Strange Wicked Worlds

Indeterminacy, Coherence and Other Implications of Dewey's Theory of Inquiry for the Design and Development of Video Games

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Abstract

Designing and making games is complex, chaotic and difficult, and the relationship between design and the game development process is not well understood. The myth of predictive design control and fallacies of misplaced concreteness have confused understandings of game design, both in theory and practice. To resolve these problems, I use Dewey's theory of inquiry, both as a method of philosophical investigation and as a way of understanding the process of game development. I also use experience-focused philosophies, embodied theories of meaning, tacit knowing and theories of design to examine the characteristics of games, game experiences and game design. These theories are used to identify important constituents in the game design situation, and to address the mix of formal, aesthetic and creative elements that defines game design. In doing so, I rely on my experience as a game designer along with analysis of several game development projects, to investigate the nature of indeterminacy and design coherence in the game development process.

This thesis shows that game design is a complex process that inherently involves at least 40 sources of indeterminacy. It also shows that the formal aspects of a game co-develop with the skilled performance of integrative design work in a social design situation. In this project-specific collaborative learning process, the meaning of design concepts can easily be disrupted in the solving of problems and coordination of different discourses. The co-development process allows designers to expand their rational capacity while coping with emergent complexity (of both games and their making). This process also clarifies and strengthens the logical forms in the design situation while allowing the bodily meaning of the design to be experienced, shared, and carried forward more precisely through further iterations. The co-development of knowledge with precise embodied feelings allows game designers to develop the needed appreciative systems and design expertise to effectively carry project inquiries forward. The long and uncertain process of game development as a succession of inquiries at the project, feature and game experience levels is necessary to achieve this outcome.

These conclusions have two main outcomes. First, they create a coherent philosophical basis for understanding the development of creative new game worlds. And second, they add much-needed depth to understanding design control, indeterminacy, design coherence, design discourse, the role of logical forms and qualitative experience, and the process of iterative development in game design.

Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

(Signed)______________________________

Jamie Lack

Keywords

aesthetics, agency, Bία~Forms, coherence, conception, conventional design, design, design control, design frame, design methods, design problems, design process, design specification, design theory, embodied philosophy, emotion, experience, experimentation, feeling, game concept, game design, game-design methodology, game development, game experience, game mechanics, gameplay, gameplay structuring, integrative concepts, interface, inquiry, image schema, incremental development, indeterminacy, iterative development, itineration, logic, logical forms, making, meaning, model worlds, patterns, philosophic fallacies, perception, philosophy, play, production, qualitative character, second-order design, tacit knowing, uncertainty, video games, video game logic, vitality affects, wicked problems.

Abbreviations

..... - a symbol used in Gendlin's theory of embodied meaning

2D - two dimensional

3D - three-dimensional

AI - artificial Intelligence

FMC - fallacy of misplaced concreteness

GDC - Game Developers Conference

GUI - graphical user interface

GTA - *Grand Theft Auto*

IDS - Indeterminate situation

NPC - Non-playing character

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Chapter 1: Introduction

1 Introduction

To say that complex video games[1] are designed and produced seems an uncontroversial statement. However, it is so misleading as to be hardly true at all. In practice, the development of such games often resembles a process of growth and mutation. If video games are best described as a mess (Bogost, 2009) rather than a clear ontological hierarchy of things, then the concept of game design is even messier. A new understanding of the nature of game design is necessary. In this thesis, I will reach this goal by examining the implications of Dewey's theory of inquiry and a naturalistic, experience-focused philosophy for conceptions of game design and development activity.

1.1 Introduction to the research problem

Game design is a challenging, multi-faceted discipline, and the uncertainty involved in the project, from conception to final product, makes control of the process through design extremely difficult. Developing large-scale complex video games in large teams produces greater challenges and more uncertainty. The need for conceptual and practical tools that can assist game designers in meeting these challenges is obvious, more so in commercial development environments where creative risks can easily become costly development problems—or worse, significant economic failures. This is a clear threat to the creative potential of game development projects and to the viability of game development as an economic endeavour. This threat gains severity as the costs of making video games continue to rise. Since the late 1990s, the field of video game design has increasingly received theoretical attention from both academia and figures within the game development industry. However, the resultant attempts at formalising concepts, theories and methods has largely failed to be useful to the practice of designing and developing video games. Similarly, methods and processes from other fields of design seem to lose traction in game design. In this thesis I argue that existing game design theory and methods have unclear or inadequate philosophical grounding,

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[1] Unless otherwise specified, the reader can assume that when I refer to games in this thesis, I mean video games.

which has led to two key problems. First, the study of game design has failed to adequately clarify the nature of game design or take into account how the conception of design is changed by the nature of game development. And second, it has undervalued what is important to the practice of game design. As a result, emphasis in the literature has been placed on analytic, reductive and categorical thinking over integrative thought and action. The literature has also failed to adequately account for the co-development of project-specific logic, embodied meaning and qualitative unity of the game experience, achieved through the game designer's experimentation, inquiry and development of skilled perception.

1.1.1 The need for a philosophic examination of game design

One of the important purposes of philosophy is to critically examine the concepts used to understand the subject-matter of a particular field of knowledge. It is, as Dewey (1929a) would say, "laying a ground map for the province of criticism" (p. 413) into game design activity. When theory and method fail to offer adequate or reliable means of control over a domain, as is arguably the case currently in game design, the need for a robust conceptual ground-map becomes clear. Dewey (1966, p. 165) argues that method should never be something outside the material: rather, method should be appropriately derived from the subject-matter the method is to deal with. I argue that a common problem in academic approaches to game design to date is that they do not show an understanding of the material of game design. Their objectivist and formalist supporting assumptions primarily serve the purpose of academic study, and effectively obscure perception of the nature of game design and the place of design in the process of game development. The result is a range of proposed methods that fail to be useful in the practice of game design.

In reviewing a number of definitions of play and games, Schell (2008) makes clear the difference in purpose between definitions that suit game design and making, and those that suit academic purposes. He argues that those people (such as academics) who perceive the lack of a precise definition of games, or a clearly defined vocabulary for games, to be a problem, are the farthest removed from the actual design and development of games. Game developers, on the other hand, deal with this ambiguity among themselves by just explaining what they mean. Rather, Schell claims that the problem is not that game developers lack *words* (and therefore, ideas) to describe elements of game design, but instead lack "clear thinking about what these ideas really are" (pp. 24-25).

This thesis critically examines the nature of game design within the process of game development, with an emphasis on collaborative, team-based design and development of large-scale video games. This examination aims to counter what I consider to be a problematic understanding of game design. Both Neil (2012), and Almeida & da Silva (2013) have surveyed the important literature on game design theory, tools and methods, including a mix of sources from the game development industry and academia. Neil (2012), who has some experience as a game designer, defines the core tasks of that role as "conception, analysis, and balancing of gameplay" (p. 3). Neil claims that these tasks generally consist of two phases, beginning with conceptual work, assisted by documentation using word-processing software. This is followed by a phase spent interacting with a playable game prototype, which must first be implemented by production staff "under the direction of designers, who as designers lack the production skills required to effectively develop the prototype themselves" (p. 3). In these views, there is a clearly assumed top-down model of design, in which a single designer produces ideas that become specifications for others to produce. Almeida & da Silva's (2013) review of the literature reinforces a similar assumption, that

> [t]he game design document is the main artifact produced by a game designer. It is used to communicate the designer's vision to the development team. It also acts as a guide to the whole development process... (p. 18)

These reviews of game design take a perspective of design (which can be called the classic view of design) in which the individual designer produces *a* design. The artifact of design is therefore a specification or plan for the production of an artifact. In this viewpoint, design control is all-important due to the up-front and top-down imposition of requirements, concepts and organising principles. The expectation that comes from this assumption is that design control comes only from the designer, which effectively places a demand on the design specification to be a complete and accurate prediction or model of the finished product. This viewpoint relies on applying general knowledge derived from prior analysis, and predictive control depends on stable subject-matter.

Some prominent professional game designers and some academics who theorise about game design assume that game design practice is too idiosyncratic, informal and ad-hoc, and that the process of game development is insufficiently controlled through design planning. Neil (2012) raises the concern that game designers seem to lack any methodology at all, claiming that "[g]ame designers are not yet applying even purely conceptual 'on paper' design tools or graphical notation systems to their design work" (p. 5). Wondering why software tools do not exist to support general game design tasks, Neil goes on to suggest that "[t]hese conceptual tools and systems, evolved and confirmed in practise, would form the basis for any computer-aided design support software" (p. 5). Neil's assessment is that the evolution of the game design discipline is in a "poor state" (p. 5) because

> [o]utside of playable contexts (a prototype, for example), the only means we have of modelling and communicating gameplay concepts has been natural language; we do not yet have a shared and commonly understood framework for designing games with anything other than words. (p. 5)

A related concern is that the accumulated expertise of experienced game designers is difficult to pass on to new designers. Almeida & da Silva (2013) discuss the

> very common practice of designers: the investigation of the emotional result of mechanics implemented in the existing games. Thus, as part of their work, designers must constantly experience a vast amount of games in an analytical way, which is quite costly. (p. 22)

From this, Almeida & da Silva (2013) conclude that "the importance of building a database of design concepts drawn from existing games becomes evident" (p. 22), as if to suggest that a database of idealised design concepts can replace the development of *design expertise* (Lawson & Dorst, 2009). Almeida & da Silva's conclusion makes clear the assumption of an objectivist or spectator view of knowledge. In this view, knowledge is treated as a discrete thing that can be acquired by simply holding the knowledge object. In addition, this viewpoint does not appreciate or respect:

- the situational nature of game design
- the connection of design expertise to skilled perception and integrated performance of design activity

- the possibility that important areas of game design might not benefit greatly from the application of existing knowledge to the development of requirements and specification for production.

Another concern is that the maturity of knowledge in the field of game design is poor due to an absence of general theories and formal methods. Proposed approaches to taming game design from both leading professional game designers and academic authors overwhelmingly see the problem as a lack of formalisation and standardisation: in concepts, language, tools and methods. Neil's (2012) review includes an examination of attempts to develop formal game design tools such as a standardised design vocabulary or gameplay notation systems. An important assumption that motivates these efforts is that game design is hindered by a lack of a shared language or a lack of formal means to communicate the mechanics of game systems. Such views are expressed in well-known attempts by Costikyan (2002), Church (1999), Cousins (2002, 2004a, 2004c), Koster (2005) and Fullerton, Swain and Hoffman (2008). Koster (2005) sought, and by his own admission failed, to develop a notation system that could provide a grammar for atomic gameplay elements and an algorithmic prediction of a game's possibility space. Cook's (2007) atomistic approach went in a different direction, and was founded not on mechanisms, but from basic psychological units of learning and mastering skills. Almeida & da Silva's (2013) review of game design tools and methods mapped the main works relating to design vocabularies and visual design language. Their review contains interesting assumptions, for example, they criticise Church's Formal Abstract Design Tools (FADT) as a model for design for being

> too simple and relationships with games or genres are not covered. It also lacks information about the use implications of each FADT in a game. Its application relies too much on the abstraction ability of each designer. (Almeida & da Silva, 2013, p. 21)

It is clear that Almeida and da Silva expect game design tools to behave like scientific instruments: having systematic explanatory or predictive power, with specific, stable relationships among theory elements and identified generic elements of games. Further, in their view it seems undesirable that a design tool requires a combination of design skills, design expertise and application based on situational factors. I argue that both assumptions are misguided, but are evident in the general failure of theory for game design.

While the game design literature (both academic and industry) has included many attempts at developing formal approaches, taxonomies, theories and methods, the capacity of such approaches to be relevant to game design practice is limited and the proposed methods remain ineffective in practice. Almost in spite of this, the standard of game design, of game design practice, and of the power of concepts in game design, in my experience, continues to improve slowly, through less formal means. My research takes the position that the problem is with academic understanding of the nature of game design and development, and that the purpose of academic approaches to the subject differ to the purpose of design approaches. The formal approaches all share the view that game design requires an abstract system of fundamental game design concepts, units and laws to sufficiently illuminate what is assumed to be the true supporting ground below. The prize in this view is not the designed game experience, but the ordering and taming of knowledge in the field, to make it amenable to computation, classification and instruction.

Neil's (2012) proposed research focuses on taking stock of existing theory, tools and methods, through testing their practical viability, utility and acceptance in real-world game design situations: however, my research seeks instead to re-evaluate the conceptual foundations on which such work has been based. I argue that the academic understanding of game design activity (including attempts at theorising from within the game development industry, which have greatly influenced later academic work) rests on a set of outdated and flawed assumptions. These assumptions have two main concerns: the nature of knowledge, design and game development; and the nature of game design (and its needs) within the process of game development. I argue that these assumptions have not only been largely taken for granted and unsatisfactorily examined in depth, but that they are also inadequate for the needs of game design. This argument points toward the clear philosophical problem that this thesis addresses: If the concepts on which game design and game development have been understood to date have failed to produce viable support for game design, then what concepts must take their place?

1.1.2 Introduction to the area of research interest

This research is about the design and development of video game *worlds.*[2] Modern video games are complex technical and social undertakings that involve creatively configuring the products of software development and digital content production. This thesis takes the perspective that the normal process of game development is a systematic process of inquiry, and is a form of what Archer calls *design research*:

> Design research is systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems. (Bruce Archer, cited in Bayazit, 2004, p. 16)

This research is therefore research *for* design: a design-focused, philosophically grounded investigation of the process of designing and making complex, creative, new and often strange video game worlds. This research inquiry, while conceptual in nature, does not assume an outside-observer position. For 14 years, I worked designing and developing games in many teams ranging from small (5 developers) to large (over 60), and in this research, I take a position from within the practice of game design. A further 5 years of experience teaching game design to university students and supervising small student teams has produced a wide range of insights into smaller-scale projects, and into the development of game design expertise. My inquiry is a meeting of that direct design experience with a systematic theoretical investigation into the nature of game design and development.

A long-standing and still commonly held view of design—even within modern conceptions of design, such as user-centred design (Krippendorff, 2006, p. 25)—assumes a separation between design activity and the process of making the designed artifact. I argue that this position is inadequate for characterising design activity in game development situations. Instead, game design is inextricably bound with the process of *making* a new game experience. Games are complex systems consisting of highly interdependent parts that affect each other: and because of the creative, goal-oriented nature of games, the constituents of games are unsettled, emerging and changing, and thus, changing *each other*. It is often difficult to determine constituents of the situation

2 In order to limit the research scope I will not consider design for multiple players, or focus on: the business and commercial aspects of game development; or organisation, management and communication processes of game development teams.

to lock into a stable problem, as Tim Schafer of Double Fine Productions (2012, 08:52-09:34) describes:

> The creative process of making a game ... is like you're looking at this field of floating multi-coloured dots, drifting slowly to the ground. And eventually when they hit the ground they're gonna make a painting on the floor ... and as they fall you start to see where you're going to need more colour, and you move them around [makes a gentle nudging motion], and slowly they settle. [begins a conversation between himself and an imaginary person] Tim! What are you doing with that green dot?
>
> [Pfft]—I can't tell you!
>
> That dot, can we just nail that down? Can we just say where that is going to be?
>
> ... No!
>
> Let's just say where all the red dots are going to be, okay? Can we just nail all the red dots down?
>
> ... No!
>
> What if we just start on this edge, and take all the dots like this [motions from one side to the other], and just nail those dots?
>
> ... No!

Rouse (2005) emphasises the shifting nature of game development when he says "I know of no original game project whose design has not changed significantly during the course of its development" (p. 378). And as Sylvester (2013, pp. 267-270) observes, developing games is filled with so many tasks and problems that we can feel great solving them without realising that we were solving the wrong ones. The interdependencies between the parts of a game may not make these mistakes apparent until much later, or at all. Sylvester (2013) warns that we become "busy idiots":

> Some imagine game development as a path that we follow toward our destination. I disagree with this image. I think it's more like a dark forest full of stinging monsters, waiting to inject you with anesthetic poison. Each time you bump into one, it stings you and the poison makes you feel warm and content. But under the surface, the stings are stealing your vigor, dissolving you from the inside. It's only later, as your strength runs low and the moon clouds over, that you might realize that the pleasant feeling you've enjoyed all this time wasn't progress. It was death. (p. 270)

This kind of design is much more like an ongoing process of learning, discovery or growth, than the process of design for production. This perspective on design has support in established views of design in the design literature, which consider design a process of learning: "you propose, experiment, and learn from the results, until you arrive at a satisfactory result" (Lawson & Dorst, 2009, p. 34). Hasan (2006), in addressing the place of design as a research method in the field of Information Systems, observes that "the design of an artefact may co-evolve with its production in an evolutionary, emergent process where experiential learning occurs" (p. 1). Hasan also notes that the "information systems artefact" is commonly understood as consisting of "a variety of component types: hardware, software, storage, processes and people" (p. 2). From the perspective of Information Systems, game design can therefore be seen as being part of larger information systems that are needed to create the game project and support it. In emphasising the process of learning within a game development project, I draw attention to the development of skills and knowledge, and to the uncertainties that the development process seeks to overcome. In my experience, this process can be so uncertain and difficult that its problems often seem like *wicked problems* (Rittel & Webber, 1973, 1984). I aim to explain the *indeterminate* causes of such wickedness that generate design problems, and design change, throughout a game development project.

At a high level of abstraction, a game development project can be understood as a creative inquiry into the making of a *coherent game experience.* In such an experience, sense, action, emotion, meaning and thought become coherently organised with a unified quality that develops over time to produce particular aesthetics. A successful development process transforms the indeterminate initial design situation of an imagined game experience into the determinate and coherently unified final game experience. Sylvester (2013) argues that developing games is a process of knowledge creation, which entails learning how to achieve a coherently designed game *experience*:

> The major challenge faced by game designers isn't implementing the game. It is inventing mechanics, fiction, art, and technology that interconnect into a powerful engine of experience. (p. 311)

In this research, I assume that coherence of design, and therefore coherence of the player experience (which emphasises aesthetic experience), is a powerful value that drives the inquiry process forward, and is therefore an important part of the nature of game design.

Together, the areas of process, indeterminacy and coherence, in the context of game development, form the core research interest of this thesis, and find a theoretical formulation in John Dewey's (1938) theory of inquiry:

> Inquiry is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituents, distinctions and relations as to convert the elements of the original situation into a unified whole. (pp. 104-105)

1.1.3 Considering the theoretical approach to this research

Dewey's theory is appropriate for this research because it offers a general approach to the study of game development as a process of inquiry. However, there are other possible theoretical approaches that investigate learning in complex technological, social and organisational environments. For example, Hasan (2006) proposes a general framework for studying design as a legitimate research method in the field of Information Systems. This framework approaches the study of design using a socio-technical approach, which focuses on "the intricate relationship between the social and technical elements of any information system" (p. 2). Hasan's (2006) framework employs systems theory, complexity theory and activity theory, based on the following propositions (p. 2):

- Systems are holistic, integrated, dynamic, purposeful
- Information systems are essentially Socio-Technical Systems
- Activity Theory provides a suitability framework for the study of information systems
- Information systems in the current environment are complex
- Concept from complexity theory have implications for Design Science

Each of these propositions remain valid when considering game design in the context of Information Systems. However, unlike Hasan's work, my research is not aimed at understanding design activity as a research method for design science that serves Information Systems or knowledge management. I also do not seek to study the game design process at the level of organisations.

However, of particular interest within Hasan's framework is activity theory, which originates from Leontyev (1981), and differentiates between types of activity based on differences in the object (i.e. the purpose or direction) of the activity (pp. 36-37). As Hasan (2006) explains, activity theory focuses on human action as a "dynamic, purposeful relationship" in which "the 'always active' subject learns and grows while the object is interpreted and reinterpreted by the subject in the ongoing conduct of the activity" (p. 3). Activity theory is based on work in the field of psychology by Vygotski from the early 20th century. Vygotski (1978) emphasises the importance of historical and cultural aspects of human psychological development. An important assumption in his work is the mediating effect of tools in human activity. Game design is a process that occurs in a highly technological environment in which tools, and the design of tools, play an important part. Hasan (2006) notes that tool mediation is a

> two-way concept ... where the capability and availability of tools mediates what is able to be done and tools, in turn, evolve to hold the historical knowledge of how the community behaves and is organised. (p. 4)

In activity theory, the unit of study is the whole situation consisting of the subject, the tools involved and the object of the activity. Game design activity is directed at creating coherent game experiences, and activity theory can offer a useful way of studying game design in terms of activities involving tool-mediated development and learning. However, because I am focusing on sources of indeterminacy and change that *affect* game design activity, Dewey's approach is more suitable to my research. This suitability is based on five main factors. First, Dewey's inquiry process is centred on the concepts of the indeterminate situation and the development of a coherent outcome to inquiry. Second, Dewey's approach to the resolution of indeterminate situations is fundamentally experimental, and playful experimentation is a central part of designing games. Third, Dewey's experience-focused supporting philosophy is comprehensive and values aesthetic experience, which is a major concern of game design activity. Fourth, Dewey's approach to inquiry can be flexibly adapted to the experiential and aesthetic subject-matter of game design. And fifth, Dewey's philosophic method aims to develop a better understanding of the subject-matter of a particular field of knowledge, and developing a better understanding of the subject-matter of game design is one of my primary research aims.

I have therefore chosen Dewey's theory of inquiry and use it in this research in three key ways: as a method, as a methodological position, and for selecting appropriate theories by which the understanding of game design can be transformed.

1.1.4 Intended audience

It should be noted that this thesis serves a philosophical purpose: it functions as a critical examination of concepts and assumptions relating to the general activity of designing games. I draw heavily on Dewey's philosophy because I believe his work has power in addressing common problems in game design theory and practice. This very specific purpose means that my research should not be considered as part of current discourse in the general practice of philosophy.

This thesis is specifically relevant to three different audiences: game developers (particularly experienced game designers), teachers of game design and academics studying game design. In the course of achieving their varied goals, all three of these groups need to make assumptions about knowledge and design control in relation to the process of developing games. This research directly confronts that subject, and is motivated primarily by seeking to understand the nature of problems and difficulties game designers experience in practice. A secondary aim for this research is addressing the problems that surface in attempts to theorise about the design of games. Of the three target audiences, game developers will best understand the subject-matter itself, having experienced the difficult learning challenges involved in the process of designing and making game worlds in creative, team-based, economically pressured technological design environments. However, even though this research is a thorough conceptual investigation that draws on literature from a wide variety of fields, it is oriented toward the practice of game design and has important practical implications. As an investigation *of* a kind of inquiry, this research aims to critically examine and expose many implicit assumptions on which approaches to game design and development rest. The abstract, conceptual and theoretical nature of the thesis requires familiarity with pragmatic philosophy and a wide range of academic research, and consequently, will likely be of most interest to the academic audience. I will not give specific consideration to game design education, in an effort to narrow the scope of this research. However, I am confident that the ground covered here has importance in that area (in part, because I teach game design and have successfully applied insights from this research in that domain).

1.2 Research questions and aims, and significance

In this thesis, I employ five approaches to the study of game design that differ from most research on the subject to date.

1. I have a rare perspective on, and first-hand experience with, the subject-matter and problems involved. I am a game developer with extensive project experience (at a variety of development scales) that spans multiple roles and disciplines, with expertise in game design. I also have a formal education in industrial design and in-depth knowledge of the field of design, its history and development.
2. This research emphasises the design and development of complex video-game worlds in large teams. One significant assumption made here is that all members of a game development team are designers (not solely those with this word in their job titles), and therefore, all hold a stake in a fundamentally social, collaborative, long-term multi-disciplinary design process. By making this assumption, I avoid over-generalising about games and game design, and increase the significance of questions about design situations, different design discourses, and levels of design expertise.
3. I do not assume that the subject-matter of game design can be tamed by an objectivist approach and its accompanying spectator view of knowledge. Video game design may rely on stable objective forms, but these are inescapably bound with the social, technological and creative processes involved in making new game *experiences*. As such, I do not take objectivist ontological and epistemological positions in this research. Instead, I take an embodied, naturalistic and pragmatic approach to the subject-matter of game design and development.
4. My approach to the study of game design relates to the overall methodological position of this thesis. The processes of game development produce shifting conditions, new phenomena and indeterminacy, and resemble a process of inquiry, rather than design for production. This places an important focus on the development of knowledge and skill *during* the process of making games, and draws

attention to limitations of knowledge, conceptualisation and judgement that support game design and acts of making.

5. This research differs from previous research in another significant way: I assume that in the face of the highly situational and indeterminate nature of game development, the analysis and formalisation of what existent, finished games *are* is of minor importance to making better games. Instead, a more promising path of study is in understanding the processes (and influential factors) of how new games are made and come to be. This path focuses my research on the processes of conceptualisation, the effects of development activities, and the nature of integrative design activity in the pursuit of design coherence.

1.2.1 Research aims

This research aims primarily to address the research problems by developing an explanation of indeterminacy in game development. This approach will show that indeterminacy (and the chaos it causes) is not chiefly due to poor process or lack of formal methods, but is an inevitable and essential part of the game development process at any scale of development, relating to the pursuit of, and difficulty of achieving, design coherence. In the process, I aim to develop an adequate philosophical foundation for game design that avoids what I believe are common fallacies in the conception of game design. As an under-explored area of study, this necessarily requires the development of a well-researched, coherent theoretical perspective for game design and development. I aim to develop this philosophy of inquiry from an understanding *within* the experience of designing and making games, which accounts for ways of knowing that are important in game development. Such research is necessary for three reasons:

1. The prolonged, difficult and uncertain design conditions that are common in game development have not been satisfactorily examined or explained.
2. Game design, as the relationship between design conceptualisation, design problems, development processes, technology development and social dynamics in game development teams has not been examined in detail and lacks appropriate philosophical grounding and theoretical support.

3. The way that the *design* of games (including knowledge that supports design judgement) is affected by the process of developing games has not been clearly articulated.

1.2.2 Primary research questions

In this research I aim to improve the understanding of game design by asking first if *an understanding of game design based on Dewey's theory of inquiry is viable for:*

- *clarifying the nature of game design and game design activity?*
- *explaining continued indeterminacy in the game development process?*
- *explaining the development of design knowledge and design coherence within a project?*
- *suggesting the form of design coherence?*

Because inquiry relates to the development of knowledge, I will also ask *how framing game development as inquiry reveal limits to knowledge, conceptualisation and judgement that support game design and acts of making?*

The premise underlying these questions is that the need for inquiry continues as long as: the nature of the game experience is *confused;* the steps needed to make it coherent are *obscure*; and *conflicts* between meaning, aesthetics and logic are perceived in the developing qualitative experience. This premise is derived from the proposition that such confusion, obscurity and conflicts arise in relationships among:

- the specific subject-matter of the game under development
- the game conception or creative direction as assumed, espoused, shared among and acted on by the developers
- the constraints and goals of the project
- the gameplay technology in use
- the qualitative experience of the game under development: feelings, aesthetics and emotions
- the conception or direction of the game suggested in response to the developing qualitative experience.

These questions make for a broad investigation, but are necessary for two reasons:

1. Game designers deal with the integration of diverse complexes of ideas, technologies and forms into rich experiences. Understanding this integrative activity requires a comprehensive perspective.
2. The question of design must show an understanding of how games are made and can be made well, and what difficulties may be in the way of intentionally achieving a desired outcome. If these fundamentals are not addressed, any research that hopes to suggest theory, processes or goals for game development lacks what Dewey (1938) would call *warranted assertibility* (p. 7).

The main research question is phrased in terms of a *viable* way of understanding game design, which means there must be an indication of how well the conclusions reached in this thesis can support game design conceptually and instrumentally. Viability could be evaluated as having effective power in:

1. understanding uncertainties and risks in game development
2. critically understanding the characteristics and concepts of game design and the experience of game development
3. understanding the use of general design knowledge, including conventional game forms and game design exemplars
4. understanding design coherence and the process of achieving it
5. improving the conception of games and evaluation of game designs
6. explaining the need for iterative development, and the sources of design change
7. understanding when top-down design approaches can be effective
8. developing effective design approaches or methods within the game development process.

Additionally, viability should mean an improved capacity in these areas over existing concepts and theories relating to game design.

1.2.3 Importance and justification for the research

The questions raised and answered in this thesis are important for at least six reasons.

1. This thesis describes the nature of game design in a way that I believe, given my experience in a range of configurations of development teams, is more appropriate, complete, and detailed than previous academic research in the area. The approach to thinking about and understanding game design presented in this thesis may therefore be more effective than previous approaches, and lead to breakthroughs in design methods, tools, development processes and teaching methods appropriate to the subject-matter of game design.
2. In gaining a greater understanding of the nature of indeterminacy in game development, risks and possible efficiencies can be better understood. This understanding has implications for game project management and organisation and may also allow development teams to realise the potential of their creative visions as new game experiences.
3. By articulating the important co-dependent relationship of embodied meaning, creative expression and formal aspects of games, the fragmenting dualisms and dichotomies present in many previous understandings of game design can be eliminated and the integrative nature of the process of making games takes on greater significance.
4. A deeper understanding of the nature of game design knowledge and the process of developing design expertise can help to improve the teaching of game design concepts and skills.
5. The philosophical ground-map produced by this research may offer general support to any social, collaborative, creative projects that involve and rely on technology development to realise products in the forms of experiences.
6. A better understanding of game design is important because designing game worlds is already significant to society, and will likely gain more social relevance as the distinction between the real and virtual dissolves through new computer interfaces.

1.3 The development of the research problem

This research follows the implications of Dewey's theory of inquiry for the process of game development. My overall theoretical perspective is also based on Dewey's philosophy and my primary research method is structured in the form of Dewey's inquiry.

Dewey was emphatic on the importance of empirical method. However, his empirical method was *not* a reduction of all things to what can be empirically verified, but a way of honestly accounting for what was claimed or reported:

> Honest empirical method will state when and where and why the act of selection took place, and thus enable others to repeat it and test its worth. Selective choice, denoted as an empirical event, reveals the basis and bearing of intellectual simplifications... (Dewey, 1929a, pp. 29-30)

In Dewey's model of inquiry, problems must be instituted from the indeterminate situation. Therefore, as part of accounting for the acts of selection and description that feature in this research, I will first outline how I came to formulate the research problem and how Dewey's theory of inquiry became the problem's complement: a hypothetical solution.

1.3.1 The pervasive quality: things that seem wrong about understandings of game design

Dewey would say that an inquiry begins with a particular, pervasive quality, which can be understood as an unsettled human–environment *situation*. In numerous situations as a game designer and developer (14 years in large teams across multiple disciplines and projects), a teacher of game design and a research student, I have experienced the pervasive quality that has led to this research. However, it has taken many attempts to arrive at the formulation of the problem present in this thesis. I will try to characterise this pervasive quality and consider the problematic nature of what it suggests. The quality I have experienced relates to:

- assumptions about design control and certainty of the ideas used in planning
- the influence and legacy of planned ideas on game-making activity in a variety of different team sizes and scales of development
- the nature of design coherence in game experiences
- the importance of a designer's emotional response to the design and aesthetic judgements in the design process
- failures of game design, and the way failures are discovered and fixed through re-design and further making activity

- the uncertain, changeable and highly problematic nature of designing and making games
- the constant discovery of problems in game development situations and the way solutions cause reconception and design change
- the inadequacy of game design theory in addressing these issues.

Rittel and Webber's (1973) theory of *wicked problems* was a promising early direction that had relevance to the pervading quality described above. Wicked problems involve the characteristics shown in Table 1.1.

Table 1.1. Characteristics of wicked problems

#	**Characteristic**
1	There is no definitive formulation of a wicked problem.
2	Wicked problems have no stopping rule.
3	Solutions to wicked problems are not true-or-false, but good-or-bad.
4	There is no immediate and no ultimate test of a solution to a wicked problem.
5	Every solution to a wicked problem is a 'one-shot operation'; because there is no opportunity to learn from trial and error, every attempt counts significantly.
6	Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into the plan.
7	Every wicked problem is essentially unique.
8	Every wicked problem can be considered to be a symptom of another problem.
9	The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10	The planner has no right to be wrong.

Source: (Rittel & Webber, 1973, pp. 161-167)

Aside from characteristics 5 and 10, which are particularly relevant to complex social problems, I think Rittel and Webber's list captures essential aspects of the difficulty of game development, and this point has also been noted by others (Mateas & Stern, 2005). The wicked problems view of design explains characteristics of intractable problems, and accounts for the social, argumentative nature of design planning. Although Rittel and Webber's work allowed my research to begin taking form, I soon discovered that the explanation of *why* wicked problems were intractable was a more significant question for understanding game development situations.

Buchanan's (1995) additions to the wicked problems perspective for design explained *indeterminacy* as the signature factor of wicked problems. If the three basic parts of a problem are: the existing situation, the preferred outcome, and the methods that transform the former into the latter (Fernandes & Simon, 1999, p. 226; VanGundy, 1988, p. 3), then in a wicked problem, one or more of these parts cannot be determined. Buchanan's discussion of indeterminacy cited John Dewey, for whom indeterminacy is a central philosophical concept. Dewey's writing in *Quest for Certainty* (1929b) struck a chord with me. In Dewey, I had found a language to formulate a problem, but I was yet to come across his theory of inquiry.

In an earlier phase of the research, I used the wicked problems framework to analyse *Game Developer Magazine* postmortems.[3] While trying to understand the sources of indeterminacy in game development, my analysis of several commercial team-based game development projects produced insights about the relationship between the game concept, the logic and patterns found in the game design, and the qualities of the game experience. At this stage, I began to explicitly develop my ideas about design coherence. I began to see connections between:

- the way games are conceptualised
- the way games are made
- the design problems encountered in the development process
- what game designers value and game developers strive for

3 Postmortems are retrospective accounts of game projects by game developers, usually written immediately after completion of a project.

- the limitations of the assumptions, concepts and philosophies underlying many views of game design in the literature.

All of these explorations helped to formulate the problem, but missed something that integrated indeterminacy and design coherence with the process of game development. Finally, Dewey's theory of inquiry allowed the formulation of both problem and solution to simultaneously emerge. Dewey's theory clearly structured, into a single form, the difficulties and unsettled qualities I felt about both my experience of, and study of, game design. It united the experiential dimension of games, indeterminate situations, design problems, transformation processes (i.e. various development processes), collective inquiry, and the notion of coherent outcome. I now had a potential solution: Dewey's inquiry—applied to game development—was a hypothesis that seemed to tackle many of the problems I have discussed above.

My formal industrial design education was an essential factor in determining the pervasive quality that led to this research because it led me to find ways of bringing design methods to the uncertain process of making games. Without that background, I would have no need to explain why game development so often seems intractable and resistant to design control. Designers learn to tolerate uncertain design conditions (Cross, 2011, p. 15), but usually their interventions lead to the development of a way of understanding the problem. Yet, even so, as a game designer, I was often forced to reflect on the absence of solid foundations for game design decisions reached by a development team. The perplexities that precipitated this inquiry accumulated through:

- seeking to understand the issues I grappled with for years in my experiences of game development
- making, playing and researching games and developing a shared understanding, with other game developers, of what makes a good game experience
- critically engaging with accounts of game development produced by other developers.

Industrial design, like other areas of design dealing with the mass production of largely physical constructions, greatly benefits from scientific knowledge. The so-called *laws* of physical reality, on which our tools and technologies are built, lend a great deal of certainty and stability to planning activities. For the designer of material things, the material world provides an anchor in the design puzzle. In game development, there are few fundamentally important or necessary constraints. Whatever is possible in hardware and software can be achieved, given enough resources and skill. This is, I argue, one reason that the model of design for production, which works well for manufactured things, does not work well for the design of new experiences co-created by player and game. Yet there are numerous reasons why this unsuitable model persists, including the benefits of economies of scale, commercial product strategies, the demands of business agreements to secure financing, the social nature of large teams, and planning and project management. Another reason is that the model is grounded on enduring philosophical fallacies.

1.3.2 Philosophical fallacies

My critical examination of literature within the design field, such as the wicked problems view of design, was a response to the failure of the literature in the field of game design to account for difficulties I had encountered in game development. Some of these difficulties can be grouped under what Dewey (1929a, 1929b) called *the* philosophic fallacy, and what Alfred Whitehead called the *fallacy of misplaced concreteness*. This fallacy was to apprehend the world in terms of the favoured stable objects of knowledge in the search for eternal truths:

> This assumption of the proper ubiquity of knowledge is the great intellectualistic fallacy. It is the source of all disparagement of everyday qualitative experience, practical, esthetic, moral. (Dewey, 1929b, p. 219)

Dewey identified three of the main fallacies that stem from the intellectual tendency to assume that experience *is* everything known:

> the complete separation of subject and object, (of what is experienced from how it is experienced); the exaggeration of the features of known objects at the expense of the qualities of objects of enjoyment and trouble, friendship and human association, art and industry; and the exclusive isolation of the results of various types of selective simplification which are undertaken for diverse unavowed purposes. (Dewey, 1929a, p. 32)

Dewey (1934) made it clear that objects of knowledge are logical instruments of inquiry, and have their reality in *use*. Mistaking the logical for the ontological (i.e. the nature of being and reality) (pp. 128, 177, 200-201, 215, 305, 359, 389, 533-534), in Dewey's view, caused a host of unnecessary problems in Western philosophy. Dewey (1929b) argues that, in the process of committing the above-mentioned fallacies, the richness of primary experience was devalued in favour of a misguided quest for certainty. He also argues that this search for knowledge, based on absolute truth and deductive reason, led to a massive array of divisions, dualisms and dichotomies, which separated humans from the richness of their world, and their ideas from experience. Additionally, these divisions created artificial ontological and epistemological (i.e. theory of knowledge) gaps to be patched together again. Whitehead's *fallacy of misplaced concreteness* (FMC) is "merely the accidental error of mistaking the abstract for the concrete" (cited in Thompson, 1997, pp. 219-220), but has far-reaching implications. Thompson (1997) states that "The FMC misleads us into thinking we have all of reality, when we have, instead, only part of it", and it can cause us to lose sight of "*what lies beyond* inquiry; this is the realm of feelings, or the aesthetic" (p. 220, original emphasis).

I believe that the specific kinds of problems with the FMC in game development are:

- taking a game concept as comprehensive and complete, and a certain guarantee of what the game experience will become
- assuming that it is possible to specify a game experience from imagination, just because you can put a concept into words
- assuming that general concepts, genres and other categories devoid of content are suitable and certain for guiding game design.

These sorts of misconceptions are exacerbated by the high cost of implementing a game design, even to the prototype stage. Turning a paper design into a real game experience is costly in time and resources, and therefore, unlike the situation in many fields of design, you cannot viably develop multiple concepts cheaply on paper. The costs of developing an imagined experience to the stage at which it can be *experienced* as real places a premium on what or whose concept is made; such costs mean that it is easy to treat whatever is decided on as the absolute and last word on what the game will become. The potential to commit these fallacies is made worse by the fact that the primary technique for making games *is* transforming abstract ideas into concrete game forms. When making games, these constructions are a necessary and natural tool, but when such transformative thinking is confused with what the outcome will *be*, its runs too far ahead of itself and turns into errors of misplaced concreteness.

1.3.3 The problem of rational design approaches in game development

Experience of game development (particularly of large-scale, complex, new games) shows that up-front detailed designs are generally inadequate (Birdwell, 1999; Novak, 2012, p. 381; Spector, 2000; Wyman, 2011; C. Zimmerman, 2009) and that designs tend to change greatly during the process of development (Druckmann & Lemarchand, 2008; Finley, 2008; Novak, 2012, p. 381; Redding, Parizeau, & Beland, 2010; Spector, 2000; C. Zimmerman, 2009, 2010). However, it is difficult to shake the expectation that games can be designed 'top-down', and the idea that creation requires form be imposed on matter, which is known as hylomorphism (Ingold, 2010, p. 2). This difficulty is, in part, due to the many pressures to treat game concepts as certain, predictive and stable, such as benefits to project management and the efficiencies that come from the standardised production of game content.

Another pressure comes from software architecture development, in which a flawed paper design is likely to lead to flawed architecture, the need to re-design the software, and unpredictable implementation schedules (Rollings & Morris, 2004, pp. 98, 200-203). A key assumption in the top-down approach is that the designer can: adequately explore the design; determine the constraints and requirements that the design must meet (engineer the requirements); and resolve significant problems prior to making the design. Callele, Neufeld and Schneider (2005) argue that game development falters in the transition between pre-production and production because of inadequate requirements engineering. Their argument rests on what I perceive to be two assumptions:

1. A game can be designed on paper prior to production, and artistic, emotional and experiential factors can be translated into a domain-specific language as a set of requirements for software engineering.

2. The game design will not change due to the production process itself, even if software development is based on thorough requirements engineering.

However, Callele et al. (2005) also note that the nature of game development poses numerous challenges to viable requirements engineering, including:

- non-functional requirements (e.g. fun, immersion) that relate to the game experience
- the difficulty representing design requirements in a single language that can be translated into computer code (i.e. establishing a domain-specific language) in multi-disciplinary teams pursuing creative goals.

A different study of several game development teams (Kasurinen, Maglyas, & Smolander, 2014) has shown that the iterative development process, and playtesting in particular, result in a constant addition of informal requirements throughout the development process, which suggests that at earlier stages, requirements are *obscured* or *confused.*[4] Their study shows that the changes produced by these constant additions tend to be managed through immediate alterations to the game software before testing again. In software development, requirements engineering, though useful in some circumstances, has limits because the design of the software occurs during coding and testing: "An early design cannot fully anticipate the complexity encountered during implementation, nor can it take into account the ongoing feedback that actually comes from building the software" (Poppendieck & Poppendieck, 2007, pp. 29-30). The difficulty of up-front design for games is more extreme because there are no determinate functional criteria for measuring completion or success. A new game experience cannot be adequately known, or evaluated, until it has been created.

Top-down or up-front design approaches are associated with what is known as the *waterfall* model of project development, characterised by Larman and Basili (2003, p. 55) as a single-pass, management- and document-driven sequence of:

1. determine requirements
2. design

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[4] IDS#1. This is the first entry accounting for indeterminate situations in game development, which is a method that will be explained in Section 3.2.1.

3. implement.

The waterfall model is a one-way, stage-based approach that assumes a project can proceed according to predictive design control, and the output of one stage is purely an input to the next. For software development, this approach—which has long been discredited (Larman & Basili, 2003)—rests on what Poppendieck and Poppendieck (2007) say is the mistaken assumption that "knowledge, in the form of 'requirements,' exists prior to and separate from coding" (p. 29). Fallacies of the sort I described in Section 1.3.2 have been known as such in the field of software development for decades (Larman & Basili, 2003, p. 52), and the damage such views caused has prompted sustained criticism of the expectation of rational design processes:

> ...the picture of the software designer deriving his design in a rational, error-free way from a statement of requirements is quite unrealistic. No system has ever been developed in that way, and probably none ever will. (Parnas & Clements, 1986, pp. 251-252)

Adams and Rollings (2003) seem to assume rational design control when say game design is the process of:

- *Imagining* a game.
- *Defining* the way it works.
- *Describing* the elements that make up the game (conceptual, functional, artistic and others)
- *Transmitting* that information to the team that will build the game (p. 4, original emphasis).

In a similar vein, Adams (2010, p. 214) also states that a design document is a detailed description, prediction or explanation of the game. Likewise, Rollings and Morris (2004) see the game designer as a highly skilled, lone creative power, who uses "his or her creative genius to think as the intended customer does", and develop an exhaustive design document prior to the beginning of the production process (p. 310). For them, the gameplay specification "is a highly detailed description of the game that if studied and comprehensively understood, allows the reader to visualize the finished product in its entirety" (p. 92). It is worth asking what assumptions are behind the use of words such as *defining*, *describing*, *transmission*, *prediction*, and *explanation,* or, behind the idea of being able to visualise a finished game experience in its entirety.

Although Duke (1981c) acknowledged that the process of *constructing* games was iterative or involved trial and error (pp. 70-71), he understood construction to be a secondary phase that followed an in-depth and thorough up-front design phase:

> Note that if proper care has been taken in developing the concept report, construction can be a highly organized and efficient process employing standard management practice. If, however, construction is coterminous with an effort at determining objectives and the methodology to be employed, at least marginal chaos is to be expected. (Duke, 1981b, p. 52)

If it is reasonable to expect thorough up-front design and requirements engineering to provide a stable and robust design foundation for a game project, then could it be argued that the kind of game development I am investigating is simply evidence of deficiencies in management and planning? The developers of *Lords of the Fallen* seem to admit as much in hindsight (Klose & Lange, 2015). Is it just that many game development projects go wrong due to inexperienced development teams and unreasonable ambitions, as the postmortem (Boccieri, 2009) of *Golden Axe: Beast Rider* would suggest? Rollings and Morris would probably agree with Duke. For them, game development cannot be allowed to slip into chaos because this would go against good software planning and construction methods. Rollings and Morris (2004) emphasise the importance of research, and warn of the risk of putting anything in the critical development path for which the outcome cannot be predicted (2004, p. 529). They argue that such risks are due to (pp. 376-386):

- changes to baseline requirements (fundamental concept changes or additions)
- poorly defined requirements and vague specifications
- an overly simple, unexplored or unarticulated design that fails to adequately deal with the major issues
- an overly complex design, the definition of which depends on the nature of the project.

Chapters 2 to 9 will explain why some of these risks commonly occur or are an inevitable part of the development process.

1.3.4 Is rational design control a realistic expectation?

The issue of prediction and planning concerns the extent to which rational design control is realistic. Parnas and Clements (1986) gave a number of reasons that we "will never see a software project that proceeds in the 'rational' way" (p. 251). Some of their reasons (p. 251) can be paraphrased as follows:

- The people who desire the software system to be built do not know exactly what they want and are unable to tell us all that they know.
- Even if we knew the requirements, many necessary details are only revealed as we progress in the implementation. Some things that we learn invalidate our design, forcing us to re-design. The legacy of previous work influences the re-designs.
- Even with all of the facts and details available, humans are unable to comprehend them and master the complexities needed to design and build a correct system. We make errors in the process of reducing complexity to a manageable amount of information.
- Even if we could master all of the detail needed, most projects are subject to changes that invalidate previous design decisions.
- Humans make errors.
- We bring preconceived design ideas, intentions, theories and assumptions, all of which may conflict with rational requirements.

In the past, I was a strong advocate of rational design approaches, and there is virtue in advocating the *ideal* of rational design control, even though it may not be realistic. One reason for this is that rational design is a methodical way of finding out how much you do not know. It seems preferable to undisciplined, ad-hoc, under-planned approaches, and in design environments where economics matter, designing rationally is an issue of competency. There is no straightforward way to determine the issue of competency in game development, but it is clear that even experienced game development teams struggle, and less-experienced teams have it much worse. There are aspects of the game development process that no amount of management or systematic design will help with, and which make it necessarily an inquiry process. It *is* risky to develop games without a clearly researched problem and without knowing at the start exactly what it is you are making. It is even riskier to do so in a large team, with massive budgets, but this does not stop such development from happening. Game developers and players alike want to have new game experiences, and investors take risks on promising creative proposals. When market conditions make risks worthwhile, risks are taken.

Creating game technology is software development, and brings with it the risks, problems and processes of that discipline, particularly those of large-scale software projects, as documented so well in books such as *The Mythical Man-Month* (Brooks Jr., 1995). It should be noted that in the field of software development, it has been well established that the development process is a process of incremental learning (Larman & Basili, 2003, p. 52). Parnas and Clements' (1986) reasons apply equally well to the software side of game development, however the difference between software and game experiences is great. This is due to game design having a creative, non-functional design goal, and the much more complex experiential and aesthetic dimensions of game experiences. One of the most important features of developing computer games is that there are no creative limits, only technological ones. Putting limits on the novelty of a game design situation may be prudent, but I argue that this is very difficult to control. A better question is how many novel aspects should a game concept have (or deviations from the concept of a previous game) before development turns into inquiry? This research is about what happens when you step beyond—wittingly or not—the conventional and the known in the process of creating a new game world to experience. It is not about the design of games in situations in which the problem is known, or assumed to be known.

Many of the calls for methods of top-down design control seem to come in response to problems detailed in game project postmortems. In a study of *Game Developer Magazine* postmortems, Petrillo, Pimenta, Trindade & Dietrich (2008) conclude that commonly reported game development problems are similar to those found in software development in general. They determined the following problems common to over 50% of cases:

- unreal or ambitious scope
- feature creep (adding new functionality during development)

- cutting features during development
- design problems
- delays or over-optimistic schedule
- technological problems.

Petrillo et al. (2008) conclude that “optimism and naivety in the scope definition, as well as in the estimate of e[ff]ort needed to do a tasks [sic], are determinant factors in the occurrence of most problems”, and that these are not “essentially technological problems, but mainly management problems” (p. 710). Shirinian (2011) came to a similar conclusion in a quantitative analysis of 24 *Game Developer Magazine* postmortems, claiming that “development teams are just much worse at planning, coordinating, and conducting the work required to produce a game as a whole, more than anything else”.

In my experience, it is true that some game developers may lack experience, management skill and training or discipline in design planning. However, I do not think this is the sole or even primary explanation of the problems and chaos of game development. As with commercial factors that influence the development process, the inadequacies suggested above may exacerbate the indeterminate nature of game development, but I argue that they are not its cause. Concluding that game development difficulties stem from game development teams not being good at managing their work reveals a bias for reductive, simplified, rational explanations that exclude the interaction of design, making, testing and human interpretations. Further, in these criticisms of game developers, the assumption that game development should be amenable to predictive control is rarely questioned.

Recent emphasis in game development on Agile development methods (Keith, 2010) and on game development as a process of knowledge creation (Sylvester, 2013, pp. 311, 320-321) suggest a movement against the expectation of rational, predictive design control. Yet there remains a conflict between the process of software development and what I suggest is a natural tendency for designers to think hylomorphically when it comes to designing virtual worlds. As Sylvester (2013) notes: “The failures of the game design process usually spring from deeply rooted assumptions that we don't know we're making" (p. 270).

My arguments in this thesis suggest that the expectation of top-down design direction and predictive control, which forms a central part of industry standard practice (featured particularly in expectations of design plans derived from initial concepts), may not be reasonable expectations at all. If production processes are reported as major problem areas in over half of all reported postmortem problems, as Shirinian (2011) finds, then it does not necessarily follow that poor or incorrect prior design specifications, and failures to manage top-down direction and control are the cause. Instead, these findings could suggest that such approaches have limits, or might be inadequate in the face of the nature of game development. Belief in rational design control assumes that the development process itself will not cause significant design change, if only the requirements can be properly established at the outset. In this view, the game designer is given the responsibility of predicting perfectly, from imagination, the precarious convergence of delicately balanced factors that produce a rich experience, in a staggeringly complex final product, made by a collaboration of many creative individuals. That such a view persists, despite its preposterousness, and despite no shortage of evidence to the contrary, is a testament to the power and allure of the quest for certainty and its accompanying fallacies and blind assumptions.

1.4 The effects of philosophic fallacies on game design theory

The kinds of fallacies and misconceptions about game design I have discussed above seem to me to be common in game development, and were more common in the 1990s and early 2000s, as was the waterfall development model. However, in my experience, they become more strongly adopted the further away one gets away from experience of concrete game development activity. It seems evident to me that part of the reason for this is because the nature of game development (particularly relating to complex games made by large teams) seems to be improperly understood by those outside the process. But I suggest that a more ingrained reason (and one which explains why some game developers also commit these fallacies in their attempts to tame game design) is that the concepts used to grapple with game design are philosophically inadequate.

1.4.1 Game design theories

Game design theory is a vital, fascinating and messy subject. Attempts at formal, rational, systemic approaches to game design have failed to be useful in practice, and much of what is written about game design by game designers (particularly in books on game design) serves as goals or ideals, or proposals for best practices, as much as they describe existing practices.

A common desire among theorists is to establish definitions, lexicons, grammars, taxonomies, processes and vocabularies, and in the field of game design, this desire has been commonly expressed (Burgun, 2013; Church, 1999; Cook, 2007; Costikyan, 2002) and surveyed (Kreimeier, 2003). Some have pursued atomic formal languages (Cook, 2007; Cousins, 2004a, 2005; Koster, 2005), and others have attempted ontological projects of determining what game design is or what games are (Burgun, 2013; Hunicke, Leblanc, & Zubek, 2004; Järvinen, 2008). Game design theorists who seek formal languages for game design, in attempting to overcome limits to design control, have favoured scientific philosophies and systematic approaches (Burgun, 2013; Cook, 2007; Cousins, 2004b, 2004c). In these efforts, there seems to be little awareness of the history of design theory. The design methods movement of the 1960s showed an eagerness to adopt rational, systematic methods (C. Alexander, 1964; Bayazit, 2004, pp. 17-20; Cross, 2007b, p. 1), and over the next 20 years, prominent individuals in that movement abandoned or severely reappraised systematic approaches and the expectation of reducing human activity to logical frameworks (C. Alexander, 1979; C. Alexander, Ishikawa, & Silverstein, 1977; Bayazit, 2004, pp. 20-21; Cross, 2007b, pp. 1-2). Dewey's entire philosophic career was almost entirely devoted in one way or another to pointing out the problems and fallacies that emerge from the quest for certainty (1929b), despite his confidence in the scientific method.

Some theorising attempts to categorise kinds of games, and what kinds of things and properties games have (Adams, 2010; Adams & Rollings, 2003). For example, Adams places great importance on genre as a way of conceiving of, and designing, games, and Arsenault (2009, pp. 149-156) also examined the use of genre, which is common in literary or film studies, for the purpose of analysing games. G*ame design patterns* (Björk & Holopainen, 2005; Björk, Lundgren, & Holopainen, 2003)*,* is a related attempt at categorisation which seeks to establish a relational network of generic gameplay interactions. The use of genre and generic gameplay concepts is intended to provide a way to extend game design knowledge beyond a single game artifact.

I argue that the use of conventions and analytic categorisations conceals several assumptions that become wrong or misleading in many game design situations. These assumptions are:

1. Game experiences can be equated to general concepts or game genres.
2. Such general ideas are like propositional categories with certain properties.
3. The identity of such categories is stable within a game design situation, and is not significantly affected by interdependence with other categories.
4. The designer can force such categories to be stable by simply declaring it to be a fixed design criterion, as if by force of will.
5. As a design move, generic concepts can be mapped onto, or relate in an important and unproblematic way, to specific game structures.
6. Generic game mechanisms or structures can likewise be mapped onto or related unproblematically to specific concepts.
7. There is no tight interdependence among: the precise feeling of an imagined game experience (a persistently felt, embodied vision); the specific articulations of a game concept (or theme or fiction); the elements that provide the game with form; and the experiential qualities of a game.
8. Games can be specified and made using generic forms and concepts.

Arsenault (2009) argues against generic concepts in saying that

> the genre of a game is tied not to an isolated, abstracted checklist of features, but to the phenomenological, pragmatic deployment of actions through the gameplay experience. ... Video game genre is rooted in game aesthetics, not game mechanics. (p. 171)

Arsenault (2009) concludes, following film theorist Thomas Schatz, that genre embodies a range of expression, and a range of experiences, and for game developers, they are an aid to communication (p. 171). I will argue in later chapters that these eight assumptions listed above ignore, or underestimate the effect of, an inevitable coherence relationship among game concepts, a game's abstract structure, and its experiential qualities.

Bojin (2010) suggests that the problem with formalising genre conventions, like other general game structures, is that they are so well known and taken for granted that they function as what Wittgenstein called *hinge propositions*: propositions that are exempt from doubt, and which function as a hinge on which all questions and doubts turn (Wittgenstein, cited in Bojin, 2010, pp. 27-28). However, unlike the formal languages of music or film, I suggest, and will argue in Chapter 5, that general characteristics or structures of games do not denote essentially fixed physical things, relationships or techniques used. General game characteristics point to kinds of experiences had, and the problem is that as conceptual instruments they have a dual status. For designers, they can function in language unnoticed, as hinge propositions in design discussions aimed at *other* questions and issues, or they can be called into question as a *target* for change or displacement by deliberate design. In the latter case, game concepts and design languages are involved in a mesh of interdependencies affected by disruptive *re-design* of concepts and language.

The concerns of much theory surrounding game design is with the analysis of a game as a finished artifact. Characteristics of games, as generally theorised about, are characteristics of *finished* games, and only have form because they relate to specific game concepts, rules and game experiences. The game designer, however, is not concerned with analysis as an end in itself because the possibility of analysing the artifact in a stable, final form is unavailable for the majority of the development process. The lack of a vocabulary for game design is therefore not an issue of building games on secure foundations. Instead, the issue arises when *design activity* deliberately seeks to change the use of familiar concepts. In such *disruptive* situations, communication and deliberation among designers serves a grappling purpose: it grapples with the implications of changing the bedrock of language that in non-disruptive design situations is taken for granted. The certainty of general forms (concepts or structures) may serve theorising, or management science. However, these forms are unhelpful when attention is called to them for their own sake, and they confuse design activity because they are either the focus of design disruption, or, taken for granted and beyond doubt in many design situations.

It is possible that some games *can* be made in a rational way implied in the generic theories mentioned above. Consider a continuum of design certainty (as depicted in Figure 1.1): on the left extreme is a direct clone of an existing game in which all design requirements can be determined at the outset of the design process; on the right extreme is a completely new and indeterminate game experience. The generic and pattern approaches would likely have more viability very near the determinate left. As suggested in Section 1.3.4, it is not clear exactly how much novelty you have to introduce into the design situation before top-down and up-front design for production causes problems and necessitates an inquiry process.

Figure 1.1. A continuum of design certainty

1.4.2 Iterative development

The game development process is typically described as an *iterative* process (Duke, 1981b, p. 47; 1981c, p. 70; Fullerton et al., 2008, p. 249; Salen & Zimmerman, 2004, pp. 11-12; Schell, 2008, pp. 79-80; E. Zimmerman, 2003). Because "it is never possible to completely predict the experience of a game" (Salen & Zimmerman, 2004, p. 12), we cannot simply design a game up-front and have it turn out perfectly first go. However, such a statement only leads to the question of why iterations are necessary and why the design situation changes so much during the process of development. Eric Zimmerman (2003) observes that

> to design a game is to construct a set of rules. But the point of game design is not to have players experience rules—it is to have players experience *play*. Game design is therefore a second-order design problem, in which designers craft play, but only indirectly. Play arises out of the rules as they are inhabited and enacted by players, creating emergent patterns of behaviour, sensation and interaction. (p. 184, original emphasis)

He also notes that the iterative design process produces questions not part of the initial design problem, and that the

> delicate interaction of rule and play is something too complex and emergent to script out in advance, requiring the improvisational balancing that only testing and prototyping can provide ... In iterative design, there is a blending of designer and user, creator and player. ... Through iterative design, designers create systems and play with them, but only in order to question them, bend them, break them, and re-fashion them into something new. (p. 184)

Further, he states that this

> iterative process of design is radically different than typical retail game development. More often than not, at the start of the design process for a computer or console title, a game designer will think up a finished concept and then write an exhaustive design document that outlines every possible aspect of the game in minute detail. Invariably, the final game never resembles the carefully conceived original. (p. 177)

Zimmerman's insights reveal something about the *nature* of game design: a purely playful, iterative process of designing *and* making games. Zimmerman also emphasises a difference between the nature of iterative game design (which includes making activity) and up-front design (which does not) in commercial design situations. However, iterative design and up-front design, in my time as a developer of commercial games in teams at a variety of scales (between 1997 and 2008), were both part of the development process. In that time, the dominance of, or tendency towards, detailed up-front design has lessened, but the tension between both approaches remains. In my view, because Zimmerman's insight presents iterative design as a different approach, it does not account for this tension. He therefore leaves unexplored the implications of how the nature of game design becomes problematic:

- in team-based design
- under the economic conditions of organised commercial game development
- when it is assumed that predictive design control is possible or viable.

The theories of game design I have been discussing can all be seen as ways of grappling with the complexity of game design, and of trying to reduce what are rich, complex, dynamic and uncertain experiential phenomena to determinate conceptual forms. It is hard to underestimate the effect that the following two aspects have in motivating this quest for certainty, truth, or absolute foundations:

1. team-based development environments
2. processes and pressures introduced by the needs of economics, business and management.

For point 1, teamwork confronts game developers with a severe need for communication, agreement and coordination of effort, and the pressures of point 2 emerge in the precise demands of contracts, plans, schedules and risk management. Both points together clearly reveal limits to the capacity of game developers to: demonstrate knowledge about game experiences; and have certainty about, or exercise control over, their work.

1.5 Chapter overviews

The research problems I have identified in the preceding sections will be addressed through the remaining chapters of the thesis, which cover:

- design
- inquiry
- experience
- characteristics of game design and game experiences
- conceptualisation of games
- game design situations and the development of design coherence
- game design as inquiry

Each chapter will contribute to formulating the subject-matter in depth, transforming the way game design is understood, answering the research questions and solving the research problem. I will now give an overview of each chapter, and explain how it serves the overall aims of the thesis.

1.5.1 Chapter 2: Design

In Chapter 2, I consider the problem of defining game design within the game development environment. To do this, I outline the way games are developed and consider the importance of playtesting and design iterations, and in this light, examine theories describing design activity. This leads to a critical discussion of the rational problem-solving view of design, and to forming a view of game design situations involving paradoxes among discourses. Finally, I further examine the issue of control in game design activity by considering problems with top-down design control, and the way the bottom-up approach to game design carries different assumptions about knowledge, the nature of design process, and the understanding of what is being designed.

1.5.2 Chapter 3: Research methodology

In Chapter 3, I begin by discussing criticisms of Dewey's theory of inquiry and views on knowledge. I then establish my methodological perspective by examining Dewey's philosophy in depth, including the importance of his concepts for game design, in addition to examining the features of Dewey's inquiry in detail. I continue by establishing my method of philosophical investigation, and evaluating the data sources I make use of. Finally, I examine the implications that definitions of games have for game design, and proceed to define games as model worlds: an approach that formulates a view of game design focusing on meaningful human experience.

1.5.3 Chapter 4: Games as experience of model worlds

Because the subject-matter of games is experience itself, in this chapter I consider important aspects of game experiences, including relevant theories of sensing, emotion and meaning. I consider basic traits of experience, and examine the way game design refines, clarifies and intensifies a range of simple experiential patterns. I conclude this examination of patterns by defining my own concept of embodied game experience patterns. I then shift attention to the design of meaningful game experiences, including a conception of interface that establishes a test for design coherence, and connects designer, player and game into a single concern.

1.5.4 Chapter 5: Characteristics of game design and game experiences

Chapter 5 provides a thorough explanation of important concepts in game design activity, including formal elements and context-shaping structures. I also consider important characteristics relating to the design of game experiences, and argue that these are *not* fundamental building blocks of games. Instead I claim they are selectively framed *concepts* that refer to a comprehensive integration of form elements into a game experience, and that they have transformative, descriptive and integrative functions. I explore how concepts describing characteristics of game experiences develop their meaning through design activity, as a skilled performance that integrates conception and action in the game development process. I also use Polanyi's theory of tacit knowing to understand the co-development of part–whole knowledge relationships in game design.

1.5.5 Chapter 6: Conceptualising games: practices and limitations

In Chapter 6, I examine game concepts and conception processes in detail, discuss the purposes a game concept serves, and consider why the conception of games is controversial. I then consider limitations and difficulties in the conception of game experiences, and explore the significance of Gendlin's theory that links logical forms (which include concepts), to precise expression of embodied feeling through appropriate expression of form. Additionally, I show how the context for the meaning of game concepts changes during development, and how conceptual shifts and reconceptualisation are inevitable.

1.5.6 Chapter 7: Game design situations and the development of design coherence

In this chapter, I examine the causes of change in the game development process using the examples of two game projects: *inFAMOUS*, and *Portal*. I use *inFAMOUS* to demonstrate problems with the use of general concepts, conventional game forms and exemplar game design solutions. Additionally, I demonstrate an interdependent relationship of concept expression, design solutions and design problems in the pursuit of design coherence. More generally I consider situations that cause design change, before gathering the work from previous chapters to clearly show the nature of change in the development process, and connections between design change and multiple aspects of the design and development process. Finally, I examine the case of *Portal* to demonstrate the way meaning and coherence in the game experience can co-develop—through a process of many related inquiries—with the making of the game artifact and skilled game design knowledge.

1.5.7 Chapter 8: Game development as inquiry

In Chapter 8, I employ the research of previous chapters to critically discuss game development in terms of the inquiry model. I argue that, in general, game development involves a range of inquiries in a hierarchy of design projects, which can be understood in terms of three domains of inquiry: the project domain, the game feature domain, and the game experience domain. I also show that inquiry in each domain serves a different purpose, and claim that the outcomes of inquiries in all three domains can affect subsequent inquiries at any level. I then identify logical forms that accrue to game design inquiry, and show how they are co-dependent on the development of embodied meaning in the process of achieving a project-specific conceptual structure. These findings demonstrate a powerful new understanding of game design, and lead directly to the concluding chapter, in which I answer the research questions and demonstrate the viability of my theory for game design practice.

Chapter 2: Design

2 Introduction

Game development involves both design and acts of making, but the relationship between them produces problems and tensions. The term *design* (which is an ambiguous concept (Lawson & Dorst, 2009, pp. 24-60)) is also inadequate for describing the complex mix of activity that occurs during a game development project. Because the nature of the tension between designing and the act of making depends on how game development situations are understood in terms of theories of design, in this chapter, I set out the problem of defining game design within the development environment. I then examine differing theories of design in an attempt to clarify this issue. Section 2.1 contains an overview of game design and game development. In Section 2.2, I discuss viewpoints on design suitable for understanding design activity in game development projects, including Hatchuel's distinction between design problems and design projects, and Dorst's concept of problematic design situations involving paradoxes between discourses. Different design theories make different assumptions about the way design outcomes are controlled by the process of design. Therefore, in Section 2.3, I examine the issue of design control in relation to design and acts of making.

2.1 Game design and development

One consequence of investigating the subject-matter of game design, and considering game development in terms of inquiry, is that it brings into question the nature and place of design activity within the development process. Because coming to a better understanding of game design is the purpose of this thesis, I will not seek to secure a strict definition of game design at the outset. However, the study of game design depends on how games are conceived. In Section 3.4, I will offer a detailed explanation of video games as model worlds, but for now, it is enough to state that my research focuses generally on video games (i.e. games that run on various modern computer platforms) that are complex enough to require design to occur in a team-based development environment.

2.1.1 Game design situations

In this research, I focus on large-scale development projects in which issues of technology development and coordinating effort in large teams matter. This focus was chosen because I believe the indeterminacy in game development is exacerbated by such factors, and therefore, is more deserving of research attention. I assume that each game development project has a different set of conditions, which vary significantly in:

- specific subject-matter
- technology
- target market and market conditions
- business conditions and development resources
- design requirements, and design intentions and goals
- team experience
- leadership and management roles.

From one project to another, the particular complexion of these factors may vary greatly, and the kinds of tasks, situations and problems encountered are often novel. Because conditions across projects vary greatly, comparisons between them are difficult. And because this research examines game development generally, I must therefore make assumptions about what can be generalised across projects, and how the factors that vary (such as those listed above) can influence the project. I assume that the general process of making games, and the formal instruments used in game making, are consistent. I also assume that varying conditions affect the project through design requirements and stakeholders' values, which in turn inform judgements and influence deliberations about possible courses of action. Development studio politics and the competency of management and decision-making can significantly affect the project outcome, but here I assume an unproblematic case of a well-organised and functioning team that collectively aims to meet the brief, create good gameplay that satisfies a range of players, and ship the game on time and under budget.

A game experience is only the end result of the game development process, which requires the collaborative design of many different kinds of artifacts. These include:

1. software components, software architecture and software tools

2. concept art, characters, animations, environments, graphics design and cinematics
3. simulations and models of ecosystems/social systems/worlds
4. stories, world histories and other forms of writing
5. game objects, activities, challenges, economic systems and markets
6. work processes, communication systems and social structures in the development team
7. production management systems and data management systems

Designs, as a specification of something to be made, or, at the least, some form of design guidance, are required for the making of artifacts 1–5 above in particular. However, unlike industrial production methods, designer and maker are not always easily separable in game development. In game development teams that have multiple programmers, game designers and artists, there are numerous different design situations occurring for many different kinds of the artifacts listed above, involving various configurations of people from different disciplines.

An important aspect of game development is the multi-disciplinary, cross-functional and highly collaborative social nature of teams. Game development teams tend towards a flat organisation structure, and for larger teams, consist of project leadership, supporting roles and development roles. Project leadership includes lead roles for each discipline, such as project management, production, programming, character art, environment art, animation, design, writing and audio, and often a creative director, who is responsible for guiding development according to their creative vision of the game. It is crucial to point out the effect of experience and expertise in development teams. In experienced development teams, each of these roles is filled by skilled experts who, after working through several complete project cycles (from conception to completion and shipping) over many years, have developed a range of skills and understanding particular to their role in large, creative, collaborative teams. In this research, when I discuss game design and development, unless otherwise specified, it can be assumed I am referring to developers with several projects' worth of experience.

2.1.2 A brief outline of the way games are developed

Video games consist of computer software running on a computer hardware platform.[5] Game software technologies are often developed specifically to meet the needs of a game design (McGuire & Jenkins, 2009, p. 146). Planning and implementing a game design is therefore intertwined with software development. In game development, as with software development, much of the effort is concerned with the design of well-organised, flexible and manageable software structures that allow the necessary features, objects and hardware to work together, free of defects (Poppendieck & Poppendieck, 2007, pp. 19-41, 70-82). Blow (2004) observes that the complexity of game software continues to increase drastically, and states that "the primary technical challenge is simply getting the code to work to produce an end result that bears some semblance to the desired functionality" (p. 29).

Game software requires data in the form of game content. As Gregory explains (2014, pp. 5-6), game content is primarily made up of graphics, audio and configuration data, which all serve to give abstract game objects a sense-able appearance. Art content is typically created manually by computer artists. As computer power increases, game art is required in ever-increasing quality and quantities (p. 856) and is therefore an expensive part of the production process. For example, a high-quality animated 2D sprite asset (i.e. game content in a form suitable for use in the game) of the kind found in the classic *Mario* games might take a day for an experienced artist to design and produce using today's tools. In comparison, a quality animated and textured 3D model of the kind found in an *Assassin's Creed* game may take months. The costs associated with graphic and sound content mean that the efficiencies of standardised production processes according to a plan or template become important considerations, and design decisions that affect art content can be costly. Art and audio content, and sometimes gameplay design, is produced by software collectively known as *digital content creation tools* (Gregory, 2014, p. 54); however, before such content is usable in the game, it must be converted to the correct data format for the game engine (p. 54). Content conversion involves additional software tools and processes, known as an asset pipeline (p. 54).[6]

5 In this research, hardware (as varied and disruptive as it can be) will be considered as a fixed criterion for each game project, and will not be discussed further.

6 Pipeline development (which can also include other pipelines, such as those that deal with game builds and asset management) can be a significant design, engineering and development task in its own right.

A playable game requires a game engine and the implementation of custom software components and game content. The total amount of implementation required can be enormous, and much of it is highly interdependent, with the requirements, design and performance of one part changing those of another. It is too risky and impractical to implement all of this at the same time, so implementation occurs incrementally, as is the practice in software development generally (Larman & Basili, 2003), focusing on the most important features and content first to avoid cascading uncertainty (Sylvester, 2013, pp. 327-330). But first implementations are only the start of making the game a *good* game. Like software developers (Larman & Basili, 2003; Parnas & Clements, 1986), game developers rarely get everything working together properly, let alone perfectly, the first time. Many cycles of iterative refinement are required to get everything working well. As the project continues and new features and content are added, the game experience changes. Incrementally added parts produce unforeseen problems, surprises and synergies, which demand solutions, create opportunities and require learning. This also means that new incremental additions can overlap with refinement iterations of earlier additions and ongoing attempts at problem solving. Such overlaps require further iterations of integration, problem solving and refinement.

Regardless of the kind of game being developed or of the process by which it is made, games are developed using an iterative process that involves cycles of design, implementation and playtesting. Playtesting is exactly what the word suggests: testing a game by playing it (Brathwaite & Schreiber, 2009, p. 12; Fullerton et al., 2008, pp. 248-249; Schell, 2008, pp. 390-401). Playtesting is both a participatory experience and a reflective, analytic process. Game developers rely on playtesting while the game is in development to gain an understanding of how players interact with the game. Organised playtesting involves observing and recording the experience a player has with the game, and can be seen as a kind of testing aimed at directly evaluating the differential between the design intent and the experience players actually have with the design (Schell, 2008, pp. 390-391). Playtesting is focused on the game experience, but it also includes usability testing and quality-assurance testing (Schell, 2008, p. 390). Probably the most common experience in making games is discovering, through playtesting, that players do not understand the game and its various elements and rules the same way you, as the designer, does. Schell (2008) says that he hates playtesting because, as a designer, he finds it “completely humiliating” (p. 391) and a “wakeup call” (p. 390) that reveals how players “hate your work” (p. 391). Despite this, he emphasises how necessary this uncomfortable process is. During playtesting, the designer’s sense of the game experience (both imagined and real) is revealed as being different to what others sense.

2.1.3 Development processes

Game development teams use a variety of approaches to software design and development, for example: Lean (Poppendieck & Poppendieck, 2007), Agile (Kent Beck et al., 2001; Keith, 2010; Schwaber, 2004), incremental (Larman & Basili, 2003), spiral development (Boehm, 1988), and software design patterns (Kent. Beck et al., 1996; Gamma, Helm, Johnson, & Vlissides, 1995). These approaches demonstrate a response to the challenge of designing complex systems that involves many dependencies, usually in team environments that also include economic pressures. From the mid-2000s, game developers have increasingly become aware of, and applied, the incremental and iterative approaches of Agile software development (Kent Beck et al., 2001). These approaches build on the long history of incremental software development (Larman & Basili, 2003), emphasising lightweight and adaptive methods. One Agile method currently common in game development is Scrum (Schwaber, 2004, pp. 2-3), which emphasises an empirical, adaptive approach to development processes. Scrum is used when the processes involved are unpredictable and when certainty occurs mainly at the level of task operations. Daily inspections of the development process, playable game builds and short information feedback cycles inform decision-making and future iterations.

However, various versions of the stage-based waterfall model (see Section 1.3.3) are also in use, particularly at the broader project level (Kasurinen et al., 2014). Agile or iterative methods therefore may be used within a broader stage-based process that suits business practices and project management, such as that outlined by Fullerton et al. (2008, pp. 376-379):

- concept/contract (team, project plan, idea)
- pre-production

- production
- quality assurance/polish.

In this view, the concept phase leads to a project plan, which includes an overall conception of the design, the goals of the project, and estimates of the time and resources needed to complete development tasks (Fullerton et al., 2008, pp. 382-383). The project plan allows a schedule and a budget to be produced, both of which make it potentially important as part of legal contract (Fullerton et al., 2008, p. 377). The pre-production stage is for testing the feasibility of the game concept with a small team and it focuses on proving the viability of proposed game features and discovering technology risks. The project plan is then refined while detailed design documentation and technical specifications are added. The design document is a detailed plan for executing the overall vision of the game, but it also serves as a means to communicate the vision so all team members work toward the same end. The more clearly "the design document or wiki describes the elements of the gameplay, visual design, and technology, the more efficient the production can be" (Fullerton et al., 2008, p. 378). The goal in production is to execute the vision and plan established in pre-production. The final stage of the process is for improving the quality and refinement of the game. This model describes typical stages of development within a publisher-financed game project, although several other finance models have recently become viable, including crowdfunding (Webster, 2011), free-to-play (Sheffield, 2008) or paid early access (Cifaldi, 2013).[7]

In order for a game development team to begin implementation, decisions must be made to specify what code is written and what game content should be made. Gameplay structures cannot be created without game features, game objects and gameplay code. However, these elements require certainty about the projected game concept and game structure. In determining how to proceed from these two-way conjectures, developers must take into account the possible interfaces and dependencies (Sylvester, 2013, pp. 322-336). This issue is further complicated by the benefits gained by a standardised approach to the production of large amounts of game content. Together, these considerations draw attention to the importance, and difficulty, of design planning in

[7] These new models each bring changes to the development process, but these variations are beyond the scope of this thesis.

game development, and hence, the issue of design control. Design control will be examined in depth in Section 2.3, but first, it is necessary to examine the concept of design as it relates to game development.

2.2 Theories of design activity

The word design has multiple senses. Design can be used as a verb (*to* design) while a *design* can mean a plan, idea or description of something to be created or manufactured. *A* design can also refer to the final result of design and the act of making; however, it does not follow that to design means only to produce a *final* plan or specification to be manufactured, nor is design activity limited to the production of such artifacts.

The conception of the role of the designer may be limited to someone who will "devise courses of action or specify artifacts, not actually realizing them" (Krippendorff, 2006, p. 25). However, games, as products, are not material artifacts, but experiences made possible by interfaces. The implementation of specified features is only the beginning of the process of designing (and making) a game. Krippendorff (2006) adds that "artifacts must make sense to most, ideally to all of those who have a stake in them" (p. 26). I suggest that the notions of designer and stakeholder become complicated within the game development environment. This is because many members of a game development team may at various times be designers and important stakeholders in the design project. This is not a commonly accepted perspective for two reasons. First, typically only those with the official job title of game designer are considered to be designers, whereas I assume that design is required in all disciplines within a development team. Second, the notion of stakeholder is implicitly held in relation to the final game product, not the various and ongoing aspects of its development. However, the work of each discipline within a development team is highly interdependent with the designs and work from the other disciplines. This interdependency makes many more of the team members *designers* than usually acknowledged: therefore, many team members are at times both proposers of realisable artifacts and stakeholders affected by those proposals. However, unless otherwise noted, when I refer to game design or game designers, I mean those specifically concerned with the integration of the various game elements into gameplay and the overall game experience.

Games are experiential phenomena: therefore, to make sense of complex video games, or their design, they must be able to be experienced in some way. A key difference between game design and forms of design that produce material or functional artifacts is that in game design, non-experiential representations of design problems and proposed solutions are inadequate. Game designs succeed or fail based on experiential qualities, not functional criteria, and this makes control of the game development outcome difficult to achieve through planning alone. Therefore, any definition of design for video games must involve the efforts of making the design concrete, to the point where it can be sensed and *make sense* to all who have a stake in the matter.

Archer (1984) defines design as "involving a prescription or model, the intention of embodiment as hardware, and the presence of a creative step" (p. 59). Archer also makes it clear that design is problem solving, and that problems require constraints, informed by pressures or needs. Prescriptions, models and creative steps are part of designing and making games, and although games are embodied as software (and therefore subject to few material constraints), game design problems are informed by other varieties of constraints and pressures. Game design is also a form of design that Buchanan (1985), following Richard McKeon's work on rhetoric, has called an *architectonic art*, which organises "the efforts of other arts and crafts, giving order and purpose to production" (p. 21). Additionally, game design, like other forms of design, pursue goals of coherence and integration (Dorst & Dijkhuis, 1995, p. 265).

I will now give a tentative definition of game design that incorporates ideas from the authors discussed in this section:

> Game design involves collaboratively devising courses of action for proposed creative complex artifacts. These courses of action:
>
> - satisfy constraints and desires
> - organise the work of team members from other disciplines into a coherently integrated whole
> - must be made understandable and sensible to stakeholders
>
> The design process, therefore, involves concrete realisation of the artifact in an experiential form.

A working hypothesis used in this research is that the above definition of design is operative in the social context of game development through the evolving processes of conceptualising, planning, making, experiencing and testing the design. This definition strongly suggests a wide range of design activity shared by multiple designers from different areas of design expertise. It also suggests that, over the course of a project, there will be a changing complexion of different design perspectives, approaches, tasks and reliance on development work that can facilitate the concrete realisation of design work.

2.2.1 Different views of design activity

In this thesis, I have emphasised that designing and acts of making in a game development project are intertwined and ongoing. A network of design activity is needed to support what Tschang (2005, pp. 121-122) characterises as the concurrent development of game content and multiple game systems. However, the typical separation of design activity from construction activity (Heskett, 1980, p. 10) pre-dates the industrial revolution, being part of "early capitalist industrial organization based on craft methods of production" (Heskett, 1980, p. 11). The division of design and making particularly suited the division of management, expertise and labour that emerged with the development of mass-manufacturing in the industrial era (Heskett, 1980, pp. 17-18, 50, 65; Sparke, 1992, pp. 3-4). The linear, stage-based process of design and production that emerged in the industrial era has more recently been reinforced by the view of design as a problem-solving process (Lawson & Dorst, 2009, p. 32).

The problem-solving view

Simon (1996, p. 134) articulated a view of design as a rational problem-solving process. His perspective focused on making design processes explicit, precise and formulable as computer operations. This approach requires design activity to be reduced to a process that moves from problem to solution in an orderly way: larger, more complex design problems must be broken down into more easily solvable sub-problems, and then re-integrated. In this view, design problems fit into a common problem-solving method, which includes:

- representing the problem
- searching for solution alternatives

- evaluating different design arrangements
- choosing an optimal, or, more frequently, satisfactory, solution.

Simon's view is a clear example of systems and operational approaches to design activity, and hence, shares assumptions about design control with the formal approaches to game design I criticised in Chapter 1.

The wicked problems view

Although Simon was aware of the importance of the social context of design in determining problem structure, it was Rittel and Webber (1973) who developed a view of design that included the broader social context design occurs in. They emphasised the social aspect of problem formulation, including issues management through deliberation and argument. Rittel and Webber's (1973) view of *wicked problems* stood in contrast to the *tamed* (i.e. well-structured) problems that the methods of operations research reduced design problems to (p. 162). In some design situations, the exact nature of the problem is not obvious at the start, or it changes during the design process. The required information to understand a wicked problem is contingent on the proposed solution, and therefore "[t]here is no definitive formulation of a wicked problem" (pp. 161-162). According to Rittel and Webber (1973):

> The formulation of a wicked problem is the problem! The process of formulating the problem and of conceiving a solution (or re-solution) are identical, since every specification of the problem is a specification of the direction in which a treatment is considered. (p. 161)

Problem formulation becomes difficult in situations where the interpretation of current conditions and goal conditions can change as the knowledge of the design situation is developed. Significantly, there may be well-understood or measurable phenomena, but the problem formulation may not be acceptable to any party involved because they may have valid goals that do not correspond well to a proposed interpretation of the problem. Rittel (1984, pp. 320-321) emphasises the cyclic and interdependent nature of understanding design problem and design solution. Cross and Dorst (2001) later studied creative design activity in expert industrial designers, concluding that "the problem space and the solution space co-evolve together" (p. 434). Simon (1996) also observes that exploring partial problem structures could produce more information about the nature of the overall problem (p. 126).

Further, in wicked problems the criteria that define relevant problems and solutions are open to judgement by many entitled and qualified parties. Proposed solutions to wicked problems are therefore evaluated according to human value judgements and "are not true-or-false, but good-or-bad" (Rittel & Webber, 1973, pp. 162-163). The choice of explanation largely depends on the frame of reference, which depends on the goals of the particular stakeholder. This means that "the existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution" (Rittel & Webber, 1973, p. 166). Rittel (1984, pp. 320-321) observed that expertise in complex design situations frequently resides in other people beyond the designer. And further, because designing involves making decisions about a network of issues with pros and cons, design becomes a cyclic counterplay of raising issues and dealing with them, while raising more issues in the process. As a result of this cyclic activity, the assumptions and positions of the stakeholders are open to challenge from all sides and expose the nature of the arguments surrounding the issues. This includes the basis for judgements in fact, or what stakeholders value as important and think ought to be the case. Therefore, design reasoning is a process of argumentation (Rittel, 1987, p. 3), planning is argumentative in structure, and the political nature of design planning is handled by exposing the assumptions of the participants (Rittel, 1984, pp. 324-326).

Design as persuasion and conjecture

Buchanan (1985) further developed the argumentative conception of design, seeing design as a form of rhetoric and persuasion, both at the level of the design process, and in terms of the influence of the designed artifact in the wider world. Buchanan provides a view of design as an integrative discipline of systematic thinking that manifests in every plan for a new product. A design is an argument that "moves toward the concrete interplay and interconnection of signs, things, actions and thoughts" (Buchanan, 1995, p. 19).

Cross (2007a) observes that design is essentially persuasive and conjectural, which means that

> creative design is not a rational search for the optimum solution to a well-defined problem, but that design is conjectural. A designer has to work by conjecture, by imagining and proposing something that does not yet exist. ... Designers are

> solution-led, not problem-led; for designers, it is the evaluation of the solution that is important, not the analysis of the problem. (p. 2)

Buchanan and Cross's views emphasise argument, solution conjectures and integration, and, in combination with the rational processes emphasised in the problem-solving view of design, offer a more comprehensive basis for considering the nature of game design activity.

2.2.2 Design activity as reflection in action

Schön (1983) also developed a view of design activity that differed greatly from the rational problem-solving perspective. He emphasises the unique nature of every design situation, which is shaped in important ways by the designer's skills, expertise and how they decide, through design activity, to *find* problems (p. 129). Schön (1983) reveals processes that characterise how professional designers think in action:

- The uniqueness of the design situation requires problems to be framed in a way that corresponds to the designer's values, goals and theories (pp. 129, 133, 165-166).
- The designer develops *moves* toward a tentative solution (pp. 131-132): "Each move is a local experiment which contributes to the global experiment of reframing the problem" (p. 94), and such design moves may "cause new problems to be described and solved" (p. 94).
- These moves cause the situation to *talk back* to the designer (pp. 131-132). The designer's moves, and any issues produced as a result of those moves, are evaluated according to a "repertoire of design domains" (pp. 102, 138-140), which are grounded in the practitioner's "appreciative system" (p. 135). This repertoire takes into account relevant features of the situation, the designer's values relating to coherent design outcomes, and how a particular interpretation of the changed situation contributes to an improvement in the overall design situation (pp. 135-136).

According to Schön (1983), the interplay of these processes and the interweaving of local experiments (i.e. experiments that respond specifically to particular elements in the current design situation) can be understood as "a reflective conversation with the situation" (p. 95). This back-and-forth dialogue involves multiple "experiments in reframing" (p. 141), and requires *reflection in action* during the design activity, and, at a later time, reflection on the effectiveness of design approaches used (*reflection on action*) (pp. 49-69).

There are important differences between a design situation that relates to existing conditions and one that relates to projected conditions (which an imagined game experience is an extreme version of). In the former, the environment may support experimental operations that allow relationships between constituents to be determined, and distinctions to be made. In the latter, the idea-generation work performed by a designer serves the function of making distinctions, proposing relationships, and producing arrangements of proposed constituent objects according to one or more simultaneous logical organising schemes. Schön (1983) refers to the designer spinning out "long lines of invention and inference" (pp. 92-93), and undertaking local experiments that use features of the unique situation according to a scheme the designer works up (pp. 136-137). Through design idea generation, the designer grapples with the complex situation. Schön (1983) characterises this as developing a hypothesis, and making moves as if the hypothesis were true, or would be made true through design action (pp. 149-150).

Schön (1983) describes how a designer reframes the situation so that they can impose an arrangement on it, while simultaneously being prepared for the situation to resist and differ from expectations, and thereby, *talk back* (pp. 137-138). Such design exploration allows possible correlations of ideas and facts to be explored, which may suggest the operations required to realise a conjectured solution. It is exactly this sort of activity that finds traction with the paradoxes that are characteristic of *wicked problems* or *ill-structured problems*. Schön (1983, pp. 157-160) essentially describes how practitioners, such as designers, who deal with complex unique situations, temporarily tame the situation by working in virtual worlds: They employ instruments (such as drawing, or conversation) that eliminate the difficult features present in the real situation that would prevent exploration, reframing and experiments.

Schön's view emphasises the expertise of individual designers. It is important to realise that, in game development, many designers, at different levels of expertise, are grappling with problems at many scales of collaboration. There may be design situations that involve only individual efforts or individual efforts whose output feeds back into the larger design situation, while other design situations are truly ongoing collaborative efforts. These situations draw attention to the fact that each designer's appreciative systems, design frames and repertoire of design moves, and the kinds of reflection in action they do, incorporate a large number of variables coming from the overall game development situation. Schön's view of design is appropriate for the highly practical nature of game development: game design manifests as action more often than as thought, representation and planning. In addition, Schön's view may apply at varying scales of the design situation: for example, a problem with a particular game mechanic, a whole game level or the underlying concept of the game as a whole. I will consider Schön's view of design further in relation to inquiry in Chapter 8.

2.2.3 Design projects, expandable rationality, paradox and discourse

Dorst (2006) examined the assumptions underlying Simon's perspective on design as rational problem solving, and criticised the conceptual structure behind Simon's notion of ill-structured problems. Lawson and Dorst (2009, p. 28) point out that one of the features that characterise design as a way of thinking is treating problems as if they had no structure. That is, designers focus on creating good solutions rather than a precise analysis of the problem. Additionally, Lawson and Dorst (2009) observe that the need for a design to integrate many issues, demands and requirements into a coherent whole is problematic for a reductive design approach. This is because decompositional techniques that reduce the design situation into sub-problems and partial solutions ignore this significant fact:

> There is no one-on-one mapping from problem to solution. The features of the design are created in such a way that they address many problems at the same time. (p. 42)

Dorst (2006, p. 10) argues that the idea that a set "design problem" can be identified at all at any point in the design process may need to be abandoned, and the very idea of design as problem solving, proceeding from a problem to a solution, is brought into doubt.

In seeking a different approach, Dorst (2006, p. 11) draws on the notion of design as a situated activity[8], in which the design problem is seen through the eyes of the designer in the situation and all it entails, rather than from an abstracted outside-observer position. Additionally, as situated, much of the design process is routine unproblematic action, punctuated by breakdowns: moments of real choice that are critical situations for design. Therefore, the definition of a design problem in this view is *a situation in which routine problem solving has failed*.

Dorst (2006, pp. 11-13) also draws on Hatchuel's (2001, pp. 265-267) work, which shows that design situations differ from problem-solving situations in three ways:

1. Design situations become *projects* with open *expansion* of the important concepts that frame the situation, and therefore, determine what the solution can be. Hatchuel (2001) states that "there is no mechanistic relation between this project and the undefined number of 'problems' that the design work will meet" (p. 265). Creativity can add new features to the design situation, and thereby change the perception of the project. In a design project,

   > the unexpected expansions of the initial concept control the generation of problems, and these will or will not be solved. Hence, Design theory is not only problem-forming or -solving, it has to capture the process of conceptual expansions. (p. 266)

2. Design situations require the design and use of learning devices—techniques such as experiments, models, mock-ups or sketches—to *learn about* what there is to be learned. These devices also provide search procedures.
3. Design situations involve the understanding and design of the social interactions within the design process: social interaction becomes a resource and a designable area (p. 267).

Hatchuel's emphasis on concept expansion through project work, which involves creating learning devices, and designing the social situation within the project, is very well suited to the ongoing, multi-disciplinary, open-ended nature of game development.

[8] Dorst cites several sources for situated problem-solving activity: Dreyfus; Suchman; Varela, Thompson and Rosch; and Winograd and Flores.

Hatchuel (2001, pp. 268-269) observes that design situations involve concepts that correspond to a set of possibilities that cannot be counted. Design involves *expandable rationality* (p. 269); therefore, design constraints may create problems to solve within this infinite set of design outcomes, but the only way to approach "infinitely expandable and non-countable sets of actions" (p. 268) is to expand the initial concept and add properties to qualify it. This view corresponds well to understanding design in terms of Dewey's theory of inquiry, as a response to indeterminate design situations that involve *obscure* design conditions that must be *revealed*. In the case of a new game concept, my discussion of *inFAMOUS* (see Sections 7.2 and 7.3) shows how this happened. A *new* superhero game (a non-countable set) eventually became a game about being a very specific kind of *electrical* superhero. The *inFAMOUS* development team, in manipulating the infinitely expandable concept of a superhero game, employed learning devices, which included prototyping, playtesting and discussion with marketing experts, to discover what the identity of their game was. This process also included developing an understanding of ways that players interacted with, and understood, the design. Hatchuel (2001, p. 271) concludes that problem solving is part of, not the whole of, the design process.

After considering situated action and Hatchuel's concept of expandable rationality, Dorst (2006, p. 14) puts forward an alternative conceptual framework based on the concepts of *paradox* and *discourse*, in the hope of gaining a better understanding of design situations. Dorst defines a paradox as a "real opposition of views, standpoints, or requirements" (p. 14), which, in order to be resolved, calls for a redefinition of the problematic situation. The statements, viewpoints and ways of thinking that make up the paradox are defined by Dorst in terms of Foucault's concept of discourse, which Dorst defines as "the complete structure of terms and relationships that lie at the basis of thinking and discussions within human activity" (p. 15). The discourse in a field "spans the *complete* breadth of human thinking within that domain" (p. 15, original emphasis), and includes captured knowledge and ways of working.

In Chapters 5 and 6, I will specifically discuss some aspects of discourse relating to game design. However, as an integrative discipline, game design also includes many other discourses: any relevant field to the shaping of human experience (as discussed in Chapter 4). Dorst (2006, p. 15) argues that designers, in dealing with a paradoxical situation, must construct a design that transcends or connects the different conflicting discourses; therefore, designers must step out of, and go beyond the thinking embodied in, the discourse. In terms of Dewey's theory of inquiry, the indeterminate situation emerges from a conflict in the conceptual structure used to understand, and therefore, selectively transform, the inquiry situation. Dorst (2006) states that

> [d]esigners use their understanding of the ways of thinking within the different discourses to create a framework in which a solution is possible for the paradoxical situation. The paradoxical problem situation works as both a trigger to creative imagination and as a context for the evaluation of the design. (p. 15)

In this view, only a solution recognised as *a* solution in *all* discourses counts. This perspective complements Buchanan's view of design as an architectonic artform (see Section 2.2). Dorst (2006, p. 16, emphasis removed) concludes with three related points:

1. The "design problem" is not knowable at any specific point in the design process.
2. The "design problem" is hard to identify because it evolves in the design process.
3. The connotations of the very concepts that are used to describe a "design problem" are shifting as part of the design effort.

Game design is difficult to consider as a single definite design problem, outcome, goal or product, particularly because ideas about these things change, develop and are refined throughout a game project. I have discussed this aspect of game design in Section 1.4.1, in relation to game design situations that call for ways of understanding possible solutions that disrupt taken-for-granted conventions and vocabularies. Dorst's evolutionary design paradox perspective is highly useful in understanding the nature of game design activity. In Chapter 8, I will argue that the game development process can be understood as the development of a unique game-specific conceptual system. This system can be considered as a developing project-specific discourse that the development team is learning to master, which means that the basis for design control is open to change.

2.3 Design control

The nature of design control over game development and production processes is complex and intermingled with game-making activity. A simple distinction can be made between *top-down* and *bottom-up* approaches to design control. The top-down approach favours predictive planning before doing. It reflects the stage-based, industrial-era, design-for-production perspective. The bottom-up approach lets the design emerge from implementing a simple core feature, and experimentally adding complexity in each iteration. Both approaches reveal ideological preferences about the desirability of control: control over creative direction and control over the development process. Rather than arguing for one approach over the other, I suggest that imposed control and emergent discoveries are both necessary characteristics of game design inquiry.

2.3.1 Considerations of control in game design activity

Each of the theories of design described in Section 2.2 deals with design as a controlling power in a creative, social and (usually) economic situation. Each viewpoint on design emphasises different ways of achieving this control and different limitations on the possibility of control being achieved. The rational problem-solving view is purely about control of the process, or finding a way to improve control over the process by analysing the situation in terms of existing knowledge and the abstraction of details deemed irrelevant according to a chosen predictive theory. Simon (1996) claims that

> the more we are willing to abstract from the detail of a set of phenomena, the easier it becomes to simulate the phenomena. Moreover we do not have to know, or guess at, all the internal structure of the system but only the part that is crucial to the abstraction. It is fortunate that this is so, for if it were not, the topdown strategy that built the natural sciences over the past three centuries would have been infeasible. (p. 16)

In this view, any situation that is not amenable to such control is not fit to be considered design and is better viewed as discovery. Simon (1996) argues that it is beside the point to ask whether the later stages of a complex, long-term and continually changing design implementation are consistent with the initial design goals: these later stages instead represent new design problems with new conditions and new goals (p. 163). Simon (1996, p. 20) gives an example of the research, design and making of the first computer time-sharing systems: little to no theory was available to guide the process, and the development took an iterative form of planning, building and modifying in successive stages. In this example, the phenomenon of a time-sharing computer was a previously unknown one, and Simon strongly implies that no empirical theory should be expected to predict the serious problems encountered in its discovery. This is an important point because it suggests that attempting to treat a complex, uncertain development project as a single design situation is too simplistic. And similarly, treating a game project that undergoes design change and goal re-evaluation as going *off course* is itself a misguided perspective. Even though the game project that is underway may retain the same name, team and overall goals, the problem-solving view of design requires it be seen as a series of design problems.

However, viewing a game project as a series of discrete design problems, each with its own problem-solving effort is very difficult and impractical. This is because of at least four reasons:

1. The game design process involves a working artifact that can be readily and flexibly modified or extended, rather than an abstract plan or design model. Design problems are not discovered through analysis and testing of design *plans*, but in experience with implemented solutions.
2. The rate of design change in game development is fast in relation to the pace of design methods requiring analysis and research, creating a *response speed-gap*.
3. This speed-gap is exacerbated by the fast pace of practical design response and experimentation, which means that the cost of slowing down to perform detailed research or planning is relatively high.
4. The day-to-day, social, close-knit and collaborative nature of game development teams, and the persistence of a focused yet open-ended creative vision, means that the history of the design situations and the continuity of design work are very strong. This makes it difficult to step back from the situation and divide it into discrete stages.

The argumentative and rhetoric-focused views of design focus on stabilising the design situation through deliberation and action leading to persuasion, so that the design problem and solution can be addressed from a perspective that integrates all the issues satisfactorily. Schön’s perspective focuses on discovering the nature of the situation and its possibilities through an interplay of experience, design moves and active reflection. These theories need to be modified if they are to address a living design situation that is ongoing and readily affected by the process of game making. The issue of design control thereby becomes much more contentious, requiring a re-think of theories of design and the nature of design in game development.

2.3.2 Problems with top-down design control

The discussion in Sections 1.1.1 and 1.4.1 suggest that formalism, and by implication, top-down design control, is assumed to be an appropriate response to the difficulties of game development. In Section 2.3.1, I have offered theoretical support for discounting this position, but I will now (and later in Chapters 5, 6 and 7) offer examples from game development that show that comprehensive top-down design for production can be particularly problematic when there is no means to test the specified design, which in turn, leads to wasted work.

Mark Cerny (2002) describes it as a myth that "It is possible to plan and schedule the creation of your game", and likened pre-production to "[m]anaging chaos". The following example shows the extreme risk in following a well-intentioned requirements-engineering approach to game design. In the development of the game *Uncharted: Drake's Fortune*, developed by Naughty Dog, the team placed a lot of effort on up-front design for the game concept, gameplay mechanics and the necessary technologies for the game engine, gameplay features and tools. Druckmann and Lemarchand (2008), both game designers on the project, stated that

> at the beginning of the project, we set out to create very complex animation and AI [artificial intelligence] systems, which were planned to provide a general solution to the problems associated with believable human interactions within a game environment. (p. 28)

Naughty Dog was an experienced game development studio, but the *Uncharted* team later discovered that their planned systems were too complex, and instead, they opted for solutions that were simpler and more specific to the intended gameplay activities.

A similar problem occurred in another area of the design:

> we had wanted to use a system of interchangeable body and clothing parts for our enemies in order to get a huge apparent variety of enemies and reinforce the reality of the world. We wanted the player to have the feeling that each enemy character was unique. The problem was that this held up our whole enemy implementation

> process. We couldn't start finalizing the enemies until we finally realized we didn't have time to create our parts system, and simply got on with making the enemies that are in the shipped game. (Druckmann & Lemarchand, 2008, p. 29)

However, simplifying the technology for making the enemies, while allowing the team to develop gameplay, revealed further design problems:

> we seriously underestimated the impact that realism would have on our game design. A major example of this was the difficulty we faced while we were tuning the health of the enemies. We initially set up the enemies to take a bunch of hits before dying, so that each enemy felt like a formidable opponent. However, we soon started getting feedback from players that it seemed incredibly unrealistic for the enemies to take more than a couple of shots before going down. This meant that we had to constantly retune our setups and spawn additional enemy waves to compensate for the change. ... A different kind of struggle between reality and game design happened when we tried to visually differentiate between the different enemy classes. We initially approached their character designs with the same subtle approach that we applied to the main characters, but because the enemies are usually some distance away from the camera on the screen, and hence are quite small, these subtle differences weren't noticeable by the player. (Druckmann & Lemarchand, 2008, p. 30)

Druckmann and Lemarchand (2008) emphasise the inquiry process of revealing what was *obscure*, when they say: "You make so many discoveries during implementation that will change the design that it's best to begin implementation as early as possible, to the extent that your tools allow" (p. 30).

Similarly, Robin Walker of Valve Software described the early stages of *Half-Life 2*:

> Early on in the project we tried to design large amounts of the game, because the technology wasn't there to build it. This resulted in a large design document full of gameplay ideas. Unfortunately, we ended up throwing most of it away. The hard lesson we learned was this: the deeper you go into design, the more you're building on top of early design choices. If you can't validate those choices, by building and putting them in front of customers, then any design built on top of them is at risk. (Wyman, 2011, p. 60)

Half-Life 2 is a first-person shooter action-adventure game that is in many ways like the original *Half-Life*, featuring similar gameplay mechanics. The sequel was made with the expertise gained from the first game, and this experience should have increased the chances that top-down design could succeed in this case. Yet *Half-Life 2* also involved new technology, new interactions, a new approach to storytelling and a higher standard of refinement. In short, it had significant differences to *Half-Life.* Therefore, even in favourable circumstances, it can still be very difficult to effectively employ top-down design methods. Subsequent experimentation and testing is required to better anticipate outcomes (reduce *confusion*) and to avoid building designs on possible *conflicts* stemming from unvalidated design choices, thus improving the quality of design decisions.[9]

It is important to realise that each new game project can easily become significantly different to any that have come before. Simon (1996) argues that the "idea of final goals is inconsistent with our limited ability to foretell the future. The real result of our actions is to establish initial conditions for the next succeeding stage of action" (p. 163). This is the case even for sequels to well-designed games. Vigil Games developed *Darksiders*, and later, *Darksiders II*. The team had developed a successful, coherent game experience with *Darksiders*, and gained valuable insights from the experience of working through its many design and production problems: "[a]bsolutely nothing in DARKSIDERS made it into the game on the first try" (Bell, 2009, p. 23). This experience proved valuable for *Darksiders II*, which has many similarities in gameplay design to the original game. However, the initial design process for the sequel, though improved, was not straightforward. David Adams, the studio general manager of Vigil Games, and Joe Madureira (the creative director on *Darksiders* and its sequel), explain:

> DA: We cut a crapload of stuff at the idea phase. We'll prototype stuff, get halfway through and go, 'Ah, that's dumb; that's not going to work,' or we can't make it work. Sometimes something gets near finished and you're like, 'Eh, we just don't have time to make that as good as it needs to be'.
>
> JM: I think we had a more clear idea at the start of this one what we could possibly achieve and what we couldn't; on the first game we had no idea.
>
> DA: Yeah, the game we ended up with is probably, in *Darksiders II*, 80 percent of what we designed; the game we ended up with in *Darksiders 1* was probably like 1 percent of what we started out with. [*laughs*] So our ability to predict what we can get done increased drastically with the second game. (Nutt, 2012, original emphasis)

[9] IDS#2

The example of *Darksiders II*, as a sequel to a well-designed game, made by the same team, seems close to a best-case scenario for low-risk large-scale game development, and this was informally assessed by the developers themselves as a drastic improvement in predictive capability. Yet, even in such a broad example, a fifth of the intended design failed to work, or to put it another way, a fifth of the game design (which likely had complex interdependencies with much of the other four-fifths) emerged completely as a result of the development process.

There are clear examples of top-down approaches working well. The designers of *Shadow Complex* made extensive and successful use of paper designs prior to prototyping and implementation. Creative director Donald Mustard explains that "before we even turned on a computer, we built the entire game on paper first" (Nutt, 2009). A different example is the development of *Deus Ex: Human Revolution.* Accounts of that project (De Marle, 2011; Dugas, 2012; Lapikas, 2012) strongly suggest that a long and thorough period of initial research and design, backed up by systematic design planning methods, can successfully result in a production process in which the concept of the game remains stable. In both these cases it is important to note that the designers were closely following the form of well-established exemplars of game design. *Deus Ex: Human Revolution* was, according to the above-mentioned accounts, intended to be a revival of the *Deus Ex* franchise.The design team carefully approached the conception of the game to understand not only what made the *Deus Ex* games special, but also how they could retain that feeling while updating it for the modern market. Similarly, the design intent for *Shadow Complex* stayed very close to the conventional form of the so-called Metroidvania games: a particular kind of 2D side-scroller game design that reached perfection in both *Super Metroid* and *Castlevania: Symphony of the Night*. Mustard demonstrates the design commitment to working within well-established conventions when he states that:

> [f]or *Shadow Complex* to be its optimal design—it's a side-scroller. Then sweet, be a side-scroller and embrace what that genre has to offer and just kind of move it forward. (Nutt, 2009)

However, despite this enforcement of discipline in the design, and despite the successful use of a paper design approach, before the final game experience could become realised, the development team still had much to learn about what *Shadow Complex* really was:

This knowledge deficit is revealed in Mustard's statement that in the context of *Shadow Complex's* development, the problem with game design is "by the time you're done with the game, that's when you really know how to make the game that you were trying to make" (Nutt, 2009).

2.3.3 The bottom-up approach: following the flow of making

At times, interviews with game developers reveal claims that a top-down design process does not work for that team, or for game development in general (Wyman, 2011, p. 9). Usually this means that the developers prefer a less structured, development-led or *bottom-up* approach.

In a bottom-up process, the game design emerges out of a simple experimental approach of trying out ideas and refining them (Cook, 2009), which is basically a process of playing with the experience of rule-making (E. Zimmerman, 2003). Out of a process of practical and playful experimentation, the designer seizes on interesting interactions and experiences and develops them in whatever direction seems appropriate: in this scenario, control is exerted by choosing how problems are identified and eliminated. The designer plays with rules and configurations in an intelligently guided way, but is open to and informed by the process of designing and making. Cook's (2009) game design method is essentially a bottom-up approach:

> 1. Create rules (initially this will be the fundamental activity).
> 2. Play through the rules.
> 3. Observe how players react to rules.
> 4. Identify problem areas with rules.
> 5. Return to step one in order to create new rules that address the problems.
>
> This process will slowly evolve a game towards a more enjoyable state. (p. 133)

This *evolutionary* process (Cook, 2009) adopts a design strategy that focuses on a *fundamental activity*. Guidance during iterations is provided by directing changes towards making the fundamental activity simple, enjoyable and easy to learn. Systemic complexity is then discovered during iterations and is built around this foundation, creating a game that has rules developed from a working and enjoyable core. Cook (2009) contrasts the coherent results of his approach with the "tangle of rules that confuse the player" (p. 135), which often result from untested top-down designs. Cook's approach shows that game development is not only a process of iteration, but is similar to what Ingold (2010) calls a process of *itineration*, or following an improvised path.[10] This itinerant process reveals the *obscurities*[11] that can only be revealed through the process of making: the maker must "join with and follow the forces and flows of material that bring the form of the work into being" (Ingold, 2010, p. 97).

When viewed from the perspective of inquiry, *itineration* becomes a significant concept for game development: it suggests that the forces and flows that a game designer must join with as they work are the forces and flows of playful *experiencing*. In Zimmerman's (2003, p. 184) statement that "through iterative design, designers create systems and play with them, but only in order to question them, bend them, break them, and re-fashion them into something new", there is a sense of both the hylomorphic impulse (breaking, re-fashioning) and itinerant improvisation (questioning and bending). However, the game designer plays with more than a system: they also play with the way the game system creates forces that influence the flow of experience, and they discover new forces and flows emerging from that *experience* that open up an improvised path to follow. The story of Valve Software's shift away from a top-down design approach illustrates the discovery of an itinerant way of developing games in combination with iterative refinement.

Cabals: a social design coordination process

In the late 1990s, Valve Software published an influential *Gamasutra* article, describing their "Cabal" approach (Birdwell, 1999). At the time, it was commonly accepted that a game designer worked in isolation to produce a complete game design document. This assumption was likely due to the importance placed on having a design specified *on paper* as part of gaining a development deal with a publisher.[12]

Valve's cabal approach began after the studio decided to re-start the design of *Half-Life* with a small multi-disciplinary group leading the creative process. This group spent months focusing intensively on developing a new, cohesive design based on the best

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10 Ingold's ideas here follow from Klee (1973, p. 269), and Deleuze and Guattari (1987, pp. 342-346, 407-410).

11 IDS#3

12 Spector's (2000) account of the development of *Deus Ex* provides an example of this.

features of their first failed attempt at the game. This collaborative model allowed everyone in the cabal to contribute and build on each other's work. The people involved were "energized by the collaborative process, and the resulting designs had a consistent level of polish and depth that hadn't been seen before" (Birdwell, 1999). The cabal approach initially involved only a few members of the team, but over the course of the development of *Half-Life*, this approach became a general philosophy for organising the design process. This philosophy emphasised the mixing of cross-discipline expertise, record keeping, a heterarchical flow of information, and critical engagement with the design process. The philosophy also allowed each team member to participate in team-based deliberation as part of the game design process, and thus take on responsibility for areas of the game they cared most about.

Valve continued its exploration of the cabal approach during the development of *Half-Life 2*, a much more complex game than the original *Half-Life*. A single cabal was used for *Half-Life*, but five cabals were necessary for the sequel. The experimental nature of the cabal approach was exemplified in the way the design for the Gravity Gun game feature became refined (see Section 7.4.3). This active design process can be contrasted with the model it replaced, in which most team members relied on a large design document and specifications to direct their work, planned by a single individual or a privileged few with the official team status of designer. Valve's attempt to find a new design process was a response to dissatisfaction with the failures and inadequacies of the previously accepted top-down approach. In the time since Valve's approach became well known, a number of development teams have reported moving away from hierarchical organisational structures and centralised, static design processes, towards cross-functional, task-focused groups with minimal management structures and an emphasis on an evolutionary design process (Wyman, 2011, pp. 8, 37, 69, 89).

Process: finding a way forward, or following steps?

In the top-down approach, each iteration is an opportunity to identify problems from the perspective of the initial direction and to exercise corrective control to *stay on course*. However, in the bottom-up approach, each iteration is a learning cycle (a new set of inquiries), in which new discoveries interact with prior knowledge, creative direction and design constraints to create a new path forward. The word *process* has its origins in Latin: processus (progression, course) and the verb procedere (to go forward) (Oxford

Dictionaries, 2014a, 2014b). In contrast, the modern sense of process, as a sequence of steps or actions in order to reach an end state, has a quite different connotation. This can be understood given the difference between the following two questions:

- What sequence of steps should be taken to reach the goal?
- What way should be taken in going forward?

The first question reflects the assumption that there is a set process—a defined end state and steps to follow. This assumption relies on the certainty of pre-existing knowledge and a predictability of conditions leading to a predictable outcome. The second question is open, inquiring and merely requires action to lead somewhere.

Adoption of the bottom-up approach to design control entails a different view of knowledge. In this view, knowledge about a new game design is not completely or reliably gained from past analysis, and cannot be adequately represented through a paper design. Instead, this knowledge is discovered along the way in the process of making it, and only requires an initial point of departure. The bottom-up approach also suggests that the process of making a game is sufficiently unreliable, problematic or surprising that a design that is initially too specific leads to a fragile, inflexible or problematic implementation. The high degree of uncertainty in the game development process is a helpful clue in explaining why linear planning approaches, such as a waterfall development model, retain appeal despite the evidence that suggests they are unsuitable. Another clue is that stage-based planning is not integral to the game design process, which can be seen by examining the four-stage game development model described in Section 2.1.2. Like Duke's four-stage model (1981b, pp. 47-48), it is a design-for-production model with the addition of a practical research phase before production, and a focus on iterative playtesting throughout. Ignoring the linear stages and focusing on the activities reveals processes of:

1. undertaking conceptual work, setting goals and gaining stakeholder support
2. transforming conceptual work into courses of action through research, experimentation, and specifying and testing details
3. implementing the design through technology creation and acts of making, on a time and budget schedule
4. identifying and correcting deficiencies, and refining details.

The typical linear sequence of the waterfall process is, I argue, better understood as the imposition, on a natural inquiry process, of the necessary control structures of management, business and production for economically constrained team-based game development.

2.4 Summary

I began this chapter by establishing the problem of defining game design within the game development environment. Different theories of design and design activity each suggest possible approaches to this problem, including design as:

- problem solving
- wicked problems
- argument and persuasion
- conjecture
- co-evolution of problem and solution
- thinking and reflecting in action.

The dominant view of design as rational problem solving relies on the notion of stable design problems, which Dorst has shown to be doubtful. It is clear that game design may involve, depending on the situation, any of these approaches, with varying emphasis, at different times. However, game design is better understood as a situated activity within one or more design projects. Those undertaking this activity seek rational expansion and concept qualification, which requires the design of not only learning tools, but also the social environment. Additionally, the social and multi-disciplinary nature of game development, combined with the disruptive nature of game design, means that game design involves the resolution of paradoxes among multiple discourses.

Each view of design discussed in this chapter reveals assumptions about the nature of design and design control. The rational problem-solving view fits well with top-down predictive control, while approaches led by experimentation can be considered bottom-up approaches. It is clear that the differing approaches conceal ideological preferences about the desirability of control over the development process. From these discussions, game development can be considered an iterative and itinerant (improvised path-following) activity that often has imposed on it the control structures that suit business and management concerns.

Chapter 3: Research methodology

3 Introduction

In Section 2.3.3, I concluded my discussion of design control by arguing that each iteration in game development is a learning cycle (a new set of inquiries), in which new discoveries interact with prior knowledge, direction and constraints to create a new path forward (itineration). It follows that inquiry is a central feature of game design, and for this reason, I have chosen to use Dewey's theory of inquiry to structure my methodological approach. This research used Dewey's theory of inquiry in three important ways:

1. as an overall theoretical perspective
2. as a method of investigation
3. as a hypothetical structure for examining game design and development.

Because Dewey's theory of inquiry was a central aspect of his pragmatic philosophy, and because Dewey's work is the main supporting philosophy of my thesis, in Section 3.1, I explain how important philosophical concepts in Dewey's work support this research. In Section 3.2, I consider the features of Dewey's theory of inquiry in detail. Chapters 4 to 8 apply Dewey's theory as a method of investigation into the subject-matter of game development, and in Section 3.3, I outline this method and the data sources discussed in later examples. Section 3.4 describes my perspective on games as experience of model worlds, which is a methodological approach that informs later chapters.

3.1 Research methodology overview: Dewey's theory of inquiry

Inquiry is a recurrent theme woven throughout Dewey's writings. It was an essential and critical part of his philosophic method, being a necessary condition for other important topics in his philosophical writing as a whole. Dewey's focus on inquiry, and his instrumental view of knowledge gives his philosophy a forward-looking drive that suits the practice of design. Although Dewey's major work on inquiry was completed over 75 years ago, his ideas remain highly appropriate to a critical examination of the subject-matter of game design. This is because the philosophic fallacies that motivated Dewey's work (see Section 1.3.2), and the related conflict between knowledge of the world and experience of the world come to a head in game design: a discipline that is heavily formal and logical, yet simultaneously experiential and aesthetic. Because I argue that game design is integral to the process of making games, rather than separated from it, a suitable conception of knowledge is required to understand the significance of Dewey's theory of inquiry for game design.

3.1.1 Inquiry as coming to know

Rather than develop a theory of knowledge, Dewey (1929a, 1929b, 1938) developed and advanced a theory of knowing, which he referred to as *inquiry*. At its most basic, Dewey's inquiry is a process of experimenting—of initiating directed changes in some situation and observing consequences (Dicker, 1973, p. 192). The specific changes, or *transformations*, must be appropriate to both the raw and transformed subject-matter.

It has been widely argued that Dewey's inquiry is an account of coming to know, rather than knowing or having knowledge. Dicker (1973) notes that Arthur E. Murphy and Bertrand Russell both argue "that Dewey substitutes for an account of knowing, an account of (i) means or ways for acquiring knowledge and (ii) means or ways for using acquired knowledge for further achievements" (p. 193). In addition, Beatrice Zedler states that "the account of the process by which knowledge is sometimes acquired Dewey takes as an account of what knowledge *is*" (cited in Dicker, 1973, pp. 193-194).

Dicker (1973) points out that the term *knowing* is ambiguous, and can refer to a process or a product. He also argues that this ambiguity led to Dewey's critics interpreting Dewey's theory in terms of the *spectator theory of knowledge* (pp. 194-196). Dewey (1929b) consistently attacked the validity of what he called the "spectator theory of knowledge" (1929b, pp. 23, 35, 196, 204, 213, 245, 291), and the "spectator, search-light notion of consciousness" (1929a, p. 310). These views, dating back to classical philosophy, are metaphors in which "consciousness is like the eye running over a field of ready-made objects, or a light which illuminates now this and now that portion of a given field" (Dewey, 1929a, p. 308). Through these metaphors the "theory of knowing is modeled after what was supposed to take place in the act of vision" (Dewey, 1929b, p. 23). The *knowing as vision* metaphor entails an outside-observer who sees or reveals pre-existing knowledge objects, and who does not engage with or change those objects. What is known is therefore "antecedent to the mental act of observation and inquiry, and is totally unaffected by these acts" (Dewey, 1929b, p. 23). Dewey (1929a) argues that:

> These analogies ignore the indeterminateness of meaning when there is awareness; they fail to consider a basic consideration, namely, that while there exists an antecedent stock of meanings, these are just the ones which we take for granted and use: the ones of which we are not and do not need to be conscious. The theory takes as the normal case of consciousness the case where there is a minimum of doubt and inquiry. (pp. 309-310)

In other words, as human organism's with adaptive biological capacities, what we have come to know through previous successful action is incorporated into habitual activity, and remains unnoticed unless circumstances cast doubt on their meaning.

Yet because Dewey's critics are trapped in the entailments of the knowing as vision metaphor, they only see inquiry as the lead up to a knowing 'event' (Dicker, 1973, p. 196), which they understand as recognition of the knowledge object. This in turn leads to the search for knowledge in the truth of propositional statements that can stand objectively apart from any specific activity. Johnson (1987, 2007a) has criticised the objectivist position at length, and has developed an embodied, non-propositional perspective on meaning, reason, understanding and knowledge. I argue that game design knowledge (or knowing) is not strongly dependent on, or related to, belief in the universal truth of rational propositional statements, and is therefore not concerned with typical academic epistemology. Instead, the values that determine viability of knowing in game design are largely non-propositional. Johnson's view complements Dewey's perspective on knowledge, and adds support to the appropriateness of Dewey's perspective for understanding game design.

Dewey used what he called *the principle of continuity* as a multi-function safeguard that ensured that we do not forget our status firstly as biologically adapted creatures existing in a cultural environment: an inescapable embodiment in which all our activity is situated. Dewey (1929a) warns that

> [w]hen intellectual experience and its material are taken to be primary, the cord that binds experience and nature is cut. ...unless there is breach of historic and natural continuity, cognitive experience must originate within that of a non-cognitive sort. (p. 23)

This principle functions as a protective measure against the philosophic fallacies mentioned in Section 1.4.1. An important implication of the principle of continuity is that inquiry cannot remain detached from experience. The inquirer should seek to test theories and conclusions in the world that is described, transformed and manipulated by theory: this is the looping nature of Dewey's empirical method (Myers & Pappas, 2004, pp. 689-690). The importance of this principle for understanding game design is obvious if we consider that every proposed game concept or course of design action is like a theory or prediction about an imagined experience. Only by testing these ideas in a playable game experience can the designer maintain continuity with what the ideas describe.

Instead of a spotlight revealing objects of knowledge that were disengaged from the act of knowing, Dewey (1929b) understood knowing as a highly complex process of serially connected operations implying other operations in thought (pp. 163-164). Dicker (1973) concludes that to understand Dewey's theory of knowing, one must understand that the ability "to anticipate the consequences of putting a thing through various changes ... becomes the root notion of acquaintance-knowledge, as opposed to the bare witnessing of a thing" (p. 207). However, insight and anticipation that leads to experimentation (whether practical or in reflective thought) may prove to be correct, misinformed or inconclusive. The relation between knowing and inquiry is that knowing is the ability to anticipate these consequences correctly and consistently (Dicker, 1973, pp. 209-210). This perspective seems to contrast sharply with the view of knowledge implicit in Almeida and da Silva's (2013) proposed database of game design concepts (p. 22), which separates the instruments of knowing from design activity and design ability.

As Dicker notes (1973, pp. 211-212), one objection to this view of knowing is that we do not seem to be "inquiring all the time", a criticism that has been made elsewhere (Gale, 2010, p. 67). However, as pointed out by Myers and Pappas (2004, p. 684), this criticism ignores the implication of Dewey's postulate of immediate empiricism (discussed in Section 3.1.2), which is that knowing is only one mode of experience. It also ignores Dewey's idea of the continuity of inquiry, in which what has come to be known in previous inquiries is taken up in subsequently experienced situations (in the form of re-cognition, re-acquaintance and successful action) and also subsequent related inquiries (Dewey, 1938, p. 143; Dicker, 1973, pp. 212-213). I argue that the strength of Dewey's theory of knowing is that it explains, and overcomes, problems with general approaches to game design knowledge. Formal game design methods and design vocabularies seek to create stable rational knowledge objects that stand apart from, and are not changed by, their use in the practice of game design. But I argue that this search for stability has problematic assumptions because game design only takes existing meanings as a starting point for playful re-design. Game design situations create widespread and ongoing doubt over the meaning of what we have come to know about games, game design and general concepts. Because game design is inventive and transformative in the way it takes up, and objectifies, concepts and relations according to a project-specific network of values, the need for inquiry is constant throughout the development process.

3.1.2 The transformative empirical method that supports inquiry

If, as I argue is the case, game designers learn, and gain design control, through an iterative inquiry process, then several questions follow: What is the subject-matter (materials) involved in this process? How are these materials transformed? And does this transformation suggest a method? These questions will be carefully answered in the remainder of this thesis, but to understand the issues these questions pertain to requires an understanding of Dewey's empirical method.

For Dewey (1929a, 1929b, 1938), scientific inquiry offered an exemplar for experimentally inducing knowledge that could not be obtained through disengaged reflection alone. It was the experimental method of scientific inquiry, in which qualitative experience and reflective knowledge were integrated, that offered a fruitful method for all inquiry. Dewey saw not what scientific method *was*, but what it *does*: it transforms the raw, doubtful material of experience into something that allows relationships between things to become refined and stabilised (Dewey, 1929a, pp. 3-7, 12, 33-35, 58, 74, 142). Such stability in physical sciences is signified by the instruments of inquiry, the abstract language of mathematics, and symbolic logic. However, for Dewey (1929a, 1938), the template of inquiry—its method—must be adapted to fit the subject-matter (1929a, p. 36; 1934, pp. 87-89, 98-99; 1966, p. 165), such that the transformations, and the means of securing stable ends, retain experiential continuity with what is investigated.

Because method is never "something outside of the material" (Dewey, 1966, p. 165), there is a close relationship in each inquiry between the raw subject-matter and the logical instruments (including concepts, theories and physical devices) that operate on it. Such operations transform the multidimensionally complex, naturally occurring situation into one that is amenable to direction and experimentation. For Dewey (1929b), ideas "direct operations; the operations have a result in which ideas are no longer abstract, mere ideas, but where they qualify sensible objects" (p. 168). For example, game design involves transforming concepts about imagined game experiences into rules and game objects, which, through play, indirectly create the sensible qualities in a concrete game experience. However, a common problem in game design is mistaking concepts about the game for predictions of what the game experience will be. In this tendency is a failure to appreciate that in the process of game development, even well-established ideas about experience or game experiences are not stable universal truths found in the spotlight of knowing. Their meaning can easily be changed by their use in the strange worlds created by game design, which can make any concept the raw subject-matter of inquiry. This suggests that in game design there is something importantly different in the way we need to understand concepts about reality and knowledge.

The Postulate of Immediate Empiricism

One of Dewey's most significant articles, his 1905 essay "The Postulate of Immediate Empiricism" (1905 / 1998), clearly outlines his views on reality, knowledge and method:

> Immediate empiricism postulates that things—anything, everything, in the ordinary or non-technical use of the term "thing"—are what they are experienced as. Hence, if one wishes to describe anything truly, his task is to tell what it is experienced as being. (p. 115)

In this view, the important consideration is what sort of experience (i.e. what sort of thing) is indicated by the *described* experience. Between different accounts, there will be variations and agreements, which is a contrast between different *real* experiences, and not between "*a* Reality, and various approximations to, or phenomenological representations of Reality" (Dewey, 1905 / 1998, p. 115, original emphasis). This view does not entail that things are only what they are *known* to be, because "knowing is one mode of experiencing" (Dewey, 1905 / 1998, p. 115). Dewey's focus on accounting for the *experience of description* is reflected in Putnam's (1981) internalist perspective (in contrast with the externalist or God's-eye perspective), which similarly holds that questions about what the world consists of only make sense "within a theory or description" (p. 49). If recognition (as identification with something known), cuts perception short, as in Dewey's (1934, pp. 54-55) view it does, then it must also cut design perception short, and thus not take into account the potential for expansion of possible meanings created through the design process.

3.1.3 The method of experience

Dewey's postulate of immediate empiricism is very important for understanding problems in the experience of game design. This is because it makes clear the nature of the gap between an actual game experience and the experience of description that informs the conceptualisation of new game worlds. It is also significant because it turns experiencing into a method of philosophical investigation. This method starts with something undeniably real, which is the reality of an experiencing being, and the "absolute, final, irreducible, concrete quale which everything experienced not so much has as is" (Dewey, 1905 / 1998, p. 117). Because each experience is real, and has its own real quality, it is the only determinate starting point for any inquiry: "If any experience, then a determinate experience; and this determinateness is the only, and is the adequate, principle of control, or 'objectivity'" (Dewey, 1905 / 1998, p. 117).

Dewey uses the word experience to refer to the particular circumstances that somebody endures or undergoes, but also as a general concept in which *experience* denotes a method, and therefore, has no particular subject-matter. Dewey's *method* of experience operates *on* experience, which could include anything felt, thought, done or imagined provided it comes from the undivided starting point of immediate, natural experience.

Immediate empiricism, which he also called *empirical method* (not be confused with earlier, different forms of empiricism), “is the only method which can do justice to this inclusive integrity of ‘experience.’ It alone takes this integrated unity as the starting point for philosophic thought” (Dewey, 1929a, p. 9). The point of the method is to make the *starting* point for inquiry things as they are immediately experienced *as*. This approach retains continuity between immediate and reflective experience: for game design, the approach is useful in understanding what may be missing from rational and formal design approaches.

The goal of game design is always to achieve coherent integration of the parts that make up a game, into a whole, dynamic, changing experience. Major conceptual problems in game design (both in theory and practice) are to conceive of games in static and general ways, and to mistreat analytic and reductive assessment of the subject-matter as predictive rather than conjectural. This problem has severe implications in the design process and such approaches struggle to cope with the ongoing reconception and rational expansion that is required to deal with a changing design situation. While general, reductive thinking is necessary for purely formal aspects of game design activity, it is inadequate for the experiential aspects, and therefore, as Dewey (1929a) suggests,

> [t]he only way to avoid a sharp separation between the mind which is the centre of the processes of experiencing and the natural world which is experienced is to acknowledge that all modes of experiencing are ways in which some genuine traits of nature come to manifest realization. (p. 24)

Experience as a method can reveal what traits of existence are manifest in good game experiences, and thus what qualities are excluded from the concepts and abstract objects that are employed to create a game indirectly, at second order. If game designers do not make themselves aware of these limits of knowing, they risk placing unwarranted certainty in, and being dishonest about, the concepts they use.

The Postulate of Immediate Empiricism was intended as a method for gaining a determinate empirical basis for philosophic concepts, one that was honest about the nature of what was described. Dewey (1905 / 1998) argues that if

> you wish to find out what subjective, objective, physical, mental, cosmic, psychic, cause, substance, purpose, activity, evil, being, quality—any philosophic term, in short—means, go to experience and see what the thing is experienced as. (p. 118).

Dewey's (1929a) ideas provides a powerful reminder of the connection of game design practice to errors of philosophy. In creating a rich experience from determinate, abstract parts, every game project is an opportunity for game designers to learn that what is actually in experience extends

> much further than that which at any time is known. From the standpoint of knowledge, objects must be distinct; their traits must be explicit; the vague and unrevealed is a limitation. Hence whenever the habit of identifying reality with the object of knowledge as such prevails, the obscure and vague are explained away. It is important for philosophic theory to be aware that the distinct and evident are prized and why they are. But it is equally important to note that the dark and twilight abound. For in any object of primary experience there are always potentialities which are not explicit; any object that is overt is charged with possible consequences that are hidden; the most overt act has factors which are not explicit. Strain thought as far as we may and not all consequences can be foreseen or made an express or known part of reflection and decision. (Dewey, 1929a, pp. 20-21)

Experience as a method is aimed at improving the knowing of things, and includes the assumption that knowledge does *not* exhaust what is there to be known. Instead, the appearance of discontinuity in *that* real experience—a perception of something unfulfilled—leads to inquiry. The problem of conceiving an imagined game experience is revealed by Dewey's method of experience. The general form of this method is that if you wish to find out *what* X is, then go to experience and see what X *is experienced as*. It follows then that if a game designer wants to find out what their game concept means, they should go to experience to find out. If a game designer speaks of a proposed design concept—for example, a game about being a magical chameleon with a jetpack—then they should go to experience and see what a magical chameleon with a jetpack *is experienced as*. If this reveals it *as* just a general idea or description, then this should be a clue as to what qualities cannot be sensed, what it cannot yet *be experienced as*, and what has escaped verbal description. Further, such concepts must be taken in the design situation as frames for conducting local experiments. However, a frame that provides inadequate direction in experiential qualities is a potentially problematic frame for game design activity. Formed this way, limits of knowledge, and therefore, limits to claims of conceptual certainty, are revealed. The design concept is now a problematic *design situation*, which, to continue the example above, calls for inquiries into richer ways of experiencing magical jetpack chameleons.

3.2 Features of Dewey's theory of inquiry

Dewey's inquiry is a general experimental method that applies to intelligently directed activity in any domain of experience:

> Inquiry is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituents, distinctions and relations as to convert the elements of the original situation into a unified whole. (Dewey, 1938, pp. 104-105)

The technical terms of Dewey's theory of inquiry must be interpreted specifically for the particular subject-matter. Constituents, distinctions, relations, instruments of transformation, methods of instituting a problem, and the unified whole (the object or outcome) of inquiry, all depend on what the inquiry is an inquiry *of*. For game design, the subject-matter spans all of experience itself.

3.2.1 Forming the content of inquiry

The problems, concepts, theories and experimental operations employed in inquiry are determined by both the subject-matter to be investigated and the experienced organism–environment situation that the subject-matter is a part of. Dewey (1938) makes distinctions between the raw subject-matter of the experienced situation, the *content* of inquiry and the *objects* of inquiry. Broadly, "subject-matter is that which is investigated, the problematic situation together with all material relevant to its solution" (pp. 520-521). *Content* is the subject-matter (existential and conceptual) selectively and provisionally taken up and used in inquiry as the "material and procedural means of reaching a resolved situation" (pp. 520-521). An *object* is a logically produced feature of inquiry: a "set of connected distinctions or characteristics which emerges as a definite constituent of a resolved situation and is confirmed in the continuity of inquiry" (pp. 520-521). An object is thus a reference to an existential thing, or to abstract entities in relation to such things. Objects are *objectives* of inquiry, and, if proven in successive inquiries, are accepted objectively, as a relevant tool (pp. 520-521).

Because the objectives of inquiry differ for various subject-matters, so do the objects produced by different inquiries. Only some forms of inquiry produce, and rely on, explicit propositional forms (i.e. statements in the form of propositions). For artistic inquiry the subject-matter is emotional and aesthetic experience, which demands its own problems, methods and objective of inquiry. However, the general inquiry method remains: some artworks produce material outcomes that offer a transformation of everyday aesthetic experience into a refined and intensified aesthetic experience (1934, pp. 2, 50, 107, 202-203). For science, experiments and mathematical models improve our ability to know the objects and relationships observed in reality. For design, sketches, working models, and partial solutions, as design conjectures, allow design conceptions to become operational, and thus, allow us to better know the design problem (Cross, 2011, pp. 12-14). This idea is reflected in Dewey's (1929b) general statement that "[t]he more connections and interactions we ascertain, the more we know the object in question" (p. 267).

The indeterminate situation and institution of a problem

The subject-matter of each inquiry is determined by the nature of the unsettled situation that requires investigation. I have claimed that game design is characterised by ongoing indeterminacy throughout the development process, and is therefore better understood as a series of unsettled design situations requiring investigation. A situation is indeterminate if it *feels* perplexing, doubtful and unsettled, and conditions must be "indeterminate in significance: that is, in what they import and portend in their interaction with the organism" (Dewey, 1938, p. 106). Dewey (1938) states that the situation is indeterminate

> with respect to its *issue*. If we call it *confused*, then it is meant that its outcome cannot be anticipated. It is called *obscure* when its course of movement permits of final consequences that cannot be clearly made out. It is called *conflicting* when it tends to evoked discordant responses. (p. 106, original emphasis)

Clearly the situation leading to inquiry is, in Dewey's (1938) view, aesthetic: it must have a "peculiar quality" that "pervades the given materials" (p. 105). Further, it

> is a unique doubtfulness which makes that situation to be just and only the situation that it is. It is this unique quality that not only evokes the particular inquiry engaged in but that exercises control over its special procedures. (p. 105)

The fact that Dewey's conception of inquiry gives aesthetic experience an important role in guiding inquiry is significant for game design, which at every stage is concerned in some way with questions relating to aesthetics of the game experience. It is aesthetic perception that "moves an inquiry forward toward a warranted unifying resolution of matters of concern" (Tristan, 1996, p. 9).

The indeterminate situation that evokes inquiry must also have the potential to be questioned (Dewey, 1938, p. 105). Because it is the experienced situation that is doubtful, only the institution of changes in the situation by particular operations can bring about a change to resolve it (p. 106). Further, because a situation that is *completely* indeterminate permits no problem formulation and thus no possible solutions (pp. 108-109), for inquiry to proceed there must be some definitely perceivable *constituents* of the situation, whether observed or implied. Dewey (1938) states that what is perceived and what is conceived are "instituted in functional correlativity with each other, in such a manner that the former locates and describes the problem while the latter presents a possible method of solution" (p. 111). Therefore, the nature of the problem determines what distinctions are made, what ideas are suggested, and thus, what kinds of experiments can be performed to learn about the relation between the things distinguished. Institution of a problem, as "*A* problem represents the partial transformation by inquiry of a problematic situation into a determinate situation" (p. 108, original emphasis). This is a significant point for game design, in which the many different kinds of problems that emerge during development lead to transformations of the design frame, and therefore, the way the problematic situation is understood or is constituents are valued.

3.2.2 Transformations in, and resolution of, inquiry

Dewey's theory of inquiry draws attention to the transformative nature of concepts, the operations that ideas suggest, what ideas mean as consequences, and thus, the meaning of ideas in action. Recognised meanings therefore have the capacity to selectively modify what we perceive and *take* from experience, which is as much a *transformation* of experience as conversion of physical space into spatial units by a measuring stick: the method is the same, but the content of the method differs.

Dewey's (1938) inquiry relies on two different functional instruments of thought: universal propositions, and generic propositions about kinds and classes (pp. 254-255). Universal propositions describe relationships among generic kinds of things, and generic kinds are themselves transformations of raw subject-matter by instruments of inquiry (whether by theoretical or physical transduction). Universal propositions are abstract, hypothetical, logical and operational: they only relate abstract objects. Generic propositions, on the other hand, *refer* to existential kinds of things: they are the sets of traits determined to describe a kind, by some universal proposition confirmed in previous inquiries (Dewey, 1938, pp. 254-256, 279). The power of the scientific method is in the substitutability of generic kinds, which allows the transformed subject-matter to be flexibly manipulated by maths and logic (Dewey, 1929a, p. 142; 1938, pp. 199-219). For other kinds of inquiry, generic qualities and kinds are the results of applying concepts, theories and other transformative instruments to what is experienced. Universal hypotheticals are proposals for how these generics are involved in the phenomenon under study.

Dewey's formulation of universal hypothetical relations was directed primarily at philosophic inquiry and modelled on the method of scientific inquiry, where explicit linguistic or symbolic propositions are *methods* that fit those subjects. However, Dewey's model can also be adapted to artistic inquiry. For example, the raw subject-matter for the artist is the aesthetic quality of experience. The content of artistic inquiry is whatever art media and technique of expression is chosen, according to the artist's logic, concepts or feeling (Dewey, 1930 / 1998b, p. 200; Okada, Yokochi, Ishibashi, & Ueda, 2009, p. 195). Generic qualities and kinds are obvious in the reductive methods techniques of scientific study, but the artist makes selections of particular kinds of material, technique and form in performing their work. Similarly, the artist does not need to produce a universal hypothetical proposition to have a coherent resolution to inquiry when they have the objective artifact—the artwork itself—to be experienced, and so speak for itself. As Tristan (1996) observes, design activity can be considered a propositional argument in Dewey's sense: one that may eventually be warranted (p. 42).

A design proposition is a proposed possible arrangement of things (some of which may also be hypothetical) to produce a conjectured desirable phenomenon. A design proposition has the character of a generative idea rather than the predictive quality suggested by a universal hypothetical proposition.

Game design inquiries involves transformations in imagination, conversation, deliberation and argument with others, and in various practical activities[13] of:

- representing ideas
- making design proposals
- modelling ideas as working systems of abstract objects
- implementing design proposals and refining the implementation
- evaluating design proposals and game experiences.

In specifying a game system, universal hypotheticals and generic qualities and kinds are employed in the abstraction of game concepts to game objects, properties, rules and states, and the following of conventional game forms. This step is a reduction of an imagined experience, through the transformative frame of the design proposal, to the logical forms that suit the technical architecture of the game engine. The generalising nature of this reduction allows the game concept to be transformed into the manipulable form of abstract game objects. This in turn allows the game designer to indirectly experiment with game experiences through configurations of interacting game objects.

The unified whole and the accrual of logical form

The experiential outcome in game development is the coherent outcome of inquiry in which design proposals become justified. This is a change from the doubtful quality of the original situation, from which the problem was instituted, to a quality of coherence between the:

- distinctions made by the inquirer
- resultant constituents of the inquiry situation
- ordered relations determined through experimental operations.

[13] These activities bear close resemblance to Lawson and Dorst's (2009, p. 51) five design activities: formulating, making design moves, representing, evaluating and managing.

A unified whole marks the closure and settlement of the inquiry situation, and it results in "the institution of conditions which remove need for doubt" (Dewey, 1938, p. 7). The nature of the unified whole will vary depending on the subject-matter of inquiry. According to Dewey (1938), logic is the *theory* of inquiry, and logical forms are the conditions that inquiry, if it is *an* inquiry, must meet (p. 14). By logical form, Dewey means known conditions that "provide a principle of direction and of testing" (p. 13): that is, they are *formative* of subject-matter, and thus, depend on the subject-matter for their character. He says that logical forms are

> formulations of ways of treating subject-matter that have been found to be so determinative of sound conclusions in the past that they are taken to regulate further inquiry until definite grounds are found for questioning them. (p. 13)

Because logical forms are ways of treating subject-matter to produce sound conclusions to inquiry, logical form *accrues* to inquiry (Dewey, 1938, p. 22, 102). Logical form, as formative, directs the selection of generic qualities and kinds, and suggests operations to be performed on them (Dewey, 1938, pp. 102, 271). Logical forms *transform* the raw subject-matter of inquiry into something logically manipulable and testable. As an outcome of inquiry, a particular logical form determines sound conclusions about the way particular qualities and kinds bear on the phenomenon in question. The logical form also describes the involvements of things said to constitute the phenomenon.

It is important to note that inquiries with differing subject-matters will produce a unified outcome and logical form that suits the materials being investigated and transformed. For artistic inquiry, a unified outcome may be the artwork that successfully arranges its materials and forms to produce a refined aesthetic experience. In game design, it is the design propositions that guide the selection and configuration of the logical forms that make up the game world and its systems. Therefore, it seems probable that the overall outcome of game design inquiry is not only a particular selection and configuration of game elements, but a viable conception and principle of their organisation.

A successful inquiry produces an outcome that suggests further ideas and operations, and thus makes further inquiry possible (Dewey, 1938, p. 8). A chain of related inquiries allows knowledge to develop. The historical continuity of inquiry was important to Dewey (1938, pp. 8-11, 489-90), who saw that humans collectively inquire into particular subjects and test each other's work in the process. The continuity of inquiry so established developed better tools of knowledge, and therefore, the inquirer could develop an ever-growing capacity to understand and regulate their experienced world, fallible as this capacity was (p. 40). Dewey (1929a) recognised that the process of inquiry led to new ways of understanding the world, and involved the creation of new tools (physical artifacts as well as knowledge) and new experiences, which could disrupt previous knowledge and ways of understanding (pp. 5-6, 34-35). As I will argue in later chapters, it is this process of experimentation and learning that allows viable game design knowledge to develop within a project, while also producing a constant source of disruption and reconception in game development, and that makes the iterative process a series of related inquiries.

3.3 Research method and data sources

I will use Dewey's theory of inquiry and philosophy of experience to focus on three important and related areas:

1. *how* and *what* game developers learn about designing game experiences within the development process
2. sources of indeterminacy in game design situations
3. the development of design coherence.

Dewey said that *ideas suggest operations*, and he also viewed theories and concepts as *instruments* that transformed the raw subject-matter of the experienced situation. The end result is *transformed* subject-matter. For science, these instruments are both real (e.g. a measuring instrument) and theoretical (e.g. a formula), and they turn natural phenomena into abstract quantities and substitutable symbols. *My* main research instrument is Dewey's theory of inquiry, which I use to transform the experience of game design and development using the following conceptual distinctions:

- raw subject-matter
- indeterminate situations
- problems and problem formulation
- transformation instruments

- transformed subject-matter
- unified outcome.

3.3.1 Problem formulation and possible transforming operations

Dewey's account of knowing involves "apprehension of a thing in terms of the results in other things which it is tending to effect" (Dewey, cited in Dicker, 1973, p. 219). My research aims to apprehend the nature of indeterminacy and change in game design. From this aim comes the hypothesis that design change and reconception are signs of the effects of indeterminacy in design situations. This hypothesis leads to the primary method of this research, which is to use Dewey's model of inquiry as an investigation method to structure and guide this research. Doing so allows the critical examination of concepts that describe the subject-matter of game design. To use this method, I must choose appropriate conceptual instruments to selectively transform important aspects of games and game development. These cover three broad areas:

1. The raw subject-matter of game design, as well as the unified outcome of a game project, is experience itself. Dewey's principle of continuity (1929a, p. 23) suggests theories and philosophies that address areas of experience such as sensing, emotion, feeling, aesthetics, meaning, decisions, action, thought and learning.
2. Indeterminate situations in game development suggest theories that relate to reasons for design change, which may be discoverable through the analysis of game design, design problems and game-making activity.
3. Game designers use various concepts and techniques to transform imagined experience and real-world experience into the abstract objects that make up games, but they improve both the concepts and their capacity to use them as development continues. This insight suggests an examination of the notion of design coherence in terms of relationship between the game experience and the transformation instruments game designers use to conceptualise, and indirectly produce it.

In view of the above points I will select theories that focus on:

- the embodied, qualitative character of immediate experience
- the meaning of artifacts in use, which involves sensing, meaning-making and acting

- the co-development of knowledge with skilled performance
- general traits and patterns of experiencing
- conceptualisation and expression involving logical forms and embodied meaning
- the evolving design situations within a design project, and its paradoxes (as already discussed in Chapter 2).

The various examinations and theories suggested here form the body of the theory guiding this research, and will be covered in Chapters 4 to 7, followed by a complete integration of the implications of each chapter's findings in Chapter 8.

Accounting for indeterminacy in game design

This research requires a consistent way of characterising indeterminate situations in game development. As explained in Section 3.1.2, Dewey used three distinctions to define indeterminate situations as confused, obscure and conflicting. I will use these distinctions as the basis for a simple accounting method. In this method, on every occasion that the discussion in Chapters 2 to 7 involves confused, obscure or conflicting game development situations, they will be noted as coded footnotes.[14] These footnotes will use the form IDS#xx, which represents an *indeterminate situation* followed by a number index.

3.3.2 Evidence: evaluations of game development projects

The primary sources of evidence about game development used in this thesis come from:

- *Game Developer Magazine* 'postmortems'
- Game Developer's Conference (GDC) talks
- supplementary documentary evidence pertaining to a particular project, such as publicly available videos, articles and interviews.

These documents and recordings are usually reflective, retrospective accounts of a selection of circumstances encountered in a specific game development project. My interpretations of these published accounts of game development produced by other game developers, in addition to the propositions and arguments I establish based on these sources, rely heavily on my experience and first-hand insights into game

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[14] For example: IDS#00.

development practice. Objectivity in this aspect of the research thus consists in shareable objectives and objects (outcomes) of inquiry, and in making clear the methods used and assumptions held, not in adopting the position of an impartial outside-observer.

In this research, therefore, sources of evidence from the game development industry are not be treated as subjective, so as to entertain subject–object divisions, or as 'data' to be identified as an instance of a kind or category. This research is not in that vein. It is research *for* design, from *within* the experience of game design, and more importantly, from a position of design expertise. Any anecdotal evidence, testimony or other claims and reports made by a game developer in such complex social, history-dependent situations cannot be viewed as a single true account: such a thing does not exist and this research does not expect or require it. Instead, these sources are taken as a *saying* of what the designer or developer means: what it precisely means is only known to us through the context implied in its saying. As an experienced game designer in the commercial game development industry, I share with other game developers some degree of implicit context which I hope to reveal more clearly in my discussion of these sources. Because I respect what the authors are saying, I use these sources throughout the research as I would normal citations, despite their non-academic pedigree: however I clearly acknowledge my assumptions about these sources of evidence.

Game Developer Magazine and similar postmortems are valued within the industry as a primary source of information about the issues facing different game projects. GDC talks feature presentations by game developers who discuss the development of game projects. These presentations are an important forum for reflection, analysis and speculation on game projects, development processes and methods. For postmortems and GDC talks, I assume that:

- the accounts are already transformations (by game developers) of the game development experience (the original subject-matter)
- the evidence is factual

- the authors have selected what they feel was or is important, to provide a necessary context for those outside the development team to gain understanding of the experience of the project and its successes and failures
- the most important event histories with the largest ramifications tend to be mentioned, while a history of smaller day-to-day details, problems and chains of events tend to be left out of the account
- game developers are circumspect with what they say before the game has been released, but communicate openly, to the extent contractual conditions permit, once the game has been published
- publicity is part of the purpose of these records
- these records mainly serve as an open form of communication, as part of reflective practice and project learning, and as records for posterity, and therefore, involve some justification and theorising.

3.3.3 Limitations of the research

It is important to recognise the limitations of the research methods chosen. To begin assessing these limitations, it is necessary to apply Dewey's postulate of immediate empiricism, as a reminder of what kind of subject-matter I have been discussing, what it is experienced *as*, and what domains the research outcome can claim relevance to.

This research inquiry primarily addresses the experience of game development at a general and conceptual level. Importantly, it uses a range of theories to

1. transforms the experience of game development
2. contextualise other game developers' accounts
3. represents my experience of, and interpretation of, game development.

As such, this research does not make any claims to being objective in the sense of describing the experience of game development in universal and absolute terms. It is, however, objective in the sense of bringing a clearly defined repeatable method to the study of game development, and transforming the experience of game development in terms of well-established general theories.

This research is limited primarily by the source accounts of game development experience, and therefore, by the distance of this research from actual game design situations and from the experiences of other game developers. When considering the limitations of this research beyond the bounds of my own inquiry, there are two main questions to answer:

1. How clear and consistent is my research method?
2. Can my results be compared with other relevant research?

In response to the first question, this research has clearly established Dewey's theory of inquiry as its method, and employed the technical terms of his theory consistently, for example, in the tests for evaluating the indeterminacy of a situation as obscure, confused or conflicting in origin. I have clearly identified and explained my understanding of the raw subject-matter of game development as *experiencing*, and my reasons for the selection of theories (such as embodied theories of meaning, or tacit knowing) that have transformed the raw subject-matter of game development into the content of my inquiry. Other researchers may select the subject-matter and transformative instruments differently, depending on the pervasive quality that guides the formulation of their research problem. However, I have clearly set out what my indeterminate situation was, and what values have guided this research. I have therefore provided a clear benchmark for comparison should other researchers wish to undertake a similar inquiry using the same method.

The second question involves asking if my research project can be compared with others. The facts point towards this work as a unique establishing study because it focuses on my experience of game development, transformed by an eclectic and particular selection of theory. There is no research that I am aware of that is comparable in its subject-matter, problem formulation, purpose, goals, range and content. Therefore, the usefulness of my research in further inquiry, or its validity within a community of inquirers, is yet to be established. However, my research inquiry could serve as a model, or a method for investigating the experience of game development for others doing research for game design.

3.4 Research focus: games as model worlds

In this research, I focus on games as model worlds because this perspective emphasises a particular set of important design values and goals related to the activity of game design. The focus on model worlds expands the focus of the game design activity well beyond the design of gameplay mechanisms alone, and includes their integration into the complete game experience. I will expand on this perspective throughout the remainder of this chapter.[15] In particular, I am concerned with the player's relationship with a game, in situations in which the game, and everything the player encounters in it, is designed to be "a little cosmos of its own" (Riezler, 1941, p. 505).

In this research, I define video games as *computer-mediated experiences of model worlds, which require a meaningful interface to be sustained between the player and game (which includes game content and formal systems).* For the designer, such experiences as design possibilities are conceptually unlimited, though as concrete experiences they are finite and limited. This is research for design, and there is nothing to be gained by restrictive definitions of what games *are*, because game designers are concerned with what video games *can be.* In this thesis, a game is not taken as an artifact, but an experience involving player and artifact, understood as an ongoing meaningful transaction that unites player and game. Schell claimed that a game "is a problem-solving activity, approached with a playful attitude" (p. 37). Schell's definition, when considered as a design goal rather than a description of a finished artifact, gets to the heart of game design activity. It emphasises that developing games is about creating a meaningful problematic situation that suggests itself to a player. In response to what the situation offers, people are willing to commit to playfully exploring, experimenting and solving the situation.

Duke's (1974) writing on gaming simulation focused on the purpose and potential of games as a form of holistic (or gestalt) communication for understanding topics that

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15 My perspective on games as model worlds should not be confused with Goffman's (1981) social science view of games as social encounters and world-building activities. Further, many academic studies of games focus on the social and cultural element of games, particularly by way of studying what are known as massively multiplayer online games. This research does not share that focus. For the game designer, model worlds are a design goal, not a theory of form for interpreting an artifact or text, for example, Klastrup's (2003) poetics of virtual worlds. My use of the phrase *model worlds* does not entail what are known as virtual environments, virtual communities or online social spaces (Klastrup, 2003, pp. 101-102).

were “complex, future-oriented, of a systems nature” (p. 78). Each particular game required its own special vocabulary:

> Through a game we are attempting to find the most efficient communications form to convey a gestalt or permit discussion about a gestalt. We do this by creating a hybrid language form which in part makes use of existing languages, and part creates a new game-specific language for this particular circumstance. (p. 118)

Such a language involved the mixing of conventional symbols with *supersymbols*, which, Duke defines as symbols that “require specific definition for use in a game” (p. 119). For Duke, this language is “the very essence of games—the establishment of a new vernacular to permit innovative confrontation with reality” (pp. 119-120). This insight is significant in understanding what game designers of all kinds achieve through their work: a new way of perceiving, understanding and acting when confronted with the reality of a game world.

3.4.1 Model worlds

In *The Art of Computer Game Design*, Chris Crawford (1984) emphasises not only that games are interactive systems with explicit rules, but also that a game is a self-supporting model world that need only refer to itself. This fits with Costikyan’s (2002) use of the concept of endogenous meaning, in which a “game’s structure *creates its own meanings*” (p. 22, original emphasis) and the “form must contextualize itself” (p. 25). Yet, by the subject-matter the game world represents, and the values by which the simulation is simplified, a game world represents things beyond itself (Crawford, 1984, pp. 7-8).

Very abstract games can offer little to represent or suggest a world, and largely consist of rules, game states and the pieces you play with. Compared with modern large-scale video games such as *Red Dead Redemption*, which create highly detailed and populated, extensively simulated fictional worlds, an abstract game such as *Chess* barely creates the faintest suggestion of a model world. But does this mean there is a continuum of model-worldness that depends on the kind and manner of representation? David Parlett claims there is no useful distinction based on representation to be found in the moment of play, explaining that how “representational a game is depends on the level at which it is being played and the extent of the player’s imagination” (Juul, 2005, location 1227).

My concept of model worlds requires a persistent and substantial relationship between the player, the agent they control and the world that agent acts in. A game experience in which the player–game relationship lasts over time and develops a history of meaningful interaction within a world provides continuity, and thereby make the notion of world and coherency more salient. For a game designer, what matters is that players understand the game coherently in the experience of play, so they can understand how to act and interpret what they sense. Juul uses the notion of an "incoherent world" (2005, location 1219) to describe a game that has features or events that cannot be explained without reference to the game rules. However, a coherent fictional world is not necessarily the same thing as a coherent experience of a model world. An important implication of the definition of model worlds for game design is the potential disjuncture between a player's experience of a model world and their knowledge, habits and other abilities from real-world experience, including meanings and tropes inherited from other games.

Gingold (2003) has studied games using the concept of games as miniature worlds. He notes that a "procedural description of a digital world defines a landscape of possible worlds" (p. 72), and the digital world's dynamics creates a *possible worlds landscape*. Further, he states that:

> Game designers define possible worlds landscapes that players traverse. The dynamics and rules of a game shape its possible worlds landscape. Rules and dynamics constrain player input, limit reachable game states, limit transitions between possible game states, and automate game state transitions. A game's rules are a web of constraints which hold its moving parts and experiences together, enable and prompt action on the part of the player, give intelligibility and plasticity to the system, imbue a miniature world with dynamics and life, generate the experience of responsibility, enable problem solving and contests, and give value to particular game states. (p. 74)

It is important to note that I am not specifically constraining my research to what are known as open-world games, as exemplified by *Red Dead Redemption*, *Grand Theft Auto IV* or *Assassin's Creed: Brotherhood*. Open-world games, with their freedom of action and exploration within a single, large, simulated game-space can be considered the most complete and complex model worlds. However, the term *open* is a distinction that contrasts with other ways of structuring game spaces, for example as discrete levels, and also the extent to which all possible game systems and mechanics are simultaneously available for interaction. The emphasis in my definition of model worlds is not in categorising the artifact, but in characterising the depth and richness of the play experience in terms of how the game systems and mechanics interpenetrate with actions, goals and obstacles.

It is better to say that this research uses a particular conceptual orientation to video games, rather than a definition or a category. The concept of model worlds is useful concept because it orients thinking towards the *building* of a self-contained world for a player to experience and understand. A player in a game world is an active power in that world, constrained only by the world's space of possible outcomes and by the player's own interpretation of the game world.

3.4.2 Model worlds and real-world experiences

My assumption in using the model-world viewpoint is that understanding game experiences is not significantly different to understanding any other kind of human experience. Both are human–environment transactions: unified, integrated wholes of experience. In games, this occurs only when a human player and the game are bound together in the moment of play, creating a meaningful flow of experience. As long as a meaningful process of play continues, the game experience is sustained. For the game designer, this sustained, meaningful play experience is, I argue, the most important consideration. By considering games as model worlds, I draw a deliberate connection between experiences of the real world and those of game worlds: both are embodied, meaningful, aesthetic experiences.

This perspective applies to all kinds of games, and shifts the focus to experience and meaning, rather than limiting it to the conventions and expectations of any one distinguished kind of experience. For the designer, this freedom from artificial constraint, and thus premature problem setting, is essential. Experience and meaning focus the issues of game design to the fundamental aspects of what it is to be human, to feel emotion, sense qualities, form meanings and have agency. By choosing this perspective, I can enrich the understanding of game design and game-making activity by considering the bearing of established knowledge about basic human experience on experience of game worlds.

This perspective also changes the way that making games can be understood. In the inquiry perspective, the process of making games becomes understandable as a process of developing *new experiences*, rather than a technological product. This shifts thinking toward learning what is necessary to make a new experience complete and meaningful, within the particular constraints of video games.

Finite and limited strange worlds

The subject-matter of game worlds, as new experiences, may be any sort of reality imaginable. The modern development of model worlds as large-scale games[16] are fantastically complicated productions and can integrate within them a broad range of expressive media: anything that can be digitised and/or interfaced with a computer program. However, model game worlds are finite and directed towards a purpose. Because I wish to study the *design* of video games, the subject for study must be bound by its purpose and limits of production.

Game worlds are necessarily limited by investment support, technology, production time, creative choice, and, after all, design. These limits mean that even though game worlds can be expansive model worlds offering immersive, engaging experiences, they are still incomplete and significantly abstracted, and contain a wide range of conflicting design criteria. This is a critical point to understand because, as simulations and systems, model worlds are selectively designed, and result in commitment to certain systems of logic in the design of game rules, game objects and representations. The effects of such selection can be far-reaching when it comes to integrating large numbers of elements into a coherent experience. For example, the effects of selective abstraction and modelling to meet the needs of game design and gameplay can produce very peculiar, and even inconsistent, logic, which is why I refer to games as *strange* worlds.

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[16] This research is not specifically about what are often called AAA games, which is business-speak for *high* everything: budget, production values, marketing expense and expected sales. However, it is true that modelling a world and everything in it in three-dimensions (3D), can be very costly; therefore, the most fully realised model worlds are often AAA games.

Limits on game worlds therefore present a challenge to the design of consistent, coherent and meaningful experiences.

3.5 Summary

In this chapter, I examined Dewey's theory of inquiry and the philosophical perspectives that support it. Dewey emphasised the full richness of experience, privileging feeling and action in addition to thought. His *method* of experience reveals what something is experienced *as*, which is important when accounting for the experience of description to avoid mistaking the logical for the ontological. Dewey clearly emphasised this transformative aspect of logical constructions, which emerge naturally as an outcome of inquiry, from the raw subject-matter of inquiry: an unsettled human–environment situation. The process of formulating problems suggests what constituents will be manipulated in inquiry, and what experimental operations will be performed to produce changes that lead to a coherent resolution, or to further inquiries. Dewey's inquiry is a theory of knowing through experimentation, and importantly, it is flexible in how its experimental, empirical method forms from different subjects. This experimental and flexible character is what makes Dewey's theory of inquiry an appealing method for both inquiring into the nature of game design and for understanding what it is that game designers do. The results of this research approach constitute Chapters 4 to 7, in which I make use of several carefully selected theories to transform the subject-matter of game development, and produce a coherent understanding of its indeterminate nature and the place of design within it. An essential component of this method is to understand games as model worlds: this allows a player's experience of a game to be considered in terms of well-established theories of experiencing, which form the subject-matter of the next chapter.

Chapter 4: Games as experience

4 Introduction

The view of model worlds introduced in Section 3.4 leads to the conclusion that understanding how to design good game experiences requires an understanding of the nature of basic human–environment transactions. This chapter serves to gain a clearer understanding of games as experiences, which is what game designers actually design, at second order. I therefore examine theories of embodied experience that emphasise the irreducible integrity of the human–environment situation. These *concepts* are not fundamental, in the sense that they can be considered in isolation from each other as elemental materials, or separated from any particular experiencing. However, I argue that they are significant for game design.

In Section 4.1, I consider basic traits and qualities of experience and consider the implications of Dewey's views on experience for game design. Then, in Section 4.2, I examine patterns of experience, such as emotion, vitality affects and image schemas, as basic embodied structures that are essential aspects of a game experience. In Section 4.3, I explore four pillars of game experience design: perception, learning, meaningful interfaces, and embodied meaning of the game artifact in use.

4.1 Games as experience

Video games offer playful, rich and diverse experiences, yet Lazzaro (2009, p. 6) states that research focusing on the *experiences* games create is quite recent. My focus on experiential qualities as a subject-matter for game design inquiry is no coincidence: Dewey's philosophy is completely woven around the concept of the experienced situation. In this section, I want to draw attention to some of the most basic traits of experiencing that are manipulated by game designers, either indirectly, through the rules and processes of the game, or directly, through the arrangement and configuration of game content.

4.1.1 Experienced subject-matter and experience as a method

Using Dewey's method of experience has potential for developing a sensitive account of experiencing that can inform game design, in much the same way that Dewey used the method to inform the development of concepts in his philosophy. Dewey developed a perspective of human–environment interaction (which he later called *transaction*) that considered aesthetics, meaning and knowledge integrally with biological, functional capacities. In this perspective, these capacities are understood as evolved adjustments to generic features of natural existence. As a living organism, we are thus concerned with the "rate and mode of the conjunction of the precarious and the assured, the incomplete and the finished, the repetitious and the varying, the safe and sane and the hazardous" (Dewey, 1929a, p. 75). Dynamics and aesthetics are also central concerns of game design (Hunicke et al., 2004). For Dewey (1929a), experience of nature is "a scene of incessant beginnings and endings" (p. 98) in which we undergo a rhythm of stable moments that mark transitions from previous experience to possible future experience. Stable moments are situations that culminate in a definite aesthetic sense, and do not, in themselves, portend of anything: rather, they have the feeling of resolution, culmination and finality, as Dewey explains:

> [a]ny quality as such is final; it is at once initial and terminal; just what it is as it exists. It may be referred to other things, it may be treated as an effect or as a sign. But this involves an extraneous extension and use. It takes us beyond quality in its immediate qualitativeness. If experienced things are valid evidence, then nature in having qualities within itself has what in the literal sense must be called ends, terminals, arrests, enclosures. (pp. 96-97)

Dewey (1929a) was careful to distinguish between natural ends (immediate culminations, self-possessed of meaning) and ends-in-view (culminations anticipated in reflective thought that may be attainable) (p. 104). A toothache, a sip of coffee, an exploding firework, laughter, witnessing an accident, a heard musical note and silence are natural ends with a resolved quality, and are experienced as immediately what they are. But in reflective thought, their significance may be apprehended and become an end-in-view. Dewey (1929a) observes that the power and particular aesthetic appeal of rational, determinate objects of knowledge is that they mark the closure of a previous episode of experience and have transitivity to a new experience, or instrumentality, in directing what comes next. Experience, as Dewey (1929a) points out, is both precarious and stable (pp. 50-51), and the certain and resolved situation marks only a transition to a situation yet to occur, more or less uncertain or perplexing in what it may become (p. 111). Thus, it is because of the uncertain flux of experienced events that the tools of controlling and ordering are so valued. It follows that to experience a well-designed game is to experience a range of things found in everyday experience:

- patterns of change
- qualities
- ends and ends-in-view
- means of change or transition.

4.1.2 Games as refined and intensified traits of existence, and patterns of ends and ends-in view

Dewey's traits of experience described in Section 4.1.1 have importance in understanding game experiences. Koster (2010) claims that games are "iconic depictions of patterns in the world", and that they are "concentrated chunks ready for our brain to chew on", minus distracting details: "Usually our brains have to do hard work to turn messy reality into something as clear as a game is" (p. 34). Each game experience that is a distinct and coherent experience therefore has qualities that are carefully selected, constrained, refined, amplified, coordinated and regulated. For example, the game *inFAMOUS*[17] involves qualities that mark it as a distinctive superhero game:

- calamity, destruction, decay and danger
- electrical forces, power, retaining or losing control, and freedom of action
- vulnerability, protection, ruthlessness and risk
- balance, growth, restoration and redemption.

I argue that for a game player, the possible ends and ends-in-view they experience are limited and intensified according to the overall conceptual, logical and qualitative scheme of the game design. The game designer first develops formal systems (and their associated game mechanics) that allow ends and ends-in-view to occur in gameplay:

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[17] *inFAMOUS* is referred to frequently in this thesis because it is a good example of a game that is a model world. Additionally, I use *inFAMOUS* as a detailed case in Chapter 7 due to the existence of informative accounts describing many aspects of the project's design and development.

then, the designer systematically arranges and orders these ends and ends-in-view to suggest patterns to be comprehended. It is important to note that my view of patterns is quite different from the theory of game design patterns by Björk, Holopainen and Lundgren (2003) They created a generalised hierarchical network of conventional game forms that have no connection to any particular game experience; however, I focus on experiential patterns of change that relate to meaning in play. These experiential patterns are intricately connected to the specifics of the gameplay design and the designer's feeling and conceptions of the game experience.

InFAMOUS provides an example of selective intensification of patterns of ends and ends-in-view. *InFAMOUS* features a limited number of phenomena (things, events, states, concepts) of a limited number of types. The inhabitants of the city in the game can be of three types: 1) civilians, 2) special non-enemies, and 3) enemies of a particular faction. Civilians and enemies can have only three existential states: a) living, b) incapacitated, and c) dead. Both civilians and enemies are hurt by the player character's (Cole's) electrical discharges, but civilians are less resistant and thus more easily harmed. The enemies in the game are indiscriminately destructive and do not care if their actions hurt civilians, whereas the player can choose, even under the pressure of enemy attacks, to take care with the aim of their electrical powers. The limited and distinctive concepts that characterise the experience of *inFAMOUS* are grounded in the rules and logic of the game system. Possible patterns are suggested in at least two ways: first, how the civilians and enemies behave, interact and are located in the spaces of the city environment, and second, how the player encounters civilians and enemies in relation to the goals of play. For example, in one of the many scenarios in the game, enemies patrol a rooftop overlooking a street filled with cars that may explode if shot at. The street is busy with civilian activity: it is likely that if the player approaches from the street, civilians will be damaged in the resulting combat encounter, particularly because some of Cole's attack powers are not precise. This game situation thus implies numerous specific ends-in-view and suggests a more general *collateral damage* pattern as an end-in-view. In response to the consequences suggested by the collateral damage pattern, the player might envisage other ends, such as climbing the high building overlooking the enemies, and using a dive-bomb attack to incapacitate the enemies below, without warning. This *stealth and dive-bomb* pattern is thus suggested from the ends and ends-in-view that are perceived while playing the game.

I also suggest that the sort of game patterns discussed above lead to particular ends-in-view that the player understands in terms of the limited, refined and intensified agency offered by the game. When change occurs or is implied in the game world, whether from player intervention in the game systems or those systems' autonomous workings, the player may form a new goal. Changes encourage the player to decide on a course of action, and to attain resolution, order and stability amid the precariousness of conflict and challenge. Continuing the previous example, the result of *inFAMOUS's* stealth and dive-bomb pattern, if executed skilfully, is:

- elimination of dangerous enemies
- protection of civilians
- successful control of wild superpowers
- risk of hazardous consequences that may harm civilians or property
- destruction
- freedom of action.

The above list is closely related to the earlier list of qualities in this section that I suggested mark *inFAMOUS* as a distinct superhero game. I argue that in a well-designed game, gameplay patterns formed by ends and ends-in-view, and the means of change that game mechanics and systems allow, relate strongly to:

- the qualities that the game experience produces
- the concepts on which the game is designed, and is understood in the act of play.

Dewey deliberately placed value on the full range of qualities of existence. This approach retained continuity between the experience of naturally occurring ends and the human habit of selectively apprehending and valuing ends in their role leading to meaning, knowledge and control. For game designers, this point must be taken in both directions, because the richness of experience is both the inspiration and the goal. A fundamental task of the game designer is to apprehend the richness of experience in terms of abstract schemes and objects, from which is constructed an emergent, rich, new experience. This experience must be understood in terms of the effects those schemes and objects create at second order.

4.1.3 Design of aesthetic experience

In my view, it is essential that game experiences be conceived as something with a particular dominant and desirable quality. In Dewey's terms, this is *an* experience, one that has a unity that marks it off as *that* experience. Dewey (1934) observes that the qualitative character of unrefined (normal, non-inquiring) experience may be distracted or dispersed, when "what we observe and what we think, what we desire and what we get, are at odds with each other" (p. 36). In contrast, a naturally occurring experience may be significant enough in direction and coherence to be called *an* experience "when the material experienced runs its course to fulfillment" (p. 36). *An* experience is one characterised by the merging of the elements of a situation into an integrated episode (pp. 37-39):

> An experience has a unity that gives it its name, *that* meal, *that* storm, *that* rupture of friendship. The existence of this unity is constituted by a single *quality* that pervades the entire experience in spite of the variation of its constituent parts. (p. 38, original emphasis)

Afterwards, in reflective interpretation, "we may find that one property rather than another was sufficiently dominant so that it characterizes the experience as a whole" (Dewey, 1934, p. 38). Game worlds can be a nexus for *many* experiences over time, and players should be considered co-creators of the game experience, not passive consumers. I am not advocating a pre-determination, by design, of *an* experience. However, I argue that a coherent game design must artfully unify what is experienced by providing the conditions for qualitative unity, given a wide variety of gameplay possibilities and meanings.

If a game experience should be conceived of as *an* experience, then the question, and the goal, for a game designer then becomes: How do we know what *this* experience should be? For example, within the generic concept of a superhero action game, there are many different experiential possibilities. What is it that makes:

- *inFAMOUS that* superhero action game?
- *Prototype that* superhero action game?
- *Batman: Arkham Asylum that* superhero action game?
- *Superman Returns that* superhero action game?

What qualities distinguish one from the other, and what is it that makes *Batman: Arkham Asylum* or *Superman Returns* feel like playing Batman or Superman ... or not? What *sort* of Batman or Superman experience is the game about? Such questions seem too subjective to be useful, yet a team of game developers must, in the end, achieve an objectively shareable experience, which they know is *that* experience. Sefton Hill, director of *Batman: Arkham Asylum*, states that the team drew their constraints from the Batman comics, rather than previous Batman games or films:

> We ... started ... taking those facets from the character in the comics directly, and said, "These are the things that are Batman." We wrote those things on a board and said, "We have to make a game that really exaggerates these things and brings them to the fore." We left those there. Nothing we came up with in terms of design could ever break those things ... If it didn't fit with who Batman was, we would drop it. (Graft, 2009)

In contrast, Eric Holmes, the director of *Batman: Arkham Origins* (a game made after *Arkham Asylum*, but set before it in the Batman timeline), defines Batman differently:

> In Arkham Asylum, if you walk down a corridor and you see a guard, he'll say, 'Hey Batman, there's a friend of mine trapped in this room. Can you help me out?' ... The Batman of Origins is not that guy. The Batman of Origins is a guy who explodes out of a shadow, jumps on top of somebody, and their friends scatter because they don't know what jumped on top of them. They think it's a monster. I think that speaks to the early career of Batman, before he becomes an institution, before he's someone people know they can trust. He's an urban myth at this point. (Totilo, 2013)

These examples show that understanding how to differentiate, and articulate, the qualities that make one kind of experience different from another is important to game design.

For game designers, the subject-matter that becomes designed in a game experience is the balance of the precarious and stable in patterns that lead to qualities, meanings and action. The full range of perceiving, culminating in "meaning so directly embodied in experience as to be its own illuminated meaning" (Dewey, 1934, p. 22), is of more value to a game designer than generic concepts or formalisations of previous games. For the designer of *that* game experience, the method of experience is the only way of knowing what *that* is, how *that* might be created, how to understand *that* conceptually, and how particular abstract forms relate to produce *that* correct balance. Further, sharing game experiences and sharing talk of them (e.g. through playtesting or design discussion) is a necessary part of coordinating understanding within a development team, and of understanding the way people perceive, come to understand, and enjoy, a game experience. The method of experience therefore reveals something missing from formal approaches to game design.

Games experiences: playing with qualitative unity

Game experiences are primarily aesthetic in the broadest sense, as indicated in the mechanics–dynamics–aesthetics framework (Hunicke et al., 2004). Both Laurel (1993) and Murray (1997) emphasise the qualitative and aesthetic character of engagement with computers and virtual environments. Game makers concern themselves with ensuring that the game *feels* right at each moment (Swink, 2009, p. xiii). This sort of judgement, I argue, must involve the way the game experience unfolds with consideration given to a scheme of principles, values and directions particular to that game project. Within a team, all game development disciplines have their own aesthetic concerns that guide design and acts of making. Establishing aesthetic direction is also an important part of developing a game concept. Audio and visual aspects of games direct the aesthetic appreciation and strongly influence the feeling of the game. However, it is the integration of all elements into a balanced gameplay experience that is the concern of game design inquiry.

The interplay of qualities, feelings, concepts, formal elements and patterns in play gives a game its own particular aesthetic character: and aesthetics conceived in a wider, phenomenological sense (Iseminger, 2009, p. 100) is an important subject-matter that game designers must learn to shape. Dewey used the concept *aesthetic* broadly, to refer to the quality of life full of sensuous, immanent meaning (McCarthy & Wright, 2004, p. 58). He built his aesthetic theory on the fact that ordinary complete experiences have the traits of aesthetic experiences, but they frequently lack clarity, intensity and development (Dewey, 1934, p. 48). However, the refined qualities that result from the experience of inquiry, such as a work of art or a scientific theory, are, and should be (because of inquiry's purpose), unified and totally integrated. Applying Dewey's perspective, a game experience is by design *an* aesthetic experience, in which

> the lively integration of means and ends, meaning and movement, involving all our sensory and intellectual faculties is emotionally satisfying and fulfilling. Each act relates meaningfully to the total action and is felt by the experiencer to have a unity or a wholeness that is fulfilling. (McCarthy & Wright, 2004, p. 58)

This is an interesting and significant point because Dewey's ideas about unified experiences and inquiry have been criticised or deemed problematic (Iseminger, 2009, p. 103) because of:

- their partly ideal nature as goals to be striven for
- their rarity in comparison with the bulk of normal experience
- the value and enjoyment of experiences that are partial or fragmented, or are deliberately conventional or lack organised direction and coherence[18] (Berleant, 2012, pp. 162-164).

Criticisms of the kind mentioned above are irrelevant in the design of game worlds. In fact, in the game design context Dewey's ideas find traction. The relevance of Dewey's ideas comes about because games are an experiential artform that involves a wide range of overt behaviour on the part of the player, including action using transformative instruments, decision-making, economics, problem solving, exploration and experimentation. Game worlds promise to be the kinds of worlds that offer a sustained aesthetic experience, and the complete and unified experience is an appealing goal to be realised. However, games also pose challenge, conflict and problems. Perplexity, uncertainty, tension, problem solving, learning, effort and competition are central features of games, and uncomfortable players may not be a sign that the game experience is poor (Griesemer, 2010). These characteristics of game experiences can potentially break up the unity of a game experience, or "break the immersive ideal" (Van Looy, 2003). However, it is the challenge of game design to play with the unity of the experience, and the possible meanings suggested, by experimenting with the way a game's integration, development and movement of meaning can be stretched without breaking. If a player exhausts the patterns a game has to offer, and the game becomes simply enjoyable overt behaviour, the experience breaks down as *that* experience, because

18 These sorts of goals are also possible design paths for games, but this topic will not be considered in this research.

> the activity is too automatic to permit a sense of what it is about and where it is going. It comes to an end but not to a close or consummation in consciousness. Obstacles are overcome by shrewd skill, but they do not feed experience. (Dewey, 1934, p. 40)

Likewise, a lack of direction and integration in gameplay may cause an aimless, drifting, wavering or, at worst, anaesthetic experience: "One thing replaces another, but does not absorb it and carry it on. There is experience, but so slack and discursive that it is not an experience" (Dewey, 1934, pp. 41-42). Dewey (1934) states that struggle and conflict can be enjoyed, even if painful, "when they are experienced as means of developing an experience" (p. 42). The game designer must therefore play with the unity of experience while maintaining it in balance. To apply Dewey's (1934) words to games, this requires the player to experience

> courses of action in which through successive deeds there runs a sense of growing meaning conserved and accumulating toward an end that is felt as accomplishment of a process. (p. 40)

4.2 Dynamic patterns of experience

The aesthetics of a designed game experience that is distinctly *an* experience must be carefully composed. McCarthy and Wright (2004, pp. 79-94) have drawn on pragmatist literature, particularly Dewey, and picked out four conceptual threads in the composition of experience: the sensual, emotional, compositional and spatio-temporal. Next, I will discuss theories of emotion, vitality affects and image schemas, which relate to these four threads. I will also argue that unified game experiences are, in effect, compositions of these basic embodied structures as experiential gestalts.

4.2.1 Emotions as patterns of change in game experiences

Emotion is an important factor in successful design (Norman, 2005), including game design (Lazzaro, 2004, 2009; Schell, 2008, pp. 121-124; Sylvester, 2013) and game environment design (Logas & Muller, 2005). First-hand accounts of intensely felt game experiences tend to be permeated with emotional language (Griesemer, 2010; Sylvester, 2013, p. 18). A passage of play in a game of *Chess* might involve mention of stress and mental strain, relief, accomplishment, dominance, glowing satisfaction, suspense and more relief (Sylvester, 2013, p. 9). Emotional experiences are therefore an important part of the subject-matter of game design.

Good game experiences amplify emotion in thought, decision-making and action, and I argue that emotion is a crucial element in coherent game design. For Dewey (1934), emotion determines the character and coherence of an experience:

> emotions are qualities, when they are significant, of a complex experience that moves and changes. ... Emotion is the moving and cementing force. It selects what is congruous and dyes what is selected with its color, thereby giving qualitative unity to materials externally disparate and dissimilar. It thus provides unity in and through the varied parts of experience. (pp. 43-44)

In Damasio's (1999) view, emotions—as patterns of chemical and neural responses to an inducing situation (pp. 22, 53-54)—are part of a continuum that serves the homeostatic regulation system of the human organism (pp. 36-54), and serve to prepare the organism for reaction to the inducing situation by modifying the operation of body systems. This combined evaluation–preparation function of emotions orients our experience to future thought and action. To design a game experience, therefore, involves the design of changes that induce desirable emotional experience in the player to prepare them for future events, choices and actions. For example, tension might prepare the player for a number of possible outcomes that might be good or bad, doubt could prepare the player to pull back from the situation and reconsider it, and delight could prepare the player to savour conditions that produce happy possibilities. Lazzaro's (2009) studies lend support to this idea because they show five distinct roles that emotion plays in increasing player engagement with a game (pp. 7-9):

- enjoyment
- focusing attention
- aiding decision-making
- facilitating the kind of performance required by the game
- as rewards and motivations for learning.

Whereas Lazzaro's work focuses on the relation of emotion and choice, Sylvester (2013) emphasises that games produce emotion because game mechanics create events that produce change. These changes are meaningful, and trigger emotions, if they involve a change in the state of a human value (p. 12). In this view, game events (via the game mechanics that produce them) are emotionally effective because of their implication, not just their occurrence (pp. 12-14). Such events portend changes in human values. The emotional value of any game event can vary depending on the significance of the implications (p. 13), for example, if the outcome of the entire game rests on a single decision or action. In games, the possibility space of outcomes at any point in time is also therefore a space of emotional implications. Designing emotional game experiences therefore involves the shaping of the significance of change in a dynamic sequence of player–game events, which is an indirectly designed effect (Lazzaro, 2009, p. 7; Sylvester, 2013, p. 9).

Vitality affects: the temporal contour of feeling

Emotional game experiences rely on an integration of many elements in the game situation such that sensed changes portend something significant. Yet there are at least two further dimensions to be considered in relation to emotion: the first is the connection of changes that produce emotion to *meaningful* experience, and the second is the fact that emotions are not simply static states, they develop over time and thus have a temporal character. Both dimensions are addressed by the concept of vitality affects.

Stern (1985, 1995) explored ways of understanding the dynamic qualities of embodied, felt experience. His terms *vitality affects* and *temporal contours* focused study on the "elusive qualities" (1985, p. 54) that characterise the pattern of flow and development of an experience. This qualitative contour is an experiential pattern that has a particular character, shape or manner that occurs over time. Vitality affects differ from discrete emotional states (known as categorical affects), such as happiness, fear and surprise, differentiated along dimensions of degree of intensity, and pleasure–displeasure (K⊘ppe, Harder, & Væver, 2008, pp. 170-171). Stern (1985) says that "[v]itality affects occur both in the presence of and in the absence of categorical affects" (p. 55), and are

> those dynamic, kinetic qualities of feeling that distinguish animate from inanimate and that correspond to the momentary changes in feeling states involved in the organic processes of being alive. We experience vitality affects as dynamic shifts or patterned changes within ourselves or others. (p. 156)

Stern (1985) states that vitality affects "concern how a behavior, any behavior, all behavior is performed, not what behavior is performed" (p. 157). He describes how we employ concepts that convey signature dynamic *shapes* of feeling, such as surging, bursting, dragging, stumbling or fleeting:

> a 'rush' of anger or joy, a perceived flooding of light, an accelerating sequence of thoughts, an unmeasurable wave of feeling evoked by music, and a shot of narcotics can all feel like 'rushes'. They all share similar envelopes of neural firings, although in different parts of the nervous system. (p. 55)

K⊘ppe, Harder and Væver (2008) explain Stern's vitality affects as highly abstract structures of changes in intensity and activity over time that are constituted in all sensory modes. Vitality affects are "a form of primitive semantics that lays the foundation for a series of abstract rules for progression and movement" (p. 176). Even though vitality affects are abstract sensorimotor schemas, Stern (1985) insists on their connection to specific experiences, saying that there "are a thousand smiles, a thousand getting-out-of-chairs, a thousand variations of performance of any and all behaviours, and each one presents a different vitality affect" (p. 56). The general–specific nature of vitality affects is found precisely in the synchronisation of energies across sensory modalities in particular experiences. For example, Stern (1985) explains that

> puppets have little or no capacity to express categories of affect by way of facial signals, and their repertoire of conventionalized gestural or postural affect signals is usually impoverished. It is from the way they move in general that we infer the different vitality affects from the activation contours they trace. Most often, the characters of different puppets are largely defined in terms of particular vitality affects; one may be lethargic, with drooping limbs and hanging head, another forceful, and still another jaunty. (p. 56)

Music and animation are highly important in game design, and are exemplars of vitality affects because they "express a way of feeling, not a specific content of feeling" (Stern, 1985, p. 56). I argue that they are also highly important expressive forms for design integration and the concept of design coherence, because their abstract structures allow

> intermodal correspondences to be made between similar activation contours expressed in diverse behavioral manifestations. Extremely diverse events may thus be yoked, so long as they share the quality of feeling that is being called a vitality affect. (Stern, 1985, p. 58)

I suggest that vitality affects, as part of our embodied understanding of the world and what we experience, relate to the design of game experiences in five ways:

1. The manner in which actions and events are felt in *gameplay*.
2. The manner of appearance (in all sensory modes) and behaviours of *game objects*.
3. Formal game elements constrain the *way* events and actions occur and unfold over time.
4. Our understanding of vitality affects enters our *conceptualisation* of the manner of things done or undergone in a proposed game experience.
5. Vitality affects, their conceptualisation, and game rules and game objects are coherently linked in the process of *design integration*.

The theory of vitality affects can provide general forms for the embodied *manner* in which activity occurs and is felt, but games also involve patterns of game objects in space and time. I will now consider a theory that complements and supports the emotional patterns of experience with the structural patterns of experienced objects in space and time.

4.2.2 Image schemas: embodied patterns of recurring experience

Koster (2010) explores the appeal of games in terms of the way our brains are structured: humans are "voracious consumers of patterns", and games are satisfying as "exceptionally tasty patterns" to consume (p. 14). For example, games involve:

- observation of patterns
- patterns of behaviour in space and time
- patterns of feeling
- the puzzling implications of suspected patterns.

As evolved and adaptable organisms in natural and artificial environments, we have sensitivities to many patterns of experience. Our experience of patterns thus has a richness to it, and we "crave the emotional satisfaction that comes from pattern completion, and witnessing even a portion of the pattern is enough to set our affect contours in motion" (M. Johnson, 2007a, p. 144).

Games typically involve dynamic spatial relationships between objects, which makes the concept of image schemas, as patterned neural responses, particularly appealing as basic subject-matter for game design. The term *image schema*, as proposed and developed by Mark Johnson (1987, 2007a), indicates “schematic structures that are constantly operating in our perception, bodily movement through space, and physical manipulation of objects” (1987, p. 23). In this view, recurring experiences involve dynamic embodied patterns that can be characterised by general schematic structures. Johnson (2007a) characterises these “recurrent, stable patterns of sensorimotor experience” (p. 144) as irreducible dynamic wholes. These dynamic wholes manifest as topological structures in stable neural activations in an organism acting within its environment (p. 144). Image schemas are part of a theory of embodied cognition and meaning, supported by evidence from phenomenological, linguistic, psychological and neuroscience research (M. Johnson, 2007a, pp. 139-143; Lakoff, 1987, pp. 266-280).

Lakoff (1987) notes that Johnson’s image schemas, because they are embodied, structure experience “in a significant way prior to, and independent of, any concepts” (p. 271). Lakoff also argues that the basic logic of image schemas is “due to their configuration as gestalts—as structured wholes which are more than mere collections of parts” (p. 272). Even though “image schemas structure our experience preconceptually” (p. 275), Lakoff claims that there are corresponding image-schematic concepts, and metaphors that map “image schemas into abstract domains, preserving their basic logic” (p. 275). Such metaphors “are not arbitrary but are themselves motivated by structures inhering in everyday bodily experience” (p. 275). For example, in filling a glass of water, we experience regular correlation between verticality (up) and quantity (more), relating to the metaphor *more is up* (p. 276).

In addition to structuring space, Lakoff argues that image schema also structure concepts, including the structure of abstract domains (p. 283). Johnson (1987) states that image schemas are the “continuous structure of an organizing activity” (p. 29). Because image schemas are *schematic*, their abstract nature “connects up a vast range of different experiences that manifest the same recurring structure” (p. 2). Johnson (1987) states that

> [t]ypical schemata will have parts and relations. The parts might consist of a set of entities (such as people, props, events, states, sources, goals). The relations might include causal relations, temporal sequences, part–whole patterns, relative locations, agent-patient structures, or instrumental relations. (p. 28)

Many basic image schemas have been identified in our bodily experience of the world (so far, mainly through linguistic analysis). For example:

> balance, compulsion, blockage, counterforce, restraint removal, enablement, attractions, mass-count, path, link, center–periphery, cycle, near–far, scale, part–whole, merging, splitting, full–empty, matching, superimposition, iteration, contact, process, surface, object, collection. (M. Johnson, 1987, p. 126)

Image schemas are flexibly transformable, for example, the *from–to* schema is a goal-less, mid-path version of the *source–path–goal* schema, indicated in Figure 4.1.

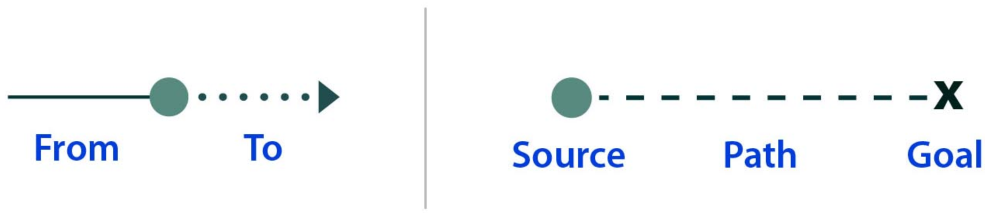

Figure 4.1. Representations of the source–path–goal image schema

In our everyday lives, we recurrently experience this pattern of something moving from one location to another, and from a source location to a goal (or target) location. This schema is an experienced event, and includes the felt sense of anticipation of the moving thing eventually reaching the target. Another common pattern is the *inside–outside* schema, which comes from the *container* schema and implies the *source–path–goal* schema, represented in Figure 4.2. We experience these two schemas in many different ways. For example, things (like food or air) can be in our bodies or outside of them, or we can be inside a building or outside of it. In both cases, we have the experience of containment in addition to the difference between inside–outside, and movement over the threshold between inside and outside.

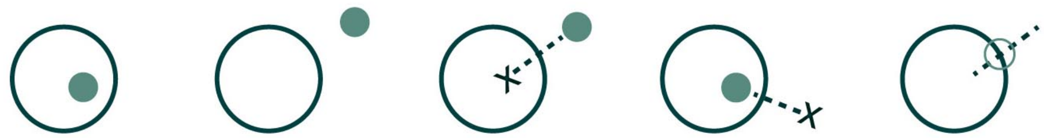

Figure 4.2. Representations of the inside–outside and container image schemas

Because image schemas are relational structures, their basic elements are recognisable even when instantiated with different objects, tempos, scales, velocities and accelerations, intensities and intensity–time shapes. Vitality affects are similarly schematic, but account for the particular *manner* of dynamic progression in which things are experienced. Image schemas are general structures, but the experience of them is emotional. For example, the inside–outside and container image schemas characterise important structural elements of the experience of walking into a room, but the feeling of the experience is quite different depending on whether the room is, for example, bright, warm and clean, or dark, cold and filthy, or possibly holding a nasty surprise. What you expect to find in the room, your experiences leading up to entering the room or your purpose in going into the room also bear greatly on the *contour* of feeling involved in that pattern, and therefore, on the meaning of the experience.

Image schemas are part of an embodied view of meaning and thought in which the continuity of experience is maintained. This means that the most refined and abstract thought is a bodily process that reaches back into simple abstract discriminations from experiential patterns, has felt qualities, and is not severed from emotional and aesthetic involvement. Dewey's (1929a) conjoined term body-mind (p. 284) focuses precisely on the total embodied quality of experience from which feeling, perception, emotion and all higher, refined thought arise. As with Stern's vitality affects, image schemas are not the same as their descriptions or representations: they are patterns of experience that mainly operate below the level of consciousness (M. Johnson, 2007a, p. 138), yet play a crucial part in feeling, emotion, thought, meaning and reason. Image schemas do not represent experience, but *are* experience. Emotions, vitality affects and image schemas all operate autonomously at the pre-reflective level of awareness, but greatly influence our thoughts, concepts and language. These three elements operate under the surface, and are part of our assumptions, expectations and normal ways of thinking, acting and communicating. And it is because they are normally hidden, yet so ubiquitous in experience, that I suggest that they are an important subject-matter for game design.

4.2.3 Bία~Forms: compositions of embodied patterns

In this section so far, I have examined three theories that each emphasise different patterns in immediate experience: emotions, vitality affects and image schemas. The embodied patterns in a game experience are experiential forms that have been shaped by the process of game design. In the remainder of this thesis, I refer to the composition of embodied patterns in a game experience as Bία~Forms, (pronounced bye-ya-forms), which is a term I have constructed that means *the shape of energy.*[19] Bία~Forms are significant because they are embodied generalising structures of dynamic experience, which have structural characteristics that relate to a game's formal systems. This continuity between the experiential and the abstract is a meaningful connection between the design of form elements and the embodied patterns that emerge from those elements in gameplay. Because of this connection, I propose that Bία~Forms offer the basis for understanding our experience of games in a way that connects:

- the logical structure of the formal elements of a game
- the aesthetic experience of gameplay and patterns of embodied meaning
- the metaphorical projection of those pattern structures in language and reflective thought.

Because the concept of Bία~Forms unifies designed forms, experiential forms and conceptual forms, it suggests a way of understanding design coherence and important relationships in the unified outcome of game design inquiry.

Three features of my concept of Bία~Forms stand out as relevant for game design:

1. As a concept, Bία~Forms reveal the basic and autonomous nature of embodied patterns, which have power in organising experience. Bία~Forms also reveal structural relationships between formal game elements, cross-modal and spatio-temporal patterns of experience, concepts and language. Bία~Forms therefore reveal

[19] In Greek mythology, Bία was the personification of force, compulsion, raw energy, strength and sometimes violence.

logical entailments in each of these domains, which affect the work of game design. For example, the term *wave* is commonly used in the design of combat encounters in many games, in which the player must defend against an onslaught of enemies that come *from* certain places in the game environment, *to* attack the player or another target (a from–to schema). Good wave design involves dynamics of ebb and flow in attention, threat, challenge and combat activity. As a result of these dynamics, the player must act skillfully and efficiently to prevent being overwhelmed by the *flood* (a concept expressing a vitality affect) of enemies. A good wave design should also push the player to the edge of their capabilities and resource limits, creating the feeling of trying to *keep your head above water* so you can prepare to meet the next wave.

2. Given their general abstract structure, Bία~Forms have the capacity to be imaginatively applied to other domains of experience. Representations of image schemas and vitality affects can serve as generative structures. They do this by allowing the metaphorical transformation of domains of experience that are complex, abstract or difficult to put into words, into familiar patterns involving space, time and objects. Rusch (2012) observed this transformation in designing a game about depression where the game space is an "emotional landscape" (p. 255).
3. As recurring patterns of experience that have space–time–object structural relations, it is obvious that games already make use of image-schematic structures. This fact suggests that one of, if not *the* special subject-matter of games, is *intensification, refinement and transformation of recurring embodied patterns of experience*.

I will now demonstrate point 3 above with examples from *Chess* and *Battlefield 1943*. In *Chess*, the varied rules governing movement of pieces on a grid create a structure that affords a number of patterns. The squares are containers, and every move makes the inside–outside pattern *important* in a personal, felt way. As players evaluate the possible moves, or appraise an opponent's move, they will experience from–to, source–path–goal, near–far, left–right and blockage schemas. In particular, the effect in play is that all of these patterns are intensified and take on greater meaning and significance, including changes that create emotion, and the feeling of emotional change over time. Every move of a piece involves a number of image-schematic patterns that have emotional contours, which vary as the game goes on.

The conquest mode of *Battlefield 1943* uses a capture-the-flag gameplay mode common to online multiplayer shooter games. Players can capture a flag-marked location in the game world by positioning themselves near the flag, and staying within a certain capture radius while fighting to keep opposing players out. This kind of gameplay emphasises the importance of being *in* or *out* of the special flag zone. The *inside–outside* schema becomes a centre of attention, purpose, action and conflict, and the difference between being in or out of the flag zone is intensely felt. Many image schemas, such as *source–path–goal*, are ubiquitous in action gameplay, for example: traversing to a point in a game level; shooting at enemies or avoiding lobbed projectiles; and developing a strategy around a tough melee-attacking enemy who suddenly sees you and closes in on your position. The ubiquity and generality of these patterns make them a stable foundation for game design, and the task of the game designer is to shape both the way the pattern is experienced and its meaning in play. To put this more simply, *recurring patterns of experience become intensified, refined and meaningfully transformed in games because of the special constraints of game rules*.

The question of what game designers do with the game structures that co-create Bία~Forms is a question of *composition*. Dewey (1934) emphasises the importance of living in a world in which "moments of fulfillment punctuate experience with rhythmically enjoyed intervals" (p. 16). Alexander (1998) states that, for Dewey, the "rhythmic flow of life is the basis for our experience of meaning and value in the world" (p. 11). McCarthy and Wright (2004) observe that the "rhythmic dance of aesthetic experience has an internal, dynamic structure" (p. 62), which Dewey identified in processes of "cumulation, conservation, tension, and anticipation" (p. 62).

It is probably no accident that patterns as simple as image schemas have not previously been considered as worthy of attention in game design. These patterns are basic and mundane, and our bodies hide them from our awareness: despite this, they manifest in our concepts, language and feelings, and thus, certainly are a part (albeit an unnoticed part) of current game design activity. Until now, these patterns have not been part of our awareness, and philosophical foundations for game design have so far struggled to discover something so basic and stable. However, as Johnson notes (2007a, p. 139), such basic, ordinary patterns are not trivial, and Gendlin (1995, pp. 553-554) points out that the idea of image schemas sits well at the interface of the embodied and the formal. What has been missing is not a vocabulary of game design concepts, but an awareness of what is the essentially human concern in game activity, what our game design concepts do with these basic embodied patterns, and how our game designs become integrated into complete experiences.

4.3 Embodied meaning in the play of games

In general, designers work with new ways of *being* in new human–environment configurations; their core design activities and concerns relate to understanding the way people make sense of their experiences with artifacts, and understanding how people come to know how artifacts work and what artifacts mean in use (Krippendorff, 2006, p. 77). A theory of meaning for design must address how people understand the possibilities for action in their environment, and the results of actions they perform (Krippendorff, 2006, p. 77). Additionally, a theory of meaning that supports game development must explain how experiences become meaningful, and must be useful in considering how games can be designed to reach that end.

4.3.1 The interface that sustains meaningful experience

Designing meaningful experiences that depend on computers requires a concept of how interfaces facilitate meaningful experience. Describing the parts that make up an interface is not the same thing as the interface itself. Despite this, it is common to conceive of an interface in terms of input or output devices, or the graphical elements on a display screen (known in game development as GUI, which stands for graphical user interface). In the input/output view, the player uses an input device as a control mechanism to send instructions to the game; then, visual, audio and haptic signals deliver the game outputs (Juul & Norton, 2009; Novak, 2012, pp. 241-246). In the sciences, it is common to treat the interface as a boundary between inner and outer systems (Klabbers, 2006, p. 119; Simon, 1996, p. 6). However, this view is inadequate for game design because it excludes any account of meaningful engagement.

Rather than a boundary, an interface (in the case of a game) can be understood as something that comes into existence when the player and game artifact merge. As Krippendorff (2006) states, interface indicates a “between-ness” (pp. 78-79), or mediation, between the user and technological artifact. He argues that an interface is a “human-technological symbiosis that cannot be attended to without reference to both” (p. 9), and that “*interfaces are prolonged and ideally intrinsically motivating interactions* between human actors and their artifacts” (p. 79, original emphasis). Laurel (1993, pp. 12-22) took the conception of interface—as a *connection* between user and computer, rather than a *cut* or separation—in a direction that focused interactions with computers on the metaphor of the theatre. Laurel emphasises the importance of human agency and the meaningful participation in a drama of computer representations; she takes computer games as an exemplar of this kind of *joining* of participant and computer technology in action, on a stage featuring representations of action.

Players’ actions in the game world cause events to unfold, as if they were actors in a drama. Interaction in games is therefore not only what the player does to the game, but also what the game does to the player in return. A more useful concept of this reciprocally effecting player–game situation is what Dewey carefully refers to as a *trans-action* (Dewey, 1930 / 1998a, p. 68). Knowing what constitutes an interaction requires only knowledge of the objects, actions and events. It is a different thing to know the quality of a *transaction,* and it is only by experiencing a playable game that the quality of the player–game transaction can be judged for design consideration.

Meaning is a process of understanding, which, according to Krippendorff (2006), is a cycle of sensing, making meaning and acting in the world (pp. 82-83). An interface allows the player to sense the game world and the effect of their presence in it. To be *interfaced* when engaged with a technological artifact, is to have a meaningful game experience: when the interface breaks down, so does the ability to sense, act and make meaning (pp. 78-89). Interfaces allow the user of the artifact to recognise where they are, explore what they can do, and focus their attention on the experience of the artifact itself, not the interface (pp. 88-91). From this perspective, the interface of a game is not simply inputs, outputs and GUI elements. Instead, considering games from

Krippendorff's (2006) perspective, the *entire* game world is an interface that suggests to the player "everything that is needed to continue a 'productive dance'" (p. 9).

Because each game world is a new experiential phenomenon, the game world is an interface that extends "human capabilities into the otherwise incomprehensible" (p. 9). The game world, when seen in this way, must be understandable by the player, and the interface allows the player to interact "as *naturally* and effortlessly as possible, without causing disruptions and reasons to fear failure" (p. 9, original emphasis). Krippendorff (2006) notes that in such situations of unfulfilled expectations, what breaks down is usually not the artifact, or the user's concepts or memories (although things can go wrong in both cases). What breaks down is

> the *meaningfulness* of the interface of which we are a part. This happens when meanings and actions lead us to expect something that is contradicted by what is sensed, when expected and actual senses deviate significantly. ...When experienced and expected senses do not match, disruptions occur. To recover from such losses of meaning, we need to pause and reconstruct the concept of the artifact or object we are facing. (pp. 84-85, emphasis added)

Game designers usually want players to experience an uninterrupted interface, but at times, designers also deliberately play with the appearance of game objects in order to cast doubt on what it suggests to the player. Some deception or obfuscation of meaning is desirable when you want players to be perplexed and puzzled, but there cannot be a complete loss of appropriate sense, which would lead to disruption rather than the drive to inquire, experiment and solve problems. Krippendorff's view of interface is a critical tool for understanding sustained meaningful engagement between player and game. The iterative game development process is, I argue, centrally concerned with improving problematic design implementations by identifying where in the gameplay cycle appropriate sense is lost, and meaning breaks down. In general, breakdown situations are design opportunities (Winograd & Flores, 1987, p. 78) to anticipate and prevent future breakdowns. For games, the resulting design changes are not limited to the abstract or functional parts of the game, but to any aspect that is involved in meaningful gameplay activity. The implication of this is that every aspect of game design is also a task of interface design, and must support sense, action and meaning-making so that a player can attend to the interface meaningfully. Interface design, in the sense I am using it, integrates technical, artistic and human-centred concerns as the basis of game design. The implication that arises from this understanding of player–game transactions is that the outcome of design inquiry is knowledge and understanding that allows better control of the interface.

4.3.2 Sense and meaning in action

Although games sometimes feature text and language, they are dominated by perception and action. The remaining sections in this chapter focus almost exclusively on meaning experienced during gameplay action.

As discussed in the previous section, an interface involves a cycle of sense, meaning-making and action. For Krippendorff (2006), "[s]ense is the feeling of being in contact with the world without reflection, interpretation, or explanation" (p. 50), and it involves all senses, including bodily feeling. Sense, as Krippendorff described it, is an embodied awareness, a "dimensionless feeling with numerous deviations", and it is the "tacit, taken for granted, and largely unconscious monitoring of what is" (pp. 50-51). Krippendorff's (2006) view of sense as "the background against which one notices what is unusual, unexpected, or different" (p. 50) is very similar to what Shusterman (2010) calls Dewey's "most basic dimension of aesthetic experience": the "immediately grasped quality of unity that binds the elements of an experience together" (pp. 30-31). Sense is being in touch with the world, or in the case of playing video games, with a video game world: it is the background from which meaning in gameplay arises. For Krippendorff (2006), meaning "is a way to remain in touch with a world that has become uncertain or in doubt" (p. 52). He distinguishes five complementary manifestations of meaning: "in perception, in reading, in language, in conversation with others, and as re-presentation" (p. 52). Perceived meaning can be considered in three ways: seeing, feeling and action, each of which is critically important to successful game design. I will now discuss each of these areas, beginning with perception in action.

According to James Gibson's (1986) ecological approach to perception (also known as *direct* perception), perception is integral with acting in an environment. Michaels & Carello (1981, pp. 14-17) state that direct perception is concerned with explaining how organisms know their environments and can successfully act within them through what is specified to the organism by objects in the environment. Human perception is therefore a human–environment system. A very useful aspect of Gibson's (1986) ecological approach to perception is the idea of affordances, a term which "implies the complementarity of the animal and the environment" (p. 127), and refers to both together: "The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (p. 127 (original emphasis)). Gibson argues that the values and meanings of things in the environment could be directly perceived (p. 127).

Norman (2002) examined ways that products succeed or fail to communicate their means of operation to those who use them, and developed the use of the term affordances in relation to designed products, saying that "affordances provide strong clues for the operation of things" (p. 9). Krippendorff (2006) elaborates the concept of affordances further, focusing on sense and meaning in use: affordances "are meanings that suggest the human ability to act so as to change an existing sense into a preferred one" (p. 53). His distinction between *perceived* affordances and *enacted* affordances draws attention to the design of situations in which affordances seem to exist, but may not be supported (p. 113).

Linderoth and Bennerstedt (2007, pp. 607-608) suggest that the "basic perceptual act for a computer gamer is to pick up affordances in the game environment. She or he sees possibilities for how to interact with the game". Thus, through the process of gameplay, the player develops the capacity to become "attentive to the differences in the perceptual field which shows her/him the game-specific affordances in the situation at hand". The game player's perceptual field is therefore uniquely adapted to the set of affordances in the game, and as the player's skill with games increases, the "represented phenomena in the games are very likely to become more and more peripheral". Linderoth and Bennerstedt (2007) conclude by saying that

> the most basic process when perceiving games is not to identify signs but to see the affordances in the gaming situation. This is not done by *construing* meaning i.e. adding elements/resources to each other, but a process of *differentiation*. (p. 608)

This conclusion points to an important tension in the nature of the meaning of game worlds in play, between:

1. the context for interpretation in reflective thought supplied by representations of game objects
2. the *differentiated* meaning of game objects in gameplay activity.

According to Krippendorff (2006), in perception, “meaning arises in the awareness of the *possibility of different ways of seeing*” (pp. 52-53, original emphasis). The visual sense usually dominates our perception, but *seeing*, in the sense of understanding, can be extended to all sensory modes. Krippendorff (2006) also states that meaning cannot be “separated from one’s bodily involvement with a perceived artifact” (p. 53). Similarly, Gendlin (1992 / 2012) claims that meaning cannot be separated from our bodily involvement in the situation because our “body-sense is part of (happens in, makes and re-makes, carries forward, is, ...) the situation” (Chapter A4-8). Our bodily involvement in an experienced situation is a network of meanings felt, from past meanings to possible meanings implied. Gendlin (1992 / 2012) refers to this bodily situation of feeling as an “implicit intricacy” (Chapter A5-4):

> An implicitly intricate body-sense functions in every situation—and in a highly orderly way. We would be quite lost without it. Our ongoing is always bodily sentient; there is an implicit sense of the situation, that whole intricacy. We can physically sense our body’s implying of the situation. (Chapter A5-4)

When something that is sensed suggests alternate ways of understanding it, it has a distinguished meaning. In Dewey’s terms, the thing suggested by what is sensed, has meaning if understanding it that way is valid in a network of meaning (Coleman, 2003, pp. 205-208). If, as Krippendorff suggested, meaning is the possibility of multiple ways of seeing, then a player can perceive a game world in terms of how it feels, what it affords or what it may signify if taken in reflective thought as a sign to be construed. The essential consideration for game design is that all three ways of meaningfully perceiving are subject to the shifting context supplied by interacting game rules.

4.3.3 The space of possible meanings of artifacts in use

Games provide many meanings that relate to the possible ways a game can be played and interacted with. Gendlin (1992 / 2012) states that our sense of a situation, and what "the situation is [,] involves the further events which it implies, makes possible, or prevents. Human events are always implying. What they are includes the implying of further events" (Chapter A5-5). In addition, because the "situation implies further events and each of these implies and enables possible actions", a "situation consists of implicit action-possibilities" (Chapter A5-5). According to Gendlin (1992 / 2012) "When we know the implied action-possibilities we know *what the situation is*" (Chapter A5-6 (original emphasis)). Therefore, in knowing this, one "always acts according to the meaning of what one faces" (Krippendorff, 2006, p. 58). For the designer, this must be taken as a principle that "always concerns sets of possibilities and presupposes human agency" (Krippendorff, 2006, p. 58). What one faces portends something in terms of possible outcomes and one's capacity to respond. In understanding how someone senses a design, we must feel what the design can imply. As Dewey (1929a) says:

> A thing is more significantly what it makes possible than what it immediately is. The very conception of cognitive meaning, intellectual significance, is that things in their immediacy are subordinated to what they portend and give evidence of. (p. 128)

Games playfully explore sets of possibilities through constrained agency. Therefore, the meaning of what one faces is systematically unique to the rule set and the particular agency of a particular game design. Duke (1981b) reached a similar conclusion over 40 years ago, although his viewpoint (as one of his three design principles) refers to higher cognitive levels of language, and more specifically, the use of symbolic structure:

> A game is really a "language" which entails the integrated use of (an) existing language(s) as well as a "game-specific" language designed for the particular game. (A language is defined as a shared symbol set subject to conventions of use.) These definitions suggest that two levels of skill are required of the game designer; first, the clear articulation of the game-specific language to ensure rapid and effective player use; and, second, careful integration of this new and unique language with each of the other modes of communication employed in this particular game. Any symbolism which is unique to the game represents a hurdle to the players until it has been assimilated. New symbols should only be introduced for specific purposes and players must be trained in their meaning. (p. 50)

Rather than focus on meaning at the level of symbols, I view meaningful interaction in games as embodied and beginning before any reflective, cognitive processes: at the level of sense, emotion, perception and action. I suggest a modified version of Duke's important insight: a game artifact produces its own particular constraints on meaning within the game experience. These constraints are systematic and language-like: in video games, this is meaning *in use,* supported by the context of possible symbolic meanings.

Considerations of sense and meaning for game deign

Games are complex systems that make use of diverse media types and technologies, rely on multiple methods of expression, and incorporate multiple modes of sensing and ways of acting. The many elements and aspects of a game experience can potentially invoke meaning (which may not be the right meaning), or, disrupt meaning. To suggest the right kind of meanings there must be coherence between three factors: what is sensed, the possibilities of the game, and what agency is supported (and therefore leads to actions and results in new senses). Krippendorff (2006) emphasises that meanings depend on, and are limited by, context, and "artifacts mean what their contexts permit" (p. 59). The dependency of meaning on limiting contexts suggests at least five important considerations for game design:

1. Rules and game systems change the context in which sense is made.
2. Different game structures and configurations will create different contexts: therefore, different possible meanings can emerge, particularly as the game is tested with greater numbers of players.
3. Anything in a game that is sensed visually, aurally and haptically has a part–whole, or *metonymic*, relation to the meaning of what a player faces. *What* is sensed invokes meaning, which shapes what things can be understood as, and therefore shapes further meaning and action.
4. Because, as Krippendorff (2006) states, "the meanings of artifacts become manifest in the set of all social contexts in which artifacts can be used without inviting disapproval or sanctions" (p. 61), the social contexts of playtesting must influence the range of possible meanings or breakdowns in meaning to be discovered. A development team's culture will therefore create a different context for the meaning of the game than what outsiders will experience.
5. From 1, 2 and 3, a more general consideration is pointed out by Krippendorff (2006), who says that the "meaning of an artifact's parts depend on the meaning of their arrangement, just as the meaning of the arrangement depends on that of its

parts. There is no simple entry into this circle of dependencies" (p. 61). Game designers therefore face a difficult challenge because the parts (form elements) and the whole experience are continually changing and developing. This is one explanation for the iterative nature of game development because to develop coherent meanings requires alternate cycles of sensing the whole in terms of the parts, and the parts in terms of the whole, with modifications at each step. This in turn necessitates further cycles to make sense of the changes.

4.3.4 The inquiring player

An important consideration in the design of affordances, symbols and contexts in games from which meaning is constructed, is how a player comes to learn and understand their use and meaning. Each video game provides players an experience that typically follows a certain sequence. As with games in general, the player must accept the game and agree to become a player (Huizinga, 1949, pp. 10-11). Then, the player engages with the game world, learns its rules and the meaning of its representations, discovers its possibility space, understands its systems, and masters a range of skills.

To become a player of a game is to engage in a learning process (Juul, 2005, location 1000), which may require significant commitment to understand all of the possibilities, meanings and strategies within the game system. Strategic games with simple rules, such as *Go* or *Chess*, and the games of the arcade-game era, are easy to learn, but hard to master. In the home-computer era, games became more complex and many required a printed manual so the player could understand how to play. Since then, the design of learning systems in games has improved such that learning occurs within the game itself, as part of gameplay. The game *Hearthstone: Heroes of Warcraft* masterfully demonstrates the effectiveness of adaptive, interactive instruction, using visual, auditory and symbolic information *just in time* and *on demand* (Gee, 2007, pp. 37-38). *Hearthstone* also demonstrates how the design of learning systems goes deep into the design and composition of the game experience itself, including the design of information feedback and gameplay sequences.

Gee (2007) observes that game designers have learned to turn their interactive imaginary worlds into enticing problematic situations. Beginning players go through deliberately constructed scenarios that involve simplified systems and isolated mechanics, and therefore, involve limited possibilities for action (i.e. limited possibility space) with low risk of being overwhelmed. Gee uses the metaphor of "fish tanks" (pp. 38-39) to characterise this approach. He also uses the concept of "sandboxes" (pp. 39-40): gameplay scenarios that involve all systems and mechanics, but with mitigated risk of failure, to help players develop skills that can then be used as strategies in facing more complex and challenging scenarios (pp. 40-41). The development of mastery is facilitated through what Gee calls "cycles of expertise" (p. 37): a series of resistances to action that gradually increase the challenge. If a game uses consistently designed mechanics, systems, objects and puzzles within a consistent logical system, players can rely on "well-ordered problems" (p. 35). In Gee's analysis, game designers thus ensure that the problems players face early on are "well designed to lead them to hypotheses that work well, not just on these problems, but as aspects of the solutions of later, harder problems as well" (p. 35). Good level design of this type is exemplified by *Super Mario Bros.* or *Super Metroid*.

Sustained meaningful engagement with a game requires learning to stretch across much of the player experience. Challenges can be extended by introducing new mechanics, game configurations, and rule variations or exceptions, such that many new gameplay combinations and strategies are possible. In *Dark Souls*, the player is taken on a demanding but satisfying journey of perplexing situations, tough challenges and alluring goals, all of which must be resolved through gameplay action, experimentation and further mastery. However, a significant game development problem is that game designers have expert understanding of, and skills with, the game they are making, while players naturally differ in skill levels, experience of games and general knowledge of the world. This "curse of knowledge" (Camerer, Loewenstein, & Weber, 1989, p. 1233; Wieman, 2007) represents a central tension in the design of games. Games should offer the player opportunities to gain skills and knowledge through exploration and demonstrate their skills and knowledge through action. For the designer, this is a balance between developing interesting, perplexing or challenging gameplay situations, and structuring these situations in a way that players can handle them at their own pace without getting stuck or becoming frustrated to the point of stopping playing. This balance is usually found through extensive testing of the game with a wide range of players.

4.4 Summary

Game design is, above all else, the design of *experiences*, and this chapter has discussed several important concepts relating to basic, embodied aspects of experiencing the world. Dewey understood lived experience as a rhythmic interpenetration of precarious and stable qualities, means, ends and ends-in-view. From these basic traits, it becomes clear that game design involves the design, intensification and refinement of a range of dynamic patterns that produce emotions, meaning, and importantly, form the basis of concepts through metaphoric projection. Game designers apprehend the richness of reality and imagination, and reduce it to abstract structures and rules which indirectly shape the game experience and its signature qualities. The various possibilities in game design lead designers to play with qualitative unity while maintaining it in balance. I have coined the term *Bία~Forms* to refer to the composition of experiential gestalts (emotional, vitality affect and image-schematic embodied patterns) experienced in the moment of play. Bία~Forms allow us to understand game experiences in a way that maintains continuity between the designed formal structure of a game (form elements) and the aesthetics and meanings that inform action, reflective thought and conceptualisation during play.

The player's meaningful experience of a game is sustained through an *interface.* This interface permits undisrupted cycles of acting, sensemaking and forming meaning, and involves a process of learning through play. Krippendorff states that we always act in terms of the meaning of what we face, and that meaning is not separable from bodily engagement with a perceived artifact. Meaning thus arises in the awareness of possible ways of seeing and acting. Gendlin adds that meaning comes from our sense of a situation, and what the situation implies, makes possible or prevents. The possible meanings in gameplay relate to the possibilities of agency and the implications of what is sensed, which are often puzzling or constrained by design. To conclude, the goal of the game designer's inquiry develops from the subject-matter of game design. This is a game experience in which the game concept, Bία~Forms and formal elements are coherently integrated, resulting (for the player) in the sense of a signature qualitative character that invokes coherent meanings and supports learning and successful action. The player's transactions with the game support the playful, rhythmic development of that quality over time. The way such a *coherent whole* might develop will be explored in later chapters.

Chapter 5: Characteristics of game experiences and game design

5 Introduction

This chapter provides a preliminary examination of concepts that relate to the practice of game design, in preparation for the in-depth discussion of game design in Chapters 6 to 9. The concepts examined in this chapter include characteristics of games and game experiences, and the forms, knowledge and values that are particular to designing games.

Many concepts found in the literature relating to games are generalisations, categorisations and definitions constructed for the purpose of making sense of, and organising, the vast amount of territory that game design covers. Järvinen (2008) examined characteristics of games and game experiences as part of developing a general theory for game analysis. His research included an attempt to create an ontological definition of game experiences, for which he divided into three broad classes of game elements:

1. Systemic: the formal parts of a system.
2. Behavioural: the human, phenomenal aspect of games.
3. Compound: goals, rules, mechanics, interface and theme.

In this scheme, compound elements facilitate and govern the interaction between systemic and behavioural elements.

Järvinen's scheme may serve analytic purposes, but I suggest that it is a mistake to assume that analytic categorical concepts can provide a language adequate to the requirements of game design because game design only indirectly controls the game experience. Characteristics of games are, prior to conceptualisation, forms of experience from which conceptual, logical and aesthetic distinctions are derived for intellectual control in meeting a particular purpose. Game characteristics, as conceptual instruments, make important distinctions about kinds of things in the game experience and characterise how those things are related. However, in the process of designing games, I argue that the primary purpose of such concepts is not to *describe* phenomena, but to assist in formulating problems and possible solutions, such as finding ways to improve the game experience.

As conceptual instruments, game characteristics therefore discriminate and assemble a range of interacting concepts. Game characteristics also denote experiential wholes that players encounter during play: these are the second-order effects of the integrated constituent parts that make up a game. Unlike Järvinen, I am not aiming to provide an exhaustive model or descriptive analytic tool for analysing games. In contrast, I focus on:

1. the formal elements that game designers and developers create and manipulate to create a game experience at second order
2. the concepts that denote either the experiential complexes in which such formal elements are present and implied, or the classes and kinds of things in a game experience
3. the use of such concepts as tools that direct inquiry, in conjunction with the values, design constraints and creative ideals that shape and integrate the formal elements.

I will attempt to show that game design concepts should be understood as being flexibly involved in different modes of game design thought and action. Rather than being simply analytic, reductive or categorical tools, I claim that game design concepts are implicated in a range of logical, evaluative and integrative action within an inquiry process.

In Section 5.1, I discuss characteristics of games as a designed artifact, such as rules and game objects. In Section 5.2, I examine characteristics of game experiences, which are significant traits or relationships that we identify in reflecting on the experience of playing complete, functional and enjoyable games. I consider how these concepts also serve an integrative function in game design activity. Designing and making games involves *knowing* as part of a practical, integrative process. Therefore, in Section 5.3, I discuss the co-development of game artifact and design knowledge from the perspective of the theory of tacit knowing.

5.1 Characteristics of the design of game worlds: form elements and integrative concepts

In this section, I will first consider the discrete (and largely abstract) elements that games are made from, and which are directly under the control of the designer. This includes the spatial, visual, audio, symbolic and procedural forms that contribute to the game experience.

The parts of the game that game developers construct are forms that both constrain and enable gameplay, and thus, indirectly determine the game experience as a meaningful whole. These parts are the objective source of the various forces that operate in the game experience, and I will therefore refer to them collectively as *form elements*. Dewey (1934) defines form as "the operation of forces that carry the experience of an event, object, scene, and situation to its own integral fulfillment" (p. 142). Form elements are more than formal game objects. They include all forms under the direct control of design and manipulation of game making, which include:

- abstract objects and formal structures
- rules and conditions
- game mechanisms and systems
- structures of game elements
- the game code: program structures, procedures and data
- appearances of game objects (visuals, sound, text).

5.1.1 Abstractions, formal structures, rules and conditions

At its core, game design activity involves making logical distinctions that abstract and reduce some phenomenon or idea to a rigid formal structure. This formal structure sets a game apart from real-life activities. To permit the existence of a game is to accept abstract objects, relationships and rulings. Huizinga (1949) notes that play "creates order, is order. Into an imperfect world and into the confusion of life it brings a temporary, a limited perfection. Play demands order absolute and supreme" (p. 10).

As mentioned in Section 2.1, a game world is made up of game objects, which are logical or mathematical abstractions that *may* also have visible representations in the game. For example, the superhero game *inFAMOUS* features a player character that can climb and jump athletically around a realistic city environment. The game program uses invisible dummy objects to mark locations on window ledges, railings and other apparently climbable objects, so that the gameplay code can successfully search for places the player character may grab or land on (C. Zimmerman, 2010). The concept of a game object can be understood in terms of what Lakoff and Johnson (1980) call *conceptual metaphors*. Each object can have particular properties (container metaphor), appearances (costume metaphor), behaviours (agent metaphor) and relationships with other objects (network metaphor). From the perspective of a game designer, game objects are general abstract entities with attributes (Fullerton et al., 2008, p. 69), which can be in various states (Schell, 2008, p. 136) and are part of systems (Salen & Zimmerman, 2004, p. 50). This object model maps well to the technical entities, actors or agents that a typical object-oriented game engine uses (Gregory, 2014, p. 853).

To design a game requires the ability to theorise about possible meanings of abstract structures and logical forms when they are employed for deliberate effect. This ability is a perceptive and imaginative skill for transforming dynamic phenomena into systems designed for playful intervention. Greenblat (1981) notes that game design is "the systematic translation of understandings into an operational model—and subsequent examination of the model through observation of play" (p. 41). Crucial features of this game design process include that it (p. 42):

- "requires a systematic understanding of the topic—a push to synthesize"
- "forces clarity in thinking about elements—and pushes one to think at various levels of abstraction"
- "forces a search for concreteness".

This objective and conjectural modelling method produces the objects in a game, and is performed by designers in the multi-disciplinary pathway from conception to implementation and refinement; this method must take into account the simultaneous requirements of many technical systems, and numerous domains and levels of abstraction (e.g. conceptual, procedural, visual, audio, haptic or purely logical). This habit of abstraction is an efficient way of stabilising and modelling reality (Dewey, 1929a): however, for game developers, it is also an exercise in efficient production and usability. Game designers, and game programmers, generally try to create systems that have the simplest number of components that will combine or vary to produce complex interactions (Burgun, 2013; Griesemer, 2010). The benefits of such abstraction include improved production, extension and modification of game elements, in addition to wider appeal for players due to a less complex play experience.

Rules and conditions

Rule-making is a logical activity. Designing game objects and systems is a form of rule-making: to design rules, is to intend things to play out one way rather than another. Game rules can form hierarchies, with some rules taking precedence over others. Game rules can also change or break other rules. Developing a network of rules can become complicated, and knowing how to configure rules and balance them to produce just the right effect in a system of rules requires a large investment in time and experimentation. Every game has a designed set of interrelated rules that determines procedures and constraints, and therefore, significantly determines the particular character of a game experience. Rules that determine or trigger effects (Fullerton et al., 2008, p. 71) are very important in game design. I call these *conditions*, and they specify how and when a game state changes or an event occurs. Form elements need to be built for configurability, so that they can produce variant forms and allow for experimentation. The game designer can experiment with various configurations of game settings to produce distinct *mechanisms* of gameplay, or reconfigure these mechanisms to work in different ways.

5.1.2 Game mechanics

The term game mechanic is a common-sense term that simply means an important rule or mechanism that makes the game play in a particular, identifiable way (Brathwaite & Schreiber, 2009, p. 28). Perhaps because the term is used so ubiquitously in discussions of game design, there have been many attempts to define what game mechanics are. Each attempt reveals a different way of grasping how a game works the way it does.

In Hunicke, Leblanc and Zubek’s (2004) MDA (mechanics, dynamics, aesthetics) analytic design framework, mechanics are defined as “the various actions, behaviors and control mechanisms afforded to the player" (pp. 2-3), but also "particular components of the game, at the level of data representation and algorithms" (pp. 2-3). MDA is intended as a two-way analytic method, for analysing the game experience to refine game components, and vice versa (p. 1). Cook (2006) defines game mechanics as "rule based systems / simulations that facilitate and encourage a user to explore and learn the properties of their possibility space through the use of feedback mechanisms". Schell emphasises that mechanics cannot be designed without also designing supporting technology, communicative aesthetics and a story that allows the sometimes-strange mechanics to make sense to players (p. 41). However, he also considers mechanics to be essentially abstract: "they are the interactions and relationships that remain when all of the aesthetics, technology, and story are stripped away" (p. 130).

The mathematical, relational core of a game mechanic is clear when considering how similar game mechanics can be distinguished by the way they transform the player's inputs into changes in the game world (Sigman, 2009). For example, different algorithms could process a button press differently, resulting in three completely different character jumping behaviours (Kevin, 2010). Three types of jumps are depicted in Figure 5.1: *jump A* launches the player character with a fixed impulse, *jump B* adds more impulse the longer the button is held down, and *jump C* scales the impulse to the player's velocity at the time of jumping.

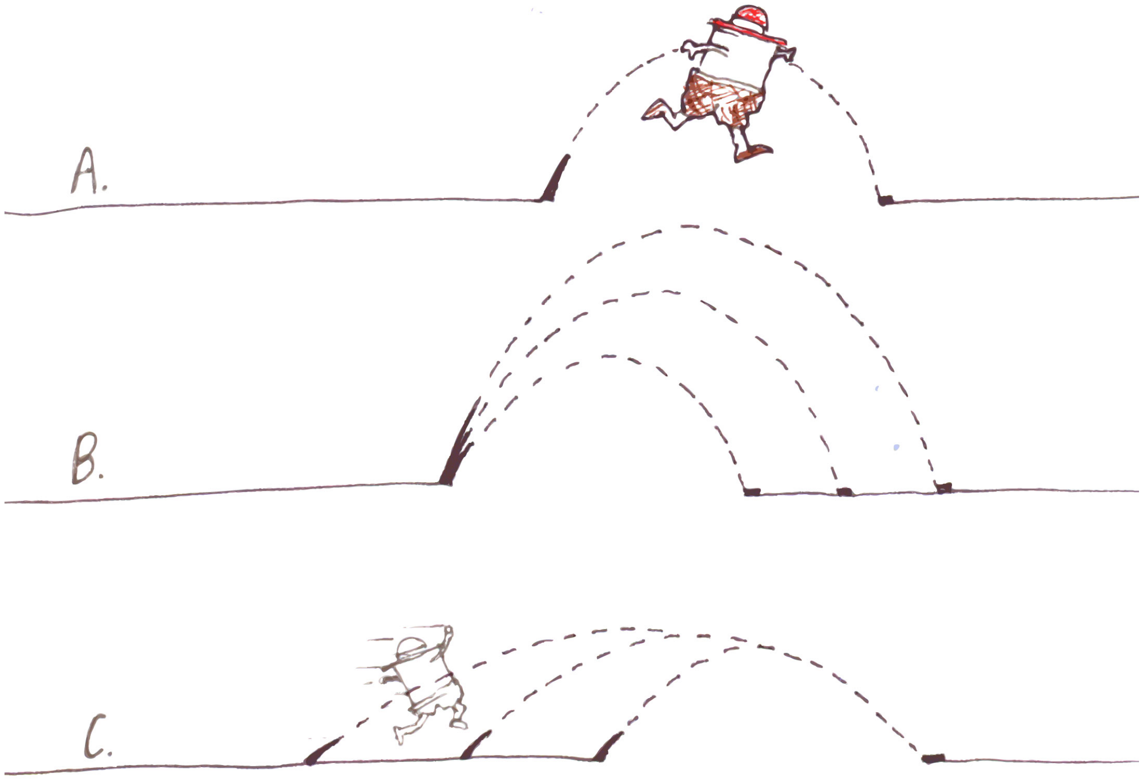

Figure 5.1. Three different jump mechanics

Although mechanics can be reduced to abstract relationships, the *concept* of a mechanic extends more broadly, referring to particular qualities of an imagined or real game experience. Such *concepts* integrate the way things work in space, with game objects, through actions, rules and changing game states, resulting in feedback: they entail the meaningful play of choosing actions with consideration to skill, chance, obstacles and goals. In Järvinen's (2008) scheme, mechanics are compound elements, combining the formal and experiential elements of games through the actions of the player. These player actions come from the player's perception of what the game system affords (p. 39). The abstract elements of a game mechanic and the general shape of its dynamics provide a recurrent, stable pattern to the play experience. This pattern is the form that makes one mechanic feel coherent, yet different, from others, but the integrity of the pattern relies on everything that is involved in a particular gameplay interaction.

Game mechanics are shaped by form elements but cannot be completely defined by them. Game mechanics are also characterised by their particular *quality* of experience, just as jumping barefoot up a sandy slope would have a different quality to jumping on a trampoline in stiletto heels. Using the example of a jumping mechanic, a game environment and the challenges contained within it are designed to produce an overall, distinctive gameplay dynamic for a particular jump mechanism. A single game environment would produce qualitatively different experiences for each different jump mechanic used.

Game designers vary environment and challenge designs to give depth and range to the use of a single game mechanic, while retaining and developing the signature qualitative character of that mechanic. Most importantly, mechanics, and the environments and challenges that make use of them, are designed to work in conjunction with other mechanics. Three examples of mechanics from the game *inFAMOUS* illustrate the way game mechanics work together:

1. Cole's energy reserves serve as the player's health and ammunition
2. Cole can clamber up drainpipes on the side of a building, which allows the player to reach the tops of buildings and access overhead power lines
3. Cole's superpowers allow him to jump onto, and glide along, overhead power lines to quickly get from the top of one building to another. Doing this may also refill Cole's energy reserves.

Each mechanic has a different quality to it, and can occur in a variety of different gameplay contexts, such as leisurely exploration or intense combat.

Game mechanics are features of game systems, and may therefore be conceived systemically. According to Meadows (2008, p. 11), a system is a set of interconnected elements that are organised according to a function, or to reach a purpose. The complex, systemic and gestalt nature of games has long been acknowledged (Duke, 1974; Greenblat & Duke, 1981). In terms of system dynamics theory, as described by Meadows (2008), the structural elements of a game system are game objects, which may have properties such as states and variables. Some of these variables can be considered as quantities (stocks) that change over time (flows) (p. 17). Game systems also contain what are called reinforcing or damping/balancing feedback loops (pp. 24-34), which act as control mechanisms on the rate of flow of stocks. The loops are caused when the change in the *value* of a stock affects the *rate* of further change in the system (p. 25). Systems theory also provides a useful shorthand for distinct nonlinear phenomena (pp. 91-92) such as runaway growth or oscillation, which are often observed in games. Such system behaviours are produced by particular configurations of balancing and reinforcing feedback loops, and by the delayed effects in system structures (p. 23). Additionally, systems theory helps to explain the phenomenon of emergent behaviour, which is of significant interest and appeal in game experiences and game design (Sweetser, 2006).

Game mechanics and systems are deeply bound up with player actions, even though it is usual to think of game systems as autonomous devices that provide consequences to player actions. For example, *inFAMOUS* has numerous systems that simulate city life: pedestrians on the streets, roaming or territorial enemy gangs and cars driving around. These systems can operate on their own: cars drive and obey the road rules, and pedestrians wander around and respond to cars and gangs in appropriate ways. But the player can use the game's mechanics to intervene in these systems and cause them to change behaviour and interact in new ways, which, in turn, may allow the game mechanics to work differently, and may open up new possibilities for intervention.

In practice, the distinctions between mechanics—as inputs and outputs, or abstract patterns or player experience—are blurred. How game mechanics are understood depends on how those discussing them want to use the concept. Mechanics denote a particular way that abstract forms consistently shape, but do not completely determine, the game experience. This is so because game designers need a way to talk about patterns in the experiential gestalt. A game mechanic is not reducible to a form element: instead it entails everything that is involved (*including* form elements) in producing a particular recurrent pattern of play. Mechanics *depend* on the logical forms that develop in the process of making games, but cannot be easily reduced to them.

For the purposes of game design, and for this research, there is no need to go further than to note that a game mechanic is an *integrative concept*. Integrative concepts (Estany & Martínez, 2013, pp. 98-99) bind together multiple other concepts, explanations or causes into a whole that "goes beyond the sum of the value of explanations grounded in the different concepts taken separately" (p. 99). I argue that when integrative concepts are required in game design, the mode of action is not analytic; in addition, the conceptual distinctions are not employed to separate elements, but to bind them together in response to a complex collection of concerns. The measure of effectiveness of the concept would therefore be expected to lie in the particular way it binds many issues local to the design situation together simultaneously.

5.1.3 Abstract gameplay structures and progression structures

Video games may involve any kind of playful activity, including minimally structured toy play or sandbox play (Salen & Zimmerman, 2004, pp. 72-73). However, adding structure or direction to play adds interest and motivation to keep playing, learning and achieving. Game-world spaces are structured designs that work well with the mechanics and systems of the game, as depicted in Figure 5.2. Gameplay structure is a configuration of game space and game objects (and their data), which makes the game work in a particular way. Games can have discontinuous structures, such as levels in *Pac-Man*, or the continuous structure of *Red Dead Redemption*, in which many different gameplay scenarios are available simply by travelling around the massive game world and finding them.

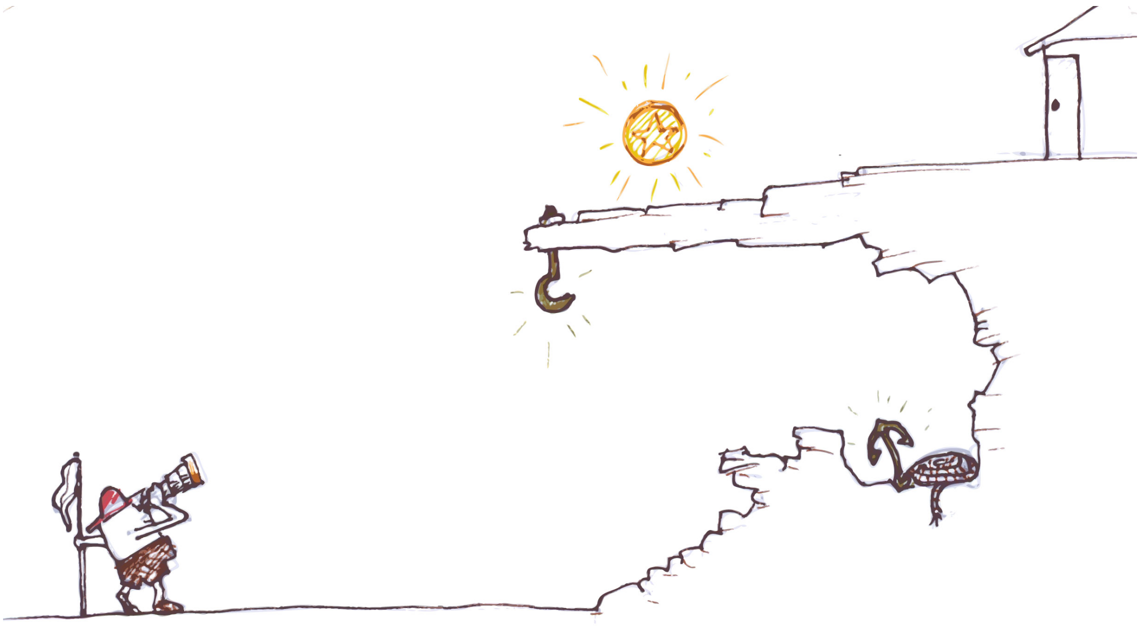

Figure 5.2. Level design: a form of gameplay structure

The design of game spaces and the placement of things in those spaces is generally known as *level design* or *environment design*. The main game mechanics—for example: exploration, combat, or climbing and obstacle traversal—complement the design and arrangement of 1) the static environment spaces or objects, and 2) the dynamic game objects placed around them. Smith and Worch (2010) state that a game environment "constrains and guides player movement through physical properties" (e.g. walls and stairs) and "ecology" (e.g. enemy and item placement). Additionally, a game environment and its ecology can be designed to "communicate simulation boundaries", and to communicate what these boundaries afford in terms of game mechanics, resources, and game systems.

In addition to the selection of game objects and choosing their spatial arrangement, the configuration of game object settings and their programmed scripts are key logical choices in the design of form elements. Configuration changes through scripting allow game objects (and less often, game spaces) to change during the game in response to choices the player has made or to story events, or during a special configuration of the game known as a mission or a quest. Game worlds and missions are populated with various kinds of challenges or encounters. Some kinds of challenges emerge from the game systems, for example, the challenge of evading law enforcement in the alert system in the *Grand Theft Auto* (*GTA*) games. Other challenges are scripted, such as puzzles or combat waves, and some might combine scripted or hand-placed encounters with systemic game-world elements. Levels, challenges, puzzles and encounters are all structured gameplay scenarios within a larger gameplay structure. Overall gameplay structure may emerge through experimentation or deliberate planning, and can be understood in terms of a nested hierarchy of challenges, goals and interactions (Adams, 2010, pp. 253-255; Cousins, 2004a, 2005; Tan & Jansz, 2008, p. 542). This structure also implies a hierarchy of *resistances* (obstacles) that can only be overcome using gameplay mechanics. The version of this hierarchical challenge/goal structure that I teach to game design students, and which I call *the goal hierarchy*, is similar but more detailed than those cited above, and is shown in Figure 5.3.

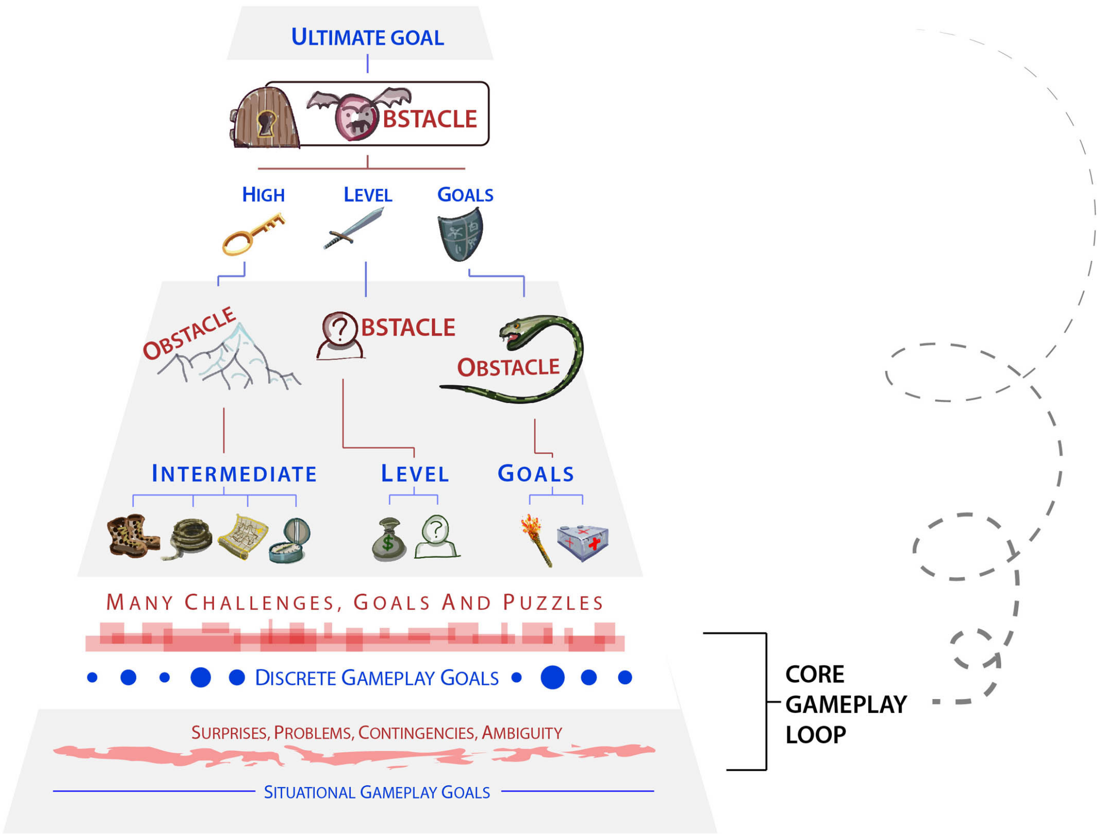

Figure 5.3. The goal hierarchy

The *ultimate goal* in the goal hierarchy is to reach the end of the game, whether that is to play through all the gameplay possibilities and scenarios or reach the end of the story. Obstacles to reaching this goal, and their accompanying milestone achievements and/or story elements, entail *high-level goals* that must be completed first. For example, *inFAMOUS* has a story that begins with the cataclysm that gives Cole his electrical superpowers. The high-level goals of subsequent gameplay missions involve finding out what caused the cataclysm, by investigating numerous mysteries and threats that have emerged in the city. Each mission in the game, as an obstacle to a high-level goal, also has its own obstacles and therefore entails *intermediate goals*. For example, one mission involves restoring power to a section of the city, which entails traversing underground environments and overcoming dangerous enemies to reach and repair a generator.

In overcoming obstacles to intermediate goals, *discrete gameplay goals* arise: goals that require the use of game mechanics and are directly attainable through gameplay activity. For example, to traverse the dangerous environments in *inFAMOUS*, the player uses

Cole's acrobatic climbing, jumping and environment traversal abilities;[20] defeating enemies requires ranged and melee combat, as well as special fighting abilities. While a player is using game mechanics to achieve discrete gameplay goals, many situations occur in which the need for specific actions emerge. Such *situational gameplay goals* usually relate to performing the gameplay activity well. For example, in *inFAMOUS*, using electrical abilities and taking damage from enemies reduces Cole's electrical energy reserves. If Cole's energy runs out, he dies and the game must be restarted from some previously saved game state. Therefore, when the player's energy is low, they will be forced to choose new goals, such as taking cover and finding a supply of electricity to drain, or using a less confrontational means of reaching an intermediate goal. The cycle of gameplay activity that involves the important gameplay mechanics and the typical gameplay experiences arising from situational goals is commonly known among game developers as *the core game loop*.

The hierarchy of goals and obstacles is a structure of gameplay scenarios that make use of, and develops, the core gameplay loop over the course of the game. The *way* the goal hierarchy and the gameplay loop develops is a structure of progression matched by the progression of a game's story and the player's learning. A highly influential game that popularised progression structures was the *Dungeons and Dragons* role-playing game system. Progression structures and narrative structures are complementary, and story goals and obstacles are often designed to relate directly to, or be the same as, gameplay goals and challenges. The concept of progression structures is used to refer to the composition of the game experience over longer periods of gameplay (Adams, 2010, pp. 76-77). Progression introduces changes to the game experience by providing further interest, enjoyment or challenge.

For the game designer, the issue of progression concerns rules and conditions that govern the way change is introduced into the gameplay structures, mechanics, systems, narrative, game environment, and game objects and their appearances. Progression systems offer goals and motivation to go further and allow the player to compare where they are *now*, to where they have come *from*, reminding them of their play history and increased mastery of the game. Progression structures are usually combined and

[20] These abilities are a central feature of the activity known as *parkour*.

interleaved so that a player experiences a rewarding sense of progress in multiple dimensions simultaneously. Not only does this allow a player choice in what goals to set next, but it also allows the player to focus on different aspects of the game experience. A player may play for a while to practise their skills, then follow the story, before exploring the game world and completing challenges: each option creates different senses of progress.

Game progression is a difficult design problem for three reasons. First, a player's sense of progress depends on their own path through the game, which means that there must already be a reasonably functioning game to play. Therefore, a good, appropriate or balanced progression configuration is *obscure* or *confused*[21] prior to significant testing with many players. Second, the specific need for progression structures can only be acutely identified when players get bored, stop enjoying parts of the game or focus too heavily on one part over others. Therefore, situations that *conflict*[22] with design goals, values or intentions become necessary design prompts. Third, balancing multidimensional progression structures requires all of the relevant dimensions to be simultaneously be in play and properly configurable. Therefore, game balance is *obscured*[23] in incomplete or inadequate implementations.

The way game structuring and progression relate to design coherence of model game worlds is through the values of consistency and continuity. Gingold (2005) has shown how the game *WarioWare Inc.: Mega MicroGame$!*, which features an incessant barrage of different micro games, each lasting about five seconds, plays with conventional design values:

> *WarioWare's* discontinuities point to how continuity is usually used to create coherent and playable games. A video game is a world with its own fiction, nouns, verbs, goals, and controls. An unstable fiction makes interpreting goals and controls confusing. Part of the cognitive friction *WarioWare* creates by changing games so fast, is that you can't map nouns and verbs from one game to the next. ... These surprises highlight the cognitive benefits of playing in a consistent world. (Gingold, 2005)

[21] IDS#4

[22] IDS#5

[23] IDS#6

For the design of coherent game worlds, consistency (H. Smith, 2002) and continuity are important design values. Gameplay structuring and game progression are therefore integrative design activities that deal with how the player experiences form elements in terms of the development of the whole game experience.

5.1.4 Context-shaping gameplay structures and progression structures

Plot, story and scenarios have long been recognised as an important game design consideration, in particular, because they help to lead players into the context of the game (Duke, 1981b, p. 50). Narrative forms and some kinds of game structures have much in common, particularly between *the hero's journey* (Campbell, 1949) or mythic archetypes, and action-adventure games, because these forms have a structure in which characters overcome trials (Dunniway, 2000; J. Johnson, 2009).

Many game experiences involve storytelling and narrative presentation. As with the game rules and sensible objects that players encounter, these story elements must be understood and become meaningful in the game experience. The implication of this player-centred view is that story design must meet a larger game design concern: which is that whatever a designer introduces into a game can have a range of possible meanings that a player tries to makes sense of. When this sensemaking process fails or results in indifference, a potential design problem emerges. Therefore, whenever *anything* in a game world is made sensible to the player, whether it is something explicitly presented by the game or something only felt implicitly in the experience of play, the issue of coherence of meaning arises. The tendency to iteratively refine a game experience away from the conflicts, obscurities and confusions that create indeterminate meaning[24], and towards coherence, is, I argue, a constant source of design change—particularly because there are so many competing ways of understanding what is encountered in the game experience.

Stories are just one way the above-mentioned trouble arises in game design. This trouble is an example of the strangeness that emerges in the clash between contexts for meaning (e.g. through appearances or symbols) and the abstract structure of form elements. For example, it is usually desirable to give players freedom to act in ways the

[24] IDS#7

rules allow: it is undesirable to arbitrarily or inconsistently constrain the player's actions or limit the way the game world works. However, often the rules will allow players to act in a way that is contrary to the details or spirit of the story, or act in ways that create problems that are beyond the resources of the design team to solve. For these reasons, a designer might be forced to arbitrarily constrain the player or the game world, so the gameplay can play out in the way the author of a story wants, or without serious bugs or glitches. This may require the invention of strange or drastic events to justify the change in gameplay logic demanded by the story.

In popular video game culture, this strange *video game logic* has become a subject of satire and humour (Know Your Meme, 2013). Examples of video game logic include:

- an enemy creature who gets progressively more powerful (and thus more challenging to interact with) as it receives more and more damage from attacks
- a player character who is unable to enter a room that has large holes in the wall, because the door is locked, they do not have the key, and the game does not have interactions for breaking down doors or climbing through gaps (due to production constraints)
- a space marine who can only carry two guns, but can single-handedly flip over an armoured vehicle that has rolled on its side (perhaps because it is better to give the player an in-game option to continue driving than punish them by forcing vehicle abandonment).

Often the strangeness of video game logic is produced by imaginative designs, but it may also come from mundane design decisions that:

- lead to more enjoyable or challenging gameplay
- reduce tedious or annoying situations that would slow down gameplay if realistic solutions were implemented.

This kind of video game logic can force game designers to invent strange stories to justify the logic of gameplay activity.

Several design solutions address the potential conflict between story, gameplay needs and game logic: however, they can be costly, and can involve fundamentally different conceptions of the game experience. One solution is to largely separate the delivery of story from the interactive parts of the game, for example, through interspersing non-interactive cinematic scenes between gameplay. Alternatively, rather than overt storytelling techniques that impose story logic on the game world, story threads are designed to emerge implicitly from the appearance and structure of the game world, and from events caused by interactions. This approach has been called the creation of *storysense*, which, according to Kelly (2012),

> is an approach to narrative which relies on the creation of an interesting world, a discoverable set of threads and bits of story, a minimalist approach to goal direction, but dispenses with dramatic plot and character development.

Games built this way tell stories through the design, arrangement and configuration of meaningful visual, audio and dynamic gameplay elements (including events that emerge from game systems (Leblanc, 2000)).

Game worlds with rich storysense and systems capable of a variety of emergent events, such as *Grand Theft Auto IV* or *Red Dead Redemption* are very effective at producing emergent stories. Smith and Worch (2010) state that the game environment "provides narrative context", and "when environmental elements are used cohesively, no one has to say anything ... the world speaks for itself as the player moves through it". These game designers emphasise coherence, stating that environmental storytelling is "staging player-space with environmental properties that can be interpreted as a meaningful whole, furthering the narrative of the game". According to Smith and Worch (2010), this relies on arranging elements in the game world that, together, provide a mix of ambiguity and subtext when actively explored. Because this subtext is discovered, and ambiguity interpreted and resolved through active involvement with the game world, they argue that environmental storytelling "fundamentally integrates player perception and active problem solving", which builds the player's sense of investment in the game world.

5.2 Characteristics of the player experience

Game mechanics, game systems and game structures are flexible concepts that involve formal objects, but they can also denote characteristics of game experiences. These characteristics, as significant traits or relationships observed when playing complete, functional and enjoyable games, are the *results* of game development. They are coherent ends reached in the process of making a game that:

- plays well in aesthetic, behavioural, functional, technical and conceptual dimensions
- meets various design requirements and goals.

Some characteristics, such as agency, uncertainty or rewards, are more difficult to connect with formal objects than mechanics, systems and structures. Unlike form elements, characteristics that refer to integrated aspects of game experiences can only be indirectly controlled by game designers.

Beyond their status as outcomes of development, characteristics of game experiences serve as conceptual tools during the design and development process. This usage involves a specific way of comprehending the possibilities of many game elements working together during play, across a large variety of gameplay configurations. For example, the perspective of *rewards* relates not only to the psychology of play and motivation, and outcomes of gameplay events, but also to gameplay systems and structures, because a player might get a reward, such as a power-up, that modifies the game rules. Looked at this way, the concept of a game characteristic guides the integration of the parts that make up a game. Simultaneously, such concepts are constituted by, and gain structure from, those parts. And further, these concepts involve development issues and design principles that are relevant to the choice of a design frame for organising form elements in the whole game experience. Form elements are thus developed from a complex mesh of design considerations: these considerations relate to the project requirements, the intended game experience, game characteristics and values of game design practice.

As initial considerations in a design process, however, the value of game characteristics is poor because they are hopelessly vague. This is because in the early stages of development, the designer’s knowledge of the proposed game experience is poor. As conceptual tools, characteristics of game experiences cannot integrate anything but vague entities in vague relations. Game characteristics, such as agency, decisions, uncertainty and flow, are therefore *not* atomic elements to be determined by design, out of which a game can be constructed.

5.2.1 Agency

The term *agency*[25] is a useful concept in the context of game design. Agency is defined in the individual's context as "the state of being in action or of exerting power; action; operation" and "a mode of exerting power; a means of producing effects; instrumentality" (*The Macquarie Concise Dictionary*, 2002). In everyday existence, we take our instrumentality for granted unless it becomes constrained or disrupted. Agency becomes a crucial concept in game design because the instrumentality of the player is artificially limited in a game, and players willingly suspend some agency when they agree to its rules and limits.

According to Murray (1997), agency is "the satisfying power to take meaningful action and see the results of our decisions and choices" (p. 126). Church's (1999) ideas of intention and perceivable consequence clearly relate to the concept of agency:

> - Intention. Making an implementable plan of one's own creation in response to the current situation in the game world and one's understanding of the game play options.
> - Perceivable consequence. A clear reaction from the game world to the action of the player. (emphasis removed)

When a player interacts with a game, their inputs are transformed by the game mechanics into particular instruments of power, first, to provoke the world, and second, to see how the world's systems, rules and inhabitant entities respond and change. For example, *inFAMOUS* gives the player limited agency appropriate to an electricity-based superhero. As Cole, the player can (among many other things):

- drain and conduct electrical current
- emit electrical energy in a variety of forms and for a variety of purposes, such as fighting, restraining enemies and healing injured civilians
- glide through the air, on power lines and electric railway tracks using electrical assistance
- use parkour and rock-climbing style traversal to scale urban structures.

Using such instruments of power, an inquiring player learns the game world (Gee, 2007, pp. 64-65), and develops a repertoire of skills (Juul, 2005, location 69). Agency

25 Agency in this thesis refers to the human experience of meaningful agency, *not* AI computer agents.

therefore involves what is sensed, what actions are possible and what the likely outcome might be. This concept of agency refers to the *experience* of a meaningful action–effect cycle.

Alternatively, as an *integrative conceptual instrument* used while designing, agency may serve to bind a complex mesh of design considerations from an aesthetic perspective on human instrumentality and the consequences of acting. Integrative concepts, such as agency, make use of many elements working together in the game experience. In the absence of experiencing a completely implemented game, a full understanding of integrative concepts is *obscured*[26] because some aspect of the integrated whole may be missing or remain unidentified.

It is precisely because the rules of a game can artificially limit, orient and virtually extend human agency that games are so interesting and difficult to design. Players often have to learn all over again how to see, understand and act according to the new constraints, possibilities and meanings of the game. Finding out what satisfactory power means for any particular game is a demanding design task. The conditions needed for agency—instruments of power, choice of action and consequences—have to be designed and implemented, and made to work properly, before a player can experience meaningful agency. For the game designer, exploring the limits and implications of agency is an important part of the experience of designing games. Knowing what agency means for a particular game design requires more than an understanding of instrumentality and consequences in terms of the game concept. The designer must reach an understanding of factors that govern the player's perception of their own agency during the game experience. This is necessary because agency in game worlds is expensive to create, and thus, agency is always limited. But perceived limits to agency are often undesirable, particularly if the game world suggests something that cannot be acted on. What is perceived must be designed carefully to suggest only the actions that are supported. Church (1999) emphasises this:

> By offering a very limited set of actions, but supporting them completely, the world is made real for players. No one who plays Mario complains that they want to

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> hollow out a cave and make a fire and cook fish, but cannot. The world is very simple and consistent. If something exists in the world, you can use it.

Wardrip-Fruin, Mateas, Dow and Sali (2009) build on Murray's and Church's ideas, as well as their own previous work, and suggest something similar:

> To create the phenomenon of player agency in relation to a fictional world it is necessary to suggest dramatically probable events, make material affordances available for taking those actions, and provide underlying system support for both the interpretation of those actions and the perceivable system response to those actions (which should preserve dramatic probabilities or suggest coherent new ones). (p. 4)

For game design, agency can only be evaluated in a particular game experience, by a human who experiences agency, and who experiences the limits to, or consequences of, agency.

5.2.2 Decisions, uncertainty, challenges and motivation

Having agency in game worlds means being free to decide among different *choices* in the use of instrumental power, something noted by designers of the *Deus Ex* series of games (De Marle, 2011; Lapikas, 2012; Spector, 2000).

Schreiber (2009) states that interesting and meaningful decisions in games involve "the player judging the value of something, where values are shifting, not always certain, and not obvious" (p. 77). Game designers must therefore establish a game situation containing things players value, and develop a game system that will produce situations in which at least two possible courses of action bring values into conflict. Offering different forms of agency and different viable outcomes are ways of making such value conflicts possible. High-quality decisions, and their emotional impact on the player, are the *target* of the design process. A great deal of design iteration therefore involves determining what qualities are missing from decisions, and determining how other elements of the game may be modified to improve them. As with agency, decisions and the value conflicts they bring about are embedded within the complex dynamics of gameplay, and are moments that integrate many elements of the game experience. Similarly, as an integrative conceptual instrument that frames design thinking, *decisions* focus on the relation of agency, goals, and different possible meanings of the experienced game situation.

Having agency and the opportunity to make meaningful decisions requires some form of indeterminacy in the outcome. Uncertainty is a defining characteristic of games (Salen & Zimmerman, 2004, p. 174) and provides a source of tension that maintains interest in the outcome of a game, both at the level of moment-to-moment gameplay and the final outcome of the game. Uncertainty in games has many benefits, such as adding risk and making for interesting decisions: however, there are also drawbacks, such as taking control away from players and reducing the return they get on their skills (Elias, Garfield, & Gutschera, 2012, pp. 144-147).

Uncertainty in games is contingent on gameplay dynamics, the outcome of a player's skilled ability, and the limits to player perception and motor control. Therefore, it is a very difficult aspect of games to take into account when designing. A game experience dominated by either uncertainty or certainty can be undesirable. If players do not find a gameplay decision interesting, then introducing uncertainty might be an appropriate solution. If players are rudely surprised, cannot make effective plans or form goals, or do not feel that their decisions are effective, then the game may have too much uncertainty. Certainty comes from stability in what is sensed, and therefore, the use of uncertainty in games is a balancing concept in systems, emotions, aesthetics, information and meaning. Importantly, uncertainty is a concept that operates within the evaluation of an experience, which requires a playable game.

As mentioned in Section 5.1.3, gameplay structures depend on the blocking of goals with obstacles—typically challenges and conflicts—which introduces uncertainty about the outcome of the game. Challenges test a player's understanding of their agency within the game system, and create opportunities for improving their repertoire of skills and mastery of the game (Juul, 2005, location 992-1022). Challenges also produce opportunities for meaningful agency with consequences when decisions result in something gained or lost. For a designer to know with certainty what makes a good challenge or conflict in a particular game requires an in-depth understanding of the rules and mechanics *as experienced*, as well as an understanding of how other players develop their skills and mastery of the game. Creating genuinely intriguing challenges also requires deep insights into the subtle shades of perplexity that can arise within a particular game system, suggested by the affordances and meanings of possible arrangements of interacting game elements within the game environment.

Motivation: goals, rewards and flow

To play a game requires motivation to willingly participate and accept the rules of the game. Therefore, the concepts I have discussed in this section (agency, decisions, challenges and uncertainty) are necessarily connected with characteristics of games relating to the concept of motivation. Despite the fact that modern games are often complex and require a significant investment of time and effort to learn and master, video games “motivate a remarkable amount of goal-directed behavior” (Przybylski, Rigby, & Ryan, 2010, p. 154). This fact suggests that game designers come to know how to create highly motivating play environments.

Motivation is a complex theoretical field involving a diverse range of concepts (R. C. Beck, 2004). Previous studies of video games have considered various factors that make games intrinsically motivating activities (Malone & Lepper, 1987, p. 229), and satisfying to fundamental human psychological needs relating to intrinsically motivated behaviours (Ryan & Deci, 2000, p. 58). Reaching goals by overcoming challenges in which agency is intrinsically rewarding can result in an experience of intense focus, if certain other conditions are met. One of these conditions is that the level of challenge must be appropriately balanced to the capabilities of the agent, which Csikszentmihalyi’s (2000) concept of *flow* describes. Csikszentmihalyi (2000) observed that the frequency and intensity of flow experiences can be shaped by designing “conditions to resemble those of a game or a work of art: by clarifying goals, providing more detailed feedback, and creating a better balance between challenges and skills” (p. 382). These characteristics for shaping flow refer to processes of *transforming* aspects of *existing* experiences. The concept of flow is frequently mentioned in literature relating to games and game design: an early example is found in Malone (1980, p. 3). Schell (2008, p. 122) notes the delicate and precarious nature of the flow state in games, and the difficulty of testing for it.

Inexperienced game developers quickly learn that players soon stop playing a game if they do not find the interaction rewarding. Game activities can be intrinsically rewarding, as in the simple pleasure of driving a car around the world of *Grand Theft Auto IV*. It can also be rewarding to learn the rules of a game and discover its strategies and possibilities (Koster, 2010, p. 40). Rewards can also be extrinsic to the play activity, such as the use of numbers (point score) to measure player performance in arcade games. Games can offer rewards as incentives for effort, exploiting behavioural psychology described in concepts such as operant conditioning (Lidwell, Holden, & Butler, 2003, p. 144) and contingencies: rules governing the giving of rewards (Hopson, 2001). Rewards are embedded in the moment of play, and game experiences may produce a variety of rewards from a variety of causes, at unpredictable times; therefore, what exactly may constitute a reward, and the effectiveness of a game's rewards, can only be tested when players experience them.

The above discussion of motivation shows how the concepts of agency, decisions, challenges and uncertainty, covered earlier in this section, are important to good game experiences, and thus, to game design. It also shows that such concepts are intertwined in a systemic way, which suggests their value as instruments of control for achieving a balanced game experience. The concept of motivation and the related ideas of goals, rewards and flow are instruments for regulating the balance of different kind of drives and needs in the game experience, for example, between skillfully executing a game action or experimenting with ways to overcome an obstacle. As such, the complex balance among many facets of motivational *forces* is something that game designers must assess in playtesting of the game experience. Because so many elements of games are involved in this balance, the right balance can easily be obscured[27]: therefore, all aspects of a game's design (including conventional gameplay forms) are open to change by playtesting.

5.2.3 Conventional characteristics and forms

The importance of previous design examples to the practice of design has been established in general (Lawson, 2004; Lawson & Dorst, 2009, pp. 146-156). Existing game forms can provide game designers with proven and reliable models, structures and

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mechanisms for exploring new subject-matter. Duke (1981a) emphasises the importance for game designers to have a "repertoire of techniques" in order to design systematically (pp. 73-74). An important aspect of this repertoire is that, in Duke's terms, supersymbols from successful games can later become commonly used conventional symbols. Conventional game forms are an important reference *language* for game designers, both as part of a culture of game players and within a development team. Conventional game forms can improve communication and design certainty, but there are also pitfalls in applying conventions to new game concepts, or combining conventions from different kinds of games.

Conventional game forms are patterns of gameplay activity that are commonly experienced across many games. They may be highly generic, such as the *third-person shooter* form, or they may refer to a particular example such as the *roadie run* or *active reload* from the game *Gears of War*. Conventions can be anything about a game that has become well established, including game features, mechanics and systems, gameplay structures, solutions to certain game design problems, and stylistic devices. Highly common conventions include:

- health, shields and health packs
- double-jump or jump-glide actions
- lock and key puzzles
- death, lives and game-saves

The best examples of conventional forms are exemplars. To gain an understanding of the complex history involved in some exemplars, consider *z-targeting* (Iwata, 2011a), which was a feature introduced and popularised in the Nintendo 64 game *The Legend of Zelda: Ocarina of Time*. Before *Ocarina*, combat in early 3D games using a third-person camera was unsatisfying because players would find the character axis, camera axis and enemy axis difficult to align. Game characters normally moved in the direction they were facing, which was determined by the direction the player moved the control stick. To line up attacks on an enemy, players had to continually correct their movement and orientation towards the target, relative to the camera (or even at the same time as controlling the camera), while also timing their combat movements. The result felt sloppy, fragmented and disconnected, and it lacked the one-on-one intensity of focus and direction of action that make martial arts combat or sword duels exciting.

Ocarina introduced a solution to this problem called z-targeting (also known as *lock-on* targeting), which, as game director Toru Osawa relates, was inspired by a choreographed fight scene that some *Ocarina* developers witnessed in Toei Kyoto Studio Park:

> A number of ninja were surrounding the main samurai and one lashed out with a kusarigama (sickle-and-chain). The lead samurai caught it with his left arm, the chain stretched tight, and the ninja moved in a circle around him. (Iwata, 2011a)

In the final version of the game, when the player presses the *Z* button on the controller, z-targeting mode is activated. In this mode, the player character (who is called Link) adopts a combat sensibility, and the control scheme changes so that Link always faces and targets the opponent regardless of control input, as if he were linked to the enemy by an invisible chain. Pressing forward or backward on the control stick makes Link move closer to or further away from the target, and pressing left or right causes Link to make a circling movement around the enemy without getting closer. This interface design maintains a sense of connection between the player and things in the game. After *Ocarina*, almost every 3D action game featuring melee combat and a third-person camera, has employed z-targeting in some form. Knowledge of exemplars in game design involves a deep understanding of the history of previous games, their technical configurations and the design problems they solved. Use of exemplars requires an awareness of the implications of design choices in terms of known technical configurations and possible problems.

These and numerous other examples make up the toolbox of the game designer. Together, these examples amount to a proven and empirically testable way of doing things, and they demonstrate how numerous gameplay elements are successfully integrated. As working models, they can help to organise thinking around a dynamic phenomenon, by providing a structure to imaginatively make substitutions or modifications of parts with hypothesised parts from the new design. Existing games can serve as prototypical examples of modelled subject-matter, or as solutions to design problems. As simulations that are accessible in existing games, they are re-experienceable and objectively shareable among members of a development team.

Conventional game *mechanics* are quite specific configurations of abstract objects, rules and actions. Mechanics are specific forms of parts, or groups of parts, in a whole. As I will argue in the next section, the meaning and instrumentality of such conventional parts depends on the whole they are integrated in.

5.3 The development of knowing in game design

From Chapter 4, until this point, I have described a range of phenomena that game designers come to know in creating a game experience. In doing so, I have emphasised that many concepts that guide game design characterise qualitative experience and are known only within the delicate balance of a *particular* game experience. These qualities are produced indirectly by a complex and intertwined set of interacting abstract objects, rules and structures. Because I am examining game design as an inquiry process, it is important to consider the way a designer's knowledge systems (which guide design and the act of making) develop during a project. Knowing in this sense is knowledge that facilitates the activity of design, and means:

1. knowing what the game is intended to be (certain qualities, concepts, and characteristics of action, dynamics, feelings, balance, configuration)
2. knowing how to achieve the intended result, including the meaning and use of any relevant concepts about games and game experiences, or concepts that support their design.

Because there are so many different things that must be known to make a game, and the things known extend from the immediately visceral and emotional, to the rational, logical and complex, it is tempting to assume that different kinds of knowledge are involved. The standard epistemological view divides knowledge into knowledge-how, acquaintance knowledge and propositional knowledge (Fantl, 2014). However, White (1982) argues that all knowing can be considered an example of knowing *that* something is the case and it is only the *things* known that differ, not the *kind* of knowledge (pp. 9-43). In this view, there is no important difference, as far as *knowledge* is concerned, between knowing how to do something and knowing that something is the case.

The key to understanding this view, according to White (1982), is that knowing is best considered an ability, rather than action, achievement, a state of mind, a performance or a disposition (pp. 117-121):

> The ability in which knowledge consists differs from other abilities ... in that it is the ability to produce the correct answer to a possible question, the solution of a possible problem. (p. 119)

Knowledge of people, places, conditions, things and activities follows the same rule, because, as White (1982) argues, it

> is what we know about them, not they themselves, which constitutes the "object" of our knowledge. ... That one has the ability to produce the required answer in any of these cases may be manifested by showing it or telling it, by deed or word, directly or indirectly. (p. 120)

Therefore, knowing *how* may consist in the ability to know *that is the way* to do something. This means that knowledge does not require verbal explication if the only way to demonstrate this ability is to show or perform it.

In such cases, there is also no requirement that knowledge be passed on to others through the demonstration of knowing. Game development is not so much a test or demonstration of knowledge, as it is a long-term collaborative commitment to imagination, technical achievement, learning, and the adaptation of skills and knowledge to a complex tangle of problems. Knowing in this environment is largely connected with proposals that can be good or bad, rather than propositions of truth or falsity.

My argument so far suggests that game experiences are artfully contrived interfaces for a continuous flow of qualities in feeling, action and thought. On the design side, rather than the technical side, game development requires sensitivity to the immediate qualities of experience, and an understanding of how these sensuous aspects relate to thought, decisions to act, behaviour, concepts, language and logic. This understanding includes how such distinctions, selections and arrangements could intensify or destroy the integrity of the game experience through the design of form elements, the use of integrative concepts and the development of Bία~Forms. I argue that game designers come to know these things in the course of a game development project by integrating the various forms and concepts into a coherent whole.

5.3.1 Integrative design knowledge

Successfully configuring and arranging gameplay scenarios requires knowing how to use game objects and mechanics to consistently produce a particular effect (allowing for player agency). The pace, flow and meaning of the unfolding experience therefore has to be indirectly created and controlled by the designer, but also, within a balanced range, be create-able and controllable by the player, whose agency also shapes the experience. Such balance depends on:

- player skill and game difficulty or challenge
- the meaning and character of experienced patterns and contours of intensity
- relevant values and concepts
- other design constraints such as narrative or game progression.

Further, testing with new players will reveal:

- where the designer's understanding of how players co-create their aesthetic experience does not address values important to the player (values are *obscured*[28])
- whether particular effects are underwhelming or *confused*[29] or may be in *conflict*[30] with what players value or find satisfying.

If a game designer reaches a point in the development process when they understand the distinctions and relations that consistently deliver a coherent experience for players, *and* they can reliably construct parts of the game to make this happen, then I suggest that what they have is *integrative design knowledge*. And therefore, a significant amount of knowledge relevant to game design has no single standard of explication, and no single standard of validity. Standards may be formed around the project requirements as agreements on rules for completeness, appropriateness and value. All knowledge useful

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in making games is ultimately tested in the embodied experience of the game, in terms of its implications in: the composition of the experience; meanings immediately had, or constructed by game players (including target player groups, team members and other stakeholders).

Tests of integrative design knowledge must therefore occur in the evaluation of existing work and the evaluation of proposed future work. The concrete game experience at each iteration is therefore the integration of concerns, values, knowledge, plans, requirements and constraints. Claims are tested in reference to the concrete design. Buchanan (1995) views design as an integrative discipline of systematic thinking that manifests in every plan for a new product. He states that design is an argument that "moves toward the concrete interplay and interconnection of signs, things, actions and thoughts" (p. 19). In this view, claims are not tested by the truth of words referring to things, but by their viability when integrated into the design as experienced, within the requirements of the project and agreed on by stakeholders.

Potential players and project managers are important stakeholders in game projects: however, the main stakeholders in the ongoing design process are the various organisational groupings in the development team, such as task-focused groups, disciplinary departments and project leadership. The importance of these stakeholders reflects the highly collaborative, intense, specialised and long-term nature of game development teams. Knowing is demonstrated during the process of making games, for example, when judgements have to be made in the course of designing and making activity. In these social and creative moments, the *possible* and *preferable* are constantly being redefined and re-evaluated. Judgements are often about courses of action never before attempted, or problems never before encountered. Just as often, they are about problems or courses that other teams may have encountered before, but about which, due to a poverty of records or commercial secrecy, little is known.

That the quality of judgements improves over the course of development is reflected in this quote about iterative development practices from Robin Walker of Valve Software:

> These iterations leveraged a lesson we'd learned in the original development of Half-Life: decisions we made later in the project were always better than ones

> made earlier, due to our better understanding of the product. As a result of this 'weighting' of our later decisions, the average quality of the game experience was significantly improved. (Wyman, 2011, p. 57)

In the remainder of this chapter, I will consider what might become known to game designers during development, how designers may make use of conceptual tools, and the role the game in development plays, particularly in the process of reaching the hypothesised *goal of a coherent whole*.

5.3.2 Tacit knowing

When developing a new game experience—one that is creatively different from existing games—the situation a game designer faces during the initial design phase is dominated by the imagination. What will the game be about? What concepts, things, places, themes, actions, challenges, emotions or aesthetics are involved, and how will they change in response to what the player does? The design task is to transform this imaginary projection so its sense becomes meaningful. A game designer can draw on previous experience to understand and give order to an emerging conception of an imagined game experience. Other games experienced might suggest ideas, or the imagined subject-matter might imply something new or different. As the resulting conception becomes clearer, the clarity achieved is in the *articulation* of the imagined experience: the ordering of thoughts and the reduction of the imagination to something more stable and certain. However, even if the feelings that mark the imagined experience become clearer, the experience remains intangible and elusive.

This elusiveness continues well into development. It is typical for the first implementation of a game specification to be quite inadequate and underwhelming (Brathwaite & Schreiber, 2009, p. 19; Duke, 1981c, pp. 70-71). At this stage, the concrete game experience may feel quite different from what was imagined. However, as a concrete experience, it presents qualities that are felt immediately and vividly. The designer, in such cases, can clearly feel that something is wrong or missing: imagined qualities are absent, feeble or confused. Questions then arise: What went wrong? And what must change? Action is called for and experimenting becomes necessary. Polanyi (2003, p. 105) describes the way a medical student comes to understand pulmonary radiograms (x-ray images of a chest): at first, on the fluorescent screen the student can only identify the shadows of the heart and ribs with some meaningless blotches in between. There is no comprehension of what the expert doctors see and talk about in the same image. Over time and after experiencing more cases, new details become apparent to the student: the x-ray, and the concepts used to understand it begin to make sense. The result is co-development of intelligent perception with the ability to conceive and talk about the concepts meaningfully:

> Thus, at the very moment when he has learned the language of pulmonary radiology, the student will also have learned to understand pulmonary radiograms. The two can only happen together. (p. 105)

This is a process of developing *some* understanding of what is seen, finding ways to articulate this understanding, and attending to the now slightly less mysterious problem with newly improved perception, and knowledge. As Polanyi (2003) argues:

> Both halves of a problem set to us by an unintelligible text, referring to an unintelligible subject, jointly guide our efforts to solve them, and they are solved eventually together by discovering a conception which comprises a joint understanding of both the words and the things. (p. 105)

An imagined game experience, unlike the physical phenomena of human bodies and x-rays, starts out with no concrete existence. It therefore has no definite material structure or regularities. It is only imagined: intangible, inchoate and vague. During the process of development, the qualities of the unfinished game, and thus what is available to be perceived, is deficient. However, the reference provided by the concrete experience, deficient as it is, can make the nature of its deficiencies clearer. It might be apparent that there is a problem in the assumptions that support what had been imagined. The previous articulation of the imagined experience may now have identifiable faults. As a result, possible changes become apparent. In this way, the conception of the game experience becomes clearer as the game designer learns how to make successful improvements to the game experience.

I suggest that during the process of game development, the designer's intelligent perception, and their ability to conceive of, and articulate, the game experience, co-develops in a similar way to Polanyi's x-ray example. To extend the idea: at the moment that the game designer has learned the *language* of the game experience, they have learned how to fuse their understanding of the imagined game experience with the process of making it. It is this insight that I think Cerny (2002) expresses when he describes the purpose of pre-production in game development as “capturing lightning”, but only when the team has the capacity to complete two game levels at shippable quality.

Polanyi’s work on tacit knowing has been popularised in the term *tacit knowledge*. However, his work has often been misunderstood (Prosch, 1973, p. 201) and misrepresented. I have summarised common misinterpretations from Grant (2007, p. 176), which assume that:

- Polanyi identifies two types of knowledge—tacit and explicit—and that this is an either/or state.
- It is impossible to convert tacit knowledge to explicit knowledge.
- Tacit knowledge is the same as implicit knowledge.
- Explicit knowledge is the same as information.

Such interpretations set up a dichotomy between explicitly articulated knowledge and an opposite, which logically must be ineffable. This dichotomy loses the point of Polanyi’s focus on integrated, embodied activity, and trades it for an objective view that grants the status of knowledge to symbolic representations of things known.

Polanyi’s theory of tacit knowing (1983, 2003) concerns cases of highly integrated activity, where knowledge serves the successful performance of some behaviour, including reflective thought and problem solving. In Polanyi’s view, the knowledge that supports such an integrated performance cannot be articulated without destroying the integrity of the performance of the activity itself (Polanyi, 1983, pp. 18-19; 2003, pp. 56-58). Accordingly, tacit knowing includes knowledge that *may* be explicable, but because the focus of the act is in performing the act well, we are not focally aware of such knowledge. Rather, we are only aware of it subsidiary to the performance (Polanyi, 1983, pp. 10-13; 2003, pp. 56-58). The knowing involved in a highly integrated act can only be experienced in the integral act itself. In the discussion to come, I will be closely following Polanyi’s model of integrated practical knowing, but I will develop the model to suit my purpose of offering a way to understand the course of inquiry in a game development project.

5.3.3 The structure of tacit knowing

The basic structure of tacit knowing is between two ways of knowing: one is not specifiable, and the other can be specifiable. Polanyi shows that when we attend *to* something, we do so based on our perception of indications that lead *towards* it. We know these indications as particulars only as part of the act of knowing *what* they imply. We attend to something *through* the particulars. The functional relationship between these two "terms" of knowing is that "we know the first term only by relying on our awareness of it for attending to the second" (Polanyi, 1983, p. 10). Dewey (1934) refers to something similar when he says that every focal object "recedes into the implicit which is not intellectually grasped" (p. 202) and that the implicit "is a function of the whole situation" (p. 202). Polanyi (1983) characterises this aspect of tacit knowing as attending "*from* something for attending *to* something else" (p. 10). This describes a directional character in perception (from–to), but it also suggests the integral character of meaning in what we consciously attend to. A skilled performance is known only as the experience of everything seamlessly contributing to the whole act. Thus, the functional structure of tacit knowing consists of attending to the integration, in action, of elementary acts that in themselves we do not attend to (p. 10). In Polanyi's terms, a *comprehensive entity* is an integrated experience of knowing through doing, attending and focusing (p. 18).

The relations of explicit knowledge to practical performance can be a source of confusion. For example, Schmidt (2012) argues that Polanyi holds "the intellectualist assumption that skilled practices always and necessarily are predicated on 'observing' 'rules'" (p. 190). Polanyi (2003) actually argues that skilled performers do not observe explicit rules: he clearly states that rules may be useful as maxims and guides, "but do not determine the practice of an art" (p. 50). Polanyi points to the fact that a skilled performer focuses on the skilled performance, in its integrity as a skilled performance. The integrity of the skilled performance is "the practical knowledge of the art" (p. 50). When a skilled performance occurs, Polanyi's argument shows that awareness is focused on the performance of the integrated activity, and the performer is only subsidiarily aware of the knowledge that is required to achieve it. Polanyi suggests that focal awareness and subsidiary awareness are mutually exclusive—*not* because humans are incapable of dividing their attention, but because a skilled performance demands complete focal awareness. Anything less that complete attention on the part of the performer results in a loss of integrity to the performance. Polanyi clearly suggests that knowledge of the particulars involved in an integrated performance may be articulated, but not while attending to an integrated performance *from* those particulars. A guitarist can look at their fingers on the fretboard and identify the fret positions and scales while playing, but this performance will lack the integrity of a performance in which full attention is given to the music. Likewise, a game designer may focus on the form elements, Βία~Forms and integrative design concepts while playing a game, but to do so disintegrates attention on the experience of play.

Polanyi (1983, p. 16) also describes the transformative nature of the from–to relationship. He suggests that things used as a means of attending to something else are understood differently, in terms of what we attend to: We embody the particular things and feel them as an extension to our acting selves; we *dwell* in them in such a way that depends on their integration in the whole activity. For example, a tool like a shovel takes on a distinct character in the act of digging a hole, which is different to its character when we suddenly use it for defending ourselves against the venomous snake disturbed by our act of digging. In both cases, the shovel becomes an extension of our body. When digging, the shovel adds power to our connection to the earth: first, as an edged separator of portions of earth into clods of dirt, and then, as a lever with a capacity to remove a familiar volume and weight. When the snake appears, the comprehensive entity, and thus, the logic of the situation, changes. The snake is dangerous and we should keep our distance. Some particulars of the shovel remain (a bladed edge for separating), but some are new (a bite-resistant prod). Similarly, I would argue that when playing *inFAMOUS*, the player dwells in the particulars of the electric superhero, and that dwelling can change as the particulars change. For example, later in the game, the player can upgrade Cole's abilities so that it is possible to gain rapid locomotion by *grinding* on electric rail tracks, and at the same time, recharging the player's electrical resources. After this new *particular* ability is gained, the game environment, with its several above-ground railways (which were previously inconvenient to get to, and offered no particular benefit), are never attended to in the same way again.

Polanyi's concept of tacit knowing entails a view of knowledge that is inseparable from skilled action. Polanyi (1983) explained the capacity to use theoretical knowledge as an *interiorisation* of that knowledge (p. 17). This is a way of embodying the knowledge, of making it part of the way we see and understand the world:

> For we are attending from the theory to things seen in its light, and are aware of the theory, while thus using it, in terms of the spectacle it seeks to explain. This is why mathematical theory can be learned only by practicing its application: its true knowledge lies in our ability to use it. (Polanyi, 1983, p. 17)

Polanyi's words about *true knowledge* are interesting because they reveal a different notion of truth than the factual truth of propositional statements. Therefore, knowledge that is relevant to an integrated performance, but is not practically integrated in a performance, is *less* true. Further, there is a certain similarity in Polanyi's idea of interiorisation, Dewey's concept of habit (Kestenbaum, 1977, pp. 2-4) and Heidegger's concept of readiness-to-hand (Heidegger, 1962 / 2008, ⁋15). Each addresses the assimilation of previous experience into a pre-reflective, non-objective capacity to attend to the world. The view of knowledge entailed by these ideas is strikingly different from understanding knowledge as something objective (i.e. as an object existing independently of its situational use). Polanyi's theory of tacit knowing suggests that the knowledge that is important in game design is not an antecedent stock of meanings found in conventional forms, or analytic categorisations of games or game experiences. Instead, knowledge is connected to the ability to selectively use or transform concepts in achieving integration of the elements in the design situation.

5.3.4 The co-development of comprehensive entities

Game worlds are often imaginary worlds (as distinct from simulations of the real world), and therefore, are not materially real. Game worlds do not need to conform to the regularity and order of the universe as we know it, and because of the necessity of selective simulation, game worlds have a strange consistency: a game-specific language. Because the reality of the game world is strange, there are no guaranteed theories to determine the parts, the whole or their relation to each other. Therefore, a game designer must learn how to create world-laws (form elements) and relate and arrange those laws into more complex experiential wholes. These experiential wholes must offer players interesting qualities and rhythms that surprise and delight, puzzles that intrigue, and challenges to be skilfully overcome. Therefore, I argue that these things must co-develop as the game experience develops. Game worlds begin as ideas, and go through a process of design and construction. The form elements develop and change, as do the Bία~Forms and the game experience as a whole. Meanwhile, for the designer, the comprehensive entity—that is, *knowing* the game experience—must also change: it must develop from incoherence or low integrity, to coherence and a high degree of integration. The fact of iterative development and the regular failure of design-for-production approaches provide strong grounds for this conclusion.

We can ask whether Polanyi's work offers any insight into how integrated practical knowledge might develop. Polanyi (2003) mentions the way integrated performances develop, such as the case of the medical student learning pulmonary radiology (p. 105), or the learning of an apprentice through continued observation and practice with a master (p. 53). What to the novice are mysteries of practical knowledge are already had by someone else, who can demonstrate what they know, and discuss some aspects of it. But these examples only hint at how such integrated knowledge develops in the first place in the absence of pre-existing demonstrated expertise. Possible ways of developing integrated knowledge are trial and error, methodic experimentation or gradual improvements, or, for game development, *iteration*. I argue that for games in development, the particulars, through which the game experience is attended to, develop at the same time that the game experience, and its organising principles, are developing. Correspondingly, knowing of the particulars, and knowing of the whole, also co-develop through the activity of designing and making the game.

The problem for game design is that the constraints of component elements of a game, and their organising principles, are not fixed. The organising principles of the whole game experience are also not fixed. Additionally, the relationship between the parts and whole are not fixed, because both are in the process of being created. I therefore claim that the following two things must proceed together:

1. *the development of form elements and the organisation of part–whole experiential gestalts in the whole game (such as Bíα~Forms)*
2. *knowing of particulars through which the designer attends to the game experience as a whole.*

Further, I argue that both proceed without a determinate foundation.

A unified structure that, as a systemic whole, unites a multiplicity of parts, has been observed to have "double determinateness" (Grene, 1974, p. 218).[31] That is, "the whole depending on the parts as conditions of its existence, but the parts existing as parts only as so constituted by the unifying principle of the whole" (Grene, 1974, p. 218). The important problem that I have described above, for game design, is in *designing and developing something doubly determinate from a doubly indeterminate situation*. The place of integrative concepts in game design now becomes clearer. Through such concepts a game designer can attend to the organisation of many parts in an experienced whole. However, the parts, their arrangement, and the organising principles governing their arrangement (which we can simplistically call the game concept), are continually changing. Integrative concepts must therefore be flexible enough to handle this shifting situation, and to provide guidelines for giving a particular organising principle form through skilled design perception and action. As with Polanyi's medical student, such a process is the development of a skilled performance: it proceeds from obscurity and confusion[32], to revelation and making distinctions.

5.4 Summary

Game designers indirectly control the game experience through a variety of designed form elements, including game objects, rules, narrative, and gameplay and progression structures. Many important concepts in game design, such as game mechanics and agency, refer to the *effects* of interactions in complex interdependent systems within a *particular* game experience. The significance of this for game design is that their design function is largely integrative, and governed by design goals. The goal becomes configuring the many form elements that make up a game into an overall experience,

[31] Grene noted that the term was previously used by Professor R. Kapp.

[32] IDS#13

according to a particular concept guiding their integration. Game design is a skilled performance of integration, and as the parts of the game, and the whole game experience co-develop, so does the capacity of the designer to know what those parts should be, and how they should be organised to achieve a coherent whole. The design constraints and organising principle of form elements, Βία~Forms and the game experience as a whole are not fixed, and neither is the relationship between them because the game experience and its parts (including ways of knowing them) are in the process of being created. This is the doubly indeterminate basis of game development.

Chapter 6: Conceptualising games: practices and limitations

6 Introduction

This chapter focuses on the conceptualisation of game experiences, which is a problematic and controversial aspect of game design that has significant implications for the success of the development process. *Game concepts* are the initial expression of the game's proposed subject-matter, which begin the transformation from the initial indeterminate situation, and give game design inquiry directive force. In Section 6.1, I examine, in general terms, the notion of the *game concept* as part of the development process. I also examine ways the conception of games has been understood. Additionally, I clarify the variety of purposes a game concept can serve, and explain why the conception of games is controversial. I then discuss several limits on, and problems with, conceptualisation of game experiences in Section 6.2. These problems can re-introduce indeterminacy, and therefore, new problems, into the inquiry situation. In Section 6.3, I examine Gendlin's theory of implicit, embodied meaning and explore ways that it reveals new insights into game design practice. These insights include problems with conceptualisation and concept communication, and new explanations for sources of design change as a result of the iterative development process.

6.1 The game concept

Usually the first step in a game project is to establish its direction in the form of a game concept. Within the game development industry, the term *game concept* has a number of possible meanings, which reflect its use for different purposes. *Game concept* can refer to a general idea of what a game might be (Adams, 2010, p. 46), or refer to a deeply considered expression of the essential qualities of the intended subject-matter (Lapikas, 2012; Rouse, 2005, p. 70). A number of other terms are sometimes used interchangeably with the game concept, including *vision* (Novak & Hight, 2008, p. 28; Schell, 2008, pp. 20, 60, 79, 349-350), *high concept* (Adams, 2010, p. 67; Novak & Hight, 2008, p. 28), *theme* (Schell, 2008, pp. 48-55), *hook* (Perry & DeMaria, 2009, p. 17) and *core* (Brathwaite & Schreiber, 2009, p. 6). The literature on game design regularly mentions the importance of having a good concept to guide the development of a game. However, there is little detail in examinations of what constitutes a game concept, or of the relationship of concept articulation to the process of developing games. In this section, I aim to clarify how game concepts are understood, what purposes they serve, and how they are used.

6.1.1 Focusing on the essence of a concept

In Section 5.3.4, I discussed the way the co-development of part–whole structures includes the development of the organising principle that constrains the design of the parts and the arrangement of these parts in the whole game experience. I suggest that game concepts are attempts to find, express and refine this organising principle, which explains why game concepts can change so much. The conception of a game's subject-matter is often approached in a naive, introspective or simplistic way (Hagen, 2010, pp. 2-4; Schell, 2008, pp. 17-21). When the aim is to explore new creative possibilities, some designers select an idea to be reflected on, questioned (Hagen, 2010, pp. 3-6; Wyman, 2011, pp. 89-91), and explored for a conceptual *core*: for example, a unifying theme (Schell, 2008, pp. 49-53), essential quality (Schell, 2008, pp. 20-21), a "fundamental activity" (Cook, 2009, pp. 134-135) or the "focus" (Rouse, 2005, p. 70).

Rouse (2005) suggests the following questions to determine the "core nature of the game you are planning to create" (p. 70):

- What is it about this game that is most compelling?
- What is this game trying to accomplish?
- What type of experience will the player have?
- What sort of emotions is the game trying to evoke in the player? ...
- How is this game unique? What differentiates it from other games?
- What sort of control will the player have over the game-world?

Rouse (2005) emphasies that such questions are not aimed at persuasion for the purposes of getting funding, or to satisfy business concerns (p. 73). For Rouse, such questions serve to establish a *focus*, which is "only what is most important to your vision of the game ... which, if you took them away, would irreparably weaken the game" (p. 71). This resembles the *minimalist* or *subtractive* design process, which deliberately focuses on ruling *out* ideas. To achieve the minimum necessary features that define a concept, a designer can begin *subtracting* features or associated connections until the point just before the essence of the concept is lost (Sirlin, 2009).

Various techniques and media such as concept art are used to evoke the intended qualities of a game: a mood, style, theme or a sense of action: these qualities are often part of an *art bible* (Schell, 2008, p. 385). Prototyping techniques such as board games or role playing can be a way of expressing some of the experiential and systemic qualities of a game concept. The bodily feeling of a game idea is important: game designers develop ideas from reflecting on popular daydreams or fantasies, and the experience of emotions (Kultima, 2010, p. 36). Some designers try to establish scenarios or goals for the player experience that are likely to produce these emotions (Sylvester, 2013, pp. 8-28). Focusing techniques often use activity-based questions (Fullerton et al., 2008, p. 162; Hagen, 2010, pp. 2-4; Rouse, 2005, pp. 72-85). Such questions direct the designer to reflect on discrete activities or *verbs*, which lead quickly to core mechanics (Kultima, 2010, p. 36). Each activity discovered in this way might then be further examined for signature emotions, thrills, challenges, goals, obstacles, rewards, roles, costs and consequences.

In social design environments, it is particularly important for all team members to have continual access to expressions or representations of the game concept, which is a way of sharing the organising principle that guides game development. Well-known game designer Harvey Smith emphasises that creative direction provides visible values and higher-level guiding principles (Van Zelfden, 2006), particularly through constant dialogue with team members. There are several approaches to forming and sharing these values:

- *Core values*, core mechanic and core experience all refer to a part of the game that is considered by the team to be of primary importance in defining the game experience (Remo, 2009a, 2009b, 2010). Core values may also contain assumptions about what values the marketplace may find important, or that a proposed game feature will satisfy.
- *Game pillars* (sometimes used interchangeably with *core values*) is used metaphorically to denote an essential supporting element of the game. A game pillar

emphasises particular actions and behaviours, usually the core game mechanics, which the player will undertake frequently.

- A *design philosophy* can refer to a systematic approach to the ideas in the game concept (Lapikas, 2012; Novak & Hight, 2008, p. 68).
- The Japanese term *sekaikan* is a concept used in both anime and game production (Condry, 2009; Steinberg, Parmar, & Richard, 2006; Wada, 2012; Wood, 2013), and broadly corresponds to the concept of *worldview* (Underhill, 2009, p. 19). In game development, the concept of worldview serves as an organising principle that orients thought in the creation, evaluation and development of new worlds, and informs the relationships between concepts and the logic of their implementation in the game.

6.1.2 The concept as a persuasive device

In practice, stakeholders sometimes lose the distinction between 1) the game concept as ideas that *characterise* an imagined experience and 2) the game concept as *the representations* of those ideas. The dominant mode of representation of game concepts is in language, both spoken and written. Apart from being quick, convenient and inexpensive, spoken and written communication are natural ways to relate experiences. Spoken communication also suits the closely collaborative shared spaces in the working environments commonly found in game development. Written representation of game concepts also commonly merges with attempts to specify the game, in the form of a *design document*, or detailed design document (Rouse, 2005, pp. 356-381; Schell, 2008, pp. 383-384).

The detailed design document is for reference among the development team only (Spector, 2000), but a condensed version of it may become part of a concept proposal or design overview (Schell, 2008, p. 383) to be circulated to other stakeholders. Design documents offer the benefits of clear and precise communication. However, the communication function of detailed design documents (which are often complex and lengthy) can be undermined by their conjectural nature and tendency to change throughout development. For Adams (2010), a game concept is "a description of a game detailed enough to begin discussing it as a potential commercial product" (p. 67). Game concepts, as written in a design document, may therefore form part of a contractual agreement between the developers and a publisher, and the development of a game concept often occurs within the broader context of developing a project plan. With such emphasis on words, the fallacy of misplaced concreteness is an ever-present risk. A game concept may therefore not be simply a representation of the subject-matter of the game, but also a mixture of technical implementation, salesmanship, business interests and other external constraints.

In a commercial context, game concepts are a projection of a new, entertaining experience designed to entice customers and convert non-players into players. Games require sustained effort, commitment and financial investment to play. The gulf between non-player and player can be large, and people require persuasion before they are willing to commit their time to learn and enjoy a game. Game concepts must be capable of demonstrating this kind of persuasive potential, not only on players, but also on the development team that commits to making the concept into a game. In addition, a game concept needs to make a persuasive argument that will convince a publisher or investment partner to support the project. This means that the expression of a game concept is in tension, having to serve different purposes and appeal to different interests, rather than just being a guide for design and development.

One technique that combines the articulation of the game concept (or a major aspect of it) with a means of expression that serves persuasive goals is the *hook.* This term has been used to mean "something amazingly cool about your game", and "that element of the game that the players, the press, and the retailers can all recognise instantly, without much explanation" (Perry & DeMaria, 2009, p. 17). A hook combines persuasive and essential qualities. David Perry refers to the *GTA* series of games, which feature, and seem to be about, criminal behaviour in a large city environment. However, Perry suggests that the essence of *GTA* is *freedom* (Perry & DeMaria, 2009, p. 18): freedom for the player to act in a wide variety of ways and pursue whatever goals they like. Freedom is the hook that makes the game appealing and unique in the market. For Perry (2009), "games are fantasies for sale" (p. 17), and the hook is a fundamental part of a viable game concept, serving business, marketing and development purposes. The business purposes of a hook include making it easier to pitch the game to publishers, providing market differentiation and material for public relations, and eventually, attracting customers. The hook serves marketing purposes as a focus for audience research and advertising. The hook "gives your team a goal upon which to base daily decisions—meaning, 'will this new idea help or hinder our main goal of delivering our hook?'" (Perry & DeMaria, 2009, p. 17).

Another example is the *high concept* (Novak & Hight, 2008, p. 26) which refers to the "vision or 'big idea' for the game" and should convey a simple, easily understood, "trite and stereotypical" idea that can be expressed in no more than a few sentences, else it be too complicated or too "vague to be a commercial success" (Novak & Hight, 2008, p. 28). The use of slogans or taglines (McGuire & Jenkins, 2009, p. 98) for this purpose is common.

6.1.3 Why the conception of games is controversial

The preceding discussion makes it clear that in practice the expression of a game concept may serve purposes unrelated to the design of the game. In my experience, the conception of a game is always a site of tension, disagreement, value conflict and many other controversies. These conflicts can undermine the effectiveness of conceptual articulation described in Sections 6.1.1. I can offer at least six sources of controversy:

1. Complex game projects require intense effort over a long period. The conception phase is felt by many stakeholders to be a precious opportunity to have creative influence.
2. The *identity* of creative projects and of the teams that work on them, comes from agreement on direction and shared goals. For creative teams in general, team cohesion and motivation depends a great deal on finding an initial concept that excites and stimulates the anticipation of creative possibilities for all team members (Bennis & Biederman, 1997, pp. 199-206).
3. The conception phase of game development often results in a formal document (such as a design document) that proposes in descriptive detail the creative direction and form of the final game experience. Often this formal direction is the basis for further stakeholder enlistment (hiring team members) and gaining financial support (as part of a publishing contract or investment proposal). For a publisher or investor, a game concept is an important factor in assessing product viability in the market, and for assessing risks before signing a contract. Therefore, these documents carry

with them a sense of finality, and their contents can exert a powerful influence over those involved.

4. Few developers are willing to embark on a game project without the feeling of certainty, but the source of certainty (knowledge, creative ambition and belief) can become confused.
5. It can be forgotten (or may not be apparent to the inexperienced) how much a game concept develops and changes throughout the project, and how many opportunities for creative input actually occur in the process of making a game. As a result, additional pressure is placed on decisions relating to the initial concept.
6. Concepts have stability and can seem definitive, and if deliberately chosen to be persuasive, can have a great deal of aesthetic appeal *as* concepts rather than as a suitable basis for developing a game.

It should be clear from this list that the social and business functions of a game concept are highly important: sometimes these functions are as important, or more important, than the design function. The social, business and design functions of a game concept are also difficult to separate, and all interact at the site of a great controversy over values and certainty.

Aside from the many factors that might cause disagreement, I have experienced factors that can prematurely force agreement on a game concept. In a team design environment, at least two factors introduce pressure to reach an agreement and reduce tolerance for prolonged uncertainty.

1. The conditions at the start of a game project are severely unconstrained and underdetermined, and ambition within the team is high. When faced with a wide range of design possibilities and no immediate resolution to them in concrete form (due to the length of time required to build the game technology), deliberation often gives way to agreement to avoid prolonged uncertainty.[33] Members of the team typically want to settle on a familiar or conventional anchor point so they can 'just decide on something'.
2. Most development staff on a project are predominantly skilled makers who prefer the certainty of practical action over abstract theorising and deliberating. This

33 This is particularly likely to occur if the number of team members is surplus to the needs of concept development, which can happen if a studio retains its skilled production staff after a project has finished, and does not have another project for them to work on.

preference is reinforced by development experience, which generally confirms that a game design that is concrete and playable is worth more, and offers more certainty, than one that only exists 'on paper'.

At the heart of these pressures is the need for certainty. Members of a game development team, and other stakeholders, seek reassurances and control over the process. Reaching agreement during the concept stage necessarily requires agreement on words, and "when we use vague language, it's easier to get an agreement. When we use very honest, precise language, it's easier for someone to realize that they disagreed all along" (Sirlin, 2009). Prolonged disagreement among team members and situations in which significant aspects of a game concept remain uncertain can be very damaging, not only within the development team, but also to relationships between all stakeholders. Additionally, common and generic concepts have the benefit of being familiar to potential customers (Lampel, Lant, & Shamsie, 2000, p. 266), which is why clichés and stereotypes are common in games: they are easier to understand (Schell, 2008, pp. 279-280) and minimise the need to explain the game to players (Dodds, 2014).

We can now consider more completely the purposes that a game concept serves:

1. It is a projection of what the final game experience might be like: an evocation using words and ideas to convey an imagined phenomenon prior to its creation.

2. It is an opportunity to externalise specific details and assumptions, eliminate ambiguity, reduce vagueness and organise ideas coherently and systematically.

3. It is a communication device that helps to develop a shared understanding of values, to increase apparent certainty and to allow agreement among stakeholders. It also establishes a frame of reference for interpretation and evaluation, aiding decision-making within a development team.

4. It can be used as a persuasion device to convince various stakeholders to support the project, particularly business interests.

5. It can be a descriptive technique that explains or predicts how to achieve the final game phenomenon, and is used as a basis for project planning and scheduling.

6. It is a conceptual scheme, or philosophical outlook, that offers a systematic logic for design choices. For example, it defines rules for what should be included or excluded. It also informs the specification of game systems and their logic.

The notion of a game concept is therefore flexible and may, at different times, involve the purposes of projection, description, persuasion, communication, reasoning, evaluation, specification and planning. Buchanan (1995) observes that different fields, such as industrial design, engineering and marketing, tend to stress different concerns when making arguments: the possible, necessary or contingent, respectively (p. 19). This is also likely true of the numerous disciplinary fields and interests that cross in game development. Given these different modes of argumentation—the possible, the necessary and the contingent—there is a definite risk that the varying concerns represented in a game concept may be taken as a single, unified final perspective rather than a source of ongoing deliberation and controversy. *Conflicting* assumptions may therefore remain *obscure*, or concept expressions may be *confused*.[34]

6.2 The problems with game concepts and the inevitability of reconception

Historically, game concepts have been expressed in design documents, which are notoriously difficult to manage because they undergo large changes throughout the development process. Game industry attitudes towards design documents are less enthusiastic now than in the 1990s and early 2000s (Hagen, 2010), reflecting a very real controversy over their place within a game development project (Novak, 2012, p. 381). A common complaint is the inadequacy of design documentation in the face of design change, and the costly overhead of trying to keep a detailed document up to date (Schell, 2008, p. 384).

[34] IDS#14

The process of writing design documents can help to clarify, organise and share thoughts and raise possible design issues: however, regardless of how a game concept is represented or specified, a working and experienceable prototype is the only test sufficient to validate the worth of the concept and its associated design. Although the power of prototyping interactive experiences is well recognised (Buxton, 2007; Manker & Arvola, 2011), not all game concepts can be easily prototyped without extensive planning and technology development, which makes specification of proposed game experiences important. However, the conceptual grounds for specifications can change greatly during development, which is problematic. In this section, I will consider possible reasons for the limitations in the conceptualisation and specification of game experiences.

6.2.1 The difficulties of conceiving rich, experiential, systemic phenomena

A great game experience can emphasise, clarify and refine patterns, situations and qualities of real-world experiences. To consider the task that a game designer faces in attempting to specify such a rich, refined experience, consider how many things, relations and events need to be arranged *just so*, for the experience to happen. Dewey (1929a) notes the elusiveness of such conjunctions in normal experience when he states that the

> richer and fuller are the terminal qualities of an object the more precarious is the latter, because of its dependence upon a greater diversity of events. At the best, therefore, control is partial and experimental. All prediction is abstract and hypothetical. (pp. 116-117)

Dewey is writing about real-world experiences that can already be had, and about which many things are known. In contrast, *conceiving* a new, imaginary, and perhaps physically impossible experience is much more challenging. An even greater challenge is *specifying* everything required to make the imagined experience concrete and happen *just so*. It follows that finding the right balance of factors that determine a good game experience first requires finding the correct factors to balance. Indeterminacy in such situations is: *obscure* if the required factor to achieve balance is missing; *confused* if the source of imbalance cannot be determined; and *conflicting* if the imbalance is due to a valued part of the design, and a solution implies design change.[35]

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[35] IDS#15

Aside from the challenge of discovering the elements that must conjoin in a certain delicate balance to produce the right quality of experience, the nonlinearity of game systems also presents a great challenge to game design. Even when modelling concrete, familiar reality in the context of gaming simulation, these challenges cause game design to be a learning process, as Duke (1981b) explains:

> Games are most frequently employed for conveying complex systems. It is readily acknowledged that the system may not be understood at the time of game design, and that the basic purpose of the game may be to either extract concepts from a knowledgeable audience, or to assist some research team in the articulation of the system. (p. 51)

When game systems are designed, the designer has to bridge a vast second-order design gap, between a projection of the desired experience, and conjectures as to what form elements (including systems and configurations) might achieve the desired experience *indirectly*. This task of second-order specification is difficult because the designer not only has limited *knowledge* of what the game experience is like or should be, but also has bounded rational capabilities (Simon, 1996, pp. 38-39).

Humans also have difficulty comprehending complex behaviours involving system dynamics (Jensen & Brehmer, 2003, pp. 132-136), particularly stocks, flows, feedback loops and delays (Sweeney & Sterman, 2000, p. 278). The extent of these problems for experienced game designers is unknown. However, Love (2010) argues that this human limitation generally affects complex design situations with many feedback loops, rather than merely complicated situations with many design elements and a maximum of one feedback loop (pp. 5-11). Love's argument would suggest real limitations in the ability to reductively model imaginative projections of dynamic phenomena, an activity that is often required in game design. An example of this limitation is that specifying game experiences in terms of simple causal mechanisms, rather than interacting systems which produce complex behaviour, can result in incomplete, inadequate or underwhelming implementations. Additionally, for new kinds of game experiences, there may not be a stable anchor or reference point, either for the phenomena to be modelled as a system, or for the particular structures and relations that a system is constructed from. Such limits to conception mean that a clear systemic understanding of a proposed game is necessarily *obscured*, or the sources of desired system behaviour (or points of intervention) are inevitably *confused*[36], which can only be overcome if both anchors co-develop during inquiry.

6.2.2 The problems of specifying experience

As noted in Sections 1.4.1, and 2.1.1, a central power of game design is making the abstract concrete, by transforming a proposed experience into a tangible reality. Game developers have the power and technical skills to create game worlds in the form of what they know or imagine. Potential problems of the FMC arise from this design impulse because hylomorphic powers can lead to hylomorphic assumptions (see Section 1.3.3). But there are two severe limits to these hylomorphic powers: 1) the concept is not the concrete experience and the purpose of game development is not to *produce* concepts and 2) the game development process is not predictable. At the very least prediction is difficult because surprising game dynamics appear once players become involved (Brathwaite & Schreiber, 2009, p. 11). FMC problems in the game design process may arise in the difference between having an *imagined* game experience, having a *real* game experience, and in the language used to talk about either. The gap that words and abstractions have from immediate experience can be problematic. I suggest this problem gap emerges between:

- the apparent certainty of a stable concept
- the elusiveness of design control in attempts to conceive of precariously balanced arrangements of complex dynamic events, for either concretely real or imagined experiences.

What I would like to call *the problem of specifying experience* suggests that our concepts and words fail to capture the qualities of an experience, particularly an imagined one. This failure also suggests that the problem of specification may not be ambiguity of reference, or the gap between natural language and program code, as has been suggested (Montero-Reyno & Carsi-Cubel, 2009). Instead, the issue is what cannot be captured by abstract, rational or systematic schemes, leading to what has been called the disenchantment of experience (Sengers, Boehner, Mateas, & Gay, 2008). The

[36] IDS#16

method of experience can be applied to game design to make clear the problem of specifying experiences. One consequence of this is when

> real objects are identified, point for point, with knowledge-objects, all affectional and volitional objects are inevitably excluded from the "real" world, and are compelled to find refuge in the privacy of an experiencing subject or mind. (Dewey, 1929a, p. 24)

Even when modelling familiar but complex real-world phenomena, oversimplification is a constant problem (Grim & Rescher, 2013). A knowing experience is only one mode of experience, and therefore, the apparent certainty of a concept conceals ambiguity and vagueness in non-propositional qualities. Such *obscurity* of experiential qualities is an indeterminate basis for the specification of a game experience that incorporates the full richness of experienced qualities.

The discussion above shows the indeterminate foundation for reducing concepts to form elements, and suggests the problem of specifying experience is also a second-order problem. A design specification that only leads to indeterminate feelings and qualities leaves open the potential for design incoherence. Form elements implemented from such indeterminate creative direction may entail *conflicting* logics, leaving open the possibly that the play experience will be *confused*, and lack qualitative and logical integration.[37]

6.2.3 The necessity of indeterminacy in game concepts

Johnson (2007a) shows that experience is too rich and complex to be meaningfully reduced to literal and linguistic meaning, and that "mechanisms of human meaning extend far beyond the capacity for language" (p. 260). Concepts, if used to recognise, define and fix an imagined experience, can cut inquiry short, trading a deeper perception of qualities for identification with what is known. Dewey (1929a) says that we should not "ignore the indeterminateness of meaning when there is awareness" (pp. 309-310), which accords with Krippendorff's (2006pp. 52-53) idea that meaning in perception is the possibility of seeing something in multiple ways.

[37] IDS#17

If conceiving of an imagined game experience is to retain an awareness of new possibilities, then the meaning of a game concept, at least in part, must *necessarily* be indeterminate. For the game designer, conceptualisation of imagined experience is an inquiry in itself that, in Hatchuel's terms (see Section 2.2.3) leads to expansion and qualification of the concept. If a game designer expects to determine an imagined game experience that is supposed to be rich with new possibilities, and fix it within a conceptual form, they have failed to consider Dewey's (1929a) observation that

> while there exists an antecedent stock of meanings, these are just the ones which we take for granted and use: the ones of which we are not and do not need to be conscious. (pp. 309-310)

It is precisely the meanings within a game concept that are *obscured*, *confused* or in *conflict* with established meanings[38], that allow new game experiences to be created, and which must be discovered during game development. The design of new game experiences cannot rely solely on taken-for-granted meanings: consequently, for any game design situation that is open to the possibility of new experiential qualities, *game concepts cannot be determinate*.

Game designers therefore may often face situations of not knowing which qualities their game must have, until they actually experience them. Such qualities are therefore *obscure* if they cannot be experienced or are not suggested.[39] These areas of dark and twilight beyond the illumination of knowledge play an important part in game design, but their connection to the conceptual forms that guide game development has not been satisfactorily explained. In the next section, I will explore a solution to this problem in detail.

6.3 The embodied sense and meaning of a game concept

Behind explicit expressions and formulations of a game concept is something more personal, tacit and difficult to express: the meaning of what the game is, or should be, about. This is the sense of what particular qualities determine the imagined game experience, and mark it out as *that* experience. Rouse (2005) emphasises the importance of a game's focus having a personal, inspirational quality: it should be "something that

[38] IDS#18

[39] IDS#19

grabs you viscerally, stirs your creative juices, and makes you feel absolutely exhilarated" (pp. 70-71). In team-based development, this sense cannot remain the feeling of just an individual. Instead, it must become shared so it can be the subject of deliberation and negotiation, and can also coordinate and guide game-making activity of many individuals. Terms such as vision, essence and identity can be seen as attempts to explicate or point towards what this sense of the game is. Manker (2012) uses the term *doxa* from rhetoric theory to characterise this as "the design team's common understanding of what the game is" (p. 88).

Gendlin shows that we conceptualise *what we mean*, and as previously discussed in Section 4.3.3, meaning comes from what is implied in our embodied, felt sense of the situation we are in. Often, people

> lose the intricacy of an actual situation as soon as they use words. If they have a hold of something implicit, pregnant, still vague because it is new and more precise, they lose it as soon as they apply a word. That is because they think that the word has put its old definition on what they were thinking about. Thereby they lose what they nakedly said (thought, felt, sensed, pursued, ...) a moment before. (Gendlin, 1992 / 2012, Chapter A3-11)

For the game designer, the imagined or yet-to-be-realised game experience is an "implicit, pregnant, still vague" situation, and Gendlin's theory of embodied meaning provides useful insights into the connection of game concepts and feeling.

6.3.1 The implicit intricacy: logical forms do not work alone

Concepts are constructed on logical differences established in the demarcation of one thing from another: therefore, concepts have a logical structure from which follow necessary logical implications (Gendlin, 1963, p. 252). Concepts, as logical forms, stabilise our experience so effectively that it is hard to imagine thinking or speaking without them. For example, when we want to talk about a certain group of fictional humans with impossibly enhanced capabilities, the concept *superhero* seems to clearly specify our meaning. However, as Gendlin (1992 / 2012) argues, logical forms "only *seem* to work alone" (Chapter A1-1), and they are "incapable of encompassing the intricacy of people and situations" (Chapter A1-1). Concepts are limited in this way because, when humans employ them, “we have the meaning of concepts only as felt meaning” (Gendlin, 1963, p. 252).

Gendlin (1992 / 2012) claims that forms “*never work alone, always only within a wider and more intricate order*” (Chapter A1-1, original emphasis). Experience is much richer than what can be captured in any concept, and our thoughts often go beyond our capacity to articulate them. Dewey (1930 / 1998b) states this quite clearly when he says “no verbal symbols can do justice to the fullness and richness of thought” (p. 199). To Dewey (1929a, pp. 298-300), meanings, as experienced:

- are “grounded in immediate qualities, in sentiencies or ‘feelings,’ of organic activities and receptivities”
- “do not come into being without language, and language implies two selves involved in a conjoint or shared undertaking”.

This mechanism of language “is in alliance with general organic behavior” (pp. 298-300). The biological process

> supplies language with the immediate qualitative "feel" that marks off signs immediately from one another in existence. ...In a thoroughly normal organism, these "feelings" have an efficiency of operation which it is impossible for thought to match. Even our most highly intellectualized operations depend upon them as a "fringe" by which to guide our inferential movements. ... They give us premonitions of approach to acceptable meanings, and warnings of getting off the track. (pp. 298-300)

Dewey clearly emphasises the important connections between the body’s feelings, meaning and language. Gendlin’s (1992 / 2012) concept of “implicit intricacy” (Chapter A3-6) denotes this wider, embodied order that conceptual schemes work in.

A strong sense of what Gendlin means by *implicit intricacy* is revealed in the process of reading his story (1992 / 2012, Chapter A3-3, original emphasis) about a poet[40]:

> The poet stops in midst of an unfinished poem. How to go on? Perhaps there is only confusion. No leads. The poet reads and re-reads the lines.
>
> Where they end something *does* come! The poet hears (knows, reads, senses, ...) what these lines need, want, demand, imply, ... What the next line must say is now already here—in a way. But how to say that? What is *that?* It is <u>.....</u>—the

40 Note that Gendlin uses ..... and <u>.....</u> as special symbols, to be explained below.

> poet's hand is silently rotating in the air. The rotating gesture says that. The poet tries this line and that. Many lines come. Some seem good. The poet listens into what each of those lines can say. ...
>
> A great many such lines come and are rejected. The poet reads to the end of the written lines again and again. Each time that ..... comes. The lines that offer themselves try to say, but do not say—*that*. *That* seems to lack words, but no. The ..... is very verbal: It knows the language well enough to understand—and reject—all the lines that come.

For Gendlin (1995), the ..... is a *blank*; a pregnant space:

> The blank brings something new. That function is not performed by the linguistic forms alone. Rather, it functions *between* two sets of linguistic forms. The blank is not just the already written lines, but rather the *felt sense* from re-reading them, and *that* performs a function needed to lead to the next lines. (p. 548, original emphasis)

Gendlin (1992 / 2012) states that the "blank is *vague, but it is also more precise* than the poet can as yet say" (Chapter A3-3, original emphasis). In his discussion of Gendlin's poet example, Johnson (2007b) observes that the meaning expressed by the poet

> is not entirely in the words themselves. It resides not just in forms, or concepts or patterns. Nor does it lie entirely in our felt sense of the situation. The structural and the felt are not two independent realities, but, rather, they are intertwined aspects of a developing process of meaning-making. (p. 99)

The felt *sense* of the poem's meaning requires a new expression, and Gendlin (1992 / 2012) says that "[t]his ..... demands and implies a new phrase that has not yet come" (Chapter A3-3). In striving to express feelings in words, the poet's felt bodily sense was tested in trying out concepts: to read, hear, simulate, sense, feel, ... if a concept could carry the meaning of the poem forward. The blank, or ..... is a tension, it "is an implying" (Chapter A3-3), and Gendlin (1995) says that the word that finally comes does not "copy the blank" (p. 548). Instead, "[t]he explication releases *that* tension, which was the .... But what the blank was is not just lost or altered; rather, *that* tension is *carried forward* by the words" (p. 548, original emphasis).

Gendlin's phrase *vague, but more precise*, and his use of ..... as a symbol are ways of revealing the precision of our felt understanding of the situation, and the tension between what we feel we mean and what *concepts*, as patterned forms, allow us to express. I have illustrated this process in Figures 6.1–6.3.

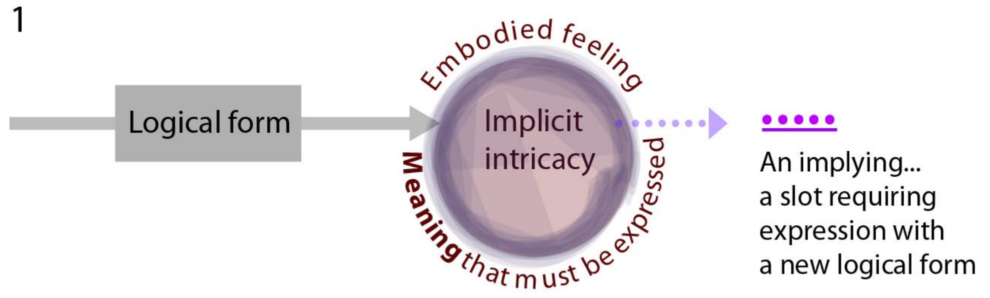

Figure 6.1. Logical forms and embodied meaning work together to create an implying, slot, ...

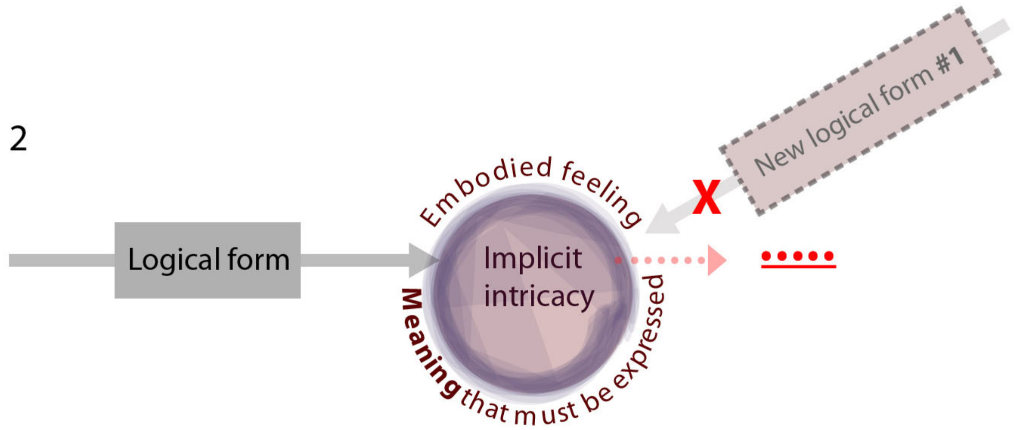

Figure 6.2. Some logical forms do not lead to a sense that fills the slot. The embodied feeling rejects inappropriate forms

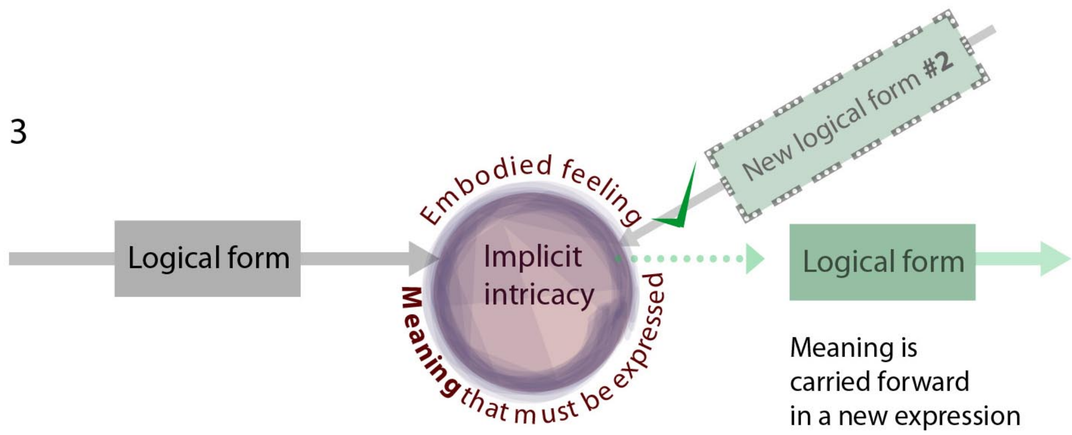

Figure 6.3. A logical form that fits the slot will lead to an expression that carries that meaning forward

That ..... is the point of what is said: “The greater precision exceeds only the patterns, not the saying. It is the saying” (Gendlin, 1992 / 2012, Chapter A3-5). The *saying* (Gendlin also called this *naked saying*) is therefore not the utterance of conceptual forms: it is the precisely felt pre-conceptual meaning that finds a *way* of expression. In other words, what we mean is *in* what we say, but our meaning is more precise than any one thing said. The context in which saying occurs implies more precisely the feeling of what we mean. For example, imagine I am beginning to design a game in which the player has the power to overcome the limits of being a ground-walking biped. For the moment, I leave open what sort of biped you play as. The context of what my game concept means is present in saying: *this game, in which you play as a ..... is about freedom, effortlessness, exhilarating feats and defying gravity*. Here I have left open what ..... could mean. Perhaps it could mean a:

- wing-suited daredevil
- jetpack commuter
- wedge-tailed eagle
- microscopic human on a dandelion seed
- motocross bike rider
- scuba diver
- lunar warrior.

In re-reading the above statement about what the game concept means, it is possible to substitute the blank for each concept on the list above. Any one of these concepts will fit the blank (or slot) I have left open. Taking up any one of these concepts adds a different set of implications. To develop this example further, consider what happens by filling the blank with the concept of a *superhero*. I will say that *this superhero game is about freedom, effortlessness, exhilarating feats, defying gravity and .....*. The blank implies specific possibilities based on the context of what has come before, now shaped by the adding of the logic of the superhero concept and the wider, intricate order it brings. Alternatively, I could change what is implied by saying that *in this game you take on the role of a maimed, claustrophobic and disease-ridden superhero, and the game is about freedom, effortlessness, exhilarating feats, defying gravity and .....*. The saying of these words produces an implicit meaning, which can only be articulated by precise concepts. As Gendlin (1992 / 2012) states:

> You can see from this, that how we *take* a word, (and how you take "take" here) depends on something that functions implicitly. The (new and old) ways in which words can make sense involve very precise *functions of implicit intricacy*. *Taking* a word a certain way, and *making sense* (or making a point) are two functions we can grasp as they happen here. ... To come into a slot, the word must work. It must make sense, but that requires a function of the implicit intricacy of the slot, together with the implicit intricacy the word brings. These cross. You can grasp the function performed by their crossing. (Chapter A3-5 (original emphasis))

As discussed in Section 6.1, game concepts feature what I will call *focusing forms*, such as essential focal concepts, hooks, core values and game pillars. Therefore, a verbal articulation of a game concept is a *crossing* of what is implied by the focusing form and what is implied by the slot that the focusing form fills. The slot is created by other expressions of, and feelings about, what the game concept means. Focusing forms, as logical formulations for game design, therefore do not work alone. They carry their own entailments, and whenever we use them, they bring forward a meaning implied in our currently embodied situation. That is, both the situation we say a focusing form in, and the purpose we have in saying something, shift the context, and meaning, of those focusing forms.

6.3.2 Limits to conceptualisation

The previous discussion of Gendlin's ideas suggests four related limits or problems in the conceptualisation of games, which I will discuss below:

1. truncated meanings in weak expression
2. weakness of connection to an implicit intricacy
3. sharing the implicit intricacy
4. changes in sense and meaning.

Truncation of meaning in weakness of expression

First, as suggested in Section 6.3.1, settling on a conceptual distinction may truncate the implied feeling of what you mean to say, resulting in an expression with poverty of meaning. Immediate, intellectual confusion may be avoided by making a conceptual distinction, but as noted in Section 6.2.3, such determinacy prevents the possibility of seeing something in multiple ways, and this may *obscure* the path to conceptual discovery: a process that leads to precise feelings about the concept, and results in a reduction of embodied *confusion*.[41] A general concept of an imagined game experience may therefore not have the power to imply a certain feeling and carry forward the creative tension in the development process.

As mentioned in Sections 6.2.3 and 6.3, an imagined new game experience must remain indeterminate: it is a pregnant situation of implying. The inquiry process is therefore a search for more precise feelings about the imaginary game, and more precise ways of expressing it. In a collaborative development environment, team members need direction, but they also need room to find the potential meanings in the game concept, and find ways of expression that lead to a more precise meaning. When searching for the essential focus of a game concept, if the *implying* of design work is retained, it will lead to fuller, more precise *sayings* of what an imagined game experience means. If the implying is cut off with *weak expression*, that search is truncated. The problem is that a design document or a game concept is usually expected to feel certain and final, not open and implying. A game concept truncated in this way may be a weak expression of the imagined experience, particularly one that aims to go beyond the most generic expression of ideas.

Weakness of connection to an implicit intricacy

Unlike a weakness of expression, the second problem with conceptualisation in games is a weakness of *connection* to the implicit intricacy from which the concept comes. This is a matter of being aware of three different meanings in:

1. the concept in the context of a statement
2. the concept taken in isolation from any particular saying
3. the *point* taken in the midst of design discussions or other experiences when the feeling of the imagined game experience is strong.

[41] IDS#20

Without a means of re-experiencing the sense from which the concept came, the *point* of what is said is lost, *obscured* or *confused*.[42] In other words, a truncated concept does not carry forward the meaning of the imagined game experience, and there is no strong or vital felt sense of it we can "dip" into or "focus" on (Gendlin, 1995, p. 553). Words on paper, or words spoken, if they are focusing forms, may not retain the implying of the situation that generated them. Perhaps this is why many game designers write up their designs in the form of stories. As Sirlin suggested in Section 6.1.3, a general concept says almost nothing but is easier to agree on in a social design situation. But what is implied by the general concept? I suggest that people disagree over very specific concepts because it is difficult to share a precise feeling without also sharing the *experience* that implies the precise concept.

From this, I conclude that an expression of a game concept that is rich in meaning is able to retain the context of a very precise saying: it implies a specific feeling of a game experience. For example, a good prototype expresses a concept successfully because it is a shareable experience, with the necessary structural forms to imply the meaning of the concept strongly. A good articulation is therefore a good crossing of structural forms (e.g. a word, pattern, image) and a slot: good articulations employ forms to create a slot, blank, ... that implies other forms precisely.

Coordinating the implicit intricacy

The third conceptualisation problem is a limit to sharing the experienced situation among the members of the development team, and thus, coordinating the implicit intricacy. This limit is overcome naturally once the playable game is accessible to all team members, but the imagined game experience is *not* the playable game experience. Concept articulation and communication methods allow a shared sense of the imagined game experience. I suggest that this is why game designers endlessly discuss the design of the game, so they can:

1. re-generate or re-experience the intricacy of the situation from which their design concepts and design issues emerged
2. explore what is implied by the concept and by the imagined game experience.

[42] IDS#21

This behaviour achieves what Gendlin's poet does: re-reading lines to retain the sense that implies what should come next, in an attempt to reveal what is *obscure*, distinguish what is *confused*, and make coherent what is in *conflict.*[43]

Changes in sense and meaning

The fourth problem is the most significant, and suggests why indeterminacy in game development persists, and why design documents never stay up to date. Well-defined concepts may change their meaning in expression if the change makes sense in a new situation:

> Anything we say, however well defined it is, *can* also be taken as a ..... . If what we say makes sense, a ..... can come where the word worked. Take any word out of a sentence; let ..... come, and let other words come there. What had seemed formed and fixed then shows its intricacy. (Gendlin, 1992 / 2012, Chapter A3-6 (original emphasis))

It is important to remember that *actions* also relate to sense and meaning, and it is not just sayings in which a change of meaning makes sense, but a change of doings:

> Your felt sense is your body's interaction with your situations. Human bodies have situations and language implicit in them. Our bodies imply every next bit of our further living. An action can explicate this implicit further living, and can carry it forward. To explicate in words and in logic are special cases of such further living. So, of course, dipping into a felt sense brings what we want to do or say next. (Gendlin, 1995, p. 553)

Recall Duke's idea that each game develops its own specific language. Gendlin (1963) offers a way of explaining the connection between the feeling of what a game experience should be, and the development and shaping of a vocabulary of form elements:

> Because felt meanings are the body's complex interactive life patterns, they are capable of being conceptualized by modifying any vocabulary, and using it in reference to this experiential process of felt meanings and differentiated aspects. (p. 250)

In addition to verbal or visual concepts (as structural forms), game designers can conceptualise their felt meanings using form elements. Such logical forms work with the implicit intricate order a designer feels emerging from an imagined or concrete

[43] IDS#22

game experience. Experimenting with form elements (e.g. through level design or system configuration) is therefore an essential way of exploring contexts for the possible meaning of a game experience, and explains why reconception can occur so readily in the iterative process. This leads to an important conclusion: gameplay design is experimentation with embodied feelings about the game experience, and with the language forms used to express its meaning.

The discussion in this section has provided a way to understand the need for changes in the game development situation to *make sense* in an embodied way. Game designers need to fully *sense* whether their second-order expressions (form elements) reduce *conflict*[44], result in coherence and appropriate meanings, and carry forward the right feeling. The only way to experience such design changes (just like the poet re-reading the lines) is through design experimentation and playtesting. In Chapter 7, I examine common situations that lead to such change during development.

6.3.3 The necessity of reconception in game development

The limits described in Sections 6.2 and so far in this section suggest why the meaning behind a game concept is not determined once and for all in one saying. If we try to *lock down* an idea through employing a concept in a slot, and if that expression makes sense, we may have still found only one possible way of doing so.

If we assume, for argument's sake, that the meaning of a game concept remains stable throughout development, there may be other, better ways of saying that meaning. The chances of better expressions emerging in a social, incremental and iterative design situation is high: other ways will be discovered that reduce the tension felt in any sense of *obscurity*, *confusion* or *conflict.*[45] We can use any number of fitting concepts

> to carry forward our own experiencing of ourselves and others, to explicate what we feel with that directly felt inward tension-release which comes from referring directly to what we feelingly mean, and saying something true of it in words. However, the truth of us resides in the concrete pre-conceptual felt meanings of experiencing, not in the conceptual patterns we employ. (Gendlin, 1963, p. 251)

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[44] IDS#23

[45] IDS#24

Because concepts “are relationships between felt meanings and linguistic symbols” (Gendlin, 1963, p. 251), it is important to consider what it means to have a stable concept or conceptual system. If a game concept is intended to be a stable thing from which to develop a game, and we use only one linguistic form to say it, then there has to be a stable relationship between that linguistic form and the felt meaning. In other words, the implicit intricacy of our bodily engagement with the world—our felt meaning—cannot be permitted to change. But this is impossible. To lock down the meaning of a concept denies the lived reality of developing games: a process of transforming an imagined experience into an interactive real experience. The imagined experience is not the game experience, and even if we tried, we cannot put ourselves into a stasis where the only felt meaning we keep is the original imagined one. Concepts on their own cannot survive contact with the many situations experienced when making a game.

The impossibility of an absolute fixed meaning of a stated game concept becomes even more obvious when we consider whose felt meaning it is. Each individual on the team has their own imagined game experience. The feeling of that imagined experience inevitably will develop as the imaginer thinks about it more, and considers it in more detail as part of the process of specifying it so it can be made. And so it will be for each member of the team, who each find meaning, and different contexts for meaning, in the specifics of their own work, whether that be code, art, sound, writing stories or economic systems. An undesirable—and impossible—situation would be one in which all team members, throughout the duration of the project, had precisely the same felt meaning, and had the same stable relationship between that felt meaning and a single stated concept. Management interests may desire that kind of stability and predictive control: however, new ideas and improvements come from a carrying forward of meaning into new forms, not stasis. The intricacy, the way our bodies understand a situation, rewards “other distinctions and divisions, yet differently”: experience as understood “is not this or that set of distinctions” (Gendlin, 1992 / 2012, Chapter A1-6).

An additional reason that meaning changes, and reconception is inevitable, is that over the course of development, the imagined game experience slowly gives way to a concrete game experience. The long, slow co-development of the parts and the whole involves many crossings of meaning: into every evaluation of meaning in the experience of the current game build, the designer brings the implicit intricacy of the imagined game experience (not to mention various design goals and other criteria). The feeling of the real game experience will differ from what is imagined, for better or worse, in ways that imply many different things. However, that feeling is always in negotiation with the feeling of:

- what is imaginable
- what is possible
- what was previously imagined, stated and committed to.

As these felt meanings cross and change, they form a complex mesh of contexts. Therefore, what is implied by the previously stated concept changes: as a result, the current design vocabularies—concepts and form elements—must be modified to find a new way of expressing (saying) what is felt. In other words, the nature of game development is to create an ongoing change in the crossing of numerous logical forms:

- game concepts
- conceptual tools for design
- design requirements
- manipulable game forms (form elements)
- the logic perceived in dynamically experienced game structures (BiaForms).

The evolving game development situation is a site of constant challenges to developing a stable, embodied, felt meaning in the designer because it is regularly *obscured*, *confused* and in *conflict* between these shifting logical forms.[46] This conclusion achieves three things. First, it adds clarity to the nature of the co-development of practically integrated knowledge and game experience that was discussed in Sections 5.3. Second, it also explains the inevitable instability of concepts, forms and languages on which game development rests. And third, it provides an explanation of the uselessness of game design theories and formal methods that attempt to reduce and generalise (decontextualise) game design knowledge and game experiences to purely logical forms.

[46] IDS#25

The ongoing process of conception during development

Each moment of the development situation, for each individual developer, is one containing many felt meanings which may *cross*, and, as Gendlin (1995) argues, "each implicitly changes, governs and gives relevance to the others" (p. 553). Factors that may retain, maximise or change the sense of what is experienced, and contribute to this network of crossings, include:

- game concepts as previously stated
- the imagined game experience
- the current game experience
- aspects of game experiences—as parts, a whole or the relation between them
- exemplar or remembered game experiences
- goals, design constraints, heuristics and design philosophies
- integrative concepts and design values
- design problems or conjectured problems
- design solutions or design possibilities
- other concepts, particularly metaphorical expressions
- what other team members are saying about any of the above.

At the initial stage of the project, before any implementation has begun, designers can only articulate what the experience *could* be. But during development, designers must also articulate what the current experience *is*, and what this means in relation to design goals, intentions, constraints, standards and possibilities. Game development therefore involves many changing design situations in which new meanings are implied, and these changing implications need to find expression. Thus, for a game development team, the meaning of the project, which is the point of their work, and is therefore what the design situation requires, is carried forward into the next phase of action possibilities. Design conjectures carry the sense of the situation forward into a more detailed working in gameplay, regardless of the meanings that are crossed. Through the iterative development process, designers necessarily perform two functions:

- They discover how various game structures imply things that stretch the intended meaning of the game beyond the original understanding, and therefore, reveal more precisely what the game experience is *not*

- They ‘say’ (through design activity, in speech or action) something new that re-shapes old understandings in terms of something that is more precise, and more integrated with the mechanisms of games. This could also be compared to Schön’s notion of framing the design situation and Hatchuel’s process of concept expansion.

Conception is therefore an ongoing process that includes any engagement with the game experience while the design situation has indeterminacy. Design discussions and design work, proposals, possibilities, and so on, are ways of drawing attention to how the game concept actually works. In these situations, game designers explore what the concept is doing, what meanings it brings, and how meanings could be carried forward. Conceptualisation is thus not an initial process that stops once a game specification is written. The different purposes that a game concept can serve (discussed in Section 6.1.3) now take on greater significance. Because the situation we are in defines our purpose, it sets up a felt sense of direction, and works with concepts to carry forward what we mean in a particular way. Therefore, what is implied by the same concept (as a logical form) may be taken differently in another situation, in which other purposes, and feelings, are at work. What is stated when a designer employs concepts to articulate a game experience may therefore differ when the designer is discussing the current version of the game in development with other team members.

Additionally, the need to express the game concept only arises when the meaning of the game concept is an issue at stake. The purpose is then to gain clarity of direction by representing the idea of the game, and managing the overall design. At other times, the need is to identify discrepancies and formulate problems, propose possible solutions or improvements, or evaluate solutions or consider their implications. In this way, the meaning of a game concept may drift simply through the process of attending to the details of the parts of the game: their reduction from an overall concept, and their specification, implementation, problems and refinement. This fragmentation process is necessary, and leads to the need for re-integration into a whole, by attending to the whole through the parts (interiorising them). In turn, when development work is integrated and tested as a whole, and the meaning or identity of the game is once more focused on, this may create indeterminate situations involving:

- surprises when something previously *obscured* is revealed
- *confusion* due to discontinuities, redundancies or inadequate designs
- *conflict* due to incoherence.[47]

6.4 Summary

In this chapter, I examined the conception of games in detail, including the various ways of approaching the conception of a game experience, the various purposes a game concept serves, and some reasons that game concepts are controversial. Because game concepts serve many purposes and interests, there are multiple contexts to the expression and interpretation of game concepts. In addition, there are important limitations to conceptualisation, including those suggested by Gendlin's work, which shows the way concepts and other logical forms work together with feeling and the expression of precise embodied meaning. This leads to *the problem of specifying experience*, which suggests that our concepts and words fail to capture the qualities of an experience, particularly an imagined one. This is an indeterminate basis for specification of the form elements of a game, which, as second-order design objects, leads to *the double problem of specifying experience indirectly*. I have also argued that game concepts are inevitably and necessarily indeterminate, and that fixing the meaning of a game concept is impossible. And finally, as a consequence, the process of development creates an ongoing process of conception and reconception.

[47] IDS#26

Chapter 7: Design situations and the development of design coherence

7 Introduction

In this chapter, I discuss cases of game development to show how a common approach to designing games—conceptualising game experiences in terms of generic concepts and conventional forms—can cause problems during development, resulting in an incoherent and fragmented game experience. I then show how the development process becomes an itinerant path of iteratively changing the design (including the concepts that guide the design work) until the game experience becomes unified through the discovery of a viable unifying creative direction.

In Sections 7.1 and 7.2, I discuss the development of *inFAMOUS.* In Section 7.1, I explore the way the game's unifying concept emerged from the process of solving design problems created by the use of generic concepts and conventional game design forms. In Section 7.2, I focus on the way the non-conceptual part of the game design (its feel), developed in a continuity of inquiries to reach a coherent, unified whole. In doing so, I develop general insights into relationships between the entailments of game concepts, logical game forms, and the felt qualities and meanings of the game experience. In Section 7.3, I outline several important design and making situations that lead to design change, and necessitate and inquiry process. These insights are further discussed in Section 7.4, in the context of the development of design coherence as an outcome of inquiry. I also examine the development of *Portal* to demonstrate the iterative and itinerant nature of reaching this coherent final game development situation.

7.1 Problems with the use of generic concepts and conventional design forms

Aside from reference to conventional gameplay forms and exemplar games, it is common to conceptualise an imagined game experience using generic concepts. However, from a design perspective, generic concepts are incomplete concepts because they cannot suggest aspects of a game experience with precision. For example, a game concept about a flaming superhero is more particular and complete than one about a superhero, which is again more particular and complete than one about flying and fighting. I argue that incomplete concepts are incapable of providing the systemic and integrative viewpoint needed to unify the game experience. Additionally, I argue that use of generic and incomplete concepts obscures[48] the nature of the game experience and limits the effectiveness of design conceptualisation. This in turn reduces coherence, increases indeterminacy and creates design problems that necessitate inquiry.

The use of game conventions in conceptualisation is convenient, but can also cause problems. Conventional forms are usually established due to their contribution to a particularly successful or innovative game experience. People become familiar with conventional forms through repeated gameplay experiences and can develop a deeply embodied understanding of them. Conventions (and particularly exemplars) work coherently because they were specifically co-developed as part of a unified whole of *a* particular game. Therefore, conventional forms, such as game mechanics or game structures, carry entailments that work with the particular logic of *one* game, which may *conflict*[49] with the concept of another game. In this section, I will use the case of *inFAMOUS* to explore these issues in detail and further examine the limits of game design conceptualisation.

7.1.1 inFAMOUS: wandering before finding a focusing form

The initial concept for *inFAMOUS* involved playing a superhero in an open-world city, including a combination of elements from "ANIMAL CROSSING, THE SIMS, and GRAND THEFT AUTO—an action game with pervasive simulation elements" (C. Zimmerman, 2009, p. 34). As the *inFAMOUS* team members developed the concept, they

> decided that parkour-style jumping and climbing would be a core ability for the game's hero. We wanted to integrate the environment into the player's tactical experience, rather than relegate it to a backdrop for the action. (C. Zimmerman, 2009, p. 32)

The team also used an exploratory approach to concept development:

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[48] IDS#27

[49] IDS#28

> One of the first lessons we learned at Sucker Punch was the difficulty of designing a fun video game on paper. We've never had much luck predicting which ideas will end up being fun, and which ones won't. The successes we've had have been the result of trying out lots of ideas, pursuing the ones that had a smattering of fun in them, then testing and iterating until we'd refined the fun into its purest form. (C. Zimmerman, 2009, p. 34)

However, on the *inFAMOUS* project, this approach did not improve the definition of the concepts involved. The team

> worked on prototyping a bunch of innovative little gameplay scenarios, expecting that a clear vision of what the game should be would arise from the prototypes. It didn't; we just ended up with a bunch of little prototypes that had nothing to do with each other. (C. Zimmerman, 2009, p. 34)

In hindsight, Chris Zimmerman (2009), development director of *inFAMOUS*, stated that

> for the first year of the project, we really didn't have much of an idea of what kind of game we were building ... we were nearly a year into the development of what was ostensibly a combat-focused action game, but still hadn't done any work on letting the player fire a weapon, or on having enemies that shot back! (p. 35)

As the concept development period reached the one-year point, the prototyping process had not brought the team closer to clearly articulating a unified game concept. They sought advice from their publisher's marketing staff, who suggested that the game was "about becoming a superhero", and that they would "market the superpowers" (C. Zimmerman, 2009, p. 34). Following this suggestion, the team members began integrating their disparate prototypes into a game experience about the use of superpowers. The introduction of a unifying principle, however general and incomplete, allowed the design to become more defined. According to Chris Zimmerman, "things progressed quickly from there; most of the innovative little gameplay scenarios were set aside, to be revisited once the core of the game was tight" (C. Zimmerman, 2009, p. 35).

In contrast, the initial conceptualisation of *inFAMOUS* (which used many generic and incomplete concepts) did not have this kind of integrative power. In the postmortem, Zimmerman (2009) regretfully stated that "we should have realized that our inability to articulate a crisp vision for the game meant that we didn't have a clue what we were doing" (p. 34). Zimmerman's perspective reveals assumptions about the expectation of design control, which, as I have argued in previous chapters, is unreasonable in the development of new games. Although a game pitched as *Animal Crossing* meets *The Sims* meets *GTA*, involving *parkour*, where you play as a *superhero* may sound vague, it should be remembered that many stakeholders, including the whole development team, and the publisher, found enough meaning and certainty in the initial design situation to continue into development. I argue that this shows how incomplete concepts, conventions and exemplars can seem more complete, integrated and experientially full due to the implicit meaning brought to their use by each individual. This example reveals a large gap between the sense of completeness in game concepts and their realisation as game experiences.

7.1.2 inFAMOUS: problems with conventional game forms lead to a refined unifying concept

inFAMOUS was conceived early on as “primarily a third-person shooter” (C. Zimmerman, 2009, p. 35), which is a very common conventional game form that is focused on combat action at range using projectile weapons. Through the exploratory prototyping process, the team experimented with different ways a player could attack enemies, and

> at various times, the main character Cole carried a pistol, or threw sharpened bike gears, or telekinetically grabbed nearby stop signs and hub caps and chucked them at enemies. (C. Zimmerman, 2009, p. 35)

This example demonstrates a process of itinerant development, and shows the indeterminacy of meaning in the team’s feeling about the player character as *simply* a superhero: a concept that implied many possibilities and allowed many different explorations and implementations. However, none of those explorations or implementations led to a precise conceptualisation that could integrate them all. Conventionally, the use of weapons and attacks in games are constrained by a limited resource, such as ammunition. The weapon system for *inFAMOUS* initially followed the conventional logic of the shooter genre:

> defeated enemies dropped ammo for your superpowers. Ammo came in multiple colors, and each superpower used a particular kind of ammo. One kind of ammo needed to be used right away, and timed out if not used quickly enough. Enemies also dropped health packs, which looked like a different color of ammo to the player. There were good reasons for all of this complexity: we wanted to limit the

> use of the most powerful hero abilities, we wanted to encourage players to use a broad set of their superpowers, and so on. (C. Zimmerman, 2009, p. 34)

However, there were problems in adopting the logic of the third-person-shooter convention: at a later point in development, when the team conducted focus tests of the game, they discovered that

> players hated the ammo model. They were confused, they didn't like having to conserve ammo, they didn't think picking up glowing balls made them feel like a superhero ... it was a complete train wreck. (C. Zimmerman, 2009, p. 34)

This feedback, when taken with the above descriptions of the ammunition system can be interpreted as revealing several problems with their design at this stage:

- The ammunition system was too complex, with too many different types of ammunition, and with too many different functions.
- The players confused the appearance of the various types of ammunition and health packs during play.
- The players had a different conception to the designers of what the experience of a superhero should be.

The feedback from players showed that by enacting processes for conserving ammunition and collecting spare ammunition, they felt as if they had limited power (agency), rather than a perception of wielding *super* power. The design team had previously identified that the ammunition system design was unsatisfactory (C. Zimmerman, 2009, p. 34) and over-constrained, but until this point had not been able to find a better solution.

The team responded to this problem by recognising the need to simplify the ammunition system. After attempting a few different solutions, they

> unified ammo and health around the hero's core electrical powers. Drawing electricity from the environment replenishes the hero's store of energy, which is then used up by his powers. Drawing electricity also heals damage to the character. The player ended up with an easy-to-understand model, and a simple rule to follow —when in trouble, look for electricity to drain. At the same time, we gained a powerful way to limit the player's abilities—if an area of the city was blacked out, the player would be relatively weak in that area. (C. Zimmerman, 2009, p. 34)

This solution shows that the team discovered a concept that had the power to do two key things: integrate all of their requirements for the ammunition system with requirements from the health system and level design; and enrich the quality of interaction with the game's city environment. The design problems and various solution attempts implied a *concept* that at once made sense of many things, eliminated many *conflicts*[50] and solved many problems.

The new superhero concept went beyond having an integrating design function; it was a reconception of the player character in operational and experiential terms. Rather than being a non-specific superhero with many, but fragmented, powers, the team had developed a conception of an "electricity-based" (Rubenstein, 2008) superhero. This concept brought with it a definite logic concealed in a conceptual metaphor. If the player conducts and emits electricity, and electrical energy is their source of power, then the player can be understood as a kind of living *electrical conduit* / *battery*. The combined electrical conduit / battery metaphor is an effective conceptual model because most people have a general understanding of the behaviour of electricity. The metaphor not only reveals the logic, or *laws*, by which the player character operates (as a receiver, conductor, storer and emitter of electrical power), but it also allows players to easily understand how the game environment relates to those operations (i.e. game objects may be power sources, conductors or insulators).

The *electrical conduit* conceptual metaphor carries entailments that help to constrain the context in which the concept is understood and suggests linkages to other game systems. For example, electricity can be a productive or destructive force, it can be converted, and devices that rely on it are rendered useless without it. All of these logics can be mapped onto super-heroic properties and functions. Additionally, electricity implies charging and discharging, conduction and arcing, and electromotive force, which imply particular image schema (see Section 4.2.2), such as attraction, collection, centre–periphery, container, scale, enablement, inside–outside, source–path–goal and compulsion. Likewise, the metaphor naturally conceals or de-emphasises concepts related to a human hero, such as using conventional weapons and ammunition, or the infinite range of other possible superhero capabilities.

[50] IDS#29

What the unifying concept achieved

The playtesting process brought about conditions that forced the designers of *inFAMOUS* to examine their assumptions about conventional shooting-game features and the nature of their superhero character. Solving the problems they discovered required an explanation of why players found conventional ammunition and health packs to be unsuitable for a superhero. In searching for a resolution to both of these problems at once, the developers recognised that the core experience of *inFAMOUS* demanded its own systemic design, rather than the systems that had been designed for conventional shooting games.

This systemic design followed the systemic logic of the electrical conduit / battery metaphor. On one side of the metaphor is the human character, who has energy reserves (health) and expends energy (ammunition). The entailments of the electrical conduit / battery metaphor simply map energy reserves to electricity reserves, and energy expenditure to the draining of those reserves. The metaphor allows both ammunition and health to become part of a single system, which makes for more interesting tradeoffs and gameplay decisions. The electrical conduit / battery metaphor also solved design problems in more abstract domains such as concepts of health and weakness. The particular composition of multiple image-schematic structures in the metaphor allowed the nature of the superhero character to be re-conceived in terms of well-defined spatio-temporal structures: the player is powerful when charged, or *near* electrical power sources, but vulnerable when *far* away from them, and especially when discharged.

This example demonstrates that an indeterminate concept can lead eventually, through an inquiry process involving many conflicting implementations, design problems and playtesting, to the conditions necessary to develop a unifying logic for the design. A similar phenomenon has been observed in studies of design creativity, which involve the "building of a 'bridge' between the problem space and the solution space by the identification of a key concept" (Dorst & Cross, 2001, p. 435). In the case of *inFAMOUS*, by re-conceiving the concepts related to the design problems, some problems were resolved (the feeling of playing a superhero), and others dissolved completely (ammunition and health pickups). In addition, generic and conventional game design solutions may not work well when the conception of the player agent is fundamentally unique and demands unique laws and logic, as was the case for *inFAMOUS*. In this case, the laws and logic of a human soldier, from which shooter conventions come, was not suitable. The game-convention design pitfall is obvious here because the third-person-shooter convention carried entailments that conflicted with the superhero concepts.

Conclusions about the relation of conceptualisation and development

The insights provided by the case of *inFAMOUS* strongly suggest that there is an interdependent relationship between concept expression, design solutions, implementation, and design problems. And further, that this relation is a driving force in the cycle of inquiries in game development. This cycle seems to involve expressing a concept (or design frame), proposing courses of action, implementing features, and dealing with the problems generated by proposing possible solutions. In turn, developing design solutions can involve reconception and require new concept expression, causing the cycle to repeat.

When considering a top-down design process in light of the cycle mentioned above, it is clear that an implementation that leads to many design problems will inevitably cause significant reconception and design change. This relationships suggests that employing game conventions or game design patterns can be a great risk, despite the certainty such forms seem to bring. The familiarity of feeling of a game convention, such as *third-person-shooter*, or an exemplar, such as *GTA* or *Animal Crossing*, will, for each person, bring an implicit intricacy (that makes sense in a different design situation), into a new design situation. However, the sense, feeling, ... of the game convention may not integrate well with the logical forms of the new design. Such logical forms are second order, and therefore, cannot be felt simply by saying them in the same breath as a reference to the game convention. This discrepancy also explains a great difficulty that must be overcome when proposing new game designs. A *new* design concept or specification for a *new* form element has no strong embodied feeling and brings no implicit meaning to the situation; however, the game convention, if familiar and previously experienced, does. The crossing over of a design proposal and game convention, and therefore, their integration, can only be tested (like the poet re-reading the lines) in the game experience itself, where they are both of the same order (i.e.

experiential gestalts, rather than one experiential gestalt and a second-order logical form).

This discussion suggests at least five conclusions:

1. Early design decisions involve implicit, and unnoticed, meanings.
2. Implicit meanings from experience of previous games and the experience of logical forms (whether proposed or simply imagined) in game design are of two different orders: their crossing over, and integration, are not properly testable outside of the game experience itself.
3. When game conventions are used, there are two potential conflicts:
   - between the implicit intricacies brought by each team member
   - between conventional game forms and the logical forms of the new game design.
   These conflicts may not be revealed unless a commensurable context for the crossing of implicit meanings is found. Only in a shareable context, such as playtesting or the evaluation of design problems, can such crossings be explored and reveal what each situation implies (including potential conflicts).
4. Incomplete, generic or even new concepts, if not grounded in feelings from an actual game experience, may have a comparatively weak connection with an implicit intricacy, and consequently, lack meaning and integrative force in the design situation.
5. Design problems discovered through playtesting seem to be effective at implying more precise meanings, possibly because they introduce conflicting constraints, values and priorities, and allow few solutions that integrate all concerns together.

7.2 Beyond concepts: the development of precise game feel

Conceptualisation of game experiences can guide game design and development and assist communication within a team. However, as Gendlin says, logical forms (which game concepts are) do not work alone. In game development, once a playable game has been established, conceptual logical forms are relatively unimportant to the design of the game experience itself. The logical forms that matter are the form elements that produce the game experience indirectly. These forms help to produce the experiential characteristics of games: means of change, ends and ends-in-view, patterns of change that produce emotions, and the proto-logical structures in patterns such as image schema and vitality affects. Yet, these forms also do not work alone: and they must ultimately be designed (or indirectly shaped in the case of Bία~Forms) such that their integration in a game experience *works* (brings the right sense). I argue that this sense is what game developers commonly mean when they refer to the *feel* of the game.

Knowing the right feel of a game is a different mode of experience than knowing explicit concepts, and is vitally important to successful game design. In this section, through further examination of the development of *inFAMOUS*, I will consider the way knowing the feel of the game co-develops with the iterative development of the game itself. I will demonstrate how the developers of *inFAMOUS* achieved a stable embodied feeling about the game experience that cohered with its logical forms. I will also discuss the way conventional game forms and exemplars from other games carry their own specific logical forms, which can work against coherent design, and produce design problems.

7.2.1 Inquiries into character control

A fundamental aspect of the design of *inFAMOUS* was the modern-city setting, which offered many objects and surfaces for climbing. The team had previous experience making games involving climbing: however, this experience turned out to be inadequate for the requirements of *inFAMOUS*. The fundamental problem was described in the postmortem:

> Our goal was to let the player grab and climb anywhere this looked plausible, but we wildly underestimated how many places in a realistic city look climbable. The resulting density of options made figuring out the player's intent from controller input a real challenge. (C. Zimmerman, 2009, p. 32)

Because the team had already committed to designs for a realistic city environment and parkour-style agency, the solution space for this problem was limited to the design of the interface between player and game world. Behind the search for an interface solution was the team's desire to achieve a quality of immersion in the *inFAMOUS* game experience. This was later articulated by Zimmerman (2010) as being *about* "the character instead of driving the character or controlling the character", because "then the player doesn't think about the controls. They're in the moment in the game". According to Sucker Punch co-founder Brian Fleming, the focus of the team's work was to create "a game that plays very natural, very fluidly, and is very ... expressive", with "great feel in the controller" (Rubenstein, 2009).

Zimmerman (2010) describes one problem in finding this good gameplay feel: there "aren't enough buttons and control axes to let players directly indicate what they want to do" and "even given enough buttons, you can't rely on their joystick input". Zimmerman articulates the idea that eventually guided work on this problem: through interacting with the game via the controls, the player should *feel* like a superhero. The team realised that "the player wants to seamlessly express their wishes in the game space", and because it is a game, "they want to feel like they're being challenged, but they also want to succeed" (C. Zimmerman, 2010). These statements suggest that at some point the team developed some necessary conditions for sustaining a meaningful interface in *inFAMOUS*: to have a feeling of power, control and challenge worthy of a superhero. Developing these necessary conditions required more than "a year and a half of senior engineer time" (C. Zimmerman, 2009, p. 32), and involved many different attempts to represent and solve the problem of player controls over the course of development.

One attempt was to "embrace the challenge in the scenarios" and "force players to target objects exactly" (C. Zimmerman, 2010). This was found to be too difficult for players, and it caused too much failure and frustration. Another idea was to "take the skill out of the scenarios: lean on the joystick to climb a wall, add a lot of magic 'slop' to targeting, to disguise inexact controller input" (C. Zimmerman, 2010). The reasoning behind this approach was that "the player just wants to get to the top of the building, so let's not get in his way" (C. Zimmerman, 2010). However, the resulting experience was found to lack suitable challenge and offered no feeling of accomplishment.

These two solution attempts show different senses of what the concept of playing a superhero character could mean. First, in the challenge-based implementation, the conception of superhero action requires advanced game controller operation skills to produce gameplay actions worthy of a superhero. However, most players do not possess advanced skills, and must spend a lot of time feeling inadequate before they can master difficult controls. Second, in the skill-less implementation the conception of superhero action is effortless. Unfortunately, neither of these entailments—mastery of effort or effortless mastery—felt right.

A third approach was to find a middle way: demonstrating a concept of a superhero that reflected the idea that "superheroes don't just fumble their way through the environment" (C. Zimmerman, 2010). In the final solution, the designers wanted to "require the player to think they executed perfectly, but provide behind-the-scenes help to do this" (C. Zimmerman, 2010). This is a clear example of two related inquiries producing insights that led to a new design frame. This frame allowed a problem and solution to be formed together along with a hypothesis that improved the understanding of how the superhero concept should feel (perfect execution), and what that logically implies (behind-the-scenes help). From this hypothesis, Cole had to appear to act *super*-skilfully, but the player would not have to match this skill completely. The job of the interface would be to amplify the player's skill and transform it into actions worthy of a superhero. This solution would give "the player a feeling of challenge and accomplishment, but still let them succeed" (C. Zimmerman, 2010).

7.2.2 Difficulties with exemplars

In the process of finding a refined implementation of player controls, the inFAMOUS team examined exemplary climbing solutions from other games. *Uncharted: Drake's Fortune* and *Assassin's Creed* also featured a player character that could traverse detailed game environments. However, adapting solutions from the context of other games proved problematic because the inFAMOUS design situation differed in important technical, gameplay and conceptual details.

As the post-development evidence shows (Fox, 2010; C. Zimmerman, 2009, 2010), the design and construction of the realistic city environments in *inFAMOUS* was far ahead of the climbing gameplay system. For this reason, the city structures in *inFAMOUS* have an abstract climbing topology[51] underlying their climbable features that was not designed in the same orderly way (that precisely matched the metrics of the player character's moves) as the environments of *Uncharted* and *Assassin's Creed*. Another significant difference between *inFAMOUS* and the two exemplar games was that the density of surfaces and climbable objects in *inFAMOUS's* city environment is greater than the natural locations in *Uncharted* and the historical cities and towns of *Assassin's Creed*. *InFAMOUS'*s technical climbing topology was consequently more complex than the other two games (C. Zimmerman, 2010).

The player character in *inFAMOUS* as a superhero also has freer climbing and jumping agency than that possessed by the human protagonists of the other two exemplar games. For these reasons, using similar computer-assistance techniques to *Uncharted* and *Assassin's Creed* was found to be unsuitable and inaccurate for the needs of gameplay in *inFAMOUS* (C. Zimmerman, 2010). This example demonstrates the difficulty of directly applying solutions from game exemplars, in this case, due to differences in design particulars. I suggest that there were logical entailments in the technical implementations of each exemplar that matched its game concept, but clashed with the superhero concept of *inFAMOUS*. The general solution for jumping used by both *Uncharted* and *Assassin's Creed*, for example, was described by Zimmerman (2010):

1. allow the player to aim at what they want to jump to
2. when the jump button is pressed, instantaneously evaluate the world and resolve a valid target
3. commit the character control and animation to that solution.

In both *Uncharted* and *Assassin's Creed*, the gameplay concept features a powerful but human character who is either a rash and impulsive adventurer (*Uncharted's* Drake) or an assassin committed to instantaneous action without reservation (*Assassin's Creed's* Altaire). I argue that the logic of these characters in their particular game situations does not match the logic a player would expect from a superhero in *inFAMOUS's* game situations.

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51 Such structures follow the form of the highly detailed geometry you see in the game, but are simplified, invisible entities that the game program aligns the player character's hands or feet with (for example, through character positioning or inverse kinematics). Essentially, such structures form the logical wireframe that underlies the surface appearances, and makes it possible for the game character to perform climbing moves on game geometry.

The implementation problems experienced by the *inFAMOUS* team relate to the design particulars of the game environments, and the kind of gameplay actions that the team was using for the *inFAMOUS* player character. Together, these different details meant that the general *Uncharted* /*Assassin's Creed* solution, once implemented, was found to be inaccurate "more than 95% of the time" (C. Zimmerman, 2010). This level of inaccuracy was not so frequently problematic that the player would blame the system; instead, they would persist with it and become frustrated (C. Zimmerman, 2010). What this meant in play was that the player would direct their character to climb or jump on some game feature, and the *Uncharted* / *Assassin's Creed* style solution would commit the player character to go to where the program thought the player intended. Once the button was pressed, the player could only watch what happened. If, on 5% of occasions, what happened did not make sense, players would feel frustrated or cheated. Due to the comparatively high density of agency-supporting features in *inFAMOUS's* environments, this occurred frequently enough to be conspicuously annoying: it broke the "immersion requirement" that the player at all times should feel like they were controlling a superhero (C. Zimmerman, 2010).

As mentioned in Section 4.3.2, "[s]ense is the feeling of being in contact with the world without reflection, interpretation, or explanation" (Krippendorff, 2006, p. 50). I argue that the logic of the daring adventurer in *Uncharted* and the logic of the assassin in *Assassin's Creed* make it more acceptable to the player to momentarily lose sense, and lose connection with the game world: for the daring adventurer, in the moment of commitment, there is reckless optimism, and the assassin's ideology permits no doubt. In these cases, discontinuous sense is accepted by the player because an appropriate result is assured by the game at an acceptable frequency. In contrast, for the superhero, the expectation of control is continuous, and thus, sense must also be continuous. Therefore, gameplay forms cannot simply be borrowed because their logical entailments may lead to confusion, conflict and incoherence.[52]

[52] IDS#30

Design solution: an invisible superhero on my shoulder

The final solution to jumping and climbing in *inFAMOUS* was described as allowing the player to steer their character close to a target, then the game would "amend their input so the landing is perfect each time" (C. Zimmerman, 2010).

The team discovered a solution in which the computer assistance acted according to the same constraints that the player had (C. Zimmerman, 2010). This can be imagined as if a perfect version of the playable superhero character is virtually operating with the player at all times. The computer assistance would react to the player's input, estimate where the player intended to go, then mix its own input with the player's input to help them, but only by the extent that the player's input was lacking. Such a dynamic solution is continually feeding-back into the action-response cycle, and leads to a precise result in which the superhero character executes moves perfectly in a complex environment. Additionally, the animation system has time to move the character with the poise of a superhero while simultaneously providing anticipatory feedback on the system's behaviour. This solution has the benefit that the player can continually *sense* the assistance as part of controlling the player character. It becomes an intuitive part of the feeling of the interface, which the player can sense, interpret and respond to.[53] Zimmerman (2010) describes this sensation: "what the system is doing on your behalf is also something that you can do. It feels natural. The feel doesn't change".

This solution contrasts with the solutions the *inFAMOUS* team considered from other games, none of which featured a superhero. In these other games, when a player uses the controller to climb on something, it commits the player to an action, and then, for a short time, the game lets the computer take over, playing an animation and moving the character about, before returning control to the player. In this period, the interface is interrupted *after* the player commits to an action, and if the player selects an action by mistake, the mistake only becomes sense-able after there is nothing the player can do to correct it. The solution reached in *inFAMOUS* instead offers a continuous[54], uninterrupted interface in which the player at all times can supply corrective feedback to

53 In Swink's (2009) work on *game feel*, this can be characterised as the aesthetic sensation of real-time control, in which perceptual, cognitive and motor processes are working together in an ongoing correction cycle (pp. 2-4, 10-15, 38).

54 The *inFAMOUS* interface is not perfect. Some situations in the game feature so few climbable objects that the character has trouble finding a valid move, making the controls feel unresponsive.

the movement system. This solution also characterises the logic of superhero actions: dynamic, continuous, powerful and in control.

Conclusion on inquiries into the feel of inFAMOUS's character control

Importantly, this discussion supports a central proposition guiding this research, which was outlined in Section 1.2.2: an inquiry process continues as long as confusion, obscurity and conflicts arise in relationships among a number of factors. Features of inquiry, such as indeterminate situations, problem formulation that suggests transforming operations, and unified outcomes with accompanying logical forms, are all apparent. Table 7.1 shows the manifestation of these factors in the *inFAMOUS* project.

Table 7.1. Confusions, obscurities and conflicts that generated the need for inquiry during the development of inFAMOUS

Factor	Manifestation in the *inFAMOUS* project
The specific subject-matter of the game.	The confused and conflicting design situations resulting from the superhero, parkour and third-person-shooter subjects.
The game conception or creative direction.	The initial *GTA* meets *The Sims* meets *Animal Crossing* conception changed and developed in response to confused gameplay and obscurity of good gameplay qualities.
The constraints and goals of the project.	The commitment to building a realistic looking character in a detailed, realistic city.
The gameplay technology in use.	Early commitment to designs for city buildings, which later affected the character-controls design problem.
The qualitative experience of the game under development: feelings, aesthetics and emotions.	The struggle to achieve good gameplay feel for character-environment interaction or melee combat. The problem of the player powers not feeling sufficiently superhero-like.
The conception or direction of the game suggested in response to the developing qualitative experience.	The development of new ways of conceiving the character: focusing on superpowers, feeling powerful in all areas of agency (e.g. melee combat, not just shooting), and being an electricity-based superhero.

This discussion of *inFAMOUS* demonstrates the process of conceptual expansion discussed in Section 2.2.3: the logical forms of the game, such as the game concept, FormBits, the logic arising from Bία~Forms, and the feeling of the precise meaning of the game experience, co-developed through a series of inquiries. It also demonstrates how expensive and time consuming this inquiry process can be when creating a new game world.

7.3 The causes of design change due to the game development process

In this section, I examine aspects of game-making activity in game development. I argue that the process of designing and making games generates the need for inquiry as much as factors discussed in previous chapters, such as the experiential nature of the subject-matter, limitations to design knowledge, and problems with conceptualisation. I will divide game-making activity into two areas: the development of the parts of the game; and the integration of those parts into the game as a whole. The integration process, in which playtesting is critically important, is the focus of this section.

7.3.1 Playtesting: discrepant senses, challenges to design assumptions

Many design and test iterations are required when creating complex interactive systems because they contain so many interdependencies: thus, many interactions and effects may be *obscure* or the precise extent of implications may be *confused*.[55] If the design changes in a single iteration are too large and numerous, testing cannot reveal clearly the effect of each individual change. Therefore, the span of the design–make–test cycle must be small and its duration short. When designing games, many changes are either second-order and/or not testable without being experienced in play. Therefore, playtesting, and design iteration, dominate the game development process: experiencing a game is the only way we can effectively stay in touch with the design and design changes, in a meaningful way. Design modelling tools (such as sketching) work well for architects or industrial designers, and allow them to maintain effective contact with the design situation. But I argue that this is inadequate for maintaining the continuity of design thought in game design, due to the complex, highly interdependent, second-order, active, experiential nature of the end product. Game experiences are full of complex, dynamic situations: these situations are too complex for humans to completely

[55] IDS#31

grasp everything that is going on with the player, their game experience and the game. To maintain a sense of the patterns experienced in a game, and to feel how they work in relation to the form elements and concepts that help to generate them, it is necessary to go back and experience the pattern again. This conclusion clearly articulates one of the main design purposes of playtesting.

A clear example of how playtesting challenges design assumptions is shown in the case of *inFAMOUS*, a development project I have discussed in previous chapters. The player character in *inFAMOUS* is an able-bodied human male whose super-heroic shooting powers operate at range. However, the development team decided it was necessary to provide normal human attack abilities as well, such as a "simple 'punch and kick' attack system" (C. Zimmerman, 2009, p. 35). The team did not consider this system to be the focus of the game and it received much less development effort than the ranged combat. The team assumed that "it wasn't important, since players wouldn't get close enough to enemies to use it" (C. Zimmerman, 2009, p. 35).

Zimmerman's statement above prompts this question: If the melee combat feature was not considered important, then why would they implement it at all? The answer is that arms and legs are clear indicators of human agency. When players perceive their character in a game environment, there is an immediate expectation that the game supports arm-like and leg-like actions, particularly if there are objects in the game world that provide affordances for such actions. Game designer Jenova Chen gives an example of this when discussing the challenges to developing the tranquil, meditative, social-interaction game *Journey*: "We cut the [character's] arms, because if you have arms, you think about picking up some kind of weapon and hitting something" (E. Smith, 2012). During playtesting, the *inFAMOUS* team discovered that these expectations of agency are amplified when players perceive their agent as being a superhero. No amount of emphasis the game designers placed on shooting and ranged combat could alter those perceptions for a significant proportion of players. The first external focus test revealed that many players misunderstood both the the ranged and melee combat systems:

> Lots of players ... dive-bombed at a full run into every group of enemies they found, expecting to use their melee attacks ... These players had no fun at all—they

> were peppered with shots when trying to rush groups of enemies, then were frustrated when their melee attacks misfired due to our under-engineered melee system. Worse, the strategy worked just well enough that punch-happy players stuck with it, even though they weren't having any fun. (C. Zimmerman, 2009, pp. 35-36)

The *inFAMOUS* team responded to their playtest observations by making melee combat more difficult, hoping to force players to learn the *correct* way to play as a superhero in *inFAMOUS*—at long range, the way the designers intended (C. Zimmerman, 2009, p. 36). The next focus test revealed that players did not learn from this negative reinforcement: they simply became unhappy. At some point after this, the designers realised that "many people assume that a game featuring a superhero will involve super-heroic punching and kicking, and that in fact super-heroic punching and kicking is what they like about superheroes" (C. Zimmerman, 2009, p. 36), so it was a mistake to "assume players would understand how we expected them to play the game (and then want to do it)" (p. 36). It is no good to the player if what they sense implies ends-in-view that are not possible in the game. If game designers are to effectively constrain the ends-in-view formed by the player, such that the game experience remains coherent, they must understand how qualities of the game experience direct thought and action.

Perceived meaning in video games is subject to the artificial limits of game rules: constrained agency and limited consequences, and the potentially unsupported, or changing, suggestions for what something can be seen as. Playtesting reveals other ways to understand the game, ones that might lead to confusion and are therefore undesirable, or might lead to different, yet valid, ways of seeing and doing. This is a question of meaning that arises when we

> become aware that others seem to see things differently, when others use words or handle artifacts in ways we would not, when others account for their world in terms different to our own. Experiencing such discrepancies challenges the obviousness of our own perceptions. (Krippendorff, 2006, p. 55)

This situation of discrepant senses occurs not only between game designers and players, but also between game designers and their designs. Every iteration in development is an attempt to deal with the apparent differences, *conflicts* and *confusions*[56] in what is sensed and what is suggested, whether the suggestion comes from alternate accounts from others, newly discovered possibilities, or reflection on previously established design intentions. In game testing, and subsequent conversation, game designers compare their expectations of what sorts of things should happen in the game at each stage, given the design intentions, with what players actually do. This includes grappling with the evidence from a playtest that the design intent (a hoped-for reaction) is not apparent in the player's response, as well as questioning whether the design intent was based on a valid assumption, given surprising or unexpected player activity.

The value of playtesting is that it challenges the assumptions made during designing with evidence of how the design works in reality with a player. The designer then gains a new understanding of the product, how players perceive and understand it, and how design problems and solutions might be related. The activities of conceptualising, planning, interacting and making become fused in the game design process because the process of making the game creates new configurations to experience. Such configurations must be tested, which reveals problems. These problematic situations inform new courses of action: in turn, the implementation of those courses of actions create new configurations.

7.3.2 Changes from the need for learning systems and perceptual (player) tools

Many playtesting problems are discoveries about how players perceive, and form meanings about, what they sense. Krippendorff's (2006) axiom of meaning in design is that humans "do not see and act on the physical qualities of things, but on what they mean to them" (p. 47). When creating the environments, the possibilities for action, the actions and the rules governing the actions, game designers focus on a particular composition of agency and activity that suits that game's concept and style. This focus limits how the player can address the game world and act within it. Environments in a game world thus never support all possible actions, and players are never able to perform all possible actions because agency and the consequences of interaction are limited. Game worlds are often new and strange environments, not least because rules

[56] IDS#32

and game logic limit possibilities in particular ways. Because learning these strange rules and patterns is a satisfying part of games, players often encounter things that cannot be known immediately or directly. Players must learn the meanings and possibilities of these new things and then master them through further game playing.

Game developers want to know what sorts of conditions improve perception (and thus, reduce *obscurity* and *confusion*[57]), just as much as they need to understand how to interfere with successful perception (and thus, selectively increase obscurity and confusion). An essential part of designing mysteries, puzzles, riddles and suggestive patterns is to artfully obstruct solutions, and therefore, make recognition a process of solving a well-ordered problem (Brathwaite & Schreiber, 2009, pp. 41-51; Montfort, 2005, location 591). This process of balancing perception is fundamentally a *conflict* in the possible meanings that are offered in a game experience.

When playtesting reveals that players struggle to learn the mechanics, rules, concepts and meanings of the game, game designers can respond in many ways. One way is to provide perceptual tools that do not require learning or skill acquisition beyond picking up a game-specific affordance (Linderoth, 2014). Such devices (often referred to as *gamey* devices, i.e. particular to games) are clearly differentiated in perception as objects with a function in the game. However, it is not always desirable or possible to teach players in this way. Such obvious artificial symbols can diminish the sense of immersion in game worlds (particularly those that are realistically rendered). Additionally, mere recognition is not enough for players to understand how to skillfully use the thing perceived in complex sequences of perception and action. For this reason, and because learning patterns through experimental action can be highly rewarding, learning systems (as discussed in Section 4.3.4) must be created.

Creating learning systems can be expensive in time and testing, but wasted if the design, and therefore what needs to be communicated, changes too much. The need for implementing learning systems or perceptual tools draws attention to how players understand the game. Such design problems are often due to the difficulty of comprehending abstract concepts and systems, or of remembering all of the functional

[57] IDS#33

relationships in the game. *Smart tools* (Gee, 2007, pp. 26-27), such as the Navi character from *The Legend of Zelda: Ocarina of Time*, the dog from *Fable II*, or Erica from *Prince of Persia*, are design solutions that distribute resources for intelligent action within various features of the game. These interactive tools embody knowledge about the game world, and serve learning and usability purposes.

The introduction of relatable characters into a game can assist the player's learning process greatly, but can also transform the design. This transformation process is clearly evident in an interview between Nintendo president Satoru Iwata (Iwata, 2011b) and members of the *Ocarina of Time* development team. In this example, the Navi character mentioned above was initially an upside-down triangle that marked the targeted enemy in the newly developed z-targeting system (see Section 5.2.3). One of the game designers, inspired by the *Legend of Zelda* setting, decided to make this game function interesting and appealing by changing the triangle marker to a fairy, and called it the "Fairy Navigation System" (Iwata, 2011b), later shortened to Navi. However, this new design suggested new possibilities and shifts in the conception of the design:

> Iwata. Naming it had breathed life into what had been an impersonal marker.
>
> Koizumi. Right. I thought, "This is Navi," and ideas started coming to me one after the other. Like being able to tell by color whether the person you're facing is good or bad, and if Navi talked, she could be an important guide for the story. So naming the system Navi really helped it grow.
>
> Osawa. Navi also gives strategy tips.
>
> Koizumi. So the text that Osawa-san had to write increased a lot.
>
> Osawa. (laughs) Yeah. (laughs) The addition of Navi had merits with regard to the script as well. We were able to expand the story around the idea of meeting and saying good-bye to a fairy.
>
> Iwata. Ahh, I see!
>
> Koizumi. And not only the script, but the game mechanics benefited as well. The first location is Kokiri Forest. The village has lots of trees and lots of people live there, but it was difficult to display them all at once.
>
> Iwata. The Nintendo 64 system had limitations making it difficult to display many characters at the same time.

> Koizumi. I came up with the idea of having each person living there followed around by a fairy. That way, even if we just showed the fairies…
>
> Iwata. I see. If you see the fairy, you know its owner is there, too. (Iwata, 2011b)

At problematic points in development, such as developing learning systems or perceptual tools, that opportunities for design expansion and integration arise, new connections are made possible, and reconceptualisation and significant gameplay changes can occur. Such situations emerge from design situations involving *conflict* and *confusion*, but also reveal what may have previously been *obscure*.[58] We can see that as the game parts and the whole co-develop, learning systems are also developed in response to playtesting. These developments can in turn change the conception, design and logic of the parts and whole.

7.3.3 The semantics of game content, and design change

In discussions of games and game design, there is sometimes controversy over the representation of game elements and the meaning of the game: How much of a game's meaning or value is in the abstract forms or in specific representations? At the heart of all games are abstract structures such as the system of game rules (which are one of a number of form elements). However, these abstract elements, and other form elements, can involve concrete game objects possessing appearances that use a wide variety of expressive forms. Any conceivable use of visual, audio and haptic mediums can be employed to add context to game content, which in combination with player activity, creates more meanings in, and specific interpretations of, what is experienced. These semantic elements can suggest typical meanings (i.e. just what they might normally represent), but meaning can also be shaped by the abstract elements of the game system (recall Duke's concept of game-specific language, mentioned in Sections 3.4.1 and 4.3.3). The construction of meaning is affected by the rules of the game.

In many discussions about games and game design, the controversies over semantic vs abstract content appear in various forms: fiction or theme vs mechanics (Sylvester, 2013, pp. 29-34); and fiction vs rules (Juul, 2005, locations 45-60, 82-90, 153). Because

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[58] IDS#34

many games rely strongly on formal systems, it is possible to have an enjoyable game that uses abstract representations with no context. Yet, highly abstract games may be difficult to learn, and adding context to game content gives players familiar references or models, or simply a theme to enjoy while playing. General commercial audiences tend to respond well to elements that provide context. Therefore, even if a game design is initially intended to be abstract, elements with specific contexts might be added if it solves problems or improves the design situation. The opposite problem exists when the game concept predominates, and the game experience therefore has plenty of context, but the mechanics may not work well. To solve this problem the designers can add new abstract structures, but the player might find these structures *confusing*, or the abstract structure may conflict with the presented context.

Whether design begins with a concept, or the abstract game, or a swirling complex arrangement of both at once, problems occur throughout development that force the controversy of mechanics vs theme to arise. This points toward a fundamental tension in the design of games between the abstract forms inherent in the rules, conditions and structures of a game, and the interpretations and sensemaking that occurs when players perceive thematic elements of the game. It is a *confusion* or *conflict* in different ways of seeing, at different levels of abstraction.[59] From a design perspective, there is a slippery slope at work. The moment any thematic elements are brought into the design, the abstract/thematic tension arises because a player cannot help constructing meaning in the attempt to make sense of the game in this context. This tension is a source of constant flux in the way a game design and its problems can be conceived. Such situations[60] are: *obscure* if the new meaning of a concept is not yet apparent, *confused* if new and old meanings are not distinguished, or *conflicted* if the meanings of the new and old concepts are not compatible. However, this tension is also an opportunity: In eliminating the tension, designers can make the abstract elements of games easier to understand by presenting well-designed concrete elements that suggest appropriate meanings. A powerful double-barrelled technique for achieving this is conceptual metaphor (Lakoff & Johnson, 1980), which allows abstract domains to be understood in terms of concrete and thematic domains. However, metaphor, and other design changes

[59] IDS#35

[60] IDS#36

that involve a shift in the context of the game experience, can severely disrupt or restructure the meaning, identity, feeling, concept, ... of the game experience.

The problems and benefits of narrative

Narrative structures are a higher order of contextual organisation in a game system, forming a conceptual network of identities and relations among game elements that develops over a course of events. This means that narratives, or more simply, stories, can serve as a system (albeit a dominating and constrained system) for supplying game situations with context, and therefore, possible meanings. Narrative can also supply a conceptual system that organises both game design and production (De Marle, 2011).

Game designs on paper and stories have many complementary features. For example, game activities and stories both usually involve a series of events, conflicts and characters in particular settings. Additionally, game progression structures emphasise development in the player character or other game characters, which is comparable to character arcs in a story. If you have a well-written story, you can confidently specify numerous elements of games: settings, characters, goals, conflicts, scenarios and progression paths. From such a specification, you can develop a fairly ordered budget and schedule for designing and making all the things in the game, in addition to marketing and business plans. However, the problem is in achieving enjoyable dynamic gameplay that works well and fits with the story. This is a big problem, but as many successful games have shown, not an insurmountable one. It is also not a problem with only one solution, as games as diverse as *Assassin's Creed: Brotherhood*, *Red Dead Redemption*, *Heavy Rain*, *Final Fantasy XII* and *Stacking* show.

However, there are at least two big downsides to committing to a story structure as a top-down design strategy. First, it commits designers to a highly ordered but narrow selection of possible meanings that provide a structure for planning and scheduling game features. These meanings are highly sensitive to change during the development process: a process that I have already argued produces constantly shifting contexts of meaning. And second, stories have narrow uses for the things that appear in them, and provide their agents limited opportunities and reasons for doing things. This very easily breaks down in games because players have no reason to limit the ways they use game objects. On the contrary, players have (given their agency) every reason to want to use game objects in as many ways as their appearance and behaviour entails. This focuses our attention on a problematic feature of narrative in game design. While narrative can provide a conceptual organising scheme and initial design certainty, it is fragile and may not handle the *conflicts* in meaning that emerge in the player–game interface.[61] These problems are yet another source of shifts in meaning which force reconception and design change.

7.3.4 Responding to change

In game development, we cannot exploit all the possibilities of a set of concepts on which a game world is built, for a variety of reasons. A game therefore limits the agency of the player, offering a smaller set of action possibilities than the appearance or description of the player character may suggest. A well-designed game world must therefore support a core set of actions that also relate to the focus of the game. The mechanics, systems, game objects and environments, not to mention the way the game concepts are represented in their visual, audio and narrative designs, are iteratively developed to support that core set of actions. In my experience, there are at least four reasons why development iterations move the design of form elements toward this selective supporting state:

1. Game structuring (gameplay scenarios, levels, challenges, puzzles) serves to integrate core gameplay systems in cycles of dynamic gameplay activity that use the same basic toolkit of mechanics, rules, concepts and logic.
2. A coherent, focused and high-quality game is shown through playtesting to be more appealing to players and to the market. This forces developers to prioritise a limited set of features that can be executed to a high standard.
3. Development resources are limited, and implementation of game features proceeds incrementally. It is not feasible from a software development perspective to begin with too much complexity. From a game design perspective, it is also unwise to begin with complex systems; it is much better to develop the gameplay from a simple core of the game.
4. To get the most out of any set of game mechanics and systems, a large amount of gameplay content must be built to support it. If the design is too complex, there will

[61] IDS#37

> be much more content to build, and it becomes less likely that players will discover, learn and master it. It is not a good policy to build more features and content than players can comfortably handle or make use of.

Design choices are always selective, but the logic guiding the selections made in the initial design process may not be clear and coherent across all form elements. These early design choices become implementations, which leave technological legacies that may not follow a clear and unified logic. The game concept selected initially has far-reaching impacts on the rest of development for just these reasons of selectivity and logical justification. The design space of a game is limited before experiential testing due to the essential project commitment to a concept. These commitments leave a legacy of technical, conceptual and logical constraints throughout the project. The process of game development often can undermine or be in *conflict* with the initial concept, feelings and commitment—and the selective logic in the design schemes derived from them—as new feelings and possibilities in the concept are discovered during making and playtesting.[62]

The majority of design work in a game project occurs in responding to changing configurations of features, content, problems, achievements and possibilities. These situations of change retain the legacy of earlier decisions and design plans. Yet, the precision of feeling about the game experience itself, and the quality of decisions, insight and feeling about important integrative design concepts, are poorer in the earlier design stages. Valve Corporation has learned to give less weight to design decisions in the early phases of game development: decisions "made later in the project were always better than ones made earlier", due to a "better understanding of the product" (Wyman, 2011, p. 57). Therefore, the limitations on conceptualisation, knowledge and experience at the early phases of the project may create legacies that influence the *majority* of making activity. This suggests the inevitability of conditions that cause indeterminacy, social, technical and design conflict, and consequently, inquiry.

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[62] IDS#38

The inevitability of game design becoming an inquiry process is a significant conclusion, because even if a game concept is defined to a satisfactory level of completeness, its meaning will change for at least two reasons:

1. Different tests of the concept are introduced in the process of making the game, such as during playtests with new players, particularly players from new demographics who may understand the game, and respond to it, in unexpected ways.
2. Different ways of expressing the concept arise due to new contexts for feeling it, which creates new crossings of meaning among the imagined game experience, the current game experience, and the current project requirements. For example, a sequel to a game might have a well-established concept, but may also introduce new content (scenarios), structures and contexts (story), or gameplay dynamics (activities and challenges). I experienced these circumstances as a designer working on *Destroy All Humans! 2*.

I will now offer a list of ways the incremental, iterative process of game development can, without deliberate creative upheaval, regularly produce situations that *obscure*, *confuse* or create *conflict* with previous determinations, and in which new design contexts become available to the development team.[63] These situations may in turn provide new crossings of implicit intricacies (as discussed in Section 6.3), which makes reconception more likely. Such circumstances include the:

- progressive implementation of game technology: features, tools and game systems
- sequential completion and integration of FormBits: game objects, interactions, scenarios and challenges
- incremental introduction of progression and context structures, such as story, upgrade systems and cinematic sequences
- establishment or refinement of quality benchmarks for game content
- discovery of technical performance limitations that force functional cuts or re-design
- cutting of planned technology, content or game structure due to schedule delays or overruns: such cutting disturbs design dependencies, requiring re-design

[63] IDS#39

- appearance of unexpected design problems, or problem combinations, that require new solutions
- regular playtesting and critical evaluation of the developing game experience, which can present new problems and opportunities for design integration, refinement or simplification, and new design possibilities
- process of integrating different types of design, values, goals, representations and abstractions characteristic of each discipline in a multi-disciplinary team, and overcoming inconsistencies in conceptual scheme, design logic or semantics.

Additionally, the feelings and knowledge on which a game concept is based can change if game-making activity produces new experiences that could not be imagined before and were therefore previously *obscure.*[64] Shigeru Miyamoto has had leading design roles in well-known and critically and commercially successful games such as the *Mario*, *Zelda* and *Pikmin* series. Miyamoto has become known for his tendency to push teams under his direction to see the game in development from different perspectives. The effect of this is usually an upheaval in the conception of the game, so Miyamoto's *disruptive* behaviour is referred to as "upending the tea table" (Iwata, 2011c, 2011d). Such new experiences and new ways of seeing could occur in game development when:

- experiencing the dynamics of a prototype or new feature for the first time
- introducing new features or systems that allow for combinatorial outcomes or emergent system dynamics (which are often a deliberate goal in game design)
- introducing new elements to the game that add new contexts to the experience, including the various takes on the concept that various team members bring to their work
- altering the meaning of elements in a game, whether through the design of their appearance or the effects of game rules
- altering the meaning of the game experience through changes to the larger game structure or to the ways the player can meet functional gameplay goals
- understanding the game experience from a different perspective, whether from playtest feedback or a change in the *vision*.

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[64] IDS#40

7.4 The development of design coherence

In this section, I will examine the development of the game *Portal*. This case is an exemplary demonstration of the way sources of design change and new ways of seeing form part of the inquiry process, and can result in the development of a coherently unified game experience.

7.4.1 Portal—an exemplar of coherent design

Portal is a first-person 3D adventure game in which you play an anonymous test-subject in a secret weapons testing facility. As you play the game, you progress through a series of test-chambers, each a brain-bending 3D spatial puzzle involving the use of a portal gun. The game is based around the mechanic of remotely placing the two ends of a portal (i.e. a door-like opening) on any surface in the game (see Figure 7.1).

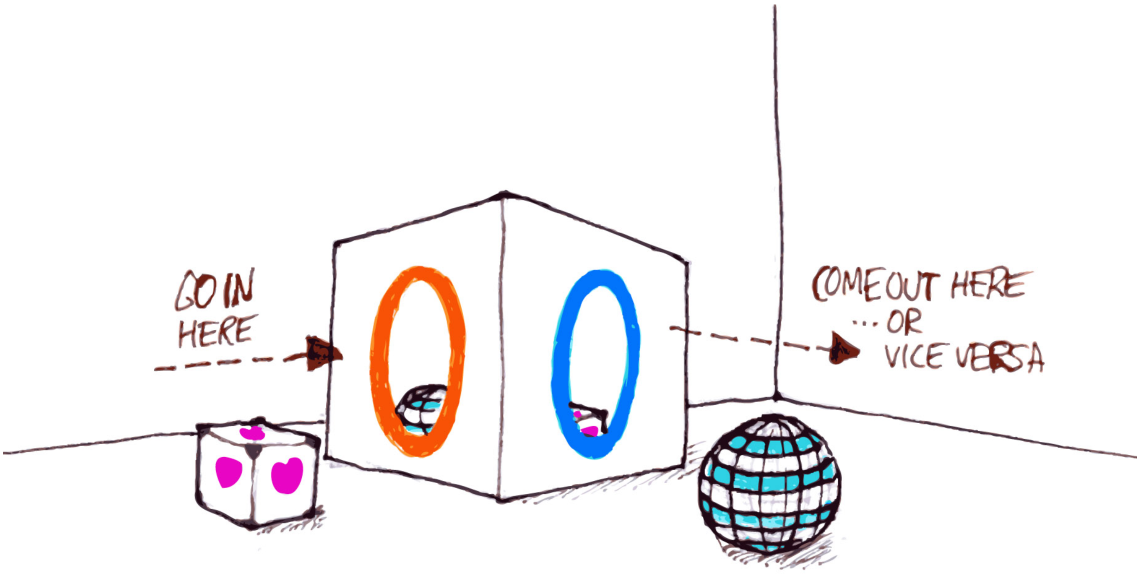

Figure 7.1. The portal gun mechanic: connect discontinuous spaces with a portal

You use a portal gun to remotely place the portal ends, by simply aiming at a surface where the portal should appear, and pressing the trigger. You can use this mechanic to gain access to places that are otherwise inaccessible. For example, you could place one end of the portal (e.g. the blue end) on a wall next to a high ledge that leads to the level exit, and the other (e.g. the orange end) on a wall next to where you are currently located. By walking through the orange end, you could effectively be teleported straight out of the blue end, and walk out onto the high ledge (see Figure 7.2).

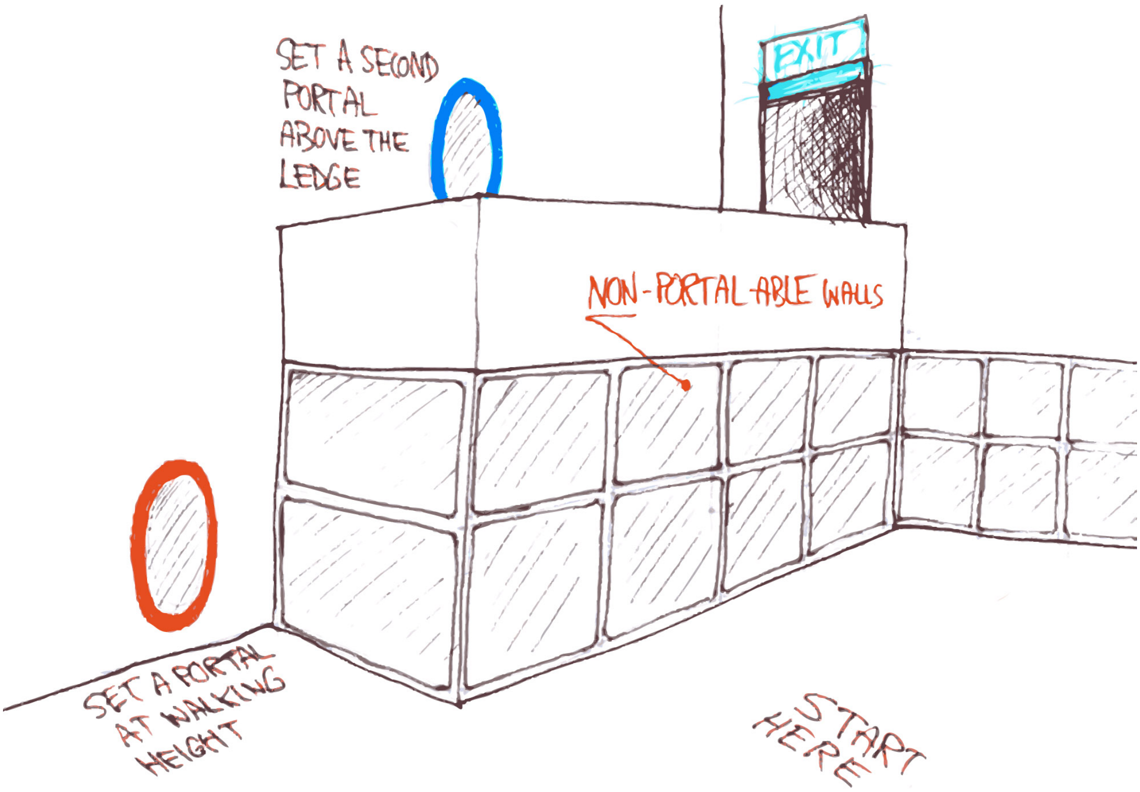

Figure 7.2. Using the portal gun to solve a puzzle

As you progress through the test-chambers, you are accompanied by, and at various times, depending on your actions, are encouraged, taunted and threatened by a disembodied, genial, yet faintly sinister and creepy, computer voice called GLaDOS. At the beginning of the game, the test facility's interior design and GLaDOS (the facility's controlling AI) seem clinical: mechanically and algorithmically perfect. As you learn how to escape through a series of test-chamber puzzles using the portal gun, each more devious and difficult than the last, you also learn to use the portal gun: a technology that allows space to be perceived in new ways that break the rules of conventional spatial logic. You learn and master this new perceptual tool within a rigidly structured test facility operated by a control-freak AI. GLaDOS *thinks* it is in control of you (the test-subject), and, constrained by the rules of the test facility, you have no choice but to submit to challenge after challenge at the whim of the AI. The abstract model of the game permits you to use the portal gun only to connect *particular* (portal-able) game surfaces in predefined, rigidly designed ways. That is, you must observe the rules of the portal gun, and of the design of the test facility levels. Therefore, at the start of the game, the logic of a procedurally codified and strictly controlled scientific experiment is manifest in:

- GLaDOS
- the test facility
- the portal gun
- the game levels.

However, as you progress through the levels, cracks in the pristine clinical facade become noticeable. Here and there, you experience glitches in the systems of the facility, and glimpse gaps in the walls and signs and hints of life, freedom and human imperfection beyond the confines of the test-chamber. It becomes clear that GLaDOS is unaware that it has imperfect sensors and cannot detect some breakdowns in the facility. Eventually, you move into a test-chamber in which the portal gun can be used to finally escape the test-chambers. You find that you are potentially free of GLaDOS, but still trapped behind the walls of the facility. It soon becomes clear that GLaDOS can operate all of the facility's mechanical systems, not only test-chamber doors. Like a rat escaping the scientists' maze, you are faced with an AI algorithm hell-bent on preserving the isolated purity of a scientific experiment, trying to catch a test-subject and make it comply with proper procedure. At this point, the abstract model of the game also changes. The rigid level-design structure gradually breaks down and becomes more organic. The new game spaces and objects are not rigorously prepared for the portal gun, as the test-chambers were. To reach the end of the game, you have to see beyond the logic of GLaDOS and the test facilities, while literally moving beyond the spaces GLaDOS controls. You see the game world from a human perspective that GLaDOS cannot. You move around the facility, access portal-able surfaces, and therefore, use the portal gun in ways that GLaDOS has trouble detecting and predicting. The final boss battle is a confrontation with GLaDOS's hardware, in a room designed according to the logic of GLaDOS's designer: presumably a human. You must seize this opportunity to defeat GLaDOS with its own logic (which, for GLaDOS, is a logical contradiction) and escape to a human world. In the process, you use all of the logic, skills and ways of seeing you have learned throughout the game: you are rewarded by reaching a space where GLaDOS and the strict logic of the controlled experiment do not exist. Therefore, when the game ends, the portal gun you carry no longer has a use. All of this happens in a few hours, and results in an enormously cathartic experience, amplified by an emotionally stirring closing song performed by GLaDOS, called *Still Alive*.

Portal has been widely acclaimed for its simple game mechanics that produce deeply satisfying gameplay, but more so, for the tight integration of story and gameplay to produce an emotionally charged, personally invested game experience (Falstein, 2008; "Portal: Still Alive for Xbox 360 Reviews - Metacritic," 2008). *Portal* is an exemplar of games as an artform (Burden & Gouglas, 2012); however, it was not designed that way from the start. The development of *Portal* exemplifies game development as a continuity of inquiry: as a combination of iterative design and testing, and an itinerant process of exploration, discovery and growth, rather than up-front design for production.

7.4.2 Portal—the co-development of GLaDOS and the companion cube

Portal began as a student project called *Narbacular Drop*, and the student team was hired by Valve Corporation to develop it into a complete game. The students, who now formed the core of the *Portal* team, embraced Valve's playtest-focused design philosophy, and began regular, weekly playtesting of the game throughout development.[65] Swift, Wolpaw and Barnett (2008), as members of the *Portal* development team, emphasise the importance of in-person observation of players, because "[w]atching them lets you monitor their moment to moment experience" (pp. 8-10). Swift et al. (2008) stated that playtesting

> often gave us ideas of how to fix problems. It even provided the inspiration for new puzzles, as we witnessed playtesters solving puzzles in ways that we hadn't previously considered. (p. 10)

This emphasis on playtesting required experimentation in level design to create a "smooth difficulty ramp" (Swift et al., 2008, p. 10). This meant that if players had problems with more complex levels, the design was broken apart and restructured as a progression of levels, so players could learn the game mechanics more effectively. Swift and Wolpaw (2008) stated that

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65 Such early playtesting is unusual, more so at the time *Portal* was developed. Many games in development are not presented to players for playtesting until closer to the end of the project, when the game looks presentable, the gameplay is working well, and the problems and bugs known to the development team have been eliminated. Playtesting can be a waste of time if players only notice the problems and bugs the team already know about.

> We adjusted our gameplay to what players looked like they needed. Whether it was more training, new gameplay elements. ... Playtests helped further refine the narrative. We adjusted the story to accentuate what players were experiencing. A lot of good ideas emerged from trying to craft story points, environmental details, and dialog that enhanced the emotions we saw players exhibiting during various parts of the game.

The tightly intertwined nature of *Portal's* story and gameplay was not in the initial design vision. The GLaDOS character and the game's story only developed in response to problems with gameplay design. The game originally focused on physics-based gameplay puzzles, but during playtesting, the team discovered that "fifteen to thirty minutes into the game, the experience started to get a little dry. We decided that the game needed some flavour and an entertaining narrative" (Swift et al., 2008, p. 10). *Portal's* small team and tight budget constrained what design solutions were possible:

> Practically speaking, we didn't have sufficient time or staffing to add any human characters, which would have required an impressive amount of animation work and scene choreography. That meant the story had to be expressed without the benefit of any visible extra characters. (Swift et al., 2008, p. 11)

The game was initially intended to be set in some kind of prison from which the player would have to escape using the portal gun (Swift & Wolpaw, 2008). When the decision was made to add narrative elements, Wolpaw wrote some announcements to play over the loudspeakers in the first room of the game. The team responded well to "the funny, sinister tone of the writing" and Wolpaw "continued to write and record announcements for other chambers, while still searching for the story proper" (Swift et al., 2008, p. 11).

Wolpaw (Graft, 1999) had previously developed an inexpensive method of recording temporary dialogue using the computer-synthesised speech of a text-to-voice program. Wolpaw discovered that people found the lines delivered by a computer-synthesised voice to be funny, even if the lines were intended to be serious. For *Portal's* narrative needs, Wolpaw decided he was going to take advantage of this side-effect:

> I was in control of temp recording. ... the weird artifacts of text-to-speech was going to make that stuff seem even funnier. ... But we were still fishing around, thinking that this would be announcements coming over the facility's speakers, and there was still going to be something else, like the villain, or somebody to interact with. It quickly became apparent that people were reacting to this voice. It may be

> a trivial realization, but it was a big realization for us. "Whoa, this voice is just the facility that's angry at you and will confront you at the end." (Graft, 1999)

Swift et al. (2008) stated that the

> announcements were providing playtesters with the incentive to keep playing that we'd been looking for all along. Better yet, in the sterile, empty test chamber environment, players were actually becoming attached to the alternately soothing and menacing computer guide. We'd found the narrative voice of *Portal*. ...
>
> Even though you literally break her to pieces at the end, the entire game is a long process of tearing her down; she becomes increasingly more vitriolic and desperate as the player progresses. What started out as a seemingly burdensome constraint—a total lack of human NPCs [non-playing characters]—eventually turned into one of the strongest parts of the game. Navigating the environment is Portal's primary gameplay challenge; In effect, the environment is your enemy. GLaDOS's disembodied omnipresence gives that enemy a voice and personality. (p. 11)

The discovery of this *narrative voice* produced a powerful logical and emotional organising scheme. This scheme was a major reconception of the game design and had far-reaching effects for the development of the game.

The co-development of the companion cube

A recurring and memorable feature of *Portal* is a humble box, which GLaDOS, the facility's disembodied computer guide, introduces to you as the *weighted companion cube*. This box is part of a frequently used gameplay mechanic in which the player must carry a weighted object and place it on a pressure-sensitive switch, which in turn opens a door that the player can pass through. Swift stated that the team

> sat down together one day as a group and decided that we wanted to create what we dubbed the box marathon level, where you would have to carry the box around with you to accomplish several tasks. This was purely a gameplay device. (Swift & Wolpaw, 2008, p. 25)

Swift (Swift & Wolpaw, 2008, pp. 25-29) explained how this level required a lot of experimentation, and went through many design iterations, primarily because players, for one reason or another, forgot to carry the box along with them, and the box was a necessary part of solving the puzzles. The various design improvements made through experimentation and the addition of perceptual hints (such as lighting or signage) "made most of our players take their box with them but there were still quite a few people that weren't getting attached enough to lug it with them everywhere" (Swift & Wolpaw, 2008, p. 28).

In a commercial game design environment, it is important to ensure the game experience works for a wide range of players, but particular attention is paid to the experience of new players. A new player must not only learn how to play, but also remain engaged with the game long enough to develop the skills needed to enjoy the challenges the game offers. During playtesting, any barrier to play, any obstacle to engagement, and any unnecessary source of confusion, frustration or loss of meaning is taken seriously as a design problem. This does not mean that a commercial game cannot have obstacles, frustration, ambiguity and perplexity, only that if such things are present, they must not turn players away from the experience but toward continued engagement. These design values make commercial design situations markedly different from those in which the game is intended to be experimental, confronting or a hardcore challenge to players. Therefore, in the *Portal* example above, the fact that some players failed to understand what to do in the game became a design problem.

To solve this design problem, they decided to have GLaDOS speak to the player. Swift stated that "we asked Erik to write up some dialogue to remind players that the box is important and that you might want to bring it with you" (Swift & Wolpaw, 2008, p. 29). Wolpaw explained his inspiration for this dialogue:

> I had been reading some declassified government interrogation manuals. According to the guys who wrote one of the manual[s], one of the common psychological effects of solitude is an attachment to inanimate objects. Since Portal player[s] are alone for the entire game, I figured a little prompting might help them bond with the cube. (Swift & Wolpaw, 2008, p. 29)

After adding in this dialogue, Swift stated that

> absolutely no one seemed to ever forget their box. As an afterthought we added pink hearts to the side of this cube in order to cue back to the dialogue that this box was special. (Swift & Wolpaw, 2008, pp. 29-30).

The series of design problems, design experiments and reconceptions that led to GLaDOS and the weighted companion cube (which established emotionally effective features of the game) would influence the design of the game further:

> Kim Swift: We had finished up this level and had simultaneously been working on our final boss battle. We settled on having to incinerate parts of GLaDOS but we hadn't trained the player on how to use the incinerator. This left our players pretty confused and they wouldn't really pay attention to the incinerator and just thrash around. We knew that we had to introduce some training and we knew exactly where to put it.
>
> Erik: Before we added the incinerator mechanic to the GLaDOS boss battle, you just sort of abandoned the companion cube at the end of the box marathon chamber. It was kind of sad, but mostly it was just anti-climactic. Adding the incinerator not only trained players for the final battle, it made the narrative a whole lot stronger. (Swift & Wolpaw, 2008, p. 31)

Wolpaw also emphasised the precarious confluence of factors that led to this design situation. It "was this moment of insight that just came from design arguments that were happening, and all of a sudden we hit on this perfect thing" (Graft, 1999), and "[t]he whole companion cube saga was a great example of gameplay influencing story, which then turned around and influenced the gameplay" (Swift & Wolpaw, 2008, p. 31).

The development of *Portal* clearly demonstrates how the game project, as a design project, generated a series of inquiries in which the game parts co-developed with the whole, primarily (but not exclusively) in a bottom-up approach to design control. This example also shows how design knowledge about the parts, the whole, and the organising logic of the parts in the whole, co-developed, and justifies my conclusions in Sections 5.3.4 and 7.3.4. It is clear how the iterative, playtest-driven process produced itineration: continually shifting contexts in which the meaning of the design situation and the game experience developed. Further, this example clearly shows, first, the importance of emotions and the feeling of the game experience in guiding development, and second, the importance of the transformative instruments of level design and story writing in the team's design experiments.

7.4.3 The final coherent design situation develops from many inquiries

As the previous case study of *inFAMOUS* clearly suggests, the final design situation, the coherent outcome of game design inquiry, could be defined as a situation in which the feeling of the experience and the conceptualisation of what the experience should be, are in accord, or, alternatively, not in discord. This may be difficult to put into words, but it need only be an understanding felt through playing the game. This can be seen in the following quote, which concerns the development of the Gravity Gun in *Half-Life 2*:

> The Gravity Gun is arguably Half-Life 2's greatest single innovation and was achieved by various people in different cabals periodically picking it up, trying a few experiments with it, and putting it down for a while. *Each set of experiments taught us more about what the Gravity Gun should be, and over time it took shape*. This collaborative development with 'room to breathe' allowed everyone to lend their unique strengths to the design, yielding a weapon and tool with *surprising richness* and versatility. (Wyman, 2011, pp. 55-56, emphasis added)

This statement is a reflection, by a member of the development team, on the collaborative process of reaching a *final* design, in its *final* implementation, with determinate features, rules and experiential qualities that are understood by the development team. This example reveals two important things: first, the existence of the co-development process described in Section 5.3.4, and second, the fact that a course of numerous inquiries produced an experiential result not foreseeable or specifiable at the outset.

The creative situation at the end of a project is no longer dominated by imaginative projection, design proposals and discussion of possibility. Rather, day-to-day work is characterised by regular close contact with the game experience, the feeling of playing it and seeing others play it. This is a stage in which sense and feeling, rather than concepts, are dominant in the design situation, and design thought and action are largely concerned with developing more game content and ever-smaller technical adjustments, refinements and fixes in the service of aesthetic and formal balance, consistency and quality.

Speculations about design coherence

The final game design situation, as argued in Section 5.3.4, can be understood as a doubly determinate integration and organisation of parts in the game experience whole.

There is therefore a definite relation between the precise feeling and quality of the game experience, the practical knowledge required to produce that experience, and the formal elements of the game. The game designer must know the right way to organise the parts of a game to produce a particular integrated whole, and to define and configure form elements to produce appropriate Bία~Forms: this shows a definite conceptual, logical and experiential coherence. This definite relation is not purely logical, and cannot be reduced to a conceptual scheme because it strongly relies on the precise feelings and embodied patterns experienced. Such an embodied understanding is the second-order result of the conceptual distinctions made, and feelings had, about form elements and their particular configuration and arrangement. I argue that, for the designer, both are connected in the same integral understanding of the comprehensive whole of the game experience.

It may be possible to conceptualise what makes a game experience coherent. The organisation of the game experience as a whole is felt in play, and brings particular senses, feelings and meanings, which find expression in the player's thoughts, decisions and actions, in a repeating gameplay cycle. On the formal side, the game experience has structural characteristics: processes and rules that effect patterns of change and result in particular Bία~Forms. In a coherent game experience, all of these forms, qualities, logics, patterns and structures must feel just right in their interdependent operation. This suggests that if such a thing as a coherent game *design* exists, then this coherence is found in relationships among the:

- *concept* of the game
- qualities of the experience, including patterns of experience
- form elements that help to produce that experience.

However, it must be remembered that design coherence manifests in the complex dynamics of the game experience as felt in the moment of play. Rather than identifying coherence as a set of logical relationships, it might be preferable to say that design coherence is a resolution, or balance, of feeling in the crossing over of many meanings that make up the design situation, realised concretely in the feeling of the game experience itself. As the outcome of inquiry, that the game experience *feels right* is a powerful and simple test, and one that is more readily achieved and useful at each iteration of development than a complex conceptual analysis. The implications of logical relations, the conceptual schemes and the formal elements are *felt* first (they create a crossing of implicit intricacies). Their coherence comes from a particular standard of coherence, discovered in inquiry, and felt in the experience of play, which may not need to be conceptualised if game-making actions can carry this meaning forward more effectively.

This conclusion suggests caution in theorising about possible formal conditions for a coherent game experience. My discussion of example game cases shows that we can attempt to conceptualise what the particular identity, feeling, quality, ... of the game experience, or of its parts, is. And it is also possible to identify well-defined concepts that sum up the game or to define Bία~Forms that are suggested by these concepts. Therefore, logical implications in a game concept that fits, and works coherently with, defined Bία~Forms are theoretically possible to articulate. This, in outline, is the method of analysing coherence that has emerged in my analysis of games such as *inFAMOUS* and *Portal*. This method of analysing cases of game development relies on the assumption that developers of a completed, coherent game experience, in reaching the end of *their* inquiries, had created concepts, representations, logics, technologies, forms and patterns according to a consistent conceptual scheme. This assumption is suggested by two factors. First, in the process of developing a game, conceptual distinctions are made real and logically formed in the parts of the game and their structure, configuration and organisation (i.e. form elements). And second, the whole development team achieves a coherent integration of numerous interacting parts in a complex whole.

Duke (1981a) had the insight that each game design required the development of a specific, suitable logic (p. 74), yet I have shown that there is a greater context in which a coherent design must operate. If it were possible to formalise successful game design, then it must be in relation to a particular set of conceptual, logical and experiential forms and qualities. Dewey's empirical method invites caution, however, because it must be understood what final coherent game exemplars are experienced *as*. A formalisation of coherent game design is an expression of the feeling of coherence, derived as logical forms that fit the implicit intricacy created by the forms and feelings of a complete game. This is a different experienced situation to the majority of the experience of game development in which those forms and feelings are developing and changing as they expand and become qualified by the concrete game experience.

7.5 Summary

In this chapter, I examined the way design coherence develops from attempts to resolve indeterminacy in the design situation. I used the example of the development of *inFAMOUS* to show how unifying concepts emerge in the process of simultaneously solving a number of design problems. In the case of *inFAMOUS*, these problems stemmed partly from the use of conventional design solutions, and reveal that concept expression, design solutions and design problems are interdependent. Another conclusion is that gameplay forms cannot always be treated generally across different projects. Their meaning is carried in the particular context in which they were experienced, and they have logical entailments that may lead to indeterminacy in new design situations.

I have also argued that the process of designing and making games is itself as much a cause of inquiry as the limitations of knowledge, conceptualisation and the experiential nature of the subject-matter. Game *design* is said to be an iterative process, but this is because *making* games is iterative: playtesting dominates the game development process because experiencing a game is the only way to effectively stay in touch with the design situation. Playtesting has three important functions: it challenges design assumptions with evidence of how the design works in reality with a player; it reveals discrepant perceptions between designer and player; and it also reveals the need for designing learning systems and perceptual tools. This constant iterative testing process causes regular design change. Additionally, the tension between abstract forms and the semantics of game content is a source of constant flux in the way a design and its problems can be conceived, which is yet another source of shifts in meaning that force reconception and design change. The situations of change retain the legacy of earlier decisions and design plans, but the context and quality of feelings, knowledge and decisions tend to improve at each iteration. Therefore, while limitations on conceptualisation, knowledge and experience are severe, their critically influential legacies in the majority of making activity suggests the inevitability of conditions that cause indeterminacy, social, technical and design conflict, and consequently, inquiry.

The development of the game *Portal* is a clear case of game development as a continuity of inquiry in which both types of design control are present. This case clearly demonstrates how design coherence can develop through this inquiry process. The final design situation, the coherent outcome of inquiry, can be defined as a situation in which the feeling of the experience and the conceptualisation of what the experience should be, are in accord, or, alternatively, not in discord. This is a practical knowing of the right way to organise the parts to produce a particular integrated whole, and to define and configure form elements to produce appropriate Bία~Forms.

Chapter 8: Game development as inquiry

8 Introduction

In this chapter, I examine the implications of the inquiry perspective for game development in a way that respects the complexity of a game project. This discussion builds on the arguments I made in Chapters 4 to 7, which demonstrate why game development is an ongoing scene of indeterminacy and reconception, and should be understood in terms of inquiry. In Section 8.1, I make conclusions about the subject-matter of inquiries in game development. I also consider how the many sources of indeterminacy that arise in the process of game development lead to the formulation of problems. Because it is too simplistic to refer to game development as a *single inquiry*, in Section 8.2, I establish three domains of inquiry in game development and consider the nature of the transformations produced in inquiries in each domain. Finally, in Section 8.3, I explain how logical forms and embodied meaning accrue together in game development inquiries, and how project-specific conceptual structures develop.

8.1 Subject-matter and its formulation

As explained in Section 3.1.2, in Dewey's theory of inquiry (1938, pp. 520-521), the subject-matter of inquiry is *what* is investigated. In this section, I will discuss features of the game design situation from which problems are formed, and which become the materials of experimentation leading to possible solutions.

8.1.1 Subject-matter of game design inquiry

For game designers, the subject-matter from which problems are formed is anything that is relevant to transforming an imagined game experience into an actual game experience, within the situation of the game project. Aside from the significant external constraints (i.e. commercial or technological concerns) on the game project, each project investigates, among other things, its own specific:

- settings and stories
- themes and styles
- conflicts and forces

- characters, abilities and activities
- values and economies.

For each project, this particular subject-matter ideally determines a unique experience of qualities, aesthetics and patterns. The particular subject-matter implies its own meanings, concepts and logics, and therefore, can uniquely determine form elements and Bία~Forms. In Chapter 5, I discussed concepts that characterise game design and game experiences, including agency, challenges and decisions. These concepts, in addition to the gameplay values they support, are essential subject-matter in any game design inquiry. Aspects of experience such as ends and ends-in-view, emotions, aesthetic qualities, vitality affects, image schemas, and sense and meaning are basic subject-matters. Over the course of development, these aspects become refined in the composition of the gameplay experience as clarified experiential patterns such as Bία~Forms, which eventually become the ultimate output of game design inquiry. Game development inquiry is therefore an investigation into what this refined subject-matter could be, while simultaneously discovering *how* ideas about experience of the world can be transformed into particular, playful, imaginative game experiences.

Because a game world is a highly complex system of many parts, and involves problems in technical, artistic and design concerns (among numerous others), there are many subject-matters for smaller design inquiries within the whole game project. The most significant are the various features that make up the game, which tend to be the focus of sub-teams within the larger development team. Inquiries that support the development process, or aid the team, might involve:

- creating technology structures, features and tools
- expanding the possibilities of concepts, and developing a design philosophy
- shaping the social design situation.

Other game-related inquiries might concern:

- rules, states and conditions
- agency, challenges and consequences
- change, decisions, values, emotion and aesthetics
- game objects and their form of representation
- progression and narrative.

The outcomes of all game-related inquiries must be integrated into a single design. It is this need for integration, which is concerned with the quality and structure of the whole experience and the relation of parts to whole, that is the most important and demanding subject-matter of game design inquiry.

8.1.2 The indeterminate situation and formulating problems

In Section 3.1.2, I discussed Dewey's concept of the indeterminate situation (Dewey, 1938, pp. 105-106), from which the elements of inquiry are formed and given direction. In Chapters 1 to 7, I described 40 different indeterminate situations that may arise in the process of game development, and argued that these confused, obscure and conflicting situations occur frequently and are ongoing during the development process. Because the goal of inquiry is to resolve or settle the indeterminate situation, then the nature of the indeterminate situation gives direction to possible ways of achieving that goal and reaching a coherent outcome. Situations in which the source of indeterminacy is obscure, aim to reveal it or give it form. Confused situations become clarified by distinguishing constituents and relations that help to anticipate changes or produce desired changes. Conflicting situations are settled by changing and unifying the conflicting elements. Each of these three forms of coherence serves its own function as a response to a particular kind of indeterminacy, and has different implications for problem formulation.

Problem formulation

For Dewey (1938), a problem stated has, "in the very terms of its statement, reference to a possible solution" (p. 108). This claim has significant implications for the conception process in game design: even though articulating the important features and qualities of a game concept does not produce a problem statement, these articulations do formulate the subject-matter of the proposed game experience. In formulating a problematic situation, inquiry gains particular content: constituents, distinctions and relations. The content of inquiry is made up of the material and conceptual elements deliberately selected for operational use in the inquiry process, both for proposing problems and testing possible solutions (Dewey, 1938, pp. 520-521). For each area of inquiry, and specifically the 40 indeterminate situations described in Chapters 1 to 7, there are many possible subject-matters, depending on what the problematic situation pertains to. Some inquiries may be within a single discipline, such as character design. Other inquiries, such as those relating to interface design, may involve multiple specialties and interests.

The concept of problem formulation, if taken to mean explicit formulation, may seem to limit the relevance of Dewey's theory of inquiry, and exclude from consideration a wide range of game development activity that proceeds informally or through making activity. However, it is important to remember that formal inquiry, as in the scientific model of inquiry, is only one form of inquiry. Dewey's view of inquiry was not bound to the rational, scientific definition of problem structure, for example, as articulated by Simon. Rather, the way the problematic situation is formalised is a methodological choice determined by the particular subject-matter of inquiry. It is important to note that constituents, distinctions and relations need not be explicitly articulated. In Dewey's (1934) discussion of artistic inquiry, it is clear that he finds it appropriate, given art's aesthetic and emotional subject-matter, for the artist to work through experiments in feeling and action (pp. 149-150). In artistic inquiry, the logic of inquiry is the logic in the artist's actions which make distinctions in the selection or manipulation of materials (pp. 203-205), techniques (pp. 148-149) and forms. Actions undertaken also suggest possible relations among ideas, feelings and materials in the inquiry situation, and suggest what operations can be performed.

A stated problem suggests what kinds of experiments can be performed to learn about the relationship between the things distinguished. However, as Dorst has argued (see Section 2.2.3), the very notion of *a* design problem (as distinct from routine problems, which are not design problems), is doubtful. Problem finding or explicit problem formulation may not be a useful method in game development situations, in which there are few hard constraints and the criteria and conceptual basis for almost anything under consideration may be changed. In such open-ended cases, finding possible directions for expanding the game concept, or ways of ruling out such expansions, are more beneficial to moving inquiry along. These approaches correspond well with Schön's view of the designer imposing a frame on the design situation as a way of experimenting with the domain of inquiry itself (see Section 2.2.2). This approach is a process of finding a suitable configuration of parts and wholes that hang well together, and is not necessarily about finding explicit requirements or constraints. Establishing criteria for relevancy and irrelevancy, for game design inquiry, may therefore be about:

1. finding an approach to ruling out possible ways of seeing the design situation
2. discovering possible ways of expressing the game concept
3. articulating possible systems of values
4. identifying potentially relevant discourses.

In short, the outcome of game design inquiry might be to find a way to form a problem, or coordinate a way of understanding the situation.

8.1.3 Problems as an outcome of inquiry

It is more obvious that being able to institute a problem is a possible outcome of inquiry when we consider the nature of wicked problems. These problems arise when attempts are made to institute problems in a situation that affects numerous social groups with different values and concerns. This kind of inquiry is common to one or more social groups, and the understanding of the problem, and its definition, must therefore be coordinated. Dewey's inquiry did not focus on inquiries undertaken by collectives, but the wicked problems viewpoint focuses on the social challenge of determining:

- the problem
- criteria for a solution
- the *impact* among stakeholders, of the solution or methods for realising a solution.

This suggests that a significant problem to be solved in social inquiries is achieving a shared pervasive quality (or coordinated implicit intricacy) among many people, from which constituents, distinctions and relations can be determined. This process is very likely to produce paradoxes between different discourses because of the variety of issues being dealt with, and the variety of stakeholders and their interests.

Buchanan's perspective of design as a concrete argument is useful when considering the sharing of experience, and the sharing of feelings about a design or design project. Further, linking Buchanan's perspective with Dewey's principle of continuity suggests that the *concrete interplay* Buchanan discusses (see Section 2.2.1) should extend to all aspects of embodied experience. For game design, this could mean that the initial design situation (the game concept and the felt understanding of the imagined game experience) can be considered as the core of a design *argument*. The many purposes that a game concept serves make sense when seen as part of an argument among many stakeholders that moves toward a goal, in a process of deliberation. At each point in the development process where the dynamic interplay of signs, things, actions, thoughts, feelings and meanings changes, the nature of the argument also changes. In such an argument, the assumptions underlying any single person's deliberations might be informed by any of the following:

- the current feeling about the game
- the problems and possibilities in the game experience and the development situation (which form an implicit intricacy)
- what that implicit intricacy implies for the game concept
- what the game concept implies for the game experience.

A complementary way of looking at this social coordination process is to combine the viewpoints of Dorst's design paradoxes and Hatchuel's design projects (see Section 2.2.3) and Krippendorff's view of design as coordinated activity among stakeholders (see Section 2.2). From this combined perspective, it is clear that for collaborative design *projects* such as game design, paradoxes call for courses of action that help to resolve conflicts in coordinating perception, meaning and action. Such courses of action may include expanding and qualifying the concept being investigated, creating or using learning devices, and creating goals and roles for stakeholders or shaping the social organisation of the team. The process of inquiry must therefore include resolutions and unifications of arguments, and ways of finding a united expression between conflicting discourses. The process of initiating design changes leads to an integration of issues in the game experience, and a shareable embodied understanding of solutions and the proposed problems they solve. As Manker (2012, p. 89) suggests, a playable game prototype can form a rhetorical function, as a part-to-whole figure that reveals something about the topos (place of thinking), and thereby, the collection of viewpoints that result in a shared understanding (the doxa) of the game. In this sense, Duke's view of games as a form of gestalt communication (see Section 3.4) transforms the way we can think about the game development process. Instead of the finished product being a communication facilitator, as it is in gaming simulation, the development process of game worlds produces successive communication-facilitating stages that improve the determination of what the final product should be. Each stage is therefore a learning device. In terms of tacit knowing, each stage of inquiry marks a new set of concepts and tools to be interiorised: these instruments suggest possible operations, and new ways of exploring and experimenting with games as part–whole structures.

8.2 Problems suggest operations to be performed

Operations to be performed depend on the particular subject-matter of the inquiry, and how it is formulated. As shown in Section 8.1, game development involves inquiry into a wide range of subject-matters. I will therefore only attempt to give a schematic overview of this proposed range of inquiries and the likely operations involved. This is done while keeping in mind that it is difficult to demarcate inquiries because a great deal of design work done in a game development project is highly interdependent and may serve the game project in more ways than solely being an end in itself.

8.2.1 The range of inquiries in game development

I argue that game development is best understood as a range of inquiries that are continually generated by the development process and are focused on various intersections of design concerns within a hierarchy of design projects (following Hatchuel's concept of a design project, as discussed in Section 2.2.3).

The broadest nexus for all inquiries within design projects is the overall game project. Within the overall project are numerous design sub-projects, each a nexus point usually focusing on a feature of the game (as shown in Figures 8.1 and 8.2). Each of these sub-projects includes a sequence of related individual inquiries that have continuity (i.e. the content, transformative operations and outcome of one inquiry informs the next inquiry). Based on my arguments in previous chapters, I suggest that each sub-project involves inquiries relating to:

1. design situations that involve concept expansion, problem finding and local design experiments, in which there is co-dependence and co-evolution of problem and solution

2. the design of learning devices, and formal or organised inquiry using such devices
3. the design of the social situation, including roles, values and group processes
4. problematic situations that are responded to informally and directly, through action
5. routine problem-solving situations.

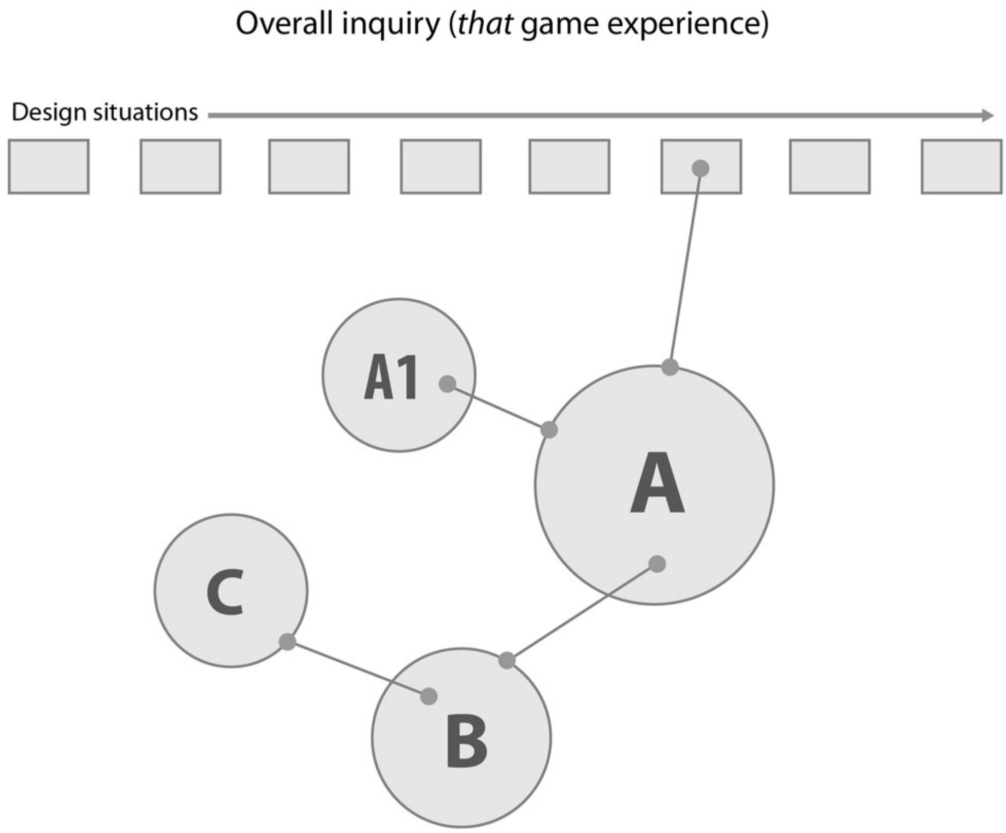

Figure 8.1. A schematic overview of different kinds of inquiry within a game development project

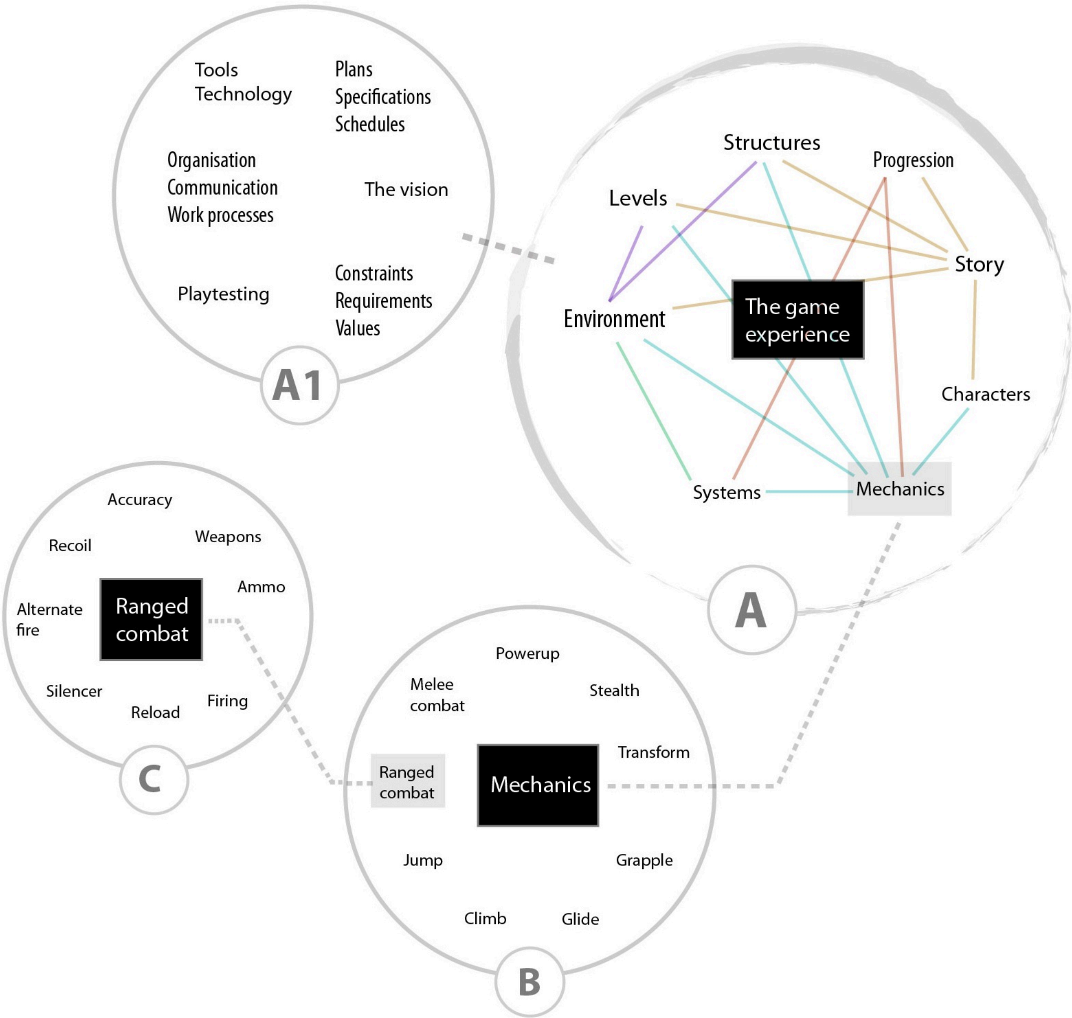

Figure 8.2. Expanded details of Figure 8.1, showing an example of interconnected features within and between each area

Each of the different kinds of inquiry outlined above suggests different approaches to problem formulation. Additionally, each kind of inquiry, as part of a social design situation, may involve paradoxes between discourses. Each kind of inquiry also entails specific kinds of operations and experimental activity. With respect to the order of the five-point list above, I suggest that these inquiries include the following operations for transforming the subject-matter:

1. Beyond simply proposing solutions or courses of action, the purpose of design activity in these inquiries is, as Schön (1983, p. 139) says, to *see as* and *do as*. That is, to understand what kind of inquiry is possible or desirable through framing the situation, and by performing moves that are simultaneously exploratory, move-testing experiments and hypothesis testing (Schön, 1983, pp. 146-147). As Schön (1983) observes, “A successful reframing of the problematic situation leads to a

continuation of the reflective conversation" (p. 136). Design activity therefore would be expected to have a different transformative effect at different levels of the project, such as the overall project direction, the various features of the game, and the game experience.

2. For a design project, an inquiry with an outcome that is a learning device will likely involve operations that produce information that helps to a) develop design solutions, b) formulate problems or c) coordinate understanding within a group of stakeholders. Examples of such operations include developing prototypes and conducting playtesting.
3. For members of a development team to gain an understanding of the social environment in a design situation, and to organise and design ways for people in that situation to behave or interact, necessarily involves deliberation, argument, negotiation, allocation of tasks and creation of report-back or communication mechanisms.
4. Problematic situations that are addressed through informal, implicit activity produce a resolved outcome through operations. The primary guide for this operational activity is the feeling the designer has about the outcome. Schön (1983) refers to the basic logic of this simple experimental approach as the logic of affirmation (p. 155): "Do you like what you get from the action, taking its consequences as a whole? If you do, the move is affirmed, if you don't the move is negated" (p. 146).
5. Routine problem-solving situations involve inquires in which a possible outcome can be inferred, useful hypotheses made, and the operations to get there are known and on hand, as in typical scientific-style inquiry. As routine and uncontroversial, these operations are likely established within a discourse as a standard approach.

I have suggested that these inquiries are generated at, and focus on, different nexus points: the overall game project and its various sub-projects. It would be expected that the focus would shift as the incremental, iterative development process first fragments the work into parts (various features and their component parts), then re-integrates the work into the whole game experience. I argue that these are the broader domains of inquiry that various smaller inquiries contribute to, move forward and refine or redefine, during the process of iterative development: they characterise the co-development of the parts and whole from a doubly indeterminate to a doubly determinate situation.

Determining the inquiry domain

Design situations are concerned with the possible. Schön (1983) argues that, for the designer, the unique situation at hand *is* the domain of inquiry: it is shaped by the designer and it shapes what the designer can do with it. Schön observes that the coherent outcome of such domain-shaping inquiries is not an end to inquiry, but something that informs further inquiry. These outcomes keep inquiry flowing (Schön, 1983, p. 136) and allow more local experiments to be made. In Dewey's terms, this would be a process of experimenting with the problematic situation itself.

The question of demarcating game design inquiries, and determining the domain of inquiry in game development situations can be approached by using Schön's view of design inquiry discussed above. However, in this approach it is also important to consider 1) the nature of incremental and iterative development and 2) the co-development of tacit knowledge. First, a game project proceeds in significant increments (when new features and game structures are proposed, planned and implemented), followed by experiments and modifications. For a large part of the development process, many team members focus on implementing new features or making game content. At each increment of making activity, there is something new to experience, experiment with and test: each new feature or addition brings new situations, arrangements, configurations, senses, problems, ideas and operations to be performed. For the designer, each increment in development is a new design situation, which can be understood as a changed landscape, with new elements, and changes to the configuration and arrangement of elements that were previously there. Each iteration that allows transformative operations to be performed, and from which ideas and connections can be formed and tested, is therefore a new inquiry. Second, at each iteration, for the game designer, there is a co-development of knowing of parts and whole, and a further integration of practical knowledge, usually resulting in a better understanding of the design, or of problems, possibilities or potential problems. This means the domain of inquiry may shift scope from minor design details to issues at the project level.

In a game development project, all of the inquiry situations serve, and merge into, the single project situation. I propose to unite these diverse inquiries through three related domains of inquiry in game development, each progressively less indeterminate, less complex and more capable of producing specific problems. These three domains (see Figure 8.3) I will refer to as domains of the:

1. project
2. feature
3. game experience.

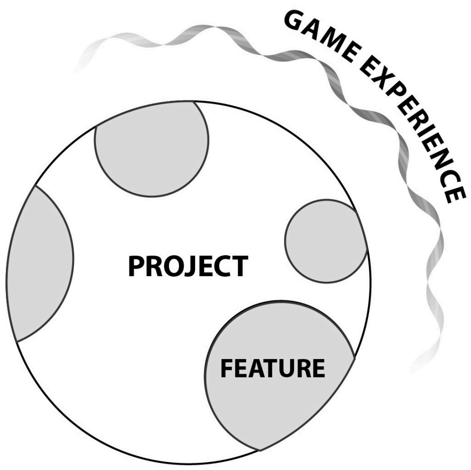

Figure 8.3. Three interconnected domains of inquiry in game development

At the level of game design concerns, the three domains respectively correspond to the focus on inquiry into 1) the game as a whole, 2) the parts of the game and 3) specific issues, problems or concepts relating to the experience of the game itself (for either the designer or player of that game). In the next section, I will consider the nature of inquiries in each of these three domains.

8.2.2 Inquiries and operations in three domains

Inquiries in the ***project** domain* stem from confusion, obscurity and conflict preventing the institution of: a specific project formulation, or some formulation that directs the work at the project level, and which frames it in some particular way. Inquiries at this level occur when the domain of the project itself is in doubt and the relevant constituent elements are confused; in addition, the nature of conflicts over values, ideas and requirements may be incoherent, and the subject-matter of the project may be confused or obscure.

Attempts at structuring a problem or proposing courses of action produce interpretations of the existing situation, the preferred outcome, and the methods that transform the former into the latter. These interpretations are articulated as relevant descriptions, concepts and values, potential solutions, and processes for implementing the solution. However, any of these three parts can be confused, obscured or in conflict: they can be paradoxes between discourses in the design situation. The constituents, distinctions and relations to be formulated are at issue in such cases. Operations are therefore required to:

- establish, explore and expand concepts
- create or use learning devices to discover ways of considering the situation, or to discover the effects of proposed concepts, and their implied problems and solutions
- understand or reveal stakeholder positions and assumptions
- coordinate or share a felt understanding of the design situation.

Examples of such operations may involve members of a development team determining something about:

- what the game experience is intended to be (a game concept)
- what goals the game concept implies or must reach, such as player experience goals (Fullerton et al., 2008, p. 14).
- conceptual schemes or design philosophies that define particulars referred to by integrative design concepts such as agency, rewards and challenges.

The lengthy conception phase undertaken by the *Deus Ex: Human Revolution* team, explained in detail in GDC talks by De Marle (2011) and Lapikas (2012), demonstrate this process clearly. Inquiries at the project level lead to the establishment of design projects aimed at project discovery: this discovery process entails possible design concepts, learning goals, deliberation and argument, experiments, moves, hypotheses and solution conjectures. Outcomes at this level become subject-matter for inquiry at the feature domain.

Inquiries in the ***feature** domain* may be moved forward by the outcome of inquiries at the project domain, although they may also become design projects in their own right.

That is, the feature domain itself may be the subject-matter of inquiry, particularly in cases of deliberately disruptive game design (mentioned in Section 1.4.1). A specific case discussed in this thesis is the *inFAMOUS* development team's inquiry into the character controls (see Section 7.2), which involved an open-ended goal (good feel in the controller) and an expanding game concept. It became a sub-project within the overall game project, which took a senior programmer one and a half years of experimentation with different solutions to resolve (C. Zimmerman, 2009, p. 32). Each of the experimental inquiries that Chris Zimmerman (2009, 2010) described functioned as a learning device, and subsequently, revealed new problems that became constraints on future solutions. The character-control design project created successive sets of constituents, distinctions and relations, and revealed new constituents, distinctions and relations to guide the next round of experiments: for example, limits for realistic animation movement, and establishing the concept that continuous control was required at all times. In the process of creating new elements in the character-control system for each proposed solution, numerous constituents and relations were developed, such as underlying systems of helper objects, and variables for control feedback (C. Zimmerman, 2010). This in turn opened up a whole set of possible operations to configure and test in the game.

Inquiries in the feature domain can come from the designer's cyclic behaviour of: temporarily removing confusion, obscurity and conflict through creative design invention and exploration; and then having the situation talk back with confusion, obscurity and conflict of its own. This cycle produces an evolving problem-solution that requires the exploration and testing of viable problem-solution formulations. Following Schön's concept of design discussed in Section 2.2.2, I suggest feature-domain inquiries have four purposes:

- to move aspects of the overall project inquiry forward
- to impose partial design control on the situation
- to produce problems or find coherent relationships
- to get the situation to talk back, in a cyclic part–whole process of experimentation, move testing and hypothesis testing.

In game development, the hypothesis is some aspect of the creative vision, or a related design proposal. This level of inquiry produces outcomes (problematic situations) that are subject-matter for the third level of inquiry: *game experience* inquiries.

Inquiries in the ***game experience*** *domain* involve indeterminacy that comes from problematic situations related to specific aspects of the game experience. To formulate specific problems in the game experience requires relevant concrete elements of the experienced game to be identified, including form elements, processes and behaviours determined at second order by game rules. Any relevant elements that influence the sense–meaning–action cycle can also become constituents of the inquiry, and these are distinguished and selected based on concepts governing the composition of experience, and the experienced characteristics of games. The constituents most easily manipulated are the form elements that can be accessed, modified and reconfigured, for example, the various properties of a game object or game system. Once identified, such constituents undergo changes by modification of existing properties, according to the tools available in the game engine. However, it may also be apparent that there are inadequacies in existing tools, or in access to the needed configurability of form elements: in this case, a design project may be instituted to arrive at a more flexible or capable system. As a result, game objects and systems may acquire new distinctions and relationships, and from them, new constituents may be created.

Because of the interdependent nature of games, one problem may affect multiple parts of the game, and can thereby influence problems emerging in the feature domain, as the examples I have given of *Zelda: Ocarina of Time* (see Sections 5.2.3 and 7.3.2) demonstrate. Multiple game-experience problems may converge to bring numerous features into doubt, which may influence problems emerging in the project domain, as the cases of *inFAMOUS* (see Sections 7.1 and 7.2) and *Portal* (see Section 7.4) demonstrate. The example of *inFAMOUS's* melee problem (see Section 7.3) was a discrepancy in actual player behaviour from the behaviour expected, desired and planned for by the development team. The inquiry that resolved this problematic situation revealed the need to change the conception of the situation: rather than assume that ranged combat was the only way to play as a superhero, the team members made new distinctions and explored new relationships in their game design.

8.2.3 Operations for transforming the design situation

In game development, the purpose of inquiry is often to better define the project and the project features (parts of the game), and to define how these parts are integrated. In such inquiries, the parts co-evolve or co-develop with the whole, while at the same time local game-experience problems emerge and must be solved. Viewing the three domains of inquiry I established in Sections 8.2.1 and 8.2.2, in Schön's terms, I suggest that the outcomes of inquiry at each level serve to keep this co-development of project and parts moving forward to a better defined, more refined and coherent state, which may not be a purely convergent process. For any of these inquiries to move forward, the inquiry situation must be formed to prepare it for its transformative phase. The general kind of operations for each inquiry domain in game development (project, feature, and game experience) can be summarised as:

1. Operations in the *project domain* require conceptual manipulation of the possible subject-matter of inquiry, including both imagined and real game experiences. Other operations required involve the creation of design projects to develop the problematic situation itself. The outcome of these operations include: clearer problem formulations; approaches to learning; methods of expression to resolve paradoxes between discourses; research and exploration of imaginative projections, conceptions and design frames; or reductive modelling. These operations result in ongoing improvement in the conception of, and feelings about, the game and how it works.
2. Operations in the *feature domains* are concerned with developing and evaluating design frames, proposals and moves. In addition, these operations involve imposing a particular order on one aspect within an interdependent mesh of design projects and concerns, in the form of: representations and models of design proposals; plans for implementation and the implementations themselves; and processes for integrating and evaluating the work into the larger whole. Additionally, there are operations needed to refine game features and content to a suitable quality standard.
3. Operations in the *game experience* domain deal with problems with the game experience. These operations require the configuring and re-configuring of the

abstract structure of the game, the concrete representations of its game objects, and the logic that organises the form elements into a whole experience.

Additionally, all of these inquiries require social operations: deliberation, argumentation, persuasion, integration and interpretation. Designers from different disciplines, or on sub-projects (each with varying concerns), are often at work simultaneously, and the perspectives of non-designer stakeholders are also part of the design situation. This mix of stakeholders may lead to conflict between discourses in the design situation. Figure 8.4 illustrates the way the views of Hatchuel, Dorst and Schön work complementarily with my concept of the three domains of inquiry in game development.

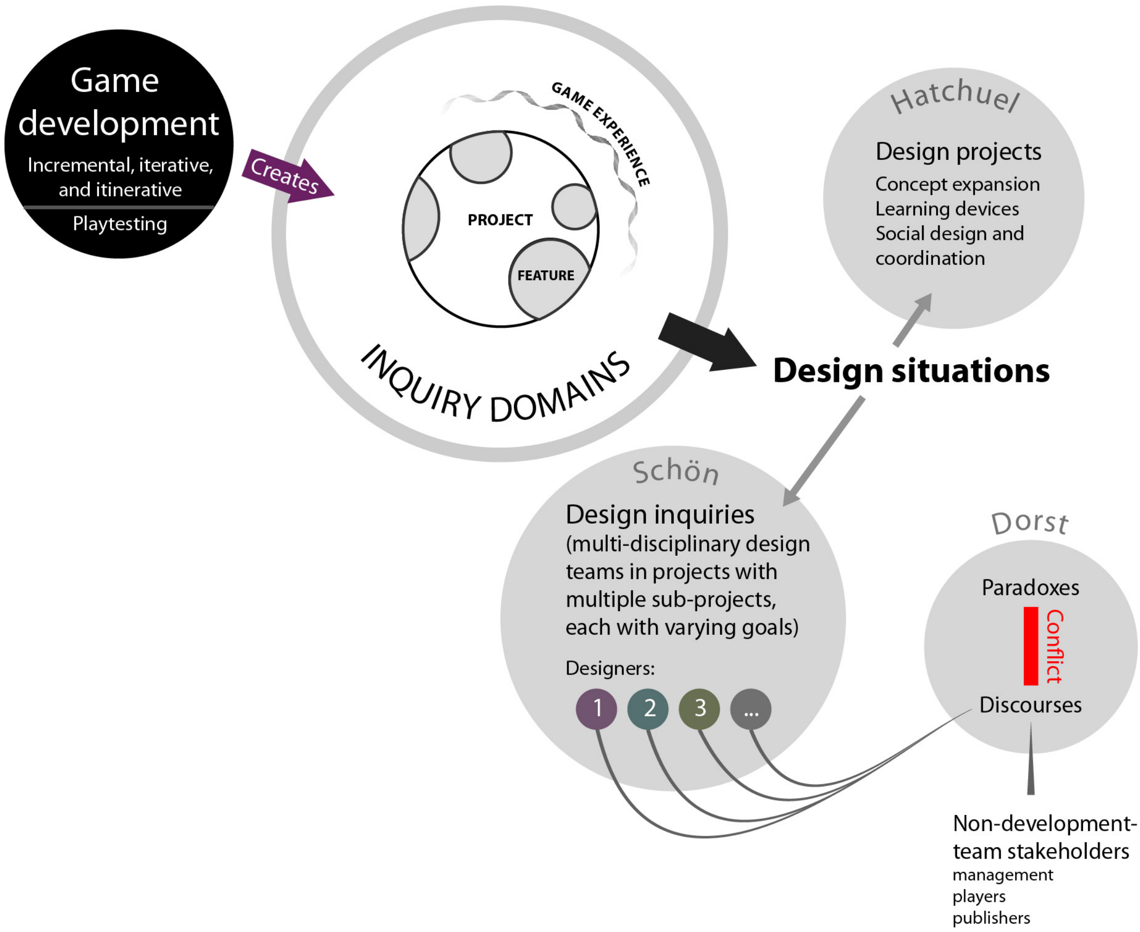

Figure 8.4. Design situations emerging from three inquiry domains, which arise due to the nature of game development

The game development project provides continuity for these inquiries, but as mentioned in Section 8.2.2, inquiries in each domain relate to, change, or further, one of the others. The operations in one inquiry domain produce transformation that affects another. In general, determining an aspect of the project domain allows design proposals to be made, which, in turn, allows parts of the game to be implemented and experienced. Playtesting then reveals problems, which can relate to the game experience, design proposals for features, or the core game experience, and hence, the overall project direction.

The concept of agency provides a useful example of the way inquiry operations can cause changes that transform design situations across multiple domains of inquiry. As argued in Section 5.2.1, agency is an integrative design concept, dependent on many other constituents of the game design. The problem of determining the kind of agency appropriate to the game integrates a variety of conceptual, imagined possibilities of the subject-matter. Choosing design proposals integrates these choices with the realities, discourses and values present in the social and technical development environment. The player's experience of meaningful action and satisfactory power in a game will depend entirely on: what kind of agency is suggested and expected; what within the game world can be changed and affected; and what purposes the player has in choosing one course of action over another. The way a player understands their capacity to intervene in the game environment is shaped by the perceivable affordances in it, whether those affordances have been intentionally designed or arise accidentally (e.g. by design oversight or error). The player's movement through, and interaction with, a dynamically responding and potentially changing game environment will therefore result in a dynamically shifting perception of agency.

It is only by experiencing the game and discovering what is disrupting or limiting the sense of agency that a game designer can respond and find ways to improve and enhance the experience of agency. Such design responses may affect various interdependent game features, or even concepts and values at the project level, including the nature of game mechanics, characters, challenges and goals, which all affect the agency of the player. Undertaking a range of specific inquiries therefore involves discovering what agency means for a particular game. This entails discovering networks of problems associated with all the possible issues and design requirements for everything that constitutes agency (e.g. mechanics, systems, consequences, goals, learning, interface). Such problem discovery can be understood as part of a sub-project: it must occur through design proposals, implementations and experiential testing, before the network of problems can be solved, resolved and refined, resulting in a coherent outcome.

8.2.4 Transformation of subject-matter

As mentioned in Section 3.1.2, the instrumental role of conceptual and technical instruments in Dewey's theory of inquiry is to transform the raw subject-matter into generic qualities and kinds. Concepts that distinguish one kind of thing from another, or that define a quality that can be measured, establish the *content* of inquiry. The raw subject-matter is thus transformed into something more generic, substitutable or manipulable. In the previous section, I discussed many of the experimental operations that make these transformations possible. The discussion of design theories in Section 2.2 and concept expression techniques in Section 6.1 each make clear a range of transformative techniques or processes that make inquiry possible by establishing general forms that can be substituted or manipulated to deal with new situations or produce new results.

Experimenting with experience: mechanics and game structures

Game designers do not conduct experiments to better understand the natural world of experience and control it. Instead, their goal is to produce new worlds, which provide new experiences—ones that, for a player, feel good, are interesting, enjoyable and satisfyingly perplexing, and afford meaningful action. The fulfillment of game design inquiry is the discovery of how to balance complex game systems to produce an experience that: is perplexing, but not confusing; proceeds through a sustained meaningful interface; and has balanced aesthetics, challenges, decisions and economies, among other aspects. During experimentation, the designers have perfect knowledge of the logical forms that define their models and interactions. What they do not have, and what inquiry produces, is the ability to know how to design and control the logical forms in their combinations and interactions, and thus, suitably shape the experience of the player.

The structuring of gameplay, often called level design or scenario design, is a transformation of form elements for the purpose of experimenting with Bία~Forms. Form elements are manipulated through: their interactions in game systems; the design of their appearances and behavioural or operational logics; and their configuration and arrangement in game structures such as levels and scenarios. Game designers need to experiment with isolated parts of the game to get a better understanding of how the system works, and how the parts of the system relate to the organisation of the experience as a whole. Game structuring involves experimenting with configurations of game objects, spaces and scripts (code). The scripts interact with the programmed game features and game systems to determine relationships, conditions and states that produce dynamic changes in gameplay scenarios. These changes depend on the player's use of the game mechanics, which are defined by numerous interacting game objects, with logical operations that cause states and variables to change. Games are designed to have a number of mechanics interact together, and player inputs may trigger multiple mechanics, or influence different game objects, which may cause further changes that trigger new mechanics. Game mechanics may thus cause dynamic effects that can be *combinatorial* and multiply in effect, leading to vast numbers of possible game states. These game states are also experienced aesthetically, as embodied patterns, with particular senses of emotions and qualities at each moment. The entire sub-disciplines of systems design and balancing are concerned with creating and modifying the game states, variables and conditions that result in desirable configurations of the game. The purpose of such manipulations is to discover certain relationships in the refined subject-matter (the game experience). These relationships produce feelings, insights and knowledge about any of the three domains of inquiry, in addition to resolving problems or paradoxes in those domains. Game structuring therefore advances inquiry by producing an objective configuration of experiencing to be tested, which will validate design propositions, or reveal further problems, wicked problems or design possibilities.

I argue that experimenting with configurations of experience is critical to successful game development because it allows the potential of game mechanics, and therefore, agency, challenge and numerous other characteristics of games, to be realised by testing actual possibility spaces. Aside from providing the necessary materials for improving the game through playtesting, each test of a possibility space reveals new meanings implicit in the game concept, or suggests new concepts from the implicit meaning felt in the gameplay. Playing the game is the only way to bring the various logical forms in the design situation (game concept, design requirements, discourses) into play with the logical forms of the game (form elements). It is this crossing of forms with the implicit intricacies of the game experience and the feelings about the intended game experience, that, when coherently expressed as a design frame, conjecture or proposal, serve to carry forward inquiry, and drive the iterative development loop forward. It is through this process of experiencing different possible worlds, and of placing the designer's embodied feelings between numerous logical forms, that the configurations that feel *just right* can be discovered through further design expression. This results in improved articulations of game concepts, problem formulations, design proposals and the ability to solve design problems. Methods of structuring gameplay are therefore transformative instruments of inquiry that lead to continuous and consistent experiences.

8.3 The unified whole

The *objects* of inquiry are products of a resolved situation that refer to the content of inquiry, or to symbols that relate to inquiry *content*. Inquiry objects are a set of logical distinctions and relations that definitely constitute the unified outcome of an inquiry: they are the objective of inquiry, and may have predictive or operational use in further inquiry (Dewey, 1938, pp. 520-521).

Unlike the doubtful quality of the original situation, the outcome of each inquiry has a unified, whole quality to it. The outcome features coherence among the objects of inquiry that were determined through experimental operations. This coherence resolves the doubt in the original situation by easing the particular pervasive quality that initiated the inquiry in the first place. A game experience is a refined and intensified form of experience, and thus, the unified outcome of the overall inquiry is a new experience that is *an* experience. However, as I have previously discussed in Section 8.2, there are numerous kinds of inquiry, and the coherent outcome of each serves a different purpose. For example, design inquiry of the kind Schön discusses, and the experimental, iterative game-making/design process discussed in the previous section, do not stop when a coherent outcome is reached. Instead, these moments of expression carry the meaning of the design activity forward by expanding or qualifying the concepts involved in the design project. The implications of this new work ripple through the complex, interdependent design situation to create new design situations with new problems and opportunities. What this suggests is that one of the logical forms that accrues to any particular game design inquiry is the language and concepts used to understand and control the game experience in question. Because so many of these concepts are part of a complex mesh of interdependent ideas, and are used as integrative concepts, this conclusion suggests that rather than entrenching general theory, each game project produces its own realm of theory that is particular to the game concept or design intentions.

Each of the three domains of inquiry outlined in Section 8.2 has its own determined outcomes. All serve the integration of particular elements of a game design (form elements) into a coherent, unified game experience, which is a doubly determinate artifact: a player–game situation that is a sustained meaningful engagement, and has a particular identity, quality, feeling, character ..... to its experienced patterns (Bία~Forms). Dewey (1930 / 1998b) describes this unified outcome in which particulars have been selected, formed and arranged (related) in such an integral way via the guidance of a controlling or determining quality:

> The logic of artistic construction and esthetic appreciation is peculiarly significant because they exemplify in accentuated and purified form the control of selection of detail and of mode of relation, or integration, by a qualitative whole. The underlying quality demands certain distinctions, and the degree in which the demand is met confers upon the work of art that necessary or inevitable character which is its mark. Formal necessities, such as can be made explicit, depend upon the material necessity imposed by the pervasive and underlying quality. (p. 200)

The "inevitable character" is the coherent overall result, and the form of the particulars determined in the game development process depends on what is implied by the underlying quality that guides development. In other words, the particular ..... that is implied in the design situation—the sense of which, throughout inquiry, is developed and carried forward into successive problem formulations, design processes and game experiences—eventually coheres into a stable problem, design and experience. As Sylvester (2013) states, the "pinnacle of game design craft is combining perfect mechanics and compelling fiction into one seamless system of meaning" (p. 34).

I argue that a game experience that is *an* experience, is a unified whole that bears the logic of its construction in the determination of its parts. The logic of construction is guided by a logic in the integrative concepts that is specifically determined for the game project, and is used to make sense of the game experience and its many interacting parts. As an example, the concept of agency will carry its own particular logic given the mechanics, systems and design values of the project. Cerny (2002) offers a general method for determining when a game is ready to go from pre-production, into production. In this view, the goal of pre-production is “capturing lightning” (i.e. a dominant character of *an* experience) in the form of a game design, not a game. However, Cerny stipulates that this game *design* must be manifest in two fully playable levels of the game at publishable quality. This means that the pre-production process, which Cerny likens to managing chaos, passes well into what, in other views of design, might normally be considered production, and may take up the major part of development. Following Cerny’s view suggests that game design inquiry at the level of the project domain continues until a significant portion of the game is completed at high quality. I will now examine what this suggests about logical forms that accrue to inquiries throughout a game development project.

8.3.1 Accrual of logical form and embodied meaning

I will limit my attention to general logical forms that relate to the design of a coherent game experience. From discussions in previous chapters, it seems clear that a number of related logical forms develop during a game project:

1. The logic of the game concept as articulated, represented and communicated, including the network of concepts that make up the game concept, and their possible entailments. This is the logic of the design intention. This conceptual logic can form the basis of assumptions, design direction and discussion among team members, and can guide their acts of designing and making.
2. The logic of design frames: the arranging scheme that a designer imposes on the design situation. This is related to the logic of conventions, forms, values and previous experience in the designer’s repertoire.
3. The logic of various requirements, constraints, design criteria and values.
4. The organising logic of the configuration and arrangement of the parts of the game in the whole.
5. The logical forms that arise in new distinctions and concepts in game design language that are specific to the game project, and arise from disruptive design.
6. The logic that arises out of general structures in recurring embodied patterns of experience, such as image schema and vitality affects.

7. The logic of form elements. Every game object, rule, appearance and arrangement of elements is either a definite logical form that interfaces with the game code, or has the logic of artistic selection, composition and refinement in its form. This includes the logic embedded in the game world, such as its worldview or game-specific language/supersymbols.
8. The logic of the tools and technology that are used to make the game.
9. The logic of metaphoric entailments, whether from imaginative projections in language of embodied patterns, or from the use of metaphor in the behaviour, processes or appearances of form elements.

As I discussed in Section 6.3.1, Gendlin argues that logical forms do not work alone. We respond to a situation through the meaning we feel in our bodies, and what it implies, given the context other logical forms bring. Gendlin calls this the implicit intricacy. In its expressive function, this feeling operates *between* logical forms to *express* the meaning we need to convey. The logical forms 1–9 described above can all potentially cross over in a design situation, represented in Figure 8.5.

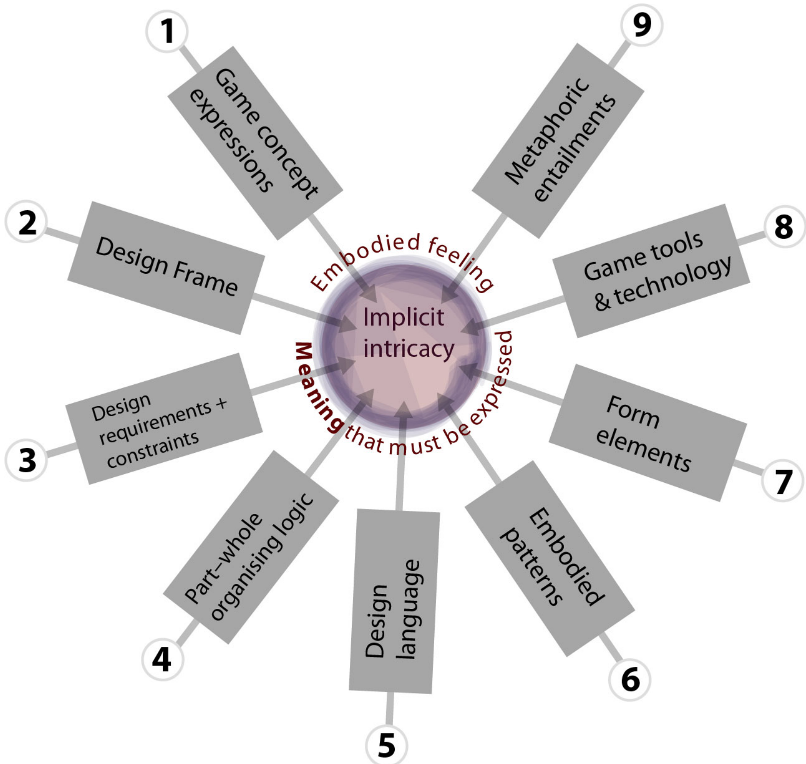

Figure 8.5. Nine kinds of logical forms that shape the context for game design expression

I argue that this concept can be extended usefully to understand how the designer's precise feeling about the game experience develops over the course of inquiry. In this thesis, I have discussed at least four different kinds of feelings that a designer might have about the design of a game:

1. The meaning the designer feels in their imagined game experience, which may be different for each team member, and may also differ from the game concept that was articulated and communicated by the team as a whole.
2. The meaning that is felt in the experience of the game.
3. The embodied meaning that is felt in guiding design and making work, which may follow the forces and flows of the unfolding situation.
4. The meaning that is felt about what the game experience *should* be, given a playtest encounter. This is the feeling that the designer needs to express in response to comparing the differential between what is/was imagined, and what is actually experienced.

I suggest that point 4 above is a coherent expression that emerges from the slot, implying, ... in the implicit intricacy that results from the crossing of any of the previously mentioned nine logical forms, and the other felt meanings in points 1–3 above (as shown in Figure 8.6 below, along with Figure 8.5). I propose that such an expression carries the designer's meaning forward in deliberate design moves that keep the iterative process of game development moving forward. To do this, the designer can employ any of the nine logical forms described above, or the statements or proposals for their design. I argue that the precision of a designer's articulation of this feeling increases as the game project continues, and therefore, the designer's capacity to logically express this meaning also improves. This also necessarily means that the designer's capacity to frame the design situation improves as their experience of the project develops. The designer accrues the right ways of looking at the design situation, and thus, allows all the logical forms in that situation to work together with a design meaning that can be viably expressed.

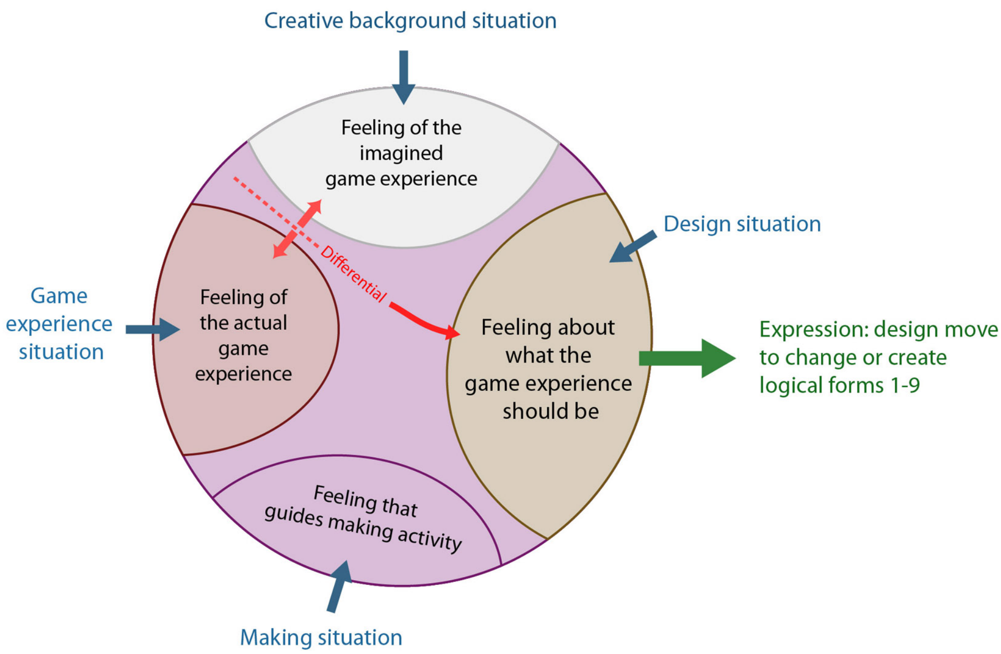

Figure 8.6. The implicit intricacy that leads to _....._*, and the need for design expression. Different felt meanings at work in the implicit intricacy during game development*

I also suggest that Krippendorff's cyclic model of making sense, constructing meaning and acting can be explained more completely using Gendlin's approach in combination with Johnson's theory of embodied meaning. In Gendlin's example of the poet, the poet must *make sense* of the lines they wrote before, in the context of searching for, and testing, the next line of the poem to come. Here, the logical forms are the assemblage of words previously written, and the potential word to come. The poet's body responds to the crossing of these logical forms: it senses and feels what the forms imply. Because the poet still has a meaning to convey, what is implied results in the need for *action*: to accept or reject the new trial expression. The poet acts by trying to *construct an expression* that says precisely what they mean, given the implying of the blank: the embodied feeling that emerges from what has been written before and what is coming next. The game designer's situation is more complicated and difficult than the poet's: game designers cannot so readily dip into the meaning they feel is implied by the logical forms at work in the game. For them, the process is not as straightforward or quick as reading and re-reading the lines of a poem. Testing a new design change is not like writing or saying a new word that might fit in the empty slot.

To experience what is implied by the crossing of the many logical forms present in the design situation, the game designer must reference the experience of playing the game. In a game experience, a few logical forms may be experienced directly: however, as a form of second-order design, many logical forms (such as game rules and code) are experienced only at one remove. In fact, the effects of many logical forms that a game designer must make sense of are felt indirectly, or they cannot be attended directly because, as a player, they are attending to the game completely in terms of the parts that make up the game. However, when experiencing the game as a designer, their attention is necessarily divided: they must experience the game as both the player and the designer. Instead of attending to the game in terms of the parts the player deals with, the designer must also at times reflect on the parts themselves, and the logical forms that constrain the parts or make them possible. Such logical forms include design requirements and design criteria, the game concept, the tools used to make the game, and the organising logic used in arranging the parts. Therefore, the majority of the logical forms that cross over, and shape what the situation implies, are at work in the reflective design situation involving the game experience, not in the game experience itself. This is where the view of Schön becomes useful: it provides a way of understanding how the game designer grapples with this complex second-order design situation.

8.3.2 Logical forms in second-order design situations

In Schön's view, the designer reflects on the situation, then frames it (that is, develops a hypothesis of how to change the situation). The designer then imposes an arrangement on the situation through design moves (conjectures) that are part of a logical organising scheme created for this specific situation. I suggest that this perspective provides a way to understand the equivalent, for design, of Gendlin's poet re-reading the lines and constructing, then testing, a new line. The difference is that instead of being able to instantly feel the sense of what the crossing of previous lines and new lines implies, the designer must first make sense of the complex design situation. They do so through their previous experience: their repertoire of design domains, and by establishing a design frame that creates an implying, slot, ... that reflects their design hypothesis, and can lead to traction in the design situation through a design move (shown in Figure 8.7).

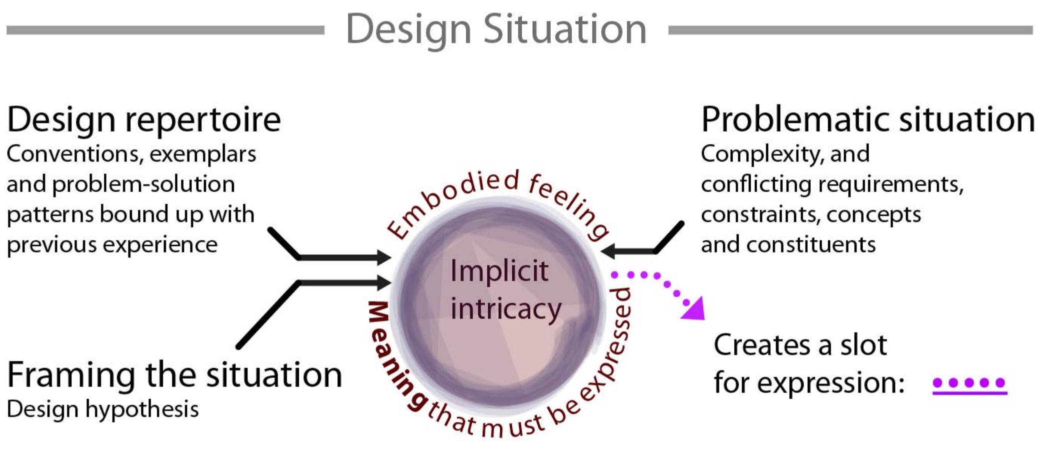

Figure 8.7. The designer responds to the situation by framing it, so that a slot, implying, ... is created and a viable meaning can be expressed

Once a possible move is suggested, the designer then expresses their meaning in the form of a local experiment. Following this, the designer makes sense of the results of the experiment, and reflects on what the experiment produces: that is, they reflect on how the *conversation with the situation* talks back. The way the designer understands and responds to problems, surprises and coherences are all dependent on the design frame, which is a complex arrangement of logical forms (design requirements, forms, rules and so on). The designer's framing of the situation and the local experiment change the situation and the inquiry domain, which leads to new feelings and new logical forms being present in a new design situation (shown in Figure 8.8). The coherent outcome of such experiments is verified through the logic of affirmation, which, I argue, can be more precisely understood as the embodied feeling a designer has when they can express a meaning that works in the design situation and makes sense. If the expression makes sense, it carries the designer's meaning forward, and thus, moves inquiry forward. For the designer, the result is a more precisely embodied meaning of the design, which allows them to make further productive or more refined design hypotheses and design moves.

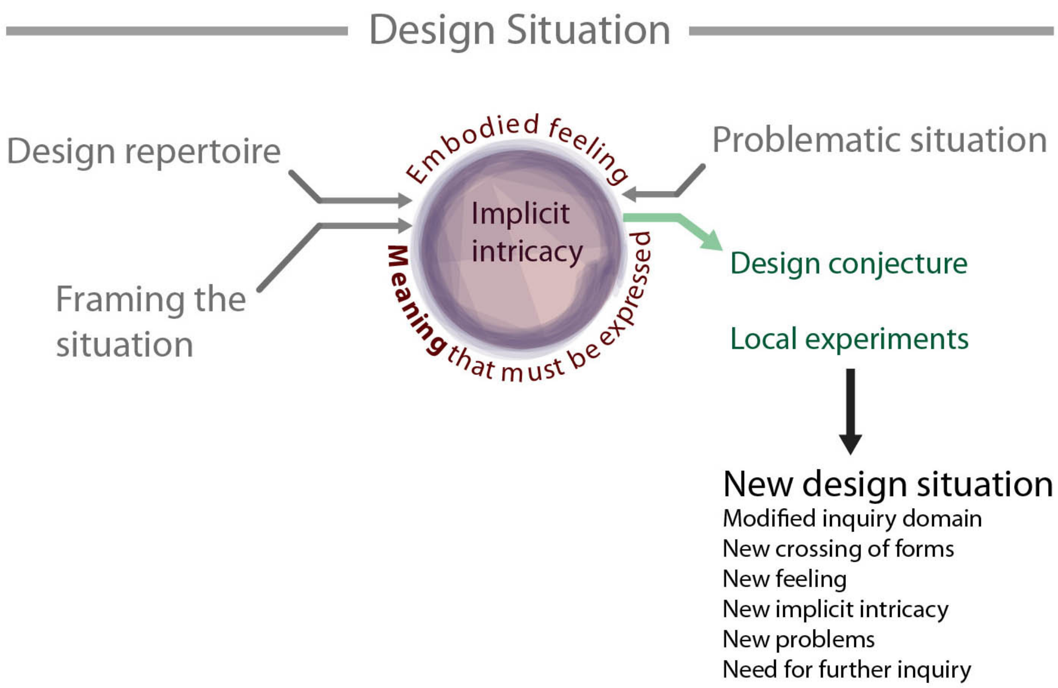

Figure 8.8. The implicit intricacy that leads to ....., *and the need for design expression. Different felt meanings at work in the implicit intricacy during game development*

For the game designer, the accrual of this precise embodied feeling is, I argue, what drives the iterative development cycle, and gives direction to the itinerant process of finding a way forward at each iterative step. The forces and flows present in the experience of the game, and in the reflective design situation, are shaped and given direction by the designer's interiorisation of the numerous logical forms that influence game design (see Figure 8.5). The disruptive nature of game design can produce a conflict in logical forms. This conflict can throw up challenges to design coherence and can obstruct the designer's ability to make sense of the situation: however, it can also provide opportunities for expressing new meanings that do make sense.

I also suggest that theories of embodied patterns (image schema and vitality affects, discussed in Section 4.2.1 and 4.2.2) provides a useful way of understanding how logical forms are made sense of in game design, and how new forms are expressed. Image schema are dynamic spatio–temporal–object patterns. Vitality affects are simple time-intensity contours that are synchronised across multiple modalities of sensory experience and associated with meaningful activity. Embodied patterns therefore provide a general structure and manner that organises the particulars of what is experienced. The meaning of such patterns is constrained by the logic implied by that structure or the manner of intensity change. This proto-logical form is part of the embodied, felt meaning that informs how we imaginatively project and construct that meaning in words and reflective thought. For the game designer, I argue that there is therefore, a very close, personally felt relationship between two elements:

1. the embodied patterns as they are experienced (in language, in design activity and in games)
2. the way the general structure of those patterns, as felt in the body's organisational response to what is experienced, gives rise to meaning and expressions that carry forward that meaning.

For example, the developers of *inFAMOUS* made sense of a problematic design situation by expressing a new meaning for the game's player character: superhero as electrical conduit / battery. This metaphorical concept finds expression in the logical forms of game design through a range of dynamic patterns. Before this design change, players were forced to enact many source–path–goal patterns to find and collect ammunition for their powers, and thereby gain power. This type of pattern emphasises the importance of the *goal* in the source–path–goal pattern because, at that stage in development, the game rules gave the player power after collecting an ammo or health pickup. However, the electrical conduit metaphor led to a solution in which power comes from a single source–path–goal pattern: in this pattern, the player is always the goal. By enacting the pattern in the new design, all nearby power is indiscriminately drawn to the player, rather than player having to fetch the small amounts of power of different kinds. This is a better fit for the nature of a superhero.

Finally, it should be noted that the implicit intricacy that I have suggested accrues to game design inquiry is personal. Even though the logical forms that I have proposed in this section may be objective and shareable, what they imply as an embodied meaning that must be expressed, when crossed over in an individual's context, will differ. This conclusion suggests another important form of expression that must take place in game development teams: which is the social process of coordinating understandings. This process necessarily involves language and agreement on expressing the same point, which is not the same thing as agreeing on the logical forms used to express the point.

8.3.3 The project-specific conceptual structure

I suggest that the logical forms posited above serve the need for logical consistency and integration in gameplay, and are required by the design activity that achieves those goals. The needs of the designer, in producing a unified experience, merge with the needs of players, in engaging with one. Therefore, I suggest that the main logical form that *should* be expected to accrue to successful game design inquiry is the logic of a project-specific conceptual structure (which establishes conceptual distinctions and creative values). I also propose that this logic is developed in the social process of coordinating the way team members understand what the game experience is intended to be. Ideally, this logical form would act as a rudder to constrain and direct the meaning of design activity. Game developers need this sort of conceptual structure as they work, fix problems and develop new experiences, as much as players need one to guide them in understanding the game world they play in. The conceptual structure can be thought of as part of a language experienced in the gameplay.

This *language* makes use of a constellation of accessible, connected meanings and senses that orient thought and action in a productive way. Game developers, in creating a game world with its own unique concepts and distinctions—which form a unique and strange kind of experience—effectively create a new way of seeing and doing things, and in the process, create their own senses, meanings and conceptual structures: effectively, a unique language. It has been noted that creative, collaborative teams develop their own idiosyncratic language, partly as a way of defining their identity, but also as a way of sharing their vision for what they will achieve (Bennis & Biederman, 1997, pp. 126-127). By developing a conceptual structure, three factors may be unified: the concepts behind design intentions: the logical structure of the game objects and systems: and the qualitative experience of play.

For the developers, a conceptual structure directs action, whether it is in forming possible problems, defining abstract models, guiding the artistic forms used, evaluating design proposals or evaluating the game experience itself. For the players, the game experience has an order and consistent orientation that can be relied on, particularly in four main areas: game systems; visual and audio forms; the patterns and problems encountered; and agency and consequences of action. This conceptual structure, and the logic that comes from it, if it is to be effective, must take root in each team member as similar embodied meaning: an implicit intricacy or felt understanding that, I propose, allows developers to know what their game is. By the end of a project, the felt understanding that supports the conceptual structure is so tightly intricate that it is effective in:

- weeding out anything that does not belong
- posing and solving problems
- identifying discrepancies and smoothing inconsistencies.

I suggest that a developing project-specific conceptual structure is one of three conceptual systems that develop over the course of the project. The second is the quasi-stable conceptual system, which consists of the general knowledge and conventions of the field of game design. This is closer to a discourse in the sense that Dorst uses the term. This system is quasi-stable because design situations in every new game project create conflicts, disjunctures and creative opportunities that put some of this discourse into question. Design solutions can disrupt the language of game design, or produce innovative elements. But it is equally important to remember that there are routine, taken-for-granted conceptual structures that are not changed significantly throughout the project by design. In fact, game designers deliberately protect sections of the discourse from design change by exercising design control over the interdependencies among the parts of the game. The third remaining conceptual system is the set of values, constraints and requirements that is formed at the start of the project and represents the various issues and concerns of the many discourses that intersect in a game design project. This conceptual system informs both individual and collective understandings of what the team is doing, why they are doing it, and what team members should consider important. Some of these aspects will change as the project develops, which can cause confusion. The project-specific conceptual structure evolves from a constantly changing design situation: a situation that throws up paradoxes and creates the need and opportunity for frames and integrating concepts to be developed or invented. This in turn can cause the assumed common understanding and the quasi-stable game development discourse to be questioned and disrupted.

The project-specific conceptual structure can also be understood in terms of paradoxes among discourses in the design situation. A project-specific conceptual structure would function as a way of developing a shared understanding of the design situation among different people, and as a way of resolving conflicts among different discourses from a coordinated perspective. I suggest that an example of this idea can be found in the following quote from an account of the making of *Portal 2*, which concerns feedback on the game from a cabal named “Overwatch”, which consisted of “the most senior Valve employees”. In evaluating a mid-development version of the game, Overwatch pointed out continuity problems, pacing issues and a missing ending, which led to the writers on the project receiving the feedback: “Make the game one complete thought” (Keighley, 2011).

In the earlier phases of development, the conceptual structure can generate possibilities, and later, orient the search for solutions. The language of this conceptual structure co-develops over many iterations throughout the project, and develops to the extent that it takes time to understand the relationships between everything that produces meaning in the experience of play. From this it would follow that a game in development that deals in new meanings, and new relationships that produce meaning, will require a longer period of inquiry than one that does not. And conversely, the ability to develop a viable language earlier in the process might be expected to reduce indeterminacy, make inquiry more productive or reduce the need for inquiry. Paradoxes in design discourse are apparent in Schell’s (2008) offering of eight filters, or tests (pp. 77-78) (see Table 8.1) that a game must pass through in order to be considered good enough. Whenever the game

> fails one of these tests, you will have to change your design, and then run it through all eight tests, or ‘filters,’ again, because a change that makes it past one filter might make it fail another one. (pp. 76-77)

Each of these filters can be considered as coming from a different design discourse.

Table 8.1. Schell's eight filters

Filter / test	Key question
Artistic impulse	Does this game feel right?
Demographics	Will the intended audience like this game enough?
Experience design	Is this a well-designed game?
Innovation	Is this game novel enough?
Business and marketing	Will this game sell?
Engineering	Is it technically possible to build this game?
Social/Community	Does this game meet our social and community goals?
Playtesting	Do the playtesters enjoy the game enough?

A mature project-specific conceptual structure, I argue, can guide the resolution of design paradoxes among the competing discourses that influence the design situation. However, this ability to guide is very likely to be weak at the beginning of the project because the context for the crossing of the various meanings in all the relevant conceptual systems (e.g. integrative design concepts, game concepts, multiple discipline-specific discourses) is weak. At that time, the game experience is either not yet developed or poorly developed, resulting in a lack of an experiential common context for social inquiry. This is why I argue that a playable game experience, as a work in progress, is a powerful rhetorical tool in the *concrete design argument*. The experienceable game can provide the consistent, stable crossing of felt meanings required for game designers to compare positions in different conceptual systems, and to frame and solve design paradoxes.

Chapter 9: Conclusion

9 Reaching a unified outcome to inquiry

Any contribution to a particular area of philosophy can be measured by the transformation it effects in understanding the subject. Dewey (1929a) suggested

> a first-rate test of the value of any philosophy which is offered us: Does it end in conclusions which, when they are referred back to ordinary life-experiences and their predicaments, render them more significant, more luminous to us, and make our dealings with them more fruitful? Or does it terminate in rendering the things of ordinary experience more opaque than they were before, and in depriving them of having in "reality" even the significance they had previously seemed to have? (p. 7)

For a philosophy to offer viable support to the practice of game design, the concepts and values on which the philosophy is based must have meaning within the game development situation. I strongly believe that the understanding of game design produced by this research renders the experience and predicaments of game design more significant and luminous. Perhaps such understandings can be applied more generally to game design situations in a wide variety of game development configurations beyond the collaborative, team-based commercial projects that inform my experience and the main cases studied in this thesis. However, this thesis offers a much deeper and detailed treatment of the subject-matter of game design than previous works on the subject. And, unlike game design theories that, I have argued, obscure the nature of game design, I am confident that the methodology adopted in this research has led to concepts with a clear and appropriate philosophical basis. This basis suggests that my research conclusions should have productive power in future dealings with game design situations. In this final chapter, I refer my research findings back to the practice of game design to justify these positive convictions. First, I will give a brief overall summary of the preceding research.

Using Dewey's theory of inquiry as a method, I have formulated the raw subject-matter of game development in terms of the problem of designing meaningful experiences in model worlds. In doing so, I employed a range of theories capable of transforming that subject-matter into a set of conceptual distinctions and relationships that are appropriate to designing and making game experiences. Of particular importance is the emphasis in game design on experience of indirectly composed dynamic embodied patterns, which I have called Bία~Forms. These include patterns of ends and ends-in-view, of emotion and vitality affects, and image schema. From these distinctions and relationships, I have argued that it is the nature of game development that this complex experiential subject-matter—which can only be tested, felt, understood and known in the game experience itself—and the capacity to experiment on, test and know this subject-matter, *co-develops* during the game design project. This co-development is understood as a process of expansion in logical forms, experiential qualities and the precision of embodied meaning and expression. I characterised this expansion process as occurring within design situations in the project, feature and game experience domains. I have shown that the nature of such design situations seems to be inherently uncertain and chaotic. Further, I have demonstrated specifically, and argued more generally, that these situations involve itinerant and iterative processes of skilled practical inquiry that grapple with indeterminate design situations and move these inquiries forward through integrative design activity.

The co-development process described above moves from a doubly indeterminate initial situation toward a doubly determinate final situation, and involves a series of related design situations (often social in nature) characterised by indeterminacy and changing design contexts. Many problems occur throughout development due to: limits and problems with conceptualisation; the commitment to, and legacy of, implementation; design paradoxes that emerge between design discourses; and the playtesting process. These situations require their own inquiry, and solutions have far-reaching effects on the interdependent parts that make up a game. Such problems of interdependency, limits and changes make it difficult to achieve integration and balance. For the game designer, knowing the way to achieve a particular coherent game design is a skill that must be developed over many iterative design and test cycles within a project. The concepts, knowledge, skill and precise embodied feeling about the design are poorer and less effective at the project start, and improve during successive inquiries across all three domains. These arguments demonstrate the conditions under which game development is necessarily inquiry, rather than production of a determined *paper* design.

I conclude this thesis by showing how the research aims were met and how the research questions were answered. I also examine the viability of the results of my inquiry, the implications that have emerged, and the possible claims, methods or studies that may come as a result.

9.1 Meeting the research aims and questions

This research has met the research aims and in the process I have:

1. added clarity to the nature of game design and game design activity, particularly within collaborative, team-based projects
2. developed a general approach to understanding continued indeterminacy in the game development process
3. explained the development of design knowledge and design coherence
4. clearly characterised the form design coherence may take.

One important achievement of this thesis is explaining the nature of prolonged, difficult and uncertain design conditions that are common in game development. I have explained how these sources of indeterminacy arise in relationships among important features of game design situations, namely:

- design conceptualisation
- development processes
- technology development
- design problems
- social dynamics in game development teams.

In doing this, I have provided game design with appropriate philosophical grounding and theoretical support, and clearly shown the way that the *design* of games (including knowledge that supports design judgement) can be affected by the process of developing games.

This research has, through framing game development as inquiry, identified limits to knowledge, conceptualisation and judgement in game design and acts of making. In developing a deep understanding of reasons that iterative development is required, I have made clear the way the limits to conceptualisation, rationality, general concepts and conventional game forms, and design control are overcome in the development process.

The research questions were supported by the premise that the need for inquiry continues as long as:

- the nature of the game experience is confused
- the steps needed to make it coherent are obscure
- the conflicts between meaning, aesthetics and logic are perceived in the developing qualitative experience.

This thesis has succeeded in articulating, and making sense of, this premise through the selection and integration of theories under the overall theory of inquiry. Each of these theories clarifies, in a different way, the nature of the conflict described above, and the way it contributes to the need for inquiry. This clarification has allowed me to articulate nine logical forms, and four forms of feeling that are involved in moving inquiry forward toward a coherently unified outcome.

9.1.1 Solving the problem of formal approaches to game design

The power of using Dewey's theory of inquiry for revealing and explaining sources of indeterminacy in game development has been demonstrated, with 40 different sources identified. I have shown how these factors lead to design change in game development, and I have successfully argued that indeterminacy is an essential feature of the design of new game worlds. My argument has clearly shown how rational design approaches and formal design methods can fail due to an inadequate understanding of, and inappropriate formulation of, the subject-matter of game design. In demonstrating this, I have demarcated a clear problem area for the use of formal methods and design approaches based on generic concepts and conventional game forms. This problem area can be explained in several ways.

One explanation is that formal methods or systematic design approaches will struggle to find relevance in game development if they attempt to formalise aspects of game experiences that can become targets of deliberately disruptive design. As mentioned in Section 1.1.1, previous attempts at developing formal methods for game design include standard vocabularies, notation systems, categorisations, general gameplay patterns and atomic gameplay elements. I have made arguments that strongly suggest why these approaches have failed: however, it is now worth considering a counter-argument. Music offers rich experiences, and music theory has established standards in concepts, notation and equipment. Music notation and tempered instruments are both logical forms. Composers use those forms to specify music. Leaving aside the issue of how complete these specifications are in the absence of musical performance, music offers a potentially good counter-argument. Why should games not be specifiable or approachable through formal methods? Why should there not be general logical forms?

The important question is not whether general logical forms are possible, but how viable they are as a tool in game design. I have argued that general concepts and conventional forms will not work well if game development becomes an inquiry situation, which, given the arguments presented in this research, is a ready possibility, even for experienced developers. These argument are warranted because of the lack of stable grounds for general forms. To continue the analogy with music, game design could be understood as offering players a coherent set of rules on which a notation system and musical instrument design depends, as well as specific limits and techniques to playing it. I argue that it is the design of those rules in each particular game project that matters, and undermines the design of standard units, concepts and a universal ordering of relations.

Attempts to formalise game design have been undermined because of the failure to appreciate the instrumental limits of general logical forms, in combination with a failure to appreciate the subject-matter of design. This subject-matter consists of the forces and flows of experience, which, prior to being transformed through the selective act of description, are proto-logical forms at best. Their intricacy can only be judged as an integral, not reductive, experience. One obstacle to generalisation is understanding the limits of selectively transforming the game experience into conceptual form. This transformation occurs through *description* of the complex embodied intricacy shaped by proto-logical structures (e.g. Bία~Forms) of change in the game experience. Such descriptions do not work alone, but instead work with embodied meaning. Another obstacle is in appreciating that embodied organising structures, such as image schema and vitality affects, are wide open to rational expansion through metaphoric projection. This makes the conception of experiential proto-logical forms in gameplay unstable and difficult to pin down in the absence of a project-specific conceptual structure.

Another explanation of the problem area for formal game design approaches is that game design knowledge cannot be usefully reduced to objective forms with (in the view of objectivist theories) an inconveniently contingent subjective component. I have made strong arguments for the importance of embodied meaning in both the appreciative systems of game designers and the affirmation logic used in design practice. These arguments include the remarkable insight that two factors accrue to game design inquiry in a gradual co-development process spanning numerous related inquiries. These two factors are:

1. logical form, including a project-specific conceptual structure and the form elements that indirectly shape the game experience
2. embodied meaning shared among a development team.

These conclusions have made strikingly clear the lack of attention that game design theories have previously given to the embodied dimension of experience in game design practice. Additionally, these conclusions emphasise the need for theories of game design to take into account the development of the game designer's integrative skills during a game project. Such skills must necessarily co-develop with the ability of game designers to come to know how to create a coherent game experience. And because many game design concepts, including conventional forms, have their meaning as integrative forms (rather than analytic forms) only within the skilled performance of game design activity, the meaning of such forms depends on the contexts they bring to the design situation. More specifically, their meaning depends on how they affect the context for the next design move, in combination with the variety of other logical forms in the design situation.

9.2 A viable understanding of game design

In Section 1.2.2, I suggested that the viability of a theoretical system for game design should be evaluated on its power or capacity to achieve eight distinct purposes. I will now draw conclusions about how well the outcome of this research inquiry satisfies these purposes.

Capacity to help understand uncertainties and risks in game development

This thesis makes at least four valuable contributions to understanding the challenges, tensions, conflicts, and domains of inquiry facing both game designers and members of a development team. First, it has shown a method for revealing uncertainties. Second, it has clearly identified, and conceptualised, 40 different indeterminate design situations in terms of well-established theories that are appropriate to the subject-matter of game development. Third, it has identified possible causes, limits or modes of origin of these uncertainties, and shown how they are part of complex social, technical, creative and qualitatively experienced situations that are typical in game development. Fourth, I have made a strong argument against the notion that these uncertainties can be reduced through predictive design control in the manner of a design-for-production model. This provides support for understanding game development as a fundamentally exploratory, experimental and inquiring process, aimed in large part to producing information that supports further design and making.

Although risks in game development have not been the focus of this research, I have clearly revealed sources of indeterminacy that can become risks when making decisions in uncertain and unpredictable conditions. My research has established a theoretical basis for understanding how uncertainties can arise in game development, which offers good grounds for identifying risks.

Power in gaining a critical understanding of the experience of game design and development

Schell (2008) has argued that the problem of vocabularies for game design is not that game developers lack words (or ideas) to describe elements of game design, but instead lack "clear thinking about what these ideas really are" (pp. 24-25). This thesis has met Schell's challenge, and carefully examined the subject-matter of game development. In each chapter I have developed critical insights into concepts that are part of the experience of game design and development. One important distinction to emerge in this thesis is between concepts that denote characteristics of games (or complexes of elements experienced as wholes) and concepts that serve as integrative tools for design activity.

This research has also demonstrated how team-based large-scale game development (and very likely other configurations of game development) is fundamentally chaotic and indeterminate in nature, and can very readily be disruptive. Because game designers are playing indirectly with the design of experience, the concepts and conventions used to grasp these experiences are sometimes disrupted, reinvented and rationally expanded in the process of designing and making games. As a result these concepts become part of the domain of inquiry rather than having stability as general forms. In connection to this, I have shown how game development may lead to new coherent conceptual systems. Such systems, along with game technology (including form elements), are expressions of an equally necessary system of embodied meaning that is discovered through play, and without which game design cannot function. The embodied, experiential and meaning-focused perspective taken in this research has provided not only a clearer understanding of game design, but also a critical examination of the problems caused by the inappropriate application of objectivist and formalist thinking to game design.

In clarifying concepts that are central to game design, I have provided new conceptual (and therefore, perceptual and instrumental) tools with which the skilled game designer can attend to their design work. In doing this, I have, as Dewey might say, constructed a ground-map for the province of criticism of game design theory. This opens the way for new critical engagement with the experience of designing and developing game worlds, and for studying game design activity. To critically understand the experience of game development requires an insight into the nature of the project situation. This thesis has revealed at least five ways of improving the way this project situation is understood:

1. Distinguishing three domains of inquiry, and explaining the way inquiry functions differently in these domains, has offered a new and more detailed way of understanding the iterative development process.

2. Demonstrating the central role of personal feeling in the iterative development of a game experience has had two key effects: allowing discussion to proceed beyond dismissing so-called gut feelings and intuition as "mystical hand waving" (Cook, 2007), and offering an important way of understanding the contribution of strong creative direction when combined with strong expression of the feeling of the game experience.
3. Considering the role of each member of a development team as a design role has helped to open the development process up to new critical understandings. This new perspective is possible due to a new understanding of how the work of the developer is a form of local experimentation, and how the work of each role (e.g. creative director, programmer, artist, writer, sound artist, animator) creates its own logical forms. The work of each development role, in the process of integrating parts into a whole game experience, provides new crossings of logical forms and embodied meanings, and thereby, opportunities for creative expression, which moves inquiry forward.
4. Developing new insights into the transformation caused by playable game prototypes and playtesting in the design situation has added depth and clarity to understanding their important function. This is because, as part of a social design process, they coordinate the interplay of logical forms and feelings within a creative team. They also reveal discrepancies between designers and players in the way they understand the felt meaning of a game experience, and reveals paradoxes in discourses among stakeholders in the design situation.
5. Explaining how contexts for meaning in the design situation, and the grounds for decision-making, can shift during a project has possibly been the most important insight into the game development experience. Further, these shifts are shown to be a strong part of the nature of game development. This insight also explains the potential and possibility of large disruptions at the project level, and of the way design problems can converge to force reconceptualisation in the project, feature or game experience domains of inquiry. The picture of development that results is not a convergent iterative process (from a wide funnel of possible options that are successively refined), but one of a mix of iteration and itineration.

Capacity to help understand the use of game design exemplars and conventional game forms

The role of, and use of, conventional forms and exemplars in game design have been clarified in at least five ways:

1. From the perspective of Schön, conventional forms provide a way of framing inquiry, and allow the designer to impose a whole or partial organising scheme over the situation. This frame may provide simultaneously provide a theory, problem formulation and possible solution. Such design hypotheses and framing moves serve to move inquiry forward, allowing for the design situation to 'resist' and 'talk back' in response to the designers moves, leading to an improved understanding of the domain of inquiry. The case of *inFAMOUS*, with the inquiry into player controls, clearly demonstrated this process.
2. A conventional game form, as a complete and refined game experience, can be understood as an integration of at least nine kinds of logical forms that produce, at second order, a coherent game experience. This comprehensively integrated whole is necessarily accompanied by patterns of embodied feeling that make it a complete expressive object. This means that the abstract form of an exemplar or convention does not work alone. Rather, it manifests the highly interdependent nature of: game concepts and their logical entailments; characteristics of game experiences as integrative concepts; embodied patterns of experience (which I have collectively called Bία~Forms) and their proto-logical structure; and the logic within the game objects themselves (form elements).
3. The concept of Bία~Forms establishes a promising and viable understanding of general patterns in game design. Bία~Forms are distinctively different from previous attempts to formulate game design patterns. Such attempts may have found limited use within game development practice because, in choosing an objectivist position and assuming a spectator theory of knowledge, the patterns lack context, and therefore sensible anchoring, in the design situation. And if they lack the meaning provided by the design situation, at best they are of little relevance among such complex interdependent contexts, and at worst, can cause conflict or confusion. This problem is exacerbated by the fact that individuals in the design situation represent a number of different discourses, or disciplines with different expressive

purposes and goals. Rather than producing confusion and conflict, (and obscuring connections among concepts, simple embodied patterns of experience, and logic), Bία~Forms, as a conceptual instrument, function differently. Bία~Forms integrate concepts, embodied patterns of experience and logic, and, they also provide an understanding of how these features are related. Of great importance to the practice of design is that Bία~Forms explain the continuity of embodied patterns and their proto-logic with language, through conceptual metaphor. This embodied perspective provides stable grounds for the conception of games, bridging logical forms and experiential patterns, and may lead to relevant design methods.

4. Conventional forms, and especially design exemplars, rely on the vital, embodied connection of creative expression, design intention, and the complex crossing of logical forms that make up the game experience situation. Essentially, game conventions and exemplars, as outcomes of one project inquiry, are integrated part–whole structures that include the embodied feeling of the creators, and are not objects that can be easily reduced and put to work in another inquiry. The insight that emerges is that there is a precarious conjunction and balance between game concepts, game logic, experiential logics and qualities, and the requirements of the design situation for each project. The possible limits to exemplars carrying over from one project to another is an interesting area for further study because it sits at the nexus of multiple issues: indeterminacy, design control, feeling, embodied patterns and creative expression. I have revealed important factors that seem to limit the continuity of game forms across different projects, which is a question that is highly significant in the debate surrounding formal approaches to game design.
5. Creative innovation, and deliberately disruptive design, undermines the stability of conventional game forms, or taken-for-granted design language. As a new design situation, this requires new logical forms and new creative expression to convert the situation to one that makes sense, and has coherence, within the parameters of the design situation, particularly with complex designs that have interdependent elements. The capacity of humans to use conceptual metaphor, imagination and a variety of logical forms (language, action, art) to make sense of the interplay of logical forms in a design situation (which is a particular system of meaning) means that innovation in logical forms is bound to occur as part of the process of framing, experimenting with, and making sense of, complex design situations.

Capacity to help understand design coherence

I have characterised the way coherence develops in design inquiry as a conjunction and balance of logical forms, contexts for meaning, and the feeling of the experience of those logical forms in gameplay. This developing relationship is clearly revealed in the cases of *inFAMOUS* and *Portal*. Additionally, as part of a social design situation, design coherence depends on resolving paradoxes among multiple different discourses. For the designer, the coherent outcome of design activity serves to advance the iterative development process, but also, to take steps forward to reveal possible new experiences of forces, flows and resistances, which will require new frames, hypotheses and design experiments. From Polanyi's theory of tacit knowing as a skilled integrative performance, we can understand how design coherence takes time to develop, and in fact, must co-develop as the part–whole structure of the game takes form. This is a view of game design activity as an integrative discipline in which normally separated characteristics are unified: formal and semantic, objective and embodied, quantitative and qualitative.

Power or capacity to improve the conception of games

My research has clearly suggested ways forward in improving the conception of games. These include the identification of several limits to, problems with, and controversies over, conceptualisation. Importantly, I have identified potential problems emerging from the many (and possibly conflicting) purposes served by game concepts and their forms of expression, and I have clarified the role of playtesting as a significant source of reconceptualisation because it directly involves questioning contexts for meaning and considering the framing perspectives of others. Design shifts and reconceptualisation emerge because of the need to express the design intent (to express the creative direction) in forms that satisfy multiple discourses, and multiple valid ways that players can feel the game experience. These conclusions have clarified the nature of game conceptualisation as an ongoing process that occurs across numerous inquiries, in projects and sub-projects. I have also used Dewey's postulate of immediate empiricism to draw attention to the difference between what game concepts, expressions of game concepts, and game experiences, are experienced *as*.

In addition, I have shown how understanding the game concept as an integration of logical forms, embodied patterns of experience and embodied meaning, completely undermines the simplistic theme/mechanics dichotomy, and opens the way to an understanding of game experiences as a unified whole. This insight relies on showing the embodied basis for meaning and reasoning in language, and emphasises continuity of conceptual forms with immediate experience. I have employed this continuity to focus on the connection of the language used to express game concepts with embodied organising structures in game experiences. The implication for conceptualisation techniques for games is that there is an important coherence relationship between the language we use to express game concepts, and the structural and logical entailments implied in their possible implementations. As demonstrated in my analysis of *inFAMOUS*, this can provide a possible way of understanding how to analyse concepts and proposed gameplay mechanics for such coherence relationships, and for potential conflicts between game concepts, game mechanics and other logical elements in the game design. It is also very likely that some variant of this approach may be helpful in evaluating existing game experiences, or game designs.

Gendlin's concept of expression of embodied meaning between logical forms, reveals that conceptualisation of games occurs not just as expressions in words, but also as *any* logical form *or* action that makes sense in the space opened up by the crossing of many logical forms in the design situation. These logical forms includes game objects and their rules, or changes to configurations of game objects. Any new logical form that releases the tension of an implying ....., and therefore, carries forward the creative intent into a newly experienceable form, is part of the conception process. By the same logic, at each step of the iterative development process, new crossings of actions and forms may create an implying ....., which may require new conceptions to carry development forward meaningfully into the next design iteration.

Power to explain the need for iterative development

A promising result of this research is the vast improvement in the capacity to explain the purpose of iteration in the design and development of games. In understanding iteration as a complement to itineration, it is possible to see how reframing and experimenting with the game experience, feature or project domains of inquiry become necessary just to keep inquiry moving forward. The co-development of the parts of the game and of their organisation in the whole of the game allow, at each step, the interiorisation of, and experimentation with, new conceptual and construction tools. This in turn allows the designer to stay in touch with the experience of feeling what the logical forms in the design situation imply. When such ..... are created, new expressions of meaning are invited, continuing the development of the skilled design performance. This part–whole co-development process also achieves an expansion of the game concept through an increase in the definition and precision of rational tools, the experiential qualities and the embodied meaning that defines and supports the work. The iterative approach is also clearly necessary to discover the conjunction of elements, and their precarious balance, that makes for a good game experience, and the disruptions and breakdowns that reveal opportunities for reconception and re-design.

Capacity to understand when top-down approaches can be effective

Top-down design approaches rely on the design situation being stable and predictable enough so that requirements can be determined. Such stability allows design problems to be formulated such that general knowledge and conventional design forms can be productively applied in the exploration and evaluation of viable solutions. Throughout this thesis I have made strong arguments for the limits of top-down approaches, and in preceding sections of this chapter, I concluded that this issue is a question of the viability of general forms. Such viability depends on the complexion of the particular design situation, and the level of awareness of the ways in which the stability of general forms can be undermined.

The conclusions reached in this research provide tools for understanding the viability of top-down approaches. These approaches may be effective if the variety of logical forms selected in a design can retain and carry forward the embodied meaning from which the design intent comes, into the experience of play. However, this requires selection and configuration of form elements to produce the game experience indirectly, at second order. For example, a game design may not seek to deviate from a generic and well-established gameplay form, and there may be no intent to change the conventional forms that make the generic game work. If the design intent is to retain a vital connection to the generic form, and the designers are careful not to select logical forms that create contexts for conflict or confusion, then top-down design approaches may be effective. Further, if the designers can understand how their selection of form elements is complementary with, or enhances, the feeling of the generic game form, then indeterminacy may be reduced and leave a less problematic legacy throughout the remainder of the project. As mentioned in Section 2.3.2, the development of *Shadow Complex* and *Deus Ex: Human Revolution* provide good examples of this sort of approach. The important consideration for game designers is becoming aware of when design intentions, and the sequence of concepts, form elements and Bία~Forms that subsequently develop, will lead to disruptive design and create contexts that challenge the meaning of previously accepted concepts.

9.3 Future paths from this research

In the previous section, I discussed many ways that the outcome of this research is viable for understanding game design activity. Some of the conclusions I have reached have direct implications for future research, and for game design methods and processes.

Although this research is conceptual, it is grounded in my experiences of game development in large teams. In completing this thesis, I have resolved the pervasive indeterminate feelings that led to this research. In that regard, I have achieved a unified outcome to my inquiry. However, there is still the question of returning the research conclusions to the site of game development, which is not of a single homogenous type, but many uniquely configured game development teams. And further, my conclusions must be tested empirically. In my practice as a teacher of game design for the last four and a half years, I have developed these ideas and used them to guide students through their development projects, and to help them better understand their design situations and become better game designers. Additionally, Morgan Jaffit (personal communication, 21 April, 2015), co-founder of Brisbane studio Defiant Development and my external research supervisor, reported that his studio has found many of the ideas in this research useful in their game development process.

Yet these local results should only be the beginning. Future anthropological or ethnographic studies of a range of game development situations will find in this research a wealth of transformative instruments suitable for grasping the experience of game design and structuring the study of game design practice, including:

- the development of game design expertise

- the development of project-specific conceptual structures
- inquiry in the project, feature and game experience domains
- the use of integrative concepts in design practice
- sources of indeterminacy and limits to design control
- embodied, experience-focused approaches to understanding meaningful player experience
- design coordination in multi-disciplinary teams.

This research also opens a new path for studying design coherence, which encompasses the game artifact, the player experience and the development situation. A related new area for future study is to investigate on a larger scale the relationships among logical forms in the game design situation, embodied patterns of experience and the imaginative projection of those patterns into higher order conceptual structures. This may lead to new techniques for the conception of game experiences, and possibly, better ways of designing new game experiences that work successfully in the chaos and change of game development.

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