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Targeting IMPACT: a New Psychological Model of User Experience

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Abstract. User experience (UX) models present, in broad terms, the domains of influence affecting users' experience of a given technology. Since the number of variables that could affect a user's experience are manifold and context specific, UX models tend to specify broad categories of influence. Prominent models highlight technology form, content, context, business goals and individual differences as key domains which all affect how a user will experience a technology product or service. These high-level conceptualisations often miss identification of key psychological variables affecting UX. Identifying psychological factors could support user-centred design by designing for user goals, critiquing why different design choices are effective and for guiding evaluation choices. To address this gap, this paper presents a new psychological model of UX, The IMPACT model, meaning Interesting, Meaningful, Personalised, Affective, Collective and Transportive dimensions of experience. The model was developed by reconceptualising an evaluation framework of technology impact and undertaking a literature review. In this paper, we apply the model to a user journey of gameplay, demonstrating the model's use for assessing which strategies build interest, enjoyment and engagement throughout the user journey. Whilst it is not a fully comprehensive psychological model of UX, we suggest hypotheses to empirically test the model for different user types. We offer these next steps as a framework to support gaining new knowledge about gamers and gaming.

Keywords: User Experience, Psychological Model of UX, Design Tool, Affective Design

1 Introduction

1.1 The User Journey

The Nielsen-Norman Group defines user experience (UX) as 'all aspects of the end-user's interaction with the company, its services, and its products' [34]. Important in the definition is the recognition of the user journey, from first hearing about a product, to engaging with it, to potentially recommending it to others. Defining the range of

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factors affecting user experience across the user journey is challenging due to individual, temporal, and contextual dependencies [19, 22].

1.2 Practical Issues: UX Models

In the last two decades, UX research has moved away from a purely functional representation of technology effectiveness and is increasingly interested in the psychological domains of experience, both antecedents and outcomes. In their 2006 review Hassenzalh and Tractinsky chart this rising importance. They state that psychological elements fall into three major domains: addressing human needs beyond the instrumental, affective, and emotional aspects of experience and the combined, temporal influence of contextual and individual differences [19].

Designing for Psychological Outcomes. UX models, which serve as 'thinking tools' to understand these key domains of influence are subsequently high-level, macro conceptualisations of both pragmatic and psychological domains. By remaining high-level they account for the ephemeral nature of UX. However, from an applied perspective these models may not adequately help practitioners critique and evaluate their design choices, where the aim is to design for the psychological outcomes of an experience. Hassenzahl [18, 19] asks whether it is possible to design for psychological outcomes and questions whether emotional and psychological states are too ephemeral and too context dependent to design for. He suggests there may not be a way to guarantee psychological outcomes through product design. We propose the intention of psychological UX models is not to guarantee the psychological outcomes of the design, rather an attempt to clarify what the designer is aiming for and to better assess the intended psychological effectiveness. Without a psychological UX model to inform design, practitioners may not select appropriate evaluation metrics to assess the effectiveness of their products. Indeed there is evidence of this issue; upon examining the UX literature regarding individual product evaluation, the multitude of psychological outcome variables evaluated in relation to experience of technology products (e.g., games, utilitarian products, and immersive technologies) is vast. Variables such as motivation, personalisation, cognition, affect, satisfaction, beauty, presence, immersion, and attention are frequently measured in relation to UX [2, 18, 38, 45, 57]. This suggests two things; there may be common states which are important markers of product success, and that without a model to guide their evaluation choices, practitioners may be overwhelmed by the range of evaluation measures available. Currently, it appears there is limited published research modelling the common factors which denote preferable psychological outcomes of an experience, developed specifically to aid product design. Our model seeks to address this gap.

A review of current UX models demonstrates practical issues for informing design choices. Lessiter et al. [30] suggest the technology form, the content, the context of use, and individual differences are the key domains of influence. This model's psychological component concerns antecedents rather than outcomes of experience. For example, an individual's technology literacy may affect perception of a product. Using this

model, a designer may gain knowledge of the contextual and individual temporality of experience, but they would not necessarily determine important psychological outcomes to design for. Simple models of UX highlight that user and business goals shape experience [24, 48]. The CUBI model [48] includes content, user goals, business goals and interaction as its core elements. It then breaks these down further into sub-factors, for example, user goals are a combination of user needs, motivations and behaviours which are said to inform intended psychological outcomes. Using this model, a designer may begin to consider psychological outcomes, but again would not determine key states. These models highlight antecedents of product usability, namely individual differences and user goals, yet they do not identify common psychological outcome domains predictive of a good user experience. We suggest that understanding the important user outcome states is necessary for optimal design and guiding evaluation choices. Many UX models, whilst useful for understanding key domains of UX, are not appropriate for linking design choices to user states due to the breadth of their scope and focus on psychological antecedents rather than outcomes of experience.

Player Types in Games. The tendency to focus on antecedents of experience is also prevalent in gaming research. Much attention is paid to player motivation and how differences in these domains affect game enjoyment. Identification of 'player types' helps the industry consider different user goals and how individuals differently perceive enjoyment. The Hexad player types builds on Bartle's classic typology (Achievers, Explorers, Killers and Socialisers) to help designers personalise gameplay to suit a range of needs and motivations. Researchers correlated 32 common games design elements with each Hexad user type to help map common player traits with design features [15]. Using player typologies does provide some insight into how the nuances of game enjoyment may depend in part on player motivation and personality domains.

Enjoyment of Games. Enjoyment of gaming can be categorised as part of the players emotional response. Multiple evaluation measures for game enjoyment exist which indicate different emotional outcomes. Yet there are concerns around the limited scope of these measures [44] and the lack of validation using empirical research [25] which may decrease confidence in their utility. Furthermore, in practical terms, without a process for hypothesis development to aid design, insights from measurement tools may not easily be interpreted into design decisions [29]. Therefore, linking evaluation methods to design features is necessary for a joined up iterative design process. There are measurement tools which seek to do this, for example Johnson et al. [25]. measure both emotional outcomes and the success of controls and Abeele et al. [1] developed a measure of both player action and psychosocial experience to enable designers to link specific player action to response. Whilst these are helpful for linking some common features of games design to intended outcomes of an experience, they do not allow for all design elements to be mapped to corresponding psychological states. As such some design features could be misinterpreted as being more important than others simply due to the absence of an evaluation process for features not listed in current metrics.

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A more flexible but less specific approach could use a games UX model to link designs to intended outcomes. Lazzaro's Four Keys to Fun model [17] suggests that enjoyment via fun is the primary psychological outcome to design for. In contrast Eyal [11] suggests that all human behaviour is motivated by reducing emotionally uncomfortable states (e.g., boredom or jealousy). In his Hooked Model he suggests prioritising design choices based on how well they satisfy what the user is psychologically 'missing'. These approaches are two sides of the same coin, they encourage designs which either reduce uncomfortable emotions, or optimise positive ones.

In the domain of emotion, there appears to be linkage of tools and research, from player typologies which help determine key antecedents of games enjoyment, to measurement tools for evaluation of enjoyment and design models to define and articulate the emotional states of interest. We propose that whilst this provides practitioners with a range of tools to design and assess gameplay, it is still limited. Firstly, it prioritises the emotional response, over and above other psychological outcome states, which may miss elements of user satisfaction. Secondly, it focusses all design effort on engagement during gameplay rather than addressing the full spectrum of the user journey. This may lead to a piecemeal design approach which does not fully allow for designs which build user interest, engagement, and investment in the game long term.

A New Psychological Model of UX. Considering these limitations we propose that a the a more comprehensive, yet broadly applicable, psychological model of UX would aid technology design across the user journey, having application for games and many other industries. Whilst there is academic and applied interest in psychological outcomes of experience, to our knowledge models which organise and conceptualises these elements are limited. The IMPACT model helps to address this imbalance by providing a model which practitioners can use whilst developing their designs and to inform evaluation criteria. The IMPACT model is conceptual in approach, and it highlights key psychological states which, if optimised through design choices, should lead to enhanced user satisfaction and loyalty. Future empirical research to test the model's effectiveness in different domains may result in adaptations. While we acknowledge that no model will be fully comprehensive, we propose these states offer a good starting point for designers. Moreover, the model is helpful for developing hypotheses to test which in turn will generate new knowledge about gamers and gaming. The remainder of this paper discusses the model's application to games during all phases of the user journey, to help illuminate how game enjoyment can be optimised.

2 Method: Developing the IMPACT Model

To develop our conceptual model, we evaluated how i2 media research's proprietary measure of audience experience, the Audience Impact Metric (AIM), could be reconceptualised as a design canvas. The AIM is an evaluation measure which was developed in 2017 through sector research and a literature review [32]. The AIM measures 5 key domains of experience; general quality, engagement, emotional intensity, cultural

value, and willingness to pay. It has been used extensively to measure audience experience across a range of immersive media productions from theatrical, gaming and arts/experiential content. The AIM also incorporates items from the Sense of Presence Inventory (SOPI) i2 media research's measure of presence developed in 2001 for the Independent Television Commission [30]. The SOPI has been cited in academic literature 1292 times and is used to assess presence across a range of media outputs (e.g., TV, games, immersive media).

Once the initial target states had been defined, we reviewed a selection of relevant literature from several perspectives and disciplines, for example user experience literature, psychology, and audience/ cultural literature. The literature reviewed was both scientific and applied since we wanted to capture both how UX is measured and assessed academically and how creative and design practitioners operationalise user experience. Taking this broad view was important for specifying the theoretical components of the model, as well as ensuring accessibility and resonance to the industries we seek to engage in its practical application. Relevant literature was selected based on its contribution to answering our guiding research questions:

- What psychological qualities of user experience are measured in technology evaluation research?
- Which of these qualities conceptually align with the IMPACT model?
- What models of user experience exist?
- What are the similarities and differences in these models?
- What theories support the psychological elements of experience which are measured?

A bibliographic search was conducted on PsychINFO and Google Scholar using a range of search terms ('User experience', 'UX model', presence + UX, psychology of UX.) A total of 74 papers were reviewed to further evidence the domains of experience included in the IMPACT model and align with relevant psychological theory (see Table 1). Theories relating to our conceptual model were selected based on their relative support for the conceptual factors generated in the model.

Table 1. Showing Theories which Support the IMPACT Model Dimensions

Theory	**IMPACT Model Dimensions**
Attenuation Theory of attention [51]	Sensory and semantic processing of stimuli happens concurrently. Individuals attend to stimuli which is personally relevant and meaningful (Interesting, Meaningful, Personalised).
Habituation [13]	Interest in novel stimuli decreases over time as familiarity increases (Interesting).
Self Determination Theory [40]	Motivation stems from the need to be fulfilled in competence, autonomy and relatedness (Interesting, Personalised, Meaningful, Collective).

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Theory of aesthetic response [4]	Emotional arousal facilitates interest. Theory suggests there is an optimal level of emotional arousal (Interesting, Affective).
Variable reward [14]	Variable reward compels individuals to attend to the stimuli which generates rewards. Dopamine release at variable intervals builds anticipation and arousal (Interesting, Affective).
Biased-Competition theory of attention [9]	Processing of stimuli will be biased to personal relevance or that which is within current visual field (Interesting).
The drive theory of social facilitation [59, 60]	An audience helps facilitate performance by increasing emotional arousal (Interesting).
Locus Focus Sensus model of presence [55]	Proposes that presence is achieved a combination of attention to a stimulus as well as minimising distractions through supported design (Transportive).

Six psychological states were defined from our reconceptualisation of the AIM and the literature review; these were:

- **Interesting**: Capturing initial interest through automatic and personalised attentional cues.
- **Meaningful**: Connecting to user values and cultural or universal goals. Meaning goes beyond initial interest.
- **Personalised**: Personalising design features. Personalisation focusses on individual relevance, e.g., achieves personal 'to be goals' [20].
- **Affective:** Emotionally arousing. The affective dimension acknowledges how changes in arousal level are important for maintaining interest and engagement.
- **Collective:** Enabling social experience or ability to connect and share with others. Features may connect individually or demonstrate collective action or community.
- **Transportive:** Feeling presence, sustained attentional engagement. The transportive dimension guides design which resolves user friction and minimises disengagement via distraction.

Each element of the model can be thought of as a 'lens' to apply to iterative design, allowing teams of designers, researchers and engineers to query features and align them with their intended psychological purpose. It is anticipated this will help design teams adopt a human-centred design approach.

3 Applying the IMPACT Model Across the User Journey

The following sections of the paper illustrate the model's application for informing design choices across the full spectrum of the user journey. We firstly apply to model to demonstrate the effectiveness of different marketing strategies for initially engaging users; secondly, we show how design choices in games optimise engagement, and finally we show which post-experience user engagement strategies are likely to be most

effective for gaining loyalty. The user journey model described is based on The Engagement Arc [6] which identifies three phases of experience, a preparation phase where awareness of the product is generated, an engagement phase where the user is experiencing the product directly and a post-experience processing phase where the user engages in meaning-making, to hopefully build satisfaction and loyalty. The Engagement Arc model was chosen for its simplicity and overall alignment with more complex user journey models [10].

3.1 Awareness

Adopting successful marketing approaches is critical to enticing users into gameplay. Central to deploying a successful strategy is knowledge of the intended audience. This is often achieved through identifying industry trends, applying segmentations, and creating customer personas to identify and describe customer characteristics. Here we discuss how the interesting, personalised, meaningful, and affective dimensions of our model are central psychological states to target within a marketing strategy.

Design Choices which Maximise Interest. Underpinned by attention theory, the interesting, meaningful and personalised dimensions of our model suggest it is important to make design choices which maximise interest in games by tailoring marketing to user goals and motivations. Targeting these psychological states can help marketing practitioners improve their customer portraits by considering the core psychological components which may motivate or demotivate users to engage with their product. The Attenuation Theory of attention [51] suggests attentional allocation to given stimuli is processed visually, linguistically and for semantic relevance concurrently, before short-term memory processing. It suggests that whilst visual and auditory cues are important for capturing attention, users will be assessing stimuli for its personal, semantic relevance at the same time.

This shows that whilst visual design is important, marketing materials which resonate with the personal needs and goals of the user are likely to be more attentionally captivating. Adding personal relevance to visual and auditory cues in any design will optimise meaning making when users are scanning their environment for personally relevant stimuli. Bright visuals and loud sounds may serve as an external trigger to capture attention initially, whereas personalised and meaningful gaming adverts will sustain user engagement and more likely lead to gaming uptake and to enjoyable interactions within gameplay.

So important is initial interest and meaning that the Nielsen-Norman Group argue the overall utility of a product or service *is* its ability to meet a user need and if it cannot meet the need then the other elements of the experience are superfluous. In other words, capture interest in a personalised, meaningful way or risk losing prospective users before gameplay even begins. Establishing interest at the earliest moment in the user journey is important for sustained engagement. When users know why they are interested in a product, internal distraction (such as, users querying “what’s in it for me”) should be diminished.

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Lazzero's gaming model Four Keys to Fun [17] posits that emotion, specifically fun, is key to capturing attention. Serious fun, hard fun, easy fun and social fun are posed as key mechanics to utilise in game design. Yet, Sander and Nummenmaa [42] show that stimuli must be personally salient and relevant to user needs to elicit an emotional response. Therefore, without personally relevant, interesting stimuli incorporated into marketing campaigns, the four elements of fun highlighted in Lazzaro's model would not necessarily be achieved through designs which consider these features alone.

To support longer term engagement and increase the likelihood of experiencing game enjoyment then, we advocate incorporating personally relevant material within marketing content. For example, users could be shown a personalised avatar or personalised trailers of a game focussing on emotionally arousing moments. This design approach could be effective for generating initial interest and an emotional connection between the user and the game before purchase and support on-boarding to the emotional design features present during gameplay.

3.2 Engagement in Gameplay

Once initial awareness and interest is established and prompts purchase or download, users move into direct engagement with the game. Successful game design approaches often focus on creating captivating visuals, developing fun game dynamics (e.g., challenge and reward), designing compelling storylines and characterisation which is then supported by frictionless, easy to grasp controls. We will consider why these design features are successful at the psychological level relating to the IMPACT model.

Optimising Interest via Novelty and Contrast. As with attracting initial attention to a game through successful marketing techniques, an initial trigger to captivate interest is necessary when users first engage in gameplay. Games designers often use contrast and novelty in their visual designs [23]. From a psychological perspective these design features are effective because they capture attention via automatic attentional responses.

Consistent with the Biased-Competition theory of attention [9], high contrast designs are easy to attend to, hard to ignore, and lead to a higher firing rate in neurons in the visual cortex [36]. As such, use of this design feature gains user interest through automatic attentional processes which have evolved to help us effectively detect important stimuli within our environment. Considering Tetris's classic layout, the use of high contrast colours between the background and the shapes moving in the display is key to capturing and sustaining our attention during gameplay. Since reconfiguration of the shapes is critical to the success of the player, high contrast between the shapes and the background is an important design choice. If instead Tetris shapes had blurred edges or were less defined from their background users could become frustrated and potentially disengage since it would be challenging to fulfil the game objective. The visual simplicity of the design allows the player to focus attention on the game dynamics. By helping the user to focus their attention on the critical object, they can better fulfill their goal and optimise their enjoyment.

Regarding novelty, infant research shows that babies attend less to familiar items and more to those which are novel. Over time they attend less to the novel item as it

increases in familiarity. This process, known as habituation, is the mechanism by which we understand what is safe in any given environment [13, 8]. A well-established theory, habituation explains why novel stimuli capture our attention. More recent research on novelty suggests that the automatic response is implicated via our orienting attentional mechanism. Johnston et al., [26] explored the ability to distinguish the location of familiar and novel stimuli in a mixed array and showed that localisation accuracy was better for novel stimuli than for familiar. This implies an evolutionary advantage in attending to novel stimuli and that our orienting system is key to this process.

Again, considering Tetris, novelty plays a key role for aiding pattern matching at speed. The design offers multiple combinations of how different shapes might fit together in different permutations of their own format. There are a recognisable number of shapes which the user can easily hold in memory to support building skill, yet there is novelty in how they appear in the display window which serves to capture interest and helps users re-engage with the game over time. Given the aim of Tetris is to reorient shapes as fast as possible so that they fit together, the link to the Johnston et al., [26] study is of note. The novelty of the shapes is likely implicated in our ability to orient our attention to the appropriate area of the screen with the speed needed to succeed in the game. If instead Tetris shapes were always the same colour or appeared on screen in their same configuration, it may be more difficult to orient attention quickly enough. This could lead to frustration, making gameplay less enjoyable and the game purpose less effective. Therefore, knowledge of automatic attentional processes to garner interest can inform the design of visuals and support player goals.

The Role of Novelty in Sound Design. Automatic attentional cues are not just present in visual designs. Auditory cues are also important, particularly given the needs of gamers with sight impairments for whom auditory features serve to make games more accessible and enjoyable [37]. Like visual design, novelty is important to consider in sound design. Research exploring patterns in music indicates that music which establishes repetition at least once and then changes (known as the AAB pattern), serves to violate our expectations and provide novelty. These patterns are said to capture attention due to an innate response of needing to pay attention to that which is novel [39]. *Assassins Creed*, successfully employs this technique, composing a simple refrain in an AAB pattern. The refrain is used throughout the game to highlight emotionally salient elements of narrative and foster greater attention from the player to these emotive moments.

Use of this technique more broadly could serve to better engage audiences and help to capture attention of gamers who may not be able to access visual designs. Making games interesting by exploiting these automatic attentional processes within visual and sound design is one effective mechanism for facilitating user goals and exemplifying emotional aspects of games.

Affective Mechanisms. Whilst visual and auditory design will help establish initial attention and focus, alone it is unlikely to sustain interest in gameplay. Self Determination Theory (SDT) suggests ongoing motivation is driven by an intrinsic need for growth which is achieved through developing, autonomy, competence and relatedness

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[**Error! Reference source not found.**]. In line with SDT game play may satisfy our need to develop in these domains and research shows the association with game enjoyment [40]. Regarding competence game players improve skills via challenge, competition and reward and as Hunike, LeBlanc and Zubek [21] advocate, this helps *sustain* the interest of the player and is also key to the emotional response. Where intrinsic motivation may help players sustain their interest, the emotional response must provide some form of reward to build engagement over the long term.

Challenge and reward are related to how we enjoy aesthetic experiences generally. Berlyne [4] proposed that experiencing moderate arousal and its resolution is key to enjoyment of any aesthetic experience. Although within gaming we would expect challenge and reward to be interactive mechanisms of gameplay, Berlyne's analysis helps illuminate how novelty and complexity in any design feature can also serve to challenge an audience. Berlyne's theory proposes that the process of resolving challenges, whether that be establishing meaning in an artwork, or resolving ambiguity in a narrative, serves to pique interest and arousal and sustain our engagement until such resolution or reward comes. In practice this translates into feeling optimally challenged by the game so that winning seems possible but is not immediately achievable. Lazzaro [17] describes this as 'hard fun', when players develop skills and thereby resolve complexity and frustration. Games which offer more complex controls and reward users for successful mastery of these skills serve to evoke a strong emotional response through building initial frustration, piquing arousal which then resolves upon mastery and reward.

Easier games still tap into this 'frustration - resolve' mechanic however, they are more likely to achieve this by employing variable reward schedules first discovered by Ferster and Skinner in 1957 [14] and popularised by Eyal [11] in the Hooked Model. Rewarding users for behaviour on a variable schedule sustains interest via reward anticipation and variable dopamine release in the brain [12]. Variable reward has been found to be highly addictive and is the mechanism employed by slot machines to keep users pulling the lever to see what rewards might be released. It is also now widely deployed across digital products (e.g., social media) and the gaming and technology sectors [11]. Whilst it offers short term gains for retaining users, critics of deploying variable reward schedules suggest there are ethical implications such as gaming addiction and manipulation of users [47].

Whilst there is more to be done to ensure user safety, affective designs which capitalise on variable arousal and its resolve via easy or hard mechanics are critical for sustaining engagement and a players return through the gaming loop. When assessing design choices using the affective dimension of the IMPACT model, we recommend identifying the emotional range within the game and opportunities to create and resolve arousal.

Using Personalised, Meaningful Content to Align with User Values. Emotional arousal alone, however, does not necessitate player enjoyment and satisfaction. When compelled purely by emotional arousal (e.g., relief from boredom), users can experience disengagement due to regret. Research on binge-watching illustrates that whilst binging is pleasurable, after a threshold (4 hours continuous watching) users experience

regret [54]. Regret was experienced when the user perceived they had wasted their time or been prevented from achieving other more meaningful goals. As with binge-watching, hours spent gaming could also lead to regret should the activity be perceived as lacking personal meaning. This leads to our inclusion of the personalised and meaningful dimensions within our model to support successful design. The 'Enabling the Good Life' study in 2017 showed that consumers were moving away from consumption for its own sake to a more meaningful use of technology products. People stated they wanted balanced simplicity and for tech products and services to support them in their values and goals [43].

Serious games such as *Pick your Plate* (a game to help children understand nutrition) and *Breaking Harmony Square* (a game to help people stop disinformation) offer users meaning by helping users achieve life goals [33]. Whilst these games are created primarily with the intent of helping users achieve a goal other than gameplay, this is a key feature of their success. Hassenzahl [20] describes this as helping users achieve 'to be goals' (e.g., those which support aspirations, learning and self-development) which similarly aligns with the core premise of SDT, that development competence is meaningful for individuals.

Design which supports these personal and meaningful user needs is therefore worth incorporating into non 'serious' games. In 2020 the video games industry in collaboration with the United Nations Environment Programme incorporated environmental missions and messages within popular games like *Angry Birds 2, Golf Clash* and *Subway Surfers* [52]. The companies were responding to gamers' interest in raising money for environmental campaigns through in-app purchases. These moves by the industry in response to consumers echo the 'Enabling the Good Life' findings in 2017 that users are interested in games becoming a medium by which to tap into broader values and aspirations. Using the personalised and meaningful lenses in the model it is possible to separate out features which will optimise general enjoyment and those which will offer users greater meaning and sense of personal achievement.

Collective Design Features for Increased Performance and Emotional Arousal. We have discussed how the meaningful dimension encourages designers to connect their content with wider social causes, yet personal social meaning is also relevant to explore. As Bartle [3] and Yee [58] attest, one of the key motivations to game is to socialise by spending quality time with others in the pursuit of fun. There are several gaming mechanisms which enable social bonding and a collective experience. Cooperation and competitive features allow players to interact with one another or with characters in the game, thus prompting a collective experience, which is shown to increase affect [53].

Social interaction at the individual or group level via competition or cooperation is arguably a defining characteristic of games. However, the larger-scale gaming audience is also important. The recent rise in popularity of platforms like Twitch allow players to be performers, demonstrating their gaming technique and ability to audiences via live streaming. Audiences can use the Twitch platform to chat to players. Commenting on gameplay establishes dialogue, connecting players with their audience. The drive theory of social facilitation [59, 60] is helpful for understanding why platforms like

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Twitch have gained traction in recent years. The theory suggests that for those skilled in their domain, an audience helps to increase arousal, and this facilitates performance [5]. For the skilled player then, having an audience present via Twitch may increase their performance and enjoyment of the game.

Sustained Engagement via Transportive Experiences. Once we have garnered interest, built affective response, and achieved meaningful and collective engagement, how do we get users to experience transportive states of presence, and why is this dimension important to consider as a separate lens? As we move towards widespread adoption of the 'metaverse' and to a more integrated method of experiencing entertainment, it will be important to re-evaluate how to keep users interested and engaged in games. Although a fully integrated metaverse is still many years away, early releases by Meta are expected in 2022 [46]. Indeed, users can already engage in games across a range of immersive platforms from fully immersive VR to MR and AR applications. Even non-immersive games still incorporate elements of the metaverse, for example Fortnite's inclusion of music concerts with real-world artists Travis Scott and Ariana Grande or the ability to buy designer clothing for Fortnite characters [46]. The way we experience gaming is changing and with it, user expectations. Whilst the IMPACT model is technology agnostic, the transportive dimension of the model is particularly relevant for future-proofing game designs given the expected rise in popularity of immersive technology.

Central to the XR (extended reality; including VR, AR and MR) is the user's experience of presence [49]. Presence is defined as the experience of 'perceptual illusion of non-mediation yielding a subjective sensation of being there in a mediated environment' [16]. Whilst presence is distinct from interest, users do need to be interested to be present [7]. Whereas the interesting dimension of our model encourages designers to think about initially capturing attention, the transportive dimension encourages consideration of design features which prolong engagement. The Focus, Locus, Sensus model of presence [55] highlights the importance of minimising distraction as well as captivating initial attention. This requires a subtle balance of design features to support maintained engagement.

Easy to use controls are one feature which support users to feel transported by gameplay [40]. Controls which are learnable, give users feedback and match their conceptual map should reduce user frustration [35]. Distraction through clunky and difficult to master controls is a common source of user friction, this inability to behave naturally in the environment leads to users feeling disengaged and less present during an experience [31].

One challenge for immersive game designers is creating interaction mechanisms which are simple enough for users to achieve when viewing representations of their controllers in a virtual world. In a study of a mixed reality gaming researchers found that simple gestures such as a thumbs-up or swiping motion supported feelings of presence [28]. The simple design, using interactions already familiar to users, was quickly learnable and did not detract from engagement in gameplay or the narrative. Immersive technology offers designers the chance to blur the boundaries of traditional games and blend them with experiences and complex narratives. While a compelling narrative can

help to draw a player in, designers will need to consider the complexity of the narrative with the need for interaction. As attentional literature shows, during task management, (e.g., game interaction tasks) users engage in attentional switching to best achieve aims and monitor for potentially salient distractions [56]. In immersive gaming if users need to interact, and simultaneously focus on the narrative, it will likely lead to switching attention to the salient task at hand. This task-switching where the user goal is undefined is likely to diminish presence and increase friction, since users may feel they are missing something important in the game. We propose therefore, that designs which optimise presence, are those which successfully guide the user to engage in narrative *or* interactive elements with effective signals and signifiers.

3.3 Post Experience

The final phase of the Engagement Arc concerns what happens after gameplay. It describes the player evaluation of the experience where loyalty can be established. A challenge for any product designer is keeping users engaged after an experience has ended. What are the best methods to use to encourage users to recommend a game or to re-engage with a game at another point in time? Whilst the interesting and transportive dimensions of the IMPACT model can be applied to post-experience features, we advise the emphasis of design features should be on the collective dimension which in turn makes experiences more meaningful, personalised and affective.

Collective Design Supports Loyalty. The collective dimension helps designers consider how they leverage social influence and social approval behaviours. Social commerce studies suggest that there are two principal ways to incorporate collective features, either through social features which are embedded into the (gaming) platform, or by connecting with users' social media platforms [61].

Games which connect users to their network are likely to extend competitive and cooperative behaviours and thereby encourage re-engagement, sharing and loyalty. For example, *Candy Crush* allows users to reach out to their network on Facebook to request lives, rather than pay for extra lives. This social component is an effective way of extending the gaming experience via cooperative behaviour. By asking your network for a favour it leverages cooperative and more altruistic behaviour whilst building reputation and awareness of the game via the social network of contacts. *Candy Crush* also extends competitive elements of play by incorporating their brand within Facebook to increase the likelihood of sustained use. For example, users can live stream their gameplay on Facebook and post about their achievements. For the collective network of users, seeing an individual's skilled gameplay triggers what Kim [27] refers to as 'aspirational neighbours', a form of social influence where players see what they could achieve in the game before they have personally achieved it. It stimulates competition and motivation, encouraging users back to gameplay, entering another 'gaming loop'. This prompts the user back into the Engagement Arc or 'hook' [11] where users need

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to engage with the game again to resolve frustration and gain rewards, prompting dopamine release. As we can see, social design features help to build the gaming habit, increasing loyalty to the game and associated brand.

4 Future Directions

Through this exploration we have shown how design features link to the IMPACT model of psychological outcomes. This should help practitioners design for and better describe their target users. It is also a tool for generating hypotheses and empirically testing elements of the design. For example, one could test the relative importance of different design features for different user groups. We specify several hypotheses of interest to inspire practitioners and researchers to use the IMPACT model as a framework for generating new knowledge of gamers and games.

There are several individual and cultural differences which suggest different responses to the importance of the IMPACT dimensions. Firstly, individualistic, western cultures may require higher levels of game personalisation to appeal to individualistic goals and values, whereas collectivist cultures may prefer games which are personalised at the group level and are more focussed on collective elements of gameplay. Secondly, personality dimensions are important to consider. Extroversion may affect the degree to which the collective design features are preferred, with extroverts preferring more social features compared to introverts. Conscientiousness levels may also affect the degree to which meaningful elements are important with those high in conscientiousness enjoying more meaningful experiences compared to those lower in this trait. Finally, gaming experience may affect the degree to which novel design features can capture attention. Experienced gamers may need a greater degree of novelty in designs compared to novice or younger gamers who will have less familiarity with 'typical' games features. We expect that through testing these hypotheses we could offer guidance on how the IMPACT states interact and affect one another, and how these interactions may change in different contexts and with different user types.

4.1 Limits to the Model

These hypotheses indicate there is much scope for further development and empirical assessment of the IMPACT model. Whilst we propose its use for ideation and hypothesis building, it is not a tool for evaluation. Rather it should guide the selection of evaluation methods and metrics to those which best measure the target IMPACT states once defined in detail by a design team. In line with other models of UX, we assert that high-level categories are helpful thinking aids to stimulate conversation and deliberation during design sprints, whilst allowing designers to own and specify the project goals. Each game will serve different purposes, for example some may target a joyful emotion, whereas others may target fear and jeopardy. The model is not designed to provide this level of detail, since this may constrain the design process, which is not our intention. Although the model does not seek to offer this granular detail, we acknowledge that as

a high-level model, it is not comprehensive. It is expected that as new knowledge emerges from future research, the model will be developed either to include other psychological outcomes, or to provide more nuanced guidance in the use of the model as it is applied practically. The model is not intended to create a strict hierarchy of design, rather it should help designers view their ideas in a layered and dynamic fashion and prompt discussion around which features offer most value in different contexts.

5 Conclusions

Through an exploration of the user journey, we can see that using psychological lenses can illuminate why certain game design choices form impactful user experiences. Whether using automatic cues to orient and guide attention, using emotion to build habit, or using social design to increase loyalty, the IMPACT model is a tool which can be applied to any human-centred design process. The model can be used for ideation, to critique designs, and to guide evaluation. Whilst there is much scope for empirical assessment of the model, we hope that this initial view of key psychological states will support practitioners to effectively communicate the value of their designs from a user perspective.

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