



# EndGame for Corruption - A DPE-Based Framework to Support the Design of Serious Games for Fight Against Corruption

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**Abstract** Corruption, a pervasive issue that affects societies globally, is closely linked to inequality and the inadequate provision of public services. In this context, where the population is the primary victim, serious games are utilized to raise awareness, aiming to empower individuals and strengthen their role as vigilant citizens. Game designers strive to develop solutions that facilitate learning and reflection on corruption. This article proposes an adaptation of the Design Play and Experience Framework, referred to as the Endgame for Corruption Framework (EgC Framework). This adaptation incorporates the reflection process and is guided by the learning objectives mapped from Bloom's Taxonomy. The EgC Framework is the basis for designing a game that immerses players in a corrupt context. We conducted a quasi-experimental study to evaluate the game's effectiveness and gathered participants' perceptions through a survey questionnaire. The collected data underwent both quantitative and qualitative analyses. The results demonstrated clear indications of player dissatisfaction and reflection on the situations presented in the game. These findings provide valuable evidence of the game's impact in prompting players to engage critically with corruption. Overall, this research showcases the potential of serious games in addressing the issue of corruption. The EgC Framework, combined with thoughtful design choices and evaluation methods, contributes to the development of games that foster awareness and reflection among players.

**Keywords:** *Corruption, Serious Games, Design of Games for Reflection, DPE Framework, EgC Framework.*

## 1 Introduction

Corruption pervades every corner of the world, indiscriminately affecting nations regardless of their level of development. Scandals involving public officials misusing their power and engaging in illicit dealings with private entities are prevalent globally (Shleifer and Vishny, 1993). Regarded as a grave societal menace, corruption is intrinsically linked to many problems plaguing our contemporary world.

One such issue is social inequality, which corruption perpetuates by exacerbating disparities and impeding efforts to ensure universal access to healthcare and a decent quality of life for all (García, 2019). Additionally, corruption worsens environmental and biodiversity challenges, as nations riddled with corruption often exploit natural resources without regard for sustainability (Laurance, 2004).

In this scenario, where the citizen appears as the most affected element of this system, releasing the mere spectator position becomes extremely necessary, where popular participation in the work of State inspection must be increasingly effective. However, for this to be achieved, it is required to overcome barriers formed by the lack of knowledge about the paths and processes of the corrupt State, with the moral and ethical weaknesses of society (Filgueiras, 2009).

Digital games provide an exciting and interactive solution for promoting learning and reflection on corruption. With their immersive and engaging nature, games can captivate players, including citizens, and effectively convey vital information and values about public processes (Classe

et al., 2018, 2021). By harnessing the potential of games as interactive tools, we can leverage technology resources to engage players and transmit crucial knowledge, fostering a better understanding of corruption-related issues.

Designing games that effectively address the topic of corruption and promote player understanding is a complex undertaking. However, various techniques and methods can assist in the game design process (Winn, 2009; Classe et al., 2019a; Tondorf and Hounsell, 2022). Given the unique nature of corruption as a subject, **the need to find solutions in designing digital serious games (DSG) becomes a significant research problem. Such games have the potential to immerse players in situations that prompt them to learn about corruption, encouraging reflection on its societal impact and exploring ways to mitigate it.**

In this sense, this article proposes a framework to support game design, adapted from the Design, Play and Experience (DPE) (Winn, 2009) framework, called Endgame for Corruption Framework (EgC). The EgC has been designed to aid the design and development of DSG focused on the theme of corruption, aligning aspects of the DPE, the psychological process of reflection, and elements of cognition and affection provided by Bloom's Taxonomy.

Design Science Research (DSR) was the epistemological-methodological approach used to create the EgC as a research artifact. In this research, the EgC is demonstrated from the design of a game prototype about prevarication crime. The game prototype was evaluated through a quasi-experimental study to validate whether the EgC framework supported the game design process so that players could understand the type of corruption addressed in it, making them reflect on its causes and the context

impacts in which the problem is inserted immersively and interactively.

The article is composed of seven sections. Section 2, we presented the Design Science Research (DSR) methodology used in the research. We show the fundamental concepts in section 3. In Section 5, we described our proposal, and in Section 6, we defined and performed the game evaluation. We discussed the results in Section 7. At last, Section 8 presents our final considerations and future works.

## 2 Design Science Research

Some traditional research methodological approaches, including the Experiment and the Case Study, etc., do not presume the elaboration of an artifact during the research, reinforcing that technological development alone does not necessarily represent a scientific advance that adds to the knowledge body. These classic methods aim to understand reality without the intention of modifying it, that is, without developing any artifact to solve problems (Pimentel et al., 2019).

From the Design Science Research, theory-practice starts to be redesigned because this methodological-epistemological approach is interested in what and how things should be, dedicating itself to proposing and building new artifacts, with specific properties that come to accomplish objectives (Simon, 1996).

Therefore, as an epistemology that seeks to conduct research effectively aimed at the design of the artifacts that support more effective solutions to real problems, the DSR has been popularizing in the area of Information Systems (IS) since the 1990s, materializing as a new paradigm of science and knowledge production (Hevner, 2007; Dresch et al., 2015).

There are several methods to target DSR-based searches (Hevner, 2007). This paper is being conducted by the Design Science Research Methodology (DSRM) (Peppers et al., 2012), one of the most cited and used methodologies in the IS area, being graphically schematized through the DSR-Model (Pimentel et al., 2019).

### 2.1 DSR in this Research

DSR establishes a rigorous process of designing artifacts to solve problems, evaluating what was developed and communicating the results (Çağdaş and Stubkjær, 2011).

Figure 1 shows the research layout based on the DSR-Model. The definitional problem is **How to design digital serious games (DSG) that allow players to learn and reflect on corruption issues.**

This problem, in addition to the existing difficulties in the design of serious games, is also related to challenges regarding transparency, cyberdemocracy and popular participation present at the I GranDSI-BR (Grandes Desafios de Pesquisa em Sistemas de Informação no Brasil 2016-2026 [Grand Research Challenges in Brazilian Information Systems 2016-2026]) (Boscarioli et al., 2017) and at GrandGames-BR (Grandes Desafios de Pesquisa em

Computação de Jogos e Entretenimento no Brasil 2020–2030 [Grand Research Challenges in Brazilian Computing Games and Entertainment 2020–2030]) (Classe and Araujo, 2020). Moreover, the United Nations – UN declarations present in the UN Convention against Corruption (UN, 2003) reinforce this problem, in which nations start to treat corruption as a problem related to Human Rights.

The artifact resulting from this proposal, the Endgame for Corruption Framework (EgC), combines the Design, Play, and Experience framework with concepts related to the process of reflection, cognition, and affection, synthesizing an adaptation focused on the development of DG to support fundamentals aimed at combating corruption (transparency, civil review, reliable information, etc.).

To this end, the EgC design is guided by three behavioral conjectures: (1) that relates learning objectives from the cognitive domain of Bloom's Taxonomy to the gain of knowledge about corruption (Ferraz and Belhot, 2010); (2) stating that the situations presented during gameplay lead the player to a situation of non-conformism capable of generating reflections on this context (Atkins and Murphy, 1993) and, (3) that defines that people better understand the process of fighting corruption through interactive and playful tools (Classe et al., 2018).

Regarding the empirical evaluation of the artifact, the design of a prototype digital game with a theme focused on corruption was established. Subsequently, exploratory studies were conducted with citizens based on a quasi-experiment using the Game's prototype. Besides, the goal is to analyze whether the method could produce a game that efficiently transmits information about corruption (1), encouraging reflection on the theme presented (2) and generating the players' immersion and interaction (3).

## 3 Fundamental Concepts

### 3.1 Reflection

Due to its high complexity, the reflection conception is still being researched by many authors. During debates on the definition of the term, participants will naturally reach a consensus close to mental processes that involve the act of thinking before acting or in re-analyzing past actions aiming at improvements for the future (Masini, 2010).

The motivation to reflect arises from the recognition of a problem, a dilemma, an uncertainty that leads the individual to a state of nonconformity (Dewey, 1910). Furthermore, the Experiential Learning Theory is based on two pillars: 1) continuity, where the individual learns from the problems experienced in the social context, having to reflect on specific situations to re-elaborate new solutions, and; 2) interaction, in which learning is historical and social, occurring throughout human life, during the experiences lived by individuals (Dewey, 1938).

Yet, it can be said that it is through experiences, emotions, and reflection that the individual learns and develops, always focusing on transformation based on critical analysis processes (Jarvis, 1987; Mezirow, 1991).

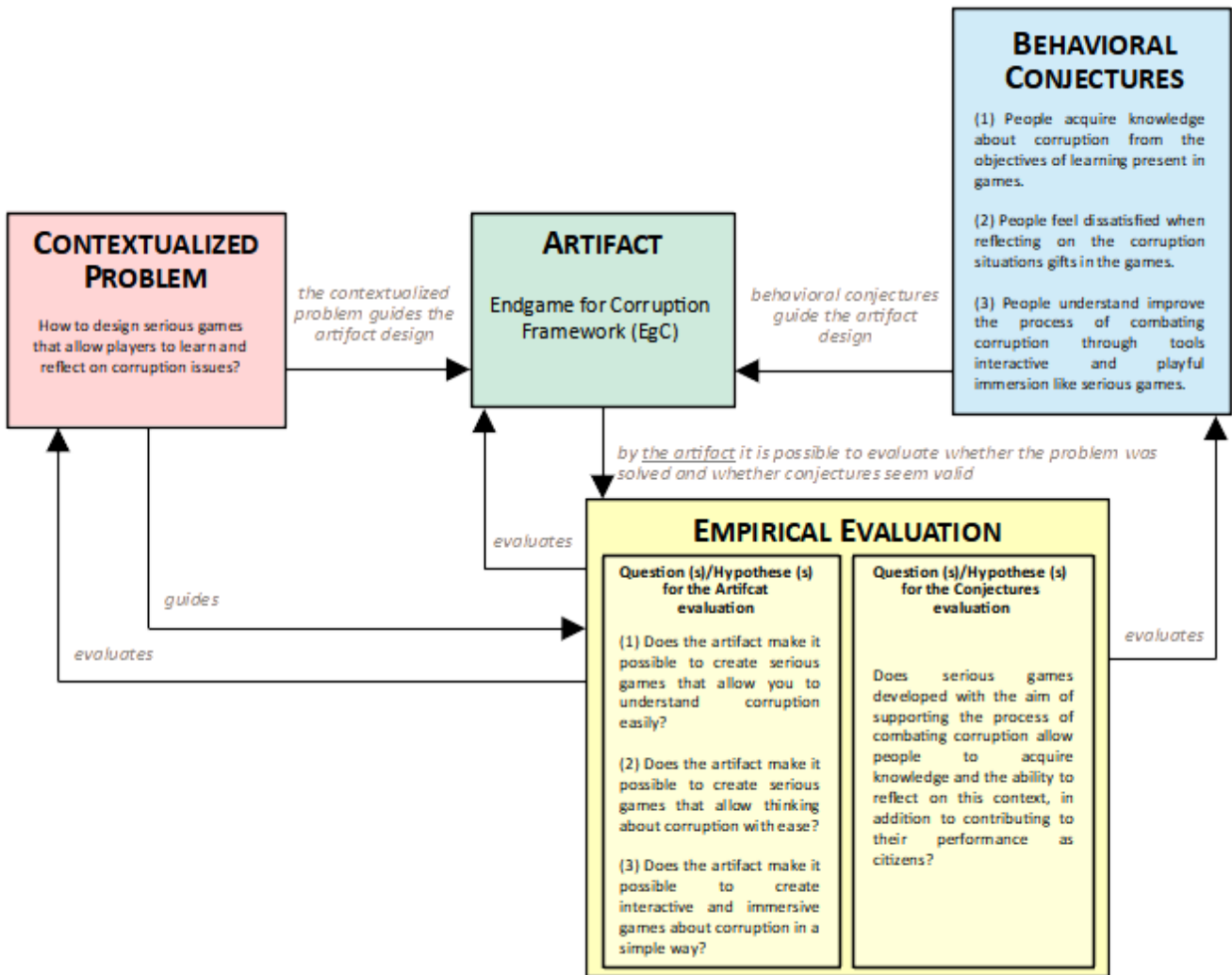


Figure 1. Instantiated research based on central elements of the DSR-Model

The literature has many definitions for the concepts of reflection and countless models for the learning process through reflection. However, in most cases, the differentiation of the authors’ speeches is only due to the use of terminologies and the number of steps involved in each model. Thus, the definition of the term ”reflection” can be summarized in three key stages, namely: i) contact with uncomfortable feelings and thoughts — nonconformity — ii) a critical analysis of feelings and thoughts, and iii) the generation of new perspectives (Atkins and Murphy, 1993).

### 3.2 Bloom’s Taxonomy

The definition of learning objectives consists of activity through a conscious and structured process to enable knowledge transmission and behaviors, values, and conducts change. In this way, Bloom’s Taxonomy presents itself as a valuable tool to support the structuring, organization, and definition of instructional objectives of pedagogical plans (Ferraz and Belhot, 2010).

The taxonomy comprises the union of three groups of processes used to classify the learning objectives in complexity and specificity levels. The model encompasses goals from the **cognitive** (related to knowledge), **affective**

(referring to feelings and postures) and **psychomotor** (concerning specific physical skills) (Taucei, 2019) domains.

When approached from the revised version, the cognitive domain (Figure 2) can be described as a six-level hierarchical model that encompasses cognitive processes from the lowest (base) to the highest level (top) of complexity. In addition, the old dimension of knowledge was divided into two new dimensions, one linked to the definition of the type of knowledge (factual, conceptual, procedural, and cognitive meta) and the other related to “remembering”, facilitating and giving clarity in the task of defining the learning objectives and aligning them with the assessment activities (Trevisan and Amaral, 2016).

The affective domain can also be described as a hierarchical model (Figure 3), which has five levels, starting from the reception (the lowest level), which is related to the fact that an individual receives willingly, attentively and consciously some information that is offered, until reaching the highest and most complex level, internalization, in which the individual’s behaviors and attitudes become predictable in certain situations (Savickiene, 2010). The present study is based only on the cognitive and affective domains, so the psychomotor

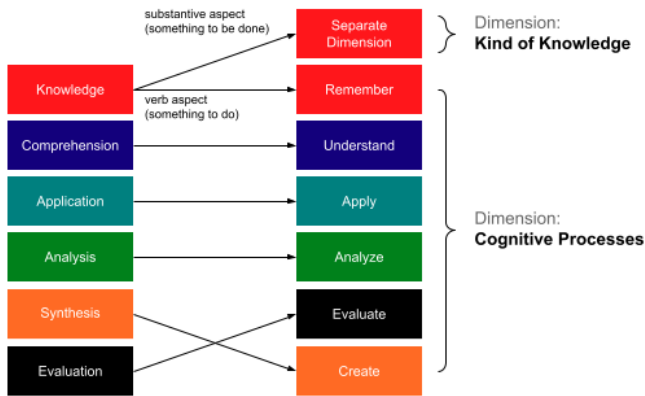


Figure 2. Bloom's Taxonomy: cognitive domain (Trevisan and Amaral, 2016).

domain will not be addressed in further detail.

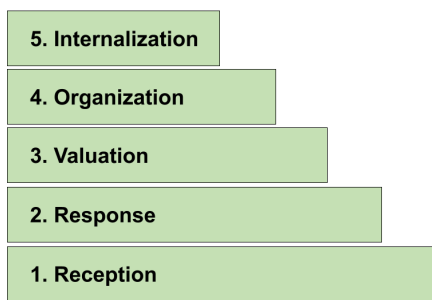


Figure 3. Bloom's Taxonomy: affective domain.

### 3.3 Digital Games and Public Services

Public services are provided to citizens in a particular jurisdiction, whether federal, state or local. Within an understanding of society, it is understood that these services, including hospital care, basic sanitation, etc., should be provided to all people directly (public sector) or indirectly (companies) (Bertot et al., 2016).

From the point of view of the population, these services are often far from being provided satisfactorily since the responsible organizations suffer from poor allocation of resources, inefficiency, high costs and imbalance in the access condition of users (Lima and Lima, 1998). In an environment of current global competitiveness, the conditions for providing services are considered essential survival strategies, even for the public sector, which is increasingly suffering from pressure from society to achieve better results concerning the quality requirements (Ramseook-Munhurrun et al., 2010).

However, in some situations, this skeptical view of the citizen about public services concerns a lack of knowledge about the objectives, practices, values, challenges and limitations involved in the provisioning process (Classe et al., 2019b).

Therefore, within a context where an attempt is made to establish a bridge between citizens and public services, aiming at leveling knowledge and improving user access, digital serious games emerge as tools for social interaction, which, in addition to generating unexpected sensations such as mere entertainment from contact with the artificial, are also capable of generating the engagement and learning

necessary to bring people closer to public sector processes (Classe et al., 2021).

### 3.4 Design, Play and Experience

DPE (Design, Play and Experience) is a framework consisting of a language to discuss game design. In other words, it is a framework derived from MDA (Mechanics, Dynamics and Aesthetic) (Hunicke et al., 2004) specifically aimed at analyzing the process of designing a serious game with the purpose of teaching and learning. It presents a relationship between the designer and the player, in which the designer designs, the player plays, and the result is a new experience (Winn, 2009).

As such, the entire game project must have an iterative character, where the generated experience returns to design to verify and refine the original learning goals. Nevertheless, it must be considered that the experience obtained by each player will be different since the game is a mediated experience that is sensitive to the target audience, cognitive characteristics, and users' social and cultural background (Winn, 2009; Amaral et al., 2019).

The framework (Figure 4) is structured under five layers, which influence each other: Learning, Storytelling, Gameplay, User Experience and Technology (Winn, 2009).

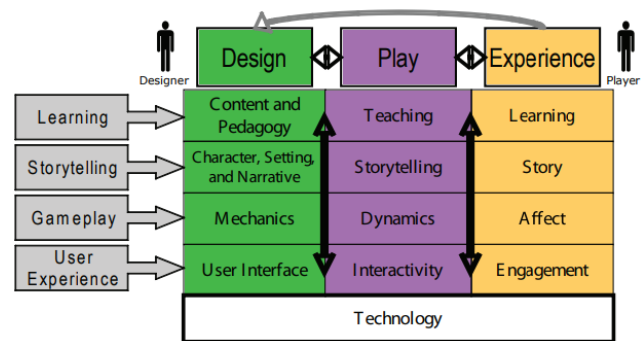


Figure 4. DPE framework (Winn, 2009)

In the first layer, the Game's learning objectives are defined — Bloom's Taxonomy, described in the subsection 3.1, is mentioned as a powerful support tool in this phase — in which the designer designs the content and the pedagogy that may result, on the part of the player, in learning during the gameplay. The story of the Game is defined in the storytelling layer. In the gameplay layer, the rules of operation of the game world are defined (mechanics), the behaviors resulting from contact with these rules during the game (dynamics) and the resulting experiences and emotions generated in the player (affection). The scope of user experience includes everything the user sees, hears and interacts with and how this occurs (Taucei, 2019).

Finally, the technology layer is presented, which generates a greater dependence from the design choices made, becoming a facilitator or a limiter of what will be developed in the game, being also dependent on the choice of media format between analogs and/or digits (Taucei, 2019).



## 4 Related Works

The search for related works was consolidated in a systematic literature mapping to investigate the relation among serious games, public transparency and the fight against corruption (Abreu and de Classe, 2022).

Within this reality, it was evaluated that the works developed to support the process of combating corruption are divided into three categories: those that seek to promote **reflection** about attitudes in life in society, those that intend to provide a **behavior change** concerning ethical and moral values, and finally, those that aim to lead to the **denounce** of illegalities identified by the player.

In the first category, the Sustainability Game allows players to reflect on the consequences of unfair actions in a society, given that the development of an individualistic and non-cooperative budget, added to the application of resources for his benefit, can bring severe results for the continuity of life in community (Theodorou et al., 2019). "Corrupt Kitchen" presents an established experience in virtual reality (VR) aimed at learning and complying with European Union food safety legislation, developing a pressure environment that leads to quick decision-making incorporating implicit and explicit dilemmas related to behavior and ethical issues, such as breaking the rules and offering bribes (Flintham et al., 2020).

Regarding the works classified in the behavior change category, Al-Zahrani et al. (2019) projects stand out, which highlight the use of VR technologies for teaching subjects related to the Code of Ethics in the field of Engineering, proposing that immersion offered by said tool is also able to support the citizen awareness process. Still in this category, we mention Ronzhyn et al. (2020), which in one of its research results proposes that games can be tools to promote sustainable lifestyles, better habits regarding public transport, etc., suggesting that these tools may be able to enhance citizens' ethical practices and their engagement in the process of combating corruption.

Finally, the studies related to the identification and reporting of possible fraud are the following: Rangel (2017), which idealizes a game design that aims to teach fraud detection concepts and use the knowledge learned by the player to manipulate real public data, enabling the creation of a collaborative network for denouncing suspected irregularities, and Classe and Araujo (2020), which proposes digital games focused on open data and inspection, where citizens learn where their taxes are being spent, having information on public investments and hunting possible irregularities, and still being able to notify authorities.

After analyzing the works mentioned above, it is possible to perceive the presence of a wide range of projects with objectives that dialogue with the fight against corruption, always considering a solid appeal for playfulness and dynamics and, sometimes, counting on the varied use of techniques and technologies, including simulation and collaboration.

Meanwhile, a gap was noticed when we looked for models that guide and systematize the serious game design aimed at learning and reflecting on corruption, making it evident

the scarcity of detailed descriptions about the methodologies used in defining game elements.

## 5 Research Artifact

Intending to elaborate a framework that directs the construction of serious games focused on the theme of corruption, the Endgame for Corruption Framework emerged from analysis and alignment between the DPE and the reflection process in such a way that the DPE's original **Learning** layer (based on the cognitive domain of Bloom's Taxonomy) enabled the insertion of perspectives linked to reflection (Figure 5).

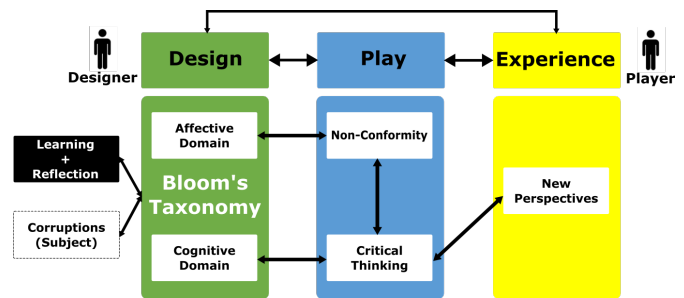


Figure 5. Endgame for Corruption Framework - Learning layer to games for reflection about corruption.

The present proposal indicates that, initially, the game designer needs to **define the subject** (thematic content) to be approached within the universe of corruption. For example, we can mention the origins of corruption, causes and consequences, legislation, types of crimes, penalties, etc.

Once the subject is defined, the **planning step (design)** begins to make the player reach the initial stage of the reflective process. That is, what is expected is to make the player have direct contact with uncomfortable feelings and thoughts (**nonconformity** state) during gameplay. To this end, it is recommended that the learning objectives be established based on the **affective domain** of Bloom's Taxonomy since this discomfort to be caused in the user, predominantly, is linked to working with the individual emotional aspects.

Then, seeking to continue the process through the **critical analysis** of the thoughts and feelings to which the player was exposed, it is suggested that the designer define learning objectives through Bloom's Taxonomy **cognitive domain**, with the idea of providing solid bases of knowledge and enabling a coherent interpretation and dialogue with the situations the player had contact. It should be noted that the definition of goals during this stage of design is a challenge that must be faced carefully since the concepts passed on during gameplay, if taught incorrectly, will lead the player to the wrong conclusions, something extremely undesirable when we refer to the results of reflection processes.

It is expected that the result of the reflection cycle intermediated by a serious game, which had its development guided by the learning layer defined in the proposed adaptation, will be an impactful and enlightening

experience from the emotional and theoretical points of view of the player, respectively. It is understood that only when there is a balance between these two fields, it will be possible to reach satisfactory results (awareness and knowledge acquisition) and generate **new vital perspectives** with the user. Therefore, continuing the iterative game design process is necessary, based on the player's feedback and aiming at refining the original learning objectives.

## 5.1 Demonstration of the Use of the Artifact

To exemplify the EgC applicability, a hypothetical scenario was taken into account where a team of game designers intended to develop a prototype of a digital game that could present the theme of corruption crimes, more specifically, prevarication crime, which is one most questioned by the Brazilian population (Abreu and de Classe, 2021).

The series of images depicted in Figure 6 portrays a troubling instance of misconduct involving a maintenance technician. The images highlight the technician's deliberate disregard for structural problems within the hospital, demonstrating a lack of care or willingness to address the issues during a conversation with a game character. Regrettably, such situations can be found in the everyday reality of hospitals and various other public institutions. These instances serve as a somber source of inspiration for the narrative design within the game, aiming to shed light on and address these systemic problems.



Figure 6. Example of a case of misconduct.

The definition of learning objectives considered the levels recommended in the affective domain of Bloom's Taxonomy, seeking to define objectives that would produce the desired nonconformity concerning prevarication crime during gameplay. For this context, the game designers aimed to RECEIVE the content about prevarication crime attentively and interestedly (first level of Bloom's taxonomy). As illustrated in Figure 7, some suggestions for this goal would be the presentation of ironic dialogues between a perpetrator of the crime and the victim, in addition to inserting the game character into a situation where he can perceive the severe consequences resulting from the act in the environment of public services.

Then, the targets of the cognitive domain were defined, focusing on strengthening the bases of the critical analysis (reflection) to be made by the player. Therefore, the following goals were defined: REMEMBERING the concept of prevarication crime (first level of Bloom's taxonomy), UNDERSTANDING the type of penalty imposed in these cases (second level of Bloom's taxonomy) and UNDERSTANDING why prevarication crime can only be committed by an agent public (second level of Bloom's taxonomy).

Thus, the game prototype, "The Prevarication Land"<sup>1</sup> appears. The narrative unfolds in a city plagued by pervasive corruption practices, as depicted in Figure 8. The player is immersed in a hospital setting, where they witness numerous instances of misconduct and observe the direct detrimental effects on providing public healthcare services.

The game employs a straightforward gameplay mechanic in which the main character navigates the hospital's interior while performing air conditioning maintenance, as illustrated in Figure 9. The character interacts and engages in dialogue with citizens and staff members through this mechanic. During these interactions, the character frequently raises awareness among the staff about the suffering and needs of the patients. However, the character often encounters difficulties being heard and understood by the public officials they encounter.

As the adventure progresses, the player is confronted with a pivotal moment that requires them to make a challenging decision. They must choose between ignoring everything they have witnessed and continuing to perpetuate the status quo or taking a stand and filing a formal complaint to hold those involved accountable. This choice presents an ethical dilemma, forcing the player to reflect critically on the boundaries between personal inaction and the pursuit of justice.

This aspect of the game prompts players to question their moral compass and their role in addressing corruption and upholding societal values. It creates an immersive experience that encourages players to contemplate the implications of their decisions and the potential impact they can have on combating corruption within the game's narrative.

The technology used to design the prototype, the RPG Maker MX (game engine), enables the creation of digital games in the simple and intuitive RPG (Role-Playing Game) style. The game presents scenes and dialogues that seek to develop the player precisely the flow proposed in the Endgame for Corruption Framework: establishing propitious scenarios for reflection generated by nonconformity, followed by critical analysis based on knowledge defined in the cognitive domain. And finally, leading the player to have new perspectives that, until then, he did not have on the theme portrayed in the Game.

## 6 Evaluation

In this research, the artifact was analyzed from the assessment of the game prototype using a

<sup>1</sup><https://jocom.uniriotec.br/games/preva>



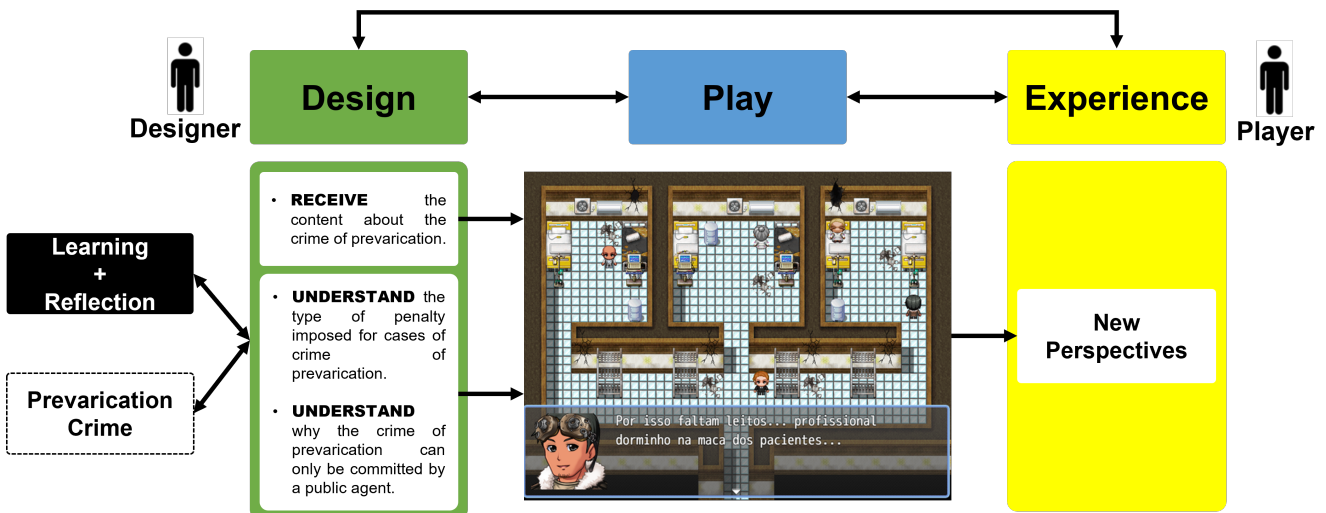


Figure 7. EgC demonstration from prevarication game.



Figure 8. City setting depicted in "The Prevarication Land".



Figure 9. Gameplay demonstration.

quasi-experimental study (Campbell and Stanley, 2015), following the steps: 1) definition, 2) planning, 3) execution, 4) analysis, and; 5) conclusion. According to these authors, quasi-experimental studies are part of a class of empirical studies that are less controlled than classic experiments. So, there is no need for randomness in the selection of participants. However, these studies require the rigor of planning, execution, and analysis, just like traditional (Cook et al., 2002; Campbell and Stanley, 2015) experiments.

### 6.1 Study Definition

The **definition of a study** intends to present the research objectives within a specific context. In this study, we used the GQM approach (Goal-Question-Metric) (Basili, 1992) to make the definition presentation clearer and more organized. Thus, the research (Goal) is described as **Analyzing** "The Prevarication Land" game prototype **for the purpose of** evaluation **concerning** Endgame for Corruption Framework (affective [AD], cognitive [CD], nonconformity [INC], critical analysis [CA] and experience game [GE]) domains; **from the perspective** of Brazilian players/citizens; **in the context** of crimes of corruption.

In GQM, the study focuses on answering research questions (Question) which in this study are: (Q1) What

were the participants' perceptions regarding affective, cognitive, nonconformity, critical analysis and game experience domains while playing the Game? and (Q2) How did the dimensions of affective, cognitive, nonconformity, critical analysis and game experience domains relate?

The metrics (Metrics) are descriptive statistical measures such as means, modes and medians calculated from the quantitative analysis of the participants' answers, described on a Likert-type scale. In addition, a qualitative study was also performed on the participants' discursive responses to answer the research questions.

### 6.2 Study Planning

A **planning** of a scientific study needs to contain all the necessary details so that other scientists can understand and replicate it. Thus, it is essential to explain who the participants were, the study steps, the instrumentation for data collection, the type of analysis performed and how validity threats were mitigated.

The **participants** (players) were selected for convenience through an invitation on social media and e-mail lists posted on the Internet. All participants are ordinary Brazilian citizens who have already experienced or

know people who have already experienced the situations presented in the game within the context of public services. All participants agreed to participate in the study by stating this in a free and informed consent form (IC). No information about the participants' profiles that led to their identification was collected. Therefore, the survey can be characterized as an opinion survey on the use of a technology tool, not requiring analysis by a research ethics committee, according to CNS 510/2016<sup>2</sup>.

The **planned steps** were four, namely: 1) Presentation of the research and completion of the IC (3 minutes); 2) Data collected for analysis of the players' profile (2 minutes); 3) Execution of the Game (10 minutes) and; 4) Response to the game perception and evaluation questionnaire<sup>3</sup> (5 minutes). The entire study was designed to run, on average, in 20 minutes.

The **instrumentalization** of the study included a questionnaire (Table 2) based on MEEGA+ model (Petri et al., 2019) items, allowing the analysis of participants' profile and the dimensions of affective, cognitive domain and game experience (38 items). As suggested in MEEGA+, the questionnaire items followed a 5-position Likert-type scale, ranging from -2 (completely disagree) to 2 (completely agree). Other items were added to allow the analysis of non-compliance and critical analysis (reflection) caused by the players based on the situations presented during the gameplay (19 items). Finally, a discursive question about perceptions, criticisms and suggestions was optionally available to the participants.

For **data collection**, the electronic Microsoft Forms were used, and the responses were stored in Microsoft Excel 365. The collected data were analyzed quantitatively and qualitatively. Data treated quantitatively were processed using software R Statistics 4.0.1 and summarized using Microsoft Excel. Data were summarized in tables and graphs, allowing a simplified interpretation. In contrast, the qualitatively analyzed data were treated in the Atlas.ti software. All information was extracted and processed from participants' responses<sup>4</sup>.

### 6.2.1 Validity Threats

In rigorous scientific research, reflecting on the observed results' validity is essential. Therefore, it is necessary to identify the threats the study suffers to the detriment of its project and seek alternatives to mitigate them. There are four types of threats: completion, internal, construction and external (Creswell and Clark, 2017). This study presents the primary threats identified in Table 1.

## 6.3 Study Execution

The **execution** of the evaluation occurred online on June 22, 2022. It took place individually, in which **24 people** voluntarily participated in the study, as stated in the free and informed consent form available in the questionnaire. None of them attended the study more than once.

<sup>2</sup>[https://bvsmms.saude.gov.br/bvs/saudelegis/cns/2016/res0510\\_07\\_04\\_2016.html](https://bvsmms.saude.gov.br/bvs/saudelegis/cns/2016/res0510_07_04_2016.html)

<sup>3</sup>Questionnaire: [https://bit.ly/SBG22\\_QPrev](https://bit.ly/SBG22_QPrev)

<sup>4</sup>Data: [https://bit.ly/SBG22\\_DataPrev](https://bit.ly/SBG22_DataPrev)

**Table 1.** Threats to validity

Type	Threat	Description	Treatment
Conclusion	The statistical power of the analysis method	It is related to using statistical methods that could reach wrong conclusions.	Scales and statistical methods more consistent with the metrics were selected and applied
	Violation of assumptions of statistical methods	Wrong use of the statistical tests to data that could not be evaluated with them	Use of statistical methods consistent with the scale and characteristics of the data sample.
	Bias in data selection	Favoring of data by researcher	The data used have been published so that others can repeat the analysis.
Internal	Lack of training	It happens when participants do not know how to operate the study object	To lessen the threat, Gather was used in previous classes to get the students into the environment.
	Participant wear	This influence the participant behavior in studies that demand hard effort	Assessments are designed to be completed in 120 minutes.
Design	Research expectations	Influence of researchers above participants in a conscious way or not.	We planned the study so that the researcher did not communicate with participants, except in issues related to analysis objectives. Also, we designed the task execution to be performed in a self-sufficient way for participants.
	Instrumentation	It happens when the study instruments are not adequate.	We used game evaluation questionnaires that were already used in previous research. Additionally, we made a reliability verification as the first analysis to guarantee the reliability and validity of participants' answers.
External	Planning	Use of reproducible methods.	To lessen this threat, the assessment was planned considering the design definitions of quasi-experimental studies Campbell and Stanley (2015)
	Generalization	It consists of generalizing the study results to a population bigger than the study participants.	We treated it using distinct participants' profiles. Every one of them is a Brazilian citizen, but each has different demands and life contexts.

## 6.4 Quantitative Analysis

Quantitative data analysis intends to present a numerical representation of the phenomenon observed in the research. In this study, the quantitative analysis relied on descriptive and inferential statistical methods to outline a panorama of the participants' responses and analyze the hypotheses related to Endgame for Corruption Framework.

### 6.4.1 Participants' Profile

Regarding the profile of the 24 participants (Table 3), the predominant characteristic could be observed as being: men (66%), aged between 21 and 40 (60%), with completed graduation (25%) or post-graduation (MBA, master or doctorate) (29%), who play some game daily (29%).

Among the primary environments where the participants play, it was observed that most of them prefer to play on smartphones (83.3%), followed by computers (66.6%), and only 37.5% pointed out the preference for consoles. This may indicate that the public uses games on mobile devices to pass the time and can often use them outside their residence as a distraction or entertainment.

**Table 2.** Questionnaire items

Category		Code	Description	
Game Experience	Affective Domain	Usability	USB01	The game's design is attractive..
			USB02	The texts, colors and fonts match and are consistent.
			USB03	Learning to play this game was easy for me.
			USB04	I think most people would learn to play this game pretty quickly.
			USB05	I consider the game to be easy to play.
			USB06	The rules are clear and understandable.
			USB07	The fonts (size and style) used in the game are legible.
			USB08	The colors used in the game are understandable.
			USB09	The game protects me from making mistakes.
			USB10	When I make a mistake, it is easy to recover quickly.
	Reliability	CONF01	When I first looked at the game, I had the impression that it would be easy.	
		CONF02	The content's organization helped me be confident that I would learn from this game.	
	Challenge	DES01	This game is suitably challenging for me.	
		DES02	The game offers new challenges (offers new obstacles, situations or variations) at a good pace.	
		DES03	The game does not become monotonous in its tasks (repetitive or tedious tasks).	
	Satisfaction	SAT01	Completing the game's tasks gave me a sense of accomplishment.	
		SAT02	It is due to my effort that I can advance in the game.	
		SAT03	I feel satisfied with the things I learned in the game.	
		SAT04	I would recommend this game to my colleagues.	
	Fun	DIV01	I had fun with the game.	
		DIV02	Something that happened during the game (game elements, competition, etc.) made me smile.	
	Focused Attention	AF01	Something interesting at the start of the game captured my attention.	
		AF02	I was so involved in the game that I lost track of time.	
		AF03	I forgot about my surroundings while playing this game.	
	Relevance	REL01	The game content is relevant.	
		REL02	It is clear how the game's content relates to real situations.	
		REL03	Play is a suitable teaching method for learning about real-world situations.	
		REL04	I would rather learn with this game than another way (another method).	
	Short-term Learning	ACP01	The game contributed to my learning about prevarication crime.	
		ACP02	The game allowed me to identify prevarication situations during gameplay.	
		ACP03	The game was efficient for my learning compared to other information and news (newspapers, social media, etc.).	
	Learning Goals	OPA01	The game helped to learn a little more about corruption crimes in Brazil.	
		OPA02	The game allows me to REMEMBER the concept of prevarication crime.	
		OPA03	The game manages to EXEMPLIFY prevarication crimes.	
		OPA04	The game contributed to LEARNING about the punishment for people framed for prevarication crimes.	
		OPA05	The game helped me to UNDERSTAND that public agents only commit prevarication crime.	
		OPA06	The situations in the game led me to REFLECT on corruption crimes.	
		OPA07	In general, the game contributed to my learning about corruption, particularly prevarication crimes.	
	Critical Thinking (Reflection)	RF01	I recognized everyday situations at a public hospital..	
		RF02	Infrastructure problems compatible with the reality of a public hospital are presented.	
		RF03	Professionals with undesirable behavior but compatible with the day-to-day life of a public hospital are presented.	
		RF04	Patients and their daily problems at a public hospital are presented.	
		RF05	Examples of precarious work situations at a public hospital are presented.	
		RF06	Situations of denunciation of the lousy performance of the public service are presented.	
		RF07	I could identify situations of prevarication.	
RF08		I was led to reflect on the problems and situations presented.		
RF09		The game made me reflect on the relationship between the precariousness of the service and corruption.		
Nonconformity	INCONF01	The setting of the game caused nonconformity.		
	INCONF02	The delay in providing care within the hospital caused nonconformity.		
	INCONF03	The lack of help for an older adult in the hospital caused nonconformity.		
	INCONF04	The extent of patients' lines at the hospital caused nonconformity.		
	INCONF05	The nurse's humanitarian care and dedication caused nonconformity.		
	INCONF06	Hospital professionals sleeping in beds that would be dedicated to patients caused nonconformity.		
	INCONF07	The small number of beds available and broken devices caused nonconformity.		
	INCONF08	The response from the hospital security guards caused nonconformity.		
	INCONF09	Complaining to the Public Prosecutor's Office caused nonconformity.		
	INCONF10	Observing the unfolding of the complaint caused nonconformity.		

**6.4.2 Reliability and Validity Questionnaire**

It is expected that in studies based on the participants' perception from the analysis of responses in the questionnaire, the reliability and validity of the data collection instrument are confirmed before the hypotheses and research questions are analyzed. Reliability aims to investigate the reproduction of results, indicating data coherence, and validity seeks to explore whether the questionnaire measures what it was designed to measure (Souza et al., 2017).

Many studies measure the reliability of questionnaires using internal consistency, that is, whether the subparts of the questionnaire measure the same characteristics as the whole. For this, Cronbach's Alpha is customarily used, in which values greater than 0.7 indicate satisfactory

reliability. Some works suggest that, in exploratory research cases, the alpha value = 0.6 can also be considered satisfactory (Cronbach, 1951). Thus, as this research is an exploratory study, the value of 0.6 for alpha will be considered satisfactory for the reliability of the questionnaire. Another measure of internal consistency is the item-total correlation, which analyzes an item individually, verifying whether it has a relationship with the other items in the questionnaire. In this measure, values above 0.3 (medium and large correlations) are expected to be observed (Souza et al., 2017).

The most relevant techniques to analyze the convergent validity of questionnaires include confirmatory factor analysis (CF), average variance extracted (AVE) and composed reliability (CR). The confirmatory factor analysis generates factor loadings that indicate that there are points



**Table 3.** Participants' profile

	Genre	Male	Female	Others	Total
		16	7	1	24
Age	18 a 20	1	0	0	1
	21 a 30	5	3	0	8
	31 a 40	7	2	1	10
	41 a 50	2	1	0	3
	51 a 60	1	1	0	2
	Above 60	0	0	0	0
Education	High School	2	0	0	2
	Technical School	1	0	0	1
	Graduate	6	2	1	9
	MBA	0	1	0	1
	Master Degree	4	2	0	6
	Doctorate Degree	3	2	0	5
Game Frequency	I have not been playing	3	1	0	4
	Daily	7	0	0	7
	Semanaly	5	2	0	7
	Mensaly	1	4	1	6
Game-preferred Environment	PC	11	4	1	16
	Smartphone/Tablet	12	7	1	20
	Console	8	0	1	9

in common among an item of the questionnaire and the others. For an item to be valid, its value must be above 0.5. The average variance extracted measures the proportion of the variance of a group of items (category) concerning the questionnaire. Like the CF, the AVE value needs to be above 0.5 to be considered valid for the questionnaire. Finally, the composite reliability validates the internal consistency of the questionnaire, and values above 0.7 are recommended for a subgroup to be considered valid (Souza et al., 2017).

With that in mind, Table 4 shows the result of the reliability and validity analysis of the questionnaire. It presents the categories grouped according to the Endgame for Corruption Framework; the analyzed variable; the variable code; the percentage of responses in each item; descriptive statistics considering the weighted mean, standard deviation, mode and median of responses; internal reliability with Cronbach's Alpha, item-total correlation and convergent validity with AVE, CR and CF.

It is possible to observe in the alpha analysis that all the observed categories presented a reliability between good and excellent (excellent: AD = 0.93 and CD = 0.91; good: INC = 0.88 and CA = 0.84) and excellent general reliability (GE), with alpha = 0.96. This measure indicates that the questionnaire presented good reliability about the categories and as a whole. However, when analyzing the questionnaire individually, some of them did not show good reliability, such as fun (0.11 - unacceptable), reliability (0.33) and challenge (0.58). For these variables, item-total correlation values were observed, and many indicated a very low correlation (value below 0.3), which could mean that the item may not make sense in the questionnaire.

The same behavior happens when analyzing the convergent validity. It is possible to analyze by the average variance extracted (AVE) that the vast majority presented values above 0.5, except for fun (0.17), challenge (0.38) and reliability (0.23). When analyzing the factor loadings (FL), it is noticed that the items that make up these variables are mostly below the value of 0.5, indicating their answers are invalid and could make no sense to the questionnaire. Finally, the composite reliability (CR) also showed reliable values for most items (above 0.7), except for fun (0.21), challenge (0.62) and reliability (0.36).

As this work is an exploratory study, it was decided to maintain the dimensions of fun, challenge and reliability in model analysis. However, it is understood that they should be better addressed and treated in new versions of the artifact. Hence, the qualitative survey analyzes possible causes that point to the low values in these variables. Finally, for the analysis of the model, it is considered that, in general, the questionnaire presents reliable and valid data, being able to proceed with the study of the research questions.

#### 6.4.3 Participants' Perception about EgC Categories

By observing the descriptive statistics in Table 4, it shows that the weighted mean, mode and median present, in most items, values above 0. Considering the Likert-type scale used in the questionnaire, these values indicate that the participants agreed with the statements of the items (values between 1 – agree – and 2 – totally agree). This conclusion is more evident in Figure 10, where the variations of the participants' answers in boxplots are presented, being possible to observe that in all categories, the median (central line) is above the zero value (neutrality).

To confirm this participants' perception, data analysis was performed using inferential statistics to analyze the hypotheses:  $H0_{(alternative)}$ : The participants had positive perceptions concerning the cognitive, affective, nonconformity, critical analysis and game experience domains;  $H1_{(null)}$ : The participants did not have positive perceptions regarding the cognitive, affective, nonconformity, critical analysis and game experience domains.

From this, the sample normality test is the first analysis to determine which hypothesis test is most indicated. In this study, as the data sets are below 30 participants, the most suitable test for analysis is the Shapiro-Wilk (Asadoorian and Kantarelis, 2005) test. It can be noted that in Table 5, the categories do not follow the normality behavior ( $p\text{-value} < 0.05$ ) and, therefore, the most indicated test to analyze the hypotheses is the Wilcoxon test.

Analyzing the Wilcoxon column, it is noticeable that all values are below 0.05. Due to this, it is possible to say with at least 95% certainty that the alternative hypothesis can be accepted. Consequently, we should say that there is evidence that the game was able to teach the players (DC), sensitizing them (DA), leaving them dissatisfied (INC) and making them reflect (AC) on the theme addressed and providing them with a good gameplay experience (EJ).

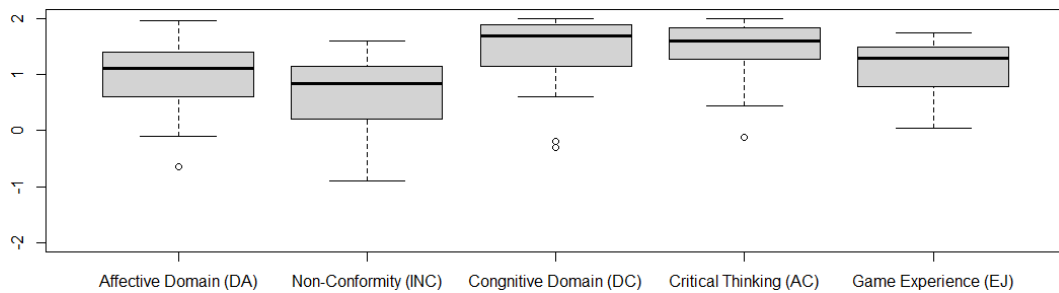
Thus, in general, it is considered that Endgame for Corruption Framework enabled the design of a game that managed to make players learn, reflect and become immersed in a topic related to corruption in a simple way. Although, there are variables to be dealt with, such as fun, challenge and reliability concerning the game prototype.

#### 6.4.4 Correlation among EgC Categories

The correlation analysis between the categories is vital because it identifies how each relates to the other. For this, correlation tests were performed among them. Since it was

**Table 4. Questionnaire Reliability Analysis**

Category	Variable	Items	Percentage					Descriptive Statistics				Questionnaire Reliability					
			P-2	P-1	P0	P1	P2	Weighted Average	Standard Deviation	Mode	Median	Internal Consistency Alpha	Item-Total	Convergent validity AVE CR		CF	
Affective Domain (DA) (Alpha = 0.93)	Focused Attention	AF01	21%	8%	29%	21%	21%	0.13	1.42	0	0	0.73	0.77	0.67	0.83	0.79	
		AF02	13%	13%	25%	25%	25%	0.38	1.35	0	0.5		0.80			0.89	
		AF03	0%	0%	4%	17%	79%	1.75	0.53	2	2		0.50			0.49	
	Fun	DIV01	25%	13%	21%	17%	25%	0.04	1.55	-2	0	0.11	0.18	0.17	0.21	0.25	
		DIV02	4%	8%	17%	50%	21%	0.75	1.03	1	1		0.18			0.25	
	Challenge	DES01	13%	13%	46%	13%	17%	0.08	1.21	0	0	0.58	0.62	0.38	0.62	0.73	
		DES02	4%	29%	25%	13%	29%	0.33	1.31	-1	0		0.60			0.65	
		DES03	0%	17%	13%	38%	33%	0.88	1.08	1	1		0.34			0.33	
	Trust	CONF01	0%	8%	25%	25%	42%	1.00	1.02	2	1	0.33	0.35	0.23	0.36	0.45	
		CONF02	21%	13%	42%	13%	13%	-0.17	1.27	0	0		0.35			0.45	
	Relevance	REL01	0%	4%	0%	25%	71%	1.63	0.71	2	2	0.82	0.60	0.56	0.83	0.58	
		REL02	0%	4%	8%	21%	67%	1.50	0.83	2	2		0.87			0.94	
		REL03	0%	8%	13%	21%	58%	1.29	1.00	2	2		0.75			0.76	
		REL04	0%	4%	4%	21%	71%	1.58	0.78	2	2		0.66			0.65	
	Satisfaction	SAT01	8%	13%	25%	25%	29%	0.54	1.28	2	1	0.79	0.62	0.52	0.81	0.61	
		SAT02	0%	4%	17%	25%	54%	1.29	0.91	2	2		0.76			0.78	
		SAT03	4%	4%	17%	29%	46%	1.08	1.10	2	1		0.82			0.86	
		SAT04	4%	4%	17%	42%	33%	0.96	1.04	1	1		0.61			0.60	
	Usability	USB01	4%	13%	13%	29%	42%	0.92	1.21	2	1	0.93	0.63	0.59	0.91	0.57	
		USB02	4%	8%	4%	38%	46%	1.13	1.12	2	1		0.71			0.65	
		USB03	0%	8%	8%	13%	71%	1.46	0.98	2	2		0.91			0.92	
		USB04	4%	4%	17%	21%	54%	1.17	1.13	2	2		0.82			0.82	
		USB05	4%	0%	17%	13%	67%	1.38	1.06	2	2		0.92			0.93	
		USB06	4%	0%	17%	13%	67%	1.38	1.06	2	2		0.77			0.77	
		USB07	0%	13%	0%	21%	67%	1.42	1.02	2	2		0.75			0.75	
		USB08	4%	4%	8%	25%	58%	1.29	1.08	2	2		0.83			0.81	
		USB09	0%	4%	17%	21%	58%	1.33	0.92	2	2		0.78			0.79	
		USB10	4%	0%	25%	17%	54%	1.17	1.09	2	2		0.72			0.72	
	Cognitive Domain (DC) (Alpha = 0.91)	Term Course Learning	ACP02	4%	4%	4%	17%	71%	1.46	1.06	2	2	0.67	0.63	0.56	0.70	0.72
			ACP03	0%	0%	21%	25%	54%	1.33	0.82	2	2		0.63			0.72
Learning Objectives		OPA01	4%	4%	4%	29%	58%	1.33	1.05	2	2	0.87	0.77	0.58	0.89	0.76	
		OAP02	0%	0%	8%	13%	79%	1.71	0.62	2	2		0.93			0.95	
		OAP03	0%	0%	8%	17%	75%	1.67	0.64	2	2		0.85			0.79	
		OAP04	8%	0%	8%	21%	63%	1.29	1.20	2	2		0.73			0.69	
		OAP05	4%	0%	4%	13%	79%	1.63	0.92	2	2		0.24			0.21	
		OAP06	4%	0%	4%	29%	63%	1.46	0.93	2	2		0.89			0.91	
		OAP07	0%	0%	13%	17%	71%	1.58	0.72	2	2		0.92			0.93	
		INCONF_01	0%	50%	17%	17%	17%	0.00	1.18	-1	-0.5		0.88			0.61	0.57
INCONF_02	0%	4%	21%	29%	46%	1.17	0.92	2	1	0.86	0.90						
INCONF_03	0%	8%	21%	21%	50%	1.13	1.03	2	1.5	0.84	0.89						
INCONF_04	0%	4%	17%	13%	67%	1.42	0.93	2	2	0.89	0.91						
INCONF_05	0%	8%	21%	4%	67%	1.29	1.08	2	2	0.82	0.84						
INCONF_06	0%	71%	8%	8%	13%	-0.38	1.10	-1	-1	0.40	0.32						
INCONF_07	0%	4%	13%	33%	50%	1.29	0.86	2	1.5	0.89	0.89						
INCONF_05.1	0%	4%	25%	33%	38%	1.04	0.91	2	1	0.79	0.77						
INCONF_09	0%	46%	17%	29%	8%	0.00	1.06	-1	0	0.41	0.28						
INCONF_10	0%	58%	13%	21%	8%	-0.21	1.06	-1	-1	0.32	0.25						
Critical Thinking (AC) (Alpha = 0.84)	Critical Thinking	RF01	0%	0%	0%	54%	46%	1.46	0.51	1	1	0.84	0.58	0.56	0.84	0.44	
		RF02	0%	0%	0%	42%	58%	1.58	0.50	2	2		0.61			0.49	
		RF03	0%	8%	17%	42%	33%	1.00	0.93	1	1		0.49			0.37	
		RF04	0%	0%	0%	33%	67%	1.67	0.48	2	2		0.70			0.68	
		RF05	0%	0%	0%	33%	67%	1.67	0.48	2	2		0.77			0.77	
		RF06	0%	0%	8%	29%	63%	1.54	0.66	2	2		0.55			0.56	
		RF07	4%	0%	0%	25%	71%	1.58	0.88	2	2		0.70			0.72	
		RF08	8%	0%	4%	17%	71%	1.42	1.18	2	2		0.82			0.88	
		RF09	13%	0%	8%	21%	58%	1.13	1.36	2	2		0.78			0.81	
<b>General Reliability (EJ)</b>											<b>0.96</b>						



**Figure 10. EcG variance categories.**

**Table 5. Categories Analysis**

Category	Weighted Average	Standard Deviation	Shapiro-Wilk (Normality Test)		Wilcoxon (Hypothesis Test)	
Affective Domain (DA)	1.014	1.061	4.33E-05	Non-Normal	4.94E-05	Accepted
Cognitive Domain (DC)	1.495	0.884	1.28E-02	Non-Normal	2.75E-05	Accepted
Non-Conformity (INC)	0.675	1.013	2.25E-03	Non-Normal	6.34E-04	Accepted
Critical Thinking (AC)	1.449	0.776	4.23E-02	Non-Normal	2.15E-05	Accepted
Game Experience (EJ)	1.099	0.980	1.24E-03	Non-Normal	1.94E-05	Accepted

already known that the category data does not follow normal behavior, the most indicated correlation test is the Pearson (Benesty et al., 2009) test.

Figure 11 shows the observed correlation measures. It is possible to see that almost all categories have a medium to a large degree of correlation – medium correlation: DA and INC (0.47); high correlation: DA and DC (0.70), DA and AC (0.75), DA and EJ (0.93), INC and DC (0.59), INC and AC (0.66), INC and EJ (0.71), DC and AC (0.87), DC and EJ (0.87) and AC and EJ (0.90). These figures show a strong correlation between the categories proposed for the model.

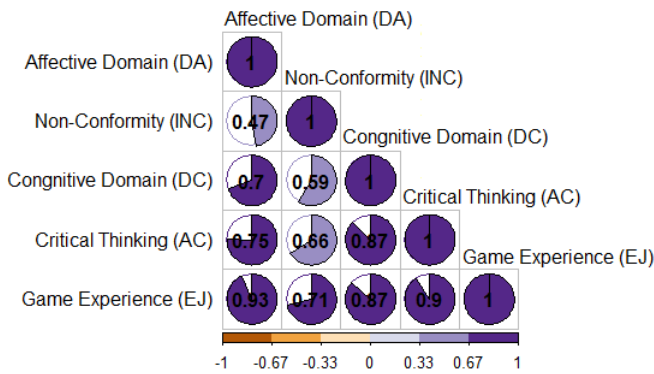


Figure 11. Correlation among EgC categories.

When we analyzed the correlation, we observed certain connections among the EgC categories, and from this, we could define some dependency hypotheses among them (Figura 5): H1 - DA influenced INC; H2 - DC influenced AC; H3 - INC influenced AC e; H4 - AC influenced EJ. To evaluate these hypotheses, we used the Structural Equation Modeling (SEM) technique, often used to explain the relationship among variables in a model (Ullman and Bentler, 2012).

Figure 12 shows the result of the SEM analysis. In the figure is possible to observe that p-values indicate the hypotheses acceptance or not; the determination coefficient (R<sup>2</sup>) indicates the variance or percentage of use of the variable in the model, and the standard coefficient ( $\beta$ ) shows the level of interference of a variable above other.

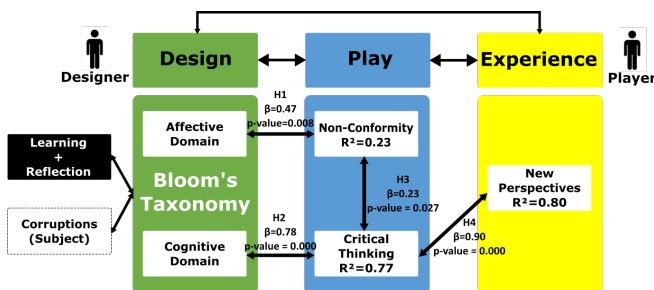


Figure 12. Correlation among EgC categories.

Based on this, it can be seen that all hypotheses can be accepted (because all p-value are smaller than 0.05). Consequently, it is possible to state with at least 95% confidence that: H1 - DA influenced INC (p-value=0.008); H2 - that DC influenced AC (p-value=0.00); H3 - INC influenced AC (p-value=0.027) and; H4 - AC influenced EJ (p-value=0.00).

Therefore, it is concluded that there is evidence that the

proposed categories, with the alteration of the DPE framework, correlate and influence each other and maybe a viable path for the design of serious games that help players think about issues related to corruption while providing the player with a good gameplay experience.

### 6.5 Qualitative Analysis

The qualitative data analysis is made by interpreting discursive participants’ answers. In this work, we used this kind of analysis to examine the participants’ perceptions of the game prototype and evaluate if the correlation among the EgC’s categories makes sense. Moreover, these analyses were vital because they allowed us to observe evidence of the reason for the negative perceptions regarding the fun, challenge, and reliability during the gameplay. For qualitative analysis, we used the software Atlas.ti for codification, creating groups and citation networks overhead participants’ answers.

Figure 13 shows the relations of the framework. However, after analyzing the responses, we could observe that there is a relation in which the affective domain and the cognitive domain influence the game experience directly <sup>5</sup>.

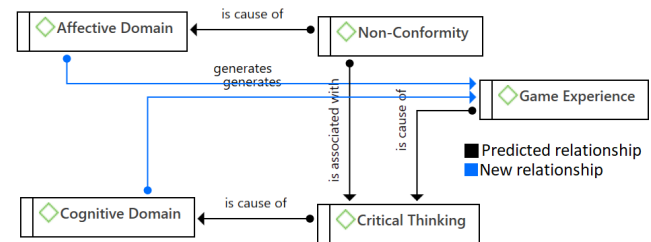


Figure 13. Qualitative relationship among the framework’s categories.

Regarding the relationship between the affective domain and game experience, certain participants expressed their thoughts as follows: “The music creates a climate that matches the feeling of each location in the game” (Participant 13) and “[...] very direct accusations can lead to the player’s lack of empathy with the game if he has a relative or acquaintance in that position” (Participant 10). These statements highlight that the affective domain significantly enhances immersion in the game experience and vice versa.

Furthermore, we observed participants’ responses that shed light on the relationship between the cognitive domain and game experience. For instance, Participant 23 remarked, “This type of game could be applied in companies to learn the code of ethics and conduct”, while Participant 5 noted, “[...] it is a different way of learning”. These comments indicate that some participants perceive games as valuable tools for promoting awareness and facilitating learning.

Accordingly, in addition to the relations pointed out in the quantitative analysis, when analyzing the characters’ responses, it is possible to observe an implicit connection among the affective, cognitive, and game experience domains, culminating in a design-experience relation

<sup>5</sup>This was also followed in the quantitative correction analysis, where DA and EJ have a strong correlation of value 0.93, and DC and EJ have a strong correlation of value 0.87

considering the DPE. What makes sense if you analyze that nonconformity and critical analysis are intermediate relations among these categories, acting directly on the DPE dimension play.

In analyzing the reliability, fun, and challenge variables, several negative quotes were observed (with one, three, and two quotations, respectively). These quotes shed light on the underlying reasons for the low agreement among participants.

Regarding reliability during gameplay, it has been reported that there is a lack of a straightforward learning process and an unclear learning curve. The game's purpose and what the player is supposed to learn are not evident. Many crucial aspects are not effectively conveyed during gameplay, necessitating clear communication through other game elements. Consequently, this ambiguity undermines the clarity of the player's actions, leaving them uncertain about their progress and the tasks that still need to be completed.

For instance, the 8th Participant expressed their perspective by stating, *"We don't know what the game is about, so we're not learning anything along the way! Only at the end the 'lesson' is given. These things must appear in the game mechanics (Procedural Rhetoric) and not be said to the player"*. This feedback highlights the need for improved reliability and clarity within the game. It suggests that essential elements, such as the game's objectives and lessons, should be woven into the game mechanics, utilizing techniques like Procedural Rhetoric rather than relying solely on explicit instructions to the player.

Regarding fun, several participants expressed that the game lacks variety in dynamics, making it monotonous. There is a limited range of activities to engage in, collectibles or discoveries to be made, and an excessive amount of text to read. As mentioned in relation to reliability, the absence of procedural rhetoric, where the game mechanics and other elements effectively convey the message, leads to a lack of diversity and monotony in gameplay. The following responses exemplify these concerns: Participant 13 stated: *"I believe that within the level, there could be more things to collect or find, to make it more dynamic."* Participant 8 noted, *"In general, there is a lot of speech and little procedural rhetoric. This is a typical problem of educational games."* (8th Participant). And, Participant 7 commented *"[...] I found that there is too much text to read."*

These remarks underline the need for improvement in terms of gameplay enjoyment. To address this, it is crucial to introduce more interactive elements such as additional collectibles or discoveries to heighten the overall dynamism of the game. Additionally, finding a balance between informative text and engaging gameplay elements will help alleviate the issue of excessive reading, ensuring a more enjoyable and immersive gaming experience.

When considering the challenges presented in the game, participants primarily expressed dissatisfaction due to certain game actions not directly aligning with its purpose and a lack of diverse mechanics. As a result, the gameplay often becomes monotonous, leaving players feeling like spectators within the story, merely traversing the scenarios

without actively engaging in concrete actions. The following participants' responses exemplify these concerns: The 8th Participant remarked, *"The game doesn't offer a challenge... it is to click on the air conditioner. Air conditioners are, in practice, a McGuffin, an object that is there but not necessary. It is just there for you to walk around and observe things in the hospital."* Additionally he said, *"Where is the 'epic' in your game? Where do we feel good (proud, etc.)? I don't see those emotions in the game. I don't see any difficulty."*

Finally, this qualitative analysis contributed to analyzing, confirming, and discovering aspects related to framework categories and identifying possible gaps in the proposal. The main ones are related to challenging, fun, and reliability, essential elements to cause the player's immersion, requiring a reflection on how to attack them within the EgC categories.

## 7 Discussions

This section aims to discuss the results found in the quantitative and qualitative analyzes contained in this work, relating them to the conjectures and hypotheses for evaluating the artifact present in the research instance of the DSR Model of the Subsection 2.1.

In addition, it is also part of the scope of this section to highlight the notable positive aspects concerning the Endgame for Corruption Framework in terms of the Participant's perception and the relation among the categories of the proposal, also describing the possible causes for the unsatisfactory results, such as the dynamics monotonously and poverty observed in the prototype "The Prevarication Land".

The EgC proposal has demonstrated its effectiveness in creating serious games that facilitate an understanding of corrupt practices and foster reflective environments. The positive results indicate that the framework enabled players to learn and engage in meaningful reflection. The quantitative analyses, including the Wilcoxon hypothesis test, provided evidence of the prototype's impact on players, evoking emotions of nonconformity and guiding them towards a scenario of reflection, all while maintaining a satisfying gameplay experience. These findings highlight the success of the EgC proposal in achieving its objectives.

The correlation between the constituent categories of the Endgame for Corruption Framework demonstrates their direct influence on each other, resulting in the intended flow of the game. The designs rooted in the affective and cognitive domains evoke feelings of nonconformity and promote critical analysis during gameplay, respectively. This dynamic ultimately leads to new perspectives and insights as part of the game experience. The qualitative analysis further supports this correlation, as player feedback highlights the significant impact of the affective and cognitive domains on the game experience. Nonconformity and critical analysis serve as key interfaces within the "PLAY" stage, working in tandem to achieve the framework's goals.

The production of immersive and interactive games has

shortcomings, highlighted by the negative results observed in the variables of reliability, fun, and challenge. It is important to note that these shortcomings are likely a result of not fully addressing the other layers of the Design Play and Experience (DPE) framework during the adaptation of the Endgame for Corruption (EgC). This is reflected in the prototype “The Prevarication Land,” where there is a strong emphasis on the learning layer but a lack of attention to the ludicity of mechanics and aesthetics. Critical comments regarding excessive speech and the limited presence of procedural rhetoric underscore the need for a more balanced approach in future iterations.

We believe that serious games developed using the Endgame for Corruption (EgC) Framework have the potential to facilitate knowledge acquisition and reflection on the topic of corruption. EgC has demonstrated its effectiveness in creating an experiential learning process by raising awareness, fostering nonconformity, and promoting critical thinking. This aligns with the Theory of Experiential Learning, which suggests that individuals learn by critically analyzing real-world problems, experiences, and emotions. The framework encourages reflective behavior and the development of new perspectives, leading to the generation of innovative solutions. By engaging players in an immersive and interactive experience, EgC empowers individuals to act as informed and conscientious citizens, contributing to the fight against corruption and pursuing a more just society.

Additionally, it is essential to note that enhancing aspects related to entertainment and incorporating engaging gameplay mechanics can effectively address the challenges, fun, and reliability issues. This improvement potential of the EgC Framework opens up possibilities for designing games that captivate players and facilitate their understanding of public sector processes and their engagement in combating corruption.

In conclusion, the evidence gathered suggests that the EgC Framework can support the design of serious games that promote systematic thinking about corruption issues. However, it is acknowledged that further improvements to the framework are necessary, as well as the need for future evaluations through the development of new serious games centered around corruption-related subjects.

## 8 Final Considerations and Future Works

Intending to strengthen the figure of the citizen as a State inspector through the use of digital games and planning to remove him from the inert situation in a scenario where corruption makes him the primary victim, this article presented an adaptation of the DPE framework incorporating the reflection process as a way to find solutions for the game’s design aimed at learning and reflection on the subject of corruption.

The viability of the game’s development was observed from the prototype “The Prevarication Land” incorporating elements of the cognitive and affective domain that would allow the player to reflect on the problem during his

gameplay experience. When evaluated by the quasi-experimental study, from the study participants’ perception, it was possible to observe evidence that the proposal to include elements of reflection in the DPE generated nonconformity in the players regarding the situation of presented corruption. This nonconformity influenced them to analyze the situation very critically.

The results obtained from this research mark a notable advancement in serious game development, particularly due to the scarcity of references available concerning the systematic design of educational content in games targeted at addressing corruption. Moreover, the endeavor to foster critical thinking and reflective analysis among citizens regarding the quality of public services and their response to everyday irregularities holds significant advantages for the population. By increasing awareness of their rights, individuals become empowered to demand improvements and actively participate in the pursuit of more effective public services. This progress is crucial for collective well-being and for establishing a more engaged and enlightened society.

However, it is possible to point out the limitations of the study. Improving the player experience concerning the game mechanics is necessary for being a prototype. It presents the situations only through aesthetics and narrative, but we consider part of the procedural rhetoric to communicate the game messages through the player’s implicit actions. Moreover, the prevarication situation was designed according to the citizen’s views. In this sense, it is also necessary to take the service provider’s side and analyze the problem so that the game does not present biased cases.

Thus, as a suggestion for future work, we intend to deepen the mapping between the learning objectives and the game elements in the other DPE layers, always relating them to the theme of corruption. Moreover, with the analysis of the questionnaires, we will pursue implementing improvements in future games that are produced involving corruption situations of Brazilian daily life, aiming at the subsequent evaluation of the developed artifacts since this article is an early part of an even more extensive work being produced based on Design Science Research.

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