CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	A cognitive model of digital transformation and IS decision making
Authors	Russell, Kenneth D.;O'Raghallaigh, Paidi;McAvoy, John;Hayes, Jeremy
Publication date	2020-11-30
Original Citation	Russell, K., O'Raghallaigh, P., McAvoy, J. and Hayes, J. (2020) 'A cognitive model of digital transformation and IS decision making', Journal of Decision Systems, doi: 10.1080/12460125.2020.1848388
Type of publication	Article (peer-reviewed)
Link to publisher's version	https://www.tandfonline.com/doi/full/10.1080/12460125.2020.1848388 - 10.1080/12460125.2020.1848388
Rights	© 2020 Informa UK Limited, trading as Taylor & Francis Group. This is an Accepted Manuscript version of the following article, accepted for publication in Journal of Decision Systems. It is deposited under the terms of the Creative Commons Attribution-NonCommercial License (http://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. - https://creativecommons.org/licenses/by-nc/4.0/
Download date	2026-11-08 12:17:33
Item downloaded from	https://hdl.handle.net/10468/12368

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Towards a Cognitive-Behavioral Model of Digital Transformation and Decision Making

Kenneth Russell[b], Paidi O'Raghallaigh[a], John McAvoy[a], and Jeremy Hayes[a]

[a]*Cork University Business School, University College Cork (UCC); b Ericsson Global Services, Dublin*

Email: p.oreilly@ucc.ie (corresponding author); kenneth.russell@ericsson.com; j.mcavoy@ucc.ie; j.hayes@ucc.ie;

Disclosure statement: No potential conflict of interest was reported by the authors

Towards a Cognitive-Behavioral Model of Digital Transformation and Decision Making

ABSTRACT

Cognition is an abstract concept that has defined philosophical debate since the classical Greek era. Individuals are complex bundles of thoughts, beliefs, emotions, and behaviors that impact how they view and react to an impending change. For a radical digital transformation (DT) to be successful, it is necessary to both understand and address how these individuals will react to the possibilities of an impending change. Cognitive- Behavioural Models describing individuals' thoughts, beliefs, emotions and behaviors are applied and researched in fields such as psychology and medicine. This study determines how prevalent the study of cognition is within the IS field and the type of research that has been undertaken. Further, we investigate what IS can learn from the use of CBMs in other sciences in order to propose a model for understanding individual predispositions and decision-making related to DT. By combining the research from the IS domain with the psychology and medical domains, this paper presents a theoretical model, the Hierarchical Cognitive Model for Information Systems, that we expect can inform future research into the cognitive-behaviors that impact individuals before, during and after DT. This model may also inform how practitioners may prescriptively align with, manage or change these cognitive-behaviors when planning a DT.

KEYWORDS

Digital Transformation, cognitive-behavioral model, change management, decision making.

1. Introduction

Digital technology is at the vanguard driving our political, economic, social, techno-logical, environmental and regulatory change. Digital transformation (DT) is defined as the "*use of technology to radically improve performance or reach of enterprises*" (Westerman et al, 2011, p.5). DT success remains largely elusive with only 12% of enterprises achieving their initial goals. Part of the issue lies in the assumption that technology is the answer. Technology is rarely transformational, and DT is as much about people as it is about technology (Marchand et al, 2000; Kane, 2019). Individuals are complex "*bundles of intense emotion, body sensations, thoughts, beliefs, and behaviors*" (Germer, 2009; p.93). Cognitive-behavioral approaches describe how individuals' perceptions of, or spontaneous thoughts about, events or situations influence

their emotional, cognitive, behavioral (and often physiological) reactions and decision making capabilities (Dolan, 2002, p.1194). Cognition is " the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses" (Oxford English Dictionary). Indeed, individual cognition prior to change acts as a useful barometer of individuals' predispositions towards a change and ultimately to their behaviors towards the change (Roberts et al, 2012).

The psychological and medical sciences have long researched the potential of cognitive-behavioral models (CBM) for understanding human behaviors towards change (Turk et al, 1983, p.4-5, Beck, 2020). A CBM "describes how people's perceptions of, or spontaneous thoughts about, situations influence their emotional, behavioral (and often physiological) reactions". In focusing on an individual's unique cognitive perspectives, CBMs are well established among medical and psychology professionals in adapting the individuals' change phase by flexibly blending "cognitive, experiential, behavioral and interpersonal strategies" (Young et al, 2006 p.49). For example, psychotherapists, such as Young et al (2006), suggest CBMs may allow people to adapt antecedent cognition and subsequent behaviors through " meaningful changes in a short period of time" (p.4). In this way, CBMs address the gaps between the individuals' initial cognition, and their ultimate behaviors, through supporting interventions that adapt their cognition of situational stimulus for enhanced behavioral outcomes. This has supported the advancement of fact-based, targeted interventions in medicine and psychology (Mitchell and Gordon, 2007; Elkins et al, 2011).

On the other hand, contemporary IS research has traditionally taken either a process or technology focus (Niven and Lamorte, 2016). While there is some evidence of the existence of a cognitive-behavioral approach in Information Systems (IS) research (Young, 2011; Davis, 2001), our literature review suggests that IS literature lacks a tradition in examining individual cognitive-behavioral perspectives, especially prior to changes. The development of an enhanced CBM for IS has the potential to drive a shift in how IS scholars and practitioners approach change initiatives. By exploring and understanding individuals' cognitive-behaviors, IS researchers may begin to recognize and understand the inter-relationships between the individuals' cognitive-behaviors and the success of organizational change initiatives. Our research objective is therefore to conduct a scoping review of existing literature to assess the prevalence and use of cognitive-behavioral models both within and outside of the IS domain.

The paper proceeds as follows. Section 2 outlines the research methodology of a structured literature scoping review. Section 3 explores the tradition of cognition research both within and outside the IS domain. Section 4 introduces the theoretical Generic Cognitive Model (GCM), and outlines the Hierarchy of Cognition Model for IS applications. Section 5 finishes with some concluding remarks.

2. Research Methodology

A systematic literature review (SLR) is defined as "… a means of evaluating and interpreting all available research relevant to a particular research question or topic area or phenomenon of interest " (Kitchenham, 2004). Research papers chosen and summarized in this SLR are referenced as *primary* studies, whereas the review itself is the *secondary* study (Brereton et al, 2007).

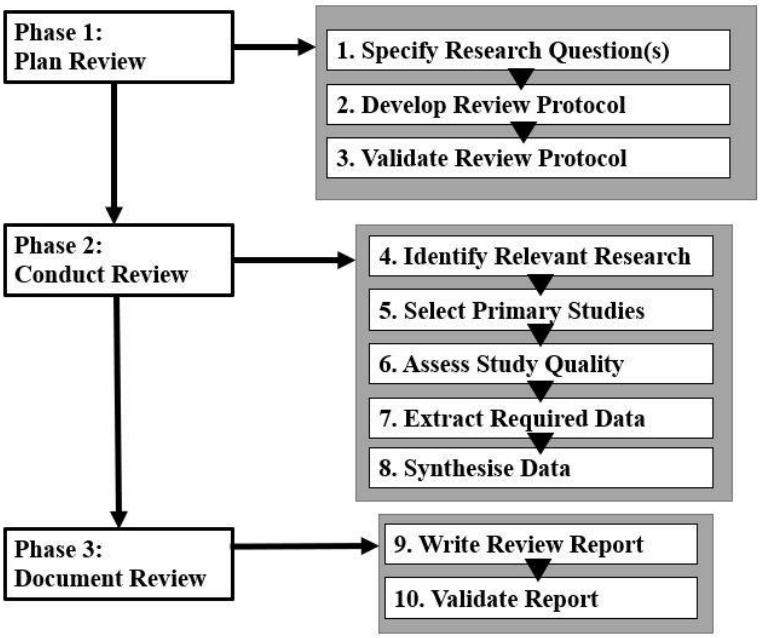


Figure 1. Systematic Literature Review (SLR) process (Brereton et al, 2007, p.572)

This study utilizes the Brereton et al study (2007, p.572) ten-step SLR guidelines (see Figure 1) for a scoping review of relevant literature. We perform two separate search steps. The first step searched Google Scholar for the top-ten most cited empirically based IS academic papers from two top ranked AIS journals - Management Information Systems Quarterly (MISQ) and Information Systems Research (ISR). The second step searched journals generally accessed through PUBMED and APA PsychNet databases, as well as through Google Scholar. Both steps used the search string "cognition". The shortlisting of primary studies was a two-phase process. The first phase (or 'plan review') shortlisted papers based on the occurrence of the search term in their titles or abstracts. During the second phase (or 'conduct review'), full copies of papers shortlisted in the first phase were thoroughly examined by the authors. The following information was tabulated from the IS papers (see Table 1): Reference; citation count (at the date of search); research focus and type (i.e. empirical, theoretical, or both); unit of analysis (i.e. individual, team, group, organization, societal, or all), environment (i.e. commercial or domestic); and the research theory. The information tabulated in the psychology-medical domain included: Reference; research focus or model; citation count; key cognition variables (i.e. thoughts, beliefs, emotions, behaviors); unit of analysis (i.e. individual, team, group, organization, societal, or all); and further comments on the research. The results of the SLR of both the IS and the non-IS sources are now analysed in Section 3.

3. Literature Review

Cognitive-behavioral theories across the scientific fields commonly assume that cognition factors, such as thoughts, beliefs, and emotions, are inherently present during the cognition-behavior process (Young et al, 2006, p.50; Dolan, 2002; Mahoney, 1974; Germer, 2009). According to Kluwe and Friedrichsen (1985, p.183), the objective should be to close the cognitive-behavioral connection (termed the '*cognition-behavior gap*') between antecedent cognition and consequent behavior. This is achieved through processes that resolve the various, competing cognitive-behavioral rules encountered. Rules can be the "*set of explicit or understood regulations or principles governing conduct or procedure within a particular area of activity*" (Oxford English Dictionary). For example, in organizations, explicit rules prescribe the way individuals behave through influencing the structure of the organizations regarding

how activities are grouped, responsibilities allocated, resources assigned, and individuals managed and rewarded (Hayes, 2010, p.304). However, the psychological literature suggests that rules can also be implicit "*beliefs, expectancies, values, and intentions"* of individuals (Kuhl and Beckmann, 2012 p1). An individual's learning evolves with their cognitive processing of the explicit and implicit rules in a given situation (Daft and Weick, 1984; Schein, 1990; Swieringa and Wierdsma, 1992; Hayes and Allinson, 1998). In essence, business management psychologists conceptualize organizations as a set of implicit and explicit cognitive-behavioral rules that prescribe the way individuals behave (Kluwe and Friedrichsen,1985; Swieringa and Wierdsma, 1992; Hayes, 2010). Schein contributes that culture is instrumental in the pattern of assumptions taught to new individuals as "*the correct way to* perceive, think, and feel" (1990, p.111).

3.1. Tradition of Cognitive-Behavior Approaches in IS Literature

One of the objectives of this study is to investigate the prevalence and use of cognition in the IS domain. The authors undertook a scoping review of the top-ten most cited papers from two of the AIS scholar basket of IS journals – see Table 1. IS research has demonstrated some limited awareness of cognition-based behavioral models, such as in the fields of machine cognition and artificial intelligence (Norman, Ortony, and Russell, 2003). However, it is apparent from our review that IS research has *separately* researched '*cognition*' and '*behavior*' rather than cognitive-behavior *collectively*. In addition, most IS cognition research leans towards examination of *post-rational* cognition rather than *prior* cognition (or cognition that takes place prior to a change). Some exceptions include the Beaudry and Pinsonneault (2010) study of emotion in user acceptance (2010). Their structural model of emotion builds on the seminal work of Folkman and Lazarus (1988) in postulating that emotion plays a compelling role in our lived beliefs, attitudes, thinking, decision making, and ultimate actions. They call for IS researchers to embrace and offer cognition-based approaches and for new emotion-infused models of IS.

#	Author(s)/ Year/Journal	Citation Count	Research Focus & Type	Unit of Analysis	Theory
1	Alavi & Leidner (2001) MISQ	13245	Investigates Knowledge Management (KM) and KM systems. *(Theoretical)*	Organizational *(Commercial)*	Knowledge Management process.
2	Gefen, Karahanna, &Straub (2003) MISQ	7651	Investigates trust and technology acceptance in online shopping. *(Theoretical)*	Individual *(Both)*	TAM+ Integrated theory ecommerce trust & ease of use.
3	Venkatesh (2000) ISR	6058	Investigates perceived ease of use through control, motivation and emotion *(Both).*	Individual *(Commercial)*	Theoretical model of determinants of system perceived ease use, TAM.
4	Wasko & Faraj(2005) MISQ	5549	Investigates sharing as social capital and knowledge contribution. *(Empirical)*	Individual *(Commercial)*	Theory of collective action.

5	Orlikowski & Baroudi (1991) ISR	5436	Investigates IT in organizations research approach. *(Both)*	Organization *(Commercial)*	Grounded Theory
6	Venkatesh, Thong & Xu (2012) MISQ	5338	Investigates consumer acceptance of IT. *(Empirical)*	Individual *(Both)*	Unified theory of acceptance and use of technology (UTAUT)
7	Mathieson (1991) ISR	5330	Investigates user intentions comparing TAM with Theory of Planned Behavior (TPB). *(Theoretical)*	Individual *(Both)*	TAM, Planned Behavior, and Reasoned Action (Aizen,1980,1991).
8	McKnight, Choudhury et al (2002) ISR	4889	Investigates E-commerce trust and defines trust through a measured topology. *(Theoretical)*	Individual *(Both)*	Multidimensional model of trust in e-commerce.
9	Venkatash & Morris (2000) MISQ	4802	Investigates gender & social influence role in technology acceptance & ease of use behavior. (*Empirical)*	Individual (Commercial)	TAM.
10	Agarwal & Karahanna (2000) MISQ	4801	Cognitive absorption / beliefs about IT *(Theoretical)*	Individual (Both)	TAM/Cognitive Absorption Theories

Table1. Literature Scoping Review of 'Cognition' in the top-ten most cited MISQ/ISR papers

Of the six technology acceptance papers, one looks at the topic of trust. Several look at ease of use, specifically emotion, motivation, control (#9), consumer acceptance (#6), intentions (#7), gender/social influence (#9) and finally absorption with beliefs for acceptance of IT use (#10). Of the remaining four papers, two analyse knowledge management and knowledge sharing (#1 and #4). Orlikowski & Baroudi (#5) investigates organizations research approaches in IT through interpretive and critical research philosophies respectively. Finally, McKnight (#8) investigates e-commerce trust models.

The studies make use of a diverse set of theories such as collective action, acceptance of, and use of technology. Also used is the theory of planned behavior (#7), linking the individual's antecedent beliefs with consequent behaviors. This reflects the theory of reasoned action (based on Aizen's 1980 work), where it is assumed the individual considers behavioral consequences before performing the particular behavior. As an antecedent, intention is a crucial factor in determining behavior and behavioral change.

The SLR reveals that within the top ten IS papers reviewed for the term "cognition", there are few references to 'holistic' theories that present a consistent cognitive model. Indeed some authors (e.g. Mathieson, 1991; Agarwal and Karahanna, 2000) call for the development of such a model. None of the top-ten reviewed refer to digital transformation. However, each paper acknowledges the need for further IS research into cognitive factors. For example, Alavi and Leidner (2001, p.132) call for "IS researchers . . . [to] build upon the already significant work. . . to provide the diversity of perspectives and approaches. . . such complex phenomenon require." Agarwal and Karahanna (2000, p.688) suggest users need to believe they may "enjoy

new technologies without fear of organizational censure". In addition, Beaudry and Pinsonneault (2010, p.706) highlight the need for IS research to study a wider emotional range.

3.2. Cognitive-Behavior in non-IS Literature

A further objective of this study is to explore what can be learned from the use of cognitive-behaviors approaches in the psychological and medical fields, and how these lessons can be brought to bear on understanding individual predispositions and decision-making towards DT. Twenty non-IS papers were analyzed for their inclusion of *situational, thoughts/beliefs, emotions, and behaviors* factors – see Table 2. These terms are defined in this paper as follows:

- **Situation** – The situation cognition factor considers how the individual perceives and interprets an occurrence or event, dependent on their environment at that moment in time.
- **Thoughts/Beliefs** - This factor considers what the individual thinks or believes about the occurrence event in the situation environment. Thoughts and beliefs subsequently precede and influence emotions and behaviors. Thoughts and beliefs may also in turn be influenced by emotions, or consequent behaviors.
- **Emotions** – This factor considers the emotions that describe the individual's state of mind, or how they feel with regard to the occurrence event in the situation environment. Emotions are not inevitably based in rationale or logic but may occasionally be based on the irrational. The individual's emotions are potentially further influenced by the antecedent situation, or thoughts and beliefs. In turn, emotions may influence the consequent thoughts and beliefs.
- **Behaviors** – This factor considers the individual's apparent response or adopted action in reaction to antecedent factors: situations, thoughts/ beliefs and emotions respectively.

Paper#	CB Factors→ ↓Author (year)	Thoughts	Beliefs	Emotions	Behaviors	Intention	Habit (Automaticity)	Coping	Other	CBM /CM
11.	Rapee & Heimberg (1997)	✓	✓	✓	✓			✓	✓	✓
12.	Frost & Hartl (1996)	✓	✓	✓	✓	✓	✓			✓
13.	Larimer & Marlatt (2017)	✓	✓	✓	✓	✓		✓	✓	✓
14.	Sharpe (2002)	✓	✓	✓	✓		✓			✓
15.	Heimberg et al (2010	✓	✓	✓	✓	✓		✓		✓
16.	Kendall (1985)	✓	✓	✓	✓		✓	✓		✓
17.	Floyd &Markman (1983)	✓	✓	✓	✓		✓		✓	✓
18.	Dugas et al (2005)	✓	✓	✓	✓		✓	✓		✓
19.	Suldo et al (2008)	✓	✓	✓	✓			✓	✓	✓
20.	Clark &Wells (1995)	✓	✓	✓	✓		✓	✓		✓
21.	Ehlers &Clark (2000)	✓	✓	✓	✓		✓	✓	✓	✓
22.	Harvey (2002)	✓	✓	✓	✓	✓	✓			✓
23.	Oliver (1980)	✓	✓	✓	✓	✓			✓	✓
24.	Garety et al (2001)	✓	✓	✓	✓			✓		✓
25.	Freeman et al (2002)	✓	✓	✓	✓		✓	✓		✓
26.	Mathews & Mackintosh (1998)	✓	✓	✓	✓		✓	✓		✓
27.	Wells (1995)	✓	✓	✓	✓		✓			✓
28.	Nightingale (1998)	✓	✓	✓	✓	✓				✓
29.	Raven & Geels (2010)	✓	✓	✓	✓		✓			✓
30.	Heckhausen (1977)	✓	✓	✓	✓			✓	✓	✓

Table2. Patterns of Cognitive-Behavioral Factors in Psychological-Medical Papers

The emergence of the four cognitive-behavioral factors (thoughts, beliefs, and emotions, behaviors) corroborates the findings of Germer (2009; p.93) that individuals are complex "bundles of intense emotion, body sensations, thoughts, beliefs, and behaviors". While these cognitive-behavioral factors are universally identified in the review, there are occasionally some additional behavioral factors considered, and these are represented in the column

annotated "other ". For example, 'perception' is found in Rapee and Heimberg (1997), Suldo et al (2008), and Floyd et al (2005). Additionally, a cognitive-behavioral model (CBM) or a cognitive-model (CM) is presented in each paper. A cognitive model is defined as "a descriptive account or computational representation of human thinking about a given concept, skill, or domain" (Lane, 2012). A cognitive model describes how people's perceptions of, or spontaneous thoughts about, situations influence their emotional and behavioral reactions. A cognitive-behavioral model is defined as one that "recognizes the interdependencies of cognitive, affective, social, developmental, and behavioral factors" (Kendall, 1985).

Since the era of the stoic philosophers, the tradition has been to study the effects of the environment on behavior. Drawing on a citation analysis of the papers returned in step 2 of the literature review, Figure 2 presents a timeline of the exemplar studies. Skinner (1938), Piaget (1951), Beck (1964, 2020), Bandura (1971, 1977, 1986, 2011) and others have primarily focused on the analysis of thoughts, and the interrelationships with beliefs, emotions and behaviors. On the other hand, Dubois (1909), Meichenbaum (1977), Agarwal & Karahanna (2000), Lewis et al (2003) and others have primarily focused on the development of beliefs and the inter-relationships with thoughts, emotions and behaviors. However, Folkman and Lazarus (1982, 1988) developed the concept of all of these factors influencing one another and the individual's coping. This is extended within the IS domain by Beaudry and Pinsonneault (2010). Beck (2011) has suggested these factors are crucial components of cognitive-behavioral therapy (CBT). CBT challenges negative cognitive-behaviors, improving emotional balance, through coping strategies that target solving current problem environments.

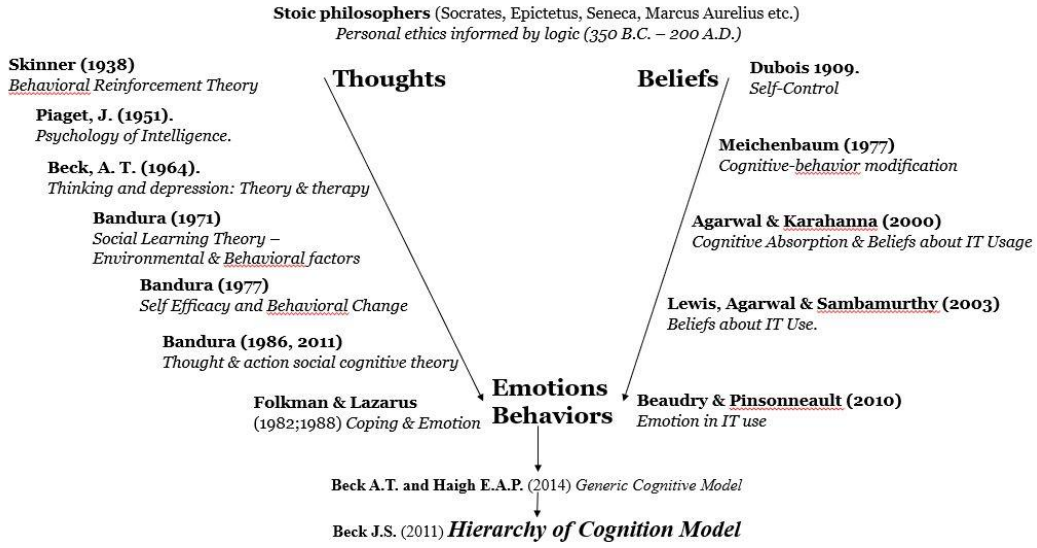


Figure 2. General Timeline and Bloodline of Development of Cognitive Theory

4. Generic Cognitive Model (GCM)

Beck and Haigh (2014) recognise a cognitive model as one which " *describes how people's perceptions of, or spontaneous thoughts about, situations influence their emotional, behavioral (and often physiological) reactions"*. The Generic Cognitive Model (from Beck and Haigh, 2014) corroborates our literature review findings in its inclusion of four elements: *situation, focus, belief* and *behaviors*. This model was updated by the Beck Institute (2020) to now

include *emotional* and *physiological* reactions. However, it is also apparent that the interrelationships and boundaries between the factors of GCM remain ambiguous.

Beck suggests that the 'individual focus' of the individual can vary across the cognitive factors (i.e. each individual has a propensity to lean on some cognitive factor more than the others). In any situation where several individuals initially perceive a DT, each perceives a different cognitive (situation, thoughts, beliefs, emotions, or behavioral response) range. Beck (2011) proposes a cognitive hierarchy that shapes each individual's reaction to change, based on their core beliefs, intermediate beliefs (rules, attitudes and assumptions) of the situation, and consequently their thoughts and reactions (including emotional, behavioral and physiological). This cognitive hierarchy may assist IS researchers to explain the individual's change and decision-making paradigm when facing into a DT. The cognitive hierarchy hypothesizes that an individual's "emotions, behaviors and physiology are influenced by their perception of events" (Beck, 2011, p.30). The situation within itself does not determine how the individual feels, rather it is how they construe each given situation (Beck, 1964).

We adapt Beck's cognitive hierarchy (in Figure 3) to incorporate the factors identified from the Systematic Literature Review (SLR) to demonstrate the role of the four factors at the three stages of changes – pre-change (Stage 1), materializing change (Stage 2), and post change (Stage 3). In essence, the cognitive hierarchy "describes how people's perceptions of, or spontaneous thoughts about, situations influence their emotional, behavioral (and often physiological) reactions" (Beck, 2020) at each of these stages. Each of these stages influences one another. For example, an individual's pre-change reaction (Stage 1) is likely to be influenced by the individual's anticipation of how the change may materialize (Stage 2). An individual's reaction while the change is materializing (Stage 2) may be influenced by the individual's reaction prior the change (Stage 1) and their anticipation of what the change will mean to her (Stage 3).

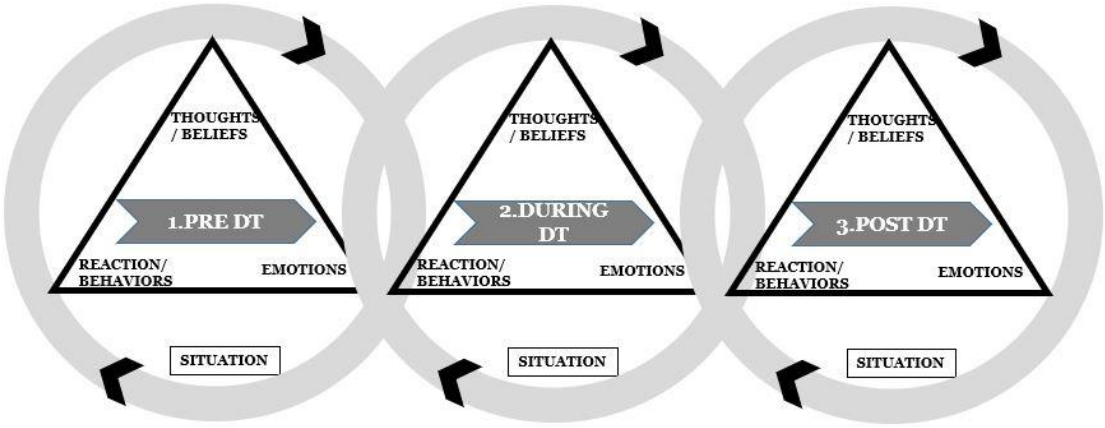


Figure3. Hierarchy of Cognition Model(HCM) – Model of Individual Cognitive Behavior in IS Digital Transformation

5. Concluding Remarks

While cognitive models (CM) exist in several sciences such as psychology and medicine, cognition is sparingly referenced in IS literature. Interestingly, where many cognitive factors (situations, thoughts, beliefs, emotions) exist in IS literature, they mainly exist in isolation (for

example emotion alone), and not combined holistically, as is the case in the other sciences where some form of CM is applied. Further research is now required in the IS community to enhance the cognitive model concept (Beaudry and Pinsonneault, (2010). In order to improve DT success rates, IS researchers could now evaluate the cognitive-behavioral paradigm leading to an evaluated and trusted model. This will enable a prescriptive approach to capturing individual cognitive factors towards a change. We present and advocate the use of cognitive models and present a generic theoretical model, the Hierarchy of Cognition Model (HCM) of individual predispositions for decision support in DT. The strength of the HCM is its framing of an individual's predisposition to DT prior to, during, and post DT. While the HCM model focuses on psychological alignment, or "the emotional attachment of people at all levels. . . to the purpose, mission, and values of the company " (Beer, 2009, p.19). Further IS research is required to validate the HCM.

References

Agarwal, R., and Karahanna, E. (2000). "Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage," MS Quarterly (24:4), December, pp. 665-694.

Ajzen, I.(1980). Understanding attitudes and predicting social behavior. Prentice-Hall

Ajzen, I.(1991). "The theory of planned behavior". *Organizational Behavior and Human Decision Processes*. **50** (2): 179–211.

Alavi, M., & Leidner, D. (2001). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. MIS Quarterly, 25(1), 107-136. doi:10.2307/3250961.

Association for Information Systems (AIS) (2020) *Senior Scholars' Basket of Journals*, Available at: *https://aisnet.org/page/SeniorScholarBasket* (Accessed: 22nd January 2020).

Bandura, A. (1971). Social learning theory. New York: General Learning Press

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change.*Psychological Review, 84*, 191–215.

Bandura, A., (1986) Social foundations of thought and action : a social cognitive theory. Englewood Cliffs, N.J.: Prentice-Hall.

Bandura, A., (2011) 'Social Cognitive Theory', in Lange et al (2011) *Handbook of Theories of Social Psychology: Collection: Vol.1&2*

Beaudry, A., & Pinsonneault, A. (2010). The Other Side of Acceptance: Studying the Direct and Indirect Effects of Emotions on Information Technology Use. *MIS Quarterly, 34*(4), 689-710.

Beck, A. T. (1964). Thinking and depression: Theory and therapy. *Archives of General Psychiatry*, 10, 561– 571.

Beck, A.T., and Haigh, E.A.P. (2014) 'Advances in Cognitive Theory and Therapy: The Generic Cognitive Model', *Annual Review of Clinical Psychology*, 10(1), pp. 1-24.

Beck, A.T. / Beck Institute (2020) *Cognitive Model*, Available at: *https://beckinstitute.org/cognitive-model/* (Accessed: 27th January 2020).

Beck, J. S. (2011). Cognitive behavior therapy: Basics and beyond (2nd ed.). Guilford Press.

Beer, M. (2009) *High commitment high performance: How to build a resilient organization for sustained advantage: Building organizational capability for sustained advantage*, U.S.A.: John Wiley & Sons.

Brereton P., Kitchenham, B.A., Budgen, D., Turner, M., and Khalil, M. (2007) 'Lessons from applying the systematic literature review process within the software engineering domain ', *The Journal of Systems and Software*, (80), pp. 571-583.

Clark, D.M., and Wells, A. (1995) 'A cognitive model of Social Phobia', in Heimberg, R.A. (ed.) Social Phobia: Diagnosis, assessment and treatment . New York: Guilford Press, pp. 69-93.

Daft, R.L., and Wieck, K.E.(1984) Toward a model of organizations as interpreting systems, *Academy of Management Review*, 9(2):284-95.

Davis, R.(2001) 'Cognitive-behavioral model of pathological Internet use', *Computers in Human Behavior*, 17(17), pp.187-195.

Dolan, R.J. (2002) 'Emotion, cognition, and behavior', *Science*, 298(5596), pp. 1191-1194.
Drucker, P. (1992) 'The New Society of Organizations', *Harvard Business Review*, 10(5), pp. 95-104.
Dubois, P., (1909). Self-Control and How to Secure It. New York: Funk and Wagnalls.
Dugas, M.J., Marchand, A., and Ladouceur, R., 2005, 'Further validation of a cognitive-behavioral model of generalized anxiety disorder: diagnostic and symptom specificity', Journal of Anxiety Disorders, 19(3), pp.329-343.
Ehlers, A., and Clark, D.M. (2000), 'A cognitive model of posttraumatic stress disorder', Behaviour Research and Therapy, 38(4), pp.319-345.
Elkins, R.M., McHugh, R.K., Santucci, L.C., and Barlow, D.H.(2011), Improving the Transportability of CBT for Internalizing Disorders in Children. *Clin Child Fam Psychol Rev* 14, pp.161–173.
Floyd, F. J., & Markman, H. J. (1983). Observational biases in spouse observation: Toward a cognitive/behavioral model of marriage. Journal of Consulting and Clinical Psychology, 51(3), 450–457.
Folkman, S., and Lazarus, R.S. (1988) 'Coping as a Mediator of Emotion', *Journal of Personality and Social Psychology* , 54(3), pp. 466-475.
Frost, R.O. and Hartl, T.L., (1996) 'A cognitive-behavioral model of compulsive hoarding', Behaviour Research and Therapy, 34(4), pp.341-350.
Freeman, D., Garety, P.A., Kuipers, E., Fowler, D. and Bebbington, P.E. (2002), A cognitive model of persecutory delusions. British Journal of Clinical Psychology, 41: 331-347.
Garety, P. A., Kuipers, E., Fowler, D., Freeman, D. and Bebbington, P. E. (2001) "A cognitive model of the positive symptoms of psychosis," Psychological Medicine. Cambridge University Press, 31(2), pp. 189–195.
Gefen, D., Karahanna, E., & Straub, D. (2003). Trust and TAM in Online Shopping: An Integrated Model. MIS Quarterly, 27(1), 51-90.
Germer, C. (2009) *The mindful path to self-compassion: Freeing yourself from destructive thoughts and emotions*, U.S.A.: Guildford Press.
Harvey, G., (2002), 'A cognitive model of insomnia', Behaviour Research and Therapy, 40(80), pp.869-893.
Hayes, J., and Allinson, C.W. (1998) 'Cognitive style and the theory and practice of individual and collective learning in organizations ', *Human Relations*, 51(7), pp. 847-871.
Hayes, J. (2010) *The theory and practice of change management*, 3rd edn., USA /UK: Palgrove Macmillan.
Heckhausen, H (1977), 'Achievement motivation and its constructs: A cognitive model', *Motivation and Emotion*, 1, 283–329.
International Data Corporation (IDC) (2020) *IDC FutureScape: Worldwide Digital Transformation 2020 Predictions*, USA: International Data Corporation (IDC).
Kane, K., (2019) The Technology Fallacy - People Are the Real Key to Digital Transformation, *Research-Technology Management*, (62)6, 44-49.
Kendall, P.C. (1985) Toward a cognitive-behavioral model of child psychopathology and a critique of related interventions. Journal of Abnormal Child Psychology 13, 357–372.
Kitchenham, B., (2004). In: Procedures for Undertaking Systematic Reviews. Joint Technical Report, Computer Science Department, Keele University (TR/SE-0401) and National ICT Australia Ltd.
Kluwe, R.H., and Friedrichsen, G. (1985) 'Mechanisms of control and regulation in problem solving', in Kuhl, J., and Beckmann, J. (ed.) *Action control: From cognition to behavior*. U.S.A.: Springer Science and Business Media, pp. Chapter 9 (110), 2010.
Lane H.C. (2012) Cognitive Models of Learning. In: Seel N.M. (eds) Encyclopedia of the Sciences of Learning. Springer, Boston, MA.
Larimer, M.E., and Marlatt, G.A. (2017) 'Relapse prevention: An overview of Marlatt's Cognitive-Behavioral Model', in McCance-Katz, E., and Clark, H.W. (ed.) Psychosocial Treatments. New York, London: Routledge, pp. 1-18.
Lewis, W., Agarwal, R., and Sambamurthy, V. (2003). "Sources of Influence on Beliefs about Information Technology Use: An Empirical Study of Knowledge Workers," MS Quarterly (27:4), pp. 657-678.
Limayem, M., Hirt, S., & Cheung, C. (2007). How Habit Limits the Predictive Power of Intention: The Case of Information Systems Continuance, *MIS Quarterly*, *31*(4), 705-737.

Mahoney, M. J. (1974). Cognition and behavior modification. Ballinger.
Marchand, D.A., Kettinger, W.J. and Rollins, J.D.,(2000). Information Orientation: People, Technology and the Bottom Line. *Sloan Management Review*, 41(4), pp. 69-80.
Mathews, A., Mackintosh, B. A (1998) Cognitive Model of Selective Processing in Anxiety. Cognitive Therapy and Research 22, 539–560.
Mathieson, K. (1991) 'Predicting user intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior', Information Systems Research, 2(3), pp. 173-239.
McKnight, D.H., Choudhury, V., and Kacmar, C. (2002) 'Developing and validating trust measures for e-Commerce: An integrative typology', Information Systems Research, 13(3), pp. 227-359.
Meichenbaum, D. (1977) *Cognitive-behavior modification: An integrative approach* , USA: Springer
Mitchell, N. and Gordon, P. K. (2007) "Attitudes Towards Computerized CBT for Depression Amongst a Student Population," *Behavioural and Cognitive Psychotherapy*. Cambridge University Press, 35(4), pp. 421–430.
Nightingale, P., (1998), 'A cognitive model of innovation', Research Policy, 27(7), pp.689-709.
Niven and Lamorte (2016) *Objectives and Key Results: Driving Focus, Alignment, and Engagement with OKRs*, Wiley Corporate F&A.
Norman, D.A., Ortony, A., and Russell, D.M. (2003) 'Affect and machine design: Lessons for the development of autonomous machines ', *IBM Systems Journal*, 42(1), pp. 38-44.
OECD (2019) *Measuring the Digital Transformation: A roadmap for the future*, Paris: OECD Publishing.
Oliver, R. L. (1980). A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions. Journal of Marketing Research, 17(4), 460–469.
Orlikowski, W.J., and Baroudi, J.J. (1991) 'Studying Information Technology in organizations: Research approaches and assumptions', Information Systems Research, 2(1), pp. 1-84.
Piaget, J. (1951). *Psychology of Intelligence*. London: Routledge and Kegan Paul
Rapee, R.M., and Heimberg, R.G. (1997) 'A Cognitive-Behavioral Model of anxiety in social phobia', Behaviour Research and Therapy , 35(8), pp. 741-756.
Raven, R.P.J.M. , and Geels, F.W., (2010), 'Socio-cognitive evolution in niche development: Comparative analysis of biogas development in Denmark and the Netherlands (1973–2004)', Technovation, 30(2), PP.87-99.
Roberts, N., Galluch, P.S., Dinger, M., and Grover V. (2012) 'Absorptive capacity and Information systems research: Review, synthesis, & directions for future research', *MISQ* , 36(2), pp. 625-648.
Rogers, E. M. (1983). Diffusion of Innovations (3rd ed.), New York: Free Press.
Schein, E.H. (1990) Organisational Culture, American Psychologist, 45(2):109-119.
Skinner, B.F. (1938). *Behavior of Organisms*. New York: Appleton-Century-Crofts
Sharpe, L., (2002) 'A reformulated cognitive–behavioral model of problem gambling: A biopsychosocial perspective', Clinical Psychology Review, 22(1)., pp.1-25.
Suldo, S. M., Shaffer, E. J., & Riley, K. N. (2008). A social-cognitive-behavioral model of academic predictors of adolescents' life satisfaction. School Psychology Quarterly, 23(1), 56–69.
Swieringa, J., and Wierdsma, A. (1992) *Becoming a Learning Organization*, Reading MA: Addison-Wesley.
Turk, D.C., Meichenbaum, D., and Genest., M. (1983) *Pain and behavioral medicine: A Cognitive-Behavioral perspective* , New York and London: Guilford Press.
Venkatesh, V. (2000). Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. Information Systems Research, 11(4), 342-365.
Venkatesh, V., & Morris, M. (2000). Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior. MIS Quarterly, 24(1), 115-139.
Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. MIS Quarterly, 36(1), 157-178.
Wasko, M., & Faraj, S. (2005). Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. MIS Quarterly, 29(1), 35-57.

Webster, J., & Watson, R. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly, 26*(2), Xiii-Xxiii.

Wells, A. (1995) "Meta-Cognition and Worry: A Cognitive Model of Generalized Anxiety Disorder," Behavioural and Cognitive Psychotherapy. Cambridge University Press, 23(3), pp. 301–320.

Westerman, G., Calméjane, C., Bonnet, D., Ferraris, P., and McAfee, A. /MIT Sloan Management /Capgemini Consulting (2011) *Digital Transformation: A roadmap for billion-dollar organizations*, U.S.A.: MIT Center for Digital Business and Capgemini Consulting.

Young, J.E., Klosko, J.S.. and Weishaar, M.E. (2006) *Schema Therapy: A Practitioner's Guide*, U.S.A.: Guildford Press.

Young, K. (2011) "CBT-IA: The First Treatment Model for Internet Addiction" (PDF). Journal of Cognitive Psychotherapy. 25(4): 304-310.