

# How Practitioners Approach Gameplay Requirements? An Exploration into the Context of Massive Multiplayer Online Role-Playing Games

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**Abstract**—Gameplay requirements are central to game development. In the business context of massive multiplayer online role-playing games (MMOGs) where game companies' revenues rely on players' monthly subscriptions, gameplay is also recognized as the key to player retention. However, information on what gameplay requirements are and how practitioners 'engineer' them in real life is scarce. This exploratory study investigates how practitioners developing MMOGs reason about gameplay requirements and handle them in their projects. 12 practitioners from three leading MMOGs-producing companies were interviewed and their gameplay requirements documents were reviewed. The study's most important findings are that in MMOG projects: (1) gameplay requirements are co-created with players, (2) are perceived and treated by practitioners as sets of choices and consequences, (3) gameplay is endless within a MMOG, and while gameplay requirements do not support any game-end goal, they do support a level-end goal, (4) 'paper-prototyping' and play-testing are pivotal to gameplay validation, (5) balancing the elements of the gameplay is an on-going task, perceived as the most difficult and labor-consuming, (6) gameplay happens both in-game and out-of-the game. We conclude with discussion on validity threats to our results and on implications for research and practice.

**Index Terms**—Massive Multiplayer Online Role-Playing Games, Gameplay design, Play-centric requirements engineering, Play-testing, Gameplay balancing, Exploratory case study, Empirical research method.

## I. INTRODUCTION

A massive multiplayer online role-playing game (MMOG), such as World of Warcraft or EverQuest, is an entertainment software system that provides an online environment to a large number of geographically distributed players to simultaneously participate in game communities and engage in social interaction and game activities, e.g. going on missions, fighting dangerous creatures (monsters), attacking castles, trading goods. Game Market Research firms (e.g. DFC Intelligence and Newzoo) indicate MMOGs as the fastest growing industry, generating worldwide revenue expected to reach 29 billion US\$ by 2016 [1,2]. Playing MMOGs is also the most intense collective human activities on the planet, including hundreds of millions of players. As the 21st century's MMOG online worlds get vast and complex, designing them usually is long and expensive [1,2]. Central to the MMOG design is the so-

called 'gameplay' which is most generally regarded in MMOG literature (e.g. [11]) as to what players and non-player characters (NPCs) in the game do that is entertaining (also known as 'fun'). For example, the gameplay in the World of Warcraft series (Level 90+), a popular MMOG game published by Blizzard Entertainment, is collaboratively planning raids and defeating monsters. Currently, gameplay as part of MMOG design processes have been empirically studied primarily in the fields of game design (e.g. [3,4,5,6,7]), human-computer interaction (e.g. [8,9,10]), social behavior (e.g. [11]), media communication (e.g. [33]), psychology (e.g. [12]) and education (e.g. [34].) In the field of requirements engineering (RE), games only relatively recently became a topic of active research (e.g. [13,14,36,37,38]) and whatever empirical evidence got published covered design of video games [13,36], console-based [37,38] and mobile phone games [14,38]. While the published research on RE for game systems [13,14,15] had acknowledged the paramount importance of gameplay requirements, it also found a knowledge gap in our understanding of these requirements, and in turn called for further research in the area. This paper directly responds to this call and extends the conversation on gameplay requirements to the realm of MMOGs. To the best of our knowledge no study has been published on the particular context of MMOGs.

We set out to execute an exploratory study in order to investigate how practitioners developing MMOGs reason about gameplay requirements and handle them in their projects. Practitioners from three leading companies in MMOGs development and publishing have been interviewed and their gameplay requirements documents were reviewed in one-on-one walkthroughs with the researcher.

The key result of the study is a contextualized description of the practitioners views on gameplay requirements and on the ways they are coped with. The findings are compared with those from published relevant studies in the fields of human-computer interaction, social behavior, and psychology, and some implications are drawn for research and practice.

In the next sections we provide background on MMOGs and related work on play-centric game development and RE. We then describe our research process, its execution, and its results. This is followed by our discussion on implications for research and practice and our evaluation of validity threats.

## II. BACKGROUND AND RELATED WORK

### A. MMOG applications

This section informs less familiar readers on MMOG as online businesses and as systems. MMOG sites are powerhouses of e-commerce, forming part of the entertainment services industry. They usually use two business models, subscription-based and ‘freemium’. The first generates profit out of a growing long-term subscriber base and, hence, player retention is key to MMOG producing companies’ financial health. In this model, subscribers buy the game (client) software for, e.g. 50 Euro, and pay a monthly fee of e.g. 15 Euro, to access the game online (server). In contrast, the freemium model assumes the presence of a huge base of free clients and a percentage of it to turn into paid clients at some point of the process of playing the game. Usually, in this model the producer gives away the game’s core functionality for free, while offering upgrades to add certain features for a small fee. Converting free players to paid ones at a consistent rate is strategic to such a producer. In both business models, to trill players and keep them playing, MMOG companies vigorously embrace innovation in both signal processing and game design, and commit to deliver new, high quality game contents (e.g. extensions, patches) on regular basis.

The MMOG functionality provides players with an extensive range of game abilities, including character design options, weapons, tools, statistics, all of which grow in number and intensity proportionate with player’s progress through the game. In a MMOG, players live through their characters (avatars), and compete with other players’ avatars and non-player characters (NPCs), e.g. dwarfs. For players to start the game, they must create their avatars first, by choosing a name, gender, race, social class, and facial features. Avatars necessarily join one of two conflicting factions – good and evil, that build up the storyline for each player. Choosing a faction implies for players to enter the game through this faction’s own home city, and that they design their avatars based on the options available to the faction exclusively. As a player’s avatar advances throughout the game, its abilities gradually grow as well as the number of potential approaches to in-game situations, e.g. quests, fighting, crafting and teaming-up. While playing, players can switch between two perspectives: the first person and the third person perspective. Also, based on whether players fight against other players or NPCs, fighting happens respectively on Player versus Environment or Player versus Player servers. In both, players use weapons and spells to deal damage to the target and upon success they are awarded experience points that are critical to moving from one game level to another. Preparing for fights and fighting gets increasingly more social and group-based, as levels advance. Once a player passes the end level of a MMOG, the only way to continue playing endlessly is by joining a group.

### B. Play-centric Game Design, Requirements Engineering, and Gameplay

MMOG companies usually use play-centric approaches to game development that span from idea conceptualization to

completion. Central to them is the goal to achieve playable and satisfying game experience; this means continually keeping the player experience as the driver in making design choices through the game development process, and testing the gameplay that these choices create with target players at each development stage [3]. In a play-centric development context, RE is an agile process as it’s not limited to the early stages of game conceptualization; instead, it accompanies the play-testing and the prototyping activities as assumptions about player requirements might render unrealistic or new requirements may be discovered; Also, RE is an on-going process because it goes well beyond MMOG launch and active play as companies keep collecting players’ feedback via online communities, which is an important way to get requirements for upgrades and new releases.

Prior research on RE for games did acknowledge the play-centric nature of requirements processes (e.g. [4,5]) and the prominent role that enjoyability, fun, emotions and gameplay take in game development [5,6,8,38]. However, in the field of RE, very little research focused on gameplay specifically. The 2010 systematic review on software engineering for computer games [19] found 37 empirical studies on RE for games. However, while reviewing them as part of preparing this paper, we found that only two [13,14] included gameplay requirements as a sub-topic in their analyses, in the context of video games and mobile games development, respectively, e.g. the study of Calleele et al [13] presents some techniques practitioners used for gameplay prototyping in video game design. Both the studies of Alves et al [14] and Calleele et al [13] point to these requirements as a particularly challenging area for which more research is needed. However, none of these studies elaborates on what gameplay requirements are in detail, nor dealt with gameplay requirements exclusively nor considered gameplay in MMOG context. We also searched the Scopus digital library for relevant RE studies published after 2010. We found three empirical studies [36,37,38] on RE for games: [36] is concerned with console-based games (e.g. Wii), [37] – with serious games, and [38] – with the role of RE in (non-MMOG) game development including various platforms. Among these studies, [38] is the only one in which gameplay requirements and related concepts such as game mechanics, prototyping of requirements and balancing games’ rules are discussed explicitly.

In the fields of human-computer interaction and social psychology, researchers investigated usability [20], playability [21], game engagement [11,12], gameplay experience [29] and aesthetics aspects [10] of video games and MMOGs, with a particular focus on gameplay. In the field of game design, gameplay was conceptualized by employing layered models, e.g. LeBlanc’s Mechanistic-Dynamics-Aesthetics [4], or gameplay structures that mean the players’ interactions in the multi-play happening in a game [6]. Approaches also have been developed to capture and document gameplay design patterns, e.g. the game ontology project [5] that employs a hierarchical structure to describe gameplay elements from players’ perspective, and the 400 rules project [7] that stores and shares knowledge in ‘rules’ format, from professional

game designers. These studies on gameplay can be useful for understanding games and games mechanics but they do not directly address gameplay requirements and how they are handled. However, following Callee et al [13], we think that even if these studies do not address RE, the techniques they proposed could possibly form an interesting extension to the RE approaches already available to practitioners.

### III. THE EXPLORATORY STUDY RESEARCH PLAN

#### A. Research Goal and Research Questions

To understand how requirements elicitation and discovery happens in MMOG projects, we set out to answer the following research questions (RQ):

*RQ1: What gameplay requirements mean to practitioners involved in MMOG development projects?*

*RQ2: What MMOG project artefacts are concerned with gameplay requirements? and*

*RQ3: How do practitioners manage the process of gameplay RE?*

Our research design followed Yin's guidelines for exploratory studies [22]. As Bensabat et al [24] suggest, a **case study** is a particularly suitable research method to situations in which (1) researchers study socially constructed processes in systems development projects and seek to achieve as good as possible grasp of reality, and (2) researchers want to answer 'how' and 'why' questions and comprehend the nature and the complexity of the processes of interest. Drawing upon this, we expected the case study research method would let us earn a rich and contextualized understanding of the practitioners' meanings behind the concepts of 'gameplay' and 'gameplay requirements' and the ways in which practitioners approach the engineering tasks essential to these requirements.

#### B. The Empirical Research Process

We designed a research process including semi-structured open-end in-depth interviews with 12 practitioners from three producers that are highly visible in the MMOG market. Because of confidentiality agreements, we would not be able to provide any information on the country location of these producers, nor on their organizations' size. However, the MMOG companies shared the following common characteristics: (i) they all use the subscription-based business model and player retention is their key strategic objective; (ii) all three games included in the study are known to be profitable ventures; (iii) each company had at least one million subscribers, (iv) they all follow play-centric approaches [3] to MMOG design; (v) all three games have a common goal, namely to increase the fitness of the player's character, which is endless in nature and not bound to a particular game level (because keeping players playing is in essence player retention); (vi) the companies all built in-game and out-of-the-game communities of players and have the continuous improvement of the players' social collaboration as an underlying motivation for MMOG development projects; they produce packs, extensions, enhancements, on annual basis.

Table 1 summarizes the information about the participating companies and practitioners. Their job titles and project roles

were diverse, including various artistic specialists, level designer, play-testing manager, community development manager, playability analyst, gameplay analyst, senior software engineers (e.g. on client and server sides).

TABLE 1. THE COMPANIES AND THE INTERVIEW PARTICIPANTS.

Company name	Details	Interviewee designation	Estimated work time spent on gameplay requirements tasks
TechGame	North-America-based game developer and publisher with a Player Support Centre in Europe and an international player base	1 Level Designer	75%
		1 Playability Analyst	30%
		1 Senior Software Engineer – Server Systems	30%
		1 Senior Software Engineer – Client Systems	50%
ArtGame	North-America-based game developer and publisher with a Player Support Centres in Europe and Asia, and an international player base	1 Environment Texture Artist	50%
		1 Character Artist	50%
		1 Project Lead	50%
		1 Play-testing Manager	100%
YouGame	East-Asia-based game developer and publisher with operations in Europe and an international player base	1 Community Dev. Manager	100%
		1 Visual Effect Artist	50%
		1 Project Lead	50%
		1 Gameplay Analyst	100%

Our study was carried out in four steps: (1) Prepare an interview guide following the guidelines in [23]; (2) Do a pilot interview with one practitioner to check the applicability of the guide to real-life context; (3) Carry out interviews with practitioners according to the finalized questionnaire; (4) Follow-up with those participants that possess **deeper** knowledge or a specific perspective. We note that after the first interview (the pilot), there were no substantial changes in the interview guide and for this reason, we included the pilot interview as a legitimate one in our data analysis (as suggested by [14]). The interview guide is receivable from the author upon requests of interested readers.

The time each interview took was between 90 and 100 minutes. Four interviews were face-to-face, and eight - over a conference bridge with shared presentation screen facility used for walking through a gameplay document that the respective interviewee presented to the researcher. As strict confidentiality agreements were discussed before the interviewees gave their consent to participate, each interviewee was informed by the author on the research process and on how data will be handled. The author provided each participant with the list of interview questions two weeks before the interview date. Each interviewee was also asked to bring a gameplay document to be used for illustration purposes during the interview, so that the researcher makes sure she understands what the practitioner means when using a specific gameplay-requirements-related concept. Each interviewee came prepared to the interview, which was key to the effective use of the interview time slots.



1) *Selecting and Characterizing the Participants*: We used two selection criteria for practitioners' participation. The participants should: (1) have exposure to the development context of MMOGs; and (2) be involved in RE tasks as part of their professional responsibility in the company. 'Involved' meant that at least 30% of the work time that a practitioner logs in a project goes to gameplay requirements. As Table 1 shows, we had two practitioners (out of 12) that spent 30% of their work time on gameplay requirements tasks, three that said gameplay requirements were the very core of their jobs and they spent 100% of their time on them, and seven who spent 50%-75% of their work time on gameplay requirements. Tasks could broadly range from writing gameplay requirements to attending review meetings, building prototypes and providing feedback. The practitioners were chosen because their jobs pertained to this study's research context. Their experience included at least three projects concerning the MMOG produced by their companies. All practitioners were avid players of their respective company's MMOG. Their playing experience was at least 6 years. We note that the hiring policies in all three companies explicitly stated preferences for job candidates who had playing experience. In fact, all 12 practitioners had met this condition when they applied for their positions in their respective companies. Last but not least, the practitioners were excited about this exploratory study, they felt enthusiastic about winning a researcher's interest in their professional activity. They all thought, researchers could help industry by promoting careers in game design, to the students they teach.

To get access to the practitioners, the author used as mediator a member of the International Game Development Association (IGDA, [www.igda.org](http://www.igda.org)). The mediator chose to remain anonymous and not participate as a co-author of this paper. He was a former colleague of the author and was instrumental to hook her up with relevant parties in the three companies. Thanks to the mediator, the author also made a visit at the European branch of one of the companies and executed the face-to-face interviews. The mediator suggested a broad range of possible contacts however the author used purposive sampling [23] to select the 12 interviewees so that they represent a broad variety of viewpoints, roles and contributions to gameplay RE for MMOG.

2) *Our data collection*: We used the method of 'focused semi-structured' interview [23] for data collection. 'Focused' means that (1) gameplay, (2) gameplay requirements and (3) managing gameplay RE were the focus of all conversations with the 12 practitioners. 'Semi-structured' means that a list of interview questions is prepared in advance, however, during the interview the researcher has the right to ask new questions (e.g. to explore a specific perspective on an issue and probe for details) or to drop existing questions based on his/her judgment of the opportunities to extract rich contextual information in the conversation with the interviewee. Choosing the semi-structured interview method ensured our data collection was shaped by both the participant's own understandings of gameplay and gameplay requirements as

well as the researcher's interests. Also, it allowed us to take unexpected routes as opportunity arose. We note that interview-based exploratory studies usually are intended to promote self-disclosure and that is what we were after in this work. As in [23], *interview studies are not used to provide statistically generalizable results applicable to all professionals with profiles similar to those of the practitioners in a specific study*. The intention of the exploratory case study is not to infer, but to understand and not to generalize, but to determine a possible range of views. Therefore, in this study we will adopt, based on the recommendations in [23], the criterion of transferability as a useful measure of validity. Transferability asks for whether the results are presented in a way that allows other researchers and practitioners to evaluate if the findings apply to their contexts.

3) *Our data analysis*: Our data analysis was inspired by the guidelines in Charmaz' *grounded theory (GT)* method [25], a qualitative approach commonly deployed in empirical studies in social sciences to construct general propositions (called a "theory" in this approach) from verbal data. The GT analysis is exploratory in nature and suitable to research settings where the researcher does not want to use pre-conceived ideas, and instead is driven by the desire to capture all facets of the collected data and to allow the propositions to emerge from the data. The essence of the GT guidelines is in making analytic sense of the interview data by means of coding and constant comparison of pieces of data that were collected in the case study. Constant comparison means that the data from an interview is constantly compared to the data already collected from previously held interviews. The data analysis process deployed in this study, leveraged the author's prior experience in empirical studies using GT (e.g. [26]). As in these previous studies, our data analysis in this study started with reading interview texts and labeling a portion of the text – a phrase or a paragraph, with a 'coding' word. The 'codes' mark the meaning of the respective portion of the interview text to a specific research question. A code can be a concept (e.g. 'look and feel', 'playability', 'player experience') or an activity (e.g. 'balancing the gameplay', 'play-testing', 'paper-prototyping'). All pieces of text that relate to the same code are then clustered in order to analyze it in a consistent and systematic way. The results of the data analysis and the discussion on them are in Sections IV and V.

## IV. RESULTS

In this section, the codes - concepts and activities, are marked by using an underlined italicized font in their first appearance, e. g. play-testing is marked as *play-testing*. As it is usual in qualitative studies, we supplement the findings with interviewees' quotations. These are given in italic.

### A. The Meanings of Gameplay and Gameplay Requirements

From RE perspective, our analysis suggests gameplay requirements refers to a group of requirements - and their interactions, that when satisfied together, deliver player's experience that matches or exceeds the players' expectation.

In our participants' views, the interactions between the requirements in the group heavily contribute to the overall effect on player's experience. While our participants agreed on this understanding of gameplay requirements, they differed regarding how they think of the term 'gameplay' itself. Our findings suggest no consensus on what gameplay is. The interviewees hinted to three ways to conceptualize gameplay: as a process, as an artefact, and as a relationship between game creators and players.

Five practitioners thought of *gameplay as a process* that a player has to go through in order to achieve the end of a level. In essence, they made a clear distinction between two types of gameplay-as-a-process: (1) *'within level'* which is bounded to a level in the game (e.g. level 2 in a game of 99 levels); and (2) *'end level' gameplay*, which is the one that happens once players exhaust all levels and start consuming the so-called 'end-level game content' (e.g. once one is at level 99). At each level, the gameplay process is perceived as a series of tasks arranged in three groups: preparing the avatar for coping with the in-level challenges, execution, and wrap-up. The tasks may vary broadly in terms of contents, complexity, and player's time and skill demands. However, once the end level is achieved, the gameplay process' goal is endless and focused solely on equipping the avatar as well as possible. E.g. the endgame experience is focused on organizing for large-scale heavily-coordinated attacks among up to 60 players, where players are expected to commit significant amount of time (up to 18 hours weekly) in configuring the avatar in a way that makes it 'fully prepared' to cope with the challenges in the run. 'Fully prepared' does not only mean accumulating weapons, magic spells and food, but also adding layers of protection against the various dangerous aspects of encountering the level's NPC (i.e. a monster).

Next, three practitioners thought of *gameplay as an artefact*. To them, this is a set of rules, penalties and awards within a game level, all intended to assert game structure, to control or to influence the players' in-game behavior. As an artefact, gameplay describes the admissible actions, definitions and constraints that apply to the MMOG world. These should be consistent and non-conflicting, and can apply to avatars, NPCs, weapons, spells, and anything else in the game. An interesting dimension of gameplay as an artefact is its linkage to 'the look and feel' document of the game:

*"The game designer comes up with the look and feel, a page long description, and then the first cut of the gameplay tells you what it is like to be in the game; you try out the gameplay to get into the looks and feel, and you've got to tell the game designer if the gameplay you experiences is indeed the look and feel he wants in the game."* (TechGame)

In the views of our participants, while the Look and Feel document is artistic and expresses a vision for the game, it's the gameplay that is the first "materialization" of this vision. Practitioners thought of it as *"the first prototype of the look and feel"*: *"Think of gameplay as the first prototype of your look and feel; you've got to start from somewhere in your game development and here is your starting point."* (ArtGame)

Last, four practitioners maintained the view of *gameplay as a relationship between players and designers*, which means endless interaction between game authors and players, in which designers provide the choices, the rules, the penalty and reward scoring schemas, and the players use those as recourses available at their disposal to *"generate their individual gameplay experience"* (as one participant put it). Players, hence, engage in *"writing their individual game story lines"* by using their individual approaches to exploring the choices available in the in-game situations they enter.

Regardless how practitioners conceptualized their understandings of gameplay, they all shared two commonalities:

1. All practitioners were reasoning about gameplay from players' perspective.

*"In [MMOG] design, there is only one perspective, and it's the player."* (YouGame) From this perspective, gameplay within a level meant providing the player with a set of relevant choices and their consequences. A choice and its consequences are deemed relevant if they are perceived as enjoyable for the player and contribute to the goal of making the player *"want more of the game"*. In the views of the practitioners, gameplay is created not only for but also with the players. In this sense, *gameplay is co-created* where the players are not passive consumers of game contents but also owners of the gameplay as they may decide to use a playing option in a way unanticipated by the game creators. E.g. it's common for players using end game contents to set up their own statistics-processing tools by writing some code with interface to the online game environment, in order to collect and analyze quantitative information showing how a players group progresses in a challenge. In the experiences of our participants, players use this 'in-game analytics' to make their play more efficient: *"Players are informed and concerned about performance and they want to know how far they advanced in killing a monster. 30%? 90%? Imagine you are in a dark cave, too dark that you even do not know where the monster is. You optimize your performance by tracking yours and the monster's statistics"*. (YouGame)

Gameplay co-creation also extends to the real-life world where players deploy off-game analytics in communities of players' web sites and blogs that serve for brainstorming, sharing experiences and crafting strategies for increasing the players' performance to defeat a NPC (i.e. a dangerous creature). For example, all interviewees agreed that their players participate in opinion polls set up outside the game. As per our practitioners, in co-creating gameplay, players also act as source of inspirational ideas for the designers to consider as candidates for inclusion in the next MMOG patch/extension: *"Your players can come up with unimaginable approaches to in-game situations. It's shocking to see players' creativity at play... You need to ask our game masters, the helpdesk guys, who are constantly challenged by players who call to say our help desk line they entered situations in ways unimaginable to the game designers..."* (TechGame)

*"Learning from those players [who play the game in unanticipated ways] is a kind of crowdsourcing for*

innovation. For example, who could ever have said that players would watch so keenly the avatar's stats and even switch off the features of our beautiful landscape and the sound of the special effects in order to play it more efficiently? I would not tell you the astronomic amount of money this [the sound effects and the landscape effects] all costs!!" (ArtGame)

"Players these days are extremely educated; they do not want just new contents but also some tools to play the game as efficiently as possible. You've got to leverage their ideas somehow..." (YouGame)

Second, all practitioners agreed on the demarcation of gameplay at lower levels compared to higher levels, and specifically to the endgame levels. In the practitioners' experiences, gameplay applied either to a level in the game, or to the '*end level game contents*', but not to the game as a whole. Because the MMOG end goal (namely, continuously improving the fitness of the player's avatar) is perceived as too abstract, practitioners consider it pragmatic to reason about gameplay from the viewpoint of a single game level that has its own (pragmatic) goal – namely, to pass the level, and not from the viewpoint of the whole game. In the words of one interviewee: "In a business systems project, you break it down in subprojects and you may have very good reasons to determine specific requirements at subproject level. That's how we deal with gameplay. The only way for you to make meaningful specifications of gameplay requirements is within a level." (ArtGame)

While at lower levels, players may choose individual versus collaborative play mode, for them to be able to cope with the challenges at the endgame levels, they must join a team of players and only collectively they tackle the challenges. In fact, many players go through the levels to arrive as fast as possible to the end level which "*offers a completely different gameplay*" in the sense that its focus is completely on collaboration. Ten out of 12 practitioners referred to this as to the so-called "*group-or-die*" gameplay because the only way for players to continue their play was by joining a group (or raiding guild, in the terminology of the game community).

### B. Requirements Artefacts Dealing with Gameplay

All practitioners thought gameplay requirements form a component ("*chapter*", "*essential part with its own heading*") of the game design document, the pillar of every game development project. It is a living document, in the sense that it's gradually refined following agile project management philosophy. When practitioners refer to it as 'complete', they do not mean 'carved in stone' or frozen, but 'complete' in the sense that it's enough for developing a piece of playable functionality. Similarly to the game design document, the gameplay requirements document component is also a living artefact. Its first version is grounded on the game's Look and Feel (LaF) document which in MMOG projects has the meaning that the project mission and vision documents have in conventional system development project (e.g. enterprise systems). Each gameplay requirement change is checked for alignment against the statements in the LaF document,

meaning that gameplay should support - at all times, the look and feel of the game as envisioned by the game designer. As gameplay requirements are elaborated gradually, traceability links are maintained between the gameplay changes and the affected other parts of the game design. The gameplay requirements document consists of six parts: (1) wireframe, (2) rules of the game, (3) playing modes, (4) scoring system, (5) level specifications, and (6) a process flowchart. The wireframe is the visual blueprint that arranges the game contents for the purpose of achieving the look and feel specified in the LaF document. It can be thought of as "the map of the interfaces". The concept of rules is self-explanatory (the meaning has already been described in the previous section). The scoring system is the total of awards and penalties. Furthermore, levels specifications explicitly state the design requirements specific to each level in the game. Last, the exact process that the player has to go through within a level is specified by means of a flowchart. The format of the flowchart can vary, for example can be manually made cartoon-like pictures, simple flowcharts based on the built-in Visio stencils, or sophisticated process diagrams using process modelling tools (surprisingly, one interviewer used a business process modelling tool that his company also deployed for documenting business process workflows in accounting and human resource management). Each level's flowchart is detailed into features. For example, each MMOG in our case study had a proprietary editor (e.g. a map editor, a layout editor) and its features were listed in detail.

Another distinctive artefact that we observed to depend on gameplay requirements was the so-called '*paper-prototype*'. It is specific to prototyping gameplay requirements at lower game levels (when no code is yet developed). It can take the form of sketches, mock-ups, pencil drawings or more complex artistic drawings. It is therefore a low-cost and easy-to-make way to demonstrate gameplay to the producing company's employees as well as relevant stakeholders. Gameplay is then experienced and feedback by those who experienced it is collected to confirm gameplay requirements. In all the companies, the colleagues of the professionals who made the paper prototype were the first to "*play with it*" in order to experience "*how it feels to be in the game*". Of course, the very first players to whom a prototype is shown are the team members in the game development project: "*It could be everyone that is at work that day; you can ask your artistic director to be a player, or your special effects artist, or a junior or a senior programmer.*" (ArtGame)

At higher game levels that feature increasingly more community-based play, the paper-prototype is usually followed by developing a software prototype, an artefact used to demonstrate how playable are the gameplay requirements from players' community perspective. The practitioners deemed this artefact central to gameplay requirements validation as it meant collecting and analyzing players' feedback (at community level).

### C. How Our Study Participants Manage Gameplay RE?

All practitioners perceived the gameplay RE process as creative, iterative and non-linear one, in which professionals

must be open-minded and be prepared to alternate “fast track lanes with scenic routes” (TechGame). An interesting observation is that no practitioner was able to describe it as a predefined flow of steps that he/she attempted to use in his/her projects. Some interviewees shared that to an external observer this process usually appears as “chaotic”, “judgment-based”, “gut-feel-grounded”. They all meant it as something that does not lend itself easily to a “process description as you do in business process reengineering projects” (YouGame). Instead, they thought of it rather as a ‘system of spaces’ in which spaces delimit various kinds of related activities that together form the continuum of gameplay RE. They referred to them as ‘spaces’ and not process phases or activities, because ‘the spaces’ did not make up any linear structure nor were executed sequentially. While carrying out the activities might look chaotic, in the views of the participants the process consistently brought the targeted results in their projects: “I’ve never seen a linear, milestone-based process here. We do have a process architecture for gameplay requirements but it’s totally different, just like out of this world... It’s like you have a bunch of tools in your toolbox but without knowing your game level, and its feel and look, you have no way to guess what tool to pool out first; even if you do know the look and feel, and you know the right tool for it, you may find out that it does not fit right in, so you’ve got to tweak it a bit and if it would not work, then go pick another tool. You should try out different things and see what works and then make sure I do more of what works and less of what does not...” (YouGame)

A common concern across all the spaces was the balancing of the gameplay requirements. To practitioners, this meant getting a requirements definition that leads to creating a playable game version that: (1) is fair with respect to all players involved, (2) brings more pleasure to play as player’s learning and experience advances, and (3) is free of repetitive in-game options, which means that no playing option is worthless and the net value of each option is commensurate with the cost of using it. Our findings suggest that balancing the gameplay requirements is recursive in nature because achieving balanced gameplay with respect to one of the three criteria above may cause an imbalance to emerge with respect to another criterion and this imbalance may need to be smoothened first, before the first one would. As one interviewee said: “You want to get the gameplay crispy like chips. But chips are fragile, and you’d better treat them that way. The crispier my gameplay gets in one dimension, the more fragile it might get on another, and if this happens then we’d go first to fix the second issue and once is done, then get back to the first. You get back and forth many times until you make it fun to play; fun AND fair, I mean.” (ArtGame)

To cope with gameplay requirements in a way that gameplay balance is achieved, practitioners experienced that they were going through three spaces (Fig. 1). We labelled the spaces ‘prototyping’, for the activities that lead to creation of paper prototypes or software prototypes, ‘play-testing’ for activities centered around the discovery of emergent requirements, and ‘tweaking’ for the gameplay redesigning

activities that lead to improving the players’ path through the game levels. We note that prototyping and play-testing have the meaning of player-centric exploration and are expected to help discover new requirements, as in MMOG projects most requirements emerge throughout the game design itself. In contrast, tweaking has the meaning of an intense synthesis of all learning that happened in prototyping and play-testing and use of this synthesis to redesign the gameplay.

We observed however that it was hard for practitioners to pin-point to one particular space that is more important than the others to the balancing of the gameplay requirements. Instead, they considered all three spaces to be integral to it, and deemed iterations to be the glue that sticks them together.

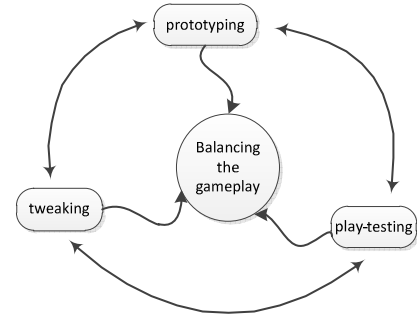


FIGURE 1. RE SPACES USED TO BALANCE GAMEPLAY

E.g., in her most recent project the playability analyst at TechGame used prototyping and play-testing as spaces for exploring various amounts of story-telling and full motion video surrounding an end level NPC and a players’ guild. Used together, these two spaces led to the creation of up to five new alternative game designs for segments of the game environment (tweaking). Each tweaked design treated differently the players’ proactiveness and needs of control. The designs also varied in terms of availability, ease to use and players’ cost of the game features included, and these three had to be balanced against their value for the players. The designs were subjected to prototyping and play-testing again whereby prototyping and play-testing were in different proportions regarding each alternative design. These alternating ways of using spaces were continued until the game would be deemed ‘balanced’ by not only its designers but also by its players (in the targeted community).

## V. DISCUSSION

This section puts our finding in the perspectives addressed in prior publications in RE for game systems as well as in other fields (e.g. human-computer interaction, game design). Our discussion follows the topics in the previous section.

*Gameplay and Gameplay Requirements.* We found three ways to think of gameplay. While this diversity may be traceable to the various background of the people involved in the multidisciplinary teams in MMOG development, we think it also reflects the lack of standard definitions of terms in the gaming domain and, in turn, the lack of common understanding in the various communities regarding what gameplay means. This is consistent with RE textbooks (e.g.



[27]) pointing out that such a challenge is typical for new domains that call for multidisciplinary approaches to solution development. Next, our results suggest that gameplay requirements are perceived as functional requirements and not as non-functional ones (quality attributes). They are mapped out by using flowcharts or lists of features [27] which are common techniques for specifying process aspects in functional requirements. We also found non-functional aspects pertaining to gameplay to be part of the LaF document where playability and fun are explicitly mentioned as quality attributes. We did not explore the dependencies between the LaF document in the light of functional and non-functional requirements that make up gameplay. Nor we explored how the relationship between playability and gameplay. We thought that such an exploration is a necessary step in order to gain complete knowledge of how three concepts (fun, gameplay and playability) relate to each other. We, therefore, suggest it as a line for future research.

Also, our observations suggest the concept of goal plays a prominent role in reasoning about gameplay requirements. We found, gameplay is bound to a level and as such - to a clearly specified goal. This may mean that gameplay requirements would naturally lend themselves to the goal-oriented RE (GORE) approaches. Our practitioners however have shown no awareness of the deployment of these approaches in the MMOG industry. As part of this study, we made a search in the Scopus database ([www.scopus.com](http://www.scopus.com)) for empirical studies that used GORE in game context. We could not obtain any hint about any attempts to deploy any RE method resting on the goal-oriented paradigm. We therefore think that empirical work to evaluate the fit of GORE and MMOG projects is necessary and worthwhile because it potentially could reveal how existing RE methods could be leveraged to this new domain. Such studies could inform both practitioners and researches on the benefits and limitations of GORE in this particular context.

*Gameplay artefacts.* Our study suggests the gameplay requirements take a prominent position in the game design document. This agrees with the studies [13,14] regarding the fact that gameplay and game design are linked concepts. However, while [13] presents gameplay as an artefact on its own, preceding the elaboration of the game design, our study found that (1) the LaF document precedes the process of gameplay requirements development and (2) that the gameplay requirements do not precede the game design, but are an integral part of the game design. In other words, gameplay requirements and game design are co-evolving together. Our observations that gameplay requirements form living documents and are created by using agile development philosophy agree with textbooks in game design (e.g. [3]).

Perhaps the most important finding in the study is the joint co-creation of gameplay requirements by game designers and players (organized in communities, or guilds). While the designers create the choices and the consequences for players taking these choices, the players are inventive in the sense that they (1) create rules of play that are not intended by the designers, (2) instill codes of conduct, (3) impact how the

game is facilitated, and (4) impact how development plans would go next. This finding agrees with the study in [11] that found gameplay as socially negotiable, which means that players and game developers together determine the rules. One could also think of parallels in meanings between our concept of gameplay co-creation and the concept of player-managed gameplay identified in the survey-based study of Deaker et al. [8] of the World of Warcraft, a leader in the MMOG market.

Our finding that gameplay is co-created with players using in-game and out-of-game analytics, could be explained with the proactiveness of the players and their willingness to form groups. As in [33], the end level gameplay experience (of World of Warcraft) is produced through guild-centric collaboration, exclusively. Furthermore, our results make us think that the intensity of co-creating gameplay seems to grow with the advancement of the levels at which players plays. Most blogs and in-game and out-of-the game analytics tools were known to be created by players identifying themselves with the end level of the respective MMOG, included in our study. We however consider this a working hypotheses only and future research is needed to collect evidence that confirms or disconfirms it.

*Our Practitioners' Managing Gameplay RE.* Our findings suggest no one-size-fits-all process to cope with gameplay RE. Instead, the case study companies had spaces that collectively helped deliver the requirements. We note that we preferred the concept 'spaces' over 'steps' because in the experiences of the practitioners they usually were not done sequentially. E.g., gameplay requirements may loop back through prototyping, tweaking, and play-testing more than once as the game development team refines them and explores new directions. This agrees with [38] regarding the role of prototyping. However, our finding seems to disagree with [13] that prototyping is hard. In fact, we found that the paper-prototype was a high value/low cost way to cope with gameplay requirements.

Our understanding of managing gameplay RE by using spaces is in line with the creative processes studied in the field of design, e.g. [28]. We think this is unsurprising as gameplay requirements definitions result out of the creativity of contributors bringing a broad range of backgrounds. We however notice that no RE research has applied so far the theoretical lens of design thinking to the study of RE phenomena in the gaming industry. For this reason, we think it would be interesting to investigate the commonalities between managing gameplay requirements and design thinking approaches [28]. This forms a line for future research.

## VI. VALIDITY THREATS

We used the checklist in [30] to assess the possible threats to validity in this study. As it is exploratory, the key question to address when evaluating the validity of our results, is [22]: to what extent can the practitioners' experiences in gameplay RE be considered representative for other MMOG companies and other (non-MMOG) game producers? While the case study companies are not representative settings for all the possible ways in which gameplay RE can happen, following [31] we



could think that it might be possible to observe similar experiences in MMOG projects and companies which have contexts similar to those in our study. E.g. other MMOG producers who use the subscriptions-based business model and have incentives for designing gameplay that serves the purpose of player retention, and has no end goal to achieve. This subscription model requires companies to commit to high quality standards (so that they retain their player base as long as possible) and incentivizes them to come up with steady releases of content. Such MMOG organizations might experience observations similar to ours. Would our findings hold for other types of games? We think that as the concept of gameplay is essential to any type of gaming systems, it might well be possible that a part of our findings would be observable in the contexts of any game that is structured in levels, e.g. gameplay as an artifact (a set of rules, penalties and awards) is likely to apply to any game. However, we think that it's more likely to observe findings similar to ours in projects delivering games for which the only purpose is enjoyment (like e.g. in [38]). If we replicate this study in serious games contexts, the results would be different since pedagogical goals and learners' behavior models dominate the game design and impact the choices and the time available to players.

There are also three inherent weaknesses of interview techniques [23] that we accounted for in this study. First is the extent to which the participants answered our question truthfully. We attempted to minimize this threat by involving volunteers, under the assumption that if a practitioner would not be able to be honest, he/she could decline his/her participation at any stage of the research. However, in interview studies there is always a residual risk that the respondents were extremely selective in choosing the documents for sharing with the researcher and that the respondents might have incentives to share the very best of their work. Second, it is possible that the researcher might instill her bias in the data collection process. We followed Yin's recommendations [22] in this respect: (i) we included participants with diverse jobs and with diverse contributions to the gameplay RE process; this allowed the same phenomenon to be evaluated from diverse perspectives (data triangulation [23]); (ii) the interview answers were sent to each participant prior to data analysis to confirm the information he/she provided; and (iii) we had the data analysis report reviewed by some interviewees (some of whom provided feedback on clarifying the concepts, but this did not change the analysis).

## VII. CONCLUSIONS AND IMPLICATIONS

This exploratory study explicates what practitioners in MMOG development teams think of gameplay requirements and how they manage gameplay RE. It found that gameplay requirements have multileveled meanings. This finding has some implications which seem to make it hard for companies to come up with a common process for gameplay RE. Instead of RE processes, we found that practitioners think in terms of RE spaces (and not steps) and these spaces collectively help addressing the key concern in MMOG: balancing the gameplay. Our study has the following implications for RE

researchers: First, in section V. we presented a number of possible lines for future research. We observed that our findings in gameplay RE did not call for development of new methods. Instead, knowing what we know now, it seems to us that more evaluation work would be an important thing to do first. For example, as we observed that the concept of goal is associated with a game level, and not with the game as a whole, we think that gameplay requirements within a level might be possible to approach by using GORE techniques. The evaluation of the applicability of GORE-methods to MMOG projects seems therefore relevant. Also, the developing game pattern community in the field of game design suggests ontology-based techniques (e.g. [5, 7] that could be adapted to serve RE purposes. Empirical evaluation on how these approaches can be leveraged in MMOG context is therefore worthwhile. Last, the three ways to conceptualize gameplay could be subjected to a more comprehensive survey with participants from a large number of companies. If confirmed, our findings would have broader implications to RE (e.g. we may need to design RE tools that support this multiple conceptualization view).

Second, this study implies some methodological considerations: (1) Our results suggests that gameplay is a concept with layered meanings that could lend themselves to multidisciplinary empirical research in which researchers could possibly use existing theories from other disciplines, e.g. psychology, media communication, to explain gameplay in more depth. E.g. our study indicated the joint co-creation of gameplay requirements by game designers and players in the MMOG domain. To understand the internal working behind the relationship between designers and players in RE, we think that future research could leverage theories about client-vendor value co-creation (e.g. [45]) from the area of e-commerce. MMOG are examples of e-commerce and therefore would be a suitable area for the application of these theories for the purpose of understanding gameplay requirements. (2) The MMOG world of players interacting online gets increasingly more distant from the traditional lab settings we know in RE-experiments. As MMOG environments keep track on a broad range of statistics and each player generates huge volumes of data all being recorded in the game system, an empirical approach to investigating gameplay as it happens real-time, could be the direct observation method. A researcher might consider entering the game, creating his/her own avatar and then collecting observations of how social gameplay works, while playing the game. E.g. a researcher can evaluate theoretical models of coordination and collaboration in the context of social networking in online game communities. Examples of this research approach are provided in [9] and [32]. Leveraging these experiences in the RE field is a line for future research.

This study has some implications to RE practice. To RE specialists who look for opportunities to join the game industry, our research indicated that the players' perspective is the one driving gameplay RE. To get intimate knowledge of the players' perspective, it seems unavoidable for RE specialists (who want to switch to the game industry) to become MMOG

players first. In contrast to other domains, e.g. accounting, health-care, where RE professionals do not have to be actual users of the systems to be able to understand the world of the users sufficiently well and do decent job, this study revealed that being a player seems a prerequisite for being a good gameplay requirements engineer. In a world where the product (the game) is produced by people with drastically diverse background, as Callele et al put it [13], being a passionate game-player may well be the only commonality that sticks professionals together.

To RE tool vendors, our findings that gameplay requirements are perceived as functional requirements and that traditional flowchart and process modeling techniques are a good fit with gameplay modelling mean that there could be a new market segment just waiting to be explored. To the best of our knowledge no RE tool vendor visible in the RE community has geared their tool to serve MMOG companies. This study suggests that MMOG companies could become potential users of such tools, i.e. they form a market and maybe tool vendors might be interested in exploring and developing it further.

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