

# Theory-Based Affordances of Utilitarian, Hedonic and Dual-Purposed Technologies: A Literature Review

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**Abstract.** The key to an information system's (IS) success is its value experienced by the user. A promising approach to enhance user value is to design for the users' experiential desires. For example, fulfilled experiential desires enhance the users' satisfaction and loyalty. Despite these benefits, few design principles exist for developing IS according to the users' experiential desires. Therefore, the aim of this literature review is to aggregate the current state of knowledge concerning the different theoretical perspectives on utilitarian, hedonic and dual-purposed IS. We build a framework that illustrates the relationship between different theoretical perspectives on IS affordances (i.e., motivational, cognitive, affective, and social) and different technology types (i.e., utilitarian, hedonic, dual-purposed). The presented framework offers a starting point for the development of theory-based design principles for experiential affordances of IS. We conclude with a summary of opportunities for future research to extend our knowledge of experientially fulfilling IS.

**Keywords:** Motivational affordances, dual-purposed systems, hedonic systems, utilitarian systems.

## 1 Introduction

The key to an information system's success is its value experienced by the user [1]. Current research mainly distinguishes instrumental and experiential values [2]. Instrumental values contain pragmatic or utilitarian product qualities and are linked to instrumental outcomes such as enhanced productivity or reduced expenditures. Experiential values contain hedonic product qualities and are linked to experiential outcomes such as meaningfulness, engagement, positive emotions or perceived enjoyment [2]. According to their main value and outcome, different technologies can be classified as three different technology types, namely (1) predominantly utilitarian, (2) predominantly hedonic and (3) hybrid or dual-purposed [3]. Utilitarian technologies are mainly used at the workplace or in productivity-oriented contexts of use and provide instrumental value. In contrast, predominantly hedonic technologies are mainly used during leisure time or at home and provide fun and entertainment [4, 5]. Dual-purpose

technologies are, however, a hybrid of utilitarian and hedonic technologies [3]. A prominent example of dual-purpose systems are social networking systems which are commonly used for either leisure or work purposes (e.g., Xing).

Since the last decade, especially hedonic and dual-purposed technologies represent an emerging type of IS. Thereby, experiential outcomes are receiving growing attention in research and practice [2, 6]. For example, gamified design elements are used as means of providing experiential value and are already integrated in many products such as internet portals and cars. Here, drivers are for example motivated to improve their fuel economic driving by gamified elements [7, 8]. The interest in the experiential perspective on technology use results from its promising benefits such as enhancing important facets of technology acceptance like for example the users' satisfaction [9], word-of-mouth [10] and behavioral intention [11]. Additionally, experiential values enhance instrumental outcomes such as perceived ease of use which will in turn again enhance outcomes of technology acceptance [9]. Moreover, experiential values enable behavioral change such as reduced energy consumption [12].

In contrast to the expected growth of experiential value [e.g., 6], attempts to design for experiential outcomes fail quite often [e.g., 13]. A prominent example from the organizational context are public leaderboards [14]. For example, managers at Disneyland tried to motivate their employees with public leaderboards of the most efficient employees. Instead of being motivated and experiencing a gamified competition, the employees mostly felt very uncomfortable with this idea of gamification. Moreover, market analysts discussed gamification trends and strategies and concluded that "80% of current gamified applications will fail to meet business objectives primarily due to poor design" [15]. Furthermore, the MISQ recently published a call for research that stated that "few research and design guidelines exist regarding gamified information systems" and called "to investigate the design and use of gamified information systems from a variety of disciplinary perspectives and theories, including behavioral economics, psychology, social psychology, information systems" [2]. Therefore, we argue that the high failure rate of attempts to design for experiential outcomes is due to the problem that few design principles exist for developing IS according to the users' experiential desires. According to [2], we define design principles as high-level design rules and formulas that should be derived from grounded theory and can support product developers through the whole development process. For example, a design principle in the field of gamification might suggest that gamified IS should include different badges depending on the different user styles and stages. For the creation, application, and evaluation of theory-based design principles that can speak directly to the users' motivation, cognition, affect and social behavior, it is necessary to use suitable theoretical foundations. Therefore, we need to analyze basic research, theories and models from a variety of disciplines like information systems (IS), behavioral economics, human-computer interaction and psychology that can be used to derive experiential affordances. Therefore, the aim of this review is to aggregate the current state of knowledge concerning the different theoretical perspectives on utilitarian, hedonic and dual-purposed IS. We build a framework that illustrates the relationship between different theoretical perspectives on IS affordances (i.e., motivational, cognitive, affective, and social) and technology types (i.e., utilitarian,

hedonic, dual-purposed). The presented framework offers a starting point for the development of theory-based design principles for experiential affordances of IS.

Our review is structured as follows: first, we describe the design of our literature review. This includes the selection of appropriate databases, journals and conference proceedings and the coding of the identified relevant papers according to their main theoretical perspective. Second we provide an overview of each theoretical perspective based on our presented concept matrix. Third, we summarize knowledge gaps and opportunities for future research. Finally, our review ends with a conclusion on theoretical and practical implications.

## **2 Design of the Literature Review**

The aim of this paper is to understand and aggregate the current state of knowledge concerning the different theoretical perspectives on utilitarian, hedonic and dual-purposed IS. Thereby, we build a framework that illustrates the relationship between different theoretical perspectives on IS affordances (e.g., motivational theory perspective) and different technology types (i.e., utilitarian, hedonic, dual-purposed). Therefore, we conducted a systematic literature review based on the guidelines of Webster and Watson [16]. We combine research from a variety of disciplines including IS, behavioral economics, human-computer interaction and psychology. An overview of the scope of our review, our search terms and the considered databases can be found in Table 1. In order to decide which papers were relevant for our review, we focused on the following two inclusion criteria: (1) we only included papers that focus on interactive technology because we are interested in designing for outcomes that users derive from the direct interaction with technologies; (2) we only included papers that concentrate on voluntary use of technology because we are interested in the consumer context and not the enterprise software context. Hence, we excluded papers that focused on the organizational context or non-voluntary use of IS in the educational context. In order to identify all relevant papers, we screened the title, abstract and if necessary the whole paper. Finally, including the results of our forward and backward search, 42 papers remained as relevant hits in our review.

Based on Webster and Watson [16] we created a concept matrix to structure our findings. Since our review is meant to provide an overview about the existing theoretical perspectives on utilitarian, hedonic and dual-purposed IS, we structured the relevant papers according to the considered type of technology, namely (1) utilitarian, (2) hedonic, and (3) dual-purposed. Moreover, we tried to find a structure to group different theories into one concept matrix. By filling out our concept matrix, we iteratively refined our columns and finally focused on four main branches of theories, namely (1) motivational, (2) cognitive, (3) affective, and (4) social theoretical perspectives. Motivational theories in the context of technology use [e.g., 17] mainly focus on the interplay of product characteristics and different kinds of human motivations (e.g., intrinsic vs. extrinsic motivation). Cognitive theories mainly focus on the cognitive processing of product characteristics, decision-making processes and product choice scenarios [e.g., 9, 18]. The core element of affective theories is the role of human emotions in the perception, use and evaluation of technologies [e.g., 19].

Finally, social theories mainly concentrate on the influence of social interaction and response patterns on technology use [e.g., 20].

**Table 1.** Systematic Literature Search Process

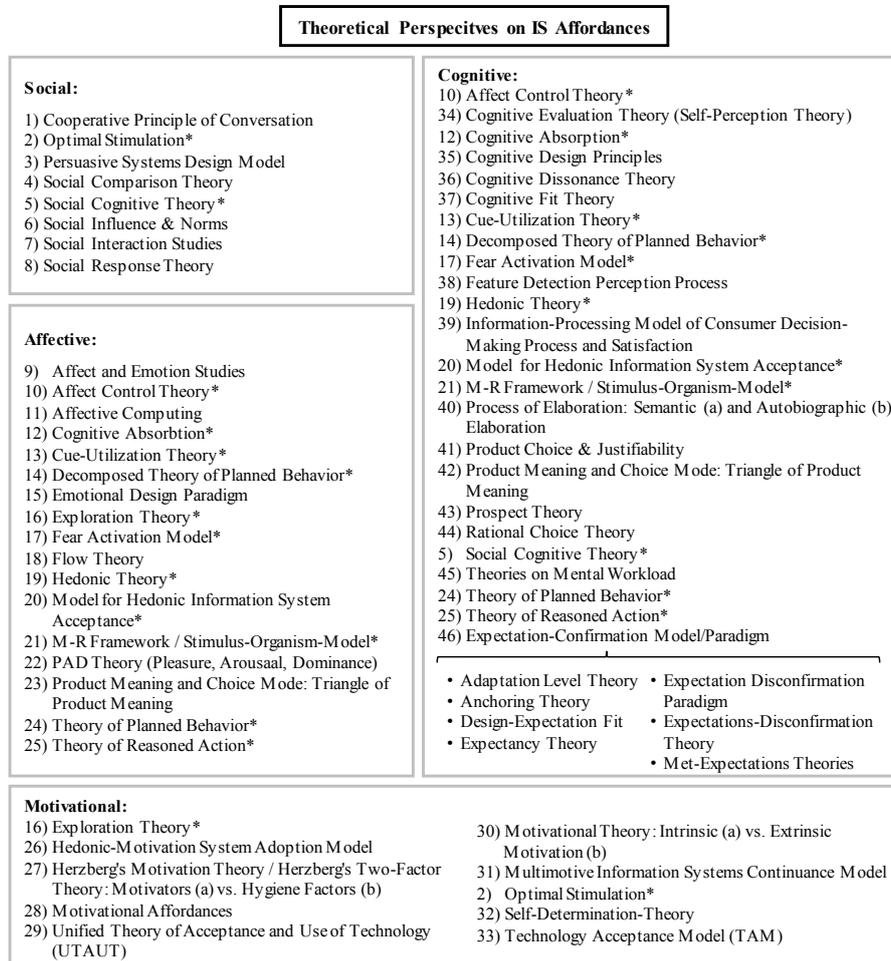
<i>Database</i>	<i>Search Term</i>	<i>Search Fields</i>	<i>Hits</i>	<i>Relevant</i>
ScienceDirect	("hedonic" OR		145	18
EbscoHost	"experiential" OR	Title,	576	7
ICIS	"enjoyment") AND	Abstract and	23	4
ECIS	("pragmatic" OR	Keywords	9	1
	"utilitarian" OR			
	"instrumental")			
			Sum	30
		Forward Backward Search		12
			Total	42

### 3 Findings

Table 2 illustrates a selection of our concept matrix. In total, 42 papers were clustered according to their main theoretical perspective (i.e., motivational, cognitive, affective, social) and the considered technology type (i.e., utilitarian, hedonic, dual-purposed). Figure 1 illustrates all theories we identified as theoretical basis in the studies that were part of our systematic literature review. In the following paragraphs, we provide an overview of the motivational, cognitive, affective, and social perspective on IS affordances and refer to a selection of the theories listed in Figure 1.

**Table 2.** Selection of Concept Matrix (Mot. = Motivational, Cog. = Cognitive, Aff. = Affective, Soc. = Social, Util. = Utilitarian, Hed. = Hedonic, D-P = Dual-purposed)

<i>Source</i>	<i>Theory</i>				<i>Technology Type</i>		
	<i>Mot.</i>	<i>Cog.</i>	<i>Aff.</i>	<i>Soc.</i>	<i>Util.</i>	<i>Hed.</i>	<i>D-P</i>
[22]					x		
[24]					x		
[27]	x		x	x		x	
[28]		x					x
[29]	x		x		x	x	x
[30]	x				x	x	
[31]		x	x		x	x	
[32]					x	x	
[36]	x	x			x		
[37]						x	
[...]							
<b>Total</b>	<b>20</b>	<b>21</b>	<b>11</b>	<b>7</b>	<b>21</b>	<b>26</b>	<b>23</b>



**Figure 1.** Theory Mind Map (\* = theories that were grouped into more than one category)

### 3.1 Motivational Perspective on IS Affordances

In total, we found 20 papers that focused on a motivational perspective on IS affordances. Motivational affordances are defined as the “properties that afford user motivation” [38: p. 274] and are seen as a “key requirement for behavior change” [38: p. 271]. Here, especially Herzberg’s [39] Motivator-Hygiene-Theory and Deci’s [40] distinction between the two fundamental types of intrinsic and extrinsic motivations are frequently mentioned and applied. While motivators are seen as IS characteristics that provide satisfaction if fulfilled, hygiene factors only cause dissatisfaction if not fulfilled. In the context of intrinsic and extrinsic motivation, user acceptance is seen as either driven by benefits derived from an engaging interaction with the system per se (i.e., intrinsic) or by expected benefits of external rewards (i.e., extrinsic).

Two newer developments within the group of motivational theories are for example the Hedonic-Motivation System Adoption Model (HMSAM) [34] and the Multimotive Information Systems Continuance Model (MISC) [35]. Both models are originally based on the distinction of intrinsic and extrinsic motivators [40]. The HMSAM is meant to improve the understanding of the adoption of hedonic-motivation systems and therefore integrates flow-based cognitive absorption as a mediator of perceived ease of use and behavioral intention. The MISC focuses on the users' expectations and disconfirmations as antecedent of behavioral intention.

Two very concrete examples of applying the motivational perspective are presented by Resatsch [41] and Füller [42]. For example, Resatsch [41] focused on motivating applications in the field of ubiquitous computing in the office, retail and ticketing context and formulated and evaluated design guidelines for NFC-based ubiquitous computing applications. Füller [42] concentrated on designing IT-based customer integration methods and created a framework for positive customer integration experience based on the Motivator-Hygiene-Theory [39].

The motivational perspectives also contain cognitive, social and affective components as for example intrinsic motivators are often conceptualized as emotions like fun, enjoyment, playfulness, pleasure, arousal or dominance [5]. Moreover, motivational needs are often conceptualized as psychological (i.e., autonomy, competence, and relatedness) or social needs (i.e., achievement, affiliation and intimacy, and leadership and followership) [38]. Therefore, the perspectives presented in the following sections are closely related to the paramount motivational perspective.

### **3.2 Cognitive Perspective on IS Affordances**

Most of the identified studies referred to a cognitive or a combined cognitive and affective perspective on IS affordances. Within this category, the Theory of Reasoned Action [43] and the Theory of Planned Behavior [44] are the basis of several models of IS affordances [e.g., 21, 23]. Here, the affective and behavioral reactions towards an IS are seen as the result of cognitive processes including attitudes, subjective norms and perceived behavioral control. Cognitive processes can for example include the semantic and autobiographic elaboration of characteristics and features of IS [19]. The cognitive processing of IS characteristics is especially important for the final product evaluation and choice as well as the justifiability of product choices. For example, recent studies have shown that the processing of pragmatic and hedonic product characteristics results in a cognitive bias. Although users appreciate hedonic product characteristics in terms of positive experiential outcomes, these characteristics are not valued in choice situations because pragmatic choices are easier to justify than hedonic choices [18]. This bias of justifiability is closely related to the construct of cognitive dissonance. For example, cognitive dissonance arises when the context of use rewards external instrumental outcomes, whereas the actual use is motivated intrinsically or results in experiential outcomes [21]. A cognitive strategy to reduce cognitive dissonance is to overlook the pleasurable outcomes and attribute instrumental outcomes to the IS usage. This rational process can be described with the following cognition: "I am voluntarily spending a lot of time on this and enjoying it, therefore, it must be useful." [21: p. 676].

In general, the cognitive basis of IS affordances highlights that detecting and using IS features creates mental workload. For example, mental workload is created by the comparison of actual IS characteristics with the users' expectations and mental anchors for these characteristics (i.e., Design-Expectation Fit, Anchoring Theory, Expectation-Confirmation Model) [e.g., 35]. Also closely connected to mental workload is the construct of cognitive absorption. Cognitive absorption characterizes a state of total attention, in which lots of cognitive resources are allocated to using a specific IS [e.g., 21]. For example, Lowry et al. [34] integrated the single second-order constructs of the first-order construct cognitive absorption, namely control, curiosity, heightened enjoyment, immersion and temporal dissociation as intrinsic motivators into their HMSAM. This integration helped to further enhance the predictive validity and conceptual understanding of intrinsically motivated IS use.

### **3.3 Affective Perspective on IS Affordances**

In total eleven papers focused on an affective perspective on IS affordances. Affective theories are receiving greater attention since recent studies on IS adoption have shown that emotions are a considerable result of a users' interaction with IS [e.g., 5, 25]. One example of affective reactions to IS usage is provided by Codish and Ravid [25]. The authors implemented cognitive and gamified design principles in the educational context and demonstrated the effect of playfulness as a positive affective response to IS usage.

Another example is provided by Wang and Scheepers [5] in the Model for Hedonic Information System (HIS) Acceptance. Here, the authors identified three overlapping conceptual identities of users of hedonic IS. These identities are described as the computer user, the hedonic consumer and the player. The computer user is associated with the technology acceptance model [45] and the hedonic consumer is associated with the Hedonic Theory [46] from consumer behavior research. The player role is associated with two affective theories, namely the Pleasure-Arousal-Dominance (PAD) Theory [47] and Flow Theory [48]. The PAD Theory is also known as the Three-Factor-Theory of Emotion and states that affective reactions can be described by three main emotions, namely pleasure, arousal and dominance. The Flow Theory describes flow as a state of intense pleasure and involvement in a certain action. Similar to cognitive absorption, flow is associated with attention focus, perceived control, curiosity, and intrinsic interest. Based on their results, the authors even argue that the intrinsic motivators "emotional responses, imaginal responses, and flow experience are three main predictors of HIS acceptance" [5: p. 255].

### **3.4 Social Perspective on IS Affordances**

Only seven of our identified papers considered a social perspective on IS affordances. Social affordances of IS mainly rely on three assumptions, namely (1) that users can personally relate to IS, (2) that users tend to interact with IS in a similar manner as in human-to-human relationships, and (3) that IS can also include the user in collective

actions. Here, the IS can serve as a mediator between different users or the system and the user can even work together on a particular task [see 38].

Two examples of applying social affordances to IS are provided by Gnewuch et al. [20] and Oinas-Kukkonen [49]. For example, Oinas-Kukkonen [49] highlighted the importance of considering socio-psychological design principles. In the context of behavioral change support systems, the authors suggested that peoples' behavior can be influenced by persuasive IS through integrated social influence (i.e., social comparison, normative influence, and social learning). Here, for example, health and healthy lifestyles are promising fields of application of behavioral change support systems. The second example was provided by Gnewuch et al. [20] and concentrated on conversational agents for customer service. In this study, the authors turned the cooperative principle of conversation and the central assumptions of the social response theory into design principles.

### **3.5 Framework of Theories and IS Use Contexts**

Figure 2 aggregates the findings described above into one framework that structures the selection of theories according to the IS use context (i.e., utilitarian, dual-purposed, and hedonic). The IS use context can be seen as a continuum that ranges from utilitarian IS to hedonic IS with dual-purposed use a hybrid of these two poles [3]. As explained above, the affordances of utilitarian IS mainly rely on the use of extrinsic motivators and hygiene factors. These factors are for example covered by classical technology acceptance models like the Technology Acceptance Model (i.e., TAM [45]) and the Unified Theory of Acceptance and Use of Technology (i.e., UTAUT [50]) [4]. In the context of hedonic IS, however, these models are no longer sufficient because these models lack the detailed integration of intrinsic motivators and predictors related to experiential and hedonic outcomes. A recent analysis [51] of the applications and extensions of UTAUT has shown that among the many extensions of UTAUT, only two extensions focused on hedonic performance expectancy [52] or hedonic motivation [53]. However, even these UTAUT extensions only regard hedonic components as side effects and do not set the focus on hedonic components [54]. This is why newer models that focus on triggering the user's intrinsic motivation like for example the Hedonic-Motivation System Adoption Model (HMSAM) [34] have to be taken into account in this context. The affordances of dual-purposed systems rely on a combination of the theoretical basis of utilitarian and hedonic IS. For example, the Multimotive Information Systems Continuance Model (MISC) [35] is based on the distinction and combination of intrinsic and extrinsic motivators [40].

## **4 Discussion, Future Research and Conclusion**

This literature review contributes to the understanding of the affordances of utilitarian, hedonic, and dual-purposed IS by providing an overview of theoretical perspectives that can be used for the creation, application, and evaluation of theory-based design principles. Our review highlights that a variety of scientific disciplines including IS,

		Theoretical Perspective			
		Motivational	Social	Cognitive	Affective
Technology Type	Utilitarian	27b, 29, 30b, 33	3	13, 14, 17, 24, 25, 35, 37, 38, 40a, 43, 44, 45	13, 14, 17, 24, 25
	Dual-Purposed	2, 16, 27, 28, 30, 31, 32	1, 2, 3, 4, 5, 6, 7, 8	5, 10, 12, 13, 14, 17, 21, 24, 25, 34, 35, 36, 37, 38, 39, 40b, 41, 42, 43, 44, 45, 46	9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 25
	Hedonic	2, 16, 26, 27a, 28, 30a	1, 2, 4, 8	12, 17, 19, 20, 21, 35, 36, 38, 39, 41, 42, 45, 46	9, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23

**Figure 2.** Detailed Framework: Classification of theoretical basis according to the context of IS use (\*/# = theories that were grouped into more than one theoretical perspective/more than one technology type; numbers refer to the numbers given to the theories in Figure 1)

behavioral economics, human-computer interaction and psychology contain basic research, theories and models that can be used to derive IS affordances. Our findings show that previous research on IS affordances can be grouped according to the four main theoretical perspectives: (1) motivational, (2) cognitive, (3) affective, and (4) social. Among these perspectives, motivational affordances can be seen as higher order affordances that can be translated into IS characteristics and features through cognitive, social and affective affordances. For example, intrinsic motivators are often conceptualized as emotions like fun, enjoyment, playfulness, pleasure, arousal or dominance [5] and motivational needs are often conceptualized as psychological (i.e., autonomy, competence, and relatedness) or social needs (i.e., achievement, affiliation and intimacy, and leadership and followership) [38]. However, the development and application of these theories in the context of IS design reveal some shortcomings which should be addressed in future research (see Figure 3). Our analysis illustrates that we need to learn more about the correct application and modification of existing theories from IS, behavioral economics, human-computer interaction and psychology in the context of motivational, cognitive, affective, and social affordances of future IS. The artefact of this literature review provides a basis to use existing interdisciplinary theories and models systematically to create, apply, and evaluate IS affordances and their impact on users. Before inventing new grounded theory for the affordances of utilitarian, hedonic, and dual-purposed technologies, we need to reinvent existing theories, i.e., extending them among motivational and hedonic components.

The first research gap is that motivational affordances are simply underutilized [38, 57]. Except of some positive examples mentioned above [e.g., 41, 42], there is still a

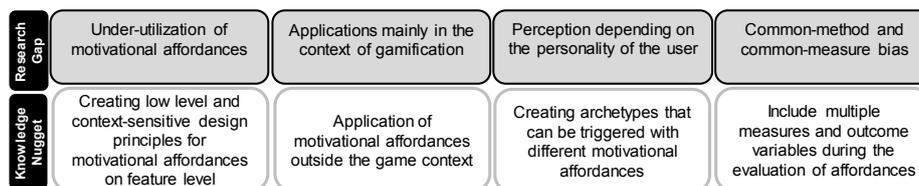
need for more applications and evaluations of motivational affordances. Precisely, “it would be useful as a next research step to prototype and isolate design features that are intended to fit certain task motivations and expectations” [35: p. 539] and thereby isolate single effects and deepen our understanding of the effects of applied motivational affordances. Here, it would be interesting to compare the effects and predictive power of certain extrinsic and intrinsic motivators in distinct usage contexts (i.e., utilitarian vs. hedonic vs. dual-purposed). Furthermore, if applied, most design principles for motivational affordances are very high level, not context-sensitive and not on feature level [e.g., 57]. User experience is, however, very sensitive to the context in which a technology is used [58–60]. Therefore, there is a need for more context-specific evaluation of lower level applications of design principles of motivational affordances.

The second recommendation for future research considers the context of applying and evaluating motivational affordances. Existing applications and evaluations of design principles of motivational affordances can mainly be found in the context of gamification or gamified systems [e.g., 5, 33, 38]. There is, however, a need to study the application of motivational affordances in the context of less hedonic dual-purposed user assistance systems. Dual-purposed user assistance systems are mainly used voluntarily and during leisure time. Their purpose is, however, not only to enhance the users’ enjoyment but also enhance their individual instrumental outcomes. Here, it would be interesting to compare the effects of certain motivational affordances in form of intrinsic motivators in this two usage contexts, namely (1) motivational affordances in gaming and gamified systems and (2) motivational affordances in non-gamified systems or rather less hedonic dual-purposed systems. This research agenda would also contribute to the present debate about the effect of gamification in non-gaming applications [61]. For example, in the context of cognitive and behavioral decision theories, it would be interesting, to investigate how the presentation of information (i.e., designed according to motivational affordances vs. purely pragmatic design) influence cognitive processes like decision-making or elaboration.

The third issue this review has identified, concerns the methods used and outcome variables measured to evaluate implementations of motivational affordances. For example, Wu and Lu [3] found that the relevance of different intrinsic and extrinsic motivators varied depending on the considered dependent variable in the research model. Consequently, future studies should always consider multiple outcome variables and pay attention to the possible differences in terms of predictive validity of the considered antecedents. Besides integrating multiple outcome variables, there is a need to combine multiple measures in order to prevent common-method bias [62]. Nearly all identified studies used self-report measures. Focusing on explicit measures exclusively might, however, result in an incomplete picture of the outcomes of motivational affordances. Therefore, implicit or rather unconscious antecedents should be studied. Here, integrating neurophysiological measures (e.g., electroencephalography) is a promising research field [26].

Finally, the fourth research gap concerns the personality of the user. Recent research has demonstrated that applied motivational affordances are perceived differently depending on the personality traits of the user [33, 38]. Different types of users prefer

to use different motivating IS. Hence, “[a]pplications designed to accommodate multiple experience tracks for different personality traits could contribute to the sustained use of the application and enable users to better meet their personal goals” [33: p. 82]. A recent example of considering personality in the acceptance of dual-purposed IS was presented by Oettl, Berger, Böhm, Wiesche and Kremer [63]. The authors classified six archetypes of users of enterprise social networks based on the two dimensions individual openness and perceived task-fit. In the context of motivational affordances in the consumer context, we need similar archetypes based on a combination of personality and motivational affordances.



**Figure 3.** Summary of Identified Research Gaps and Potential Knowledge Nuggets

In sum, although motivational affordances should be a key requirement for IS, many ISs are not based on grounded theories and empirical insights on human motivation, cognition, affective reactions, and social interactions. Our review highlights that there is no need to invent new grounded theory on IS affordances. Instead, we need to rethink existing theories. Therefore, future research should apply and modify the identified theories and models from IS, behavioral economics, human-computer interaction and psychology in order to derive theory-based affordances for IS design. Since past research has mainly focused on the gaming context and gamified elements are more and more used in non-gaming applications, our research agenda focuses on motivational affordances in the context of non-gamified and dual-purposed systems. Here, low level and context-sensitive design principles for motivational affordances on feature level are needed. This is especially important for dual-purposed IS which should combine intrinsic and extrinsic motivators. For the evaluation of these design principles it is important to include multiple measures and outcome variables in order to avoid common-method bias and biases related to a specific outcome variable. Moreover, the interplay of personality traits and motivational affordances should be further studied in order to create archetypes that can be triggered with different motivational affordances. In sum, “taking into account a user’s motivational needs is one of the most crucial (but often neglected) design aspects for IS” [38: p. 271].

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