Gamification as a Way of Facilitating Emotions During Information-Seeking Behaviour: A Systematic Review of Previous Research

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Abstract. Games and game elements have been studied and applied in various domains to encourage sustainable behaviours, often without a clear understanding of how they achieve these effects. One unconventional domain is the management of emotions during information seeking. This paper presents a review of current research literature covering gamification and game elements beyond entertainment and outlines their theoretical practicalities. A total of 40 records from different perspectives were reviewed studying the effects or user perceptions of gamification within motivation, emotions and information-seeking. The results reported in the reviewed records indicate that applying gamification is a promising approach for managing emotions in the information-seeking research process. However, the study identified shortcomings, thematic gaps, and the direction of future research which is discussed in this paper.

Keywords: Gamification · Games with a purpose · Emotions · Information-seeking · Systematic review

1 Introduction

Substantial advances have been made in research on emotions and the affective, not only in disciplines in which that interest might be expected (such as psychology, medicine or neurology) but, more generally, in the realm of the humanities and social sciences [1]. There is an increasing interest in both academia and relevant industries in how motivational technologies, i.e., gamification, serious games, and persuasive technology, can affect human behaviour in various domains, such as information systems, or education, and learning behaviours [2].

One of the reasons for this is the rise of the affective dimension in social life, where relevant transformations in the expression of effect are made in the private and public arenas (i.e., the growth of the vibrant culture in the realms of education, the proliferation of self-narratives and the changes in information seeking practices). In this regard, some of the most fruitful theoretical approaches are developed from psychology (particularly social psychology) and the 'sociology of emotions' [3]. Therefore, various theoretical

frameworks on emotions are conceptualised and explained both from neurobiological and sociocultural standpoints [4]. Moreover, emotions are not merely a subject matter of research but rather the perspective for a new epistemological turn [5]. Conversely, the complex reality of this facet of human nature makes it an interdisciplinary study object, albeit one about which there is still no comprehensive vision, capable of bringing together and integrating all these different disciplines.

The present study sets out to address this by providing a thorough description, via a literature review, how the digital realm is an emotional space, and how the various types of game elements and its gamefulness are activated for expressing emotion. The review focuses on gamification and gamification technologies in the domain of emotion and use of information seeking and retrieval systems to synthesise the literature. Historically, the body of literature has been somewhat fragmented into areas such as motivational technologies [2] that primarily include gamification ([3, 7, 8]), and serious games [9] and persuasive technology [10] that engage individuals with activities that are commonly considered mundane, such as using the internet for buying products. Gamification refers to transforming systems, services, products, organisational structures or practically any activity to afford similar experiences as games do use game design [8].

Serious games commonly represent full games designed for purposes other than pure entertainment [7]. On the other hand, persuasion technology did not emerge from game research and commonly refers to adding a type of design onto an existing practice. A second area or body of literature relates to the study and tools which focus on emotion regulations and expression in various scenarios [6]. The use of technologies can be intricately tied to affective processes, both with emotions altering technology use patterns and technology use changing one's emotional state. A specific context, feelings during information seeking has shown this behaviour to be influenced by emotions and different persuading factors [11, 12].

The third area is the specific application of motivational technologies using gamification to activate emotion within a particular domain of information seeking and retrieval technologies. As a result of this fragmentation, whilst successful applications of motivational technology have been developed, previous research lacks systematic investigations of the mechanisms of gamification [13], and in this review, we aim to address this in synthesising the literature on gamification, and on emotion and its influence in motivation, and specifically in the domain of information-seeking behaviour.

Therefore, the present study can be conceptualised as a comprehensive description of how the digital realm is an emotional space and how gamification mechanisms are activated for facilitating emotion. By focusing on the specific context of information-seeking behaviour, and the influence of emotion, the thematic review of previous research aims to identify information-seeking behaviour as a prominent context for further gamification research.

2   Materials and Methods

To compile a comprehensive scientifically sound literature review about theoretical fundamentals of using games and game elements in emotions and information-seeking, a systematic literature search was conducted on and through available and the most

relevant online databases, specifically Scopus, ScienceDirect, IEEE and Springer. The search was conducted from January-July 2020 over records' titles, abstracts and key-words to include only records whose focus was "emotions and information-seeking using gamification". The search terms used are depicted in Table 1 (2010–2020 records).

Table 1. Search terms employed in the keyword search

Focus Area	Search Term(s)
Gamification	"gamifi*" OR "gamify"
	"gamification"
Games with a purpose	"games" AND "purpose"
Serious Games	"serious" AND "games"
	"serious" AND "gaming"
Emotions	"emotions" AND "emoti*"
	"emotions" AND "games"
Information-seeking	"information-seeking" OR "information-behaviour"
	"information-seeking" AND "gamification"

Types of records included in the search were conference papers, articles and book chapters. A total of 504 records were obtained with the user search query. After the search, the titles and abstracts were examined. Fourteen records were excluded for not being available in English. A total of 205 records were identified as not related to gamification, serious games, or persuasive technology, thus excluding further analysis. Of the remaining records, 259 are excluded as they are not focused on emotions or information seeking, or not based on empirical studies. Sixty records were not fully accessible even through inter-library loan. After screening the titles and abstracts, a total of 35 emotion and search behaviour related records were included in the review. Two additional records were identified using a forward search and three using backward search. Thus, a total of 40 records are included in Fig. 1.
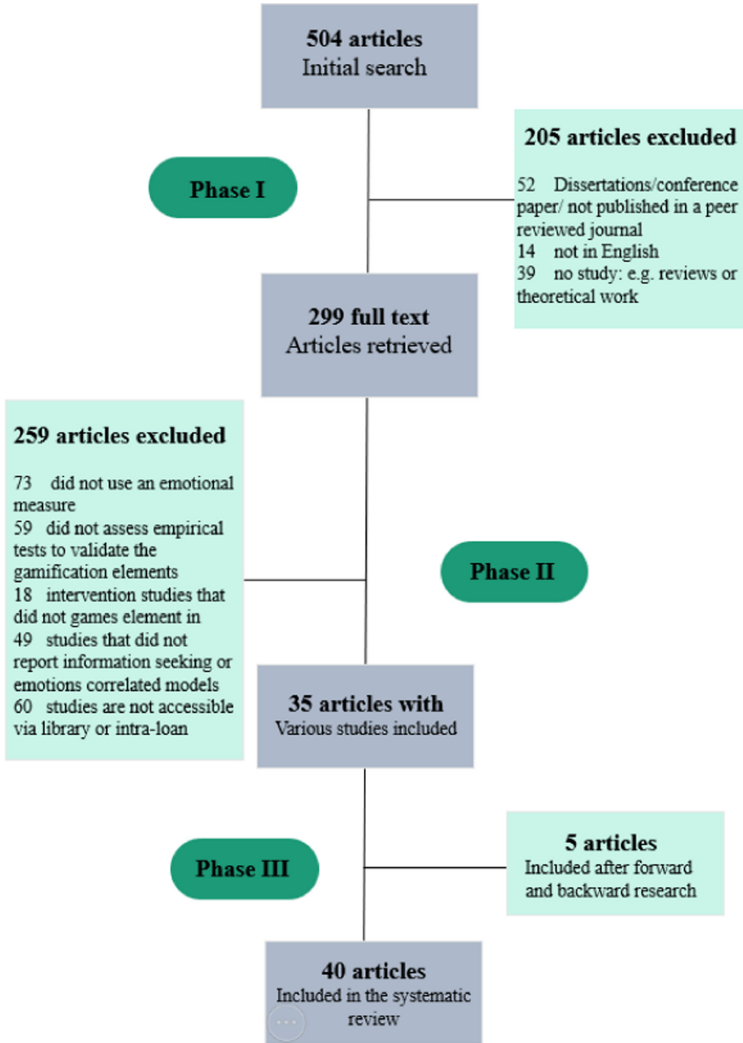
504 articles
Initial search

205 articles excluded

52   Dissertations/conference paper/ not published in a peer reviewed journal
14   not in English
39   no study: e.g. reviews or theoretical work

Phase I

299 full text
Articles retrieved

259 articles excluded

73   did not use an emotional measure
59   did not assess empirical tests to validate the gamification elements
18   intervention studies that did not games element in
49   studies that did not report information seeking or emotions correlated models
60   studies are not accessible via library or intra-loan

Phase II

35 articles with
Various studies included

Phase III

5 articles
Included after forward and backward research

40 articles
Included in the systematic review

Fig. 1. Procedure and results of the literature search

In reviewing the study employs the review format suggested by Fettke [14]. This categorisation can clarify the characteristics of a review study and is based on several literature recommendations [14]. According to this framework, this study presents a review in natural language that focuses on theory, takes a neutral perspective and aims to highlight central aspects of the literature selected for review. This framework is based.

on characteristics of Type, Application, Perspective, Aim, Structure, Literature, Target Audience and Future Research (Table 2).

Table 2. Characterisation of this review based on Fettke [14]

Characteristics	Classification				
Type	Natural Language				
	Mathematical-Statistical				
Application	Research Result	Theory	Experience	Research Method	
Perspective	Neutral				
	Positioned				
Aim	Not Mentioned	Mentioned	Integration	Central Aspects	Criticism
Structure	Chronologically				
	Methodologically				
	Thematically				
Literature	Not Explained	Explained	Keyworks	Representative	Selective	Exhaustive
Target Audience	Common Public				
	Practitioners				
	Researchers in General				
	Specialized Researchers				
Future Research	Mentioned	Not Mentioned			

3 General Description of the Reviewed Research

Although the differentiation between different types of gamification definitions and game elements can be ambiguous, all the records were considered according to whether the technology described in them matched the definitions of the topic gamification, as outlined in the introduction section. Drawing on the terms and labels used by the authors of each manuscript, this process was conducted to ensure that all the papers included were about gamification. It resulted in two additional sub-labels 'serious games' and 'games with a purpose' where this differentiation was needed. Papers that used similar terms to 'serious games' such as 'simulation games', or 'learning games' were categorised as serious games in this study.

Furthermore, gamified simulators, learning platforms and training applications for librarians in information seeking were classified as 'games with purpose'. They focused

on providing games, explicitly using empirical data, on completing a task for learning. Of the 40 records included in this review, 32 focused on gamification, six on serious games, and two related 'games with purpose' technology.

Moreover, all 40 records were analysed according to the different search concepts of motivation, emotion, and information seeking. This identified four labels which could differentiate the papers by their focus area (Fig. 2).
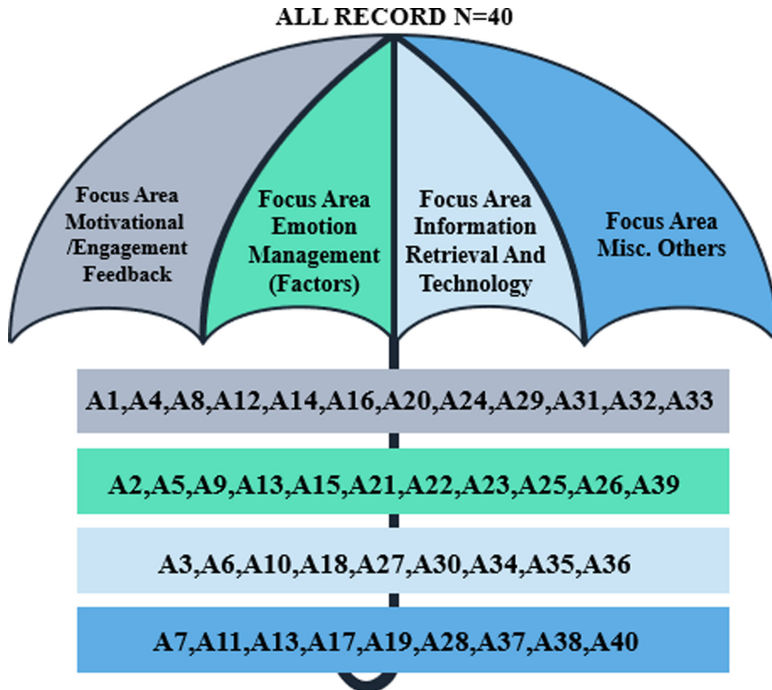

ALL RECORD N=40

Focus Area Motivational /Engagement Feedback

Focus Area Emotion Management (Factors)

Focus Area Information Retrieval And Technology

Focus Area Misc. Others

A1,A4,A8,A12,A14,A16,A20,A24,A29,A31,A32,A33

A2,A5,A9,A13,A15,A21,A22,A23,A25,A26,A39

A3,A6,A10,A18,A27,A30,A34,A35,A36

A7,A11,A13,A17,A19,A28,A37,A38,A40

Fig. 2. Contexts of the records

These broad areas identified as a) *Motivational/Engagement Feedback.* Which draw on the notion that emotions triggered in this feedback influence behaviour such as technology use patterns; b) *Emotion Management.* Papers focus on emotional responses and state through using technologies and managing responses people have, e.g. customers behaviour or library researchers and c) Information Retrieval & Technology (specifically in eLearning) papers focus on the specific context of information seeking and in which emotions influence and alter technology use patterns. Alternatively, these papers focus on the technology used to conduct information seeking and retrieval tasks that can change one's emotional state. *d) Misc. Others,* which includes all related papers which are advanced research on gamification and its use in different contexts.

3.1 Gamification Affordances and Outcomes in Reviewed Studies

The four broad focus themes emerged while examining the papers, namely *Motivational/Engagement Feedback, Emotion Management, Information Retrieval & Technology and Misc. Others.* Papers in each focus theme were further explored to identify subcategories relating to the most applied affordances. For example, gamification affordances could include, visual demonstration in-game behaviour consequences, textual feedback, praise or rebuke by in-game characters, forms of ambient audio or optical input and motivational reports. This study of affordances further helped distinguish the research in the main areas of Motivation/Engagement and Emotion Management and Information Retrieval & Technology. The next section details each of the four themes and its subcategories and to emphasise the distinctions made.

A) Motivational/Engagement Feedback. The 11 reviewed papers reported the motivational affordances as forms of motivation and engagement are shown in Table 3. The most applied affordances in most of the studies are forms of *motivation and game engagement*. In paper A4, A8, A16 for *positive intrinsic motivation.*, various motivators techniques are identified such as visual demonstration of in-game behaviour consequences, textual feedback, praise or rebuke by in-game characters, forms of ambient audio or visual motivators.

One paper (A12) applied explicit *performance feedback.* In the form of performance reports. Study A12 and A20 explains *progress visualisation* and reward system. **Simultaneously,** in A31, A32 *technology challenges* and **in A33** *social collaboration* are also identified as gamification affordances and positive outcomes related to motivation and gamification in the domain of information search behaviour.

Table 3. Motivational outcomes

Motivational /Engagement Outcome	Records	Frequency
Motivation & Engagement	A1,A4,A8,A12,A14,A16,A20,A24,A29,A31,A32,A33	12
Intrinsic Motivation	A4,A8,A16	3
Performance Feedback	A12	1
Progress Visualization	A12,A20	2
Technology Challenges	A31,A32	2
Social Networking, Social Collaboration	A33	1

B) Emotion Management. Emotion management in this study refers to regulating emotion in the gamification context where the rule is the effort individuals submit to amplify, maintain, or decrease emotion aspects. It requires a conscious effort to change the emotions following the rules to express emotions specific to the gamification. Eleven of the papers were grouped as focusing on emotion management and were further grouped by one or more emotional outcomes studied (Table 4).

Outcomes related to effects of *behaviour agreement, emotional engagement and perceived enjoyment* of the player (individual user) are the most studied similar context during the emotional engagement. Seven of the records reported (A2, A5, A15, A22, A23, A26, A39) that a gamified system was key in its user's positive attitude, which resulted in effective learning outcome. Six records reported that gamification brings emotional connectivity and engagement when applied to different scenarios, e.g. customer empathy, employee productivity with positive system assignation.

Table 4. Emotional outcome

Emotional Outcome	Records	Frequency
Behaviour Agreement, Attitude	A2,A5,A15,A22,A23,A26, A39	7
Emotional Engagement	A9,A13,A22,A23,A24,A26	6
Enjoyment, Fun, Entertainment, Flow	A2,A5,A15,A39	4
Self-Efficiency	A25,A26	2
Fatigue, Boredom, Arousal	A5	1
User Experience, Ease of use	A2	1
Perceived Vulnerability	A23	1
Perceived Challenge and Gameplay Difficulty	A22	1
Perceived Positivity	A2	1

Four records in A2, A5, A15, and A39 inform that when individuals are pleased with the activities or feel positive emotions while doing gamified tasks, they tend to do a better job. It reflects upon their behaviours (fun, entertainment). In A2, A22, A23 the resulting outcomes are related to user experience, perceived positivity, challenge and vulnerability and occur due to individuals' interaction with their gamified environment. Specifically, this feedback relates to whether their expectations have been met or not. Records A25, A26 specifically identified a positive outcome of users' feeling of self-efficacy, whereas A5 focused on Fatigue or Boredom's negative outcome.

The theme of emotion management relates to individuals' learning as influenced by their emotional states and those game elements make people feel more ownership and purpose when engaging with tasks. The literature reviewed considers gamification's effectiveness as positively impacting the emotions of a 'player'.

C) Information Retrieval & Technology. The third emerging theme while synthesising the literature was *Information retrieval & technology*. In the reviewed manuscripts, Table 5, specified that gamifying Information Retrieval in A3, A10, A18, A27, A35 highlighted gamification phenomenon during system research and human computation games. Outcomes related to e-learning, in A6, A30 & A34 indicated that a gamification is a powerful tool in raising engagement in information system research, e.g. in collaborated systems research, and a bookmarking system. The paper A3 and A36 concluded that gamification elements created a competitive environment and positively influenced the e-learning participation of individuals. Lastly, articles A10 and A18 studied the potential for computation games and gamification in making search tasks fun and that a competitive environment had a positive influence on an online web search.

Table 5. Information retrieval & technology outcome

Information Retrieval & Technology Outcome	Records	Frequency
Information Retrieval	A3,A10,A18,A27,A35	5
Information System Research	A6,A30,A34	3
E-learning	A3,A36	2
Search Tasks	A10,A18	2

D) Misc. Others. The related topics and affordances related to gamification and its ongoing advance research have also been reviewed. The reported manuscripts identified

perspectives on the importance of gameful designs and serious games for water sustainability, service marketing, gamification in learning and education. Nine of the records included in systematic review came under this category, as shown in Fig. 2.

4   Discussion and Concluding Remarks

Most of the reviewed studies focusing on the effect and activation of emotion during information seeking approached gamification, by designing with game elements, to enhance serious single-player gaming. The literature grouping of *Emotion Management, Motivational Feedback and Information Retrieval and Technology, identified* gamification affordances. These describe the fragmentation of the literature on gamification identified in the introduction. On the one hand, we see the gamification studies with a core focus of emotions associated with outcomes such as enjoyment and their management in motivational technology/gamification. These studies appear to relate to the deployment of gamification to help complete otherwise mundane or unrewarding tasks. On the other hand, the studies focusing on motivational outcomes, such as feedback on progress or praise which activate emotion associated with influencing and motivating. The papers on information seeking and retrieval and gamification identified how game elements could enhance the search task involved and the emotions experienced and activated by the user(player).

The following key points are identified from this analysis of each of the themes:

- Emotion-based studies focus on how gamification could activate many emotional responses, such as player/user engagement, fun, self-efficiency, perceived challenges and behaviour agreement.
- Motivational studies recognise that by gamifying a task, the flow of emotion activation could be identified. It enhances intrinsic motivation, progress visualisation, motivational feedback and social collaborations.
- Information Seeking/Retrieval studies on gamification branded the affective states of user/player and associated the emotions of task search e.g. in A10 the Library-Tree searching game explained how gameful elements trigger users' intrinsic motivation to increase their interaction with the system. This helps identify the affective states of searching according to [11] such as uncertainty, optimism, confusion/frustration/doubt, clarity, sense of direction/confidence and satisfaction or a sense of disappointment.
- Further analysis of the inter-related gamification fields helps to acknowledge the gamification mechanism, e.g. reward that leads to various enhancement to system and process. The conceptual basis of gamification is exploring new phenomena such as multilevel achievements agreement, virtual reality, and customer enhancements.

In conclusion, research on emotions and motivation in information-seeking tasks provides a bridge for gamification. The affective state in information-seeking tasks is understood to influence technology use and can be activated by gamification outcomes by using gamified technology. All the records that studied gamification in the 'field' were

related to the task emotions and information search behaviour. The results implicate that most of the current body of research focuses on emotion frameworks.

Moreover, gamification in information retrieval is mostly aimed at enhancing motivation and individual level (gamifying). The literature reviewed themes and outcome to serve as a foundation for future studies by opening up several research possibilities. This is achieved by identifying several research gaps that need further investigation of the research community. Furthermore, in-depth literary analysis of the exposed under-researched aspects of gamification in the unconventional study of emotions and information-seeking behaviour promises essential insights.

5   Limitations

In this study, the research reviewed various aspects of gamification in the context of emotion and information-seeking behaviour. In the literature search, the critical terms derived from gamification, games with a purpose, serious games, emotions and information seeking are used. Thus, records that have not used the previous terms to describe their research focus were not included even if they studied gamification. Moreover, as the research focused on just emotions-related search terms, records that did not use these terms to describe their focus were not reviewed. The literature search is limited to related databases and although it indexes most relevant databases, using only these databases might have resulted in missing out some relevant records. Moreover, the study analysed the applied affordances based on the descriptions of applied gamification technologies reported by each manuscript's authors. However, it is possible that some of the implemented affordances remained unreported and therefore, not included in this manuscript.

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