Lunenburg, F.C., 2011. Expectancy theory of motivation: motivating by altering expectations. *International Journal of Management, Business, and Administration*. 15(1), pp.1-6.
- Ndubisi, N.O., 2006. Factors of online learning adoption: a comparative juxtaposition of the theory of planned behaviour and the technology acceptance model. *International Journal on e-Learning*, 5(4), pp.571-591.
- Oye, N.D., Iahad, N.A. and Ab-Rahim, N., 2012. The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Education and Information Technologies*, 19(1), pp.251-270. DOI: 10.1007/s10639-012-9189-9
- Pajares, M., 1992. Teachers' beliefs and educational research. Cleaning up a messy construct. *Review of Educational Research*, 62(3), pp.307–332.
- Parijat, P. and Bagga, S., 2014. Victor Vroom's Expectancy Theory of Motivation: an evaluation. *International Research Journal of Business and Management*, 7(9), pp.1-8. Available at: <http://irjbm.org/irjbm2013/Sep2014/Paper1.pdf> [Accessed 16 August 2020]
- Park, S.Y., 2009. An analysis of the Technology Acceptance Model in understanding university students' behavioural intention to use e-Learning. *Journal of Educational Technology and Society*, 12(3), pp.150-162. Available at: https://www.researchgate.net/publication/220374248_An_Analysis_of_the_Technology_Acceptance_Model_in_Understanding_University_Students'_Behavioral_Intention_to_Use_e-Learning. [Accessed 16 August 2020]
- Pintrich, P.R., 2003. A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, 95(4), pp.667-686. Available. <https://pdfs.semanticscholar.org/1907/3c567d6c0bb4c9034bface4794ff5f1d5315.pdf> [Accessed 16 August 2020]
- Prestridge, S., 2012. The beliefs behind the teacher that influences their ICT practices. *Computers and Education*, 58(2012), pp.449-458.
- Richardson, V., 1996. The role of attitudes and beliefs in learning to teach. In Sikula, J. ed. *Handbook of research on teacher education* (2nd ed., pp.102-119). New York: Macmillan. Available: https://www.researchgate.net/publication/239666513_The_role_of_attitudes_and_beliefs_in_learning_to_teach. [Accessed 16 August 2020]
- Rogers, E.M., 1995. Diffusion of innovations. 4th ed. New York, NY: Free Press.
- Sadeck, O., 2016. An exploration of e-learning practices of teachers at selected schools in the Western Cape. Cape Town, South Africa: Cape Peninsula University of Technology.
- Sadeck, O. and Cronjé, J.C., 2018. When Tam just won't do. Proceedings of the 13th International Conference on e-Learning ICEL 2018. Cape Town, South Africa. Ivala, E. ed. Reading, UK: Academic Conferences and Publishing International Limited.

- Sadeck, O. and Cronjé, J.C., 2017. A Continuum of Teachers' e-Learning Practices. *The Electronic Journal of e-Learning*, 15(5), pp.396-409. Available at: https://issuu.com/academic-conferences.org/docs/ejel-volume15-issue5-article627?mode=a_pg [Accessed 24 October 2020]
- Samaradiwakara, G.D.M.N. and Gunawardena, C.G., 2014. Comparison of existing technology acceptance theories and models to suggest a well improved theory/model. *International Technical Sciences Journal*, 1(1), pp. 24-28
- Solis, C., 2015. Beliefs about teaching and learning in university teachers: Revision of some studies. *Propósitos y Representaciones*, 3(2), pp.227-260. <http://dx.doi.org/10.20511/pyr2015.v3n2.83>
- Straub, E.T., 2009. Understanding technology adoption: theory and future directions for informal learning. *Review of Educational Research*, 79(2), pp.625-649.
- Taylor, S. and Todd, P.A., 1995. Understanding information technology usage: A test of competing models. *Information Systems Research*, 6(2), pp.144–176.
- Thomas, H.E. and Cronjé, J.C., 2007. Computers in schools: implementing for sustainability. Why the truth is rarely pure and never simple. *South African Journal of Higher Education*, 21(6), pp.759-780. Available at: https://journals.co.za/docserver/fulltext/high/21/1/high_v21_n6_a12.pdf?expires=1597571441&id=idandacname=guestandchecksum=6E0F3159E5B42DA1722B2C3BE54EAA00. [Accessed 2014]
- Usher, A. and Kobe, N., 2012. Student motivation: an overlooked piece of school reform. Center on Education Policy, George Washington University, Washington, DC. Available at: https://www.cep-dc.org/cfcontent_file.cfm?Attachment=UsherKober%5FBackground1%5FMotivation%5F5%2E22%2E12%2Epdf [Accessed 16 August 2020]
- Van Eerde, W. and Thierry, H., 1996. Vroom's expectancy models and work-related criteria: a meta-analysis. *Journal of Applied Psychology*, 81(6), pp.575-586. Available at: <https://pdfs.semanticscholar.org/e769/32a547cfb064ff641b17e5427184ea71fd60.pdf;Vroom&>. [Accessed 16 August 2020]
- Venkatesh, V. and Bala, H., 2008. Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), pp.273-315.
- Venkatesh, V. and Davis, F.D., 1996. A model of the antecedents of perceived ease of use: development and test. *Decision Sciences*, 27(3), pp.451-481.
- Venkatesh, V. and Davis, F.D., 2000. A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, 46(2), pp.186-204.
- Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D., 2003. User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), pp.425–478.