Game Engine for Change (E4X), A Theoretical framework for Balancing the Intrinsic, Extrinsic, and Player States at the Heart of Game Design

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ABSTRACT

This paper introduces the E4X framework—a theory-informed model for designing persuasive and educational games aimed at changing players' interests, activities, and opinions beyond gameplay. By examining the interplay between play and non-play states and the dynamic roles of user and player, E4X reframes how interactive experiences can drive lasting change. The model synthesizes insights from communication, psychology, and game design to account for the ongoing transitions between intrinsic and extrinsic motivations and knowledge states. Grounded in the observation, development, and evaluation of over 50 such games across diverse domains, this work outlines practical strategies for designing and testing playful systems that target transformation. It concludes with a list of methods for testing this and related theories in game design. *E4X offers researchers and designers a novel lens for understanding and crafting experiences that extend their influence beyond the screen.*

Keywords

Game design, design frameworks, persuasive games, educational game design, social impact games, disinformation

INTRODUCTION

Much has been written about the potential of games and playful experiences to engage players in a myriad of topics. The domain of such work has evolved to cover several domains, such as computer games in specific educational contexts (Mayer, 2019), serious games (Laamarti et al, 2004), social impact games (Grace, 2019) and advergames (Cañete Sanz & De La Hera, 2023). It's also the basis for more specific topics such as persuasive games (Bogost, 2010) and newsgames (Sicart 2009). All of these games and playful experiences generally apply the aim of changing the player's interests, activities or opinions through play. In marketing and allied terms this is commonly reference to as AIO data and is used for psychographic profiles.

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The foundation of these designs is typically informed by a variety of design theory informed by prior practices in game design, communication theory, or behavior modification. Notably theories and frameworks include Captology (Fogg, 1998), which focuses on the persuasive nature of software systems and Critical Design (Bardzell et al, 2012), which aims to use a kind of expectation transgression to change player affect. Among critical designers, the work of Dunne and Raby is perhaps most pointed in its design theory aimed at offering perspective on the ways in which designed objects and systems make claims about values in the everyday world (2024). Particularly in game design such theories are incorporated through varied implementations in games for change (Antle et al, 2014), Critical Game design (Grace, 2014), Transformational Games (Culyba, 2018) and in general efforts to create change in players through play employed in marketing and advergames.

Given the relative newness of digital games in particular, general communication theories have further been adapted for the unique situation of games and play experience. These theories typically blend psychology with the unique characteristics of designed communication. Because such work often predates the narrower design of digital game design, research in the domain often adapts general communication theory to the design context of games. Examples of such psychology-informed theories for persuasive intent include Narrative Transport Theory originating from the dramatic arts (Deighton, Romer, & McQueen, 1989) and novel writing (Gerrig, 1993), Social Learning Theory (Bandura and Walters, 1977) applied commonly to educational games (Turkay et al, 2014), and Flow Theory (Csikszentmihalyi and Bennet, 1971) widely applied to games aimed toward player engagement (Chen, 2007). A well-received contemporary implementation designed to prevent the spread of misinformation and disinformation, for example, adapts the concepts of inoculation theory (McGuire, 1961), to positive effect in games (Roozenbeek, Van der Linden, and Nygren 2020).

One way to interpret the parade of theory and practices is to consider a fundamental dichotomy between work that considers communication before digital interactivity and that which considers communication in the context of interactivity. That is, it's important to recognize that much of the early work in communication theory, and thus behavior change through media design, was proposed without a focus on the uniqueness of digital interactive media and its resulting dynamics. Logically what follows is a variety of work that sought to adapt theory and practice work toward the added dimension of interactivity. At the other end of the dichotomy is work that began with a focus on interactivity, sometimes informed by preceding communication and behavior change theory, but often and logically following prior research in one way, non-interactive, or broadcast communication.

This dichotomy would seem obvious if one were to consider the evolution of communication aimed to persuade as moving from broadcast models (e.g. theater, radio, television) toward interactive models (e.g. hypertext, websites, games, etc.). Such an evolution of course fails to recognize the wider history of such communication, ignoring for example that oral communication precedes all of these, and that oral communication is an interactive system in itself. Hence, as the evolution of playful digital interactive systems research and the aim to persuade through them evolved, work from researchers like James Paul Gee, aimed to pull from the history of linguistics and discourse (Gee, 2014) among others. The obvious history of such research needed not only to draw from theories that preceded Ivan Sutherland's seminal work in human computer interaction (1963) but also consider the ways in

which digital interactive experiences reframed the challenges and efficacy of interactive communication designed to change player's activities, interests and opinions (aka AIO). Hence Captology and other frames acknowledge the persuasive propensities of digital experiences.

While the research and application of these concepts has continued a trajectory of effective work in the domain, it may prove more fruitful to consider the interplay of communication theory, digital interactive design and the unique psychological state of play. The aim of this research is to provide a framework that supports an equitable and effective analysis and implementation of playful experience to drive change in players. Instead of considering the designed playful experience as a single element in the equation that results in changing players, it suggests a more complete equation to be balanced between player, designed experience, play state and non-play state. This is a blend of theory in psychologic, communication and game design.

PLAYER EXTRINSIC AND INTRINSIC STATES

Design research, across a myriad of disciplines, but often related to communication and applied in advertising, highlights the distinction between any persons' intrinsic and extrinsic values. It aims to help design and research seeking to understand behavior, interpret the difference between forces that shape AIO and behavior within a given context. In its simplest it is used to frame motivations, as a user that is intrinsically motivated is motivated from internal, self-governed impetus. In contrast, an external motivation drives the user behavior through outside forces, such as remuneration for effort or other motivations linked to uses and gratification theory (Weiyan, 2015). There are far more nuanced interpretations of this interplay of intrinsic and extrinsic motivations, but this fundamental dichotomy is a useful way to introduce the value and challenge to designing effective persuasive playful systems.

Intrinsic motivation frames often include self-motivated drives to play, such as the pursuit of joy that comes from engaging play. Extrinsic motivations might include having a game assigned as an alternative to a more traditional learning experience. The space between is inhabited by situations like engaging in a language learning game to acquire new skills, which may be valuable for communicating for a job or useful in preparing for a trip to a new country. In either, the motivational source dictates whether it is intrinsic or extrinsic. Such a frame incorporates some notions of self-determination theory. Those unfamiliar with self-determination theory (SDT) in games, may want to review the work of Richard M. Ryan, notably (Ryan et al., 2006) and the metanalysis of 110 SDT publications in games human-computer-interaction research (Tyak and Mekler, 2020) for deeper exploration.

The concepts of intrinsic and extrinsic can not only be applied to motivations, but also to knowledge sets within a system. This is a frame more commonly used in design, particularly of fictional experience and products. A reader of a piece of narrative fiction (e.g. a movie, book, etc.) reads with an external knowledge set informed by their years of experience preceding the reading activity. However, as they read, they engage in acquiring new knowledge produced as at least intrinsically valuable to experiencing the fiction. The names of characters and places within the fiction, for example, are common to the intrinsic knowledge set but may have limited use as extrinsic knowledge outside fan affinity communalities or popular culture. To better understand the dynamic design frame of intrinsic and extrinsic motivations, it would be useful to review both reversal theory as applied to product design (Apter, 2014)

and their core observations about meta motivational modes in art (Apter 1984). The psychological focus of reversal theory prove value in the frame of games as both product and art orbiting player AIO interests and motivations.

Essential to AIO changes is the notion that what was intrinsic, may become extrinsic for later experiences. This is the concept on which many exposure and experience theories are predicated. The user, player, or audience enters the designed experience with an extrinsic sense of a problem and its solutions, but the intrinsic experience within the game offers something new that may shape their extrinsic knowledge or motivation later. From a marketing ideal, once one sees the tantalizing image of a mass marketed hamburger, they will not only be extrinsically motivated to crave that food, but they will also internalize the feelings associated with acquiring that marketed object and even reframe their understanding of how good food should look. This same frame has been applied to innumerable playful experiences with games aiming to change players from such simplicities as craving specific candies through advergaming to such complexities as modifying interpersonal communication. Fundamentally, however, this work rarely considers these dynamics between the intrinsic and extrinsic states.

For players, intrinsic and extrinsic states are dynamic states. They are at constant interplay in much the way that feedback systems as a foundation of interactivity are also at play. There is not only a state for each, but they are analogous to the feedback loop used to describe the relationship of actor and audience, broadcaster and listener, or interactive systems. In much of the literature in this domain, the research fails to emphasize that players are perpetually balancing exposure to intrinsic motivations and knowledge sets in an experience.

To establish a logical understanding of the system, the player enters the designed experience with whatever external knowledge and motivation they had. These knowledge sets might be the expected outcomes for failing at the playful experience, the definition of what is good and bad within the given context, or the limitations to the system. In experiencing the designed system, the players are then perpetually testing those extrinsic expectations, informed by external knowledge acquired through a history of play and non-play experiences.

The new knowledge is thus produced through the intrinsic lessons learned through the experience. If a game defies convention for winning and losing, providing an unlimited number of lives for example, that is applied in an intrinsic knowledge set for this game. The player continues, adopting that intrinsic knowledge set and playing within the constructed environment's atypical, but acceptable, intrinsic rules.

However, it's important to note that the player is not wholly and irrevocably connected to the fiction of the world. Any user experience analysis, and games user research recognizes that in such experiences the player is also at least marginally aware of the extrinsic. They may be given infinite lives, but they may find more challenge in values to conserving those lives regardless of the lack of intrinsic penalty or benefit in doing so. The player often attempts to fit the new intrinsic knowledge produced with the external knowledge they hold. This is where conventional communication models fail to recognize the perpetual loop in playful interactions.

The ability to hold two conflicting knowledge sets, such as the idea that there are infinite lives in one game and not another, or that in the real world one may only have

one life, is a unique characteristic in this context. It affords the player the ability to engage in two kinds of realities at once. The reality of the fictional world and the reality of the non-fictional world. This is why intrinsic and extrinsic motivations become an essential element in balancing the equation of player impact. It is also why in practices like critical design, the tension of player expectation (aka extrinsic knowledge) and play experience (i.e. intrinsic experience) are so important. In such designs the player learns or is otherwise affected by the contradiction of extrinsic knowledge and intrinsic knowledge that creates a critical moment for reflection.

The player, much like a theater goer, or a novel reader is in a state. While in many media that state may be a relatively passive state of holding attention, maintaining a perpetual gaze, or of processing the many lines of an actor to interpret a narrative arc, the player is engaged in a perpetual state of play. Figure 1 describes a typical change-oriented communication design, demarcating an individual audience member, their transition to user of a system, the experience of a change aimed stimulus and a resulting change outcome. These discrete states are managed, controlled and evaluated as part of such research and practice. This is the conventional way, for example, to evaluate the efficacy of a change-oriented game intervention when comparing it to other types of media. A conventional research study might simply swap the change stimulus of a game for a video, a pamphlet or other media to compare efficacy.

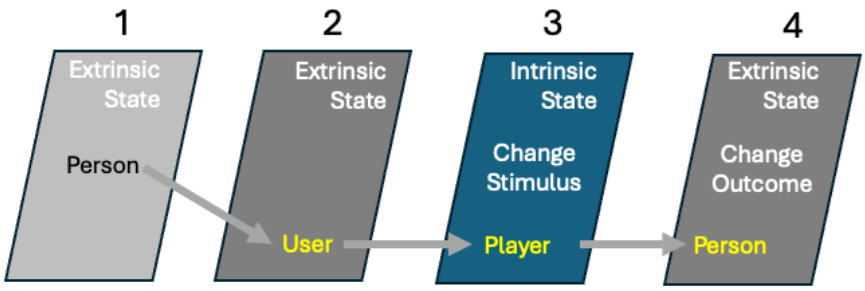

Figure 1: A diagram of traditional game-based design for change, which moves sequentially from target audience (1) to user state (2), to player state (3) with the aim of change outcome (4), as illustrated by the author.

The difference between the state of play and other states, however, is that it requires a balance of extrinsic and intrinsic motivations and perpetual re-engagement from between those states. In playful experiences, typically, nothing happens without the player motivating the experience of the fictive world. While a theatrical production may go on, a movie continues when one's gaze is averted, or a book may pause when one is not reading it, an interactive experience, particularly a playful interactive experience, needs the feedback loop of interactivity to propel it. The player character must be moved, the virtual farm must be tended to, the line must be guided to avoid the wall. Yet all of this is done under full knowledge that it is bound by an internal rule set that may have no bearing on the outside world.

That is, the motivations are both intrinsic, perpetuating the forces that keep the game and its fiction moving, and extrinsic, keeping the game going to remain in the state of play. Play itself is an *extrinsically informed intrinsic motivation*. That phrase is not accidental. Play is dependent on the contrast of non-play, of the existence of extrinsic contrast, to maintain it. Players understand play as contrasted to the non-play world but need that contrast to motivate insistence in the play state. This is why the balance of extrinsic and intrinsic motivation is more complex and more nuanced than in many other media. Play itself is perpetually acknowledging the balance of intrinsic knowledge with extrinsic knowledge, just as it's perpetually balancing intrinsic motivation and extrinsic motivation. The player knows they are being motivated intrinsically but willfully engage in the process identifying in-game intrinsic motivations and recognizing the external motivations they propel through wanting to play. They also hold two knowledge sets that are perpetually aware of each other, recognizing that play may have ended not only because they failed to keep the virtual car on the road, but because they really failed the feedback loop, hitting a button milliseconds late as an artifact of the external world (e.g. a distracting non-player, the inability of their finger to react in time or a delay in their digital network).

Figure 2 illustrates this basic dynamic between the extrinsic and intrinsic knowledge and motivations sets that are bound through the play state.

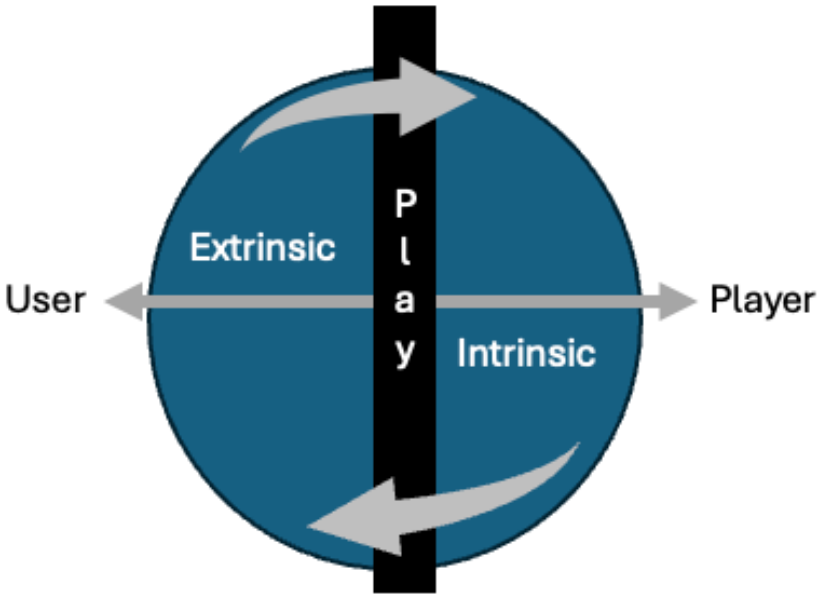

Figure 2: Illustration of the cyclical nature of extrinsic and intrinsic knowledge sets and motivations along a continuum of user and player states, bound by the play state.

From this constant interplay in play, the opportunity arises to synthesize new understandings. The tensions, not only the synergies, of the intrinsic and extrinsic are the engine that propels opportunity for player change. That engine is uniquely focused and used to drive controlled change through managing the play state. The

play state is propelled by this tension that maintains the play state, as a product of the mental movement between these states.

By analogy, these real-time tensions can produce enough energy working like positive and negative ions in the human heart, or the management of controlled explosions in an internal combustion engine, to produce and direct energy. Hence, the design that successfully manages these dynamics could be considered a kind of engine, employing these tensions by design can employ the game engine for change, or E4X theory. It's moment highest potential, from this theory, is the play state.

THE PLAY STATE

A variety of research has been done around defining the play state. In game design and related disciplines, a common connection has been made to positive psychologies' flow state (Csikszentmihalyi, 1990). This became particularly popular in the late 2000s, with the growth of flow predicated design analysis and theories aimed at finding a formula for optimally engaging play design (Chen, 2007). Other work in this domain that helps shape a contemporary perspective on play state includes earlier work by Brian Sutton-Smith's seminal work on the ambiguity of play (2012) and Stuart Brown's work on play and the brain (2009).

Unifying all these definitions of the play state are a few common themes. First, that play itself is a state and that state is contrasted by a non-play. Most of these do not define play as opposite serious activity, but instead opposite a state in which the player is not willingly engaged in the psychologically distinct moment of play. All of this play is not necessarily euphoric, it can certainly be arduous, but it is intrinsically initiated even if extrinsically inspired. This is where Brian Sutton-Smith, for example, includes the idea of playing with ideas as a means for entering a state of play. Such a border is a mental border, where perhaps time or situation can afford for such play.

These theories are also unified by the idea that a play state is a variable state. The scale of the value differs within these well-cited researchers, but ranges from the personal to the societal. They also each emphasize that play states can't be enforced but instead must be willingly engaged. That does not mean that a mental switch to enter the play state can't be triggered, as witnessed in the reaction of children to a recess bell or the starting sounds of a sporting event. While these foundational researchers may differ in their interpretation of the reasons play exists, they are unified in understanding the fundamental demarcations between play and everything else.

Understanding the User-Play States for Extrinsic Impact

The value of reviewing the historical contexts and frames for interpreting the potential of play to engage and change a player offers an opportunity to formalize the practice of AIO changes through play. The prior work on play, in communication and psychology theories and the practice of game design focus on a single dimension of the dynamics that is player change. Each is predicated on a model that fails to highlight the ways in which the state of play is a feedback loop itself. While motivation theories emphasize the willingness to engage in a play state and the forces that might drive a player toward or away from play, they do less to describe the ways in which the oscillating between state cs neb employed toward persuasive ends.

Combining the observations of intrinsic and extrinsic player knowledge and motivation, it's reasonable to frame such an opportunity as needing play to encapsulate and aim communication efforts. That is, if the extrinsic-intrinsic tension serves as an engine for producing new understanding, how might that engine's energy be directly toward controlled, positive ends?

The logical conclusion as framed is through play and management of the play state. This is because, just as the play state oscillates between extrinsic and intrinsic motivation and knowledge sets while playing, they also rotate between play and non-play states. These rotations are far less frequent than the tensions of intrinsic and extrinsic knowledge the player balances to remain in a play state, but the transitions between play and non-play state are essential to the post-play impact of a design experience.

To understand this dynamic of play and non-play state as a superset to the synthetic energy of intrinsic and extrinsic tension, its useful to consider the user state. In much of the literature and practice, there's an uncomfortable tension between a user and player. A user, in classical human computer interaction, is a person engaged in any interactive system offering the typical feedback loop of input and output. The player, by contrast, is a kind of subset of user, engaged in the narrower feedback loop of play.

It would be perhaps more useful to interpret user and player not as a general to a specific, but instead as a threshold between two equal states. The player starts as a user, engaged in play to become a player, but also returns to being a user when they are no longer in the play state. Practical demarcations of this transition can be seen in start game and game over states, but also in moments when the player is by design reminded that they are in users. Such events happen when designers aim to create moments that break play's metaphorical fourth wall or employ metafiction narrative, of which games like The Stanley Parable (Sarian, 2020) and Undertale (Özdal & Çatak, 2022) both employ and for which peer-reviewed research has assessed.

Such is also the practice of critical games designs like Bang!, which allows players to shoot non-player characters, but in so doing also requires them to review the real-world photographic history of the assassinated character's life (Grace,2012). Similarly in the art-game, Lose/Lose (Gage, 2009), creator Zach Gage challenges the user to shoot enemies, knowing full well that each destroyed enemy represents a real and random file on their computer. The tension in both is the balance of the intrinsic rewards in game, with the extrinsic reality of destroying valued digital files or carrying the guilt of destroying a life.

In other cases, arguments are made through the cognitive break between what the playful experience purports to do and what is witnessed by the user upon gaining critical distance from the play state. One such example, Molle Industria's, the Best Amendment (2013) makes an argument about the cycle of gun-based violence. In the game's own description, it pits good guys and bad guys with guns against each other, but after a few minutes of play it's revealed that the good guys and the bad guys are the same. The player has been playing against themselves, a moment designed to create extrinsic reflection for the player turned user. These games employ the shift between play-engaged player and non-game affected user sharply. The contrast is the focus of their impact.

Understanding the user-player transitions as demarcated by the play state, also works to help frame the balance of extrinsic and intrinsic player knowledge sets and motivations. This is because the user can be understood as the extrinsically motivated force that initiatives the adoption of internal knowledge adopted by the player. The player is that open-minded, ready-to-play-state of the user. The user is the directed, goal oriented, state of the person bridging the non-game world to the game world.

Hence figure 3 illustrates the model at the heart of playful experiences aiming to change players toward new interests, activities and opinions. It is a way of understanding through design implementations and for research analysis the engine, or driver, of player-user interactions.

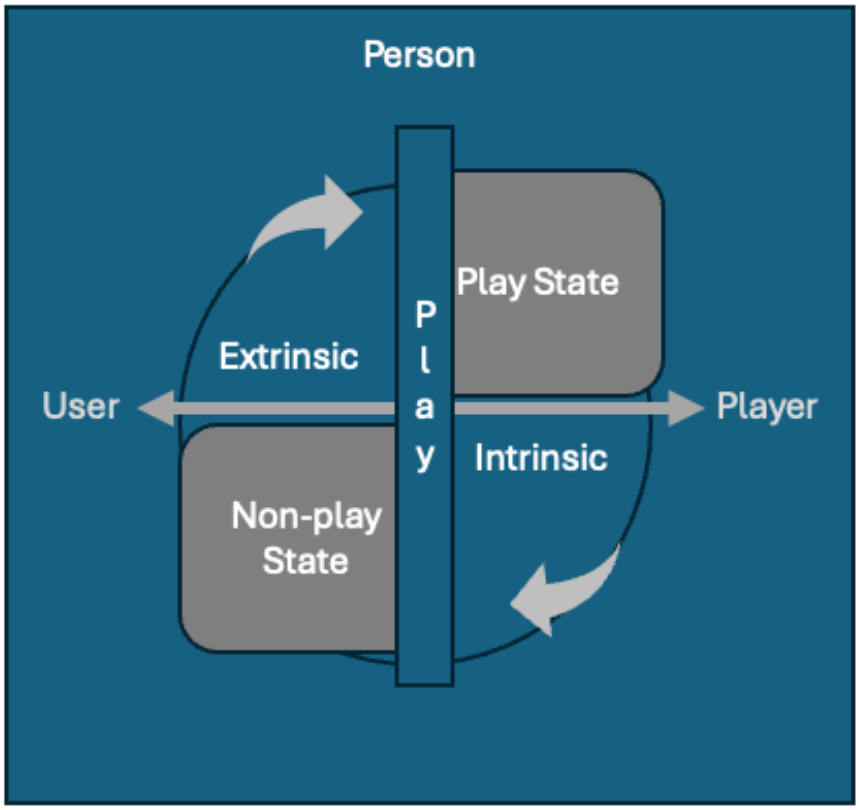

Figure 3: Demonstrates the dynamics of the engine of game change, E4X, as system initiated through a user toward a play state, with perpetual rotation between states.

The user enters and exits a playful experience through extrinsic experience in a non-play state. The Play state is the gateway to the kind of open-mindedness that allows players to acquire new intrinsic knowledge and motivation. That intrinsic adoption supports in-game efficacy that allows the play state to continue. Meanwhile the player positions that in-play knowledge and motivation against extrinsic knowledge sets and play states. The cycle of balancing the instruction and intrinsic states, fueled by the psychological power of the play state's own energy, propels the player continuously through each state. The result is a kind of change engine that affects the person outside the user-player continuum. This figure helps to frame the considerations more

vividly when designing such experiences and to recognize the factors that shape not only the in-game experience, but the ways in which a new, perhaps disinterested audience, might engage with materials that may even run contrary to their motivations.

METHODOLOGICAL APPROACHES FOR TESTING THE E4X THEORY

The engine for change theory posits a dynamic interplay between intrinsic and extrinsic motivations, structured through player-user transitions mediated by the play state. To empirically assess the theoretical claims that the play state functions as a change engine—one capable of transforming players by cycling them through motivated states of engagement and reflection—this section outlines a multi-method research agenda. This section was the direct result of peer-review feedback and aims to provide a productive means by which future research can not only apply the theory through design consideration but also test the state and evaluate it. These methods are provided as a starter guide to designing research that aims to measure the efficacy and power of E4X inspired work. To continue a prior analogy, these methods offer the probably measures for E4X implementations, serving as the possible means by which horsepower or rotations (RPM) might be measured in an internal combustions engine, or the way in which researcher measure the pulse or blood pressure of a games for change. These approaches span experimental, physiological, and design-based methods and are proposed to operationalize and evaluate the central tenets of E4X. These suggestions are derived from prior work the author has done with psychometricians on efficacy analysis of prior game designs that employed earlier protoypes of E4X method. Such research includes affect change (Lehman et al, 2017), social norms (Jackson et al, 2020) and goal orientation (Grace et al, 2020).

Motivational Pre- and Post-Test Assessment

To determine whether gameplay experiences lead to measurable motivational shifts, participants can be assessed using validated psychometric instruments such as the Intrinsic Motivation Inventory (IMI) or the Self-Determination Scale (SDS). The survey tools offered by Vahlo and Humari as the IMG (2019) and the tool provided by Király et al (2020) are good examples from which to draw. Administering these surveys before and after gameplay enables comparison of intrinsic and extrinsic motivational orientation. Changes that align with gameplay experiences designed to engage both internal and external tensions would support the theory's claim that play fosters motivational transformation through oscillation between user and player states. Changes that fail to align would demonstrate inefficacy or inefficiency design intention.

Critical Incident Technique (CIT) and Play-State Boundaries Identification Through Metafiction

To investigate how players react to key decision points designed to invoke moral, emotional, or epistemological tension, researchers can apply the Critical Incident Technique of Critical Game Design. Games designed with specific incident triggers—such as irreversible moral decisions, dissonant feedback, or confrontation with real-world consequences. can be used to elicit narrative reports from players. The aforementioned work, Bang! And Lose/Lose are examples of these critical that are designed to incite real-world immediate. Other examples include the collection of

games employing pain as haptic feedback (Laso, 2017). By embedding survey prompts immediately following these moments or conducting short debriefing interviews, researchers can examine how players interpret such transitions, and whether they perceive themselves shifting into a more critical or user-oriented stance, consistent with GEX's conceptual framework.

These accounts can be analyzed to determine whether players shift into a user-state, becoming more critically reflective or ethically aware, consistent with E4X's model. The design moments around which to evaluate these incidents are likely at the apex of social critique and game mechanics critique along the spectrum of continuous and discontinuous mechanics as described in the author's prior work on critical design (Grace, 2014).

Player Experience Journaling and Thematic Narrative Analysis

Participants may be asked to keep structured journals before, during, and after gameplay. Journaling prompts would encourage reflection on motivation, intention, perceived agency, and emotional state. Thematic analysis of these journals can surface qualitative evidence of the tensions and transitions posited by the E4X theory, particularly how players interpret their own changes in mindset or values across the play cycle.

Biometric and Physiological Feedback

Objective physiological measures may complement self-reported data. Employing tools such as heart rate monitors, galvanic skin response sensors, or EEG recordings at key state transitions—e.g., game start and end points, moral dilemma moments, or metafictional disruptions—can help identify measurable affective or cognitive fluctuations. These data may reveal whether transitions between intrinsic and extrinsic motivation, or between player and user identities, are accompanied by heightened physiological arousal or attentional shifts.

Comparative Variant Testing Through Experimental Game Design

A design-based research approach can involve creating two or more versions of a game, one that leverages primarily intrinsic motivations (e.g., exploration, narrative), and another that introduces extrinsic pressures or stakes. Comparing participant responses across these game variants may yield measurable features. These variants could include measures of affective response and post-play reflection allowing the researcher to isolate the impact of extrinsic-intrinsic tension on motivational change and user-player rotation.

Embedded Reflective Prompts Within Gameplay

To capture player awareness in real time, designers may insert embedded prompts during gameplay at key narrative or mechanic junctures. Prompts may ask players to identify whether they feel like a user or player, or what is driving their current behavior (e.g., curiosity, guilt, reward expectation). Analyzing players' reflective responses helps reveal their recognition of play-state transitions and their motivational orientation at various moments within the experience. While such solution may read as clunky, for narrative games in particular, there's an opportunity to integrate such prompts as operational feedback or engaged in the game's fiction.

Such prompts could read as part of the metafiction of the game or a necessary part of standard game operations (e.g. save game delays, content loads, etc.).

Longitudinal Follow-Up Studies

Because the E4X frame suggests that meaningful transformation may extend beyond the immediate play session, evaluating long-term impact via follow-up surveys, interviews, or behavioral tracking days or weeks after gameplay also makes sense. These follow-ups may assess attitude change, value shifts, or actions taken in the real world (e.g., civic engagement or critical media consumption) and help verify the sustained influence of the user-player cycle proposed in the model.

Re-engagement and Return-to-Play Testing

A final approach involves offering players the opportunity to re-engage with the game or related experiences, after a delay. Researchers may track whether players' motivations for returning demonstrate reflective reasoning linked to earlier extrinsic-intrinsic conflicts (e.g., wanting to explore moral implications or reassess decisions). Higher re-engagement rates or shifts in in-game behavior may serve as evidence for the lingering persuasive or epistemic power of play-state transitions.

Collectively, these methodological strategies provide an illustration of a framework for testing the core claims of the E4X theory. By triangulating between quantitative measures, physiological data, qualitative reflection, and experimental design, researchers can assess whether player-user transitions and motivational tensions function as theorized. These methods not only support the empirical validation of E4X theory but also offer practical pathways for designers aiming to harness the transformative potential of play via other means.

CONCLUSION

The goal in this theoretical framework is to help provide a starting point for the design, implementation and analysis of games designed to change user-players in substantive ways. Instead of adapting from prior work written without the context of modern digital games and lacking the benefit of an anthropological, sociological and psychological understanding of play, this work aims to embrace a contemporary understanding of their interplay to offer a kind of frame that illustrates the heart or engine of games for change. Such games are widely considered, from social impact games to advergames and political propaganda. It aims to examine the unique factors of counterpart design with a model that supports implementation of a variety of motivational and transformational frameworks.

It aims to offer a way of considering design decisions by exploring what is used to pump energy into the play state, to entice users into playful experiences, retain players in a play state or change their understanding of the non-game world remain variables that can be employed through real-world implementation. The formulaic nature of such a frame is not to prescribe a solution, but instead to offer the vehicle through which solutions can more efficiently be transported.

Critics of the interactivity emphasis in this work for games and play, might take issue with the notion that games are uniquely playful or the only medium for which dialogical states are recurrent. This work does not aim to claim that other media, such

as theatrical performances, film watching or reading a book are not similarly aligned, but instead it aims to emphasize that in a game studies and game design context there is added opportunity in such frame and analysis. This work exists in the continuum of media studies and the intellectual dialogues that offer perspective on the nature and variety of play, including such examples as cosplay of anime characters or reenactments. That is, this work doesn't aim to exclude other work that may claim interactivity among forms that may not be commonly labeled as interactive (e.g. games, websites, etc.) but instead aims to augment the general appreciation for play as a means for encouraging social shift.

Long term future for this model will investigate how such work can inform other phenomena that may be detrimental to social progress. Such examples examining how the model applies to engagement with unique scenarios of misinformation and disinformation like communities that indulging in conspiracy theories or how such a model explains elements of alterative reality and subscription fictions. The hope is that by sharing this work with the wider community, the potential for such frame can help unravel the complexities between play states, social change, and experiences designed to change how others view the world. Future work aims not only to further positive social impact design, but to help examine how this model might explain and perhaps offer a solution to the myriads of problems resulting from the aforementioned patterns of remaining in subscription fictions and otherwise detrimental misinformation and disinformation scenarios.

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