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Possible titles

ICE TEA: interactive content engagement theoretical framework, extrinsic factors and automatic assessment (I.C.E T.E.A)

Abstract

- Providing information is critical

- However…

- This proposal aims

- To do so…

- In phase I

- In phase II

- In phase III

- Results

1. Introduction

    1. Background

Understanding how information is consumed, perceived and used, and why, is a question of fundamental interest to IS researchers and practitioners. In a recent editorial of the DATA BASE, Petter, Carter, Randolph and Lee (2018) express concerns about the lack of clear understanding of the core concept of information is defined as the meaning of data, in Information Systems (IS) research. Specifcally, effectiveness. The challenge becomes how to

This research suggests an innovative framework to conceptually and operationally define, measure and design effective information.

The question is not in IS research. During the last two decades, the use of ICT has increased radically . the growing proliferation, use of information and communications technologies (ICT) profoundly changing all aspects of social organization, including the economy, education, health, warfare, and government... The creation, use and communication of digital information come to play an increasingly important economic, political, and cultural role with the growing reliance on ICT.

ICT have become a crucial medium in the online environment for presenting the information and delivering informational services. Websites become part of strategic organizational tools for generating revenue ranging from the corporate sector, government ministries to municipal, nonprofit organizational, semi-structure company and even in small business. ICT are becoming prominent way for people to consume information (Horrigan, 2017). Foe example, 93% of American adults reported consuming information online, either via a mobile device or a computer (Smith, 2017; Stocking, 2017). 79% of U.S. adults reported ever making an online purchase, spending nearly $350 billion annually (Smith, 2017); 80% of Americans have used at least one online government service (Chan & Pan, 2008; Im, Porumbescu, & Lee, 2013); and 71% of Americans report looking online for health information (Perski, Blandford, West, & Michie, 2017; Rock Health, 2015). 93% of Americans report of consuming information online, either via a mobile device or a computer (Stocking, 2017). 80% of Americans have used at least one online government service

(Im, Porumbescu, & Lee, 2013). 79% of U.S. adults reported ever making an online purchase, spending nearly $350 billion annually

(Smith, 2017) . 71% of Americans report looking online for health information

(Rock Health, 2015).

However, as technology advances, new challenges emerge.

The substantial increase in online information, published by commercial businesses, governments, healthcare organizations, and private citizens, lead to billions of Web pages available (Lucian, 2014). As information becomes increasingly abundant and immediately available, two undesirable phenomanens: **Information pollution** refers to the contamination of information supply with irrelevant, redundant, unsolicited , hampering and low-value information. The spread of information, often useless and undesirable, can have a detrimental effect on human activities. this is called **Information overload** is a term used to describe the difficulty of understanding an issue and effectively making decisions when one has too much information about that issue.

 The flood of information has become a ubiquitous research and business problem, from reading relevant articles or reports to screening e-mails or browsing the Internet (Eppler & Mengis, 2004).

Encounters with massive amounts of potentially relevant information limit cognitive abilities and satisfaction As content has grown increasingly abundant and immediately available, attention becomes the limiting factor in the consumption of information.

. As more web content becomes available user attention stretches even thinner across the online space, making it possible only for a small percentage to receive significant traffic (Arapakis, Cambazoglu, & Lalmas, 2017). From the information that is noticed, less than a third is read by users – On the average Web page, users have time to read at most 28% of the words during an average visit (Nielsen, 2008, 2015). Only a small portion of information receives significant attention, while the remaining majority is barely noticed

(Szabo & Huberman, 2008).

Information overload is associated with a host of undesirable outcomes including diminished productivity, poor decision making, or simply lack of effectiveness, as most information consumed using ICT is quickly forgotten (Ackoff, 1989; Chen et al., 2009; Eppler & Mengis, 2004; Klingberg, 2009).

constructs

Objectives and approach

the paper proposes approaches to mitigate them.

I put forward information delivery and user engagement as important research constructs, and argue for their applicability across contexts.

Drawing upon the knowledge-based view of information, we present a revised model of decision-making based on the interplay between data, information, and knowledge

Identify three information constructs that help define the problem space and identify possible solutions.

They are **information interaction** (the task), information experience and **engagement** (the user) and the **system** (information management and communication).

Information interaction (HII)

Information interaction is specifically the "process that people use in interacting with the content" of a system (Toms, 2002, p. 855).

Data are sensory stimuli that we perceive through our senses. Information is data that has been processed into a form that is meaningful to the recipient (Davis and Olson, 1985). Knowledge is what has understood and evaluated by the knower. Data is the representation of information in a formalized manner, and hence capable of being communicated or manipulated by some process. Information is the meaning that a human assigns to data.   (Holmes, 2001). Data are a representation of facts or ideas The representation of the Digital content, or simply "Content", refers to information stored and accessed via computers. Digital content may take the form of text (such as electronic documents), multimedia files (such as audio or video files), or any other file type that follows a content lifecycle requiring management.

most work until the early mid-1970s was concerned with system use rather than user behaviour or "information behaviour". Since the 1980s there has been a shift towards a "personcentred" approach, rather than a "system-centred" approach .

Second, there need to be a focus on the information itself. Early IS literature points to information, not technology, as the core of the IS discipline (Petter

et al., 2018).

Addressing this call, we acknowledge that while the aspects of information in business operations and decision-making have been studied for decades, there is still a gap in theorizing the concept in the IS literature.

lack of clear understanding of the core concept of in Information Systems (IS) research, IS researchers often overlook the role of information as a component of (Petter et al., 2018). "information effectiveness" refers to a "literal economy of information and the reference disciplines which deals with assessments of performance or valuation of information" (Keen, 1980, p. 12).

Information The meaning that a human assigns to data by means of the known conventions used in their representation. (Zins, 2007)

Data are a representation of facts or ideas in a formalized manner, and hence capable of being communicated or manipulated by some process.

Interaction pertains to the communication between the user and the computer interface (Schneiderman, 1997), where the interface is the medium enabling user experiences. The interface represents the union of information design (i.e., how data is categorized, presented, and made meaningful to the user), interaction design (i.e., how the information tells a story), and sensorial design (i.e., the techniques employed to stimulate and utilize the five senses; Shedroff, 1994). Information interaction is specifically the "process that people use in interacting with the content" of a system (Toms, 2002, p. 855).

The essence of the information phenomenon has been characterized as the occurrence of a communication process that takes place between the sender and the recipient of the message. Thus, the various concepts of information tend to concentrate on the origin and the end point of this communication process (Wersig and Neveling, 1975).

Interaction design focus on interactivity, or behaviour. It connects and transforms data to knowledge by extracting information from data, and exploiting the ability of the human mind to assign meaning to information.

Information engagement (IE)

engagement is an expression of that interactivity.

Information experience (IX) - User engagement is a quality of user experience characterized by the depth of an actor's investment when interacting with a digital system (O'Brien, 2016a). **The international standard on ergonomics of human system interaction, ISO 9241-210,[1] defines user experience as "a person's perceptions and responses that result from the use or anticipated use of a product, system or service".**

Engagement is more than user satisfaction: it is believed that the ability to engage and sustain engagement in digital environments can result in positive outcomes for citizen inquiry and participation, e-health, web search, e-learning, and so on. Yet user engagement (UE) is an abstract construct that manifests differently within different computer-mediated contexts, and this has made it challenging to define, design for, and evaluate.

Quality of UX (usability.gov). **Estimate of The level of involvement end-users have with information interaction.** Focused attention on a particular item of information.

Desired, even essential, experience when consuming online information (Attfield, Kazai, Lalmas, & Piwowarski, 2011, Laurel, 1993)

Engagement is considered a desirable—even essential—human response to computer-mediated activities (Laurel, 2014). Despite the need to engage users and create engaging technologies, there is no agreed upon definition of the construct. .

According to The Advertising Research Foundation (ARF), "The industry is moving toward customer engagement with marketing communications as the 21st century metric of marketing efficiency and effectiveness (Plummer et al., 2006)

2016

Influenced by different variables – system, context, user, design, content (O'Brien, 2011)

In recent years, the term user engagement (UE) has been increasingly used to describe users' interactions with Information and communication technologies (ICT). Given the competition for users' attention and interest, it is agreed that technologies must engage users to be successful.

User engagement is a quality of user experience characterized by the depth of an actor's investment when interacting with a digital system (O'Brien, 2016a). Engagement is more than user satisfaction: it is believed that the ability to engage and sustain engagement in digital environments can result in positive outcomes for citizen inquiry and participation, e-health, web search, e-learning, and so on. Yet user engagement (UE) is an abstract construct that manifests differently within different computer-mediated contexts, and this has made it challenging to define, design for, and evaluate. User experience, a term used to describe **all aspects of a product or service as perceived by users.**

As a whole, research emphasizes user-centred approaches to user engagement, highlighting the individual's cognitive, affective, and behavioural factors of human-computer interactions, and their need for technologies that stimulate each of these components.

In recent years, the term user engagement (UE) has been increasingly used to describe users' interactions with Information and communication technologies (ICT) [@dvir2019]. User engagement. While information interaction focuses on the user experience with content, **engagement is an expression of that interactivity.**

To move the mind of your readers, you'll need their interest and tacit consent.

A quality of user experience characterized by the depth of an actor's investment when interacting with a digital system [@obrien2016]. Engagement is more than user satisfaction: it is believed that the ability to engage and sustain engagement in digital environments can result in positive outcomes for citizen inquiry and participation, e-health, web search, e-learning, and so on. **Yet user engagement (UE) is an abstract construct that manifests differently within different computer-mediated contexts, and this has made it challenging to define, design for, and evaluate.**

UE is a significant factor in system design and adoption, with theoretical and empirical evidence of the positive impact of user engagement in education, government, business and more (Arapakis, Lalmas, Cambazoglu, Marcos, & Jose, 2014; R. Jacques & others, 1995; Oh & Sundar, 2016). It is generally agreed that given the competition for users' attention and interest, technologies must engage users to be successful (H. L. O'Brien, 2016c). Thus, there is a growing need for a deep understanding of the process of **user engagement and the factors that influence it** (Lalmas et al., 2014; H. L. O'Brien, 2016c). **Engaging the user has become a goal – and to some extent, a necessity – in a variety of information-rich contexts (Lalmas et al., 2014). However, current research is unstructured and spread across various disciplines, leading to wide-ranging, and sometimes disparate, perspectives, vocabularies, and measurement methodologies.**

The Merriam-Webster dictionary defines the term *engagement* as a "state of emotional involvement or commitment" and "process of drawing favorable attention and interest" ("Engagement," 2018).

Both as an end-state and a process, engagement has been considered a desirable goal in various contexts, such as government, education, marketing, health and more (Feng & Ots, 2015; Frick, 2010; Lagun & Lalmas, 2016; Lalmas et al., 2014).

For example, in the context of government and public policy, the terms the "civic engagement" or "political engagement" indicate healthy participation in the political process (Abbas, 2010; Chan & Pan, 2008; Dvir, 2017; Grimmelikhuijsen et al., 2013; Gutman, 1982); In education research, "student engagement" describes desired participation in learning experiences (Appleton et al., 2008; Bomia et al., 1997; Cole, 2009; Dvir, 2015; Meece et al., 1988); In business and marketing, "consumer engagement" is used frequently to describe positive consumer relationships with a company or a brand (Batra & Ray, 1986; Brodie et al., 2013; Rowley, 2008; Zheng et al., 2015).

Recently, researchers from diverse fields and with a common interest in technologies began to pay attention to a new type of engagement – that is user engagement (UE). The term is used to describe users' level of involvement and investment in the interaction with Information and communication technologies (ICT) (Attfield et al., 2011; O'Brien & Toms, 2008). It pertains to the quality and depth of the user experience (UX) (O'Brien, 2011; O'Brien & Toms, 2008). It emphasizes the phenomena associated with being captivated by technology and so being motivated to use it (Attfield et al., 2011; O'Brien & Toms, 2008).

Research on UE is thriving, as the term has been increasingly used in professional and academic literature. This reflects the centrality of UE to the formulation of successful interaction with technology.

However, current research is unstructured and spread across various disciplines, leading to wide-ranging, and sometimes disparate, perspectives, vocabularies, and measurement methodologies.

engagement with information at a theoretical and conceptual level is still limited (Boell, 2017). In Petter et al.'s (2018) words, the IS discipline needs to be more "deliberate" about its study of information.

Content

Information delivery - Content strategy (CS) - representation

UI design Content

Digital nudging is the use of user-interface design elements to guide people's behavior in digital choice environments (Weinmann, 2016). Digital choice environments are user interfaces – such as web-based forms and ERP screens – that require people to make judgments or decisions. Humans face choices every day, but **the outcome of any choice is influenced not only by rational deliberations of the available options but also by the design of the choice environment in which information is presented, which can exert a subconscious influence on the outcome. In other words, "what is chosen often depends upon how the choice is presented" (Johnson et al. 2012, p. 488)**

User interface (UI) or user interface engineering is the design of user interfaces for machines and software, such as computers, home appliances, mobile devices, and other electronic devices, with the focus on

Content management (CM) is a set of processes and technologies that supports the collection, managing, and publishing of information in any form or medium.

importance of the sender in the communication processes

include generation and reception of information in such a way that a state of knowledge is transformed.

[@content2019]

"Content" is the representation.

However, the measurement of within-content engagement remains a difficult and unsolved task. **This is because of the lack of standardised, well-validated methods for measuring engagement, especially in an online context.**

How to create engaging interactions with digital content, or interactive

content engagement (ICE)

Part of the efforts have focused on understanding how users interact and engage with web content,

Nim has developed a conceptual model of user engagement with digital content; a methodology for evaluation and creation of engaging content based on reliable and reusable metrics, and an instrument for automatic optimization of given content employing

☐

☐

The challenge becomes how to conceptually and operationally define, measure and design ICE engaging content interactions, as importantly. how to operationally measure and design it.

ICE

The objectives of this research are to define engagement conceptually and operationally in the context of interactive search systems. This research will deconstruct engagement into a set of attributes that can be defined and measured. Specifically, it will confirm which attributes constitute engagement, develop and instrument for assessing engaging interactions, and then evaluate the reliability, validity, and generalizability of the instrument by examining humancomputer interactions with applications such as multimedia webcasts repositories and Web searching.

The purpose of this research is to develop a theoretical framework to root engagement, defining it both conceptually and practically, and to construct a reliable, valid, and generalizable model instrument **that measures engagement outcomes**.

The key research questions are:

Q1. What characterize ICE?

What are the distinct stages in engagement? How can we reliably and validly measure those attributes?

Q2. What content features influence ICE?

Q3. Can ICE be systematically evaluated and developed?

To do so, I propose a three-phase research project:

Phase I — Conceptual definition

Identify the dimensions of ICE by developing and testing a conceptual model of engagement.

I support my thesis through an interdisciplinary literature review, in which I synthesize relevant research streams.

First, I draw on well-established theories relating to **motivational behaviour** (e.g., self-determination theory and uses and gratifications theory), **technology adoption and usage** (e.g., the technology acceptance model and the unified theory of acceptance and use of technology), and the **subjective user experience** (e.g., flow and play theories).

Second, This section investigates domain research and empirical studies that have expanded our understanding of the complexity of user engagement and its role in various contexts: Digital news, e-commerce and marketing, Gaming, Social media, online information search, Digital Health Technologies, Public policy and governance and eLearning.

Third, user interviews

User experience research focuses on understanding user behaviors, needs, and motivations through observation techniques, task analysis, and other feedback methodologies (Kuniavsky, 2003). ADDIN ZOTERO_ITEM CSL_CITATION

{"citationID":"EmHoQin2","properties":{"formattedCitation":"(Zins, 2007)","plainCitation":"(Zins, 2007)","noteIndex":0},"citationItems":[{"id":161,"uris":["http://zotero.org/users/2644296/items/4XGQVNVF"],"uri": ["http://zotero.org/users/2644296/items/4XGQVNVF"],"itemData":{"id":161,"type":"article-journal","title":"Conceptual approaches for defining data, information, and knowledge","container-title":"Journal of the American Society for Information Science and Technology","page":"479-493","volume":"58","issue":"4","source":"CrossRef","URL":"http://doi.wiley.com/10.1002/asi.20508","DOI":"10.1002/asi.20508","ISSN":"15322882, 15322890","note":"00000","language":"en","author":[{"family":"Zins","given":"Chaim"}],"issued":{"date-parts":[["2007",2,15]]},"accessed":{"date-parts": [["2015",12,6]]}}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"}
(Zins, 2007)

The result of these steps is **a conceptual process model of user engagement with digital content.** In particular, the model explicates three steps (discovery, perception, and participation), and identifies a set of attributes of engaging content (i.e., novelty, familiarity, and sentiment polarity).

Phase II — Instrument development

In this phase, I conduct exploratory (qualitative and quantitative) studies to refine the content attributes, operationalize the constructs, and **develop a method for creating engaging content that is precise enough to allow for quantitative evaluation and operational formulation.**

Quantitative predictions are made from a model for word recognition. The model has as its central feature a set of "logogens," devices which accept information relevant to a particular word response irrespective of the source of this information. When more than a threshold amount of information has accumulated in any logogen, that particular response becomes available for responding. The model is tested against data available on (1) the effect of word frequency on recognition, (2) the effect of limiting the number of response alternatives, (3) the interaction of stimulus and context, and (4) the interaction of successive presentations of stimuli. Implications of the underlying model are largely upheld. Other possible models for word recognition are discussed as are the implications of the logogen model for theories of memory. (30 ref.) (PsycINFO Database Record © 2016 APA, all rights reserved)

Based on the method, I develop an instrument for automatic or semi-automatic evaluation, optimization, and creation of engaging content using NLP techniques, such as word frequency, sentiment analysis and lexical substitution.

Phase III — Empirical validation

In this phase (future) I will test the reliability and validity of the instrument and conceptual model, and assess their generalizability to other contexts.

In the doctoral consortium I plan to present the results from a pilot study (n=416) in which the model, methodology and instrument were **employed to formalize evaluation and optimization of engaging content; specifically, titles and abstracts of academic publications.**

Significance

interactive content engagement requires a theoretical framework that takes into account multiple attributes that are likely related to users, systems, and tasks within search contexts. This research will confirm the nature of ICE, how to measure and design it. The **Interactive Content Engagement** Theory will bridge interdisciplinary (e.g. information science, computer science, HCI) approaches

to framing search experiences by demonstrating the complex and dynamic relationships between users' behaviour, affect, and cognition and the computer interfaces they use to accomplish their tasks in various search contexts. By understanding and operationalizing engagement, we can begin to focus efforts on designing search interfaces that engage users with features appropriate to the task and context of their interactions. Thus, the contributions of this work are both theoretical and applied, and will benefit the information science field by enabling researchers and practitioners alike to understand the dynamic relationship between users and computer applications and tasks, and how to assess whether engagement is taking place. Future work will examine how to design interfaces that engage users.

Literature review

significant prior research
no established theoretical frameworks exist for articulating engagement, but several theories may be drawn upon to explore and understand it.

For the synthesis, We followed an approach suggested by Webster and Watson (Webster & Watson, 2002): We first analyzed and compared the various contributions to research and identified similarities and differences among the various perspectives. **We then followed an inductive method of generalization – the formulation of general concepts from specific instances by abstracting common properties.**

The existence of multiple conflicting theories regarding information poses challenges to IS research. A critical mission for IS research is to design IS to improve business operations and decision-making (Arnott & Pervan, 2014; Lederman & Johnston, 2011)

The DeLone and McLean Model of Information Systems Success

The DeLone and McLean Model of Information Systems Success [@delone2003]

The information systems success model (alternatively IS success model or Delone and McLean IS success model) is an information systems (IS) theory which seeks to provide a comprehensive understanding of IS success by identifying, describing, and explaining the relationships among six of the most critical dimensions of success along which information systems are commonly evaluated.

The IS success model identifies and describes the relationships among six critical dimensions of IS success: information quality, system quality, service quality, system use/usage intentions, user satisfaction, and net system benefits.

Information quality - refers to the quality of the information that the system is able to store, deliver, or produce, and is one of the most common dimensions along which information systems are evaluated. Information quality impacts both a user's satisfaction with the system and the user's intentions to use the system, which, in turn, impact the extent to which the system is able to yield benefits for the user and organization.

Information quality was proven to be significant and measured in terms of accuracy, timeliness, completeness, relevance, and consistency" (DeLone & McLean, 2003; William H. DeLone & Ephraim R. McLean, 1992)

The quality of information is positively related to decision quality

> The creation of the D&M IS Success Model was driven by a process

> understanding of IS and their impacts. This process model has just three components: the creation of a system, the use of the system, and the consequences of this system use.

The information systems success model (alternatively *IS success model* or *Delone and McLean IS success model*) is an information systems (IS) theory which seeks to provide a comprehensive understanding of IS success by identifying, describing, and explaining the relationships among six of the most critical dimensions of success along which information systems are commonly evaluated.

- Information use is key factor

- Individual impact was measured in terms decision-making performance, job effectiveness, and quality of work

- *Satisfaction* refers to the extent to which a user is pleased or contented with the information system. the User Information Satisfaction (UIS) instrument [2, 19]" (DeLone and McLean 2003:20)"UIS continues to be the most commonly used and developed **success measure;** but, when used alone, it cannot fully measure IS success." (DeLone and McLean 2003

    1. Wilson's theory of information behaviour

□

Figure . Wilson's Model of Information Behavior ADDIN ZOTERO_ITEM CSL_CITATION

{"citationID":"wXMyNd4j","properties":{"formattedCitation":"(Wilson, 1997)","plainCitation":"(Wilson, 1997)","noteIndex":0},"citationItems":[{"id":1508,"uris":["http://zotero.org/users/2644296/items/ZACW4ZUX"],"uri": ["http://zotero.org/users/2644296/items/ZACW4ZUX"],"itemData":{"id":1508,"type":"article-journal","title":"Information behaviour: An interdisciplinary perspective","container-title":"Information Processing & Management","page":"551-572","volume":"33","issue":"4","source":"CrossRef","abstract":"This paper reports on a recent review of the literature of "information behaviour" as it is studied in a variety of disciplines, other than information science. As a result of the review, areas of research interest to information science are identified and a general model of information behaviour is proposed.","URL":"http://linkinghub.elsevier.com/retrieve/pii/S0306457397000289","DOI":"10.1016/S0306-4573(97)00028-9","ISSN":"03064573","note":"01197","shortTitle":"Information behaviour","language":"en","author": [{"family":"Wilson","given":"T.D."}],"issued":{"date-parts":[["1997",7]]},"accessed":{"date-parts": [["2016",4,12]]}}}],"schema":"https://github.com/citation-style-language/schema/raw/master/csl-citation.json"} (Wilson, 1997) (Wilson, 1996)

the reduction of uncertainty or doubt

Wilson's theory of information behaviour was born out of a need to focus on human use of information, rather than the use of information systems and sources. Wilson proposed that the term **information behavior** refers to **the way people search for and utilize information and** covers all aspects of human information behavior, whether active or passive, in relation to sources and channels of information (T.D. Wilson, 1997, 2000).

Wilson's model of information behaviour include the following sub-processes:

'Activating mechanisms' - Relevant impetus that prompt a decision to seek information

(Wilson, 1996)

Information Seeking behavior is the act of actively seeking information in order to answer a specific query, i.e. **purposive seeking** of information as a consequence of a need to satisfy some goal.

Information Searching behavior is the behavior which stems from the searcher interacting with the system in question.

Information Use pertains to the searcher adopting the knowledge they sought.

maximizing usability and the user experience. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals (user-centered design).

Usefulness is the issue of whether the system can be used to achieve some desired goal. It can again be broken down into the two categories of utility and usability. Utility is the question of whether the functionality of the system in principle can do what is needed, and usability is the question of how well users can use that functionality (Nielsen, 1993).

Wilson's Model is aimed at linking theories to action. However, there have not been many links made between this research and **changes in policy or practice** (Tom D. Wilson, 2010) .

UE theory

Since its early days, HCI research focused almost exclusively on the achievement of behavioural goals. The task became the pivotal point of **user-centred analysis and evaluation techniques** (e.g. usability testing).

-

There have been a few attempts to develop models that depict the UE process, its influences, and its antecedents. Extant UE models focus on engagement as an interaction process and examine relationships amongst variables with the goal of predicting or identifying outcomes of UE (O'Brien, 2016).

(Jacques, 1996; Jacques & others, 1995) proposed that engagement consists of six attributes, each of which operated along a continuum. These components include the degree of attention (divided or focused), motivation to continue the task, perceived control (presence or absence), and needs satisfaction experienced by the user, as well as the user's perception of time ("dragging on" or "flying by") and attitude (negative or positive).

Hart et al. (2012) focus on users' judgement within session. Originating from a series of experimental studies a three-stage process model of user judgement for quality was proposed, encompass the nature of interaction as explored through affect, flow and presence. It focuses on how judgements of quality criteria (e.g. usability, classic and expressive aesthetics) are determined by the intersection of the user goal or task, the domain or application type and product features. According to Hart et al. (2012), the principles of affect (mood and emotion), flow (immersion) and presence (involvement) are known to affect human behavior and judgement, yet how these principles influence user engagement is poorly understood.

O'Brien and Toms (2008) also suggested that UE is not a singular element, but rather a process, as users move in the same trajectory when interacting with ICT. The process model is comprised of four distinct stages: point of engagement, period of sustained engagement, disengagement. Each of these is characterized by a set of attributes.

Figure 3. The Process model of User engagement (O'Brien & Toms, 2008)

./media/image5.png

This conceptual behavioral model views engagement as a process in which computer users initiate and sustain engagement, disengage with the application or task, and potentially re-engage once or several times (O'Brien & Toms, 2008).

The point of engagement occurs when the user decides to invest in the interaction. It is initiated by the aesthetic appeal and novelty of the interface, interest, motivation, or a specific or experiential goal to be achieved through the interaction.

Period of sustained engagement happens when users are able to maintain their attention and interest in the application.

Disengagement occurred when participants made an internal decision to stop the activity, or when factors in the participants' external environment caused

them to cease being engaged.

Re-engagement is returning to an application in future was the result of positive experience with that application.

By segmenting engagement into stages, O'Brien & Toms were able to identify attributes of UE from previous research that seemed most salient for that phase of the interaction and therefore predict and facilitate engagement.

engagement attribute is a characteristic of the user-computer interaction that influences or is a component of the engagement. Engagement attributes are products of users' interactions with the technology, since they depend on what the user finds innately compelling (O'Brien & Toms, 2008).

O'Brien and Toms (2010) developed an attribute-based approach to UE, which can be used as a methodological framework for measurement. They produced and evaluated a multidimensional tool for evaluating engaging outcomes with a technology called the User Engagement Scale (UES). The UES taps into six dimensions of experience: Novelty and aesthetics reflect users' attraction to the media system or interface, focused attention and felt involvement capture cognitive and emotional focus on media content, and the endurability of system use represents evaluations of success and voluntary participation to recommend the website to others.

Figure 4. The User engagement scale (UES) (O'Brien et al., 2018)

./media/image6.png

Recently, the UES was refined to a new short form. Although the original six factors had some explanatory power, a revised model was recently offered, where the items did not change, but how they were grouped based on modified dimensions as subscales were altered. The of the UES are an aesthetic appeal, focused attention, perceived usability, and endurability (O'Brien et al., 2018).

The table below lists the various attributes of the UES and the definitions:

Table 4. Attributes of UES and their definitions

Attributes	Definition
Novelty and Aesthetic Appeal	Users' level of interest and curiosity evoked by the system and its contents. The users' perception of the visual appearance of a computer application interface
Focused Attention	The concentration of mental activity; contains some elements of Flow, specifically focused concentration, absorption, and temporal dissociation
Felt Involvement	Users' feelings of being drawn in, interested, and having fun during the interaction
Perceived Usability	Users' affective (e.g., frustration) and cognitive (e.g., effort) responses to the system
Endurability	Users' overall evaluation of the experience, its perceived success and whether users would recommend the site to others. This factor combines concepts related to users' likelihood to return and evaluation of system success.

The frameworks proposed of the UE Process Model and the UES have been tested for reliability, validity, and generalizability in various domains, mostly leisure (online news, shopping, digital games, social media) (O'Brien, 2011). The studies corroborate the UE process model and the feasibility of a universal measure of UE (O'Brien et al., 2016, 2017, 2018; O'Brien & Cairns, 2016; O'Brien & Toms, 2008, 2010). The studies also demonstrated that engagement is consistent across diverse types of applications in terms of the trajectory followed by users through the process and the attributes present. The UES has been adopted by more than 50 international research teams who have used it to examine UE with educational technologies, search systems, haptic technologies, health and consumer applications, and other media (O'Brien et al., 2018; O'Brien & Cairns, 2016).

THE USER ENGAGEMENT SCALE (UES)

Attribute-based approach for evaluating engaging outcomes with a technology.
Taps into six dimensions of experience:

Novelty & Aesthetic appeal	Focused attention & Felt involvement	Perceived usability	Endurability & Reward
Users' level of interest and curiosity evoked by the system and its contents.			

Novelty and aesthetics reflect users' attraction to the media system or interface, focused attention and felt involvement capture cognitive and emotional focus on media content, and the endurability of system use represents evaluations of success and voluntary participation to recommend the website to others.

The UE process model does not emphasize content; Rather, it focused primarily on the characteristics of the system and how these were perceived and acted upon by users.

O'Brien et al. (2016) suggested that the user engagement framework be broadened to incorporate content

Cumulative prospect theory

Cumulative prospect theory (CPT) is a model for descriptive decisions under risk and uncertainty which was introduced by Amos Tversky and Daniel Kahneman (Tversky & Kahneman, 1992).

The main observation of CPT (and its predecessor Prospect Theory) is that people tend to think of possible outcomes usually relative to a certain reference point (often the status quo) rather than to the final status, a phenomenon which is called **framing effect.**

Prospect theory distinguishes two phases in the choice process: framing and valuation. In the framing phase, the decision maker constructs **a representation** of the acts, contingencies, and outcomes that are relevant to the decision. In the valuation phase, the decision maker assesses the value of each prospect and chooses accordingly.

Cognitive biases - Unconscious, automatic influences on human judgment and decision making that reliably produce reasoning errors.

Heuristics - Simple, efficient rules which people often use to form judgments and make decisions. They are mental shortcuts that usually involve focusing on one aspect of a complex problem and ignoring others.

Although no formal theory of framing is available, we have learned a fair amount about the rules that govern
the representation of acts, outcomes, and contingencies (Tversky & Kahneman, 1992)

1. Thesis / project statement

    1. Unified definition

- Aims to provide a conceptualization that is applicable across a range of situations, Integrates knowledge and methods from different disciplines

- Includes adoption and usage of technology, the feeling when using the technology and the motivation to use it

- As a whole, research emphasizes **user-centred approaches** to user engagement, highlighting the individual's cognitive, affective, and

behavioural factors of human-computer interactions, and their need for technologies that stimulate each of these components.

- UE should be measured using a thoughtful mix of qualitative and quantitative methods, considering the particulars of the use context, and balancing established and emerging subjective and objective metrics (O'Brien, 2018).

    1. Information rerival

The activity of obtaining information system resources relevant to an information need from a collection of information resources.

reasons for requiring information, fulfilment of factual or emotional goals

possibilities of action

reception of information

the **recognition** of

Evaluation

the process of assessing how well a system meets the information needs of its users.

1. Akusion / affect

2. Decision making

R	E	A	D
Retrieval	Evaluation	Acquisition	Decision making
	UES		

H1: Same trajectory

Content

- Disposional and situatiutional

- user's internal state (predispositions, expectations, needs, motivation, mood, etc.)

- Characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and

- the context and task (e.g. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc)

R	E	A	D
Recognizability	Emotion	Accessibility	Distribution (distinctiveness and diffusion)

Recognizability

if you cannot establish common ground with your readers—it is likely they will dismiss your work as untethered to reality or simply find it irrelevant to anything they can relate to or wish to read more about (Davis, 1971).

1. Emotion

2. Accessibility

3. Distribution

must negotiate the trade-off between novelty (distinctiveness) and recognizability (diffusion). The greater the novelty, the less anchored it may be to the current literatureand themore challenging it may be for your readers to understand and accept. In contrast, a more incremental complication may strike your readers as trite and mundane.

Modification

- Lexical substitution is the task of identifying a substitute for a word in the context of a clause (using semantic analysis, natural language processing and a rule-based approach)

- automatic substitution (synanoms) to improve user engagement with academic content.

- Sentimental analysis

- Frequency

  - ▫

Research plan

developing or refining theory

Project I: User research

*R.E.A.D: A conceptual framework for **defining interactive content engagement** *

1. Objectives

2. Method

- a comprehensive literature review of the various dimensions of user engagement.

- **User and task analysis –** a form of field research, it's the analysis of the potential users of the system by studying how they perform the tasks that the design must support, and conducting interviews to elucidate their goals.[3] Typical questions involve:

- What would the user want the system to do?

- How would the system fit in with the user's normal workflow or daily activities?

- critical interpretive synthesis

  1. Potential outcomes

  2. Project II: Content analysis

- C.H.E.R: Content Heuristics Evaluation and Refinement

  1. Objectives

  2. Method

  Web scraping, data extraction and automation.

Potential outcomes

Project III: Web experiments

- D.I.M.A: Digital Information Modification and Assessment

    1. Objectives

    2. Method

    3. Potential outcomes

Conclusion

User engagement requires a theoretical framework that takes into account multiple attributes that are likely related to users, systems, and tasks within search contexts. This research will confirm the nature of engagement and measuring engagement with search interfaces. The Conceptual Model of User Engagement will bridge interdisciplinary (e.g. information science, computer science, HCI) approaches to framing search experiences by demonstrating the complex and dynamic relationships between users' behaviour, affect, and cognition and the computer interfaces they use to accomplish their tasks in various search contexts. By understanding and operationalizing engagement, we can begin to focus efforts on designing search interfaces that engage users with features appropriate to the task and context of their interactions. Thus, the contributions of this work are both theoretical and applied, and will benefit the information science field by enabling researchers and practitioners alike to understand the dynamic relationship between users and computer applications and tasks, and how to assess whether engagement is taking place. Future work will examine how to design interfaces that engage users.

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1. Appendix I: Glossary

   1. Definitions

information behavior

The way people search for and utilize information

Information overload

is a term used to describe the difficulty of understanding an issue and effectively making decisions when one has too much information about that issue.

Information pollution

the contamination of information supply with irrelevant, redundant, unsolicited , hampering and low-value information. The spread of useless and undesirable information can have a detrimental effect on human activities.

User experience (UX)

momentary, primarily evaluative feeling (good-bad) while interacting with a product or service

Dispositional attribution

The assumption that a person's behavior reflects his internal dispositions like his personality, beliefs, attitude etc.

Situational attribution

The assumption that a person's behavior is influenced by an external influence from the environment.

Dispositional attribution

~ The assumption that a person's behavior reflects his internal dispositions

like his personality, beliefs, attitude etc.

Content management (CM)

A set of processes and technologies that supports the collection, managing, and publishing of information in any form or medium.

Digital content (or simply "Content")

to information stored and accessed via computers. Digital content may take the form of text (such as electronic documents), multimedia files (such as audio or video files), or any other file type that follows a content lifecycle requiring management.

Interaction *[UE]: User Engagement* [UX]: User Experience *[IM]: Information Management* [IS]: Information Systems

Interaction *[UE]: User Engagement* [UX]: User Experience *[IM]: Information Management* [IS]: Information Systems

Cognitive biases

User experience (UX)

momentary, primarily evaluative feeling (good-bad) while interacting with a product or service

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The assumption that a person's behavior reflects his internal dispositions like his personality, beliefs, attitude etc.

Situational attribution

The assumption that a person's behavior is influenced by an external influence from the environment.

Cognitive biases

Unconscious, automatic influences on human judgment and decision making that reliably produce reasoning errors.

Information management (IM)

concerns a cycle of organizational activity: the acquisition of information from one or more sources, the custodianship and the distribution of that information to those who need it, and its ultimate disposition through archiving or deletion.

Abbreviations

ICT

Information and Communication Technologies

IM

Information Management

IS

Information Systems

HCI

Human-Computer Interaction

UE

User Engagement

UX

Apendix II: Proposed dissertation chapters

1. Introduction

2. Literture review

   1. I draw on well-established theories relating to **motivational behavior** (e.g., self-determination theory and uses and gratifications theory), **technology adoption and usage** (e.g., the technology acceptance model and the unified theory of acceptance and use of technology), and the **subjective user experience** (e.g., flow and play theories).

3. READ

4. CHER

5. DIMA

6. Discussion

7. Conclusion