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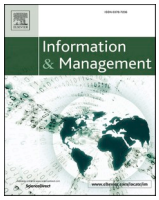

In-game content purchase motivations (IGCPMs): Conceptualization, scale development, and validation

Ali Hussain [a,*], Linda D. Hollebeek [b,c,d,e,f], Ben Marder [g], Ding Hooi Ting [h]

[a] Hertfordshire Business School, University of Hertfordshire, UK
[b] Sunway Business School, Sunway University, Malaysia
[c] Vilnius University, Dept. of Marketing, Lithuania
[d] Tallinn University of Technology, Dept. of Business Administration, Estonia
[e] Dept. of Business Administration, Umea University, Sweden
[f] Dept. of Marketing Management, University of Johannesburg, South Africa
[g] Marketing Division, University of Edinburgh Business School, University of Edinburgh, Edinburgh, UK
[h] Department of Management, Universiti Teknologi PETRONAS, Seri Iskandar, Malaysia

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ABSTRACT

Despite the rapid growth of virtual content purchases in online games, understanding of how to measure gamers' motivations to purchase such in-game content lags behind to date, exposing an important gap in the literature. Addressing this gap, we take a self-determination theory perspective to conceptualize *in-game content purchase motivations* (IGCPMs) as a player's drive for autonomy, competence, and relatedness in online games that leads the individual to purchase in-game virtual content. Following established scale development procedures, we conceptualize, develop, and validate an eight-dimensional, 30-item IGCPM scale. As a formative higher-order construct, IGCPMs comprise three second-order factors (i.e., autonomy, competence, and relatedness motivations), which are each composed of particular facets: (i) players' autonomy motivation comprises creativity, choice, and uniqueness, (ii) their competence motivation includes dominance, achievement, and skillfulness, and (iii) their relatedness motivation comprises social interaction and social affiliation. The findings generate pertinent implications for gaming researchers (e.g., by applying the proposed scale) and developers, manufacturers, and marketers (e.g., by allowing them to deduce players' key IGCPMs).

1. Introduction

Free-to-play (F2P) or freemium games represent a transformative trend in the gaming industry [1]. Despite initial cynicism, the F2P model has shifted from the "ugly stepchild to [a] dominant force," accounting for a reported 78 % of aggregate global gaming revenue in 2021, which is predicted to grow to 95 % by 2025 [2]. F2P games are therefore growing rapidly, which established game developers (e.g., Activision-Blizzard, the makers of Call of Duty Warzone) have also recognized [3]. The profitability of F2P games is based on in-game micro-transactions and sales, including those involving virtual cash (e.g., game coins), weapons, artifacts, and/or skins (costumes), among others [4–6]. Unsurprisingly, F2P games are also attracting rising scholarly attention [e.g., [7,8],.

While each transaction individually only raises a few dollars, collectively, they generate significant revenue. By 2025, the estimated total global revenue generated by such transactions is forecast to amount to US$74.4 billion [9]. While the F2P model is already lucrative, its true potential remains unrealized. Though developers are making significant investments in creating and marketing in-game content, it is estimated that only 2 % of gamers are willing to part with their cash [10,11], reflecting a key challenge for F2P marketers. Specifically, how do marketers motivate players to regularly purchase in-game content (i.e., seeing them transition from freemium to premium players) [12]?

To answer these questions, it is paramount to understand players' motivations and psychological drivers for purchasing in-game content [13,14], which remain under-explored to date [15–18]. While prior research has addressed key drivers of consumer decision-making [e.g., in the context of tangible goods;15], the less tangible and typically immersive, escapist, competitive, and/or shared nature of online games

* Corresponding author.
E-mail addresses: a.hussain37@herts.ac.uk (A. Hussain), lindah@sunway.edu.my (L.D. Hollebeek), Ben.Marder@ed.ac.uk (B. Marder), ting.dinghooi@utp.edu.my (D.H. Ting).

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[16] yields their predicted unique dynamics (vs. tangible goods), raising a need for the dedicated exploration of IGCPMs. Relatedly, while some prior studies have examined IGCPMs [17,18], these have tended to adapt existing customer purchase motivation scales developed in other (e.g., retailing) contexts to measure IGCPMs [18,19], including those developed for durable goods [15], food and beverage [20], and fashion retailing [21], among others. However, these may fail to adequately capture the unique characteristics of online video games, including immersion, flow, and competition [22,23], raising an important literature-based gap and warranting the development of a dedicated IGCPM measure. Addressing this gap, we conceptualize, operationalize, and validate a proposed IGCPM scale, which is of strategic important to the online gaming industry, given the growth of in-game content purchases [24].

To explore these issues, we draw on self-determination theory, which examines players' innate motivations to engage in specific activities [25], to conceptualize IGCPMs. Using the theory, we propose that players' drive for online game-based autonomy, competence, and relatedness drives their in-game virtual content purchase behavior [26], as detailed in Section 2. Using five studies, we develop and validate a 30-item IGCPM scale [27,28] comprising players' self-determination theory-informed autonomy, competence, and relatedness motivations, which each contain specific sub-facets [29,30]. The proposed scale has applicability to online, typically competitive games that allow players to purchase in-game virtual content (e.g., ammunition, food supplies, or skins to enhance their avatar's appearance or boost player performance).

While prior studies have tended to conceptualize self-determination theory's autonomy, competence, and relatedness motivations unidimensionally [31,32], respectively, authors including Van den Broeck, Howard [33] and Gagné, Forest [34] advocate for the *multi*dimensional nature of these respective motivations, as adopted in this research. Based on an in-depth review of the literature and our empirical findings, we propose that (i) autonomy motivation comprises the facets of creativity, choice, and uniqueness, (ii) competence motivation contains dominance, achievement, and skillfulness, and (iii) relatedness motivation comprises the facets of social interaction and social affiliation.

This article makes two main contributions to online gaming and in-game content purchasing literature. First, addressing the aforementioned limitations of prior work, the proposed IGCPM scale provides an important tool for gaming scholars seeking to measure and conduct further empirical research on IGCPMs. The scale offers important literature-based advancement, as rigorous measurement is a precondition for valid empirical investigation and for the development of actionable managerial insight [35,36]. Overall, the proposed scale enables game developers, manufacturers, and marketers to better understand and to gauge players' motivation to purchase in-game content, offering key strategic value.

Second, the findings extend self-determination theory [25] by highlighting the multi- (vs. uni)-dimensional nature of IGCPM-based competence, autonomy, and relatedness motivations, respectively. Though these dimensions have been viewed as unidimensional, reflective motivational constructs [e.g., 31,32], our analyses support the existence of further nuance (sub-facets) in these respective motivations. Specifically, we operationalize IGCPMs in a reflective-formative model [37] containing the overarching second-order motivations of *autonomy, competence*, and *relatedness*, which each contain specific sub-facets that are modeled using reflective indicators (e.g., *dominance/achievement*). The proposed multifaceted view of players' autonomy, competence, and relatedness motivations serves as an important springboard for further information management research and beyond (see Appendix 1).

We next conceptualize IGCPMs in Section 2, followed by an overview of the proposed studies and their respective approach and findings in Sections 3–4. Section 5 concludes by discussing our main findings, followed by an overview of key implications and further research avenues that emerge from our work.

2. Conceptualizing IGCPMs: A self-determination theory perspective

2.1. IGCPM conceptualization

To conceptualize IGCPMs, we draw on Ryan, Rigby's [38] self-determination theory, which addresses people's innate motivation and psychological need to develop in the absence of external influence [39]. The theory, which focuses on the extent to which human behavior is self-motivated and self-determined [40], proposes three main motivational drivers [41] that have been widely applied in prior interactive (e.g., online gaming) studies [38,42,43], suggesting the applicability of this perspective in this research.

First, *autonomy motivation* reflects an individual's desire for freedom of their own will [44]. For example, customizable online games (e.g., Fortnite) allow users to choose the appearance of their avatar [165], while their in-game decisions also shape the direction of the game. Second, *competence motivation* denotes an individual's drive to control the outcome of the game and the extent to which they are motivated to experience mastery over it [43]. For example, online gamers may acquire game-related skills over time and experience challenge or competition, facilitating the development of their perceived self-efficacy [10]. Third, *relatedness motivation* refers to individuals' desire to interact with and be connected to others [38]. In online gaming, users may play with or against one another, fostering a sense of recognition, friendship, and/or bonding [13]. Given the applicability of the theory's motivational dimensions in the context of in-game purchasing [26,43], we adopt a self-determination theory perspective of IGCPMs.

Self-determination theory posits that the fulfilment of these human needs will positively impact behavior [42]. For example, when an online game satisfies players' autonomy, competence, and/or relatedness needs, they are more likely to continue playing the game, enjoy playing it [45,46], and purchase specific in-game items [47,48], boosting their IGCPMs. While prior work has explored IGCPMs, it has tended to adopt extant scales that were developed in other (e.g., retailing) contexts, thus failing to capture the unique hallmarks of IGCPMs (e.g., competition [49]), as outlined. Moreover, though prior authors have typically viewed players' autonomy, competence, and relatedness motivations as unidimensional constructs, respectively [e.g., 31, 32], recognition of the multidimensional nature of these motivations (i.e., with each comprising specific sub-facets) is emerging (e.g., [42,50]; see Table 1). Adopting this perspective, we conceptualize IGCPMs as follows from a self-determination theory perspective [38,51]:

> A player's drive for autonomy, competence, and relatedness in online games that leads the individual to purchase in-game virtual content.

2.2. Self-determination theory-informed motivations and their respective facets

Unlike prior authors, who have tended to view players' motivations as unidimensional variables [e.g., 31, 32], scholars like Guiot and Roux [52] and Otoo, Kim [64] argue for the multifaceted, multidimensional, or composite nature of purchase motivations, as purchase behavior is commonly driven by multiple motives that each contain unique considerations [55,65]. To conceptualize IGCPMs, we adopt self-determination theory's tripartite (autonomy, competence, and relatedness) motivations [66], which each contain specific sub-facets [e.g., 50] that are applicable in the online gaming context, as discussed further below.

2.2.1. Autonomy motivation

In self-determination theory, *autonomy motivation* refers to the extent of an individual's desire for psychological freedom of their internal will [67]. While prior self-determination theory research has widely viewed

Table 1
Overview - prior multidimensional approaches to measuring purchase motivations.

General customer motivation studies					
Study	*Scale development*	*Context*	*Theoretical foundation*	*Dimensions*	*Findings*
Sweeney and Soutar [15]	✓	Consumer durable goods brands	Experiential value	Emotional value Social value Functional value (price/value for money) Functional value (performance/ quality)	Perceived value dimensions emerged e.g., emotional, social, price/value for money, and quality/performance significantly explaining consumers' attitudes and behavior.
Guiot and Roux [52]	✓	Second-hand product purchase motivations	None articulated	Nostalgic pleasure Treasure hunting Social contact Ethics and ecology Fair price Gratification Originality Distance from the system	Findings support the tripartite nature (critical, economic, and recreational) of second-hand product purchase motivations.
Arnold and Reynolds [53]	✓	Hedonic shopping purchase motivations	None articulated	Adventure Gratification Social Role Idea Value	Hedonic shopping-related motivations significantly influence specific shopping behaviors (e.g., impulse purchasing and compulsive consumption).
Petrick [54]	✓	Consumer value in leisure services	None articulated	Quality Emotional response Monetary price Behavioral price Reputation	Demonstrated a five-dimensional valid and reliable scale for measuring consumer perceived value.
Varshneya and Das [21]	✓	Fashion retailing	None articulated	Cognitive value Hedonic value Social value Ethical value	The scale provides an integrated framework for measuring experiential value and includes cognitive, hedonic, social, and ethical dimensions.
Choe and Kim [20]	✓	Local food consumption	Experiential value	Emotional value Epistemic value Health value Prestige value Taste/quality value Price value Interactional value	The scale was effective in identifying visitor satisfaction with local food, positive postpurchase intentions, and positive perceptions of the food destination.
Padmavathy, Swapana [55]	✓	Online second-hand purchase motivations	Hierarchical theory of shopping motivation	Price orientation Bargaining power Critical orientation Usefulness Ease of use Need to be unique Nostalgia Trust Assurances	Findings show that OSSM as a formative higher-order construct positively predicts online second-hand shopping attitude and repurchase intention.
Nwankwo, Hamelin [56]	–	Luxury good purchase motivations	Value attitude-behavior system	Conspicuous Unique Hedonic Social Quality	Luxury goods are prioritized for quality and uniqueness, with religion playing a minor role.
Hudders [57]	–	Luxury goods purchase motivations	None articulated	Uniqueness Identity Conformity Functional Emotional	The primary motive for purchasing luxury goods is to enjoy them (quality and pleasure), while expressive motives like status are secondary.
Kumar and Yadav [58]	–	Green apparel purchase motivations	Theory of shopping motivation	Convenience Information availability Customized offerings Adventure Authority and status Hedonic motivation Selection	In general, consumers' intention to purchase green apparel is motivated by utilitarian (practical) and hedonic (pleasure-based) factors, with gender and income playing a significant role.
Prior studies addressing players' motivation to purchase in-game virtual items					
Guo and Barnes [59]	–	In-game purchase motivations	Transaction cost theory, unified theory of acceptance and use of technology	Effort expectancy Performance expectancy Perceived value Perceived enjoyment	Intrinsic and extrinsic types of motivators significantly influence Second Life users purchase behavioral intention.

(*continued on next page*)

Table 1 (*continued*)

General customer motivation studies					
Study	*Scale development*	*Context*	*Theoretical foundation*	*Dimensions*	*Findings*
Hamari, Alha [60]	–	In-game content purchase motivations	None articulated	Advancement Customization Social influence Unobstructed play Social interaction Competition Economic rationale Indulging the children Unlocking content	Highlights that in-game purchases are highly influenced by motivations such as uninterrupted play, social interaction, and economic rationale.
Marder, Gattig [61]	–	Non-functional game item purchase motivations	None articulated	Novelty Aesthetics Self-gratification Character dedication Reciprocity Gifting Social distinction	Rather than the inherent value of an item, hedonic, social, and utilitarian motivations play a key role in the purchase of non-functional items in League of Legends
Jang, Lee [19]	–	Mobile game content purchase motivations	Self-determination theory	Play frequency Stage Social interaction	Play frequency and social interaction positively correlate with intention to purchase, while stage level correlates negatively.
Shukla and Drennan [62]	–	Virtual world items purchase motivations	Social influence theory, Kohler's motivational gains effects theory, social network theory	Normative interpersonal influences Community identity Perceived enjoyment Customization Advancement Outcome expectancy	Virtual purchases are significantly influenced by interpersonal influences and community identity, while opportunities for advancement and enjoyment are critical drivers of buying behavior.
Wang, Luo [63]	–	Non-functional item purchase motivations	Social comparison theory	Peer purchases Envy Conformity	Both envy and conformity play vital roles in motivating players to emulate their peers' purchasing behaviors when it comes to peers with strong ties.
Wang and Hang [42]	–	Role-playing games items purchase motivations	Self-determination theory	Defense effectiveness Continuing growth Competence signaling Caring for others Peer recognition Aid self-expression Moral duty of care	While competence, autonomy, relatedness, and purpose in life contribute to one's pseudoimonic game experience, each psychological need has its own dimensions.
Gong, Wagner [5]	–	Role-playing games item purchase motivations	The Wixom and Todd framework	Immersion Social comparison Advancement	Purchase intentions are significantly influenced by advancement motivation and immersion, with aesthetic design, customization, and sociability influencing immersion.

autonomy as a unidimensional facet of individuals' psychological self-determination, evidence for its *composite* nature is also observed. Specifically, based on an extensive review, we identify the autonomy motivation sub-facets of creativity, choice, and uniqueness, which each contribute to players' game-related immersion, competition, and flow, as outlined below.

First, *autonomy* motivation has been viewed to comprise *creativity*, an individual's ability to produce or use original or new ideas [e.g., [68–70], which is conducive to immersion and flow [71]. For example, drawing on self-determination theory, Lin, Shipton [72] find that employees' intrinsic motivation mediates the association of creativity-contingent extrinsic rewards and employee creativity, which we propose to also apply to IGCPMs. To illustrate, in *Minecraft*, players may autonomously decide to purchase custom content, including skins, worlds, and mods, helping them to imagine or develop creative ideas and gameplay experiences, fostering creativity and autonomy [73].

Second, *choice* refers to the range of options available to players to satisfy their game-related interests or needs [74], including through personalizable items [e.g., avatar skins or outfits; [61]], the ability to choose one's preferred tools [e.g., weapons or vehicles; [48]] or activities [e.g., driving a car, taking a swim, socializing, or moving around different area; [75,76],. Choice not only tends to boost players' competitive game performance [77], but also stimulates their immersion and flow [78]. It is at the core of players' autonomy motivation because without it, they are unlikely to feel autonomous in their game-play [79]. Therefore, the broader the array of players' game-related choices, the more autonomous they will tend to feel.

Third, *uniqueness* denotes a player's need for distinctiveness or individuality in the game [80], which also contributes to their immersion, flow, and competition [78,81]. As in the real world, individuals tend to desire establishing their own unique identity (vs. other players), whether through their appearance or their actions [5,10]. By establishing a unique game-related persona (e.g., through the appearance of their avatar; [48]), players will tend to feel closer to the game, fostering their immersion and flow and improving their competitive performance [82].

2.2.2. Competence motivation

In self-determination theory, *competence motivation* refers to individuals' desire to control the outcomes of their actions and to experience mastery over their task(s) [14,83]. Based on our review, we identify the competence motivation facets of achievement, skillfulness, and dominance [42,84], which we suggest impact players' game-related immersion, flow, and competition [16,85], as detailed below.

First, *achievement* denotes a player's sense of game-related accomplishment [e.g., by progressing to the next or final level in the game or by winning a badge or a crown; [69,86]. Typically, the greater players' perceived game-related achievement, the more competent they will feel

(e.g., in *League of Legends*, players may feel a sense of accomplishment when they achieve a *Pentakill*). Games tend to provide specific incentives or rewards that help players celebrate their accomplishments (e.g., after completing in-game challenges, players are publicly ranked in World of Warcraft). Overall, achievements tend to be conducive to players' game-related enjoyment, intrinsic pleasure, and perceived self-efficacy [87], helping them fulfil their needs, as outlined in self-determination theory [88] and boosting their game-related immersion, flow, and competence [87].

Second, *skillfulness* reflects players' game-related skills, which help them perform in the game [43]. Generally, the more people play a game, the more skillful they become at it, boosting their immersion, flow, and competition [85]. Moreover, in-game design elements may also be used to foster players' in-game performance in lieu of their game skills [89]. For example, paid-for versions of games tend to offer additional analytical tools (e.g., heat-maps) that help premium gamers avoid traps or risks, fix their mistakes, or boost their in-game actions, which are not available to freemium players [76]. Therefore, such in-game elements can foster paying players' perceived skills by other players. However, despite these, players' skills remain essential in shaping their game-related immersion, flow, and competition [90].

Third, *dominance* refers to gamers' desire to be more important, stronger, or more successful than others [91,92], raising their status in the gaming community [93] and fostering their game-related immersion, flow, and competition [94]. For dominance to occur, game-related achievement and skillfulness are necessary, illustrating their theoretical linkage. In competitive (e.g., role-playing) games, premium items can be purchased to enhance dominance in different ways [95], including by affording their exclusive access to strategic game resources (e.g., virtual cloaks with special abilities), facilitating gamers' dominance over others.

2.2.3. Relatedness motivation

According to self-determination theory, players are also driven by their *relatedness motivation*, or their desire to interact with and be connected to others [39,96]. While prior research has commonly viewed relatedness motivation unidimensionally [31], other authors have proposed *composite* perspectives [97], as adopted in this research. Based on our review, we identify the conceptually distinct relatedness motivation facets of social interaction and social affiliation [98] that we suggest to impact players' game-related immersion, flow, and competition [22], as discussed further below.

First, *social interaction* represents a player's communication or collaboration with others [99,100], which is common in online gaming [101–103]. Prior authors have argued that interactive gaming features stimulate player engagement, immersion, and flow (e.g., by reaching specific in-game milestones/fulfilling communal objectives [e.g., by reaching specific in-game milestones/fulfilling communal objectives; [11,93]. For example, the premium version of Minecraft encourages players to work together on participating in streaming challenges, boosting their social interaction in- and outside the Minecraft community [e.g., on Twitch or YouTube [104].

Second, *social affiliation* reflects the extent to which players experience a sense of belonging or connection to a gaming community [105].

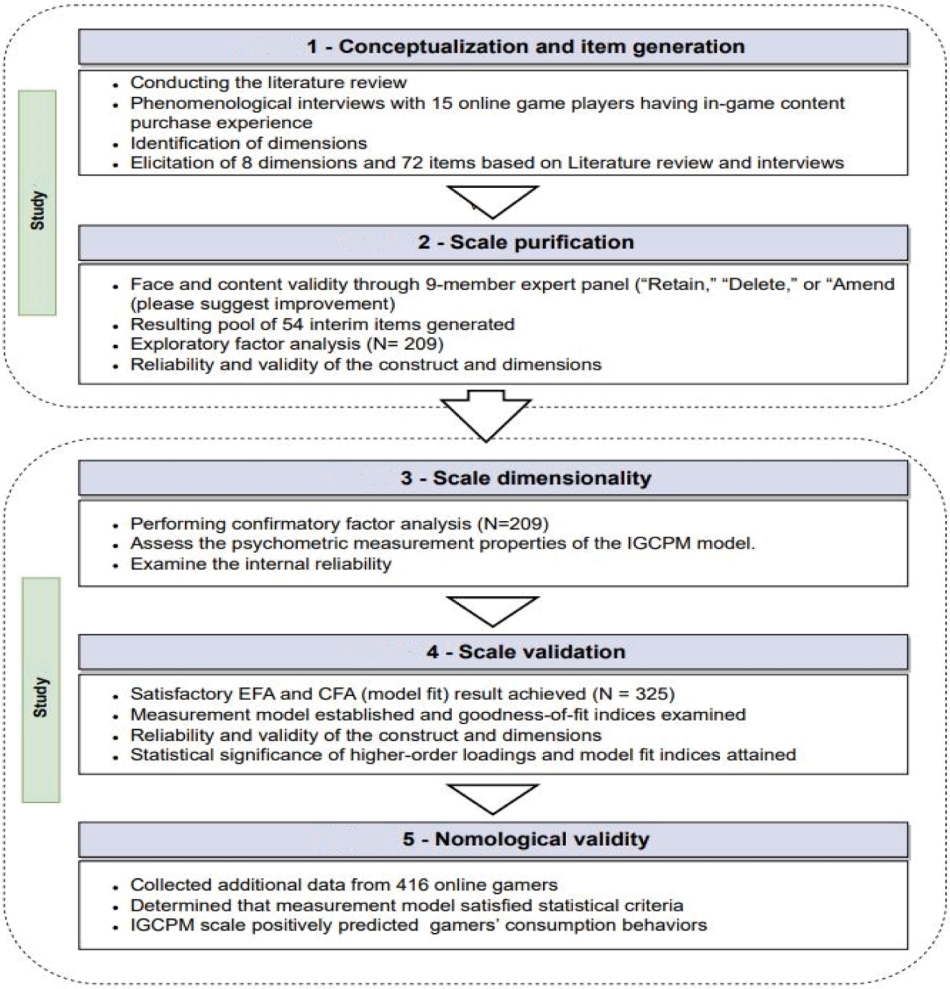


Fig. 1. Scale development procedures.

The more players are emotionally connected to a gaming community, the greater their expected relatedness motivation and desirable (e.g., pro-social) behavior [98]. For example, in massively multiplayer online role-playing games (MMORPGs), team members tend to use the same appearance (e.g., skin) to symbolize their shared social affiliation.

3. IGCPM scale development and validation procedures

To develop a psychometrically valid, reliable IGCPM scale, we follow established scale development procedures [27,106,107] (see Fig. 1). We first conduct a qualitative study to better understand the nature of IGCPMs, followed by four quantitative studies to develop, purify, and validate the proposed scale.

3.1. Study 1: item generation

3.1.1. Data collection procedures

The qualitative study aimed to attain a rich, deep understanding of IGCPM (sub-)themes, serving as a foundation for the subsequent development of the IGCPM dimensions and items. We deployed semi-structured in-depth interviews in which the respondents were requested to reflect on their IGCPMs in the past two months.

We interviewed 15 online gamers who regularly purchase in-game content. Participants were recruited through a multi-stage snowballing approach [108], which identified two active gamers through personal referrals, whom then referred fellow gamers, etc. Prior to the interviews, respondents were screened to meet the following criteria: (i) they have at least 2 years of active online gaming experience in a genre offering in-game purchases, (ii) they play online games at least 3 hours daily, (iii) they have made at least one in-game purchase in the last 2 months, (iv) they are a member of at least one online gaming community, and (v) they have engaged in online discussions about in-game purchasing in the last 2 weeks. The adopted snowballing approach ensured that the respondents knew one another [109], (also) permitting the emergence of *relatedness* motivations in the data.

We discontinued interviewing when theoretical saturation was reached (i.e., when no significant new insight was attained from interviewing further respondents; [110,111]). A semi-structured interview protocol was created [42,112], which applied self-determination theory's autonomy, competence, and relatedness motivations to IGCPMs. We also incorporated questions asking about the proposed autonomy, competence, and relatedness facets. The interviews were audio-recorded and transcribed [110].

3.1.2. Data-analytic procedures and findings

The interview transcripts were analyzed to identify their key themes, reflecting an inductive approach [113,114], which were subsequently linked back to the gaming literature to theoretically situate IGCPMs in this discourse (i.e., deductive approach; [115]).

Drawing on Ahmed and Ting [116] and Crawford, Newmeyer [117], we adopted the following five-step procedure to analyze the data: (1) *Data familiarization*: we iteratively read the interview transcripts to familiarize ourselves with the data and identify preliminary IGCPM themes; (2) *Initial coding*: the transcripts were decomposed into thematic units, each of which was assigned a specific code reflecting a possible IGCPM theme; (3) *Theme development and categorization*: codes were grouped into broader themes that are consistent across the respondents. The attained themes served as a foundation for the subsequent IGCPM dimensions; (4) *Integration with literature*: the proposed inductively generated IGCPM themes were cross-checked against prior relevant literature, ensuring their theoretical alignment while also permitting the emergence of novel insight. Deploying this process [118,119], we developed an initial set of 8 IGCPM themes aligning with self-determination theory's autonomy, competence, and relatedness motivations and facets, corroborating the findings of the literature review. We also identified a preliminary pool of 73 IGCPM statements reflecting the proposed 8 dimensions.

Finally, in step 5, *expert feedback and item generation*, we drew on a panel of five marketing researchers with expertise in consumer behavior, scale development, and online gaming, who have published extensively in reputable marketing/human computer-interaction journals, and four game developers who also play online games. These respondents were identified based on their game design and virtual content creation involvement and were required to have at least five years of experience. Overall, the panel reflects a suitable balance of academic and practical expertise, contributing to the IGCPM scale's content and face validity [109]. The panel was provided with the proposed IGCPM definition, definitions of its dimensions and facets (see Appendix 2), and preliminary items (see Table 2). They were requested to assess the extent to which the items represent their respective IGCPM dimension or facet, respectively. For each item, panel members recommended to retain, remove, or amend its wording.

To establish inter-rater reliability, we employed the Delphi technique by using multiple rounds of feedback, in which the experts were requested to further consider their answers based on the collective feedback offered until a consensus was reached [120]. The results reveal elevated alignment between the proposed IGCPM dimensions, sub-facets, and items and the panel's recommendations. For items featuring a level of dissensus, we retained only those that were supported by at least 7 of the 9 experts [121], leading to the removal of 19 items. For example, "I value being stronger above everything," "Being imaginative is important to me," and "Awards and material things are important to me." All the experts indicated the need to remove these preliminary items, given their lack of specific applicability to the in-game purchase context. Based on this process, 54 items were retained, with a small number receiving minor revisions.

3.2. Study 2 - scale purification

Study 2 purported to purify the preliminary set of 54 IGCPM items, organized along 8 dimensions. Data was collected from 209 Malaysian online gamers to ascertain the underlying IGCPM factor structure and refine the items as necessary. We conducted a self-administered survey featuring the preliminary 54-item IGCPM scale, in which the items were rated on seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). Data was collected from gaming zones, e-sports and cyber cafes in five different Malaysian states [13]. To recruit the respondents, we deployed the following screening criteria: Participants are required to have at least 6 months online gaming experience, play online games at least 1–2 h weekly, have made at least 1 in-game purchase in the last 2 months, and are active players in a game genre that offers in-game purchases. Overall, we obtained an ethnically diverse sample (39.9 % Malay, 38.0 % Chinese, and 22.1 % Indian respondents).

To determine the factor structure of IGCPMs and purify the measurement instrument, we first performed the Kaiser-Meyer-Olkin (KMO) test for sample adequacy ($\geq$0.5), which showed KMO=0.715, revealing the applicability of conducting factor analysis on the data [122]. Bartlett's test of sphericity also revealed a chi-squared value of 2804.783, df=435 (p = 0.000), suggesting that the correlation matrix is not an identity matrix.

Based on Fabrigar, Wegener [123] recommendation, principal component analysis was performed to identify the minimum number of factors using maximum likelihood estimation on the 54 items. The factors were assessed through oblique rotation (Promax with kappa 4), which is able to generate an interpretable structure, indicating correlations among the variables [124]. The first rotation pattern matrix provided a 12-factor solution (cumulative observed variance: 67.89 %). However, 9 items exhibited cross-loadings, with a further 7 items showing low factor loadings (<0.60), leading to the removal of these 16 items and retaining 38 items for further analysis.

We next performed principal component analysis on the remaining

Table 2
Exploratory factor analysis results.

Variables	Items	Factor loading	Cronbach's alpha
Dominance (Eigenvalue = 2.578; Variation =8.592)	DO2. Buying in-game content allows me to power up my gaming character.	0.72	0.85
	DO3: In-game content helps me become superior to other gamers.	0.81	
	DO4: In-game content helps me be a dominant player in the game.	0.71	
	DO5: I enjoy buying in-game content because it allows me to control other gamers.	0.82	
Achievement (Eigenvalue = 2.313; Variation =7.711)	AC3: Buying in-game content makes me feel more accomplished in the game.	0.81	0.84
	AC4: In-game content helps me win more badges or medals in the game.	0.71	
	AC5: Above all, I buy in-game content because it improves my status or progress in the game.	0.72	
	AC6: In-game content helps me achieve increasingly difficult tasks in the game.	0.78	
Skillfulness (Eigenvalue = 3.030; Variation =10.101)	SK1: By buying in-game content, I feel very effective.	0.75	0.85
	SK3: By buying in-game content, I feel I better understand the game environment.	0.76	
	SK5: I like buying in-game content because it helps me enhance my expertise in the game.	0.73	
	SK6: I like buying in-game content because it allows me to broaden my gaming abilities.	0.81	
Creativity (Eigenvalue = 1.962; Variation =6.539)	CR1: Buying in-game content allows me to be imaginative in the game.	0.70	0.80
	CR3: I enjoy buying in-game content because I feel more creative in the game.	0.72	
	CR6: I enjoy buying in-game content because I feel it provides new, innovative ideas.	0.84	
Choice (Eigenvalue = 1.838; Variation =6.127)	CH1: In-game content buying enables me to pick and choose from a greater range of relevant content.	0.76	0.77
	CH2: What I like about buying in-game content is the sense of freedom it provides.	0.71	
	CH3: In-game content purchasing allows me to buy the content of my choice.	0.69	
Uniqueness (Eigenvalue = 2.724; Variation =9.081)	UN1: In-game content allows me to express my individuality.	0.76	0.83
	UN3: By buying in-game content, I show other players that I'm different.	0.78	
	UN4: I buy in-game content because I want to depict a distinctive personal image in the game.	0.79	
	UN5: I like buying in-game content because it helps me customize my gaming character.	0.72	
Social interaction (Eigenvalue = 2.225; Variation =7.417)	SI1: Buying in-game content boosts my interactions with other players.	0.72	0.85
	SI4: In-game content helps me play online games with multiple players.	0.76	
	SI5: Buying in-game content allows me to talk to other players and share game-related information with them.	0.86	
	SI6: In-game content helps me broaden my social circle in the game.	0.68	
Social affiliation (Eigenvalue = 4.420; Variation =14.734)	SA1: I like buying in-game content because it helps enhance my acceptance by other players.	0.84	0.84
	SA2: Buying in-game content stops me from feeling left out of the group I want to belong to.	0.74	
	SA3: By buying in-game content, I feel I have companions.	0.89	
	SA5: Buying in-game content fosters a sense of intimacy with other players.	0.75	

38 IGCPM items, which suggested the existence of a 9-factor solution (cumulative variance explained: 73.70 %). Further, 6 factors exhibited cross-loadings, while 2 items had low factor loadings, as suggested by the pattern matrix. We thus removed these 8 problematic items, leading us to retain a total of 30 items organized along 8 dimensions. These include: Factor 1 (Dominance, 4 items), factor 2 (Achievement, 4 items), factor 3 (Skillfulness, 4 items), factor 4 (Creativity, 3 items), factor 5 (Choice, 3 items), factor 6 (Uniqueness, 4 items), factor 7 (Social interaction, 4 items), and factor 8 (Social affiliation, 4 items). Collectively, these factors were found to represent 82.53 % of the cumulative variance. We also assessed the reliability of the 30-item instrument by using Cronbach's alpha ($\geq$0.70; [100]), which yielded the following scores: Dominance (0.85), Achievement (0.84), Skillfulness (0.85), Creativity (0.80), Choice (0.77), Uniqueness (0.85), Social Interaction (0.83), and Social Affiliation (0.84) (see Table 2).

3.3. Study 3 - scale confirmation

The proposed eight-factor structure was subsequently verified using confirmatory factor analysis (CFA) with AMOS 21 [125], deploying the same dataset as that in study 2. The results suggest the existence of the IGCPM scale's convergent and discriminant validity. Specifically, composite reliability surpassed the minimum threshold (0.70), suggesting the scale's high internal consistency [126]. The average variance extracted (AVE) values also exceeded the 0.50 threshold, explaining >50 % of the observed variance in the latent constructs. To assess discriminant validity, the Fornell and Larcker [127] criterion was used, which suggests that the AVE values must exceed the value of the inter-construct correlations, which was also met. Overall, the model was found to exhibit a good fit to the data: $\chi 2/df = 1.57$, $p = 0.000$, Goodness of fit index (GFI)=0.92, Tucker-Lewis index (TLI)=0.94, Normed fit index (NFI)=0.94, Comparative fit index (CFI)=0.95, Incremental fit index (IFI)=0.95 (GFI, NFI, TLI, CFI, and IFI$\geq$0.90), and Root mean square error of approximation (RMSEA)=0.054 ($\leq$0.06; [128]), as shown in Table 3. While some authors suggest that CFA can be performed post-EFA using the same dataset (e.g., [129]), others indicate

Table 3
Convergent and discriminant validity.

Factors	Composite reliability	Average variance extracted	Achievement	Affiliation	Choice	Creativity	Dominance	Interaction	Skillfulness	Uniqueness
Achievement	0.842	0.573	**0.803**							
Affiliation	0.841	0.572	0.468	**0.823**						
Choice	0.765	0.521	0.549	0.385	**0.854**					
Creativity	0.801	0.574	0.571	0.466	0.628	**0.860**				
Dominance	0.849	0.585	0.538	0.401	0.510	0.593	**0.828**			
Interaction	0.841	0.572	0.556	0.618	0.483	0.522	0.449	**0.802**		
Skillfulness	0.849	0.584	0.730	0.449	0.646	0.565	0.540	0.516	**0.863**	
Uniqueness	0.848	0.582	0.398	0.531	0.324	0.434	0.341	0.491	0.432	**0.824**

Note - The diagonals represent the square roots of the AVE; The off-diagonal values reflect the inter-construct correlations.

this may incur a risk of tautological conclusions [130]. Acknowledging the latter, more conservative perspective, we collected a new dataset (study 4) to validate the proposed scale.

3.4. Study 4 - scale validation

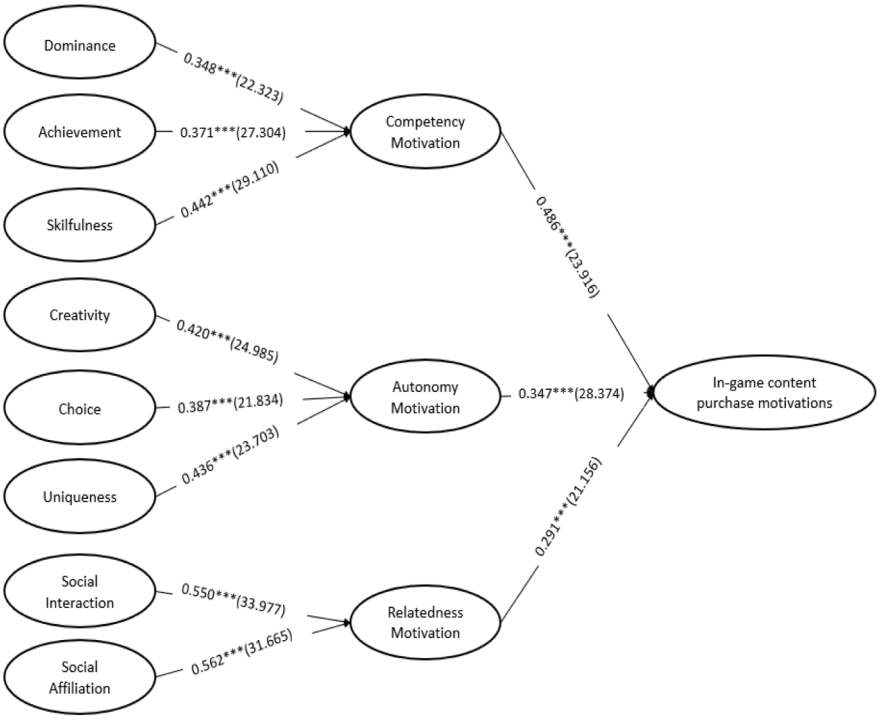
Study 4 sought to validate the newly developed IGCPM scale. We deployed a questionnaire incorporating the eight-dimensional, 30 IGCPM scale alongside respondents' demographic information in five Malaysian states. This study replicated the data collection procedure employed in study 2. After removing invalid responses (e.g., those with straight-lining tendencies), we retained a total of 325 valid responses.

We tested for common method bias using Harman's single-factor test [131]. The results showed that the variance explained by the first factor accounted for 32.83 % of the total observed variance, remaining well under the 50 % threshold [132,133]. Confirmatory factor analysis was again performed using AMOS 21 to validate the IGCPM scale. The model was found to exhibit a good fit to the data: χ^2/df=1.43, GFI=0.95; NFI=0.92; CFI=0.94, and RMSEA=0.044 [128]. The AVE was >0.50, and all 30 items loaded onto their respective factor, indicating the scale's convergent validity [134].

We propose IGCPMs as a third-order construct comprising 3 second-order constructs (competence, autonomy, and relatedness), which in turn comprise 8 first-order constructs (dominance, achievement, skillfulness, creativity, choice, uniqueness, social interaction, and social affiliation). We undertake hierarchical component modeling of the scale using SmartPLS 3, allowing us to test reflective and formative measurement constructs. Specifically, IGCPMs are operationalized as a multidimensional type II (reflective-formative), third-order construct [135]. Multicollinearity was assessed by examining the VIFs to validate the measurement properties of the reflective-formative higher-order construct [136]. The results indicate that the VIFs remained under the threshold value of3.3 [137]. We also examined weights and statistical significance of the higher-order construct. The findings (see Fig. 2), confirming IGCPM as a multidimensional construct comprising reflective and formative elements.

3.5. Study 5 - nomological validity assessment

To test the nomological validity of the IGCPM scale, we examine its invariance and validity across virtual content consumption contexts using a new dataset obtained from 416 online gamers aged 15 years and over. To collect the data, we distributed 500 QR codes to the online questionnaire to potential respondents. Data was gathered from five



Notes - Path coefficients (t-values); ***P < 0.001

Fig. 2. Results - third-order model.

Malaysian states (Kuala Lumpur, Selangor, Penang, Kedah, and Perak), which are considered to be among the country's largest metropolitan areas and economic hubs. These states are located in different geographic parts of the country and collectively, offer a holistic view of Malaysian online gamers. The respondents' demographic profile is shown in Table 4. Nomological validity, which tests the theoretical associations of IGCMPs with other relevant constructs in a nomological net, was assessed by examining the inter-construct correlations [138].

The measurement model exhibits a theory-driven nature (e.g., by taking into account the proposed construct conceptualization; [40]). As each IGCPM dimension comprises gamers' multifaceted motivations, we model IGCPMs as a higher-order construct [55]. Thus, to assess the predictive validity of higher-order IGCPMs, we examined its effect on potential response variables, including purchase behavior, recruitment, and word-of-mouth [139], as discussed below.

3.5.1. IGCPMs → purchase intent

According to self-determination theory, players' competency, autonomy, and relatedness motivations propel them to engage in specific gaming behaviors [e.g., in-game purchase;[42]]. In freemium games, players' motivation to play the game has been found to influence their in-game purchase behavior [60]. For example, Teng, Huang [31] find that players' (e.g., autonomy, competence, or relatedness) motivation is conducive to their satisfaction with the game, which is expected to be driven to an important extent by their game-related skill levels. Therefore, online gaming environments that stimulate players' autonomy (e.g., through in-game or game style choice decision-making options), their competence (e.g., through challenging, yet achievable missions), and relatedness (e.g., through social interaction) are likely to see their elevated in-game purchase behavior [140,141]. We propose:

H1: IGCPMs positively impact players' intention to make in-game purchase intent.

3.5.2. IGCPMs → positive word-of-mouth

The fulfilment of fundamental psychological motivations or needs, including self-determination theory's autonomy, competence, and relatedness motivations, plays a significant role in predicting individuals' intent to disseminate positive word-of-mouth about an object [e.g., in-game items; [92,142]. In-game purchases allow players to engage in additional (e.g., collaborative) activities, participate in more challenges, access a greater array of in-game tools (e.g., skins/ammunition), and develop new skills, among others, that tend to be lacking in the freemium version of the game [13,143], thus better meeting their autonomy, competence, and/or relatedness needs and raising their perceived game-related value.

Accordingly, we predict a positive effect of players' game-related autonomy, competence, and relatedness motivations to purchase in-game content on their positive word-of-mouth about the game, or their favorable reports about it [144], because the more motivated they are to purchase in-game content, the better they will tend to feel about it. We hypothesize:

H2: IGCPMs positively impact players' intent to disseminate positive game-related word-of-mouth.

3.5.3. IGCPMs → new player recruitment

Recruitment, the extent to which gamers are able to attract (recruit) other players to purchase in-game content ([e.g., by providing referrals for the value of doing so; [145]]), is strategically important for game developers, manufacturers, and marketers (e.g., to safeguard continued growth; [139]). Players who are highly motivated to purchase in-game content (e.g., to fulfil their game-related autonomy, competence, and/or relatedness motivations) are likely to have already made in-game purchases themselves. These individuals are likely to recommend others (e.g., their fellow players or team-mates) to *also* purchase in-game content, which would not only enhance their, but also their *own*, game performance [145]. We thus expect players who are highly motivated to make in-game content purchases themselves to also exhibit an elevated intent to recruit other players to purchase in-game content (e.g., to elevate their collective in-game performance). We postulate:

H3: IGCPMs positively impact players' intention to recruit their team members to also purchase in-game content.

3.5.4. Nomological validity assessment

We used partial least squares structural equation modeling (PLS-SEM) to test the nomological validity of the model in a hierarchical framework (Smart-PLS 3.2). The measurement model was assessed based on the factor loadings, Cronbach's alpha, composite reliability (CR), and AVE values. The factor loadings for each construct were significant (>0.60), and the AVE >0.50, indicating convergent validity [146] (see Table 5). Further, we deployed the heterotrait-monotrait (HTMT) ratio to assess discriminant validity [147]. As shown in Table 6, the HTMT ratios remain well below the conservative 0.85 threshold, indicating the discriminant validity of the modeled constructs.

We next tested the hypotheses using the structural model (i.e., by assessing the path coefficients; see Table 7). First, the results suggest that IGCPMs significantly and positively influence players' in-game purchase intention ($\beta = 0.700$; $p < 0.01$), supporting H1. Second, the findings indicate that IGCPMs significantly and positively impact players' intent to disseminate positive game-related word-of-mouth ($\beta = 0.475$; $p < 0.01$), supporting H2. IGCPMs were likewise found to significantly and positively affect players' recruitment ($\beta = 0.276$; $p < 0.01$), thus also lending empirical support for H3.

Table 4
Respondent profile ($n = 416$).

		Frequency	%
Gender	Male	276	66.3
	Female	140	33.7
Age, years	15–18	106	25.5
	19–25	143	34.3
	26–32	96	23.1
	33–39	47	11.2
	40 and older	24	5.8
Ethnicity	Malay	166	39.9
	Chinese	158	38.0
	Indian	92	22.1
Frequency	Every day	218	52.4
	Once a week	177	42.5
	A few times a week	21	5.04
Duration	1–4 hrs/daily	223	53.6
	5–8 hrs/daily	121	29.0
	9–12 hrs/daily	53	12.7
	Over 12 hrs/daily	19	04.5
Spending	RM1–100	26	6.3
	RM101–200	37	8.9
	RM201–300	135	32.5
	RM301- 400	167	40.1
	> RM 400	51	12.3

Note - RM: Malaysian Ringgit.

4. Discussion, implications, and further research

4.1. Discussion

We conducted five studies to conceptualize IGCPMs and to develop and validate the proposed eight-dimensional, 30-item IGCPM scale. Using self-determination theory, we conceptualized IGCPMs as players' drive for autonomy, competence, and relatedness in online games that leads them to purchase in-game virtual content [26]. We specified IGCPMs as a third-order formative construct comprising three second-order formative constructs (autonomy, competence, relatedness), which in turn consist of 8 first-order reflective constructs (creativity, choice, uniqueness, dominance, achievement, skillfulness, social

Table 5
Measurement model summary for nomological validity.

Construct	Items	FL	CA	CR	AVE
Dominance	Buying in-game content allows me to power up my gaming character.	0.784	0.888	0.901	0.782
	In-game content helps me become superior to other gamers.	0.928			
	In-game content helps me be a dominant player in the game.	0.889			
	I enjoy buying in-game content because it allows me to control other gamers.	0.874			
Achievement	Buying in-game content makes me feel more accomplished in the game.	0.735	0.749	0.841	0.572
	In-game content helps me win more badges or medals in the game.	0.859			
	Above all, I buy in-game content because it improves my status or progress in the game.	0.737			
	In-game content helps me achieve increasingly difficult tasks in the game.	0.771			
Skillfulness	By buying in-game content, I feel very effective.	0.776	0.877	0.916	0.733
	By buying in-game content, I feel I better understand the game environment.	0.826			
	I like buying in-game content because it helps me enhance my expertise in the game.	0.886			
	I like buying in-game content because it allows me to broaden my gaming abilities.	0.928			
Creativity	Buying in-game content allows me to be imaginative in the game.	0.860	0.781	0.873	0.696
	I enjoy buying in-game content because I feel more creative in the game.	0.777			
	I enjoy buying in-game content because I feel it provides new, innovative ideas.	0.865			
Choice	In-game buying enables me to pick and choose from a greater range of relevant content.	0.845	0.821	0.893	0.736
	What I like about buying in-game content is the sense of freedom it provides.	0.839			
	In-game content purchasing allows me to buy the content of my choice.	0.889			
Uniqueness	In-game content allows me to express my individuality.	0.810	0.750	0.842	0.573
	By buying in-game content, I show other players that I'm different.	0.777			
	I buy in-game content because I want to depict a distinctive personal image in the game.	0.801			
	I enjoy buying in-game content because it helps me customize my gaming character.	0.714			
Social interaction	Buying in-game content boosts my interactions with other players.	0.754	0.801	0.870	0.627
	In-game content helps me play online games with multiple players.	0.850			
	Buying in-game content allows me to talk to other players and share game-related information with them.	0.821			
	In-game content helps me broaden my social circle in the game.	0.726			
Social affiliation	I like buying in-game content because it helps enhance my acceptance by other players.	0.751	0.735	0.834	0.559
	Buying in-game content stops me from feeling left out of the group I want to belong to.	0.808			
	By buying in-game content, I feel I have companions.	0.853			
	Buying in-game content fosters a sense of intimacy with other players.	0.864			
Purchase intention	I intend to purchase in-game content for my characters in the gaming world.	0.954	0.923	0.951	0.867
	My willingness to buy virtual items in online games is high.	0.914			
	The likelihood that I will purchase in-game content is high.	0.925			
Recruitment	I try to get my friends to purchase in-game content.	0.843	0.898	0.928	0.763
	I have invited my teammates or gaming family to buy in-game virtual content.	0.836			
	I try to get people to purchase in-game content for the first time.	0.863			
	I tell people to try virtual items.	0.841			
Word-of-mouth	I share information about in-game content with other gamers.	0.865	0.813	0.914	0.842
	I enjoy providing information on in-game content to other gamers.	0.896			

Notes - FL = Factor loading; CA= Cronbach's alpha; CR= Composite reliability; AVE = Average variance extracted.

interaction, and social affiliation). The scale was found to exhibit elevated construct, nomological, and discriminant validity.

The proposed IGCPM scale extends the literature as follows. While prior studies have measured consumers' purchase motivations in other or related contexts (e.g., retailing; [15,53]), and while previous authors have tended to use specific extant purchase motivation scales to measure IGCPMs [18,19], as shown in Table 1, these may fail to fully capture IGCPMs, given the unique hallmarks of online gaming environments (e.g., immersion, flow, and competition; [148]). Addressing this gap, we developed and validated a dedicated IGCPM scale, which is of strategic importance to the online gaming industry, given its capacity to further grow in-game revenue.

Moreover, while prior research has typically viewed consumers' autonomy, competence, and relatedness motivations as unidimensional constructs, our findings suggest their respective multidimensional nature, thus offering a more nuanced motivational perspective in the context of IGCPMs. Overall, our findings are expected to help online gaming scholars, developers, manufacturers, and marketers to better

Table 6
Discriminant validity assessment.

	Achievement	Affiliation	Choice	Creativity	Dominance	Interaction	Purchase	Recruitment	Skillfulness	Uniqueness	Word-of-mouth
Achievement											
Affiliation	0.515										
Choice	0.622	0.390									
Creativity	0.586	0.485	0.760								
Dominance	0.703	0.466	0.626	0.765							
Interaction	0.544	0.679	0.483	0.504	0.505						
Purchase	0.583	0.489	0.653	0.677	0.634	0.427					
Recruitment	0.213	0.156	0.267	0.182	0.305	0.355	0.410				
Skillfulness	0.804	0.462	0.745	0.610	0.618	0.541	0.625	0.227			
Uniqueness	0.512	0.713	0.477	0.593	0.492	0.644	0.505	0.163	0.536		
Word-of-mouth	0.437	0.373	0.501	0.428	0.449	0.310	0.759	0.300	0.472	0.366	

Table 7
Hypothesis testing results.

Hypothesis	Path Coefficients	T Statistics (|O/STDEV|)	p-value	Decision
IGCPM -> Purchase intent	0.700	19.624	0.001	Accepted
IGCPM -> Word-of-mouth	0.475	11.700	0.001	Accepted
IGCPM -> Recruitment	0.276	5.551	0.001	Accepted

understand players' motivations for purchasing in-game content, offering enhanced insight into how to engage gamers and boosting in-game content revenue.

4.2. Theoretical implications

This research raises important implications for further theory development. First, we undertake five empirical studies to conceptualize, operationalize, and validate the IGCPM scale. While prior studies using self-determination theory have tended to take a unidimensional perspective of gamers' autonomy, competence, and relatedness motivations [31], respectively, we extend this perspective by identifying these as multifaceted motivations [55,60]. This more nuanced multidimensional perspective matters, as it allows gaming scholars, game developers, manufacturers, and marketers to better understand the multifaceted nature of IGCPMs (e.g., permitting developers to design their games based on users' core motivations and their respective facets).

While gaming scholars and practitioners were previously unable to distill whether the effect of players' relatedness motivation arose from their need for social interaction or social affiliation, the proposed scale indeed permits them to tease out the unique effects of these relatedness facets, allowing game developers to focus their offerings on that motivational facet that is more (vs. less) salient to players. For example, if social interaction is found to be pivotal, developers may wish to focus on interaction-facilitating attributes (e.g., individual/group chat); however, if social affiliation is key, the strategic use of tools like using clan tags will be pertinent. These findings raise pertinent implications for further theory development. For example, to what extent can the proposed IGCPM dimensions and facets to leverage online game hallmarks (e.g., immersion/competition)? For the proposed autonomy, competence, and relatedness motivations, which of their respective facets are most (vs. least) important to gamers in specific contexts? What are the bottom-line (e.g., revenue) implications for firms that optimally cater to users' core motivations?

Second, we model IGCPMs as a formative higher-order construct [37]. While prior self-determination theory research has tended to operationalize autonomy, competence, and relatedness motivations as purely reflective constructs [e.g., [31,32]], we take a formative measurement approach that affords a more comprehensive understanding of the construct. Specifically, in formative measurement, each sub-dimension covers a unique, conceptually distinct domain [126, 149], which we identified for gamers' autonomy, competence, and relatedness motivations, unlike in reflective measurement [150]. These findings also raise key implications for further theory development. For example, while we developed the scale in the in-game purchasing context, scholars in other (e.g., non-gaming) domains may wish to test the proposed autonomy, competence, and relatedness motivations in other or related (e.g., digital/offline) contexts (e.g., gamification; serious games; online quests, challenges, or training courses), where we expect them to likewise be applicable [151].

4.3. Managerial implications

This research also raises pertinent implications for online game developers, gaming studios, managers, and marketers. First, game developers and manufacturers are faced with key challenges, including retaining their players' engagement and converting freemium to premium users [17]. The proposed IGCPM scale thus represents a valuable tool for practitioners (e.g., to better understand players' in-game purchase motivations, facilitating in-game content monetization). By administering the IGCPM scale to their customers, managers are able to distill their core motivational drivers and align or adjust their strategies accordingly, raising gamers' willingness to make in-game content purchases [60]. We thus advise game developers, studios, manufacturers, and marketers to administer the proposed scale to their audiences, which (with appropriate strategic action taken based on the findings) we expect to raise their future in-game content revenue.

Second, the IGCPM scale can be leveraged to help firms better allocate their resources to cater to players' salient (vs. peripheral) game-related motivations. For example, for games featuring a core competence motivation, we recommend game re-assessment and/or redesign to incorporate a range of competence-enhancing or nurturing (e.g., through tutorials, Q&A, or mentoring by experienced players) and competence-celebrating tools (e.g., through badges, trophies, or public player rankings, catering to players' need for dominance). Alternatively, for games featuring players' core relatedness motivation, we advise incorporating ample opportunities for social interaction (e.g., by allowing gamers to collaborate/play with others) and social affiliation (e.g., by allowing them to personalize the game).

4.4. Limitations and further research

Despite its contribution, this research also has limitations that offer additional research opportunities. First, the proposed IGCPM scale was developed in the context of Malaysian online gamers, including by adopting a snowballing approach in several of our studies. While the findings offer important insight, the single cultural context likely limits

the generalizability of the findings [152]. Moreover, the deployed non-probability snowball sampling technique may further limit the transferability of the results to other contexts [109]. Future researchers may thus wish to further validate the IGCPM scale by adopting probability samples (e.g., using simple random sampling).

Second, while we adopted self-determination theory [153], future studies may adopt alternate or complementary theoretical lenses to explore IGCPMs [e.g., social identity theory or the theory of planned behavior; [93,154]), which may generate novel or refined results. For example, social identity theory posits that individuals derive key parts of their identity from their social interactions [155,62]. Therefore, how may players' socially constructed identities (e.g., in massively multiplayer online games) influence their IGCPMs?

Third, while the nature of IGCPMs vis-à-vis other specific constructs (e.g., positive word of mouth) was assessed in study 5, other conceptual associations remain to be tested. For example, researchers may wish to examine IGCPMs versus (e.g., individual-level) antecedent or dependent variables, including players' engagement, involvement, experiential value, or brand loyalty [e.g., 156], among others, or specific demographic (e.g., age/gender) or psychographic (e.g., hardcore/casual gamers) variables, to further augment the acumen of IGCPMs. Moreover, future studies may establish the relative importance of players' autonomy, competence, and relatedness motivations and their respective facets to determine *which* most strongly drives behavior [e.g., by using conjoint analysis; [157]. Assessment of potential moderating factors (e.g., players exhibiting a high vs. low need-for-control) is also of interest, which may differ across game contexts or genres (e.g., games with strong network effects, in which player interactions form a key part of the gaming experience, will tend to see a greater relative importance of the relatedness facets).

Finally, we examined IGCPMs as a holistic phenomenon, thus not accounting for differences across (a) *pay-to-win purchases*, in which purchasing items provides gamers with in-game benefits, and (b) *cosmetic-only purchases*, where buying in-game items does not offer any in-game advantage [61]. Further research may thus wish to examine players' IGCPMs across these contexts, which are likely to see differing dynamics.

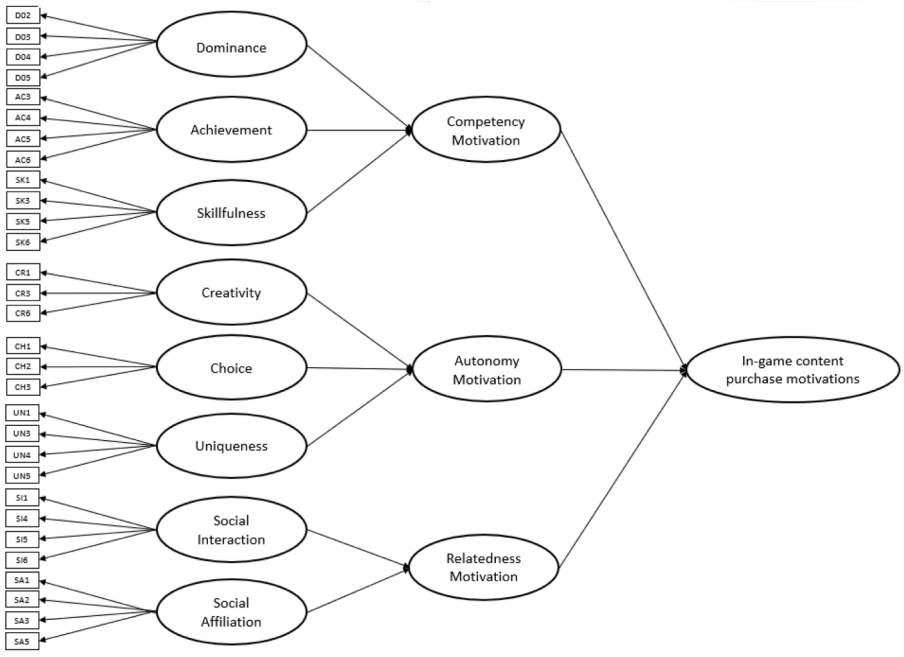
CRediT authorship contribution statement

Ali Hussain: Writing – original draft, Validation, Formal analysis, Conceptualization. **Linda D. Hollebeek:** Writing – review & editing, Validation, Methodology. **Ben Marder:** Writing – review & editing, Methodology, Conceptualization. **Ding Hooi Ting:** Writing – original draft, Validation, Supervision, Conceptualization.

Declaration of competing interest

Declaration of Interest Statement We (authors) declare that we have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1: Third-order IGCPM operationalization



Appendix 2: Definitions of the proposed IGCPM dimensions and their respective facets

Construct level	Construct name	Scale type	Definition
Third-order construct	In-game content purchase motivations	Formative	A player's drive for autonomy, competence, and relatedness in online games that leads the individual to purchase in-game virtual content.
Second-order construct	Competence motivation	Formative	A player's desire to control the outcomes of their actions and to experience mastery over the task(s) in the game [40,83].
	Autonomy motivation	Formative	The level of a player's desire for psychological liberty and freedom of internal will in the game [67].

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(*continued*)

Construct level	Construct name	Scale type	Definition
	Relatedness motivation	Formative	A player's desire to interact with and be connected to others in the game [39,96].
First-order construct	Dominance (*Competence motivation*)	Reflective	A player's desire to be more important, stronger, or more successful than other players in the game [91,92].
	Achievement (*Competence motivation*)	Reflective	A player's sense of accomplishment in the game (e.g., by progressing to the next or final level in the game or by winning a badge or a crown) [86].
	Skillfulness (*Competence motivation*)	Reflective	The level of players' game-related skills, which help them perform in the game and achieve a sense of mastery [43].
	Creativity (*Autonomy motivation*)	Reflective	A player's ability to produce or use original or new ideas in the game [68,70].
	Choice (*Autonomy motivation*)	Reflective	The range of in-game items or options available to players to satisfy their game-related interests or needs [74].
	Uniqueness (*Autonomy motivation*)	Reflective	A player's need for distinctiveness or individuality in the game [80].
	Social interaction (*Relatedness motivation*)	Reflective	A player's communication, contact, or dealings with other users in the game [99,100].
	Social affiliation (*Relatedness motivation*)	Reflective	The extent to which players experience a sense of connection or belonging to a specific gaming community [105].

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Ali Hussain, PhD, is a Lecturer in Marketing at Hertfordshire Business School, University of Hertfordshire, UK.. His research interests include digital marketing and consumer behavior, particularly in relation to the use of digital technologies and the transition from freemium to premium online business models. He has also published in reputable journals, such as *Information Technology & People, Journal of Retailing and Consumer Services, Journal of Services Marketing*, among others. He is the corresponding author and can be contacted at: alihussain.08@hotmail.com.

Linda D. Hollebeek, PhD, is the Teng Yew Huat Endowed Chair of Marketing at Sunway University, Professor of Marketing at Vilnius University and Tallinn University of Technology, Guest Professor at Umeå University, and Distinguished Visiting Professor at the University of Johannesburg. She has authored over 100 articles, including in the *Journal of the Academy of Marketing Science, Journal of Service Research*, and *International Journal of Research in Marketing*, among others. She has been named a Clarivate Highly Cited Researcher (2020–2024), is listed on Stanford University's Highly Cited Researchers (2020–2024) and MKTBig15.com (April 2025), and serves as Associate Editor of the *Journal of Service Research*.

Ben Marder, PhD, is Professor of Marketing and Director of PGR Programmes at University of Edinburgh Business School, University of Edinburgh, Edinburgh, UK. His research interest surrounds social and commercial consumer behaviour linked to the use of digital technologies. He has published 35+ articles at well-known journals, such as the *Journal of Retailing, Journal of Advertising Research, Psychology & Marketing, European Journal of Marketing, Industrial Marketing Management, International Marketing Review, Computers in Human Behavior, Journal of Travel Research, New Technology, Work and Employment, Journal of Health Psychology*, and the *Journal of Business Research*.

Ding Hooi Ting, PhD, is an Associate Professor at the Department of Management, Universiti Teknologi PETRONAS, Malaysia, where he also serves as the Cluster Head of the Business and Management Cluster. He received his doctorate in marketing, and his research interests are in consumer behavior and behavioral transformation. He has also published in reputable journals, such as *Information Technology & People, Journal of Retailing and Consumer Services, Psychology & Marketing, Electronic Commerce Research, Electronic Markets, Journal of Computer Information Systems*, among others.