# Establishing a theoretical background for a museum-centric entertainment system

**Antonio Origlia**
Dept. of Information
Engineering - University of
Padua
antonio.origlia@dei.unipd.it

**Dario Di Mauro**
Dept. of Electrical
Engineering and Information
Technology - University of
Naples "Federico II"
dario.dimauro@unina.it

**Maria Laura Chiacchio**
URBAN/ECO Research
Center - University of Naples
"Federico II"
marialaurachiacchio@gmail.com

**Francesco Cutugno**
Dept. of Electrical
Engineering and Information
Technology - University of
Naples "Federico II"
cutugno@unina.it

## ABSTRACT
The use of gaming to provide additional value to cultural experiences, like museums visits, is not novel. The increased possibilities to access the game market opened by online platforms make the communicative and emotional characteristics of digital games an opportunity for promotion. In this paper, we discuss the theoretical foundations of an approach aimed at producing digital games meant to be part of a continuing emotional experience. We draw from psychological and museological research to motivate our view on the relationships between game designers and museum experts. By concentrating on archaeological and art museums, we advocate for the need of a methodological approach to the design of games for museums aimed at promoting the value of cultural experience as it is, thus countering the plethora of technological instalments that often risk averting the attention from the collection.

## Author Keywords
Digital games; cultural heritage; game design

## INTRODUCTION
Interactive technology is generally considered to be a powerful *cultural amplifier* [5] but, while it is indeed a powerful support for learning, motivating people to access cultural contents requires a higher attracting power than the novelty offered by innovative technology alone. While being underestimated in the past, the use of games for cultural transfer has received an increasing amount of interest in recent times. Playing has an intrinsic, biological value and an important role in activating neural structures [20] that interact with brain areas typically associated with emotions, like the amygdala, whose role has been studied relatively to the emergence of fear [12]. This is of interest for our work as the positive effect emotions have on strengthening memories is established [15]. From a psychological point of view, intrinsic and extrinsic motivations together with Self-Determination Theory are a common choice for frameworks designed to support *gamification*, as reported in [26].

Gamified museum visits and serious games have been investigated in the past to support learning tasks. Playful games, designed only to amuse, cannot be used for learning but they do have the potential to be powerful means of promotion, as they can help creating positive attitudes towards museum contents. Such games are of interest for museums as storytelling has an important communicative function in cultural heritage [9]. The concept of *museum* includes too many different kinds of places ranging from art museums to zoos [4]. It is, therefore, necessary to establish the boundaries in which we are going to move. The domain of interest, for our work, is constrained to archaeological and art museums because this specific kind of institution is particularly challenging for interface design as special respect is due to the collections. Summarising, our theoretical framework aims at highlighting the key points through which the value of digital games can be exploited to create interest around archaeological and art museums. By using game elements and narrative design to connect all the phases of cultural heritage experience, we describe systems composed by heterogeneous interfaces that lead users from engaging in playful activities to accessing deeper contents. The ultimate goal of the proposed approach is to provide designers with the methodological knowledge needed for the creation of gaming experiences in this field. The main goal should be to increase the perception people have of museums as places capable of satisfying personal interests and worth investing free time. We design this approach on the basis of previous results coming from psychological, museological and game design research.

## A MUSEUM-CENTRIC ENTERTAINMENT SYSTEM

Given the strong research trend towards gamification and serious games, attempts to introduce gaming mechanics to support cultural heritage have been focusing on learning. Visits to museums, however, are primarily motivated by personal interests and are the result of a choice concerning a very delicate matter for people: how to spend free time. The main difference in accessing cultural heritage sites as part of a learning program or during a Sunday morning trip lies on the approach people adopt towards it. In the first case, motivation is extrinsic and pain-avoiding strategies, like gamification and serious games, may apply. In the second case, however, people adopt a pleasure-seeking approach to select an activity among a set of available ones. In the case of due tasks it is possible to assume that people will be on-site to start the design process. In the opposite case, failure to show that visits to cultural heritage sites possess endogenous value means people will not even reach them. One of the main roles of a human museum educator is to recreate the context around artefacts through storytelling, as stories have the power to reinstate the context lost by atomisation while creating meaning, relevance and empathy [6]. The idea of putting stories before collections for museums has been explored in [1]. While appreciation was shown towards the proposed narrative context, it was reported that people showed resistance towards accessing deeper contents. One of the proposed interpretations was that users perceived the proposals of accessing deepening material as *cognitive kickouts* and rather chose not abandon the story. From this reported experience, we conclude that it is critical, for a successful presentation of art and archaeological museums as activities possessing endogenous value, to avoid making them compete for the visitors' attention. Our approach to the use of digital games in the considered case, therefore, advocates for their use only when off-site. In our view, the digital game should create the conditions for other approaches designed to deliver information to be spontaneously accessed by users. Starting from the framework of cultural heritage experience presented in [11], considering the three steps of *Planning*, *Visit* and *Summary*, we prepend a *Motivation* phase that can be supported by technology through the use of playful games. The integration among different technologies supporting the various phases of cultural heritage experience gives rise to a coherent system where museum visits are part of the experience. Aiming at motivating spontaneous exposition to cultural contents through the use of entertainment, we will refer to this framework as the Museum-centric Entertainment System (MES). We define it as *a set of interactive technologies combined into a transmedia storytelling system to increase the perceived value of art and archaeological museums*. As, reported by [4] for some categories of museum visitors, the role of curiosity in motivating a museum visit is fundamental. Interestingly, psychological literature confirms that a number of behaviours shown by curious people are of interest for cultural heritage. When curious, people ask questions [19], manipulate interesting objects [21], read deeply [25], persist on challenging tasks [23], examine interesting images [28].

The relationship between surprise and curiosity is very strong and, according to [13], curiosity reflects the desire to close inherently unpleasant information gaps. This desire, however, depends on the perceived likelihood that the gap will be closed by accessing information [14]. Moreover, it has also been suggested that "[...] the amount of pre-existing knowledge in a particular domain may impact on the perceived likelihood of closure" [16, p. 57]. This implies that curiosity may arise not only by increasing the amount of information delivered, but also by reducing the *perceived* size of the domain. Museums can be intimidating for the general public as information gaps may be perceived as less likely to be closed because of topics wideness. If a narrative is designed to leave small information gaps, however, the interest domain will be constrained to the story itself, which is more manageable and therefore likely to stimulate curiosity. In the framework of MES, information gaps in game stories should be placed as part of the background and left to be filled after the story has been told, in order to motivate access to the other modules. Examples of how to accomplish this are recurring jokes, historical events in the background, casual conversations among non-playing characters and external causes of narrative twists. It is important to note that curiosity towards a topic is not the same as knowledge: while the two indeed correlate, curiosity has a higher value for people who go visit museums [3]. Museums represent, to visitors, only a step in a lifelong learning process that involves voluntary exposure to contents belonging to the area of interest. It gains value because of the pleasure it provides in giving information that is perceived as *interesting*. Games share with museum visits the same motivation people have to interact with them: for some kind of personal reason, they are both perceived as possessing *endogenous value*, which is not quantifiable in material gain but only in the satisfaction coming from fruitfully investing free-time in them. A finished and successful gaming experience gains credibility that can be spent in proposing experiences that provide insight and different views on the topics depicted by the game. Proposing these experience extensions beyond the boundaries of the game is a nowadays common strategy used by game producers to capitalise on merchandising. Through this same strategy, deep contents may be provided with the additional value endowed by narratives while avoiding cognitive kick-outs. Contents used to create background to an entertaining narrative may later come to the front and be more easily contextualised when encountered on-site. In MES, the difficult task of on-site content delivery can be efficiently supported through the use of *echoes*: multimedia references to the gaming experience that are designed to reduce the time needed for museum educators to reconstruct context around the objects of interest. *Echoes* are strictly linked to the emotional memories created during the gaming experience and are designed to let context be easily evoked, rather than created, during the visit. This particular point differentiates the use of games we propose from *persuasive games*, which are a subset of serious games and have the primary goal of changing or reinforcing specific attitudes [18]. As for other serious games, in persuasive games the underlying message is always contained in the game itself. Digital games, in MES, do not have a persuasive intent if taken independently: it is
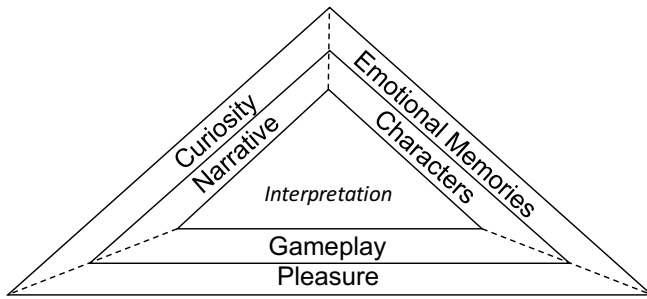
**Figure 1. Game design elements, designed on the basis of exhibit interpretation, support different aspects of museum experience promotion and support.**

the larger system they are part of that is, instead, intended to raise interest towards the museum. While previous work has investigated the importance of preconditions to the visit both from a museological [4] and from a technological [11] point of view, we further detail this by distinguishing promotional activities, centred on pure entertainment, from advertisement activities, designed to encourage commitment.

## STORYTELLING OF CULTURAL EXPERIENCE

In order to design user cultural experience as transmedia storytelling, we have to delimit the roles and methods used in each phase of cultural experience, summarised in Table 1. Interaction design should adapt accordingly to support the goal of each phase. For the objectives of this paper, we will concentrate on aspects related to game design and on their use throughout the overall experience.

### Promoting

Digital games used to create curiosity around the museum should be designed to present emotionally powerful experiences and should prepare the ground for later steps to capitalise on this. We detail how this can be accomplished by describing the design process here. The design of the promotion involves gameplay, narratives and characters as shown in Figure 1. The whole process starts from an *Interpretation* provided from analyses performed by domain experts, so that the development of the presented game elements builds on the collection of historical facts. The dashed lines indicate that gameplay, narrative and characters are strongly intertwined.

### *Exhibit analysis*

Before starting to design the digital game to promote visits to the museum, it is necessary to establish what the museum can offer, how it presents itself to the public and how the public actually perceives it. In the case of art and archaeological museums, where cultural heritage preservation and presentation are the objective, the museum often struggles to go beyond its image of a place of learning only. It is important, at this stage, to identify the characteristics of the exhibits that are better suited to be included in a coherent narrative that can be later used to present the museum as a source of an interesting story and a provider of deeper contents about it. In restoration of damaged artefacts, the original status of a partially destroyed piece can be just imagined; similar hypothesis are made on elements around which the game experience should be built.

It is necessary to collect the historical data available and, at the same time, identifying blank spots that can be safely filled with narrative contents. The result of this phase should be a set of historically established *facts* combined with a set of *blank spots* to exploit for the benefit of the narrative. Additionally, occasions to introduce *fun facts* in the game should be noted to support discussion elicitation in later phases of the experience through exhibition. In MES, the set of *facts* and *blank spots* is used to plan which parts of the gaming experience should be highlighted and later recalled during the other phases of cultural heritage experience.

### *Gameplay design*

Through gameplay, designers deliver the message they intend to communicate. This is not to advertise the museum visit but rather to communicate that objects exposed in the museum were once part of everyday life and had specific goals and importance. However, differently than interactive technologies already applied to cultural heritage, in digital games, player choices must have a clear impact on the story being told as "[...] a failure to provide a convincing sense of agency is frequently a reason that game scenes (or entire games) fall flat" [8, p. 106] and it reduces their sense of *Autonomy*. Learning how to move through the game and making the avatar look more and more competent about the tasks he performs appeals to the mental need of *Competence*. From a social perspective, it is mandatory for games to provide an invitation to play. When accepted, this testifies the user's will of entering *lusory attitude*: the "curious state of affairs wherein one adopts rules which require one to employ worse rather than better means for reaching an end" [29, p. 23]. This element is critical for technological systems as it gives users a socially acceptable reason to accept the constraints established by the game. The role of gameplay design in MES is to highlight objects of interest by making people use them to perform actions in the game. Objects made interactive or playing a significant role in the story become prominent in the eyes of the player as they clearly stand out of the surrounding context. Choosing which objects should become part of game mechanics is a decision that should be taken in accordance with the importance of objects in exhibits. This not only refers to the iconic value of the object for the exhibit: the role the object has as part of the whole story the exhibit is designed to convey should be taken into account.

### *Narrative design*

The role of narrative design in MES is to show the dynamics of the world objects of interest were part of by immersing the user in them. The produced narrative intentionally leaves information gaps to be filled by accessing the museum. These gaps should not be related to the main plot but only be present in the contextual setup. This is to create a situation in which users are led to believe that accessing a minimum amount of information will complete their knowledge of the game world, thus eliciting curiosity. Although many of the traditional aspects of narrative design hold for stories told through games, the strong presence of interactivity challenges traditional theoretical frameworks of narrative description [10]. They may take into account, for example, the

| Phase | Goals | Methods |
|---|---|---|
| Promoting | Create curiosity<br>Create emotional memories<br>Provide pleasure | Game narrative<br>Game characters<br>Game mechanics |
| Planning | Advertise commitment to visits<br>Connect the game to the museum | Website<br>Game additional contents |
| Visiting | Satisfy curiosity<br>Entertain | Deliver information<br>Evoke emotional memories |
| Summarising | Strengthen memories of the visit<br>Promote further cultural experience | Discuss game and visit relationships<br>Provide personalised recommendations |

**Table 1. Goals and methods adopted in cultural heritage experience to exploit digital games designed to support museums.**

manually annotated tension of narrative events or the user inclination towards specific playing styles to predict emotional feedback and adjust itself accordingly [7]. In order to satisfy agency through interactivity, this [17, p. 60] "[...] must have consequences that make sense, and what the user does must have a true impact on the story. On the other hand, too much freedom will give users the chance to disrupt the plot line by adopting unforeseen behaviours. To balance the two aspects, designers should not aim at giving the player full freedom in the game but they should rather create the *illusion* of freedom. If this is successful, "[...] the player has the wonderful feeling of freedom, and the designer has managed to economically create an experience with an ideal interest curve and an ideal set of events" [24, p. 319].

*Character design*
There are two main groups of characters in digital games: Playing Characters (PCs) and Non-Playing Characters (NPCs). PCs are the player's *avatar* into the game world while NPCs are controlled by the game system to follow the narrative, present challenges and make the story move forward. In our discussion, we will consider design and roles of these two categories of characters separately. In both cases, however, the goal of character design is to create actors that will make players *care* about their fate. Role playing games (RPGs) have been proposed for cultural heritage, but there is still confusion about player and PCs. One common misunderstanding lies in assuming that the player *is* the character. In RPGs the player *creates* a character she would like to guide through the narrative by exploiting his capabilities and, as importantly, dealing with his deficiencies. This, combined with social data coming from sources normally used for recommendation (see [22]) may yield critical insight to efficiently advertise and support museum visits. NPCs, either allied with or opposing the player, provide the motor force that drives the story. Conflict is the most important aspect NPCs introduce in the game system: having a significantly strong and motivated opponent is one of the key aspects in building drama and, therefore, keep the player interested in playing the game. Other characters that are not under the direct control of the player but are clearly influenced by her choices can provide further motivation to keep playing. The main characters in the game should evolve as the story progresses by growing and developing. Growth "[...] describes the changes that occur to the character as she progresses through the story" [27, p. 45] while, following William Archer, development is "[...] not change, but rather unveiling, disclosure" [27, p. 45]. The role of characters in MES is to show the relationships people had among themselves, their perception of objects of interest and of the world they lived in. Showing the growth and development of both PCs and NPCs as they move around the world creates emotional memories linked to the depicted events. Characters provide a representation of the past not as lifeless historical records but as cause of change and personal discovery for real people.

**Planning**
As it is well known, a museum website is designed for a larger audience than the one represented by people who played the digital game linked to the exhibit but, for our discussion about the design of the planning phase, we will concentrate on those aspects of museum visits advertisements that can be presented as a consequence of having played the game. The link between the game environment and the website can be established using a now commonly adopted technique exploiting the start screen. While formulating the invitation to play, this element now provides information about further contents available online before the game actually starts. While the user may not choose to follow the link the first times the game is launched, she will have to visualise it every time. The start screen has evolved, in recent years, to become a channel to promote extended content, to spread news of upcoming games and attract players on the producers' websites. Once on the website, advertising the visit can be done using well-established techniques or by experimenting with narrative approaches in a similar way to what has been done in [1]. Web-based narratives, if present, should refer to emotional moments in the game to advertise the experience of coming into contact with the objects that inspired the game narrative. Assuming this was able to capture the player's favour, the museum now has additional value as it hosts the *same* objects the player has come to know in the fictional world. The website should also be used to adequately prepare visitors to a museum experience motivated by the emotional content of the game, as "[...] one of the best ways to ensure that visitors have a satisfying experience is to try as much as possible to prepare and orient them *prior* to their visit" [4, p. 259]. The website should communicate explicitly that the player-visitor will have the chance to enter in direct contact with the remains of the world depicted by the game, attempting to exploit the common knowledge ground established by the game experience as part of a persuasive strategy based on *echoes*.

**Visiting**
A visit to the museum, viewed as an entertaining experience shaped with the collaboration of the visitor himself, should appeal to the same mental needs considered for the development of a game. For example, interacting with a museum

educator on a verbal and non-verbal level, establishes a social situation in which the appropriate amount of detail is provided depending on the social signals shown by the visitor. When people feel involved in shaping the visit, there is satisfaction of the *Autonomy* mental need. Technology can be a powerful means to showcase cultural heritage and museum experts pay a lot of attention in communication campaigns that involve modern communication channels to deliver information. In our work, we focus on the case of art and archaeological museums, where a successfully enjoyed experience lies in establishing a *direct* relationship between the preserved heritage and the visitors. It is important to deliver the interpretative keys people need in order to relate with the object and make sense of it by themselves. Being able to spot details previously undetected and understanding their meaning, either in the context of artistic expression or of everyday use, is the main kind of pleasure sites of interest for our work can provide and is directly related to satisfying the *Competence* mental need. Discussing new, interesting topics with visit companions and interacting with the museum educator are elements that satisfy *Relatedness*. In this setting the most competent element of the social group, the educator, is not an authoritative figure: it rather is an important part of the experience itself. By interacting with the museum educator people can feel part of a social network in which information relevant for the task at hand, making sense of the exhibit, flows as a discussion rather than as a frontal lesson. In this social network, the museum educator has a relevant role as she represents the centre of a system in which questions are continuously asked and, more than answered, discussed. Visits to art and archaeological museums require that technology stays in the background as much as possible. The visual channel, in particular, should not be contended to objects of interest by technological artefacts. Also, the mediating presence of a human being cannot be entirely substituted by automated approaches: the efficacy of human-human communication to transmit the value of preserved objects and works of art as part of ancient, living worlds remains unsurpassed. The museum educator, though, can be supported in her task of context creation by using technologies occupying channels other than the visual one. In the framework of MES, audio augmented reality can represent a particularly powerful option. The effect of storytelling and acting has been demonstrated in the past to help entertain visitors while delivering serious content [2]. This strategy would allow using powerful *echoes* of the gaming experience, like soundscapes, music and voice actors, to reduce the time the educator needs to create the context without contending visual attention to the objects of interest. Information gaps left open by the game narrative should be closed during the visit to provide satisfaction in the visitors who played the game.

### Summarising

The last phase of the cultural heritage experience should strengthen the memories of the visit by eliciting discussion about it. In the framework of MES, discussion can be elicited primarily by revealing the connections between the exhibit and the game. It is common, in the movie industry, to provide *behind the scenes* documentaries to describe how a cer-

tain film was created. The same kind of content is becoming more and more available about games, especially now that the tools to produce such artefacts have become publicly affordable. Describing the process through which the creative team has interpreted the exhibit provides a good way to connect the fresh experience of the visit with the emotional memories of the game and opens a new point of view over the entire experience for the visitors to discuss. This is the chance to expose *fun facts* and to use the collected data to provide a profile of the visitors to recommend further cultural experience.

### RESEARCH ISSUES

While the theoretical background we presented is motivated by previous findings in the literature, the core of MES, the information flow from playful games to the various phases of cultural heritage experience, needs to be investigated in practice. Since MES spans multiple views of cultural heritage experience and involves different aspects of game design, we will describe here the research issues we prioritise and provide a brief description of how these will be investigated in the next future through the use of simple games focusing on different aspects of MES. Concerning narrative-related issues, it is necessary to establish how information gaps should be planned and presented in order to stimulate curiosity towards museum visits. A story-focused game will be designed to test this issue. The game should inform the user that a piece of background information is not present through narrative expedients, as described before. In order to measure the impact these strategies have in directing users towards deeper content, links to an informative interface will be provided when the user is not playing the game (i.e. in the main menu screen). The number of users that were successfully redirected towards this second interface and the subsequent interaction analysis will represent the evaluation measures for this task. Concerning characters, the first aspect to explore, in MES, is the possibility to substitute user profiles with customised characters to inform assistant AI systems. By developing a game focusing on character building and progression and by recording the way the user interacts with NPCs, a user model will be obtained and subsequently used to recommend museum visits. The standard measures used to evaluate recommendation systems will, then, be used to evaluate the appropriateness of the obtained model. Concerning gameplay, the research issue to be primarily investigated will be the efficacy of different components of gameplay (mechanics, sounds, visuals. . . ) in acting as *echoes*. A game based on emergent mechanics will be developed to maximise replayability and expose users to repeated play sessions. Different types of *echoes* will be associated to specific information to be given during a guided museum visit. The amount of information users will be able to recall after being presented the corresponding stimuli on-site will represent the evaluation measure to be used in this task.

### CONCLUSIONS

We have presented the theoretical background for a approach to game design applied to cultural heritage linking all the phases of cultural experience into a cohesive narrative. Different interfaces work together in this museum-centric framework on the basis of entertainment contents provided by a

leisure activity: playing the game. In our view, games are not designed to deliver serious contents or persuade players to visit museums. They rather promote cultural contents and create the preconditions for other interfaces designed to advertise and support museum visits to build upon. The playful experience can be capitalised during visits and summarisation using *echoes* of the playful contents, provided as part of a continuing experience. In this setting, games acquire a motivational and preparatory value for museum visits to exploit without suffering invasive intervention. Future work will concentrate on designing and deploying cultural experiences produced using the methodology presented here to further report on the design process.

## ACKNOWLEDGEMENTS

## REFERENCES

1. Birchall, D., and Faherty, A. Big and slow: adventures in digital storytelling. In *Proc. of Museums and the web* (2016).

2. D'Auria, D., Di Mauro, D., Calandra, D. M., Cutugno, F., and SNC, V. C. A 3d audio augmented reality system for a cultural heritage management and fruition. *Journal of Digital Information Management 13*, 4 (2015), 203.

3. Dierking, L., and Holland, D. Utilizing interpretive carts to collect naturalistic data in a natural history museum. *AAM Committee on Audience Research and Evaluation, Current Trends in Audience Research and Evaluation 8* (1994), 38–43.

4. Falk, J. H., and Dierking, L. D. *The museum experience revisited*. Routledge, 2016.

5. Griffin, P., and Cole, M. Cultural amplifiers reconsidered. *The social foundations of language and thought* (1980), 343–364.

6. Haven, K. F. *Story proof: The science behind the startling power of story*. Greenwood Publishing Group, 2007.

7. Hernandez, S. P., Bulitko, V., and Spetch, M. Keeping the player on an emotional trajectory in interactive storytelling. In *Eleventh Artificial Intelligence and Interactive Digital Entertainment Conference* (2015).

8. Heussner, T., Finley, T. K., Brandes-Hepler, J., and Ann, L. *The game narrative toolbox*. OUP Oxford, 2014.

9. Johnsson, E. *Telling Tales: A guide to developing effective storytelling programmes for museums*. Museums Hub, 2006.

10. Koenitz, H. Towards a specific theory of interactive digital narrative. *Interactive Digital Narrative* (2015), 91–105.

11. Kuflik, T., Wecker, A. J., Lanir, J., and Stock, O. An integrative framework for extending the boundaries of the museum visit experience: linking the pre, during and post visit phases. *Information Technology & Tourism 15*, 1 (2015), 17–47.

12. LeDoux, J. *The emotional brain: The mysterious underpinnings of emotional life*. Simon and Schuster, 1998.

13. Loewenstein, G. The psychology of curiosity: A review and reinterpretation. *Psychological bulletin 116*, 1 (1994), 75.

14. Loewenstein, G., Adler, D., Behrens, D., and Gillis, J. Why pandora opened the box: Curiosity as a desire for missing information. *Unpublished manuscript, Department of Social and Decision Sciences, Carnegie Mellon University, Pittsburgh, PA* (1992).

15. McGaugh, J. L. Consolidating memories. *Annual review of psychology 66* (2015), 1–24.

16. Miceli, M., and Castelfranchi, C. *Expectancy and emotion*. OUP Oxford, 2014.

17. Miller, C. H. *Digital storytelling: A creator's guide to interactive entertainment (Third Edition)*. Taylor & Francis, 2014.

18. O'keefe, D. J. *Persuasion: Theory and research*, vol. 2. Sage, 2002.

19. Peters, R. A. Effects of anxiety, curiosity, and perceived instructor threat on student verbal behavior in the college classroom. *Journal of educational psychology 70*, 3 (1978), 388.

20. Porges, S. W. The polyvagal perspective. *Biological psychology 74*, 2 (2007), 116–143.

21. Reeve, J., and Nix, G. Expressing intrinsic motivation through acts of exploration and facial displays of interest. *Motivation and Emotion 21*, 3 (1997), 237–250.

22. Rossi, S., and Cervone, F. Social utilities and personality traits for group recommendation: a pilot study. In *Proc. of the International conference on Agents and artificial intelligence*, vol. 1 (2016), 38–46.

23. Sansone, C., and Smith, J. Interest and self-regulation: The relation between having to and wanting to. sansone, c., & harackiewicz, jm (eds.). *Intrinsic and Extrinsic Motivation: The Search for Optimal Motivation and Performance* (2000).

24. Schell, J. *The art of game design*. CRC Press, 2015.

25. Schiefele, U. Interest and learning from text. *Scientific studies of reading 3*, 3 (1999), 257–279.

26. Seaborn, K., and Fels, D. I. Gamification in theory and action: A survey. *International Journal of Human-Computer Studies 74* (2015), 14–31.

27. Sheldon, L. *Character development and storytelling for games*. Nelson Education, 2014.

28. Silvia, P. J. What is interesting? exploring the appraisal structure of interest. *Emotion 5*, 1 (2005), 89.

29. Suits, B. *The Grasshopper: Games, Life and Utopia*. Broadview Press, 1990.