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Playing by the rules:
Towards a gameplay framework of creativity in design

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DECLARATION OF ORIGINALITY

I hereby declare that *Playing by the rules: Towards a gameplay framework of creativity in design* is my own work and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

ABSTRACT AND KEY TERMS

Creativity plays an important part in design and problem-solving. While the role of play has enjoyed a great deal of attention in the study of both creativity and problem-solving alike, the overlap between games and the creative problem-solving process has not enjoyed much scholarly attention. This dissertation therefore focuses on exploring the overlap between games and the creative problem-solving process. This exploration seeks to enhance the manner in which the role and function of gameplay within the creative problem-solving process is understood. This study is approached from the viewpoint of a thorough literature review and synthesises insights from design discourse, creativity studies and game design literature. Firstly, this study demonstrates the systemic similarities between games and creative problems. These similarities prove that both systems are capable of generating or allowing the emergence of gameplay. The second aspect focused on is the manner in which gameplay emerges from creative problem-solving and the value that it holds for that process. The third aspect focused on is the role and function of rules in both games and problem-solving in eliciting gameplay. These explorations culminate in a rudimentary framework that describes the manner in which the rules and limitations in a creative problem become established in order to allow gameplay to emerge. Lastly, the paper explores the psychological factors inherent in eliciting gameplay from a creative problem in the form of adopting a lusory attitude. The study ultimately demonstrates the crucial role of gameplay in creative problem-solving and the aspects that influence its emergence.

Key Terms:

Gameplay
Creative Process
Problem-solving
Rules and Constraints
Lusory Attitude

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CHAPTER ONE: INTRODUCTION

"Engagement with ideas, like engagement with a game, is all about the play the ideas make possible" — Katie Salen and Eric Zimmerman (2005:78)

1.1. BACKGROUND AND CONTEXT OF STUDY

Creativity, described as a "vital form of human capital" (Runco 2014:xi), is an important topic of research that has enjoyed an increasing amount of attention over the past century. This increase in attention is in part due to the recognition of creativity as an important aspect in many different domains including education, innovation, science, art and design (Runco 2014:xi). In fact, creativity enjoys a particularly prominent role in design praxis. Gabriela Goldschmidt (2011:63) emphasises this by stating that "design is by definition a field in which innovation and creativity are always a high priority". Similarly, Henri Christiaans (1992:15) notes that creative capacity is a dominant quality that practicing designers are expected to possess and utilise on a regular basis. With the importance in status that creativity clearly holds in the design discipline, it is not a surprise that creativity research also carries a special importance with regard to understanding the way that creative design occurs (Dorst & Cross 2001:425). Design is inextricably linked to activities of problem-solving and creativity is often employed in an attempt to solve these problems.

In general, design is an activity focused on the generation of creative solutions for "ill-defined or ill-structured problems" (Christiaans 1992:12). The problems encountered in the design process (and many other situations where creativity needs to be applied) can be described as "wicked problems" – a concept originally coined and elaborated upon by Horst Rittel (Rittel & Webber 1973:160; Buchanan 1992:15). In contrast to general types of problems, wicked problems are by nature ill-defined, containing often confusing information and many stakeholders with conflicting values. Wicked

problems have no obvious limitations, goals or boundaries. It is thus up to the problem-solver to assign these limitations, goals and boundaries to the problem space through the application of creativity in order to be able to generate a solution to the problem at hand.

With the above in mind, the success of the solution to the problem invariably hinges on the ability of the designer to frame and define the problem at hand (Cross & Dorst 2001:431). In other words, creative problem-solving is deeply affected by the manner in which the problem-solver manages to represent the problem to be solved. In this regard, Margaret Boden (2004:106) notes that it is through the production of creative ideas that the problem can be viewed in different ways. Thus, the creative ideas produced by the creative problem-solver not only help to solve or generate solutions to the problem at hand, but also serve as a means to explore and structure the problem space itself. Accordingly, one can assume that the ability to effectively apply creativity is of utmost importance to being an effective creative problem-solver. However, despite the prominence creativity enjoys in design and many other disciplines, the creative process is still misunderstood and difficult to unravel.

Boden (1996:75) writes that “inventors, scientists, and artists rarely know how their original ideas arise” and this is presumably also the case with designers and other creative problem-solvers. It is often only in retrospect that creative designers, or even the observers of the process, can identify how creativity occurred, and these accounts are often unreliable (Cross & Dorst 2001:425). Therefore, creativity research in design carries special importance, especially in attempting to understand the ways in which creative design occurs (Cross & Dorst 2001:425). Given the weight that creativity carries in the design discipline it seems only logical that a great deal of effort should be spent on studying this phenomenon and the manner in which it functions To this end I would add that creativity research should strive to provide more applicable theoretical perspectives that include practical mechanisms and methodologies in order to make the creative process more approachable.

In an attempt to understand the mechanisms and methodologies of the creative problem-solving process in design, perspectives are often sought from many other fields. Ken Friedman (2003:508) positions design as an "integrative discipline ... at the intersection of several large fields", and the continual rise of new domains and technologies provides even greater possibilities for the investigation of creativity in design (Runco 2014:230). Theorists have turned to the fields of computer science and artificial intelligence (Boden 1998), biological and cognitive science (Dietrich 2015), social science and organisation (Glăveanu 2014), educational science (Sternberg & Williams 1996) and even philosophy (Runco 2014:317) to uncover new insights surrounding creativity and its associated processes. As a result, knowledge and understanding of creativity is growing and new insights are continually gained by incorporating perspectives from many different fields.

However, despite the rising overlap between creativity research and new areas of study, certain established fields of research still contain many perspectives yet to be explored. It is these same areas of study that may hold valuable information and insights regarding the creative problem-solving process. One field that still holds potential for exploration in terms of creative research is the field of ludology. Ludology is a discipline that studies games (including video and board games) and different forms of play in general (Frasca 2001). The field of ludology has enjoyed quite a bit of attention, especially when considering the topic of play. Play has been investigated and scrutinised according to many theories including its role in games (Huizinga 1949; Caillois 1961; Sutton-Smith 1997; Salen & Zimmerman 2004; Holopainen 2011) and creativity (Rand 1965; McAlhone & Stuart 1996; Csikszentmihalyi 1990/2008). Even considering the amount of research already dedicated to the overlap of play and creativity, there is still potential for further exploration.

There are many theorists that already demonstrate the value of play in creativity. For instance, Boden (2004:58) mentions that "creativity has much in common with play". Sandra Russ (2003:291) supports this view in saying that

"play and creativity have been linked both theoretically and empirically, in numerous ways". Even more importantly, not only is the link between play and creativity clearly established, but play also actively facilitates creativity by improving insight and divergent thinking ability (Russ 2003:300; Hennessy & Amabile 1987:22). This view aligns with the perspective of Paul Rand (1965:156) who states that a problem "conducive to the instinct of play" will often and most likely yield meaningful and novel solutions. Even from this brief overview it is clear that play enjoys a prominent and considerable role within design and creative problem-solving. The role that play fulfils within creativity also shares a particular relationship with the structure within which it is applied or occurs.

Steven Heller (2002:35) emphasises the importance of structure regarding play in design. Heller sustains the idea that even though play is an important part of creativity and the design process itself, limitless freedom does not engender playfulness or creativity since this would be counterproductive. Thus, play in design or problem-solving needs structure or limitations to be "intellectually sustaining" instead of draining. The structure referred to here is provided by a problem with well-defined boundaries. In essence, play in creativity emerges as a result of well-structured problems. In this regard, Rand (1965:156) proposes that most of the "psychological and intellectual factors implicit in game-playing are equally implicit in successful problem-solving". This statement implies that a creative problem can resemble the structure of a game in order to allow gameplay to emerge. Following on this, I believe that the link between play and creativity can be expanded upon to include a closer scrutiny of games[1] and the way that games overlap with creativity.

This perspective is supported by Bruce Nussbaum (2013:158) who similarly not only stresses the essential role of play in creativity but also views games as an important aspect of play. Jussi Holopainen (2011:11) clarifies that

[1] In this regard, the word 'games' refers to well-defined structures that allow for play to emerge. I will elaborate on the definitions of games in the second chapter of this study.

playing in games can exist apart from the formulations of play that classify it as “free, voluntary, and for the sake of itself”. This suggests that play within a game structure could lead to a goal-directed outcome similar to the actions taken in seeking a solution to a problem. In view of these statements I believe that creativity and games possess similar characteristics; thus it is possible to frame the creative problem-solving process as a game structure and subsequently the designer as a player within it. In essence, if it is possible to elicit gameplay during the creative problem-solving process, it should follow logically that it is possible for the structure of a creative problem to resemble that of a game. By framing creativity in this way, I hope to uncover new insights into the way in which the creative problem-solver interacts with creative problems through gameplay. This study seeks to explore this overlap in more detail as will be outlined in the next section.

1.2. AIM AND OBJECTIVES

The main aim of this study is to investigate the intersection between games and creativity with specific regard to the function and role of gameplay in creative problem-solving. By investigating this overlap I hope to provide new and helpful insights regarding the nature of creativity and problem-solving and the manner in which creativity functions on both a theoretical and practical level. This study seeks to ask if it is possible to better understand and navigate the creative problem-solving process through the application of gameplay and game concepts. By leveraging these concepts it may be possible to suggest ways in which the creative problem-solver may engage more productively with his or her creativity process.

To achieve this, the first objective of this study is to represent creativity and games as similar systems or structures. The value of this is to demonstrate the ability of both the creative problem-solving process and games to produce the phenomenon of gameplay. This comparison sets the stage for the exploration and comparison of other structural elements related to games and creative problem-solving later in the study. This objective is addressed in

Chapter Two, which discusses and compares the structures of games and creative problem-solving in depth.

The second objective of this study is to explore a more nuanced understanding of play in the context of both games and creative problem-solving, as well as the conditions under which gameplay may emerge from these structures. The purpose of this is to delineate a separation between different types of play in order to understand the specific significance of gameplay. In this manner it becomes possible to pinpoint its importance in both games and creative problem-solving. This also allows for more specific insights into the structural elements that create the conditions that facilitate gameplay. This demonstration creates a necessary link between gameplay and rules which is crucial to the other objectives in the study. These aspects are discussed at length in Chapter Three.

The third objective of this study seeks to explore the nature and the role of rules and constraints in both games and the creative problem-solving process. Rules and constraints are a very important structural element in both games and creativity. It is worth noting that despite the importance of rules and limitations in creativity, this perspective is largely under-represented or even ignored. Few sources directly reference this phenomenon or try to elaborate upon this aspect of the creative process. Thus, in order to address this shortcoming, this objective explores in further detail the functions of rules and constraints and the manner in which they affect the emergence of gameplay in both games and creative problem-solving. This focus also serves to highlight the key similarities and differences between rules in games and constraints within the creative problem-solving process. This comparison demonstrates that the creative problem-solver not only needs to apply rules to the problem space but also plays a significant role in discovering these constraints. This is discussed in Chapter Four.

To further the issues raised in tackling the third objective of this study, the fourth objective of this study is to explore the manner in which rules and constraints are discovered in the creative problem–solving process. This

becomes necessary in order to understand the manner in which the creative problem-solver can construct problem spaces in order to discover rules and ultimately create the possibility for gameplay to emerge in the process of problem-solving. This aspect is discussed at length in Chapter Five.

The last objective of the study is to demonstrate the influence of motivation and attitude on the emergence of gameplay within both games and creative problem-solving. This is to supplement the more technical perspectives presented in the previous objectives with a more psychological perspective on the process of eliciting gameplay. This analysis basically positions the creative problem-solver as a player within the problem-solving process instead of a mere participant. This demonstrates the value of motivation in shaping what is known as the lusory attitude and how it may be beneficial in creative problem-solving. This is discussed at length in Chapter Six.

1.3. LITERATURE REVIEW AND RESEARCH METHODOLOGY

The research is conducted through a thorough archival ethnography, which focuses mainly on seminal historical and contemporary sources. Considering and interrogating historical sources in parallel with more recent studies yields important insights into the subject at hand. The study analyses, compares, contrasts and synthesises different viewpoints from different fields of study including ludology, creativity and design. Through this methodology the study seeks to apply insights from these different disciplines to the research topic in order to uncover new perspectives and new avenues of research related to the conceptual overlap discussed above. This literature review provides a sense of the theoretical territory that the study will be negotiating.

Firstly, in order to understand the field of creativity the work of seminal authors is investigated. This includes but is not limited to the works of Margaret Boden, Arthur Koestler, Mihaly Cziksentmihaly, Ken Robinson, Keith Sawyer, Robert Sternberg, and Mark Runco. These authors all provide comprehensive overviews on the definition, nature and role of creativity albeit

from different perspectives. For instance, Margaret Boden provides an investigative perspective on creativity from within the field of artificial intelligence and computer thinking. Ken Robinson situates creativity within the field of education whilst others such as Mark Runco, Keith Sawyer and Mihaly Cziksentmihaly look at creativity from a historical and psychological perspective. Some of these theorists also touch on the role of play in creativity. Other more practical creative theorists such as Edward De Bono, Michael Michalko and Roger von Oech are also consulted. Whilst the basis of this research paper is about creativity, it also needs to comprehensively cover the role of play and problem-solving within this field.

The work of Paul Rand, Richard Buchanan, Henri Christiaans, Kees Dorst, Horst Rittel are seminal with regard to providing perspectives on creativity specifically related to design and creative problem-solving. Buchanan, Rittel and Christiaans provide a deep focus on the nature of creative problems and the manner in which they should be approached and solved. These authors deal with problem-solving from the point of view of design thinking. It is specifically Rand who provides the clearest overlap between creativity, problem-solving and play. However, this specific perspective can still be explored in more depth, which is what this study tries to do. A special mention must be made of the work of Patricia Stokes. Her work most directly addresses the roles of rules and constraints within the creative process. This is presented from a problem-solving perspective and serves as an important bridge to the ludological perspectives on rules as discussed below.

Although a large portion of this paper is dedicated to creativity and problem-solving, the field of ludology provides the perspectives necessary to investigate games and play in more depth. In this regard there are many different theorists consulted. With regards to the nature of play generally the work of Johan Huizinga, Clark Abt, Brian Sutton-Smith, Miguel Sicart and Roger Caillois. These authors serve to provide a comprehensive overview of the psychological and social dimensions of play and the means of defining the topic. However, these theorists do not address play from the perspective of games, but rather as a psychological and social phenomenon. In order to

supplement this view on play to include games, other seminal ludological authors are consulted.

The most important work in this regard is that of Katie Salen and Eric Zimmerman. Their text *Rules of play* lays a lot of the ground work that allows for the exploration of the role of games and the manner in which they function in terms of play. This text also addresses the role of rules within games in great detail. Other authors consulted in this regard include Bernard Suits, Bernard De Koven, Greg Costikyan and Jesper Juul. These authors specifically allow for a more robust and comprehensive perspective to be synthesised on the nature of games and how they function. Authors such as a Juul and Costikyan approach games from a very technical point of view, dealing with the formal elements of games such as rules. It is Suits and De Koven who provide more philosophical views on the role of games in the lives of players. It is the work of Suits that provides the most comprehensive perspective on the lusory attitude that is discussed in Chapter Six.

These sources are supplemented with many other theorists in order to provide an in-depth study of this field. The most notable fact concerning all of these sources listed above is that there is no single work to my knowledge that comprehensively addresses the formal overlap between creative problem-solving and games in terms of structure and elements. This is the knowledge gap that this paper adresses.

1.4. OUTLINE OF STUDY

Chapter Two investigates the relationship between play, creativity and games. Moreover, this chapter seeks to provide a working definition for creativity by leveraging the insights of several creative theorists. This section also includes an overview of the different elements associated with the creativity. After this definition and overview, I position creativity in relation to problem-solving. I investigate the types of problems that need creativity to be solved. Here I seek to demonstrate that the creative process forms a part of the problem space that must be solved and structured alongside the creative problem

space itself. I also briefly cover the role of gameplay in creative problem-solving. As already intimated, this overlap enables me to discuss the similarities between games and the creative process. I propose that games and creativity are both systemic in nature. As a result, both these structures contain the functions and elements of a system. I compare and contrast the creative process with games to show similarities and demonstrate that both processes contain the necessary elements that allows for the emergence of gameplay.

Chapter Three starts by providing a comprehensive, encompassing definition for play. This allows for a distinction to be drawn between the concepts of games and play. This is essentially to parse how these concepts inform one another. Once this definition and distinction has been drawn, the next section seeks to establish play as a method of interaction in both the creative problem-solving process and games. In this section I assert that play and progress originates from these structures as a result of decision making. I discuss the nature of these decisions and how they might inform the emergence of gameplay. The last section outlines the three categories of play as proposed by Salen and Zimmerman and discusses these different categories as they might appear within the creative problem-solving process. The purpose of this discussion is to draw a clearer distinction between the different types of play in order to demonstrate the value of gameplay in creative problem-solving and how it is tied to the structure that informs it. This chapter concludes by asserting that this structure is informed by rules and constraints.

Chapter Four is dedicated to a comparison between the role of rules and constraints within both games and creative problem-solving. The relationship between creativity and rules seems to largely be ignored in creativity research, hence my attempt to address this knowledge gap here. This chapter firstly investigates how rules and constraints serve to construct a state machine within the processes of creative problem-solving and games. It is this state machine that allows for movement within these structures through decision making. This chapter also investigates the relationship between rules

or constraints and the goal or state that they are intended to bring about. The means specified by rules and constraints in order to reach these goals is of great importance here. This section also investigates the nature of these means and the manner in which they function to elicit gameplay. Furthermore, this chapter details the paradoxical relationship shared between rules and creativity. The last section of this chapter seeks to draw a comparison between the types of rules found in games as outlined by Salen and Zimmerman and the type of constraints found within the creative process as outlined by Patricia Stokes. Once again, by doing this I wish to demonstrate the strong correlation between game structures and the creative problem-solving process, as well as the ways in which both processes rely on their inherent constraints to elicit gameplay.

Chapter Five demonstrates that unlike the rules of a game system, the constraints of the creative problem-solving process are discovered and applied as the problem space is structured. This chapter will propose a simple framework that models how rules and constraints are discovered in the creative problem-solving process. The framework consists of three stages respectively: applying heuristics to the problem space, recognising or “grokking” the patterns in the problem space and finally, using reflective judgment to assign rules to the elements uncovered in the process. Each of these stages is discussed in-depth before finally providing an example of how these stages might function in practice. This chapter intends to create a more practical link to the way in which the creative problem-solver might facilitate the problem-solving process in order to elicit gameplay.

The psychology and attitude of the person engaging with a structure also presumably have an effect on eliciting gameplay. The attitude with which a player approaches a game in order to elicit gameplay is known as the lusory attitude. This attitudinal approach may presumably hold insights for the creative problem-solving process as well. There seems to be very little literature discussing the role of the lusory attitude in creativity and this chapter attempts to address this shortcoming to some degree. Chapter Six demonstrates the correlations between motivational states and how this

impacts the formation of the lusory attitude. The function and application of the lusory attitude in games is also discussed at length. Once this overview is complete, I demonstrate the possible value of applying the lusory attitude in the creative problem-solving process. This chapter contends that although the creative problem-solving process contains all the necessary structural elements to elicit gameplay, there is also a psychological component to this process that must be exercised by the creative problem-solver.

CHAPTER TWO: CREATIVITY, PROBLEM-SOLVING AND GAMES

2.1. INTRODUCTION

There are a variety of aspects to explore in both games and the creative process. The main premise of this research is that through understanding the mechanisms and nature of games, insights can be laid bare into the working of the creative process itself. However, to investigate this relationship, it becomes necessary to find common ground from which to address both these phenomena. Paul Rand (1965:156) asserts that problem-solving and gameplay share similar psychological and intellectual properties. Following from this insight, it would seem that the most probable starting point to find common ground between creativity and games is to investigate problem-solving. This will also allow me to situate this exploration within design discourse.

This chapter begins by providing an overview of the concept of creativity. Through this overview I explore the theoretical landscape informing creativity and arrive at a working definition for the concept. From this definition I unpack a few different key insights related to the creative process and the aspects informing it. This section aims to link creativity to the production of ideas and also to explain exactly what qualifies a creative idea. This exploration provides a reasonable starting point to address the role of creativity in problem-solving.

After the overview of creativity and its associated elements, I discuss problem-solving through the lens of creativity and its role in design, bearing in mind the general nature of a problem and the manner in which creativity aids in exploring and eventually structuring a problem space. The aim here is to demonstrate that, in using creativity to structure a problem space, creativity becomes a component of the problem space itself. The consequence of this insight is that the creative problem-solver must not only solve the problem itself, but also solve the creative process as part of the problem space. I also provide a short overview of the general role of play in problem-solving and

specifically address the role of gameplay in problem-solving by providing a short comparison between the problems found in games and the problems found in the creative process.

After this I turn my attention toward finding a comprehensive and useful definition for the concept of games through a short comparison of definitions by different theorists. A comprehensive definition of games can emphasise the integral elements associated with games and lay the groundwork for an exploration into the similarities between creativity and games. The remainder of this chapter is spent drawing comparisons between the defining features of a game and creativity. As already noted, the aim of this comparison is to establish that both games and creativity share similar elements that allows for the emergence of gameplay. Once this demonstration is complete, this chapter can function as the underpinning for a deeper exploration of gameplay in problem-solving in the following chapter.

2.2. DEFINING CREATIVITY

In an effort to make a meaningful contribution to the realm of creative studies and design, the first necessity is to define creativity and situate the creative process as something essential to the discipline of design. Through defining what creativity is, it is possible to firstly gain a clearer understanding of the nature of the creative process and consequently what is involved in the outcome of the creative process. The attitude of many theorists toward creativity is that the concept is hard to define (Runco 2014; Sawyer 2003). This comes as a result of the fact that definitions of creativity incorporate many concepts that can be construed in different ways. Regardless, I follow Carl Hausman's (2009:4) recommendation that “what is needed at the beginning of a study of creativity is a sober, straightforward structural account”.

A good starting point for defining creativity can be found in the words of Rollo May (1994:38), who calls ‘authentic’ creativity “the process of bringing

something new into being". This definition is admittedly broad but it does point to arguably the most important aspect of creativity – namely the newness that is associated with creative products. A striking number of definitions compliment this definition by stating that creativity is the production of ideas that are both original and have value (Robinson 2011:1; Higgins 1994:3). Boden (2004:1) elucidates these definitions further when stating that "creativity is the ability to come up with ideas or artifacts that are new, surprising and valuable". These conceptions already allow us to sufficiently discern some key insights related to the nature of creativity.

The first key insight provided by this amalgamation of definitions is that the creative act is specifically linked to the production of ideas. Koestler's (2009:251) definition of creativity highlights the focus on ideas as the product of the creative process by stating that "the creative act consists in combining previously unrelated structures in such a way that you get more out of the emergent whole than you have put in". If the outcome of creativity is the idea, it is also necessary to briefly review the nature of an idea.[2] Most people understand an idea as a concept or unit of meaning that originates in the mind. In terms of creativity, ideas take on a slightly more complex nature. James Webb Young (in Foster 2007:4) writes that ideas are "nothing more nor less than a new combination of old elements." Austin Kleon (Kleon 2012:9) writes that ideas are "just a mashup or a remix of one or more previous ideas". Thus, creativity is firstly concerned with producing ideas and these ideas are often the outcome of unexpected combinations and connections between different ideas themselves. Following on these insights it might be possible to formulate a definition of an idea in creativity as a unit of meaning that results from the combination of other units of meaning. The nature of ideas in creativity is that through combination new meaning is created. Ideas in the context of creativity could refer to anything from concepts to theories to

[2] The word "idea" originated in the late 14th century directly from Greek to English and referenced the original meaning found in Platonic idealism. In Platonic philosophy an idea refers to "an archetype, or pure immaterial pattern, of which the individual objects in any one natural class are but the imperfect copies, and by participation in which they have their being" (Harper 2016). The word idea is derived from the greek word idein which means 'to see'. The meaning later shifted to a more colloquial understanding of an idea as something one thinks of.

poems (Boden 2004:1). However, even though ideas may be combinatory or even derivative, the ideas produced in the creative process should exhibit both originality and value.

Creative ideas that display an element of originality or novelty must appear as something 'saliently' new; however, ideas that are considered new can vary quite drastically (Gaut 2009; Sawyer 2011:7). It may be necessary to define what is meant by newness or originality in this context, seeing as ideas are derivative or combinatory. Carl Hausman (2009:5) states that a minimal condition for newness to be present in a creative idea is that it be different from the past or the thing that preceded it. Thus, newness or originality can refer to a departure from previously tread ground. However, this conceptualisation of newness may be too broad. Hausman (2009:10) further suggests that, in addition to this departure, the creative idea also needs to exhibit a structure that is unprecedented. The idea should exhibit something in its make-up that is intelligible as being new but that also could not necessarily have been predicted. The idea must be both unprecedented and unpredictable and not be reliant on necessarily the uniqueness of ideas that came before it to be found unique in its own right. Thus, an idea may retain elements of previous ideas or products but should transcend the structure of the ideas before it to become a structure of novelty in its own right. The sum of the parts of a creative idea should exhibit a surprising but discernable departure from the elements informing it.

Furthermore, a distinction can be drawn between ideas that are considered new psychologically and historically – this can be referred to as P-creative and H-creative respectively (Boden 2004:2, 2010:31; Gaut 2009:84). P-creative ideas involve the process of coming up with new, valuable and surprising ideas that are new to the person coming up with them. This could be a simple variation on a recipe or new subject matter explored in a painting for instance. The second category (H-creative) refers to coming up with new, surprising and valuable ideas that have never arisen in history. For instance, the theory of relativity as proposed by Einstein changed the domain of physics when the idea was proposed. An idea that is considered H-creative is a

completely new idea that no one has thought of before. Of course, to come up with an idea that is H-creative is much harder than coming up with an idea that is P-creative. Ideas that are H-creative however are also usually P-creative (Boden 2009:237). Ideas also need to provide a sense of value alongside their novelty or newness to qualify as creative.

For an idea to be considered creative, it must be seen as valuable in the context in which the idea appears (Gaut 2009:84–85). Admittedly, the value that an idea adds in its context can also be a matter of degree or interpretation. According to the system theory of creativity as proposed by Csikszentmihalyi (1999; Csikszentmihalyi 2014b:229) creativity happens at the interrelation between the domain, the field and the creative person or problem-solver. The domain consists of the information, rules and procedures that inform a certain area of practice. For instance, art is a domain. The value that an idea holds relates to the domain that the idea is crafted in. Furthermore, the second element that influences the value of an idea is the field. The field consists of individuals who act as the gatekeepers of a domain. An idea produced in a given domain must be selected and accepted by the field for inclusion into the domain. That means even though an idea may be introduced to a domain (such as an art piece), the field may not recognise its value or contribution to the domain. Value, then, is a case of subjective interpretation and hinges on many factors outside of the creative person's influence. Many times, the surprise that an authentic idea causes may be the reason that it is not accepted into a domain by the field, yet a truly authentic idea should engender surprise as discussed next.

Boden's (2010:31) definition adds a third dimension to creativity: surprise. The element of surprise inherent in any given idea refers to the degrees in which the idea can be creative. This means that some ideas can be considered more creative than others. Surprise can also be a factor in the way that newness is conceptualised as seen earlier. Furthermore, Boden (2009:240) states that "the surprise we feel on encountering a creative idea is sometimes due, in part, to the unfamiliar values that we are being invited to adopt". Surprise is just as important to the creator of an idea as much as it is

important to the observers or intended audience of an idea. The conceptualisation of a creative product should emerge from the consciousness of the creator but the means by which the idea is reached and the manner in which the final idea manifests should be just as surprising to the creator in order to engender the idea of flair as presented by Berys Gaut. This is the last key insight related to the definition of creativity.

Gaut (2009:85) critiques most definitions of creativity for being too product-oriented and thus lacking in a skill he calls *flair*. Here the word product refers to an implemented idea that results in some output in the world. Gaut believes ideas can only be qualified as creative if flair – the intention to create the idea or be involved in the creative process – was displayed in the production of the idea. This is an interesting distinction that means the person should choose to interact with the creative process. This interaction, in the form of decision making, is an important aspect that is returned to at a later stage. From the above investigation, then, it may be said that creativity is the intentional production of ideas that are considered new, valuable and surprising. At this point, one might ask what the point of the production of these types of ideas are, how they might be applied and, not least, what the process of generating these ideas may entail? These questions can be addressed through the lens of design and problem-solving.

2.3. CREATIVITY AND PROBLEM-SOLVING

As the previous discussion shows, creativity can be thought of as a desirable and noteworthy ability and is often associated with many fields including design. Indeed, in relation to design, creative capacity is a dominant quality that practicing designers are expected to possess and utilise (Christiaans 1992:15; Dorst 2003:14). It is also undoubtedly an important criterion that defines the quality of a design artifact (Christiaans 1992:1). It is for this reason that creativity research (in design and in general) carries special importance, especially in aid of understanding the ways in which creative design occurs (Dorst & Cross 2001:425). Developing an understanding of the creative

process as it functions within design could potentially benefit creative design education and training, as well as the personal development of creative ability. One of the prominent aspects that relates to understanding creativity in design is the relationship that it shares with problem-solving.

Generally, problems are characterised as a discrepancy between a starting state and a goal state; they basically refer to a gap between where a person is and where a person wants to be (Ward 2011:254). A problem can be classified as either well- or ill-structured based on the information that is provided for its solution (Stokes 2005:4; Ward 2011:256). A well-structured problem means that all the information in the problem space is specified and clear. Alternatively, information in an ill-constructed problem is not completely specified and aspects of the problem may still be unknown or lack clarity. In order to solve a problem, the problem-solver aims to construct a representation of the problem space based on the available information.

The more information is available the clearer the path to the solution for the problem will be. This representation aims to include a goal state, criteria for when the goal state is reached and means by which the problem-solver can move from the initial state of the problem to the goal state. When this information becomes available or is uncovered by the problem-solver, the problem reaches a well-structured state. When the problem reaches this state, the problem-solver can successfully generate ideas to solve the problem. However, the problems encountered in design and other creative disciplines are particularly difficult to structure and solve as is made more apparent below.

The nature of design is described as an activity focused on the generation of creative solutions for “ill-defined or ill-structured problems” (Christiaans 1992:12). The problems encountered in the design process (and many other situations where creativity needs to be applied) can be described as wicked problems – a concept originally coined and elaborated upon by Horst Rittel (Rittel & Webber 1973:160; Buchanan 1992:15). In contrast to general classes of problems, wicked problems are by nature ill-defined, containing

often confusing information and many stakeholders with conflicting values. Wicked problems have no obvious limits, goals or boundaries. They contain a fundamental “indeterminacy” (Buchanan 1992:16). The “wickedness” here refers not to evil but rather a resistance to being solved and the “wickedness” of the problem can only be reduced as the problem is tinkered with. There is no pre-defined solution or automatic response to these problems. To uncover the information necessary to solve a wicked problem, the problem needs to be experienced and tested. Examples of wicked problems can be found in a range of cultural or social spheres. Climate change, sustainable living and war are all examples of wicked problems – albeit on a dramatic in scale. Creativity is a necessary trait in the efforts to solve these types of ill-structured or wicked problems.

It should be clear that problem-solving is deeply affected by the manner in which the problem-solver manages to represent or frame the problem to himself or herself through their creative ability. Boden (2004:106) notes that it is through the production of creative ideas that the problem can be viewed or framed in different ways. It is this same creative ability that also determines the success of the solution. Dietriech (2015:131) observes that a solution to a problem “is deemed creative after a problem has been solved in a manner that violates our expectation”. This harkens back to the importance of surprise in creativity as mentioned earlier. Thus, problem-solvers not only seek to use their creativity to probe and structure the problem space itself, but also to structure it in such a manner that will allow a novel and valuable solution to be generated. This brief description of the role of creativity in problem-solving and design should sufficiently demonstrate the importance that creativity holds in the discipline. Yet, despite the prominence creativity enjoys in design and problem-solving, the process is still misunderstood and difficult to unravel.

Boden (1996:75) writes that “inventors, scientists, and artists rarely know how their original ideas arise” and it is fair to presume that this is also the case with designers. It is often only in retrospect that designers, or even the observers of the process, can identify how creativity occurred but even these accounts

are often unreliable (Dorst & Cross 2001:425). This becomes problematic when creativity is an instrumental part in structuring and solving problems.

The problem-solver is essentially in possession of a tool that is extremely useful but the operations of the tool are mysterious. Thus, the creative process seems to be a part of the problem in itself. The information of the process is often hidden to the creative problem-solver and only becomes clear as the process is executed. This may mean that in addition to using creativity to structure and solve problems outside of the process, the creative process is in itself a problem that is structured and solved in parallel. The creative process is a part of the problem space that is being solved. This insight positions the creative process itself as an ill-defined problem that becomes well-structured over time[3]. If this is indeed the case, it becomes necessary to frame the creative process more deeply and usefully to uncover the mechanics that drive this process.

Paul Rand (1965:156) offers an interesting insight here regarding the nature of problem-solving by asserting that “depending on the nature of the problem, some or all of the psychological and intellectual factors implicit in game-playing are equally implicit in successful problem-solving”. In fact, Rand (1965:156) mentions that a problem “conducive to the instinct of play” will often and most likely yield meaningful and novel solutions. This seems to suggest that problems with a game-like quality are easier to solve than problems lacking in that quality. Sicart (2014:17) draws a direct comparison between creativity and play by stating that play itself is creative and classifies it as “the act of creatively engaging with the world”. The value of this insight is further supported by the perspective of Bruce Nussbaum (2013:158), who not only places emphasis on the essential role of play in creativity but also views games as an important aspect of play. Rand (1965:156) states that the play found in the creative process incorporates elements of gameplay. These observations stress a very important aspect of creativity, namely the role of

[3] From this point onwards in the study, anytime creativity, the creative process or problem-solving process is mentioned it refers specifically to the creative problem-solving process. The reason for this is evident when considering the interplay between the act of creativity and problem-solving as is made clear in this section.

play – and specifically the value of gameplay – in creativity and problem-solving. For gameplay to exist in the creative process, it is logical to assume that the creative process should and can emulate a game structure that allows for gameplay to emerge. The connection here lies in the similarity between the problems found in games and the problems encountered within the creative process. In order to elucidate this, the nature of the problems in games should be investigated.

Dorst (2003:22) offers a useful comparison between problems found in design and problems found in a game structure. Chess can be used as an example. Problems in a game of chess are generally well-structured. This means the value of the objects or pieces, the inherent possibilities of the problem space and the boundaries of the interaction are usually clear. The player understands the goal and the actions that can be taken toward the goal are clear. In terms of chess, the player (having played the game before) understands his or her position on the board and the options that are available to him or her in the possibility space of the game. The player also understands what exactly he or she is trying to achieve: this is generally to win the game. The problem itself possesses clarity and all the necessary information is present. The actions that can be taken toward solving the problem are known and contain little ambiguity. In contrast, the (wicked) problems that necessitate the use of creativity do not necessarily have these qualities as I have demonstrated. Neither does the creative process itself necessarily contain this type of structured clarity. Players in games can make directed and informed decisions as a result of the clarity of the problem space whereas creative problem-solvers cannot always enjoy that same benefit during the problem-solving process.

For the creative process (which is a problem in and of itself) to contain elements of gameplay (which is entirely possible if the accounts of Paul Rand are to be believed), the structure of the process should then mimic that of a game. Costikyan (2013:7) provides some helpful direction here by pointing out that the word “game” is “merely the term we apply to a particular kind of play”. This type of play has gone beyond the simple and has been “complexified and

refined by human culture". Can the process of engaging and ultimately defining the boundaries of the wicked problems and the creative process itself potentially establish a game structure that allows for this particular type of play be evoked?

As the creative problem-solver probes and discovers the boundaries of the wicked problem and the creative process, essentially lending the problem a greater sense of structure and meaning, play and gameplay could emerge. This leads us to an interesting intersection where the concepts of play, games, and creativity meet. If play emerges from the creative process in a similar manner to a game structure it becomes necessary to look into the experience of both the creative process and game structures to draw comparisons in the play it elicits and the value that this connection might hold for research in creativity. In doing so one may take necessary steps in helping to define and understand the creative process better. I will now take a closer look at the ways in which creativity and games might resemble one another to establish the necessary similarities.

2.4. DEFINING GAMES

So far I have outlined the terminology and aspects of creativity as it relates to problem-solving and design. This section will narrow the scope toward the overlap between games and creative problem-solving. In order to explore this overlap even further the term *game* should also be outlined. The term *game* is generally considered hard to define owing to its many uses in language with many roots and implications (Abt 1970:5; Salen & Zimmerman 2004:73). The use of the word game has a surprising range. It can be used to refer to something being limp and cripple (a game leg) to referring to field in which one earns a living (the writing game) to the more obvious board and card games. It is exactly for this reason that the term needs to be elaborated on to explain the context in which it will be referred to in this study.

Bernard De Koven (2013) defines a game as something that provides a common goal but the achievement of which does not have any bearing outside the game. This definition provides a good starting point as it points to two very important elements: the pursuit of a goal and the separation of that goal from repercussions in real life. Abt (1970:6) defines a game as an "activity among two or more independent decision makers seeking to achieve their objectives in some limiting context". Similarly, Stephen Sniderman (1999) calls a game "a play activity that consists of an object (a goal or goals that the players are trying to accomplish) and constraints on the players' behaviour". Both these definitions focus on the participants and the means the participants have available to them in order to make decisions to reach the goal. These definitions also point to important concepts necessary to define games in this context but do not provide a sufficient encompassing definition.

However, through an extensive comparison of different definitions provided by various theorists including the theorists mentioned above, Salen and Zimmerman (2004: 80) arrive at the definition of a game as "a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome". This definition is encompassing and contains all the elements mentioned in the previous definitions. This allows for further exploration into the structural similarities between games and the creative process. This definition hinges on four main elements: *a system, artificial conflict, rules and a quantifiable outcome*. For a game to exist, then, the space needs to possess these elements. With this in mind I move to establish that all the elements inherent in games (as mentioned above) are also inherent in the creative process. For this to happen, it is first necessary to establish that the creative process is a systemic structure similar to a game system.

2.5. GAMES AND CREATIVITY AS A SYSTEM

According to Salen and Zimmerman (2004:50), a *system* is "a set of things that affect one another within an environment to form a larger pattern that is

different from any of the individual parts". This view of systems is also echoed by Littlejohn (2009:950) when he describes systems as "an integrated set of interacting variables that together create a larger pattern or whole." In essence, the components comprising a system result in something wholly different than the individual components comprising the system. Littlejohn (2009:950; see also Salen & Zimmerman 2004:51) identifies four components of systems namely: *objects, attributes, internal relationships, and an environment*. It is my assertion that game systems and the creative process alike share these components, as is shown below.

Firstly, *objects* in a system refer to the parts or variables that comprise the system itself. Objects in a system can be both physical or abstract (Littlejohn 2009:950; Salen & Zimmerman 2004:51). In a game, these objects may be pieces on a board or characters on a screen. Similarly, within the creative process, objects may be thoughts or ideas or even physical objects like brushes or paper. In both games and the creative process, objects refer to any parts used within that space and have some kind of meaning within the system. Objects in a system gain certain characteristics, attributes or meanings as a result of the manner in which the system operates. The operation of the system itself is influenced according to the rules that inform it.

Attributes are the second component of a system. This refers to the characteristics of the objects as well as those of the system as a whole (Littlejohn 2009:950; Salen & Zimmerman 2004:51). In a game, attributes and characteristics are given to objects by the constraints imposed by the rules. For instance, in a board game, pieces on a board can only move in certain ways. Similarly, characters can only jump or move in a certain way in video games. The creative process and the objects associated with it are also given certain characteristics based on the constraints of the activity or the problem. Keep in mind however, that the characteristics of objects in the creative process can change as the problem space is developed. An ordinary object can gain more or less significance in the creative process unfolds. For instance, an idea that doesn't seem useful initially, may become very useful if new information is discovered in the problem space. Similarly ideas that seem

very promising may fall by the wayside as the problem space develops. Essentially, the attributes of the objects in creative problem-solving depends on the perspective applied to the problem itself. In addition to the attributes possessed by objects in a system, these objects also share internal relationships.

The third component of a system is the *internal relationship* between the objects in the system (Littlejohn 2009:950; Salen & Zimmerman 2004:51). In board games, the position of pieces on a board may dictate the internal relationship of the objects in the game. The fact that one player has a chess piece in a certain position on the board, for instance, determines the strategic possibilities and relationships that are available to the other player. When one player moves a piece on the board, a limitation is imposed on all players involved in the game. This limitation determines the possibilities available in the next move. The internal relationship shared between the pieces influence the objects and the possibilities that can be expressed by those objects in the system. The objects within the creative process also share internal relationships. For instance, the ideas generated by the creative problem-solver shares a relationship with the mediums used to express those ideas. The medium might determine the success of the idea or the potential the idea possesses for exploration. Similarly, different ideas might share internal relationships that help to determine which idea might be more suited to solve the problem than another. Although these might be broad instances, it is quite clear that objects (or ideas) within the creative process share an internal relationship within the system.

The last component of a system is the *environment* possessed by the system or the context within which the system operates (Littlejohn, 2009:950; Salen & Zimmerman 2004:51). Systems are affected and to an extent established by their surroundings. People sitting down for a game of chess expect to elicit play[4] from the process. Thus, in this scenario play provides the context for the

[4] I will more fully expand upon the definition and idea of play in the next chapter.

game system to exist. When considering creative problem-solving, there are myriad contexts which could put the process in motion. A client brief submitted to an agency or a personal problem that needs attention are all equally valid contexts that may prompt creative problem-solving. Additionally, each of these contexts may allow the process to unfold in a different way. Of course, these examples are far from comprehensive but merely serve to demonstrate the fact that both creative problem-solving and games are influenced and affected by context. From this investigation, it is clear that both games and creativity possess the necessary components of a system. This establishes the first major overlap shared between games and creativity. The next element that a game possesses is artificial conflict and it bears investigating whether creative problem-solving also possesses this element.

2.6. ARTIFICIAL CONFLICT IN GAMES AND CREATIVE PROBLEM-SOLVING

The second element necessary for a game structure to be established is *artificial conflict*. Games maintain a boundary from "real life" in both time and space (Salen & Zimmerman 2004:80). This means that any kind of conflict that happens between the decision makers in a game is by extension artificial, as it does not happen in "real life". Of course, many games model real world activities and events (Abt 1970), such as a war and competitions. This grants the game a sense of conflict between the players themselves or even between players and the system itself. One only needs to consider the game 'Risk'[5] (Levin and Lamorisse 1959), which causes conflict between players who seek domination over different countries and continents in the game. The game suffers from terrible luck-driven gameplay that may very well drive artificial conflict between players into real conflict but this observation stretches beyond the investigation of this paper. Artificial conflict can also be

[5] 'Risk' is a very popular mass-market family war game with the goal of conquering the world. Players occupy different territories on a world map. Each turn players gain reinforcements and move their armies to adjacent territories in an effort to take over the spaces occupied by their opponents. Combat is decided by rolling a certain amount of dice. This makes the combat extremely luck driven and can be a sore point among the players at the table.

found in the creative process but does not necessarily manifest as a result of modelling real world activities.

Artificial conflict in the creative process can be conceptualised according to two different notions regarding how creativity takes place. The first popular conception of creativity is known as the individualist conception. This is an approach to creativity that focuses on the creative process as exercised by the individual. In this view, the creative act is a mental combination expressed by an individual in the world (Sawyer 2011:7). One can consider here that the artificial conflict exists between the individual and his or her own mind. The individual must in some sense compete against his or her own mind to bring about new ideas. De Bono (1970) contends that the creative process is a battle against the patterns of the mind. The same patterns that are employed to function in every day life can be the very thing that keeps creative solutions from ones' thoughts. Although the argument can be made that the act of getting ideas and having thoughts happen in "real life", it is the context of the creative problem that lends an artificial nature to this conflict. There is also a second conception of creativity that can be addressed here.

The second conception highlighted by Sawyer (2011:8) is the sociocultural conception of creativity. According to this conception, "creativity is the generation of a product that is judged to be novel and also to be appropriate, useful, or valuable by a suitably knowledgeable social group". This conception of creativity favours the product of the creative process above the creative individual. The individual can only be deemed creative if the product is deemed valuable and original in the context that it appears. Thus, the artificial conflict exists between the individual and the context into which a product is introduced. This also correlates to the system theory of creativity presented by Csikszentmihalyi (2014:229). The creative problem-solver delivers a product in the domain of choice. The field (or gatekeepers) of the domain decides whether the product can be included in the domain and considered creative. The field and the creative may have different notions of what constitutes value and originality. Just ask any starving artist or student who has to accept a critique of his or her design. The creative problem-solver must continually

struggle against his or her expectations and beliefs and try to meet or exceed the expectations and beliefs dictated by the domain and field. Hence, an artificial conflict exists between the person and the domain or field. Each domain has its own rules, conventions and guidelines within which people operate. This is also the third element of games that can be found in the creative process.

2.8. RULES IN GAMES AND CREATIVE PROBLEM-SOLVING

Juul (2005:6-7) describes a game as a “rule-based system”. Salen and Zimmerman (2004:302) clarify that these *rules* are the means for creating play inside the game. Sicart (2014:8) supplements this view in stating that all contexts of play contain rules and that “play is derived, mediated and situated by the use of rules”. These statements make it clear that games contain a formal set of rules that construct the boundaries according to which players can interact with the system. Earlier it was noted that players interact with these boundaries to elicit play from the system. In boardgames, these rules are often contained in the rulebook and in digital video games the rules are coded into the algorithms that comprise the game system. Rules can be overtly stated as in the case with board games. Going into the game, all players are made aware of the rules that govern the system and act accordingly in order to reach the outcome or goal of the system. In other cases, such as video games, rules are implied or discovered through exploration instead of necessarily being stated outright from the start. A player may for instance discover that an object can be picked up and used in a game or that certain areas are inaccessible. According to Gadamer (1989:107) “the particular nature of a game lies in the rules and regulations that prescribe the way the field of the game is filled”. This means that the rules not only make play possible, but also determine in a very real way the flavour and atmosphere of a game.

The creative process also contains rules, constraints and boundaries. The creative act is geared toward the production of ideas and solutions through

thought. The creative problem-solver must identify and select constraints that promote novel, surprising outcomes in the creative process (Stokes, 2005:xiii). These constraints basically function as the rule set for the creative process. For example, an artist may choose to limit the colour palette and materials when working on a new piece. These constraints inherently structure the creative problem and preclude certain outcomes and promote other outcomes in the process – very similar to a game. Through the application of creative thinking, individuals are knowingly and unknowingly following a set of rules informing the outcome of the process. In fact, an essential part of the creative process is the act of deciding on limitations.

I will explore the role of rules in the structure of games and creative problem-solving in more depth and also how these rules and constraints are discovered in Chapter Four and Chapter Five respectively. For now however, it should be clear that rules and constraints are unmistakeably part of the make-up of any game and similarly serve a useful function in creative problem-solving. Rules and constraints are set in place to affect a certain type of outcome in both games and creative problem-solving. The outcome of these processes is the last element that will be compared in the next section between the structures of games and the creative process.

2.9. OUTCOMES IN GAMES AND CREATIVE PROBLEM-SOLVING

The last element provided in Salen and Zimmerman's definition of games is the idea of a *quantifiable outcome*. An example of a quantifiable outcome might be that players can count up points or some other measure to determine if they have won or lost the game (Salen & Zimmerman 2004:80). Juul (2005:6-7) provides a useful overview of these quantifiable outcomes in games by mentioning that "different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are negotiable". The goals of the game determine the value of the different outcomes. If the aim of the game is to amass points, outcomes involving lower

point counts obviously have less value than outcomes that involve higher point counts. Players can measure the success of their effort within the game system and against other players based on the values assigned to these outcomes. All decisions and movements made in the game are tied to realising these outcomes and players do this because they are invested in the game itself. The most important aspect of the outcome of a game then, is the fact that the outcome can be measured by some criteria to assess the success of participation in the game.

Similarly, the creative process also results in an outcome about which a value judgment can be made. The notable difference between games and the creative process however, is that the outcome is not necessarily completely quantifiable in the most literal sense of the word. There are criteria by which creativity and creative products can be assessed however. When assessing creativity “the goal is not to predict specific creative outcomes, but rather to measure characteristics related to creative production irrespective of specific outcomes” (Clapham 2011:458). The variety of ways and perspectives by which creative outcomes can be assessed and measured falls well outside the scope of this paper. However, the success of a creative solution or idea can be determined by the criteria or parameters of a defined problem space. Much like games, once a problem space presents a goal and constraints to reaching that goal it is possible to assess the relevance and originality of the creative solution according to these boundaries. The context in which the idea appears specifies to an extent the parameters by which the outcome can be quantified. Once again this refers to the perceived originality of the creative product as well as the value that the product holds for that context. The creative problem-solver must make certain movements or choices that move the process to the desired outcome.

From this section it should be clear that creative problem-solving and games both share similar elements to a large extent. This includes a systemic nature, rules or constraints, a form of artificial conflict and an outcome that can be measured by a value judgment. Although there are minor differences between games and creative problem-solving, there are enough overlaps and

similarities to position these phenomena as congruent. This allows me to move forward in the next chapter and discuss in more depth the nature of play, and more specifically the nature of gameplay, within both games and creative problem-solving.

2.10. CONCLUSION

This chapter started by outlining the basic elements of creativity and defining it as an act that produces novel, valuable and surprising ideas with intent. Creativity is situated in many disciplines and is especially associated with the act of problem-solving in the design discipline. Problems that require the use of creativity to solve are often ill-structured problems (or wicked problems, as is often the case with design). These problems do not offer a great deal of information to construct a representation of the problem in their initial state. The creative problem-solver tinkers with the problem and its boundaries to try and uncover the necessary information to be able to represent the problem space and eventually solve the problem.

Not only does the creative problem-solver have to generate ideas to frame the problem space but the creative problem-solver must also generate ideas that will solve the problem once it has been structured properly. The problem-solver, however, does not necessarily have a complete understanding of how the ideas are formulated through the creative process and might only be able to rationalise and discuss decisions taken in the process after the fact. Essentially, in addition to figuring out the problem at hand, the creative problem-solver is also grappling with his or her own process. This situates the creative process as a part of the problem space that must be constructed and solved. In essence, the creative process also moves from being ill-structured to well-structured as the problem is reframed and eventually solved. This view conflates the creative process and problem-solving to some degree and as a result references to creativity and creative problem-solving is used to refer to the same process throughout this study.

In attempting to solve a problem space, the process becomes easier when there are elements of gameplay present. Play is a very important part of the creative process and emerges through the process. Games are classified as well-structured problems that allow for the emergence of gameplay. In the process of constructing a problem space and the creative process, the same elements should be present to allow for the emergence of gameplay in problem-solving. To investigate this aspect further the correlations between game structures and the creative process had to be investigated.

I used the definition offered by Salen and Zimmerman (2004: 80) of a game as “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome”. I then set out to demonstrate that creative problem-solving and games share these same common elements. In essence this establishes that creative problem-solving and games share the same building blocks. Both are systemic structures featuring artificial conflict, contains rules and constraints and result in an outcome that can be measured by a value judgment. This means that there is an established connection between games and the creative process. Theoretically, in sharing these same elements, both games and creative process should have the capacity to produce gameplay.

Attention can now be directed toward investigating certain aspects found in games through the lens of the creative process: specifically gameplay and the manner in which rules and constraints function in facilitating it. By doing so, it may be possible to discern valuable insights that will allow for a deeper understanding of the nature of the creative process. I therefore turn to consider more critically how play unfolds in the creative process as compared to a game structure in the next chapter.

CHAPTER THREE: CREATIVITY AND GAMEPLAY

3.1. INTRODUCTION

In the previous chapter, the concept and definition of creativity was investigated. The conclusion was reached that creativity relates to the production of ideas that are novel, valuable and surprising. Creativity is especially prominent in design and artistry related disciplines and features strongly in problem-solving. Problems that need creativity to be solved are often ill-structured and feature no readily discernable goal or means of reaching that goal. In other words, the problem space of design problems is not represented sufficiently. The creative problem-solver must therefore tinker with the problem in an effort to structure the problem properly and then produce ideas that may provide a solution to the problem.

In addition to the representation of the problem space, the nature of the creative process is also elusive and foggy. Creative problem-solvers often have to grapple with the mechanics of the creative process itself, as well as the problem they are working on. The creative process as applied in the problem space also forms a part of the problem space. Therefore, the creative problem-solver is not only solving the problem but is also solving the creative process itself and how it fits in the problem space. The mechanics involved in the creative process becomes clearer as the problem becomes structured better.

The discussion in the previous chapter has also demonstrated that problems are likely easier to solve if they contain elements of gameplay. Gameplay emerges most often from games. Games are generally considered to be well-structured problem spaces owing to the fact that the goal and the means to reaching the goal are clearly represented. The creative process and games share a series of fundamental aspects: a systemic nature, artificial conflict, rules, and a quantifiable outcome (to an extent). Thus, for gameplay to emerge from the creative process and to subsequently be applied in problem-

solving, a well-structured creative problem is key. In this chapter I investigate the role of play in the creative process through the lens of games in order to demonstrate how gameplay might emerge as a result of structuring the problem space

Firstly, I aim to explore the relationship that exists between creativity and gameplay. To do so, I begin by exploring the concept of play in more depth by drawing on the definitions offered by Johan Huizinga, Roger Caillois and Salen and Zimmerman to arrive at a working definition of the concept of play. When it comes to play and games, the two concepts are often conflated. A separation of these concepts, or at least an understanding of how they inform one another, becomes necessary in order to successfully explore the relationship of play with games and creative problem-solving itself. I attempt to show how play and games function alongside one another whilst also showing how they intersect. I also demonstrate that play is both a method of interaction and a behaviour that can be engaged in when it comes to games.

From there I seek to explore the idea of play as a means of engagement with a game structure in more detail. This section aims to provide more clarity regarding the structure of a game system as well as the way in which play behaviour allows for exploration and movement in a game structure. I then demonstrate that play behaviour in a game structure manifests as a result of decision making. By making decisions in game structures, the state of the structure is changed and moved toward a resolution. I contend that this same type of play behaviour and movement through decision making is present within the creative process.

The next section of this chapter considers the different categories of play, namely general playfulness, ludic activity, and gameplay. The aim here is to deliver a more nuanced understanding of play by outlining the different play categories and describing what each entails. I also provide an outline of the stages of the creative process in more detail. The descriptions of both the categories of play and the stages in the creative process provide the basis for an exploration of how these categories of play function and emerge from

within the creative process itself. The aim is to establish the conditions that allow for gameplay to emerge from the creative process. I aim to demonstrate that as the creative problem–solving process gains more clarity and structure, the emergence of gameplay becomes more likely. In essence there is a movement from a more general type of playfulness to a more directed and functional type of gameplay as the process unfolds.

3.2. DEFINING PLAY

In order to investigate the role of *play* in both games and the creative process, it is necessary to explore the concept in greater depth. The seminal writing of Johan Huizinga on play is an excellent place to start this investigation. In his influential book *Homo Ludens,* Huizinga investigates play as a social and cultural phenomenon. Huizinga (1949:7-9) describes play as a completely voluntary activity that is removed from ordinary life. It is an activity that is engaged in for the sake of the activity itself and only exists for a limited period of time before it ends. Huizinga paints a picture of play as elevated above other activities, and as something that exists within the sphere of experience whilst also existing in its own space. People move in and out of the space of play, flitting between different experiences.

Other theorists have also taken it upon themselves to explore and elaborate upon the concept of play. Roger Caillois (1961:9-10) defines play as an activity that is: non-obligatory, separated from real life, uncertain in terms of outcome, governed by rules, make believe, and unproductive. Here one can see some overlap in the qualities of play as described by both Huizinga and Caillois. One may also note that many of the qualities of play itself sound like the qualities of games as described earlier – however the two are not necessarily the same thing. A distinction must be drawn between games and play as these concepts share a “paradoxical union” (De Koven 2013). Therefore, one must consider the role of play in games and the role of games in play to arrive at a truly useful definition of the concept of play.

Salen and Zimmerman draw a useful distinction between defining a game and

the act of playing a game. For them, games can be a subset of play but play can also be an element of games themselves (Salen & Zimmerman 2004:303). In essence, games cannot exist without play, for play is the main mode of interaction with a game system. From this perspective play is contained within a game and is an essential part of what makes a game function. Interaction with a game happens through play and the quality of the game itself is defined by the way in which play manifests itself within the structure. The game is thus the context for play and is intended to manifest the play experience. However, play can exist without necessarily depending on the presence of a game. Even though games can be seen as a way for play to manifest itself, a game is only one way in which play can emerge. Thus play can have many other contexts from which it can emerge and is not limited to games. Therefore, the definition of play needs to be more encompassing in order to apply it in the context of creative problem-solving.

Salen and Zimmerman (2004:304) provide an open-ended definition of play as “free movement within a more rigid structure”. In this view, play is seen as the “expression of a system”. In other words, by engaging in play, a participant takes advantage of the space of possibilities created by the structure of a system. It is only through play that the different degrees of expression that may be inherent in an activity can be experienced. Playing allows a participant in an activity to stumble upon different possibilities inherent in the experience itself. The example of a steering wheel can be used to illustrate this concept effectively.

The steering wheel is attached to the structure of a car and the movement capability of the steering wheel is dictated by the structure it is attached to. The steering wheel has freedom of movement to a certain extent but the possibilities of this movement are entirely dependent on the system to which the steering wheel is attached. The steering wheel has a certain amount of “play” within the possibility space created by its own mechanisms (Salen & Zimmerman 2004:304). As noted by Sicart (2014:90), playing is “negotiating a wiggle space between rules, systems, contexts, preferences, appropriation, and submission” Following these interpretations, play is not only a behaviour

that can be engaged in during a game but also indicates the main mode of interaction that allows for the exploration of a systemic structure. In the case of games, decision making is the manner in which players explore the system. This means that decision making and play are intertwined. In the next section I address decision making as both a means of play and movement within a game structure before moving on to discuss this same phenomenon in the context of creative problem-solving.

3.3. DECISION MAKING AS PLAY AND MOVEMENT

Following on the definition provided by Salen and Zimmerman in the previous section, it becomes easier to see the interplay between the experience of playing a game and the act of exploring a game. It will also become apparent that this interplay gives us insight into the structure of games. In essence, exploration in a game system is essentially akin to playing in a game system. Playing means exploring the possibility space afforded by the rules of the game (Bogost 2007:43). This means that players use the rules and mechanics of the game to make choices. The game generates events as a result of these choices that ultimately serve as input to the players. Players can then react to these events. It is not hard to see why Sylvester (2013:44) describes a game as an engine of experience. But what exactly is the experience that game systems generate?

In their conception of the play experience situated within games, Salen and Zimmerman (2004:316) provide a simple three-part model that encapsulates the experience of participation in any game structure. This model outlines the manner in which players explore a game system and ultimately plays a game. The model describes the relationship between the player, their choices and the game system itself. Essentially, the game system provides input to the players through the current game state. This input leads to internal decision making that is executed by the player within the game system. Ultimately this decision results as an output in the game system and is then received as input by the player once more. The model is circular, meaning that the one

component of the model influences the next. However, each iteration of the model moves the game state further and further along the path to resolution. This three-part model is intended as a universal illustration of the player experience within any game system, though more intricate details may vary from one system to the next. The example of chess is useful for illustrating the model as well as describing each component of the model in more detail.

Player A and Player B sit down to a friendly game of chess. The board is set up and Player A is chosen to start the game. At this point the game reflects a certain state and, as a result of this state, certain actions are available to be taken. The first component of the model is the *internal decision* that a player must make based on the state of the system presented. In the example, Player A can make any legal move with one of his or her chess pieces and deliberates the options that are available. The second component of the model is the *action* that the player takes based on the internal decision decided upon previously. This decision might result in Player A moving his or her pawn. This action then triggers the third component of the model, namely an *output* in the game system that serves as input to a new internal decision. The output in this case is only made possible by the system put in place. The pawn that player A has moved causes a change in the game state which serves as input to player B. The moved piece opens certain possibilities to Player B whilst also limiting other options. Player B must now take his or her turn. This state again results in some kind of internal decision, which leads to action and ultimately to output in the game system. The pattern then repeats until the game ends.

This model illustrates not only the components of the experience of a game but also demonstrates that movement or exploration within a game system hinges on decision making. Players explore game systems by taking actions or decisions in the game system. Decisions are simultaneously the basis of play and the basis of exploration in a game system. This connects to the idea of play as movement within a larger rigid structure and in essence supports the definition of play as provided by Salen and Zimmerman (2004:304). Fritz (1994:7) mentions that when the parts of a structure interact they set up

tendencies or inclinations for movement. The structure contains within itself the tendency to move from one state to another. The player in the game interacting with the components and elements of the game structure facilitate this movement through decision making. At this point, it is possible to demonstrate how this model of experience and movement is also inherent in the creative process.

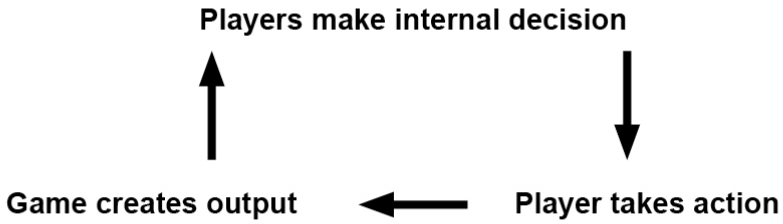

Figure 1: General structure for understanding how players experience a game (Salen & Zimmerman 2005:316)

Sternberg (2003:98) proposes that creativity and the associated development of creative fields is largely based on decision making. He recognises that, to a large extent, creativity is based on attitude[6] and the associated decision to be creative. When a person makes a creative contribution to a domain, it "represents an attempt to propel a field from wherever it is to wherever the creator believes the field should go". In this view, creativity is a type of propulsion that is brought on by the decision to apply creativity in a specific domain. This view provides a helpful perspective on creativity to demonstrate that decision making also equates to movement. However, the view provided by Sternberg externalises the decision making process outside of the creative process itself. I would propose that this idea of creativity as propulsion through decision making also holds true during the process. The creative process is based on both a decision to practice creativity in a particular domain as well as myriad decisions throughout the process itself. Creativity

[6] I will address the attitudinal component related to creativity more directly in Chapter Six.

can be modeled as possibility space within which decision making is the key mode of interaction. The theories of both Dietrich and Boden can support this view, as demonstrated below.

Dietrich (2015) explores the biology of the human brain and the manner in which creativity manifests itself. For creative work to manifest, there needs to be a space within which the creative brain can function and produce creative ideas. This space is referred to as “design space”. Dietrich (2015:98) describes the design space as “the logical space that contains all possible permutations of information”. Basically, the design space presents a topographical view of creativity. The design space contains all possible solutions, creations and ideas from the vantage point that the creative mind happens to inhabit at any given point. A person occupies a certain position in space and time and from that position an infinite number of possibilities are present.

To elaborate further, Dietrich (2015:98) states that “anyone making moves in an unknown fitness landscape, therefore, creates and designs”. The ‘moves’ referred to here by Dietrich are decisions. When a person embarks on a creative endeavour, they are making decisions in the “design space”. At first any number of decisions can be made and any number of outcomes can be reached but once a decision is made it affects the possibilities inherent in the space. The more decisions are made, the closer a person moves to a creative product and the narrower the set of possibilities become. Dietrich (2015:98) states that any and all movement made within these conceptual or design spaces is in itself an act of creation and design. Any choices in the creative process delineate and narrow the possible outcomes of the process.

Boden echoes a similar idea to the concept of design spaces. Instead of referring to ‘design space’ Boden proposes the idea of “conceptual spaces”. According to Boden (Boden 2004:4; 2009:241; 2010:32), conceptual spaces are “structured styles of thought” that are picked up through cultural transmission and do not exist in the individual mind alone. Within these conceptual spaces, different thoughts are possible, some of which have been

thought and some of which are yet to be thought. To be creative, individuals work within and explore these conceptual spaces to produce novel ideas and solutions to problems that arise. Both Dietrich and Boden highlight the nature of the structure that both games and the creative process occupy. In essence, both games and creativity are represented by a structure of possibility that can only be manifested and explored through decision making and the resulting movement of those decisions. By engaging with the structure through decision making, the structure gains clarity and the boundaries of the space become clear.

Dietrich (2015:98) aptly uses a game metaphor to illustrate this idea by stating the following:

> The game of chess illustrates this nicely. At the start, the match is wide open and most moves are actually possible moves, permitting a near infinite number of paths the game could take. As play unwinds, however, in its own peculiar way, many otherwise permissible moves become inaccessible from the actual position of the figures on the board. This precludes, in turn, countless trajectories from being actualized that are entirely possible trajectories in chess. At some point, often toward the end of play, the configuration is so twisted that a player has but one move if she is to stay alive.

By following this logic, Dietrich highlights how movement through the creative process might echo the patterns of play in a game. In a game structure, continuous decision making eventually leads to a narrowing of the possibility space. As a result, the decisions any one player can make are also narrowed. This becomes especially apparent toward the end of a game. The denouement of the creative process features a similar narrowing down of choices and options. Decision making in the creative process eventually narrows down the possible outcomes that can be reached as the process converges. At the start of the creative process, options for outcomes and decisions are almost infinite. The end of the process features a narrower possibility space with a more modest set of possible outcomes and more obvious choices. The creative problem-solver has to try and direct these movements through the conceptual or design space to result in the production

of novel and valuable solutions.

This idea echoes many of the experiential accounts of creativity, each of which can lead us to think of creativity even closer related to games than initially anticipated. The actions taken in the creative process represent an attempt to propel the process forward. Once a decision is made in the creative process, it influences the possibilities available to the creative problem-solver. The output provided by a decision made in the process serves as the input for the next decision but at the same time represents a narrowing of the possibility space of the process. Here one can see a clear correlation between the model of experience within games as provided by Salen and Zimmerman and the experience of creative problem-solving. Similar to games, decision making in creative problem-solving is simultaneously the experience of the process itself and also the means of exploration in that same process. On a surface level, this equates game structures and the creative process quite nicely but there is a glaring flaw.

It may be observed that not all decisions during the creative process are necessarily experienced as play, much less as gameplay. The reason for this may be that it is not enough for decisions simply to be present. These same decisions also need to present the player with a challenge. More specifically, the play of a game exists in the challenge presented by the decisions of the game (Hiwiller 2016:101). I elaborate on the relationship between the player and challenge in Chapter Six. For now, the reader should just be aware that the simple existence of decisions does not necessarily engender play. However, an understanding how gameplay emerges from the creative process is still important. To repeat, it is gameplay that is sought as an aid in creative problem-solving. In the next sections, I will outline different categories of play and what they entail. This discussion will eventually allow me to discuss the emergence of play (specifically gameplay) in the creative process

3.4. CATEGORIES OF PLAY

Play can be grouped into three distinct but interrelated categories namely: gameplay, ludic activities, and being playful (Salen & Zimmerman 2004:303). Gameplay represents the most structured of these play types, whilst playfulness represents the least structured. In this sense, structured refers to how formal the type of play is in terms of rules and process. In other words, the more rules and processes, the more structured the type of play. The relationship between these categories of play can be visualised as three concentric circles (Figure 2), with the most structured category of play (gameplay) occupying the central circle and the least structured category of play (playfulness) occupying the outermost circle. The least structured categories of play contain the more structured categories as these categories are broader and more open.[7] An apt metaphor would be the nested Russian Matryoshka doll. The largest doll (representing playfulness) nests the smaller dolls (ludic activity and gameplay respectively) within its boundaries. These categories of play are represented by distinct types of activities as I discuss below.

The first category of investigation is gameplay. According to Salen and Zimmerman (2004:309-310) gameplay is a formalised type of interaction that allows players to experience play within the rules of a game system. This means that gameplay refers to the experience of a game as initiated and propelled by the participation of the player in a rule-bound structure. The definition of gameplay provided by Holopainen supports this view. Holopainen (2011:vii) defines gameplay as "the interaction between the game rules, challenges, elements, and players". The game system and the rules that comprise the game system "encapsulate, coordinate, frame, and to a certain

[7] These different conceptions of play moving from the center circle to the outside are progressively more open and envelop one into the other (Salen & Zimmerman 2004:304). For instance, gameplay is a form of ludic activity and ludic activity is a form of being playful. This suggests that the more formal types of play are still bound and informed by the more open forms of play. The rule-lessness that informs being playful can thus still inform formal play structures. Basically, each more formalised category of play is a special subset of being playful.

extent determine play" (Sicart 2014:86). Examples of structures or activities from which gameplay could emerge include board games, video games, sport matches (like cricket) – any activity with a determined rule set and specific actions and interactions. Gameplay is a concept that incorporates both the functional and the experiential aspects of a game (Holopainen 2011:30). From these sources it can be deduced that gameplay is a very specific and narrowed down type of play and, following the trend of the present investigation, seems to be present in both creative problem-solving and game systems. Games (and subsequently gameplay) represent a specific type of more formalised ludic activity (Salen and Zimmerman 2004:309-310). However, there are many less formalised, yet still structured, versions of play. These types of play fall under the category of ludic activities.

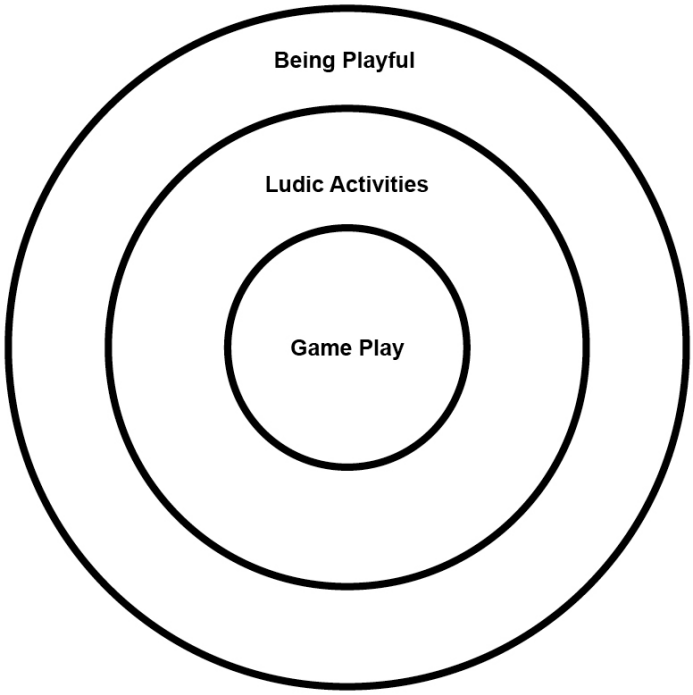

Figure 2: The three categories of play (Salen & Zimmerman 2004:303)

Ludic activities are a broader category referring to play activities in general, not just specifically gameplay. This includes activities that are not as formally structured as games. As mentioned previously, games feature a goal and quantifiable outcome. Most non-game ludic activities do not share these traits generally speaking (Salen & Zimmerman 2004:307). There is a wide range of

activities included in this category of play. This might include things like building a sandcastle or playing with a dog. These activities are less rule-bound than games and the outcome of these activities are not as rigid as might be found in games. Play activities that are even more free-form and unstructured than ludic activities fall under the last category of play: playfulness or being playful.

Being playful is the broadest category of play. It describes not only general play activities but also a state of mind that is applied to general activities. (Salen & Zimmerman 2004:306) One might be playful in an interaction in a classroom or when cooking dinner. Playfulness does not necessarily contain many rules or formalities. Sicart (2014:21) notes the approach and value of playfulness and defines it as “physical, psychological, and emotional attitude toward things, people, and situations”. Playfulness is a way of engaging with a particular context or objects but simultaneously respecting the goals, operations and purpose of the context or object being interacted with. In other words, playfulness is a type of play that appropriates and augments the context it is applied in without necessarily overwhelming the context itself (Sicart 2014:27).

That being said, a single play experience may oscillate between these categories of play and the experience of the more formal categories almost always contains traces of the less formal categories. A playful mood may extend itself into a ludic activity and finally full-blown gameplay. For instance, a playful beachgoer might start playing with a ball and soon is enveloped in a friendly game of catch with more formal rules.This section has established a preliminary understanding of the different categories of play and the nature of each. From here, the study will move to investigate how these categories of play function and relate to the creative process and the stages contained therein. The ultimate aim is to understand how gameplay may emerge from the creative process. In order to do so, first an understanding of the stages of the creative process is necessary.

3.5. THE STAGES OF THE CREATIVE PROCESS

Salen and Zimmerman (2004:314) note that when experiencing a game through play, the experience is "fuzzy, murky and messy", and the formal rules of the game only reveal themselves through the experiential effects of participation within the game. Almost every person who has had to sit down to a rules explanation for a boardgame can attest to the feeling of confusion a new game can engender when first embarking upon the process of playing. By experiencing a game, however, the play of the game gains clarity and the way in which the mechanics interact makes more sense[8]. Once a game has been experienced, the play seems less fuzzy and the decisions one makes seem clearer and more focused. An argument can be made that the creative process unfolds in a similar manner.

The start of the creative process can also be seen as a "fuzzy, murky and messy" affair until the more formal structure of the problem reveals itself through continual interaction with the process. Furthermore, the play experienced in the creative process also grows more formal as time and familiarity with the problem grows. I have already investigated the fact that the structure of the creative process resembles a game structure in terms of decision making and possibility spaces. However, the details of what that structure entails still need to still be discussed. The stages of the creative process undoubtedly influence the nature of the play experienced in the process. Through understanding the stages of the creative process, it is possible to establish how structure is added to the problem space, the nature of the types of decisions that are made at different points during the process, and finally the type of play that may emerge from the decisions at these different stages.

The creative process, as described by Wallas in his book *The Art of Thought*, consists of four distinct cognitive stages: preparation, incubation, insight and finally, verification (See Runco 2014: 22; Sawyer 2011:439). This cognitive

[8] This phenomenon is known as "grokking" and is extensively discussed in Chapter Five.

model of creativity was certainly influential. This model served to inspire and direct research into the creative process in the following years and many other psychologists and theorists found that creativity occurs in a sequence of stages. These models range from simple two stage models to models that contain four or more steps. Keith Sawyer (Sawyer 2011:88–90) proposes a comprehensive eight-stage model that takes into account, whilst also expanding, Wallas's and other historical models of creativity. The stages in this model include the following:

1. Finding and formulating the problem
2. Acquiring knowledge relevant to the problem
3. Gathering a broad range of potentially related information
4. Taking time off for incubation
5. Generating a large variety of ideas
6. Combining ideas in unexpected ways
7. Selecting the best ideas
8. Applying relevant criteria, externalise the idea using materials and representations

The attributes or elements of each stage in the process as outlined by Sawyer (2011:88–90) are as follows. The first stage in the creative process is the problem definition phase. In this stage, the creative problem-solver tries to *understand* the problem that needs to be solved by probing the boundaries of the problem. Here the participant asks questions and tries to uncover a unique perspective on the problem at hand. This process is informed by *research* in the relevant domain and exploration of other domains for potentially *related information*. This corresponds to the first three stages as outlined by Sawyer above. These stages can be recognised in almost any creative endeavour from painting to furniture design. The creative problem-solver always asks questions, does research and seeks inspiration from a variety of information sources – especially at the start of a project or problem.

After the creative problem-solver has sufficiently explored the domain and gathered research it is crucial for the creative problem-solver to let the

problem go and allow for the unconscious mind to process the information. This is referred to as *incubation* (Runco 2014:21). Incubation is a crucial part of the creative process and allows for progress on a task without the conscious mind working on the problem. Incubation leads to a moment of illumination – often described as an 'a-ha' moment. This illumination that follows the incubation phase is knows as insight (Runco 2014:22). Insights are often experienced suddenly and should not be mistaken for trial and error experimentation. Illumination can occur several times during the creative process and is not necessarily located between the problem-definition and idea-generation phases. The creative problem-solver utilises these mini-insights as stepping-stones toward uncovering the solution of the problem. These mini-insights are strategic waypoints informing the way the process unfolds. Insights serve to restructure the problem space and provide a new representation of the space (Runco 2014:24).

As the process progresses the creative problem-solver utilises these insights to *generate and combine ideas* in an effort to try and solve the problem at hand. There are a variety of ways in which ideas and combinations can be made and extrapolated but these methodologies fall outside the scope of this study[9]. After these insights and combinations emerge from the consciousness of the creative problem-solver, the ideas need to be evaluated to determine whether the ideas are indeed valuable (Sawyer 2011:129). The creative problem-solver is fully conscious at this point and draws on his or her immense knowledge of the domain in question to deliver a judgment on the idea or insight in question. The creative problem-solver then selects the ideas with the most potential and uses them as a starting point for either more research or further ideational exploration. Once a proper idea has been selected the last phase of creativity is *externalisation*.

The final stage of the creative process is also a conscious and very directed process. The creative problem-solver shapes the raw idea or insight into a

[9] Books like Lateral Thinking by Edward de Bono (1970), Ziz-Zag by Keith Sawyer (2013) and Creative Thinkering by Michael Michalko (2011) are but a few examples of sources that provide methods by which ideas can be explored and extrapolated upon.

complete product (Sawyer 2011:134). Once again, this stage of the creative process requires a rooted understanding of the domain in which the product is meant to exist and the complexities inherent therein. There is a common misconception that the externalisation stage of the creative process is a straightforward execution activity with no need for further creativity but it is often the case that externalising ideas lead to new and follow up ideas (Sawyer 2011:134). Externalisation may even be used early on in the creative process, when an idea is simply a hunch or inkling. In putting the idea out into the world in these early stages, externalisation may even help to structure or define the problem space for further exploration.

As can be seen from this overview, the creative process is not necessarily a linear experience with one stage unfolding into the next. The stages may overlap one another, appear in reverse order and repeat as a cycle throughout (Sawyer 2011:138). These stages are therefore rather referred to as disciplines or habits of mind. The unpredictability of these stages and the manner in which they unfold in the creative process makes it difficult to pinpoint the different categories of play as they would appear in each specific stage. A more productive way of viewing the stages of the creative process is as decision points. As the creative problem-solver switches between the different stages in the process, and as a result makes more decisions, the creative problem gains more structure and the possibility space of the problem grows narrower.

The different categories of play can be associated directly with the breadth of possibility within the problem space. The creative process unfolds as choices are made. As choices are made and results are discerned, the creative problem-solver can narrow down the possibilities of the problem space and move closer to defining a clear goal and eventually a clear method to a solution. As the creative problem-solver engages in the process, the solution space of the outcome narrows towards a point. The further one progresses, the clearer decisions become – the decisions being informed by other movements. The movement through the creative process is in essence the reduction of the possibility space as found in games (Koster 2005:128-130). In

the next section, I will address the emergence of play in the creative process as a result of decision making and a reduction of possibility in the problem space.

3.6. CATEGORIES OF PLAY IN THE CREATIVE PROCESS

Steven Heller (2002:35) emphasises the importance of structure regarding play in design. Heller, like Rand, sustains the idea that even though play is an important part of the design process, limitless freedom does not engender playfulness or creativity since this would be counterproductive. Rand (1965:156) stresses that, through understanding the boundaries, limits or, more appropriately, the rules of a problem, space is created for play. Thus, play in design and creativity needs structure to be “intellectually sustaining” instead of draining. Salen and Zimmerman (2004:304) make a similar proposal in pointing out that in almost every case, play can exist because of more rigid structures surrounding it. This is also consistent with the definition of play provided by these theorists earlier.

From this point of view, when formalised play or gameplay emerges within the creative process, the creative problem has changed into something similar to a game structure. The more formal or defined the structure of a creative problem becomes, the greater the possibility of gameplay emerging from the process. However, play can still be present in the creative process even when the creative problem is still ill-defined. Essentially, the categories of play change and become more formalised as the creative process develops and the creative problem gains more structure. One can also roughly plot these changes in relation to the stages of the creative process.

Play, as experienced at the beginning of the creative process, can be characterised as generally playful. This coincides with the broadest category of play as discussed earlier in this chapter. The reason for this is that the possibility space of the design problem is vast at this stage and can only be explored through broad, almost random, playful movements. Sicart (2014:27-

28) describes playfulness as an act of appropriation. Instead of play simply emerging from the structure, playfulness is also a manner of occupying a context with play in an effort to be creative or even disruptive. At the start of the creative process, the context is not structured enough to allow for the emergence of more structured forms of play, and the creative problem-solver can only react to the rough structure of the creative problem. Through playfulness, qualities of play and subsequently the qualities of games, can be projected upon other serious activities (Sicart 2014:22). On some level, playfulness at the beginning of the creative process can be said to try and emulate the effects of more formalised categories of play without necessarily having the rigid structure to provide these formalised types of play. Through playfulness the creative problem-solver sets the creative process in motion to allow the problem to gain more structure.

When considering the creative process as proposed by Sawyer earlier, the first stages generally involve problem-framing, research, exploration or even externalisation. The creative problem-solver does not necessarily know which information is relevant or useful in these early stages. The creative problem-solver absorbs and seeks out information following their intuition. The information uncovered may lead to some kind of insight and a few ideas but rarely is this enough to solve the problem at hand. These movements made by the creative problem-solver slowly uncover the edges and limitations of the problem space. After the discovery of these boundaries, the participant can gauge the next steps based on intuition and the insights gained from the exploration activities.

As the creative process unfolds, the structure of the problem gains more clarity and formality. Even though playfulness may still be present as the process continues, the play that emerges from the process starts to resemble ludic activities. This is the second category of play as discussed earlier. The play activity is informed by general rules but retains some of the free and random movements present in general playfulness. This type of play also necessarily includes the mindset of playfulness experienced in the problem-definition phase. The approximation of the goals of the problem may start to

become clearer at this point. It is difficult to pinpoint the exact point at which the process switches to include this type of play, as the unfolding of the process is in many cases unpredictable and difficult to discern. However, the creative problem-solver may recognise this type of play as the decisions in process gain clarity and the approximation of where the process is heading becomes clearer and more discernable. There is a movement at this stage where the creative problem-solver is not necessarily simply occupying the process with their own sense of playfulness but rather the sense that play is emerging from the process itself as decisions are made. At this stage, the creative problem-solver may feel the sense that decisions in process have certain effects and can ascertain the outcomes of those choices on the process to an extent.

As the creative process draws closer to a solution, the play experienced in the process may start to feel like the play that may be found within a game structure. Here play is informed by a much more formal structure in which the boundaries of the problem are clearly defined and the elements informing the problem are all present. The creative problem-solver can make clear and direct choices informed by the formal rules and goals of the problem.

Gadamer (1989:102) looks at play in the context of art and sees it as a way of being – a structure that envelops the player. Gadamer (1989:105) goes further, stating that “the structure of play absorbs the player into itself, and thus frees him from the burden of taking the initiative”. The creative problem-solver no longer needs to invade the context with playfulness – the problem is structured in such a manner that each choice made is an act of gameplay. The problem space is clearly delineated, the goal of the problem is clear, and the decisions made in process have a clarity of outcome and changes in the system are clearly visible. This type of play presumably only really emerges toward the end of the creative process (Figure 3). One of the most important aspects to allow for the emergence of game play in creativity is the clarity of the goal. If the creative problem-solver can clearly discern the goal of the problem space then the structure of the creative process more or less starts to resemble a game structure. In essence, as the creative process unfolds, the

type of play found within the process moves from general playfulness to gameplay. This movement coincides with decision making and the gathering of insights as stepping-stones. As more decisions get made, more insight may be gained, lending the problem space a greater sense of structure and heightening the chance of gameplay emerging from the decisions made in process.

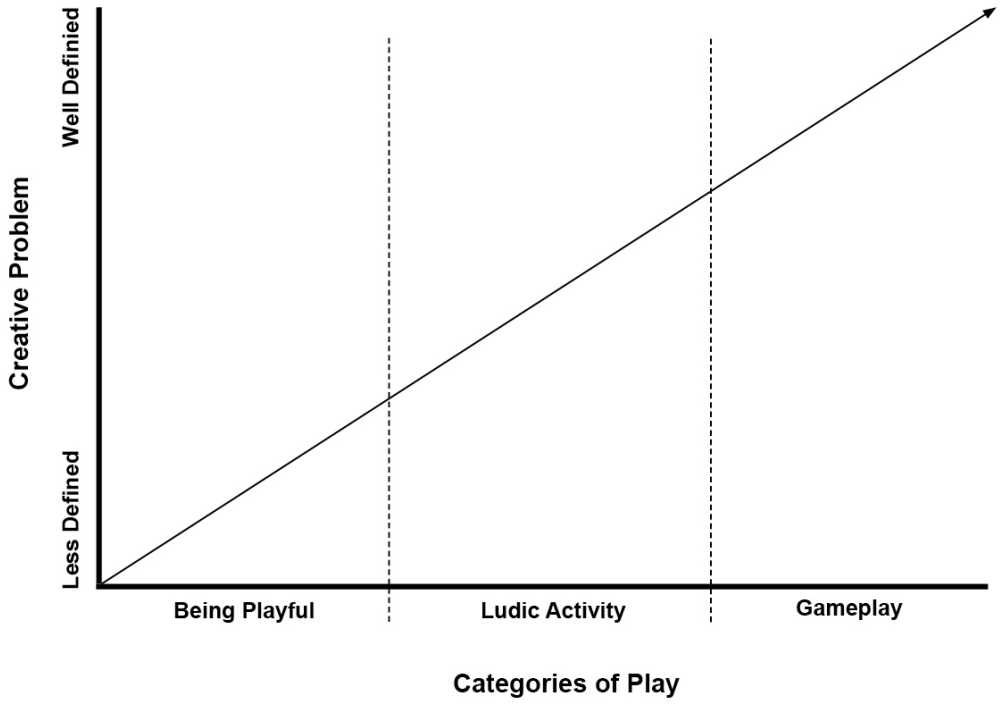

Figure 3: The emergence of different categories of play in relation to the structure of a creative problem (Venter 2016)

3.7. CONCLUSION

This chapter investigated the relationship shared between gameplay and creative problem-solving in a more detailed manner. It was firstly necessary to seek a useful definition of play. Salen and Zimmerman provided that definition with the idea that play is free movement within a more rigid structure. This movement is made possible by decision making. Decision making is the means of exploring a structure but also the means of experiencing the structure. The experience of a game structure hinges on the player making decisions, which in turn produces an output in the system that the player can then react to. Similarly, creativity is also a structure wherein the main method

of interaction is decision making. Both games and creativity are structures represented by a possibility space wherein a variety of outcomes can be reached. By making decisions, this possibility space is explored and options are narrowed down toward an outcome.

The decisions in the process should also carry some kind of challenge; the means specified for reaching the goal of the problem space should in some sense be limited and inefficient. The creative problem-solver should find the means to reaching their goals challenging and sometimes even difficult. This is usually only possible toward the end of the creative process when goals are clear and the means to reaching these goals can be made apparent through limitations and boundaries. It is these challenging decisions that are more likely to allow for the emergence of gameplay.

There are different categories of play as identified by Salen and Zimmerman, namely playfulness, ludic activities and finally gameplay. These categories of play are progressively more formal in their nature depending on the structure surrounding the play. The creative process consists of different stages. Movement through these different stages allows the creative process to gain more structure. As a result different categories of play emerge from the process. Once the creative problem space gains enough structure, gameplay can emerge from the process. Clear goals, means to reach these goals and discernable feedback from decision making are some indicating factors of a structured problem space that can allow for the emergence of gameplay.

In summary, gameplay is a result of the structure and decisions available in the process of doing creative work. At first, decisions narrow the field of possibility in the problem space to illuminate the goal and the means to reaching the goal. If the means for reaching the goal and the effects of the decisions made by the creative problem-solver are clearly visible, it might lead to the emergence of gameplay in process. Therefore, to facilitate the emergence of gameplay in the creative process, the creative problem-solver should try to explore the problem space efficiently in order to structure the problem space quicker. The formal nature of gameplay is associated strongly

with rules. In the next chapter I discuss the role of rules in both games and creativity, as well as how rules create the structure from which gameplay can emerge.

CHAPTER FOUR: RULES AND CONSTRAINTS IN GAMES AND CREATIVITY

4.1. INTRODUCTION

In the preceding chapters, I explored the relationship between problem-solving, creativity and games. So far, I have shown that creative problem-solving activities benefit from gameplay and that the structure and nature of the creative process share enough similarities to games to allow for the emergence of gameplay. I have also shown that as the creative process unfolds and gains more structure, the play in the process tends toward resembling the gameplay found in game structures.

Gameplay emerges from the creative process when the problem at hand showcases sufficient structure in terms of goals and a clear means to reaching the goal. Furthermore, the decisions that the creative problem-solver makes in process is the main mode of interaction that allows for gameplay to emerge. These decisions are directly informed by the definition of the problem. If the goal is clear and the means for the reaching this goal is apparent, then conditions are ripe for the emergence of gameplay from the creative process. Decisions gain interest through the limitations and rules that inform them. In many games the rules present inefficient means for reaching the end goal. It is this same inefficiency that allows for challenging decisions in games and possibly results in gameplay emerging from the system. In other words, the rules make for interesting, challenging decisions.

Games cannot exist without rules. The focus of this chapter is therefore on the manner in which rules inform gameplay both within the creative process and games. The manner in which rules function in games is distinct from other contexts in that they establish an artificial system separate from ordinary life (Salen & Zimmerman 2004:121). The authority of these rules is only applicable within the context of the artificial system they establish. Conceivably, this observation bears important similarities to the ways in which

rules function in creativity. By exploring this facet, it is possible to better articulate the nature of rules and constraints in the creative process, as well as how it is possible to leverage the concept of rules in gameplay as a tool in creative endeavours. In this chapter, I set out the qualities afforded to games through the use of rules and constraints and how these same qualities are present in the creative process. If the similarities that have so far been established between games and creative problem-solving hold true, then the similarities between the rules and constraints in games might present some insights into the functioning of rules and constraints in the creative process.

In order to investigate this facet of rules in relation to creativity and games, the first section of this chapter aims to define and thereafter explore the role of rules in games specifically in terms of the formal structure they provide. A large part of the focus centers on how rules institute a structure known as a "state machine" that allows for decisions made in the structure to affect the outcome of future decisions (Juul 2005). Using this concept as a starting point, this section also explores the elements or aspects that are crucial to the structure of a game. This includes discussing the idea of emergence and the manner in which the end goal of a game affects the rules and structure of a game. This will lead to an explanation on how the end goal of a game ties into the rules and how the challenge inherent within these rules ties to gameplay.

Once I have sufficiently demonstrated the role of rules in establishing game structure and challenge, the second section explores the relationship between rules and creativity. The aim of this section is to demonstrate the manner in which rules and constraints serve to structure not only games, but the creative process as well. To do this the paradoxical relationship shared between creativity and rules is clarified – especially regarding when rules are beneficial for structuring creativity and when it is not. I also explore the value of end goal criteria in structuring and developing creative problems and the impact it has on the manner in which rules function in that space.

Once the value of rules in both these spaces has been demonstrated, the third section elaborates upon the types of rules found in games and the

constraints that guide the creative problem-solving process. I compare the different types of rules and constraints found in each arena and try to establish the common ground and differences between them. In doing so, I aim to demonstrate that not only do rules and constraints serve a similar function in both games and creativity, but that they also fundamentally contain the same type of rules or constraints.

4.2. RULES AS STRUCTURE IN GAMES

The relationship between games and rules is obvious. I doubt that there is even one person who does not readily associate the mention of a game with a set of rudimentary rules. The entire nature of a game is defined by the rule set that informs it. It is a common occurence to place emphasis on rules and formal structures in most of the definitions of what a game is (Whitson 2010). The preceding chapters would have made this clear. Thus far, I have highlighted the relationship between games and play but here I will focus on describing the nature of the rules informing games. Generally, rules are defined as statements, limitations or boundaries set in place to define and govern conduct in a given situation or activity. Rules are described as prescriptions used to provide part of the structure of an action or situation. The prescriptions provided by the rules refer to “which actions (or states of the world) are permitted, obligatory, or forbidden” (Ostrom et al. 1994:77). Following this description, rules can be seen as guidelines, constraints, directions or even steps that inform how specific situations should be treated.

The rules in games can be described as explicit, complete, and unambiguous (Salen & Zimmerman 2004:122). They are “absolutely binding and allow no doubt” (Huizinga 1949:11). These statements leave the very distinct impression that the rules of games are set-in-stone[10]. Any major change to a set of rules or misinterpretation of these rules would change the fundamental identity of that particular game. Rules afford games many of the qualities that

[10] This does not mean that there is no flexibility regarding rules in games. Players may make changes or even create house rules for game. What qualifies a “set-in-stone” rule is less the inflexibility of the rules itself and rather the general consensus on what the rules are and not to violate said rules.

they possess or need to possess. Most importantly, they provide the structure necessary for a game to exist in the first place. Game rules specifically constitute a kind of formal structure that dictates possible actions and movements from which gameplay can originate as previously indicated. What does this formal structure entail and what exactly does the rule set of a game constitute?

The formal structure of a game can be described as a state machine. A state machine is “a machine that has an initial state, accepts a specific amount of input events, changes state in response to inputs using a state transition function (i.e., rules), and produces specific outputs using an output function” (Juul 2005:60). In essence, the state machine that the rule set of a game establishes consists of the possibility space that the game contains and the possible outcomes of the activity. One of the most defining features of games is the need to make decisions (Costikyan 2005:11). By making decisions within a game, players are exploring the conceptual space of the game whilst simultaneously moving through the conceptual space. The state machine interprets the decisions taken by players within the game and an output is given to which the players can then react. In the previous chapter, I have already covered in detail a very similar model of games as proposed by Salen and Zimmerman, together with how it aids in the appearance and experience of gameplay through decision making. The idea of a state machine however develops this model and puts a much larger emphasis on the role of rules as the mechanisms that allow for decision making to happen. Rules not only establish a possibility space but also give meaning to the decisions taken in that space. The possibility space contained within a state machine relies on the phenomenon of emergence to create renewable interest in the game.

Salen and Zimmerman (2004:152) state that “emergence” is a crucial aspect of games, as it is through “emergence” that the systemic nature of games and the space of possibility represented by the game is linked. The “emergent behaviour” (Koster 2005:128) of systems creates new patterns to continually unfold from a rule set that allows for players in games to do new things that was not necessarily intended. This is also the phenomenon that allows for

novel products to emerge from a rule set. If a rule set or a set of constraints is emergent, it sets the stage for continual surprise and engagement. Emergent rule sets continue to offer new experiences and different permutations of the same rules (Salen & Zimmerman 2004:165). Juul (2005:5) calls emergence a "primordial game structure" where the game is initially stated as a small number of rules that can "combine and yield large numbers of game variations for which the players must design strategies to handle". Given the emergent behaviour of rules in games, it is a given that players or creative problem-solvers in question must formulate strategies to deal with the phenomena presented in the process (Juul, 2005). But, even if a rule set is able to generate a variety of novel patterns and ways to experience the rules of a given game, the entire process is meaningless if not tied to some kind of necessary outcome.

Suits (1978:24) mentions that the rules of a game "stand in a peculiar relation to ends". This means that the rules constituting a game are heavily influenced by the state they are intended to bring about. The state machine that a game constitutes would be pointless without some kind of goal or victory condition. End goals or victory conditions are therefore a crucial structural element provided by the rule set of a game. Games often have explicit requirements and clear cut boundaries, usually stated as a goal or endpoint to be reached (Holopainen 2011:39; Hughes 1999:101). The goals or victory conditions of games can be a variety of things. I will use the famous board game *Settlers of Catan* (Teuber 1995) as an example in this case to illustrate the point. In *Settlers of Catan*, the victory condition or end goal for the game is reached when one player reaches ten victory points at the end of his or her turn. These conditions, set by the game, influence the rule set of the game as a whole. Every choice or action made by the players in the game according to the stipulated rules is intended to move the state machine of the game closer to the intended outcome.

Rules are inseparable from the end goal of games given the fact that by breaking the rules the end goal becomes unattainable. By this I mean that the rules of a game are designed around the idea of bringing about the special

state that is the victory condition or end goal of the game. Adding new rules or ignoring others within the rule set will influence this end state – making it either impossible to reach or even too easy to reach. Rule sets are often balanced to make the end goal of the game a meaningful endeavour. The actions taken in the state machine of a game are usually correlated to the efforts of players trying to reach the end goal. The completion of the goal results in closure and signals a clear change in the game state and appears meaningful to the players involved (Holopainen 2011:35). Goal criteria dictate to a large degree the way in which the game unfolds and in turn shapes the rules that are involved in reaching the goal. Without a clearly stated end-condition, the actions and decisions taken in games become aimless and unnecessary.

Rules are directives that are useful in reaching the end goal of the game but are also limitations on the means by which to reach the end goal (Suits 1978:32). Rules have to restrict the actions and means by which the end goal can be reached. The rules in a game do not simply specify constraints or limitations of the structure itself, but also specify the affordances available to players at any one time (Juul 2005). They also serve to limit the activities of players to a large degree (Salen and Zimmerman 2004:122). In other words, the means permitted to reach the final goal are more restricted than if no rules were present at all (Suits 1978:31). The main idea is that these affordances are meaningful actions available to the player in the context of the game yet are also restrictive to the players in question.

Game rules give context to the activity by “identifying an appropriate setting, a set of necessary props, and game roles” (Hughes 1999:96). In the example of *Settlers of Catan*, it was highlighted that the end goal is about accruing victory points. The game rules inform which components in the game (simple wooden pieces and cards to the untrained eye) are worth these victory points. This context is then embellished by outlining “a sequence of game action, which is usually cyclical and repetitive” and that allows players to understand how to obtain the objects of the game that are worth points (Hughes 1999:96). In the instance of *Settlers of Catan*, in each turn, players are asked to roll a pair of

dice, receive resources (if any) and then spend these resources to “build” structures that afford them points. Thus, the rules in a game not only provide boundaries or limitations of the space to be explored but also give context to the actions that can possibly be taken. These actions are also usually a less direct means to achieving the end goal and to many might seem unnecessarily convoluted.

The nature of rules in games is that they often prohibit efficient operations in favour of less efficient operation in reaching the goal of a game. The way in which rules function in a game prohibit the use of the most efficient way of achieving the directive goal (Suits 1978:34, Whitson 2010). It is these limitations imposed by the rules of a game that also specify the challenges (and to an extent the resulting gameplay) to the players involved. Juul (2005:5) states that the rules of a game “provide the player with challenges that the player cannot trivially overcome”. Similarly, Crawford (2003:38) states that rules are the conditions under which challenges are presented – these are forces imposed upon the player from outside. In games the most important rules are the rules that inform the challenge that the game presents. It is this challenge that allows for gameplay to emerge from the decisions taken during a game.

Costikyan (2005:17) makes a case for the role of challenge in games and mentions that a game needs challenge and struggle to be classified as such. Specifically, a game requires interaction and a struggle toward the stated goal state. In the case of *Settlers of Catan,* players are challenged to build up their structures that are worth victory points using resources obtained during the game. But luck inherent in dice rolls and the starting placement of your initial structures determine the resources you might receive during the game. If players could simply choose the resources they get each turn, the game would not afford any challenge. The challenge lies particularly in how players choose to spend their finite resources whilst also contending with the other players at the table.

From this discussion it is clear that rule sets in games are of the utmost importance, especially concerning the structure of a game itself. Rules

establish the state machine of a game, which allows for player decisions to affect the outcome and state of a game. Rules contain emergent properties and behaviours, which allow for different outcomes to be reached by players when playing a game. Rules also provide a meaningful end goal and the means toward reaching it. The means provided by rules to reach the end goal ensure sufficient challenge that allows for gameplay and meaningful decisions. Koster (2005:152) sees playing games as a fundamentally creative act. In his argument, games are not prescriptive but demand that the player create a response to the game given the tools at hand. In this view, the tools given to the individual in a creative problem are the rules and constraints governing the problem itself. However, interestingly, Koster (2005:152) also mentions that it is easier to fail to respond to a painting than to a game. This suggests that responding to rules and constraints in the creative process is less straightforward than in the case of games. It is clear that games cannot function without rules and the case is the same for creativity but becomes significantly more complex. The next section explores the relationship between rules and creativity in more depth.

4.3. RULES AS STRUCTURE IN CREATIVITY

Creativity has a somewhat paradoxical relationship with rules and constraints. There is a mythology surrounding the detrimental effects of rules on the creative process. Many people still believe that the greater the degree of freedom (i.e. fewer rules) in the creative process, the more effective or pleasurable the process may be. However, this may not necessarily be the case. The possible detrimental effects of rules, constraints and procedures on creativity are often mentioned by creative theorists (Davis 2011:116; Runco 2014:183). Rules are restrictive to creativity when they determine a predefined set of actions and outcomes within a specific problem space. Rules and constraints that are followed within an already well-structured problem space do not promote creative activity (Stokes 2005:7). In these problem spaces, the inherent constraints of the activity only allow for a single correct outcome. These types of problem spaces only promote a single

correct solution to the problem at hand. Activities that are demonstrative of this type of problem space and associated rules include things like memorising directions or following a recipe.

Organisational and institutional rules also reflect an ambiguous relationship with creativity. Rules are a necessary aspect of any cultural, business or social environment, and contribute to the formalisation and routinisation of practices (Kern 2006:64). Many structures need rules to function effectively and the routines established by rule sets allow for the smooth functioning of day-to-day activities. However, in an organisational setting especially, restrictive rules married with inflexible attitudes inhibit the sense of playfulness necessary to explore domains to get creative ideas. These habits and routines can be detrimental to the creative process if enforced and followed in a very restrictive manner.

Jane Piirto (2011:35) writes that no creator is ever removed or isolated from the rules, laws or members that inform a certain domain. This means that creativity will always be informed and affected by rules – no matter the domain, organisation or setting. However, according to Sternberg and Kaufman (2010:481), constraints do not necessarily have to be harmful to creativity and creative problem-solving. It is the way that rules are approached that informs whether they are detrimental to creativity or not. Rules can be interpreted in a subjective and an objective manner. When rules are approached as objective artifacts with objective meaning imposed upon the creative problem-solver from afar with no space for interpretation, they could indeed constrain creative activity and the resulting production of creative ideas (Kern 2006:64). Rules or constraints that promote inflexibility and propogate foregone conclusions are in general detrimental to creative activity. The rules imposed upon individuals by their contexts or domains and the rules they impose upon themselves could both lead to creative impairment if viewed as objective and unchangeable.

I have already established that problems that require creativity can be classified as wicked problems (see Chapter Two). One specific property of wicked problems is that they have no stopping rules (Buchanan 1992:16).

This means that there is no specific built-in mechanism in a creative or wicked problem that indicates when the process should be stopped or concluded. The problems described in the previous paragraph, wherein the rules are detrimental to the creative process, are usually problems with built-in stopping rules. In other words it is obvious to the problem-solver when the process has reached a conclusion and should be stopped. This in itself goes against the very nature of creative problem-solving. The creative problem-solver should be able to choose his or her approach to rules in a more subjective manner for creativity to flourish.

When rules are approached in a way that frames them as subjective artifacts that can be interpreted, instead of dogmas that need blind obedience, one can start to glimpse the positive relationship shared between rules and creativity. Anja Kern (2006:67) propagates the view that creativity is in fact the creative use of rules and not the absence of rules. One may in fact actually use constraints and rules as a means of structuring creativity instead of inhibiting it – much like the rules in games create structure. Stokes (2005:7) refers to these constraints as “barriers that lead to breakthroughs”. The application of certain constraints in a creative problem serves to structure and lay bare the solution path in the creative process by simultaneously precluding and promoting certain actions. The constraints used to structure a creative problem exist in pairs: on the one hand a constraint may preclude or limit certain well-known or well-trodden responses to the creative problem, acting as a barrier. This allows the other paired constraint to promote more novel responses. In essence, these rules or constraints simultaneously act to “promote” certain responses to the problem and “preclude” other types of responses without prescribing an exact set of steps. What this essentially means is that each constraint employed in the creative process simultaneously directs the possibility space to allow for certain responses whilst denying certain others.

Through the application of these constraints, the creative problem-solver is in essence also creating a state machine similar to a game. Constructing and employing pairs of constraints that ‘promote’ and ‘preclude’ certain responses

creates a conceptual or possibility space wherein myriad outcomes may be reached. By changing the constraints informing the space, new possibilities are made available and other possibilities are made unavailable. As is the case with games, the development of the creative process hinges on the decisions made during the process. Not only do the decisions made in process provide an outcome to which the creative in question can react (a result of the state machine), but decisions also become more clearly defined as the process unfolds. Unlike game rules, however, rules in the creative process are not necessarily fixed and absolute. The creative problem-solver must continually investigate and question the constraints employed in the process. Not unlike games, the rules and constraints employed in the process of creativity are also influenced by the end goal or result the creative problem-solver is seeking to achieve.

As I have demonstrated with games, the goal of the creative process also functions to structure the constraints placed upon the process. The constraints employed in the creative process are most often put in place in order to realise a “novel goal criterion” (Stokes 2005:7). The goal criterion (or “victory condition” when stated in game terms) of a creative problem is usually stated in the form of a brief or problem statement – self-generated or provided by external parties like clients. The goal may be a logo design or a product to market certain aspects of a company. This goal criterion dictates the application of rules and constraints in the process as much as the way in which elements and objects are used. Say, for instance, I am tasked to develop a website for a company. This simple goal already dictates the fact that certain conventions need to be applied. I know that the product will need to be produced digitally and that certain documentation will need to be drawn up in order to plan and develop the product. From this it is possible to draw the conclusion that the goal criterion informing the creative problem shares a hand in formulating the rule set or constraints informing the process. However, the brief or project may state the required goal criterion but not necessarily the shape or form of the end result. In creative problem-solving, the end goal is usually only partially stated which in turn means the constraints in place to reach the goal is also only partially stated.

Koster (2005:56) notes that many games involve thoroughly exploring the conceptual space of the game itself as a part of the victory condition. A creative problem also usually requires a thorough exploration of the conceptual space of the problem to reach the end goal. However, the explorations in the conceptual space of a creative problem may be less directed than a game scenario. The creative problem-solver is not necessarily aware from the very start which constraints are necessary or unnecessary even if the individual has an idea of what the end product should entail. The problem-solver is not always aware of the effect a certain action may have on the creative process or the rules informing any given action. Koster (2005:56) states that merely understanding the manner in which a conceptual space works and how the rules function inside that space is not enough. Players must strive to understand how the space will react to changes and decisions to exercise any power over it. As the creative problem-solver begins to understand the problem space and the effects of the constraints employed in the process, certain choices can be made to actively include certain constraints in the process in order to fully realise certain outcomes. The decisions that are necessary to take become clearer as the effects of certain constraints in the process become clearer.

From this discussion the conclusion can be drawn that rules serve to structure both games and the creative process. The rules or constraints employed in either processes serve to set up a state machine. This state machine allows for decisions to be made that produces an effect that can in turn be reacted to. The main difference, however, is that the rules informing the creative process are not necessarily as clear from the start as is the case with games. The creative problem-solver only uncovers the constraints informing the process through experimentation and decision making. It then becomes necessary to investigate the manner in which this rule set gets uncovered in more detail in a later chapter (see Chapter Five). The important thing for now is that it has been established that rules have an important role in structuring both creativity and games alike.

But what of the nuances within rules themselves? It would be naïve to believe

that all rules are the same. The rules and constraints used in the creative process fall under a variety of types and each type comes with its own set of elements that are promoted and precluded. Similarly, games also have certain types of rules informing the structure. I therefore now proceed to outline these different categories of constraints and rules that can be found in both games and creativity and seek to discuss their similarities and differences.

4.4. TYPES OF RULES IN GAMES AND CREATIVITY

Salen and Zimmerman (2004:130) define three levels or types of rules in game structures: operational rules, constituative rules and implicit rules. These different rule types work together to create both the structure and the experience of a game. These three types of rules constitute the limits or constraints that make up the foundation of a game. In essence, the rules create the formal structure necessary to facilitate play (Salen & Zimmerman 2004:124). In order to play a game, then, players are required to submit to the game and limit their behaviours and actions as specified by the game's rule set. Similarly, Stokes (2005:8) identifies four different types of constraints or rules which help to structure the creative process namely: domain constraints, talent constraints, cognitive constraints and finally variability constraints. Although there is no explicit overlap in the way in which these different rules are named, through careful investigation it is possible to compare the rules found in the creative process and game structures to discover the functions they share. I will now provide an overview of these different rules and constraints in order to assess the relationship between their functions in both structures.

The first category of rules found in games is called operational rules. These are the "rules of play" – the often written out guidelines and explicitly stated rules of a game. These rules are contained in the booklet you find in the board game box or enclosed in the case of your favourite digital game. The primary concern of these rules is to guide the explicit behaviour of players (Salen & Zimmerman 2004:132). These rules tell players what they can and cannot do.

For instance, in a board game, these rules might include things like drawing a card at the start of a turn or that players must place a piece on the board during a certain phase. In digital games these rules can be, but are not necessarily, stated outright. Players soon discover through experimentation whether they can open doors or collect certain items during the game. From these examples it is clear how operational rules dictate the happenings and actions of players during a game. The function of operational rules in games is to tell the players what the game is, where the game is headed and what they can do to get to the end (or at least how the end of the game can be brought about). A mere understanding of the operational rules may not necessarily be enough to grasp the caveats and complexities of the game system. As soon as players start to execute the actions and see the mechanics of the game in action, however, the operational rules may gain greater clarity and meaning. In terms of the creative process, domain constraints can be seen as the equivalent of operational rules.

Domain constraints are the rules or guidelines that dictate the behaviour and actions of the creative problem-solver during the creative process. The domain represents the specialised area of knowledge and practice within which any creative activity takes place and follows on Csikzentmihalyi's (1999; Csikszentmihalyi 2014:229) systems model. The domain basically refers to the area of practice within which creative ideas and products can be produced. Artistry (of all kinds), mathematics and sciences included, can all be classified as a domain. As is the case with the operational rules found in games, domain constraints construct a boundary within which the creative problem-solver is expected to function. For instance, if an artist wishes to produce a painting, this activity is informed by the domain of artistry, or more specifically, painting. There already exists a multitude of techniques, knowledge and practices in this domain that the artist can draw from in order to produce the painting. The domain guides and informs the artists' actions during the creative process, much like the operational rules of a game might inform the actions of players.

It should be mentioned that when the domain constraints, as mentioned

above, are mastered by the creative problem-solver, it becomes what is referred to as the "first chorus" (Rivers 1987; Stokes 2005:8). The first chorus becomes the bedrock upon which the creative problem-solver improvises and makes variations. When the creative problem-solver understands and masters the constraints of a domain, he or she can choose to employ interesting and novel constraints in the domain based on a firm understanding of what has come before. When the creative problem-solver substitutes knowledge and competence for ignorance and ineptness, within a domain, a first chorus has been built and a foundation is laid upon which variations can be made. Painters study the art of the masters and musicians study the early composers in an effort to understand the domain and the constraints that have informed it before in order to build this first chorus. Once this understanding has been built, new novel constraints can be employed in order to arrive at new outcomes. A domain consists of more specific constraints that can be adjusted or applied to arrive at new novel outcomes. These are called goal, task and subject constraints respectively (Stokes 2005:8). I elaborate further on these constraints below.

Firstly, goal constraints specify certain styles within a specific domain (Stokes 2005:8). Different styles and explorations within a domain are implemented in order to achieve different types of outcomes. This type of constraint can be encapsulated in the question: What is the creative problem-solver trying to achieve or explore in a specific domain? For instance, elaborating upon the artistic example of the painter, impressionism was a goal constraint in the domain of painting. The artists tried to represent their subjects through light – not necessarily line or shape. Similarly, cubism and impressionism, like any other artistic movement, specified different types of achievements or outcomes within the domain of artistry. This is the goal, the guiding philosophy, at the heart of the creative act. Games share this type of goal constraint in the form of a "victory condition". The "victory condition" of a game often determines the manner in which players make choices in a game as seen previously. The "victory condition" may even determine the mechanics or theme of a game. "Victory conditions" specify what the player is aiming to achieve and draw from the techniques and knowledge inherent in the domain

of gaming to manifest it.

Subject constraints involve the content of whatever is being produced (Stokes 2005:8). If one is going to paint, what will be contained in the painting? In terms of the impressionist painters, landscapes or still life paintings were quite popular. When considering a game, subject constraints still apply. The theme or subject matter of a game certainly applies constraints and can (but don't necessarily) dictate the operational rules. If the game is about colonising a foreign island or space warfare, for instance, the operational rules can be written in an attempt to reflect or enhance these thematic elements. The actions available to the player, the names of items or even the flow of events throughout the game can be designed to reflect the subject constraints and consequently shapes the operational rules. Similarly, in terms of creativity, the subject matter that one addresses within any specific domain will lead to certain actions or operational processes. Painting a landscape is certainly different to painting a tasteful nude, for example, and the process involved with these different actions will reflect that. In other words, the subject matter dictates the operations undertaken to a large extent.

Lastly, task constraints may consist of the materials involved in the domain and how these materials are used (Stokes 2005:8). As with subject constraints, the task involved in the domain dictate to a large degree how the materials are spent. I use the difference between landscape and nude painting as an example once more. The subject matter dictates how paint is applied, what colours may be used and, depending on whether the painter is a cubist or a realist, even how the body should be represented. In terms of games, the type of game may to a large degree dictate the task constraints. It is, for instance, easier to fire a gun in a digital game than in a board game (and more appropriate for that matter). And, once again, the task constraints dictate the unfolding of the operational rules in games. All these criteria (goal, subject and tasks) serve to dictate the domain constraints as a whole.

The next type of rule that can be found in games is called constituative rules. This type of rule is not necessarily so blatantly apparent in the structure of a game as operational rules might be. Constituative rules are the underlying

structures that exist below the surface of a game. These rules exist independent of the players in the game and are abstract. These rules could be based on mathematics, formulas or logic that are manifested through the operational rules but an intrinsic relationship does not necessarily exist between the operational and constitutive rules of a game (Salen & Zimmerman 2004:132-133). These rules have a logic all their own and it is not necessarily stated how players will make use of these rules (as is the case with operational rules). In the case of a basic board game, constitutive rules might include rules that each player starts with a value of zero, during each turn a player adds a random value between 1 to 6 to their total or that the first player to reach a certain amount of points wins the game. These rules can be enacted and manifested through different operational rules. For instance, the manner in which players add the random number between 1 and 6 to their current value might be manifested through a dice roll or by selecting a number from a hat. The constitutive rule remains, although the operational manner in which it is manifested might differ. Once again, in terms of creativity, there are constraints that correlate to the constitutive rules of a game. These are known as cognitive and variability constraints faced by the creative problem-solver.

Cognitive constraints are reflected in the psychological limitations of the creative problem-solver and the processing that is allowed by the mind (Stokes 2005:9). These constraints feature a mental and biological component and also tie in with the experience of the problem-solver in their particular domain. Essentially, cognitive constraints are determined to a large extent by the strength of the creative problem-solvers' first chorus as explained earlier. As a creative problem-solvers' mastery of his or her domain grows, the complexity of the thinking surrounding the domain also increases. For instance, imagine a painter who has spent 10 years learning the basics of oil painting. Through the years, the painter improves his or her technique and prowess in the medium. This person automises certain parts of the process as his or her skill increases. Soon the painter does not have to consider how best to hold the brush or how to get the best results when mixing paints or composing a picture. When these elements of skill become automatic, this

frees the mind of the creator to consider more complex and nuanced issues surrounding the activity. The painter can now, for instance, consider the activity from different points of view without getting bogged down by basic skill learning. Thus, the constraints imposed upon the process by the mind depend on familiarity with the domain and the skills inherent in the domain.

How do cognitive constraints reflect the functions of constituative rules? I have already mentioned that cognitive constraints broaden or become more complex as the knowledge and skill automisation of the creative problem-solver grows within a domain. The creative problem-solver is aware of the cognitive constraints and can more readily distinguish and tinker with these constraints. Similarly, one might argue that a player in a game too might be more readily able to discern the constituative rules and their complexities with a solid foundational knowledge of the operational rules of a game. As a player experiences a game over the course of a few plays, the operational rules eventually become internalised. As a result, the player may no longer need to consciously consider the operational rules, freeing his or her mind to consider other elements in the game like the constituative rules. A seasoned player may be able to count the cards his or her opponents are holding, discern the odds of a dice roll or through logic determine the best course of action within the operational rules. Once the cognitive constraints become more complex and a good grasp of the domain or operational rules has been established, variability constraints can also be applied.

Variability constraints specify how differently something can or should be done (Stokes 2005:10). Constraints that promote high variability often lead to more novel responses. The difficulty inherent in learning a skill in a certain domain may in fact influence this type of constraint. The more difficult a skill is to learn, the more the creative problem-solver is forced to explore different things to solve the problem. In learning the skill, the problem-solver might be forced to engage with different approaches and strategies. This constraint is obviously a subjective constraint and depends on the approach of the creative problem-solver towards the domain of practice. Many creative problem-solvers habitually try to maintain high levels of variability in their practice in

order to stave off boredom and promote novel results.

There is similarity to be drawn in the experience of games concerning variability. Variability influences the operational and constituative rules of a game. If a game is very difficult to learn, the player is likely to try very many different strategies in order to try and understand the game. These strategies, as in creative practice, may be accidental at first. However, once the player understands the system and the operational rules of a game, the player may actively try to vary their strategies. Variations in playing may need a good grip of both the operational rules as well of the constituative rules. These rules and constraints mentioned thus far are relatively opaque and easy to discern. The last type of game rule however is not so easily pinpointed.

The last category of rules found in games is that of implicit rules – in essence the unwritten rules of a game that include things like good sportsmanship, etiquette and other forms of 'good behaviour' in games (Salen & Zimmerman 2004:133). Sniderman (1999) comments that games are governed by constraints that are rarely or never made explicit. A good example of this might be the time players take to play their individual turns in a game. When players sit down to a game of chess there might be an unwritten understanding of what the appropriate length of time is to take a turn. If players spend too much time deciding what to do on their turn the other players might alert them to this fact. This means that players are adhering to a general idea or rule of what the appropriate duration of a player turn should be even though these things are never explicitly stated in the rulebook.

The creative process, too, has unwritten and implicit practices. How long is long enough to spend time generating ideas? When is the right time to switch from idea generation to incubation? Which idea is the best? The answers to these questions lie with intuition. Intuition plays a role in both games and creativity. Intuition occurs when a person comprehends an appropriate course of action or decision relating to a problem or idea immediately without necessarily knowing how the notion arose in the first place (Keen & Gallate 2011:683). It is this phenomenon that governs reactions to implicit rules and practices. Players intuitively know when a turn is taking too long and the

creative problem-solver intuitively switches between the necessary stages in the creative process.[11] From this discussion it is clear that the constraints that govern the creative process and the different types of rules that determine the character of a game share an undeniable amount of similarities.

Having demonstrated these similarities one might ask what the implication of this comparison is? I would suggest, despite the perceived unpredictability of the creative process itself, that the constraints and rules informing the creative process are just as discernable and recognisable as the rules in games can be. Understanding the function of rules and constraints in the creative process as discussed above, provides a key to recognising these effects in process. In other words, if the creative problem-solver understands the shape and function rules might take during the creative process, it is easier to spot and discern those rules for use in the creative endeavour. The ability to uncover and utilise these rules in the creative process is the focus of the next chapter.

4.5. CONCLUSION

This chapter investigated the role of rules in both the creative process and in games. Rules are fundamental elements that provide structure to both these processes. Rules and constraints provide boundaries and limitations, which in turn construct a state machine. A state machine represents a space of possibility wherein players or creative problem-solvers can make decisions and receive output from the state machine that can be reacted to. The rules or limitations put in place often have emergent qualities that allow players and creative problem-solvers to end up at new states and outcomes during the process. Rule sets are also invariably linked up to the end goal or victory condition that players and creative problem-solvers are aiming to reach. Rules inform the construction of the goal itself but also the affordances available to players and problem-solvers and actions that can be taken to reach these goals. The limitations put on the actions of the player or problem-solver

[11] It should be noted that the subject of intuition in creative problem-solving can be considered in quite some depth but falls outside the scope of this investigation.

provides challenge to the player and is fundamental to the experience of gameplay.

There are also certain types of rules and constraints in both games and the creative process and these were extensively compared throughout the chapter. Firstly, operational rules exist to dictate the behaviour of players in a game. These rules coincide with the domain constraints found in the creative process. Domain constraints include goal, subject and task constraints. The second category of rules found in games is that of constituative rules. Cognitive and variability constraints in the creative process correlate with these type of rules. The last category of rules found in the both games and the creative process is that of implicit rules. These are unspoken, undefined rules that are employed almost on instinct. In the next chapter I investigate how rule sets are discovered and subsequently established in the creative process itself.

CHAPTER FIVE: DISCOVERING RULES IN CREATIVE PROBLEMS

5.1. INTRODUCTION

In the previous chapter, I investigated the correlation between rules in games and constraints in the creative process on a more detailed level. Rules and constraints are essential to games and provide the necessary structure for both games and creativity. While rules and constraints play a similarly important role in creativity as they do in games, the paradoxical relationship creativity shares with rules cannot be understated. Rules can both undermine the creative process, as well as allow it to flourish. The most important structural element provided to the creative process and games through established rule sets is the constitution of a state machine. When a state machine is established, decisions made by players and creative problem-solvers in the respective processes lead to an output that changes the overall state of the process. Players and creative problem-solvers can then react to this output following the established rules that are necessary to reach the specified end goal or victory condition. A variety of rules and constraints can be found in these processes and they are discussed in depth in the previous chapter.

From here, however, I must set off into decidedly more murky waters regarding the discovery of rules in the creative process. There is a fundamental difference between rules or constraints in the creative process and rules found in games: whereas the rule set that governs a game is established and absolute (to an extent) at the outset of a game, the same cannot be said for the rules and constraints found in the creative process. Even though it can be observed that players in a game only truly discover the interaction between rules of the game as the game is being played; the rule set itself is there, written in proverbial stone, not necessarily to be interpreted but rather to be discovered as play proceeds. With the creative process, on the other hand, the constraints and rules informing it are not so clear-cut and established from the outset. In fact, the creative problem-solver may not even be acutely aware of the rules or constraints being enforced or used until much

later in the process, if at all. I have shown that it is possible to state the types of rules or constraints that may be found in the creative process and there is evidence for the existence of these rules or constraints. However, unlike games, the creative problem-solver simultaneously assigns and discovers the rules or constraints as the creative process unfolds. The rule set may even shift and change as the process unfolds. Essentially, the creative problem-solver invents or discovers the rules and constraints informing the process and problem space even as he or she is solving it.

This chapter seeks to further explore the relationship between rules, constraints and creativity, specifically by attempting to transcribe some sort of framework for the mechanisms that allow for the discovery of rules in the creative process. I contend that rule discovery is in essence the discovery and definition of the problem space itself. Essentially what this chapter aims to achieve is to understand the steps that can inform the establishing of rules in the creative process that ultimately allows for gameplay to emerge. Here I draw a correlation between discovery and problem-definition processes in science to illuminate this aspect. This chapter is by no means intended to be a complete and comprehensive overview of this rule-establishing process but instead seeks to establish a simple framework that can serve as an entry to deeper exploration.

The first section of this chapter therefore aims to explain the types of problem spaces that allow for the discovery of rules. This is done in an effort to establish a correlation between problem definition and rule discovery and to indicate that rule discovery forms a part of problem definition. Once this has been established, an explanation of the necessary steps or criteria that have to be met before rule sets can be discovered or extrapolated from problem spaces commences. As always, the ultimate aim in establishing these rule sets in process is to facilitate the emergence of gameplay.

The next sections outline the basic framework of rule discovery. This framework essentially consists of three steps or phases that the creative problem-solver must fulfill in order to be able to assign or discover a rule set in the creative process. The first part of the framework is the application of

heuristics to the problem space. In order for the creative problem-solver to expose enough information in the problem space to apply some sort of rule or law, the creative problem-solver must firstly apply heuristics to the problem space to simultaneously determine a direction for exploration and to expose information along that trajectory. Once a sufficient number of elements and sufficient information have been uncovered, the creative problem-solver can seek to attribute meaning to these elements through a set of rules or laws.

The second phase of rule discovery relates to the idea of “grokking”. To “grok” something is to so fully and thoroughly understand something that the understanding itself becomes profound, even beyond intuition or empathy (Koster 2005:28). The argument here is that grokking is the manner by which players and creative problem-solvers make sense of the patterns inherent in a problem space. Grokking a problem space helps the creative problem-solver develop an intuitive understanding of the elements in the problem space and how they relate to one another after initial heuristics have been applied to the problem space. Through this discussion, I hope to make clear that this is a crucial step to extrapolating a rule set from a problem space.

The last section of this chapter focuses attention on the idea of judgment as a function in assigning rules or laws to information and patterns uncovered in the creative problem-solving process. This is the last step or phase in the framework for rules discovery. This section of the chapter will primarily outline the function of judgment as a faculty of the mind necessary to make sense of experiences and phenomenon. The ultimate aim here is to investigate how the creative problem-solver uncovers and establishes rules through the use of reflective judgment once the problem space has been sufficiently explored and an intuitive understanding has been gained. Following on this, the last section of the chapter will seek to showcases this framework from a practical vantage point in order to situate the theory in practice.

5.2. THE RELATIONSHIP BETWEEN PROBLEMS AND RULES

It has already been established that problems need to be structured in a certain way to allow for creativity to flourish. Similarly, different problem spaces also have different effects on the rules or constraints in creativity. Previously, I have shown that in order for creative problem-solving to occur, it is important for the creative problem-solver to be presented with an ill-defined problem space. Through decision making within the problem space, the creative problem-solver defines the problem space and provides a clearer structure. As the problem space gains clarity in structure, the decisions made in the process could elicit a type of gameplay similar to that felt in games. This has all been discussed at length in the previous chapters. What should be mentioned here, then, is the fact that the emergence of gameplay and structure in the creative process is a direct effect of the discovery or inclusion of constraints and rules to the problem space. Problem spaces should exhibit certain characteristics in order for rules and constraints to be established that aid in creative problem-solving processes as I will demonstrate below. I have already discussed the categorisation of problems as ill-defined and well-defined. However, there are other perspectives one can take on problem spaces to elucidate their relationship to rule making and discovery.

Jacob Getzels and Mihaly Csikszentmihalyi (2014:2) propose that problems can be split into two different categories - namely discovered problem situations and presented problem situations. The main distinction between these two problem states is the amount of information present in the problem itself upon encountering it. These problem categories also relate to the idea of ill-defined and well-defined problem spaces respectively as mentioned earlier. Presented problems are situations in which the problem, methods for solving the problem and optimal solutions are already known, and solving the problem is simply a matter of adopting the correct “procedure”. The information necessary to approach the problem is already established, the rules and constraints are apparent and the movement toward the goal is clear. These types of problems may seem positive at first, given the fact that all the information necessary to solve the problem is presented to the problem-solver

from the start. However, presented problems inhibit creative behaviour because all the constraints inherent in the problem are clearly and objectively stated from the start. The creative problem-solver thus has no room for interpreting or exploring the problem space. The process of solving the problem is put on rails and it is simply a matter of following certain steps. The rules imposed upon the creative problem-solver come from the outside and are referred to as “constants” (Kelly 2011). These constants are rules that cannot be changed and invite a fairly low amount of engagement and interpretation. Games also restrict player action but the rules do not necessarily resist interpretation, as is clearly the case with constants and presented problem spaces.

Discovered problem spaces present a stark contrast to the rigid structures of presented problem spaces. Discovered problems are situations where the problem is not yet formulated and the methodology for reaching a solution and the nature of a satisfactory and useful solution is still unknown. Creative work is mostly the outcome of these discovered problem spaces (Csikszentmihalyi & Getzels 2014:2). These descriptions of problem spaces bear a very close resemblance to the already discussed nature of ill-defined and well-defined problem spaces. However, the descriptors used to define these problem spaces are significant because of what they might reveal about the nature of rules and constraints.

In presented problem spaces, the creative problem-solver is offered a set of objective constraints. The problem-solver simply applies the constraints and the problem is solved sufficiently. Discovered problem spaces stand in direct contrast to this. In these spaces the creative problem-solver is a participant in the discovery of the rules and constraints informing the problem space. It is in discovered problem spaces that creativity benefits most fruitfully from rule sets and constraints. It is through the discovery and exploration of the problem space itself that the rule set of the problem also reveals itself. The rules used in these types of problems are unearthed or revealed by the efforts of the creative problem-solver. This observation begs the question as to what the process of discovering these rules or constraints entails.

The next sections outline a basic framework that explains where these rules come from and what the process of discovering or establishing these rules entails by drawing upon observations of scientific discovery. The framework is based on three select stages that need to be fulfilled in order for a rule set to be discovered or formulated during the creative process. These stages are heuristic application, grokking (pattern recognition) and reflective judgment respectively (Figure 4). Each following section will outline the details of each phase or stage in detail.

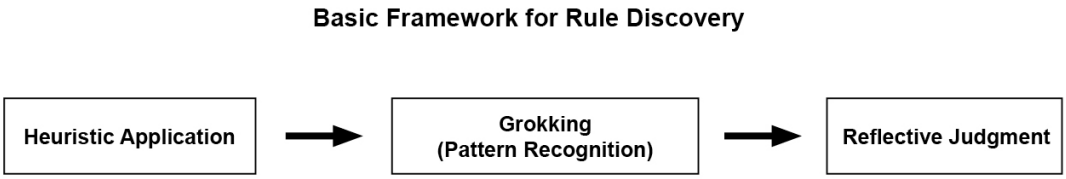

Figure 4: Basic Framework for Rule Discovery in Creativity (Venter 2016)

5.3. HEURISTICS AS DIRECTIONS IN PROBLEM SPACES

Up to this point, it should be clear that, when using creativity to solve a problem, the creative problem-solver seeks to structure the problem space by discerning the rules that govern it. In order to start exploring exactly how these rules get uncovered in the creative process, one can turn to the sciences for guidance. As it turns out, creativity and science have a lot in common in terms of discovery. The creative problem-solver is essentially faced with what Langley *et al*. (1992:16) refer to as “the problem of discovery”. The problem of discovery is “precisely to find some generalization that is parsimonious and consistent with all the given data”. In other words, this means discovering some explanation that describes a given set of data or phenomena within a problem space.

Similar to the process of scientific discovery, then, the “first and vital task” of the creative problem-solver is to “discover laws” that give meaning to the elements in the problem space (Langley *et al*. 1992:17). These explanations or generalisations help to structure the problem space and give the problem-solver a way to understand the elements contained therein. There may be more than one explanation that fits the data or phenomenon present. The explanation can also change with the addition of new information or be replaced by an equally valid explanation. In order for this to happen, the creative problem-solver needs to expose enough information in the problem space to allow for an explanation or rule set to be formulated. This may not be as straightforward as it seems at first.

The most glaring issue here is the fact that any given problem space is very large (especially considering discovered or ill-defined problem spaces). A problem space can be likened to a very large maze with multiple paths to explore. At the beginning of the creative process especially, each path in the problem space seems equally likely to hold the answer to the problem. The creative problem-solver in essence needs to stumble onto the right elements and pathways within the problem space. However, as noted by Langley *et al.* (1992:9), the problem space at the start of the discovery process is “far larger than could be searched in any acceptable amount of time”. How then does the creative problem-solver choose a direction to explore in the space and in so doing generate elements to which rules can be assigned and ultimately solve the problem at hand?

Once again, the process of scientific discovery offers a solution to this problem. Langley *et al.* (1992:5) mention that the mechanisms informing scientific discovery are not particular to that process alone but should rather be seen as special cases of general problem-solving. The first aspect of problem-solving that needs to be discussed is the manner in which problem spaces are explored. When confronted with a problem space that contains an infinite amount of possibilities for exploration, the creative problem-solver must somehow decide on the best course of action to hopefully stumble upon the right elements to use in the formulation of an end product or solution to

the creative problem. Choosing a direction for exploration within a problem space is the first step toward establishing rules by which gameplay can emerge in process. At this stage, the problem is still very much ill-defined and the creative problem-solver is faced with myriad possibilities. The creative problem-solver must thus choose a direction in the problem space that promises to lead to the goal state he or she seeks to achieve. This choice of direction is done through the application of “heuristics” to the problem space itself.

The term heuristic “denotes any principle or device that contributes to the reduction in the average search to solution” (Newell *et al*. 1959:22). In other words, heuristics are rules of thumb that can be applied to a problem space and result in the narrowing down of the possible directions that can be followed in order to reach a solution to the problem at hand. Heuristics are a type of shortcut that may provide ways of systematically searching a problem space or allow for “best guesses” about how to approach the problem space (Runco 2014:338; Yilmaz and Seifert 2011:385). Knowledge and intuition are closely linked to the application of heuristics in a problem space (Conroy 2012). The application of heuristics to a problem allows the creative problem-solver to find a way to approach a problem space and consequently search and move in a useful direction within the problem space. Heuristics are applied “to reduce the possibility space of a problem to be able to search the problem space in a reasonable time” (Newell *et al*. 1959:61). This makes it clear that the application of heuristics is a logical first step in creative problem-solving and rule discovery.

Heuristics are derived from the information contained in the problem space itself to suggest useful areas of exploration and search (Langley *et al*. 1992: 8). This of course becomes problematic when the information in the problem space is still largely undefined and uncertain. In these instances, the creative problem-solver may employ exploration activities associated with the first stages of the creative process (as explained in Chapter Three) to aid this issue. Domain exploration and research can uncover valuable information and may assist the creative problem-solver in selecting useful heuristics. These

exploration activities could even function as good starting heuristics themselves. The strength of the heuristics applied to the problem relies largely on the quality of the information present in the problem space itself. In other words, the heuristics that can be applied to a problem space grow in strength as information is uncovered. Therefore, it is imperative for the creative problem-solver to uncover as much information in the problem space as possible.

Heuristics are constructed by understanding the pattern of the task or the problem space at hand. As pointed out by Langley *et al*. (1992:10), "if there is no pattern in the problem space, then there is no basis for the construction of selective heuristics". The result is that one may choose certain heuristics to guide the problem-solving process but may soon realise that the heuristics being applied to the problem space do not in fact allow for the problem to be searched in a constructive manner. The creative problem-solver may then choose to switch the heuristics applied to the problem space. Changes in heuristics can be classified as learning. Learning happens in games too. When one learns and replaces a set of heuristics for another it is referred to as a change in set (Newell *et al*. 1959:61).

To demonstrate the application of heuristics to a creative problem space, imagine that there is a small child who has a set of Lego blocks in front of him or her. The Lego blocks are various shapes and sizes and there is no discernable pattern to the blocks and how they are arranged at this point. The child wants to start playing with these blocks but does not know exactly how to go about it. The problem space is vague. The child can apply heuristics to the problem space in order to uncover information that can help him or her structure the problem space. One such heuristic is to create variations on ideas. This refers to the generation of a variety of ideas based on the information and knowledge available[12] (Hoff 2013:406). The child may select different types of blocks and combine and rearrange them in different ways

[12] A comprehensive overview of all possible ideational heuristics used in exploring problem spaces falls well outside the scope of this study. However, popular examples of ideational heuristics may include the SCAMPER methodology (Eberle, 1996) or the Synectics framework (Gordon, 1961). These structured thinking methods provide ways of considering and rearranging information to create varied ideas.

until such a time that a suitable or intriguing prospect becomes available. As the child applies these heuristics the information in the problem space may grow and he or she might apply stronger heuristics to move the problem space closer to a desired outcome or solution. Once an intriguing avenue of exploration becomes clear selective retention[13] may be applied. This refers to an evaluation of the different ideas according to some criteria (Hoff 2013:406). For instance, the child may want to create a story with knights and dragons. Thus the child will discard any previously built Lego contraptions that he or she feels do not fit with this evaluation. Here, the child applied the heuristic task of idea variation by combining ideas and exploring information in a problem space where the goal and the path to reach the goal was initially vague and unclear. Once a promising avenue of exploration is uncovered, the child can apply the algorithmic method of selective retention to further structure the problem space.

From this discussion it should be clear that the first part of problem-solving is the selection of heuristics that allow for the exploration of the most probable aspect of the problem space that can lead to a solution. These heuristics are not necessarily hard rules applied to the space and do not necessarily allow for the emergence of gameplay specifically. It would probably be closer to the truth to state that heuristics are more applicable in the categories of general playfulness or ludic activities. Once the correct aspect of the problem is identified, where does the creative problem-solver move next? It is only once heuristics are applied to the problem space that the rules that inform the gameplay in the process can be experienced and uncovered. In essence, heuristics are likely to increase the odds of finding a basic direction within the problem that may yield fruitful results. It is once these heuristics are applied that discovery can possibly take place. Once heuristics have been selected,

[13] Selective retention can be classified as an algorithm instead of a heuristic task. Algorithms are “precise processes for solving a problem or obtaining some goal” (Runco 2014: 338). In many ways algorithms are like equations: with effort, the correct outcome or answer can be reached. This implies that the problem space has been structured to a degree and the goal has become clearer.

the creative problem-solver explores the problem space and hopes to spot the patterns informing the problem space in order to select even stronger heuristics. By spotting the patterns in the problem space, the creative problem-solver is one step closer to uncovering the rule set informing the problem space. The next section will turn once more to gaming in order to explore the nature of this pattern recognition.

5.4. GROKKING PROBLEM SPACES AND PATTERNS

I have already established that rules need undefined or discovered problem spaces to function constructively in the creative process. The rule set informing the creative process gets discovered and structured along with the problem space itself. The discovered rule set is intertwined with the nature of the problem space. There is a similarity between the way in which a player in a game might experience the rule set of a game and the manner in which a creative problem-solver might experience the discovery of rules in a problem space. Even though the game player is not necessarily discovering the rule set of the game itself, there is still an element of discovery inherent in the interaction. The second stage of rule discovery in the creative problem-solving process hinges on the exploration of this link.

According to Raph Koster (2005:34), games can be construed as iconic depictions of patterns that exist in the real world. This means that games are a simplification and abstraction of situations or processes found in reality. The formal rule set of a game serves as this abstraction of reality. In other words, the rule set of a game serves to codify different situations that are found in reality. These rule sets could have varying levels of abstraction. In a game, there might be a rule stating to draw a card or play a card from your hand. Drawing a card could serve as an abstraction of many different situations in reality. It could symbolise an event happening (like getting resources or having an encounter) and playing a card could symbolise taking certain actions (building a structure or taking action against another player.) The point of these examples is to bring to light the fact that a rule in a game could be a

symbol that mimics reality. The rules of games use reality as a measure or basis from which rule sets are then subsequently abstracted.

When these situations are abstracted and a matching rule set is created, they become patterns that one can learn and recognise. Koster (2005:34) refers to the way that the rules of a game are perceived as pattern recognition. Whenever a game is played, it relies on the recognition of the pattern that the rules present to be successful. The mind perceives the patterns of rule sets in games in a similar manner that other phenomena in reality may be perceived. It is here that I also want to reintroduce a term mentioned by Koster in relation to playing games and recognising patterns. Koster (2005:28) mentions the term “grok” to describe pattern recognition and the intuitive understanding that players develop during games. This term was first used by Robert Heinlein in his book *Stranger in a Strange Land.* The word ‘grok’ is explained as follows in the original book:

> Grok means to understand so thoroughly that the observer becomes a part of the observed—to merge, blend, intermarry, lose identity in group experience. It means almost everything that we mean by religion, philosophy, and science—and it means as little to us (because of our Earthling assumptions) as color means to a blind man (Heinlein 1961).

Based on this, to “grok” something is to so fully and thoroughly understand something that the understanding itself becomes profound, even beyond intuition or empathy. By understanding something so thoroughly the participant becomes one with it in a sense. Grokking a pattern or rule set means to comprehend the pattern fully and that pattern can then be accessed as needed – almost like muscle memory. Grokking is basically a way to describe the process of learning and gaining an intuitive understanding of something.

A game is grokked when the manner in which the rules function and the actions that can be take in relation to these rules makes sense on a visceral, intuitive level to the game player. When starting a new game, players might often experience a feeling of unfamiliarity in the game, even if an

understanding of the basic rule set has been established. As the game progresses and players settle into the game, a new understanding of the rules and the way in which they shape the game begins to form. The outcomes of actions taken in the game can be extrapolated naturally and the player can make decisions whilst grasping the effects of these actions on the game system. It is more than simply not having to check the rulebook for reference anymore. It is an awareness of how the rules of the game feel to play and how decisions within the game may lead to different outcomes. The player understands the patterns presented by the rules and the meaning of all the items and phenomenon inherent in the game. This is why it becomes so much easier to explain a game once an understanding has been developed of how it feels to play the game in question.

I would say that “grokking” can also be applied to the creative process and is a crucial step to understanding how rule sets in the creative process are established and discovered. In terms of games, players enter into a set of already established rules with clear patterns. Experiencing these rules and patterns allows the player to grok the game and develop an intuitive understanding. I would suggest that grokking in the creative process works slightly differently. When the creative problem-solver understands and defines the problem space fully, then the problem space is “grokked” by the creative problem-solver. Once this happens, the creative problem-solver spots and understands the patterns presented by the problem space. But unlike the patterns of a game that can be clearly related back to an existing rule set, the creative problem-solver intuitively sees the patterns of the problem but does not necessarily comprehend the rule set informing those patterns fully.

I would argue that it is apparent that many creative problem-solvers “grok” creative problem spaces without necessarily understanding the rules informing the space as a whole. One can return to the example of a painter. The artist produces new works and intuitively grasps the direction in which he or she wants to take each painting. The painter can see similar themes emerging from the different pieces and he or she knows how to manipulate the materials to produce specific results. However, he or she may not be

aware of the rules informing this artistic exploration. He or she may not have assigned an explanation to the explorations or methods of working. In this instance, one can say that the space was “grokked” but the rule set is still there to be discovered. The problem space has been defined and structured yet the creative problem-solver is functioning on intuition. “Grokking” the problem space is a necessary criterion that must be met in order to discover or extrapolate the rules from creative problem spaces.

It was mentioned earlier that the rules in games are abstractions of reality symbolising actions that take place in “real life”. If this is true, then one may ask: What are the constraints and rules within the creative process abstractions of? In other words: What is being codified in setting up the rules inherent in the creative process? The creative process takes place in reality, meaning that the language of the rules are written in the nature of existence, whereas the rules of a game exist in a play space that does not necessarily engage with the natural world. Where is the rule set of creativity abstracted from if the actions in the creative process not only symbolise actions in the real world but indeed are actions taken in the real world? I would suggest that the rule set of the creative process is an abstraction of the problem space itself.

I believe judgment (a concept discussed by Immanuel Kant) is an important function in extracting rule sets from problem spaces that have been grokked. I will attempt to leverage the insights of Koster regarding grokking and pattern recognition and link it to the principles of finality and the act of judgment as expressed in the work of Kant. This link can be used to understand the manner in which the creative problem-solver abstracts rules or constraints from the problem space as will become clear in the next section. I will first try to establish an understanding of the act of “judgment” as proposed by Kant in order to explain how rules are abstracted from the creative problem space. This is also the third stage of rule discovery as set forth in the proposed framework mentioned earlier in the chapter.

5.4. JUDGMENT AS FUNCTION FOR RULEMAKING

In his philosophical explorations, Kant examines the human faculties of the mind. In the introduction to *Critique of Judgment*, Kant (1987:16) describes these faculties as reason, understanding and judgment respectively. Mary Warnock also uses these faculties described by Kant to investigate imagination and provides a succinct and slightly more accessible explanation of Kant's account of human faculties. According to Warnock's (1978:43) examination of Kant, understanding is the manner by which the individual applies scientific concepts to nature. Reason is the faculty by which the individual applies laws to his or her own experiences. Lastly, judgment lies between these two faculties and links them. Judgment can be described as the faculty that "consists of the application of a concept or general rule to a particular instance" (Warnock 1978:43). Kant (1987:19) himself states that judgment is the ability to "think the particular as contained under the universal". In the instances described here, an individuals' understanding of nature is a function of judgment. It is only through judgment that concepts informing understanding and reasoning can be established. Already, a strong link is created here to the act of rule making or rule application. Kant basically describes judgment as the ability to assign and discover rules. But in order to describe how the act of judgment facilitates the establishing or discovery of rule sets in creativity, further investigation is needed into the concept of judgment.

Kant (1987:19) distinguishes two types of judgment – namely determinative judgment and reflective judgment. These types of judgment are narrower instances of the broader concept of judgment as described above. Determinative judgment is the ability to assign a particular instance or phenomenon to an already existing universal law or concept. For instance, if I understand that dogs have four legs, are furry, and have certain facial and bodily characteristics, I have an idea of the universal law or rule that governs this natural phenomenon called Dogs. If I then see a dog in the street, it is my determinative judgment that allows me to place this particular dog I just saw

within the universal category of Dogs. In this example it is clear that if the broad laws or rules informing a category is established and understood, assigning particular instances to the category is easily done. In terms of creativity, determinative judgment fits well with the idea of presented problem spaces. These problem spaces exist as a universal law or category and the problem-solver can easily assign certain phenomenon to this category. For instance, oil painting can be a universal law or category. When I get paint and put it to a canvas, I understand that the particular phenomenon I am producing fits this universal law or category. The rules are clear and the outcome can easily be directed. However, it may also happen that phenomenon may be present that does not have a readily apparent universal law or category. In these instances, reflective judgment is applied.

Individuals may use reflective judgment to find a universal law fitting a particular instance when no universal law or category is obvious (Kant 1987:19). In other words, in the experience of a particular phenomenon, the individual, through the use of imagination and contemplation, invents or derives a universal law or rule set informing that particular phenomenon. Another example can help elucidate this insight. Imagine if I were to give you a board game box containing all the necessary pieces except for the rulebook. Upon opening the box and examining the cards and different pieces you realise that you have no idea what each piece is supposed to do, and nor do you know how the game is supposed to be played. At this point you can try and figure out how the pieces relate to one another and what the “game” is supposed to be. You might stumble upon the intended solution, but, then again, chances are you could probably derive a whole new set of rules for the components. What you are essentially faced with in this scenario is a particular observable phenomenon that needs a universal principle or law assigned to it. Reflective judgment is basically a means of extrapolating rules from particular instances when the rule set informing the particular instance is not entirely clear. The principle of finality informs an individuals’ ability to extrapolate universals from particulars.

Kant (in Warnock 1978:44) states that the application of reflective judgment

requires the person in question to first subscribe to the finality of nature. The principle of finality is the belief that all phenomena are embedded in some system or pattern. This principle does not commit the person to any specific pattern or system, but rather simply to the belief that some system or pattern exists and that any phenomenon is embedded in the system. Thus, the person looking to apply reflective judgment in order to extrapolate a rule set from the observed phenomenon must to some degree subscribe to the idea that even if they do not particularly know what rule set or law is governing the phenomenon observed, there must at least be some kind of system or law governing it. In the example of the board game with the missing rulebook, the person who is trying to figure out how to play the game assumes that at some point there was a rulebook informing the use and design of the pieces and cards in front of him or her. The individual is searching to match rules or laws to these objects to eventually hopefully arrive at a semblance of what the game is supposed to be in the first place. Armed with an understanding of the concepts of reflective judgment and finality, the next section relates this back to the creative process. I also refer to the processes of scientific discovery to give the application of judgment a more practical vantage point.

5.5. JUDGMENT AND RULE DISCOVERY IN THE CREATIVE PROCESS

In order to put the role of judgment in context of the creative process, a short review of what has been discussed so far is in order. The goal of the creative problem-solver is to discover or assign a set of laws or rules to explain the phenomenon or elements generated during the creative process. Initially, faced with an ill-defined problem, the creative problem-solver selects and applies heuristics in order to identify a feasible direction for exploration in the problem space. The application of heuristics to the problem space generates new information as the process unfolds. The problem space gains more clarity and structure as a result of this and stronger or more applicable heuristics can be chosen and applied. As the creative problem-solver explores and structures the problem space through the application of heuristics, the patterns and boundaries of the space become intuitively understood. At this

point, the creative problem-solver has grokked the problem space. Once this point has been reached, the creative problem-solver can actively assign or discover rules for the elements within the problem space using reflective judgment. It is clear from this overview that the application of heuristics to the problem space and the eventual grokking of the space are closely connected and necessary for the application of judgment.

I can thus illustrate the use of the proposed framework for assigning rules to a creative problem space using the following practical example. Imagine a designer is asked to produce a creative logo for a local business. The business relays their brief and requirements to the designer and the designer embarks upon solving the problem. At this point the problem is ill-structured and the designer may have a vague idea of the eventual goal of the process. He or she must employ some heuristics to find an appropriate avenue of exploration within the problem space. This may initially take the form of a “trial by error” searching process as the creative problem-solver creates sketches, applies specific thinking methodologies, writes down ideas, explores different research material and develops prototypes. This is the point in the process where free play or playfulness is most likely to appear. These actions can be classified as solution-generating processes during problem-solving (Newell et al. 1959:14). Solution-generating processes can be seen as the production of elements or phenomenon unto which new rules can be attached. At this point however the creative problem-solver might still be unaware of the significance of the elements produced in the process.

At some point the designer reflects upon the elements he or she has produced in the process. The designer observes the ideas and sketches he or she has made, the discussions he or she has had with the client and colleagues and any relevant research or prototypes that he or she may have done. The designer may also have developed a clearer understanding of the goal criteria for the project at this point. The designer intuits that some of the ideas feel closer to the solution than other ideas. Yet, he or she is not necessarily sure why that is. The designer may feel that there is a system of rules informing and describing the elements in the process but he or she has

not yet stumbled upon it. This aligns with the principle of finality as expressed by Kant. The designer at this point is like a scientist observing a phenomenon in nature that cannot yet be fully explained. The designer now seeks to uncover the structure or rule set surrounding the phenomenon he or she has produced. This might happen even without the designer being fully aware of the fact.

In trying to understand the elements generated during the creative process, the designer is applying a process known as verification (Newell et al. 1959:14). As the creative problem-solver moves through the problem space, producing more ideas and applying more influential heuristics, new points are reached successively and each new “discovery” is tested and evaluated for its contribution to the problem-solving enterprise (Langley et al. 1992:37). This is where the faculty of reflective judgment enters the picture. Using the faculty of reflective judgment the designer seeks to assign or discover a structure informing the phenomenon observed in process. By observing how the space changes and by noticing the reoccurrence of symbols or elements within the creative problem space, the designer eventually learns enough to compose a rule set or in this case observe to some degree the pattern governing the outcomes during the process (Koster 2005:56). Here the overlap between grokking the problem space and the use of reflective judgment becomes clear. Reflective judgment needs the creative problem-solver to develop an intuitive understanding of the problem space in order to start uncovering or assigning a structure to the elements within the problem space.

The designer now understands the problem space more thoroughly. He or she has a good idea of the unique goal criteria informing the project and understands (intuitively or logically) which actions can be taken to move closer to the goal criteria. It is also at this point that gameplay is likely to emerge from the process. By exploring the conceptual space the creative problem-solver solidifies the structure and patterns of the creative problem. Whether consciously or unconsciously aware of it, rule sets govern the behaviour of the creative problem-solver and form the eventual constraints that govern the actions and explorations toward the final outcome. After the

rule set has been established and the proper constraints for the creative problem have been set, it is these very constraints that become the object of the creative process as much as the product itself.

It may happen that the rule set that informed the creative process only appears or is understood in hindsight. A particular outcome within a rules system is often irreducible. The meaning of each action in the creative process, whether guided by rules or not, is only given meaning after the act has occurred and by subsequent actions. In some ways the rule set is being built as the creative problem-solver engages in the process of solving the problem. But even once the process is done, it is often difficult to guage in exact terms the sequence of events that led to the outcome of the creative product in question. Each action that the creative problem-solver takes in the process is an addition or elaboration on the frame guiding their actions. One might even posit that the creative insights that occur during the problem-solving process is the mind ascribing rules to the phenomenon observed. Regardless, once the process has been completed, other creative problem-solvers can access the goal criteria and constraints informing the process.

Kant (1976:39) mentions that rules become abstracted from the fact (product) once manifested. In other words, the rules informing the production of a creative solution can become a set or standard that can be followed by others. The novel goal constraint can be adopted by other creative problem-solvers and used to reach new outcomes using different sub-contraints and rules. Similar constraints can lead to different outcomes in the hands of different creative problem-solvers (Stokes 2005:13) . The interpretation of rules or constraints creates the possibility for different creative outcomes in creative problems. Hughes (1999: 94) states that ‘‘rules can be interpreted and reinterpreted toward preferred meanings and purposes, selectively invoked or ignored, challenged or defended, changed or enforced to suit the collective goals of different groups of players.” Thus, the discovery of rule sets and novel goal criteria within creative problems creates the possibility for new explorations in different domains. The key point here is that the discovery of a rule set in the creative process is not only crucial to the successful exploration

and solving of individual creative problems but also for the development of different domains and the emergence of gameplay.

5.6. CONCLUSION

In this chapter I have attempted to give a framework of the mechanisms and processes through which the creative problem-solver arrives at a rule set that ultimately allows for the emergence of gameplay from the creative process. The structure of a problem space and the rule set that allows for the emergence of gameplay are strongly intertwined. The creative problem-solver is in essence dealing with the nature of a given problem and also the problem of discovery. This chapter proposed a framework of three necessary phases or stages in creative problem-solving that can lead to the discovery of a rule set – namely heuristic application, pattern recognition or grokking, and finally the application of reflective judgment.

The creative problem-solver first seeks to explore the problem space in order to start the process of uncovering the necessary elements in the problem space. Problem spaces are potentially infinite and therefore the creative problem-solver needs to employ some mechanisms by which the problem space can be reduced to a general direction or area for exploration. The creative problem-solver applies heuristics in this case, aided by empathy and intuition in order to achieve this. The heuristics chosen by the creative problem-solver are also dependent on the information supplied by the problem space. As a result, it is possible that the creative problem-solver may choose heuristics that are less suited to solving the problem and it may be necessary for the creative problem-solver to adjust his or her strategies or change the heuristics applied to the problem space. Once a proper avenue of exploration has been defined in a problem space, the processes of generation and verification can start. This is known as learning and also correlates with the phenomenon of grokking which is the second stage of the framework.

When a problem space is grokked, an intuitive understanding of the problem

space is created in the mind of the creative problem-solver. In essence, the problem-solver grasps the patterns of the problem space to such an extent that heuristics can be selected and reactions can be made to the space almost subconsciously. This phenomenon also occurs in games when players understand how the rules of the game intertwine. Grokking occurs once the problem-solver defines a direction for exploration in a problem space and starts discerning the underlying patterns. This in turn allows for the selection of better heuristics and ultimately a more defined path of exploration. After that the creative problem-solver can discover or assign rules to the problem space and the elements within using reflective judgment.

The creative problem-solver, in wrestling with the problem, generates a number of phenomenon and elements. The creative problem-solver then uses his or her faculty of Reflective Judgment, as described by Kant, to assign a frame of meaning to the elements generated in the process. As soon as the creative problem-solver finds a frame that can function as a type of universal law binding these elements together, the decisions in the process become clearer and starts resembling the decisions made whilst playing a game. This may happen in process or after the process has unfolded. As soon as the rule set is uncovered, it becomes abstracted from the problem space and can then be applied easily in other situations or problem spaces.

Once the law or frame has been applied to the problem space at hand, the creative problem-solver in essence assigns a set of rules by which clearer and more constructive decisions can be made. If the goal of the problem is clear and the creative problem-solver has identified some constraints or rules that can act as a means toward reaching that goal, gameplay can emerge from the problem space. In doing so, the uncovered elements and rule set combined may lead the creative problem-solver to a novel end product that may satisfy the problem at hand.

This chapter provided a very broad overview of the process that allows the creative problem-solver to establish the necessary structure to enable gameplay to emerge from the creative process. However, many details can still be unpacked and explored. I believe that this is a necessary step toward a

framework of understanding the creative process through the lens of games and gaming attitudes. So far the study has focused solely on the creative process and the aspects that may allow for gameplay. However, there are also personal aspects of the creative problem-solver that can contribute to the emergence of gameplay in creative problem-solving. In the next chapter I will take a slight departure to discuss these personal aspect that may play a role in the creative problem-solving process.

CHAPTER SIX: CREATIVE PROBLEM-SOLVING AND THE LUSORY ATTITUDE

6.1. INTRODUCTION

The parallels between the structure of the creative problem-solving process and games have been made apparent in the preceding chapters. The first part of this study investigated the relationship between problem-solving and creativity. I investigated the manner in which different categories of play feature during creative problem-solving and how the eventual emergence of gameplay can aid that process. For gameplay to emerge, a set of rules or constraints is necessary. From there, the focus shifted to exploring the role of rules in facilitating the emergence of gameplay. I compared the types of rules found in games structures to the constraints found in the creative process and found an extensive overlap between the two. The previous chapter then explored a basic framework that allows the creative problem-solver to understand how rules get discovered or applied in the creative problem-solving process. It is clear that the focus of the study so far has focused extensively on the creative problem-solving process itself. However, the personal aspects related to participating in the process of games and creative problem-solving has not yet been addressed. In this chapter I would like to turn my attention to the overlap between the game player and the creative problem-solver, specifically with regard to how these personal aspects may influence the emergence of gameplay during both the creative problem-solving process and games.

Simply investigating the formal elements of games and creativity respectively does not paint a complete picture of the nature of these processes. Therefore it becomes crucial to investigate and scrutinise the human or personal elements involved. The approach of the player or the creative problem-solver has a direct affect on these processes and subsequently the play that is derived from it. To this end, Sutton-Smith (2001:174) discusses the rhetoric of the self in relation to play. In his view, play is a state of mind: a mental

approach to the world and the actions one takes in it. Many of the theories related to the self and play focus on the feelings and meanings generated by the individual player. These feelings and meanings include things like "freedom, fun, intrinsic motivation, attitude, subjectivity, hope, optimism, autonomy" (Sutton-Smith 2001:192). So far, this investigation has demonstrated that the creative process shares a similar structure to that of a game. That being the case, it is not a stretch to assume that there might be value in investigating the approach of a player to a game and the insights it may hold regarding the approach of the creative problem-solver to the creative process. With regard to this approach, this chapter specifically investigates the effects of motivation and attitude on these processes.

There is value in considering the effects of motivation and attitude on the creative process. Firstly, the attitude of the problem-solver going into the creative process affects the success of the creative process. Although no specific consensus has been reached as to what constitutes an attitude, it can be described as a summary of judgment built from experience, beliefs and feelings toward some event, object or stimulus (Basadur & Basadur 2011:85). In essence, an individuals' attitude toward something allows him or her to categorise the event, object or stimulus on a cognitive, emotional and experiential level. Dominic Arsenault and Bernard Perron (2008:109) state that one acts differently or follows different rules according to the way in which an activity is framed. Essentially, the attitude with which something is approached can act as a framing mechanism for certain behaviours and outcomes. Investigations into the effects of individual attitudes upon the creative process have suggested that creativity is suppressed by negative attitude adjustments and enhanced by positive attitude adjustments (Basadur & Basadur 2011:87). Negative attitudes and behaviours toward the creative process can result in creative inhibition and even stagnation (Davis 2011:116). Although this specific aspect of creativity research could benefit from additional research, these insights suggest a correlation between the success of the creative process and the attitude of the individual.

Not only does attitude or behaviour affect the successful outcome of the creative process, it may also affect the enjoyment and pleasure experienced during engagement with the process. Although the creative process may share a similar structure to that found in games, and the emergence of gameplay is possible from engagement with the process, one is still left with the inevitable fact that the creative problem-solver does not always elicit play or necessarily derive enjoyment or pleasure from engaging with the creative process. Arguably, the enjoyment of the creative process is influenced by the manner in which it is conceptualised in the mind of the creative problem-solver. Approaching the creative process as a structure of play necessarily entails conceptualising and approaching the process as a game. From this perspective, the value of investigating the attitude and approach of the creative problem-solver becomes clear.

Thus, below I want to investigate the personal aspects or approaches of the individual that may allow the creative problem-solving process to gain the qualities associated with games and gameplay. It is in this specific aspect that the investigation into the attitudes of players toward games may be invaluable; in essence, investigating the reasons why players might seek to engage in games and the insights this may hold for the creative process. Individuals may choose to involve themselves in a game or in the creative process and may be motivated to do so for various reasons. Motivation plays a key role in the manner in which activities are approached and the associated attitude with which they are handled.

Therefore, the first part of this chapter investigates the motivations of players when participating in games. The aim is to show how motivation may change the experience of engaging in a game. This section of the chapter mainly tries to show that an individuals' motivations are directly linked to the attitude informing the process and experience of that process. This section seeks to showcase that motivation consists of paradoxical and meta-motivational states that may influence the way in which experiences are approached and consequently shaped. In the process, I specifically address the aspects of motivation as it relates to the attitude of the game player – known as the

lusory attitude.

The next section investigates the lusory attitude as defined by Bernard Suits and seeks to give a comprehensive overview and definition of this attitude. This then leads into the next section, which provides a comprehensive discussion of the characteristics of the lusory attitude and how it influences and shapes the experience of a game. This section specifically addresses how the lusory attitude shapes the player's behaviour and attitude toward the game, as well as the goals that are presented within the game system.

Once the characteristics of the lusory attitude have been discussed in relation to games I focus on the value of the lusory attitude in the creative problem-solving process. I then outline the benefits and uses of employing the lusory attitude in the creative process. This section argues that the lusory attitude not only aids in shaping the creative process but actively helps to elicit gameplay from the process that in turn aids in problem-solving and enjoyment.

6.2. MOTIVATION TO PLAY

The previous chapters in this study pay close attention to the process of playing games and the resulting gameplay. When participating in a game, the player engages with the formal elements (rules, objects, goals etc.) of the game structure and as a result gameplay can emerge. Similarly, the individual may interact with the elements found inside the creative process and gameplay can emerge from this interaction given that a set of rules and interesting decisions are present. Not only does the play that emerges from the creative process and games resemble one another, it is crucial to the functioning of both processes. In terms of creative problem-solving "play assists creativity by generating novel combinations of thoughts or actions, or by providing experience that enables the subsequent production of novel solutions to problems" (Bateson *et al.* 2013:122). Donald Winnicot (2005:72) also elucidates the relationship between playing and creativity by stating that it is only in playing that an individual is able to be creative and that it is only in

creativity that an individual may discover himself. Both of these perspectives elucidate the value of play in both games and creativity. However the motivation for participating and eliciting play in both creativity and games still need to be addressed.

Motivation can be viewed through the lens of reversal theory as laid out by Michael Apter. Reversal theory claims that “we move between a set of different motivations for our actions as we move through our daily lives, and in pursuing these contrasting motives we see the world in different ways” (Apter 2007:xi). In every action or situation, the participating individual might move between different or even opposing mindsets or attitudes in the movement to completing any given task or activity. These different mindsets are determined by the motivation of that particular individual at the time. Essentially, this theory proposes that the motive of pursuing different tasks or activities influences the attitude and even the personality of a person at any given time (Apter 2007:xi). The reason reversal theory and motivation is useful in this discussion, is the fact that the same activity and process can be experienced and thus situated within experience in different ways. Two people can play the same game or work on the same creative brief but the experience of the activity can be drastically different. I now attempt to unpack the aspects of motivation in more detail.

The experience of motivation “is a complex phenomenon with a number of aspects” (Apter 2007:10). One of the most prominent aspects associated with motivation is the idea of *arousal* (Apter 2007:10). This is the degree to which one feels worked up or emotionally charged to engage in a particular activity. Arousal can be experienced at different levels. This means that arousal can be seen as the intensity component of motivation and ranges from high to low. Besides the level of intensity, the “hedonic tone” of the arousal state also impacts the experience. The hedonic tone of arousal refers to the pleasure or displeasure associated with the anticipation of engaging in a certain activity (Apter 2007:11). Arousal may be experienced as a mode of excitement-seeking or as anxiety-avoidance according to reversal theory (Apter 2007:17). These are called meta-motivational states – ways of interpreting the

motivational state of arousal.

Each meta-motivational state can be experienced on a scale of pleasure or displeasure. When arousal is experienced as excitement-seeking it is often pleasant when the excitement increases whereas a decrease in excitement could result in boredom. Here, an increase in the excitement state is associated with pleasure and a decrease in excitement associated with displeasure. Arousal experienced as anxiety-avoidance becomes unpleasant when increased yet becomes more pleasant when decreased (becoming a state of relaxation). In this state, a decrease in anxiety can be seen as pleasurable and an increase in anxiety can be seen as displeasure. To put these states in perspective consider the following examples: One may feel a sense of anxiety about going to the dentist and this can be experienced as unpleasant. However, upon leaving the dentist office the feeling of anxiety may decrease and in turn become more pleasant feeling of relief. Similarly one might feel a sense of excitement about seeing an old friend and as this feeling increases so does the pleasure. Once the encounter is over however the excitement may decrease and one might become bored which in turn could be unpleasant. Essentially, both of these examples feature some kind of arousal that affects the motivation to participate in the activity. This component of motivation can be described as an intensity component – the drive to participate. However, arousal or intensity is not the only aspect that influences motivation to participate in an activity.

Alongside the aspect of arousal, motivation is also influenced by the goal that needs to be reached and the different means by which one can reach this goal (Apter 2007:34). This means that motivation contains an intensity component as well as a directional component. The manner in which the goal informs the motivation to participate in an activity is of importance. In terms of reversal theory there is a movement between the separate poles of the activity itself and the goal of activity (Apter 2007:37). This means that at times, reaching the end goal of a task or activity is the primary function that informs motivation. However, at other times, the participation in the activity itself is the main function that informs motivation to take part in the activity. In these

secondary cases, the main goal becomes a pretext or excuse for participation in the activity. In cases where the activity itself is the primary focus, sub-goals can still arise from participation in the activity (Apter 2007:36). For instance, in terms of game experiences, there is certainly a focus on the main goal presented by the game – whether this is to beat your opponent or gain the most points – but there may be sub-goals arising from this interaction as well. These sub-goals may include things like having fun or beating your own high score.

As was the case with arousal, Apter (2007:38) introduces us to meta-motivational states related to the goal component of motivation. The pursuit of the goal within an activity can be influenced by a “telic” or “paratelic” state. These states also directly influence the pleasure experienced in an activity. In a telic state, the pleasure in experience comes from movements towards the end goal of the activity. Movement away from the goal could be experienced as displeasure. Conversely, in a paratelic state, pleasure in experience comes from the immersion and participation in the activity itself without an overt movement toward the end goal of that activity. In this state, direct movement or overt focus on external goals could detract from the pleasure experienced. As mentioned with general reversal theory, individuals may osccilate between these different types of pleasures in the experience of an activity. The telic mode is concerned with long term goals and the significance of such achievements whilst the paratelic mode is concerned with removing ones mindsets from such serious achievements.

In summation, it is clear that the experience of motivation is impacted by two prominent aspects. Firstly, arousal is the degree to which one feels worked up to engage in an activity. Arousal may be driven by anxiety-avoidance or excitement-seeking. The second aspect is the relationship of the individual with the goal of the activity. One may be motivated to engage in an activity to complete the main goal or simply to participate in the activity for the sake of it. These two aspects inform the motivation and the subsequent attitude of the person engaging in an activity. I now consider the role of motivation in both games and the creative process.

When considering the motivation to participate in games, the most important reason is to enjoy the game and to have fun (Hiwiller 2016:131). The ideal experience of playing a game is supposed to be a fun, pleasurable experience associated with various positive elements including immersion, flow and presence as a result of the gameplay that is elicited (Calvillo-Gámez *et al.* 2010:42). Thus, the motivation to participate in a game has an element of excitement or relaxation in terms of arousal. The more excitement or relaxation felt to participate, the greater the pleasure experienced. Equally, whilst the final goal of the game might be important to the structure of the game, it may not be only reason for participation. The player may also enjoy the activity of playing for the sake of the activity itself. This means there is a clear alignment with the most positive aspects of motivation when dealing with games. The motivational state to participate in a game determines the attitude and approach of the player toward the game itself. The attitude that the motivational state brings about in the player can be conducive to the emergence of play and enjoyment but can also just as easily have the opposite effect. Motivation to participate in the creative process can also be conceptualised in this manner.

When considering the creative problem-solvers' motivation to participate in the creative process it becomes clear that it osscilates more readily between different states of motivation. The arousal to participate in the process may come from either an anxiety-avoidance or excitement-seeking point of view. For instance, the creative problem-solver may be under pressure to finish a project (anxiety-avoidance) or there might be a new and intriguing idea the creative problem-solver wants to explore (excitement-seeking). The end goal of the process drives participation as the creative problem-solver often has a very specific end to meet. However, the creative problem-solver may just as easily languish in the pleasure of participating in the activity itself as they enjoy expressing their creativity in the activity of their choosing. Depending on these meta-motivational states, the attitude of the creative problem-solver may be positive or negative. I would also argue that the likelihood of eliciting

gameplay is dependent on the attitude of the creative problem-solver.

In view of this assumption it might conceivably be necessary that the creative problem-solvers' approach to the creative process should more closely resemble the approach of a player to a game in order to elicit the same effects from the process. These effects include eliciting gameplay and deriving enjoyment from participation. Juul (2005:88) raises this point in saying that gameplay is a consequence of the rules of a game and the disposition of the player. As I have shown above the approach of the player toward a game aligns more readily with the pleasurable aspects of the arousal and directional meta-motivational states. If these are the motivational states inhabited by the player then the question becomes: What does the attitude of a player entail when immersed in a game compared to other participants?

Keith Oatley (1992:355) draws a valuable comparison between being a player of a game and being a participant in game. Being a participant simply means generating actions according to the ruleset established by the game, whereas a player takes on the goals of the game as their own. Despite the fact that one may refer to all individuals engaged in a game as being engaged in the act of 'playing', not all individuals engaged in the act might actually be playing in a real sense (Feezell 2013:12). It is the attitude of participation that is the differentiating factor that turns a participant into a player. I believe it is possible to draw a distinction between a "player approach" and a "participant approach".

Firstly, a participant approach would constitute an attitude that is detrimental to establishing the structure of a game and would not necessarily promote the emergence of play and the enjoyable aspects that are associated with games. On the other hand a player approach would constitute the behaviour and psychological state that a participant would embody when approaching a game scenario that not only helps to establish the game structure but also promotes the emergence of gameplay and the elements of enjoyment associated. Thus, approaching the creative process as a player may in fact raise the quality of the experience and also make it easier to elicit gameplay.

Bernard Suits (1978:35) calls this particular attitude the “lusory attitude”. The next section defines this attitude in detail and also explains the relationship of this attitude to the motivational states described previously.

6.3. DEFINING THE LUSORY ATTITUDE

In order to be able to discuss the manner in which motivation informs the lusory attitude, it is necessary to define the concept. Suits (1978:35) refers to the lusory attitude as a crucial attitude of the game player. This attitude is so crucial in fact, that Suits asserts it would not be possible to play games without it. The lusory attitude of the player is the crucial element that ultimately binds the other elements of the formal game structure (goal, rules, objects, et cetera) into a coherent whole. The lusory attitude functions as a binding mechanism that pulls these elements together. Juul (2009:9) considers players and games as mutually defined: two entities that “interact with, define, and presuppose each other”. From this perspective, it is the lusory attitude of the player that allows for the constitution of a game structure and the consequent emergence of successful gameplay from the interaction between the player and the game itself. However, it is then also the game that allows the individual to take on the role of player. The views of Hans-Georg Gadamer on play further supports this concept.

To Gadamer (1989:103), play – the same applies to gameplay – has its own essence outside of the player and reaches fulfilment or representation through the player. The player chooses to submit to the process and derive the associated benefits. Gadamer’s (1989:106) view on play emphasises the fact that the player is not only playing the game but is in fact also being played by the game itself. This idea supports both the views of Suits and Juul, and serves to legitimise the concept of the lusory attitude as means for the player to allow this interaction to take place. In taking on the lusory attitude, the player is essentially opening himself or herself up to the play experience.

Bearing this in mind, one can conceptualise the lusory attitude as an attitude of submission to process. The player allows the process to come to fulfilment through participation in the process. The player allows the reality of the game to surpass himself or herself and in such a way allows gameplay to manifest. Ultimately, the lusory attitude is taken on in an effort to experience the pleasure of play (Salen & Zimmerman 2004:98). The lusory attitude is thus an attitude of ludic submission. The lusory attitude is necessary to enter the system of a game and change the system of a game into an experience of gameplay. Therefore the main function of employing the lusory attitude is the constitution of a space that allows for this ludic interaction to take place. This space is known as the “magic circle” (Salen & Zimmerman 2004:94 - 95).

The magic circle constitutes an imaginary space where a game takes place and is formed when players decide to employ the lusory attitude and take part in the play of a game (Salen & Zimmerman 2004:94 - 95). The magic circle is a metaphor for the border that “delimits an instance of playing” (Stenros 2014:147). In essence, players create a new reality by partaking in a game. This new space allows for new rules and meanings to be transferred to the objects and actions taking place in that space. Inside the magic circle, the rules of the game carry authority. This once again aligns to the idea of the lusory attitude as an attitude of submission – an acceptance of the authority of the game. Besides the main function of the lusory attitude in creating a space wherein play can take place, the lusory attitude also has several other characteristics worth noting. These characteristics are directly tied to the motivation of the player. The next section outlines these characteristics of the lusory attitude and the manner in which it relates to motivation.

6.4. CHARACTERISTICS OF THE LUSORY ATTITUDE

The lusory attitude presents several characteristics that can be identified by analysing the process of engaging with a game. The first characteristic of the lusory attitude is a pull or a need to engage with a game and experience playing the game. The pulling power of a game depends on the games that

people have played before, personal tastes and, of course, a willingness to submit time to the completion of the activity (Juul 2010:4). Before the game starts, the player is usually primed in some way. This may be a result of reading the rulebook for a boardgame or seeing a cutscene in a digital game. This pull that is experienced by the player toward a game relates to the arousal aspect found within the experience of motivation as discussed earlier. The player would seek out the optimal hedonic or pleasant state of arousal, which would constitute either a state of relaxation or excitement (as opposed to a state of boredom or anxiety). Thus, the lusory attitude shares a mutually beneficial relationship with these states. The lusory attitude is aided by both relaxation and excitement whilst also perpetuating these states as the same time.

Once a player has experienced sufficient arousal and chosen to engage with a game, the structural elements of the game itself become a more prominent factor influencing the lusory attitude of the player. A large part of the play experience is related to the goals that players are trying to reach when entering a game. In order for players to have interesting decisions to make during a game, there need to be goals involved in the process and the challenges presented in a game is often the result of trying to achieve these goals. Players in a game are aware of their own goals, the goals of other players and play toward reaching these goals. It is an understanding of this intention that establishes the social meaning of a game (Juul 2010:126). This is another important characteristic of the lusory attitude: establishing or understanding the goal of the game and the subsequent concious movement toward that goal by overcoming challenges.

Earlier, I discussed the goal component related to motivation. The lusory attitude drives the adoption of goals presented during the game and the movement toward these goals. Yet, paradoxically, this also promotes participation in the game for the sake of the activity. From this, the conclusion can be drawn that the lusory attitude is aligned with both the telic and paratelic meta-motivational states.The player understands that the goal and associated actions in the game bear no significance outside of the game

space itself, yet the lusory attitude allows the player to take these challenges seriously at the same time.

The goals of the game are given meaning through the rules of the game (McLaughlin 2008:28). The rules of a game specify the means that a player can use to reach the goal of the game. These means often involve restrictions and generally indirect approaches. Suits (1978:28) uses the example of golf to illustrate this aspect. The aim of golf is to sink the ball into a small hole. If this were a matter of efficiency, the person would simply pick up the ball and drop the ball in the hole. However, the rules of golf specify that the ball must be sunk using strokes from a club. Thus, it does not completely ignore efficiency, as one might actually be quite efficient at hitting a ball with a metal club and sinking it in the specified hole. However, the means specified does hamper the most efficient manner of acting in accomplishing the said goal in relation to the same challenge in a real world space.

Keeping this inefficiency in mind, another characteristic of the lusory attitude is an openness to the possibility of taking indirect means to reaching player goals by following the specified rules of the game (Salen & Zimmerman 2004:97). The lusory attitude of a player allows for the adoption of rules "which require one to employ worse rather than better means for reaching an end" (Suits 1978:38). In essence, along with the lusory attitude comes a certain type of acceptance of inefficiency. Gadamer (1989:107) sheds further light on this aspect of the lusory attitude by stating that it:

> …. determines exactly why playing is always a playing of something. Every game presents the man who plays it with a task. He cannot enjoy the freedom of playing himself out except by transforming the aims of his behavior into mere tasks of the game.

When engaging with games, the challenges presented by the rules are often unrelated to the real world and are only meaningful in terms of the goals set out in the game. According to Douglas McLaughlin (2008:36), the lusory attitude indicates a "problem-seeking and problem-appreciation stance that one takes in or toward the world". The lusory attitude entails a specific manner

in approaching the challenges presented by the game and provides a logical basis for addressing these “unnecessary problems”. It is this attitude that allows players to gravitate to situations that are sufficiently challenging and also to accept the possibly unnecessary nature of these challenges. Mclaughlin (2008:107) elucidates this aspect of the lusory attitude by providing the following insight:

> The meaning that the lusory attitude ascribes to participants in a task or a game is extraordinary. It allows participants to discern worthwhile experiences that provide sufficient challenge and also enhances and preserves the very experience itself by providing conventions and community to the task at hand.

From this insight, it becomes clear that the lusory attitude provides the player with a way to approach challenges in a positive manner. In this light, the lusory attitude becomes very important in the relationship between players and the challenges found within games. The difficulty presented by the challenges found in the game is important for the player interacting with the game (Juul 2010:39-40). Players seek out difficulty in games and lose interest if the game is not difficult enough. Games hinge on interesting decisions and are designed to instigate and propel players forward by presenting these dilemmas. Decision making in a game should be designed to keep a player in a space between challenge and boredom by presenting challenging scenarios (Hiwiller 2016:101). In approaching these challenges, the player may also experience failure and a lusory attitude that may in fact facilitate and aid the player in dealing with this failure.

According to Juul (2013:2), people generally seek to avoid failure but are drawn to games and will most likely be forced to encounter the feeling of failure. Failure is an integral element in a game and allows players to reassess their strategies and approaches by actively encouraging and proliferating feelings of inadequacy and humiliation in defeat (Juul 2013:9). Even though the argument can be made that games are separated from real life (taking place in the magic circle separated from reality) and as a result the failure experienced is not as serious. However, the truth remains that one will

still react as if the failure is monumental and worthy of reaction – as if it does mean something (Juul 2013:4). The last characteristic of the lusory attitude is that it allows for the player to better handle the experience of failure. It allows the player to adapt the experience of failure as a motivational tool to get better at the game. When playing a game, even though one might experience the feeling of inadequacy, the promise of becoming better is also inherent in the game if one were to continue playing (Juul 2013:7). The lusory attitude promises redemption – that is, a fair chance to get better.

Following this discussion, the nature of the lusory attitude can be summed up in the following manner. Firstly, it is a necessary component to elicit and establish play when engaging with a game. The lusory attitude starts with arousal – a need to engage with the formal elements of a game to elicit play. The player employs the lusory attitude when engaging with a game: firstly by accepting and acknowledging the goals of the game and subsequently by accepting and following the more or less inefficient means laid out in order to reach these goals. The means to reaching these goals present challenges and interesting choices. The lusory attitude enables the player to assess and appreciate the difficulty of the problem at hand, whilst simultaneously allowing the player to experience and transcend the failure that may arise from trying to beat the challenge at hand. Once the player employs the lusory attitude and successfully fulfils the conditions mentioned previously, gameplay may emerge from the interaction between the player and the game. The next section considers the manner in which adopting a lusory attitude may be helpful in the creative problem-solving process.

6.5. THE LUSORY ATTITUDE, PLAY AND CREATIVITY

As previously mentioned, the attitude of the creative problem-solver influences the experience and outcome of the creative process. Similarly, it should also be apparent that the attitude of the player going into a game has a profound influence on both the experience of the game and consequent gameplay that is derived from that interaction. Bearing this in mind, one can

start to glimpse the value and benefits that the lusory attitude could potentially hold for creative problem-solving. Basically, if the creative problem-solver can adopt the attitude of a player entering or playing a game, it is possible that the problem-solver may derive more pleasure from the process and stand a higher chance of eliciting gameplay to aid in solving the problem at hand. In this section, I attempt to elucidate the value and effects of approaching the creative process with a lusory attitude. It is my contention that the lusory attitude can be beneficial to the creative process in two ways: firstly, it can direct the approach toward the problem at hand and, secondly, it can affect the manner in which the process is experienced.

The lusory attitude may improve the way in which creative problem-solvers approach problems initially. From the discussion on the characteristics of the lusory attitude, it should be clear that it entails a large amount of positivity. Creative problem-solving benefits from a positive mindset directed at problem finding (Basadur & Basadur 2011:86). If this is taken into account, by adopting a lusory attitude going into the creative process, the creative problem-solver adopts the suggested positive mindset. This positive mindset may influence the motivation and subsequent arousal the creative problem-solver feels to engage with the problems presented. The problem-solver may experience a pull or need to engage with the creative process as a result of a lusory attitude – very similar to the pull a player feels in terms of a game. The creative problem-solver is primed for this arousal through an introduction to the brief or context of the problem. McLaughlin (2008:117) describes the lusory experience as “not merely valuing something intrinsically, but intrinsically valuing both a gratuitous problem” and “the necessary problem-solving associated with it.” Thus, the lusory attitude may inherently make problems and the means toward solving them more appealing. The lusory attitude arouses the problem-solver and prompts them to engage with curiosity and positivity.

Once the creative problem-solver decides to engage with the creative process to solve the problem, the lusory attitude has further functions. It may aid in framing the ill-defined problem at hand to discover the rule set and goal of the

problem space. McLaughlin (2008:117) describes game experiences as "confrontations with just-right problems". The term "just-right problems" refers to problems constructed by human thinking and logic. This suggests that reframing the creative problem accordingly, whilst employing a lusory attitude toward the problem, may in fact allow the creative process to more closely resemble a game. Subsequently, once the problem has been framed and defined, the lusory attitude allows for interactions with the problem that is likely to facilitate the emergence of gameplay in the process. If the problem is not framed in the right way, seemingly too easy or too hard, then the process will not be conducive to the emergence of gameplay and may even be detrimental to the adoption of a lusory attitude going forward. Paradoxically, it may be the initial adoption of a lusory attitude that allows for the creative process to be shaped in such a way to allow for the ongoing adoption of the lusory attitude. Once a problem is framed properly, the goal of the problem space becomes clearer. The lusory attitude may aid the movement toward this goal in the creative problem-solving process.

During a game, the lusory attitude facilitates the acceptance of the goal and the rules, as well as the means for reaching these goals. Relating this to the creative process, a creative brief or situational problem initially presents a broad goal to be reached by the creative problem-solver.[14] As discussed previously, at this point the goal is not clear and the problem space is ill-defined. However, by framing the problem properly, the goal can be narrowed down and the actions needed to reach the goal can be properly defined.[15] Here I return once more to the idea of flair as mentioned previously in Chapter Two. Flair involves not only using creativity to more fully specify the goal of a problem space to a greater degree, but also finding different means of reaching this goal (Gaut 2009:89-91). These means may include following certain rules, but the manner in which these rules are applied or interpreted makes for creative outcomes. I would argue that the concept of flair displays a

[14] Grey *et al* (2010:5–6) refer to this as "fuzzy goals" that give a direction to the process but also leaves space for interpretation and intuition.
[15] Grey *et al* (2010:8) also note that movement toward these types of goals are aided by an emotional connection to the project. The goals are also progressive in nature and change as the creative problem-solver learns more about the problem space.

great deal of overlap with the lusory attitude. It concerns the way that the creative problem-solver applies their attitude and approach to solving the problem. Once the goal is defined, it is up to the creative problem-solver to discover or employ a rule set that will allow the creative problem-solver to fulfill the goal in an unexpected manner. These rules and means need to contain some level of challenge to create interesting decisions.

When the goals of a game and the means to reaching them are presented to or imposed upon the player, it follows logically that actions are selected to try and meet these goals. In turn, these rules and inefficient means create difficulty, challenge and interesting choices. Juul (2013:30) describes games as the "singular art form that sets us up for failure and allows us to experience and experiment with failure." I would argue that the creative process is a space where the same thing happens. The means chosen to reach the goal in the creative problem-solving process may present difficult challenges, even resulting in the failure of the creative problem-solver at certain stages during the process. An important function of the lusory attitude is to make failure experienced in games palatable and even enjoyable. Similarly, employing a lusory attitude during the creative process, could also allow the problem-solver to rise above the failure and accept it as a part of the process. The lusory attitude allows the creative problem-solver to adopt the goals of the process as their own and acknowledge the possibly inefficient means by which the goal can be reached. The goal of the activity combined with the lusory attitude may also help to engender the experience of flow in process. This has a direct impact on the enjoyment experienced during an activity.

Flow or optimal experience is present in many activities where play is present and, if certain conditions are met, can be present in other activities as well (Csikszentmihalyi 2014a:136). The experience of fun in the creative process and in-game playing can be linked through the experience of flow as this is a phenomenon most often observed in these activities (Csikszentmihalyi 2014a:137). Descriptions of the flow state in games and in creativity share similar characteristics. However, the manner in which games are designed allows for a more effective experience of the flow state than necessarily the

experience of the creative process. Thus, it is possible that through the adoption of a lusory attitude the creative process may resemble more closely the structure of a game and by extension heighten the possibility of entering the flow state.

There are a few factors that need to be observed in order to make the state of flow possible. Flow is facilitated by conditions where there is an opportunity for action or a perceived challenge that does not exceed or underutilise the participants' existing skills creating the perception of engaging with the task at an appropriate level. Furthermore, the task must be facilitated by a clear goal and immediate feedback regarding the progress towards the goal should be present (Nakamura & Csikszentmihalyi 2002:90). If a problem has been framed properly to present a clear goal and the means chosen to reach that goal is sufficiently challenging, then the conditions to facilitate flow has been put in place. With these conditions in place a state of seamless experience can be established that exhibit characteristics such as:

1. Intense concentration
2. A merging of action and awareness
3. A loss of self-consciousness
4. A sense of control over ones actions
5. A loss or distortion of sense of time
6. The sense that the experience of the activity is intrinsically rewarding (Nakamura & Csikszentmihalyi 2002:90).

In many cases where flow is present, the participation in the activity is often the reward itself. The flow experience is thus autotelic in nature and appears to not require external rewards or goals external to the activity itself (Csikszentmihalyi 2014a:145). In other words, when flow is present the activity is intrinsically rewarding. However, to facilitate this autotelic experience the activity needs a clear goal that can be reached and worked towards. The actions taken within the process must provide clear and consistent feedback of the movement toward the main goal of the activity to

facilitate the experience of flow. This means that there is also a telic component to the experience of flow.

The experience of flow is also more likely to come about if gameplay is involved in the process. Gameplay is a type of play that is by nature designed to place the player in a state of flow as it functions in a space where challenge and skill level move along together. Thus, if the lusory attitude is helpful in establishing the necessary conditions for gameplay to emerge from the creative process the odds are also that the lusory attitude could also be beneficial to the experience of flow in the creative process. As the flow state is also associated with enjoyment, by extension, the employment of the lusory attitude may in fact heighten the enjoyment experienced throughout the creative problem-solving process as a whole.

6.6. CONCLUSION

This chapter explored the influence of individual motivation and attitude in eliciting gameplay and enjoyment from both games and creative problem-solving. Both games and creative problems have the inherent capacity and necessary elements to facilitate the emergence of gameplay. However, without the necessary motivation and individual attitude, an individual might struggle to elicit gameplay by participating in these processes. It is therefore important to understand the aspects of motivation and attitude that will facilitate this. Motivation directly influences the attitude adopted by an individual.

The first section explored motivation through the lens of reversal theory as put forth by Michael Apter. Basically, opposing states of mind can drive motivation during the experience of executing a task. Individuals inhabit and switch between these opposing states of mind during the experience of a task and as a result the motivation and attitude of the individual is also affected. There are two basic aspects that affect the motivation of an individual: the arousal to participate in a task and the goal of the task at hand respectively. These

aspects consist of further meta-motivational states.

Arousal is affected by anxiety-avoidance and excitement-seeking. If individuals experience a high enough level of either states they will be aroused and primed to participate in the necessary activity. The state of excitement or relaxation is usually associated with games and creativity. The goal of an activity can also be a driving force for motivation. This aspect is influenced by telic and paratelic states. In a telic state, the pleasure and motivation of participating in a task is driven by the completion of the end goal of the task. In a paratelic state, pleasure and motivation for participating in a task is simply the act of participation and not the drive to complete the final goal. In terms of games and creativity, both of these states may influence the motivation to participate. In general one can see that games are more readily aligned with the most positive aspects of motivation, whilst the motivation to participate in the creative process may be slightly more complex.

When considering the motivation of a player to participate in games, one can see a clear attitude that informs his or her approach toward a game. This attitude is known as the lusory attitude. This concept describes an attitude that not only benefits the experience of games but is completely necessary for games. The lusory attitude essentially binds the elements within a game together in order to elicit game play and enjoyment. The lusory attitude allows the player to establish a space separate from reality (the magic circle) in order to experience the play of the game and allows the player to submit to the process of playing the game. The player and the game can be viewed as separate entities that are completed and fully realised through the interaction with the lusory attitude.

The lusory attitude exhibits several characteristics in relation to games. Firstly, it allows for sufficient arousal to motivate a player to participate in the play of a game. The second characteristic of the lusory attitude is that it allows the player to submit and essentially accept the goals of the game as his or her own. Not only that, the lusory attitude also allows the player to accept the means to reaching these goals. This is significant, as the means for reaching

goals in games are often roundabout and unnecessarily inefficient. In essence, the lusory attitude facilitates an acceptance of “unnecessary problems”. The means and goals of the game space also provide the player with challenging decisions and activities. The third characteristic of the lusory attitude is that it allows the player to better handle the experience of failure in relation to these challenges. Overall, the lusory attitude engenders a positive mindset with which the player can approach games and through a combination of these characteristics, allows the player to elicit gameplay and the associated enjoyment from game systems.

This attitude can also be useful when approaching the creative process. The main argument here is that the lusory attitude is a key component for eliciting the gameplay necessary to aid in problem-solving during the creative process. Firstly, the lusory attitude allows the creative problem-solver to approach the creative process with the enthusiasm and positivity necessary for success. In other words, it arouses the creative problem-solver in a positive manner. Secondly, the lusory attitude may aid the creative problem-solver in framing the elements of the problem space in such a way as to facilitate the emergence of gameplay. This would entail discovering the constraints and the goal of the problem space. Once these elements have been established, the lusory attitude allows the creative problem-solver to submit to the goals of the process but also allows the problem-solver to actively reject the most efficient means of reaching the goal in order to explore more inefficient and challenging means to reaching the end goal. This in turn may result in more creative outcomes in solving the creative problem. The lusory attitude may also allow the creative problem-solver to tolerate the experience of failure during the creative process more effectively. Lastly, the lusory attitude allows the creative problem-solver to access the flow state that is a key factor in facilitating enjoyment in the creative process.

From this discussion it should be clear that the personal approach and associated attitude of the creative problem-solver toward the creative problem-solving process plays a big role in eliciting both gameplay and enjoyment. The combination of personal attitude and the elements inherent in

the creative process make this a possibility. The next section concludes the study and reflects on the insights and contributions gained from this exploration.

CHAPTER SEVEN: CONCLUSION

7.1. SUMMARY OF CHAPTERS

This study set out to investigate the conceptual overlap between creativity and games in order to unpack the role and value of gameplay in creative problem-solving. This chapter serves as a conclusion to the research. Here I discuss key insights gained throughout the course of the study, and provide an overview of the limitations of the research and suggestions for further research. Before I do that, however, I provide a summary of the arguments presented in each chapter to encapsulate the approach of each section.

Chapter Two served as a locus for the study and laid the necessary foundation from which the seemingly dissimilar areas of creativity and games could be addressed from a common vantage point. The connection drawn by Paul Rand (1965:156) between gameplay and creative problem-solving served as the springboard that allowed for comparisons to be drawn between games and creativity. The first section of Chapter Two addressed the issue of providing a comprehensive working definition for creativity and investigating the role of creativity in problem-solving. By drawing on definitions from various sources it became clear that creativity could be defined as the intentional production of ideas that are considered new, valuable and surprising. Creativity is applied in the many different disciplines (creative design being a notable example) in an effort to solve problems. The problems that require creativity to solve often have a very specific nature are prevalent in the design discipline.

Problems generally indicate a sort of gap – a space between where the creative problem-solver is and where he or she wants to be. The creative problem-solver must find a way to move from one end to the other and often relies on the creative process in order to achieve this This study identified two different types of problems that may be traversed: ill-defined and well-structured problems. Well-structured problems are those problems where the

boundaries and means to solving the problem are abundantly clear. It is simply a matter of following steps to solve the issue. This is certainly handy in day-to-day life but in situations where creativity is necessary it is hardly useful. The other type of problem does not have such a clear structure. The boundaries of these problems are vague, the goal of the process is barely perceived, and the means of reaching the solution are not clear owing to the variety of ways the problem can be defined and perceived. These problems are referred to as 'wicked problems' and it is exactly these problems that creativity is used to solve. In this regard, the production of ideas plays a critical role in creative problem-solving, both as means to traverse and solve the problem at hand.

Creativity is employed in an attempt to explore and structure ill-defined (or wicked) problems where the goal of the problem and the means to reaching this goal are initially unclear. Not only is creativity a necessary means to structuring these problem spaces and reaching novel solutions, but I have argued that the creative process itself also forms a part of the ill-defined problem space for the duration of the process. This means that both the creative process and the problem space gain more clarity and structure as the process unfolds. In essence, the creative process and the problem are solved together as a unit. This unification of the creative process and the problem space meant that when referring to the structure of a problem, one is also referring to the structure of the creative process itself. This is where the overlap between games and creativity comes into play.

Paul Rand (1965:156) asserts that problems that are conducive to play are easier to solve. He also states that the same psychological and intellectual factors implicit in gameplay can be found in creative problem-solving. Seeing as gameplay is a type of play most readily associated with games, the implications of this insight became clear: it must be possible for a creative problem space to resemble the structure of a game to allow for the emergence of gameplay during problem-solving. Games are generally regarded as well-structured problem spaces in which actions and outcomes are clearly discernable. Considering creative problem-solving from this

perspective it became clear that once a creative problem reaches a well-structured state, it should contain many of the same elements that are contained in the structure of a game to allow for the emergence of gameplay specifically. The definition of games provided by Salen and Zimmerman served to demonstrate this overlap.

Salen and Zimmerman (2004: 80) define a game as “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome”. This definition essentially describes the necessary elements that comprise the structure of a game, namely: systemic properties, a form of artificial conflict, limitation or rules and an outcome about which a value judgment can be delivered. Through careful investigation and comparison it became clear that the creative problem-solving process also contained these same elements to some degree. This insight was critical on two fronts: firstly, it demonstrated that both games and the creative problem-space shared the necessary structural elements that allows for gameplay to emerge. Secondly, it provided the foundation for a deeper exploration of these structural elements and how it relates to creative problem-solving process.

Chapter Three sought to examine the conditions under which play (more specifically gameplay) may emerge from the creative problem-solving process. This chapter presented an examination of the progression of play in the creative problem-solving process and sought to pinpoint when exactly gameplay may emerge from the creative problem-solving process. In order to do this it was necessary to explore the different types of play as outlined by Salen and Zimmerman in more detail and how this correlated with the different stages of creativity and creative problem-solving. This chapter made an argument that play emerges as a result of decision making in both games and creative problems.

Initially it was important to establish a separation between the concepts of games and play. These concepts are often conflated, sharing a “paradoxical union” (De Koven 2013). Play is a necessary and crucial component of games but play does not necessarily need the presence of a game to manifest itself.

It was necessary to avoid such a conflation in order to more succinctly describe the way in which play may emerge from certain structures. In this regard, following on the definitions of theorists such as Caillois and Huizinga, Salen and Zimmerman (2004:304) provide a more open-ended and encompassing definition of play as “free movement within a more rigid structure”. In keeping with this definition, play is seen as an expression of the system in which it takes place. In other words, the movement generated by the player within the structure is what allows for play to emerge from the structure itself. I argued that decision making in a game structure is at once the manner in which one creates movement inside the game structure and consequently is also the manner in which one allows play to emerge from the structure. These insights highlighted the importance of decision making as a means of progress and play within both games and creative problem-solving.

In aid of this insight, Salen and Zimmerman (2004:316) provide a three-part model that encapsulates the way in which decision making in a game structure simultaneously provides input to the game system and also allows progression toward an expression or an outcome in that same system. An internal decision made in the game by the player is followed by an action taken within the game system. This action changes the game state and creates an outcome that the players can react to. This cycle proceeds until the end of the game has been reached and the system has expressed a potential outcome. This indicated that the emergence of gameplay hinges not only on decision making but also on a specific type of decision typically found in games. These decisions offer a clear, challenging means toward reaching an outcome and also clear discernable feedback on the changes that happen in the system as a result of that decision. This insight served to demonstrate even more emphatically the special nature of gameplay and its relationship to the structure that envelops it.

Following on the insights outlined above, I proposed that decision making fulfills a similar function in creative problem-solving as a means of creating movement and eliciting play. A creative problem represents a vast space of potential and, in order to explore this space and reach any type of outcome, it

is necessary to make decisions to create movement and direction within this space. These decisions are also the means by which play may emerge within the creative problem-solving process. However, as I have pointed out, it is not just any decision that elicits gameplay. For gameplay to happen, decisions should be coupled with a clear, present goal and a challenging means for reaching the goal whilst also providing discernable feedback on the impact of the decision within the creative problem-solving process. This means that the creative problem needs to reach a well-structured state (similar to that of a game) before it is possible to elicit gameplay from the creative problem-solving process. This insight indicated that the type of play elicited and experienced in the creative problem-solving process might change depending on the current state or structure of the problem.

There are three categories of play as proposed by Salen and Zimmerman (Salen & Zimmerman 2004:303). These are respectively: being playful, ludic activities, and gameplay. Each of these categories is progressively more formal and directly relates to the structure from which it emerges. In other words, the more defined the structure, the more formal the type of play. Playfulness is the most open and least formal category of play, whilst gameplay is the most controlled and formal. I proposed that there is an analogous movement through these types of play (from less to more formal) as the creative problem space progresses from less to more structured. In essence, just as the creative process grows more structured through decision-making and problem-definition activities, so too does the play that the process elicits. It can therefore be contended that when Rand mentions that a problem conducive to gameplay is easier to solve, he means that a problem should be well-structured and defined with a clear goal and a challenging means for reaching that goal. The goals and the means for reaching the goal are usually encapsulated in the rules of a game and as such the rules of a game have a special bearing on the decision making in these structures. I believe creative problem-solving uses rules or limitations to similar effect.

In order to show the manner in which rules serve to create the structure for decision making it became necessary to focus on the nature and function of

rules and constraints in both games and the creative problem-solving process. Chapter Four provided an overview of the manner in which rules create a structure from which gameplay can emerge through decision making. Game rules often have explicit requirements and clear cut boundaries, usually stated as a goal or endpoint to be reached (Holopainen 2011:39; Hughes 1999:101). The rules of a game also usually specify the means toward reaching the end goal and these means are often inefficient and challenging. It is this very quality that allows gameplay to emerge from the decisions made within game structure. If the means for reaching the goal of the game does not limit or challenge the player to some extent, gameplay would not emerge from the interaction between the player and the structure. The structure that rules create within a game is the engine that drives decision making and the resulting gameplay.

Essentially, the rules of a game aid in the construction of a state machine: a systemic phenomenon that allows for input in the form of decisions and then responds by providing some kind of output (Juul 2005:60). This aligned with the experience of a game as described by Salen and Zimmerman in Chapter Two. The state machine relies on emergence to reach new outcomes and possibilities allowed by the specified rules. Emergent rule sets continue to offer new experiences and different permutations of the same rules (Salen & Zimmerman 2004:165). In other words, emergence is the quality that rules possess that allows the same set of rules to reach different, novel outcomes as a result of their interaction. The reaction of the player to these permutations of the rules in trying to reach the goal is the locust of gameplay. Often the inefficiencies and challenges that allow for gameplay decisions arise as a result of the emergent interaction of the rules within the state machine.

Creative problem-solving relies on rules and constraints in a similar fashion. However, creativity shares a paradoxical relationship with rules. Restrictive rules can easily inhibit creative problem-solving activities but rules also provide a means to structure creative problem-solving for surprising output. As with games, the creative problem-solving process is geared toward bringing about some kind of end goal or solution state. In addition, the

outcome brought about in a creative problem needs to be novel and surprising. I argued that both the novelty inherent in the solution of a creative problem and the gameplay experienced in the process of generating that solution is based on a state machine similar to the one constructed by the rules of games. Creative problem-solving relies on the emergent quality of the constraints employed within the problem space to bring about a unique or novel solution. It is also these same constraints that serve to create the challenge and inefficiency that produce gameplay through decision making. In summation, rules and constraints create a similar structure in both games and creative problem-solving which then lends the system the characteristics necessary to produce gameplay.

The next section of the chapter was dedicated to exploring the types of rules or constraints shared by the creative problem-solving process and games. According to Salen and Zimmerman (2004:130), games contain three different categories of rules, namely: operational rules, constituative rules and implicit rules. Similarly, according to Stokes (2005:8) the creative process features domain constraints, talent constraints, cognitive and variability constraints. I drew correlations between the categories of rules in games and the constraints found within the creative process. Even though strong correlations exist between these types of rules and constraints, one glaring gap became evident. Unlike a game structure, there is no external source that relays a set of rules to the creative problem-solver. It is therefore up to the creative problem-solver to discover or choose the rule set informing the creative problem-solving process in order for it to resemble a game structure.

Chapter Five explored the process involved in discovering rules and constraints within the creative problem-solving process. As noted previously, this is the most significant aspect that sets game structures apart from the creative problem-solving process in relation to rules. In addition, the constraints that the creative problem-solver chooses to employ have a direct effect on the outcome of the process. In order to structure the problem space to resemble a game and successfully elicit gameplay, it is necessary for the creative problem-solver to have a way to assign or discover the constraints

governing the process. In aid of this venture, I proposed a basic framework with three steps or stages that sought to outline the process involved with discovering rules or constraints in the creative problem-solving process. This framework is by no means completely comprehensive, but it can possibly provide the first steps to a more in-depth methodology of rule discovery. The stages that comprise the framework are respectively: applying heuristics to the problem space, recognising or “grokking” the patterns in the problem space and, finally, using reflective judgment to assign rules to the elements uncovered in the process.

The first part of the framework described and explored the application of heuristics to the problem space. The application of heuristics is a means for reducing the potential of the problem space in finding a useful direction for exploration in the problem space. Given the large, almost infinite, possibilities the creative problem-solver faces when a problem is still ill-defined, a method is necessary by which the creative problem-solver can gain direction or that allows the creative problem-solver to make a best guess as to which aspects of the problem space should be explored. There are many different heuristic methods that can be applied. This includes activities related to information discovery and methodologies for producing variations on ideas to name but a few. The creative problem-solver may select and vary their choice of heuristics as more information about the problem is uncovered. To this end, comprehensive knowledge of the stages of the creative problem-solving process may be helpful in aiding the creative problem-solver in selecting or adapting to the most appropriate heuristic activities at certain points in the process.

After the creative problem-solver has delineated a direction in the problem space, the creative problem-solver starts to take action and make decisions in the problem space that produces outcomes and results associated with the process. These outcomes or results may include different thoughts, ideas or artifacts. As the creative problem-solver continues to tinker with the problem, they may start to recognise reoccurring patterns, behaviours and elements in the problem space. This recognition may be based on an intuitive, almost

subconscious, understanding of the problem space itself rather than an overt, cognitive analysis. This phenomenon is known as “grokking”. The term “grok” describes the phenomenon of pattern recognition and intuitive understanding that players develop during their interaction with games (Koster 2005:28). When the creative problem-solver “groks” the problem space this does not necessarily mean they explicity know the rules or constraints that inform the problem space or their decisions within it. The creative problem-solver may in fact be enforcing rules and constraints subconsciously as a result of having built an intuitive understanding of the patterns inherent in the space. However, once this understanding has developed the creative problem-solver may start to uncover or assign rules to his or her process.

The creative problem-solver can apply reflective judgment to assign or discover a set of rules to the elements generated in the process (Kant 1987:19). The ability to do this requires the creative problem-solver to subscribe to the principle regarding the finality of nature. The principle of finality is the belief that all phenomena are embedded in some system or pattern. It is this fundamental belief that enables the creative problem-solver to search for the pattern governing the creative problem-solving process. In doing so, the creative problem-solver in essence selects constraints that he or she feels describes or fits the system governing the problem space best. These constraints are related to the goal of the problem space and directly inform the means for reaching this goal. Constraints are selected that have a likelihood of producing novel outcomes in the process. Once the creative problem-solving process is completed, the rules or constraints selected in the process become abstracted from the outcome itself. In other words, the rules informing the production of a creative solution can become a set or standard that can be followed by others.

The framework in this section provided an overview of the steps involved in generating constraints in the creative process. This framework provides a technical perspective upon the creative problem-solving process and how it may gain structure through the selection and use of rules and constraints. It is this structure that ultimately allows the creative problem-solving process to

resemble a game structure and allows for gameplay to be elicited. However, this framework does not consider the personal psychological factors of the creative problem-solver in eliciting gameplay. This was the last aspect to be considered in this study.

Chapter Six addressed several key psychological factors involved in the experience of eliciting gameplay. The main attitude that aids in eliciting gameplay from a structure is known as the lusory attitude. In this chapter I sought to draw a comparison between the approach of a player to a game and the approach of the creative problem–solver to a problem in order to uncover the personal elements that may be beneficial in adopting this attitude. Here, motivation plays a key role. The motivation of the player directly influences the attitude with which a game is approached. Presumably, the same holds true for the creative problem-solver. Therefore, exploring the mechanics of motivation before investigating the lusory attitude itself becomes necessary.

I used the model of reversal-theory as proposed by Michael Apter to explore and explain the motivation that accompanies or informs the attitude of both the player and the creative problem-solver. In essence, Apter states that motivation is informed by two respective elements, namely: arousal to take part in an activity and the goal of the activity itself. Motivation has an intensity component (arousal) and a directional component (goal orientation). Each of these components feature meta-motivational states that can be experienced in terms of the continuum between pleasure and displeasure. Arousal is composed of meta-motivational states related to excitement-seeking and anxiety-avoidance and goal orientation is affected by telic and paratelic meta-motivational states. Essentially, motivation to participate in an activity is highly influenced by the pleasure associated with the activity.

Firstly, arousal can be induced either as excitement-seeking or anxiety-avoidance. If arousal is experienced as a function of excitement-seeking, an increase in excitement results in more pleasure, whereas a reduction in excitement results in less pleasure. Similarly, if arousal is experienced as a

function of anxiety-avoidance, an increase in relaxation causes more pleasure whilst an increase in anxiety causes displeasure. The manner in which the goals of an activity are approached also influence the motivation to participate in the activity. In a telic state, the pleasure in experience comes from movements towards the end goal of the activity. Movement away from the goal could be experienced as displeasure. Conversely, in a paratelic state, pleasure in experience comes from the immersion and participation in the activity itself without an overt movement toward the end goal of that activity. In this state, direct movement or overt focus on external goals could detract from the pleasure experienced.

When considering motivation in terms of approaching and playing games, it becomes clear that the motivation to participate in a game is aligned with the most positive aspects of arousal and goal orientation. In terms of arousal the more excitement felt or relaxation induced in participation, the greater the pleasure experienced. Equally, whilst the final goal of the game might be important to the game, the player may also enjoy the activity of playing for the sake of the activity itself. The player oscillates between these meta-motivational states in terms of both arousal and goal orientation in order to keep a state of positivity related to the activity of playing the game. These positive aspects of motivation directly inform the adoption of the lusory attitude of a player when entering into a game. I made the argument that the lusory attitude functions similarly in both game structures and the creative problem-solving process.

Players employ the lusory attitude in order to facilitate the structure of a game and elicit gameplay. The lusory attitude is crucial to binding the separate elements (rules, goals, objects etc.) of a game structure together. The lusory attitude allows the player to set up an imaginary space wherein the game can take place, known as the magic circle. The magic circle constitutes an imaginary space where a game takes place and is formed when players decide to employ the lusory attitude and take part in the play of a game (Salen & Zimmerman 2004:94 - 95). The lusory attitude is essentially an attitude of submission. It allows the individual to submit to the process of playing a game

and provides acceptance of the goals and rules of the game as their own. The lusory attitude also displays a number of characteristics. It engenders and promotes positivity (presumably perpetuating the motivational state that informs it), promotes a motivated attitude toward challenge and inefficiency and also allows the player to handle failure better and ultimately allows the player to elicit gameplay from the game structure.

The creative problem-solver can also employ the lusory attitude in order to experience the benefits listed above. The lusory attitude can engender positivity toward the challenges inherent in the creative problem-solving process. This allows the problem-solver to establish a space separate form reality much like the magic circle in a game. In doing so, the creative problem-solver is less susceptible to failure during the process. It also allows the problem-solver to gain a tolerance for more inefficient means selected for reaching the goal of the problem. These same supposedly inefficient means may lead the creative problem-solver to more original and novel outcomes. The most important factor however is that the lusory attitude allows the creative problem-solver to approach the creative process in such a way as to elicit gameplay. This is clearly useful for solving problems and reaching novel outcomes in the creative problem-solving process.

This concludes the chapter overview of this study. It should be clear by now that creative problem-solving and games share a great deal of overlap – both in the manner in which they function and in terms of the elements inherent in these structures. This discussion has essentially demonstrated three things: Firstly, it is indisputable that gameplay can be elicited in the creative problem-solving process, as the structural elements inherent in games are also present in creative problem-solving. Secondly, there are certain factors that are associated with gameplay and these factors undoubtedly contribute in eliciting gameplay. Lastly, this discussion demonstrated that gameplay is not only important in creative problem-solving but may in fact be a crucial component. The next section will elucidate these insights and describe the contributions of this study.

7.2. CONTRIBUTIONS OF THE STUDY

The main aim of this study was to provide a thorough investigation of the overlap between games and creativity specifically regarding the manner in which gameplay aids the creative problem-solving process and how it is possible to elicit gameplay from the creative problem-solving process. Up to now, there has been very little serious consideration or investigation into the significance of the overlap between games and creativity. This is especially apparent in the obvious lack of material directly addressing the value of gameplay in creativity. Therefore, the first contribution of this study was in outlining exactly why gameplay is so useful in creative problem-solving.

Gameplay is conducive to creative problem-solving because it is so readily associated with indirect, challenging decision making. When eliciting gameplay from a problem space, the decisions are necessarily challenging because of the indirect means selected toward reaching the goal. This bodes well for the creative endeavour seeing as unconventional and challenging means may lead to more original and novel outcomes. When gameplay emerges from an interaction with a system, it alleviates pressure and facilitates acceptance of the many (sometimes unnecessary) twists and turns that are the side effects of the challenging means chosen to reach the final goal. Considering the nature of the creative problem-solving process and the uncertainty inherent therein, gameplay assists in tolerating ambiguity when moving towards the final goal or solution. It is more likely that gameplay will emerge from the creative problem-solving process when the final goal has been more clearly delineated. However, even with a clear goal, ambiguity and uncertainty remain until the problem has been solved.

Gameplay is also associated with the state of flow and enjoyment. Flow and gameplay and their reasons for appearing are both based on similar conditions. These conditions include a clear goal, feedback on movement toward that goal, and a sense of challenge. This means that when gameplay is elicited through interaction with a creative problem, the chances are also that that the creative problem-solver may elicit a sense of flow. As mentioned

before, flow is associated with fulfillment and enjoyment. In essence, by structuring the creative problem-solving process to elicit gameplay, it improves the journey of creative problem-solving whilst also meaningfully adding to the process at hand.

This study also more closely investigated the apparent parallels between the structure of the creative problems and games. The creative problem-solving process and games share many of the same characteristics, as I have demonstrated through explicit comparisons. This allowed me to conduct a more direct and meaningful investigation into the way that rules and constraints function, as well as clarifying how they are selected, within the creative problem-solving process. While there are some studies that clearly address the role of constraints in the creative process (see Stokes 2005), very few have ventured to address the manner in which these rules or constraints get discovered and subsequently applied. This study proposed a basic outline concerning the manner in which rule discovery in the creative process functions and more specifically tried to address the shortcoming of the academic field in this regard. This investigation could lay the groundwork for further investigation into the role of rules and constraints in the creative problem-solving process and this may prove a meaningful area of investigation in future studies of creativity.

Another aspect explored and shown in this study is the idea that the creative process is not so much applied to problem-solving but actually forms a part of the problem space itself. It would seem as if creativity and problem-solving share a similarly paradoxical relationship, as is the case in the relationship between games and play. Creativity may be influenced by the structure of the creative problem but it does not necessarily need a problem to exist or be applied. However, in applying creativity to a problem space it gains structure and definition in the same manner as the problem space as the process develops. This situates creativity not as an outside force applied to problems but rather as a component of the problem itself. This insight could hold significant implications for the manner in which creative problem-solving is considered in future research. This insight also directly relates to the manner

in which play functions and develops within the creative problem-solving process.

Often, when play is mentioned in relation to creative problem-solving, it is used as a catch-all phrase that implies that play is a static, unchanging phenomenon. This study has demonstrated, however, that play is more nuanced when it comes to its integration and emergence in the creative problem-solving process. As the creative process and the problem space grows more formal in structure so does the type of play that emerges from the interaction between the problem-solver and problem-solving process. In some ways, the type of play that emerges from the creative problem-solving process can be used as a barometer to determine the progress and structure of the problem space.

This study also introduced a prominent link between the lusory attitude and the creative problem-solving process. It also drew a direct comparison between the motivational states that influence the lusory attitude. The lusory attitude is an aspect that is rarely addressed even in literature concerning games and play and even more rarely in literature concerning creativity. This study thus demonstrated the benefits that the lusory attitude holds for the creative problem-solving process and the way in which it can be employed to the benefit of both gameplay and pleasure in the creative process.

7.3. LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR FURTHER RESEARCH

As with all studies, there is space for further exploration on all fronts. Firstly, even though this study demonstrated key ways in which the structure of creativity and games are similar, many elements can still be expanded upon and explored in more depth. This includes looking at the systemic properties of the creative process more closely, exploring the significance of the artificial conflict between the creative problem-solver and the creative process and the psychological impacts thereof.

When considering this study from the perspective of ludology, many prominent links were drawn between topics in the creative field and games that may hold potential for further explorations. This bridging between fields might allow other topics like game design and gamification to be approached from new angles. Even though this study situated itself within the overlap between games and the creative process I believe there is also space to explore the overlaps between game design and creative problem-solving. Approaching this subject from such a practical point of view may elucidate how the creative problem-solver can actually structure the creative problem space through game design activities intended to produce the effects of gameplay.

This study also showed the development of the creative process and play. This included the manner in which the type of play changes and matures as the structure of the creative process becomes more defined. I believe here more in depth research can be applied as well. This can include exploring in more detail the exact play activities that may emerge in the creative process as it unfolds and the manner in which it can be harnessed to further structure the creative problem space. The play activities associated with different types of play may hold some kind of significance for the creative problem-solving process.

Staying with the previous point, another limitation of this study is the fact that it did not, owing to its necessarily limited scope, address the possibility of gameplay emerging from the creative problem-solving process when the problem space is still undefined. Even within an ill-defined problem space, the creative problem-solver may partake in or initiate more structured activities in an attempt to define the problem space. This means that there exists a possibility that activities taking place during the process of structuring a problem space may in fact lead to the emergence of gameplay. Here gameplay can only be achieved given the presence of short-term goals and the means to reaching said goals. This study provided a macro overview of

gameplay and the manner in which it relates to the creative problem-solving process. However, the study fails to take into account the possibility of gameplay experiences as a result of activities undertaken in an effort to structure the problem space. This aspect can certainly be expanded upon in future studies.

The framework proposed in this study concerning the discovery and selection of rules in the creative process only presents a high-level and macro overview of the mechanics involved in that interaction. Further study and development of that framework with more nuanced and defined steps can be explored in future studies to make it more robust. It may also be possible to explore the framework from a more practical slant in order to make it more accessible from actionable, execution point of view. Further perspectives that can be explored may include a more thorough exploration of different ideational and information-searching heuristic methods, the psychological link and mechanics between grokking and intuition, and the psychological functions of reflective judgment and how it can be applied in a more practical fashion.

The study also explored the role of motivation and the lusory attitude in the creative process. Even though the study explicitly tries to show the benefits that the lusory attitude may hold for the creative problem-solving process in general, very little has been said about the psychological mechanics involved in employing the lusory attitude within the creative problem-solving process. Further studies along these lines could suggest which mindsets and psychological factors play a role in aiding the adoption of the lusory attitude within the creative problem-solving process. This could also expand the knowledge and research regarding the elements of pleasure and enjoyment within the creative problem-solving process.

7.4. CONCLUDING REMARKS

Even given the limitations of this study, I believe this study has contributed a great deal to exploring the fertile overlap between games and the study of creativity and problem-solving. The study provided a variety of vantage points present within this overlap that are very rarely addressed. I believe that exploring the field of games holds much more value for the creative problem-solving process than the scope of this study accounted for. It generally seems to be a rarely noticed and even more rarely explored field of study. Thus, in the spirit of the study and with the above-mentioned possibilities in mind, it may be safe to say: “Let the games begin”.

SOURCES CONSULTED

Abramis, D.J. 1990. Play in Work: Childish Hedonism or Adult Enthusiasm? *American Behavioral Scientist,* 33(3):353–373.

Abt, C.C. 1970. *Serious games*. Viking Press: New York.

Adams, J.L. 2001. *Conceptual blockbusting: A guide to better ideas*. Perseus Publishing: Cambridge.

Amabile, T.M. 1998. How to kill creativity. *Harvard Business Review*, 76(5):77–87.

Amabile, T.M. 1993. What does a theory of creativity require?. *Psychological Inquiry*, 4(2):179–237.

Apter, M.J. 2007. *Reversal theory: The dynamics of motivation, emotion, and personality*. Oneworld Publications Limited: Oxford.

Arsenault, D. & Perron, B. 2008. In the frame of the magic cycle: The circle(s) of gameplay in *Video Game Theory Reader 2*, edited by B. Perron & M.J.P. Wolf. Routledge: New York:109–131.

Avedon, E.M. & Sutton-Smith, B. 1971. *The study of games*. Wiley: New York

Barron, F. & Harrington, D.M. 1981. Creativity, intelligence, and personality. *Annual review of psychology,* 32(1):439–476.

Basadur, M. & Basadur, T. 2011. Attitudes and Creativity in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:522–528.

Bateson, P., Bateson, P.P.G. & Martin, P. 2013. *Play, playfulness, creativity and innovation*. Cambridge University Press: New York.

Belsky, S. 2010. *Making ideas happen: overcoming the obstacles between vision and reality*. Penguin: London.

Belsky, S. & Stella, F. 2013. *Manage Your Day-to-day: Build Your Routine, Find Your Focus & Sharpen Your Creative Mind*. Amazon Publishing: Las Vegas.

Bergen, D. 2009. Play as the learning medium for future scientists, mathematicians, and engineers*. American Journal of Play*, 1(4):413–428.

Bergström, K. 2012. Creativity Rules: How rules impact player creativity in three tabletop*. International Journal of Role-Playing*, 1(3):4–17.

Berns, G. 2008. *Iconoclast: A neuroscientist reveals how to think differently.* Harvard Business Press: Boston.

Bertalanffy, L. von, 1968. *General system theory: Foundations, development, applications*. Braziller: New York.

Biasutti, M. 2011. Flow and Optimal Experience in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:522–528.

Bjork, S. & Holopainen, J. 2006. Games and design patterns in *The Game Design Reader: A Rules of Play Anthology*, edited by E. Zimmerman & K. Salen. MIT Press: Cambridge:410–437.

Boden, M.A. 1996. What is Creativity? in *Dimensions of Creativity*. Edited by M.A. Boden. MIT Press: Cambridge:75–117.

Boden, M.A. 1998. Creativity and artificial intelligence. *Artificial Intelligence*, 103(1):347–356.

Boden, M.A. 2004. *The creative mind: Myths and mechanisms*. Routledge: New York.

Boden, M.A. 2009. Creativity: How Does it Work? in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:237–250.

Boden, M.A. 2010. *Creativity and art: three roads to surprise*. Oxford University Press: New York.

Bogost, I. 2015. *How to talk about video games*. University of Minnesota Press: Minneapolis.

Bogost, I. 2011. *How to do things with videogames*. University of Minnesota Press: Minneapolis.

Bogost, I. 2008. The Rhetoric of Video Games in *The Ecology of Games: Connecting Youth, Games, and Learning.* Edited by K.Salen. The MIT Press: Cambridge:117–140.

Bogost, I. 2007. *Persuasive games: The expressive power of videogames*. MIT Press: Cambridge.

Bohm, D. 2005. *On creativity*. Routledge: New York.

Bohyun, K. 2015a. The Popularity of Gamification in the Mobile and Social Era. *Library Technology Reports*, 51(2):5–9.

Bohyun, K. 2015b. Game Mechanics, Dynamics, and Aesthetics. *Library Technology Reports*, 51(2):17–19.

Bohyun K. 2015c. Gamification As a Tool. *American Libraries*, 46(3/4):26–26.

Briskman, L. 2009. Creative Product and Creative Process in Science and Art in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:17–42.

Buchanan, R. 1992. Wicked problems in design thinking. *Design issues*, 8(2):5–21.

Burkus, D. 2014. *The myths of creativity: The truth about how innovative companies and people generate great ideas*. John Wiley & Sons: San Francisco.

Caillois, R. 1961. *Man, play, and games.* University of Illinois Press: Illinois.

Calvillo-Gámez, E.H. & Cairns, P. 2008. *Pulling the strings: A theory of puppetry for the gaming experience*. Paper presented at the Philosophy of Computer Games conference, 8-10 May, Potsdam, Germany.

Calvillo-Gámez, E.H., Cairns, P. & Cox, A.L. 2010. Assessing the core elements of the gaming experience in *Game User Experience Evaluation*, ddited by R. Bernhaupt. Springer, Switzerland:47–71.

Cameron, J. 2002. *The artist's way*. Penguin: New York.

Cariani, P. 2009. *Emergence and creativity*. *Emoção Art.ficial*, *4*(1):21-41.

Carlson, C. 2011. The "playing" field: Attitudes, activities, and the conflation of play and games. *Journal of the Philosophy of Sport,* 38(1):74–87.

Carroll, J.M. 2012. *Creativity and Rationale: Enhancing Human Experience by Design*. Springer Science & Business Media.

Cattanach, A. 1998. The Role of Play in the Life of the Child. *Child Psychology and Psychiatry Review,* 3(3):113–114.

Christiaans, H.H.C.M. 1992. *Creativity in design: the role of domain knowledge in designing*. Delft University of Technology: Utrecht.

Chudnoff, E. 2013. *Intuition*. Oxford University Press: New York.

Clapham, J.S. 2011. Testing/Measurement/Assessment in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London: 458–464.

Conroy, S. 2012. *How to Use Heuristics in Problem-solving and Minimise Errors.* [O]. Available: http://www.constantmentor.com/what-are-heuristics/. Accessed 9 May 2016.

Consalvo, M. 2005. Rule sets, cheating, and magic circles: Studying games and ethics. *International review of information ethics*, 4(2):7–12.

Corning, P.A. 2002. The re-emergence of 'emergence': A venerable concept in search of a theory. *Complexity*, 7(6):18–30.

Costello, B. & Edmonds, E. 2007. *A study in play, pleasure and interaction design*. Paper presented at the Conference on Designing Pleasurable Products and Interfaces, 22-25 August, Helsinki, Finland.

Costikyan, G. 2013. *Uncertainty in games*. MIT Press: Cambridge.

Costikyan, G. 2005. I Have No Words & I Must Design: Toward a Critical Vocabulary for Games in *The Game Design Reader: A Rules of Play Anthology*, edited by E. Zimmerman & K. Salen. MIT Press: Cambridge:192-211

Crawford, C. 2003. *Chris Crawford on game design*. New Riders: Indiana.

Harnad, S. n.d. *Creativity: Method or Magic?* [O]. Available: http://cogprints.org/1627/1/harnad.creativity.html. Accessed 9 May 2016.

Cropley, A. & Cropley, D. 2008. Resolving the paradoxes of creativity: an extended phase model. *Cambridge Journal of Education*, 38(3):355–373.

Cross, N. 1997. Creativity in Design: Analyzing and Modeling the Creative Leap. *Leonardo*, 30(4), 311–317.

Csikszentmihalyi, M. 1975. *Beyond Boredom and Anxiety*. Jossey-Bass Publishers: San Francisco.

Csikszentmihalyi, M. 1981. Some paradoxes in the definition of play. *Play as context*, 1(1):14–26.

Csikszentmihalyi, M. 1990. *Flow: The psychology of optimal experience*. HarperPerennial: New York.

Csikszentmihalyi, M. 1994. *Evolving Self.* HarperPerennial: New York.

Csikszentmihalyi, M. 1996. *Creativity: Flow and the Psychology of Discovery and Invention.* HarperCollinsPublishers: New York.

Csikszentmihalyi, M. 1997. *Finding Flow: The Psychology of Engagement with Everyday Life.* Basic Books: New York.

Csikszentmihalyi, M., 1999. A Systems Perspective on Creativity in *The Handbook of Creativity*, edited by R.J Sternberg. Cambridge University Press: Cambridge:313–335.

Csikszentmihalyi, M. 2004. *Good business: Leadership, flow, and the making of meaning*. Penguin: New York.

Csikszentmihalyi, M. 2014a. *Flow and the foundations of positive psychology*. Springer: Dordrecht.

Csikszentmihalyi, M. 2014b. *The systems model of creativity*. Springer: Dordrecht.

Csikszentmihalyi, M. & Bennett, S. 1971. An exploratory model of play. *American Anthropologist*, 73(1):45–58.

Csikszentmihalyi, M. & Csikszentmihalyi, I.S. 1992. *Optimal Experience: Psychological Studies of Flow in Consciousness*. Cambridge University Press: London.

Csikszentmihalyi, M. & Getzels, J.W. 2014. Discovery-Oriented Behavior and the Originality of Creative Products: A Study with Artists *in The Systems Model of Creativity*. Springer: New York:1–10.

Csikszentmihalyi, M. & Nakamura, J. 2002. The concept of flow in *The Oxford Handbook of Positive Psychology*, edited by C.R. Snyder and S.J. Lopez. Oxford University Press: New York:89–105.

Csikszentmihalyi, M. & Nakamura, J. 2014. The concept of flow in *Flow and the foundations of positive psychology*. Springer: Dordrecht:239–263.

Cunningham, J.V. 2014. convergence, connectivity, CREATIVITY. *Economic Development Journal,* 13(2):13–21.

Dacey, J. 2011. Historical Conceptions of Creativity in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:608–618.

Dandridge, T.C. 1986. Ceremony as an integration of work and play. *Organization Studies*, 7(2):159–170.

Danos, X., Constantinou, C.P., Livitzis, M. & Avraam, C. 2014. Action Research to Develop and Validate a Scheme of Work to Promote Creativity and Designerly Thinking Through Play. *Design & Technology Education*, 19(2):17–29.

Davidson, D. (Ed.). 2011. *Well Played 3.0*. ETC Press: Pittsburgh.

Davis, G.A. 2011. Barriers to creativity and creative attitudes in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:115–121.

De Bono, E. 1970. *Lateral Thinking: Creativity Step by Step*. Penguin Group: London.

De Bono, E. 1992. *Serious creativity: Using the power of lateral thinking to create new ideas*. HarperCollins: New York.

De Bono, E. 2009. *Think!: Before It's Too Late*. Random House: London.

De Koven, B. 2013. *The well-played game: A player's philosophy*. MIT Press: Cambridge.

De Koven, B. 2014. *A Playful Path*. Lulu. com.

De Koven, B. 2015. *Playfulness, Play and Games*. [O]. Available: http://www.aplayfulpath.com/playfulness-play-and-games/. Accessed 16 March 2016.

Dennett, D.C. 2013. *Intuition pumps and other tools for thinking*. WW Norton & Company: New York.

Dietrich, A. 2015. *How Creativity Happens in the Brain*. Palgrave Macmillan: New York.

Dissanayake, E. 1974. A hypothesis of the evolution of art from play. *Leonardo,* 7(3):211–217.

Dorst, K. 2003. *Understanding design*. BIS Publishers: Amsterdam.

Dorst, K. & Cross, N. 2001. Creativity in the design process: co-evolution of problem–solution. *Design studies*, 22(5):425–437.

Eberle, B. 1996. *Scamper on: Games for imagination development*. Prufrock Press Inc: USA.

Edge, G. 2000. Innovation and creativity in design. *RSA Journal*, 148(5492):106–112.

Egenfeldt-Nielsen, S., Smith, J.H. & Tosca, S.P. 2013. *Understanding video games: The essential introduction*. Routledge: New york

Elsbach, K.D. & Hargadon, A.B. 2006. Enhancing Creativity through "Mindless" Work: A Framework of Workday Design. *Organization Science,* 17(4):470–483.

Fariborzi, E. 2015. Increasing Creativity in Virtual Learning Space for Developing Creative Cities*. International Journal of Academic Research*, 7(1):99–108.

Fauconnier, G. & Turner, M. 2008. *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities.* Basic Books: New York.

Feezell, R. 2013. A pluralist conception of play in *The Philosophy of Play*, edited by E. Ryall, W.Russell & M. MacLean. Routledge: London:11–31.

Feinberg, M. & Nemeth, C. 2008. The" Rules" of Brainstorming: An Impediment to Creativity?. *Institute for Research on Labor and Employment*, 167(8):n.d.

Flora, C. n.d. Everyday Creativity. [O]. Available: http://www.psychologytoday.com/articles/200910/everyday-creativity . Accessed 5 January 2015.

Ford, L.S. 2013. Transcendent Creativity. *Process Studies*, 42(1):20–46.

Foster, J. 2007. *How to get ideas*. Berrett-Koehler Publishers: San Francisco.

Frasca, G. 2001. What is ludology? A provisory definition. [O]. Available: http://www.ludology.org/2001/07/what-is-ludolog.html. Accessed 04 April 2017.

Friedman, K. 2003. Theory construction in design research: criteria: approaches, and methods. *Design studies*, 24(6):507–522.

Fritz, R. 1994. *The path of least resistance: Learning to become the creative force in your own life.* Butterworth-Heinemann Ltd: Great Britain.

Fullerton, T. 2008. *Game design workshop: a playcentric approach to creating innovative games.* Morgan Kaufmann Publishers: Burlington.

Gadamer, H.G. 1989. *Truth and method 2nd Edition*. Continuum Publishing Group: London.

Gardner, H. & Boden, M.A. 1994. The creators' patterns in *Dimensions of Creativity*, edited by M.A. Boden. MIT Press: Cambridge:143–158.

Gaut, B. 2003. Creativity and imagination in *The Creation of Art: New Essays in Philosophical Aesthetics,* edited by B. Gaut & P. Livingston. Cambridge University Press: Cambridge:148–173.

Gaut, B. 2009. Creativity and Skill in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:83–104.

Gaut, B. 2010. The philosophy of creativity. *Philosophy Compass*, 5(12):1034–1046.

Gero, J.S. 2010. Future Directions for Design Creativity Research in *Design Creativity 2010,* edited by Y. Nagai & T. Taura. Springer: London:15–22.

Gero, J.S. & Kannengiesser, U. 2011. Design in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:369–375.

Glăveanu, V.P. 2014. *Distributed creativity: Thinking outside the box of the creative individual*. Springer: Dordrecht.

Goffman, E. 1986. *Frame analysis: An essay on the organization of experience*. Northeastern University Press: Pennsylvania.

Goffman, E. 1961. *Encounters: Two studies in the sociology of interaction*. Penguin University Books: Harmondsworth.

Goldschmidt, G. 2011. Not from scratch: The DMS model of design creativity in *Design Creativity 2010,* edited by Y. Nagai & T. Taura. Springer: London:63–70.

Goldstein, J. 1999. Emergence as a construct: History and issues. *Emergence,* 1(1):49–72.

Goldstein, J. 2003. Emergence, creativity, and the logic of following and negating. *The Public Sector Innovation Journal*, 10(3):31-41.

Gomez, J.G. 2007. What Do We Know About Creativity? *The Journal of Effective Teaching*, 7(1):31–43.

Gordon, G. 2014. Well Played: The Origins and Future of Playfulness. *American Journal of Play*, 6(2):234–266.

Gordon, W.J. 1961. *Synectics: The development of creative capacity.* Harper and Row: New York.

Gray, D., Brown, S. & Macanufo, J. 2010. *Gamestorming: A playbook for innovators, rulebreakers, and changemakers*. O'Reilly Media, Inc: Sebastopol.

Gray, P. 2009. Play as a foundation for hunter-gatherer social existence. *American Journal of Play*, 1(4):476–522.

Gruber, H.E. & Bödeker, K. (Ed.). 2005. *Creativity, psychology and the history of science.* Springer: Dordrecht.

Guilford, J.P. 1987. Creativity research: Past, present and future. *Frontiers of creativity research: Beyond the basics*, 13(3-4):33–65.

Gustina, C. & Sweet, R. 2014. Creatives Teaching Creativity. *International Journal of Art & Design Education,* 33(1):46–54.

Hagman, G. 2005. *Aesthetic experience: Beauty, creativity, and the search for the ideal*. Rodopi: Amsterdam.

Hagman, G. 2015. *Creative Analysis: Art, Creativity and Clinical Process*. Routledge: New York.

Hammershøj, L.G. 2009. Creativity as a Question of Bildung. *Journal of Philosophy of Education*, 43(3):545–558.

Hans, J.S. 1981. *The play of the world*. University of Massachusetts Press: Amherst.

Harper, D. 2016. Online Etymology Dictionary [O]. Available: http://www.etymonline.com/index.php?allowed_in_frame=0&search=idea&searchmode=none. Accessed 6 December 2016.

Hausman, C.R. 2009. Criteria of Creativity in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:3–16.

Heinlein, R.A. 1961. *Stranger in a strange land*. Hachette UK: London.

Heller, S. 2002. *Design humor: the art of graphic wit.* Allworth Press: New York.

Hennessey, B.A & Amabile, T.M. 1987. *Creativity and Learning: What Research Says to the Teacher*. ERIC: Washington.

Hennessey, B.A. & Amabile, T.M. 2010. Creativity. *Annual Review of Psycholog,y* 61(1):569–98.

Henricks, T. 2008. The nature of play: An overview. *American Journal of Play*, 1(2):157–180.

Higgins, J.M. 1994. *101 creative problem-solving techniques: The handbook of new ideas for business*. New Management Publishing Company: Florida.

Hiwiller, Z. 2016. *Players Making Decisions*. New Riders: USA.

Hoff, E.V. 2013. The relationship between pretend play and creativity in *The Oxford Handbook of the Development of Imagination*, edited by M. Taylor. Oxford University Press: New York:403–416.

Holopainen, J. 2011. *Foundations of Gameplay*. Blekinge Institute of Technology: Karlskrona.

Hughes, L. 1983. Beyond the rules of the game, why are rooie rules nice in *The Game Design Reader: A Rules of Play Anthology*, edited by E. Zimmerman & K. Salen. MIT Press: Cambridge:504–516.

Hughes, L.A. 1999. Children's games and gaming in *Children's Folklore: A Source Book,* edited by B. Sutton-Smith, J. Mechling, T.W. Johnson & F.R. McMahon. Utah University Press: Utah:93–119.

Huizinga, J. 1949. *Homo ludens: A study of the play-element in culture*. Routledge & Kegan Paul: London.

Izard, B.S. & Izard, C.E. 1977. Play is the thing that brings it all together. *Theory Into Practice*, 16(3):215–219.

Jagoda, P. 2013. Gamification and Other Forms of Play. *Boundary*, 2(40):113–144.

Jaquith, D.B. 2011. When is Creativity?. *Art Education*, 64(1):14–19.

Jarvie, I.C. 2009. The Rationality of Creativity in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:43–62.

Järvinen, A. 2008. Understanding video games as emotional experiences in *Video Game Theory Reader 2*, edited by B. Perron, M.J.P. Wolf. Routledge: New York:85–108.

John, A. 2007. *The Art of Creative Thinking*. Kogan Page: London.

Johnson, S. 2001. *Emergence: The connected lives of ants, brains, cities, and software*. Touchstone: New York.

Johnson, S. 2010. *Where good ideas come from: The natural history of innovation*. Penguin: New York.

Juul, J. 2005. *Half-real: Video games between real rules and fictional worlds*. MIT press: Cambridge.

Juul, J. 2009. A *Casual Revolution: Reinventing Video Games and Their Player.* The MIT Press: Cambridge.

Juul, J. 2013. *The art of failure: An essay on the pain of playing video games*. MIT Press: Cambridge.

Kant, I. 1914. *Kant's Critique of Judgement*. Revised. Macmillan & Company: London.

Kant, I. 1976. Genius Gives The Rules in *The Creativity Question*, edited by A. Rothenberg and C.R. Hausman. Duke University Press: Durham:37–42.

Kant, I. 1987. *Critique of Judgement*. Hackett Publishing Company: Cambridge.

Kaufman, G.D. 2007. A Religious Interpretation of Emergence: Creativity as God. *Journal of Religion & Science,* 42(4):915–928.

Kazmierczak, E.T. 2003. Design as meaning making: from making things to the design of thinking. *Design Issues,* 19(2):45–59.

Keen, S. & Gallate, J. 2011. Intuition in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:683–688.

Kelley, T. & Littman, J. 2007. *The art of innovation: lessons in creativity from IDEO, America's leading design firm*. Doubleday: New York.

Kelly, R. 2007. *Towards a Definition of the Creative Process*. Waterford Institute of Technology: Waterford.

Kelly, T. 2011. *Constants, Constraints and Conditions.* [O]. Available: http://www.whatgamesare.com/2011/02/constraints-constants-and-conditions-game-rules.html. Accessed 29 January 2016.

Kern, A. 2006. Exploring the Relation between Creativity and Rules: The Case of the Performing Arts. *International Studies of Management & Organization*, 36(1): 63–80.

Kerr, A. 2006. *The business and culture of digital games: Gamework and gameplay.* Sage: London.

Kim, B. 2015. Designing Gamification in the Right Way. *Library Technology Reports*, 51(2):29–35.

Kleon, A. 2012. *Steal like an artist: 10 things nobody told you about being creative*. Workman Publishing: New York.

Koestler, A. 1964. *The act of creation*. Hutchinson and Co: United Kingdom.

Koestler, A. 2009. The Three Domains of Creativity in *The Idea of Creativity*, edited by M. Krausz, D. Dutton and K. Bardsley. BRILL: Leiden:251–267.

Koster, R. 2005. *Theory of fun for game design*. Paraglyph Press: Arizona.

Kuittinen, J. & Holopainen, J. 2009. *Some notes on the nature of game design*. Paper presented at the Digital Games Research Association Conference, 1-4 September. London: Brunel University.

Kultima, A., Niemelä, J., Paavilainen, J. & Saarenpää, H., 2008. *Designing game idea generation games*. Paper presented at the 2008 Conference on Future Play: Research, Play, Share, 3-5 November, Toronto, Ontario: Canada.

Lamarque, P. 2009. On Bringing a Work into Existence in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:105–128.

Langley, P., Simon, H.A., Bradshaw, G.L. & Zytkow, J.M. 1992. *Scientific discovery: Computational explorations of the creative processes*. MIT press:Massachusetts.

LeBoutillier, N. & Marks, D.F. 2003. Mental imagery and creativity: A meta-analytic review study. *British Journal of Psychology*, 94(1):29–44.

Lehrer, J. 2012. *The new rules of creativity: nine mind hacks to boost your brain.* [O]. Available: http://www.wired.co.uk/magazine/archive/2012/05/features/the-new-rules-of-creativity. Accessed 24 May 2015.

Lessig, L. 2001. *The future of ideas: The fate of the commons in a connected world.* Random House: New York.

Littlejohn, S.W. 2009. System Theory in Encyclopedia of Communication Theory, edited by K.A. Foss & S.W. Littlejohn. Sage Publications: California: 950–954.

Littlejohn, S.W. & Foss, K.A. 2008. *Theories of Human Communication 9th Edition*. Cengage Learning: Belmont.

Levin, M. and Lamorisse, A. 1959. Risk. Barnes & Noble: USA

Livingston, P. 2009. Poincaré's "Delicate Sieve": On Creativity and Constraints in the Arts in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:129–146.

Mainemelis, C. & Ronson, S. 2006. Ideas are born in fields of play: Towards a theory of play and creativity in organizational settings. *Research in Organizational Behavior*, 27(1):81–131.

Manning, F.E. 1983. *The world of play*. Leisure Press: New York.

May, R. 1981. *Freedom and destiny*. Dell Publishing Co.: New York.

May, R. 1994. *The courage to create.* WW Norton & Company: New York.

McAlhone, B. & Stuart, D. 1996. *A Smile in the Mind: Witty thinking in graphic design*. Phaidon Incorporated Limited: New York.

McCaskill, C.L. 1943. Play: A Big Business. *The American Journal of Nursing*, 43(12):1086–1090.

McGonigal, J. 2007. *The Puppetmaster Problem: Design for real world, mission based gaming*. Cambridge: MIT Press.

McGonigal, J. 2011. *Reality is broken: Why games make us better and how they can change the world.* Penguin: London.

McLaughlin, D.W. 2008. *Reinventing the wheel: On games and the good life*. ProQuest: Michigan.

Michael, D. & Chen, S. 2006. *Serious games: Games that educate, train, and inform*. Thomson Course Technology PTR: Boston.

Michalko, M. 2011. *Creative thinkering: Putting your imagination to work*. New World Library: California.

Montola, M. 2005. *Exploring the edge of the magic circle: Defining pervasive games*. Paper presented at Digital Arts and Culture Conference, 1 December, IT University of Copenhagen, Denmark

Montola, M., Stenros, J. & Waern, A. 2009. *Pervasive games: theory and design.* Morgan Kaufmann Publishers Inc: Massachusetts.

Mumford, M.D., Vessey, W.B. 2011. Heuristics: Strategies in Creative Problem-solving in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:601–607.

Nanay, B. 2014. An experiential account of creativity in *The Philosophy of Creativity: New Essays*, edited by E.S. Paul & S.B. Kaufman. Oxford University Press: New York:17–38.

Nelson, H.G. & Stolterman, E. 2003. *The design way: Intentional change in an unpredictable world: Foundations and fundamentals of design competence.* MIT Press: Massachusetts.

Ness, R. 2015. *The Creativity Crisis: Reinventing Science to Unleash Possibility*. Oxford University Press: New York.

Newell, A., Shaw, J.C. & Simon, H.A. 1959. *The processes of creative thinking*. Rand Corporation Santa Monica: California.

Niedderer, K. & Townsend, K. 2014. *Craft, innovation and creativity*. Craft Research, 5(2):149–153.

Nussbaum, B. 2013. *Creative intelligence: Harnessing the power to create, connect, and inspire*. Harper Collins: New York.

Oatley, K. 1992. *Best laid schemes: The psychology of the emotions*. Cambridge University Press: New York.

Oman, S.K., Tumer, I.Y., Wood, K. & Seepersad, C. 2013. A comparison of creativity and innovation metrics and sample validation through in-class design projects. *Research in Engineering Design*, 24(1):65–92.

Ostrom, E., Gardner, R. & Walker, J. 1994. *Rules, games, and common-pool resources*. University of Michigan Press: Michigan.

Paulus, P.B. & Asuncion, A.G. 1995. Creativity: Illusion and reality. *Creativity Research Journal*, 8(4): 397-403.

Pelaprat, E. & Cole, M. 2011. “Minding the Gap”: Imagination, creativity and human cognition. *Integrative Psychological and Behavioral Science*, 45(4):397-418.

Piaget, J. 1997. *The moral judgement of the child*. Simon & Schuster: New York.

Pigrum, D. 2009. *Teaching creativity: multi-mode transitional practices*. Continuum Publishing Group: London.

Piirto, J. 2011. *Creativity for 21st century skills*. Sense Publishers: Rotterdam.

Pincott, J. 2014. ARE THESE Rules WORTH BREAKING? *Psychology Today*, 47(6):68–88.

Pinker, S. 1997. *How the mind works*. Penguin: London.

Pritzker, S.R. & Runco, M.A. (Eds). 2011. *Encyclopedia of Creativity Second Edition*. Academic Press: San Diego.

Polanyi, M. 2009. The Creative Imagination in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:147–165.

Rand, P. 1965. Design and the Play instinct in *Education of Vision*, edited by G. Kepes. Braziller: New York:154–173.

Rank, J., Pace, V.L. & Frese, M. 2004. Three avenues for future research on creativity, innovation, and initiative. *Applied Psychology*, 53(4):518–528.

Richardson, D.K. 2002. *Models Of Cognitive Development*. Psychology Press: East Sussex.

Rieber, L.P. 1992. Computer-based microworlds: A bridge between constructivism and direct instruction. *Educational technology research and development,* 40(1):93–106.

Rieber, L.P. 1996. Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational technology research and development,* 44(2):43–58.

Rittel, H.W. & Webber, M.M. 1973. Dilemmas in a general theory of planning. *Policy sciences*, 4(2):155–169.

Rivers, L. 1987. *Improvisation and the creative process in jazz and the visual arts*. Columbia University: New York.

Robinson, K. 2011. *Out of our minds: Learning to be creative*. John Wiley & Sons: United Kingdom.

Rothenberg, A. & Hausman, C.R. (Eds). 1976. *The Creativity Question.* Duke University Press: Durham.

Rothschild, M. 2013. *The Art of Making Mistakes: Unexpected Painting Techniques and the Practice of Creative Thinking*. North Light Books: Cincinnati.

Rouse III, R. 2005. *Game design: Theory and practice 2nd Edition*. Wordware Publishing, Inc.: Texas.

Rua, P.L. 2010. Making and breaking the rules: lexical creativity in the alternative music scene. *Language Awareness*, 19(1):51–67.

Runco, M.A. 2014. *Creativity: Theories and themes: Research, development, and practice*. Elsevier: San Diego.

Russ, S.W. 2003. Play and creativity: Developmental issues. *Scandinavian Journal of Educational Research*, 47(3):291–303.

Russ, S.W. & Christian, K.M. 2011. Play in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:238–243.

Russ, S.W. & Wallace, C.E. 2013. Pretend Play and Creative Processes. *American Journal of Play,* 6(1):136–148.

Sacchetti, S. & Tortia, E.C. 2013. Satisfaction with creativity: A study of organizational characteristics and individual motivation. *Journal of Happiness Studies,* 14(6):1789–1811.

Salen, K. & Zimmerman, E. (Eds). 2006. *The Game Design Reader: A Rules of Play Anthology*. MIT Press: Cambridge.

Salen, K. & Zimmerman, E. 2005. Game design and meaningful play in *Handbook of Computer Game Studies*, edited by J.H. Goldstein & J. Raessens. MIT Press: Cambridge:59–79.

Salen, K. & Zimmerman, E. 2004. *Rules of play: Game design fundamentals*. MIT press: Massachusetts.

Sánchez, J.L.G., Vela, F.L.G., Simarro, F.M. & Padilla-Zea, N. 2012. Playability: analysing user experience in video games. *Behaviour & Information Technology*, 31(10):1033–1054.

Sarath, E.W. 2013. *Improvisation, creativity, and consciousness: jazz as integral template for music, education, and society*. SUNY Press: Albany.

Sawyer, R.K. 1999. The emergence of creativity. *Philosophical Psychology*, 12(4):447–469

Sawyer, R.K. 2000a. Improvisation and the creative process: Dewey, Collingwood, and the aesthetics of spontaneity. *Journal of Aesthetics and Art Criticism*, 58(2):149–161.

Sawyer, R.K. 2000b. Improvisational cultures: Collaborative emergence and creativity in improvisation. *Mind, Culture, and Activity*, 7(3):180–185.

Sawyer, R.K. 2003. Improvised Dialogues: Emergence and Creativity in Conversation. Greenwood Publishing Group: Connecticut.

Sawyer, R.K. 2003. Emergence in Creativity and Development in *Creativity and Development*, edited by R.K. Sawyer, J.S Vera, S. Moran, D.H. Feldman, H. Gardner, J. Nakamura & M. Csikszentmihalyi. Oxford University Press: New York:12–60.

Sawyer, R.K. 2011. Explaining creativity: The science of human innovation. Oxford University Press: New York.

Sawyer, K. 2013. *Zig zag: The surprising path to greater creativity*. John Wiley & Sons.

Sawyer, R.K., Vera, J.-S., Moran, S., Sternberg, R.J., Feldman, D.H., Gardner, H., Nakamura, J. & Csikszentmihalyi, M. (Eds). 2003. Creativity and Development. Oxford University Press: New York.

Schaffer, S. 1994. Making up discovery in *Dimensions of Creativity*, edited by M.A. Boden. MIT Press: Cambridge:13–51.

Schauer, F. 1991. *Playing by the Rules: A Philosophical Examination of Rule-based Decision-making in Law and in Life.* Oxford University Press: New York.

Schell, J. 2015. *The Art of Game Design: A book of lenses*. CRC Press: Boca Raton.

Schmidhuber, J. 2010. Formal theory of creativity, fun, and intrinsic motivation (1990–2010). *Autonomous Mental Development*, 2(3):230–247.

Schultz, K. 2010. *Being wrong: Adventures in the margin of error*. Harpercollins Publishers: New York.

Scott, A. 2014. How playcentric research methods are contributing to new understanding and opportunities for design in *The Routledge Companion to Design Research*, edited by P.A. Rodgers and J. Yee. Routledge: London:400–416.

Seel, R. 2015. *Creativity in Organisations: An Emergent Perspective*. [O]. Available: http://www.new-paradigm.co.uk/creativity-emergent.htm. Accessed 6 May 2016.

Severance, A.D. 1919. Play in Education. *The Lotus Magazine*, 10(3):116–120.

Shimanoff, S.B. 1980. Communication rules theory and research. SAGE publications: California.

Sicart, M. 2011. *The ethics of computer games*. MIT Press: Cambridge.

Sicart, M. 2014. *Play Matters*. MIT Press: Cambridge.

Simonton, D.K. 2009. Creativity as a Darwinian Phenomenon: The Blind-Variation and Selective-Retention Model in *The Idea of Creativity*, edited by M. Krausz, D. Dutton & K. Bardsley. BRILL: Leiden:63–82.

Sniderman, S. 1999. Unwritten rules. *The Life of Games*, 1(1):2–7.

Snyder, C.R. and Lopez, S.J. (eds). 2009. *Oxford handbook of positive psychology*. Oxford University Press: New York.

Sosa, R. and Gero, J. 2003. *Design and change: a model of situated creativity*. University of Sydney: Sydney.

Sotamaa, O. 2009. The player's game: Towards understanding player production among computer game cultures. Tampere University Press: Finland.

Squire, K. 2006. From content to context: Videogames as designed experience. *Educational researcher*, 35(8):19–29.

Stenros, J. 2014. In defence of a magic circle: the social, mental and cultural boundaries of play in *The Gameful World: Approaches, Issues, Applications*, edited by S.P. Walz & S. Deterding, The MIT Press: Cambridge:147–185.

Stenros, J. 2015a. *Playfulness, Play, and Game: A Constructionist Ludology Approach*. University of Tampere: Finland.

Stenros, J. 2015b. Behind games: Playful mindsets and transformative practices. in *The Gameful World: Approaches, Issues, Applications*, edited by S.P. Walz & S. Deterding, The MIT Press: Cambridge:201–222.

Sternberg, R.J (ed). 1999. *Handbook of creativity*. Cambridge University Press: Cambridge.

Sternberg, R.J. 2003. Chapter 3: The Development of Creativity as a Decision-Making Process in *Creativity and Development*, edited by R.K. Sawyer, J.S Vera, S. Moran, D.H. Feldman, H. Gardner, J. Nakamura & M. Csikszentmihalyi. Oxford University Press: New York:91-138.

Sternberg, R.J. & Kaufman, J.C. 2010. Constraints on creativity: Obvious and not so obvious in *The Cambridge Handbook of Creativity*, edited by R.J. Sternberg & J.C. Kaufman. Cambridge University Press: Cambridge:467–482.

Sternberg, R.J. & Williams, W.M. 1996. *How to develop student creativity*. ASCD: Virginia.

Stokes, P.D. 2005. *Creativity from constraints: The psychology of breakthrough*. Springer Publishing Company:New York.

Strohmeyer, R. 2014. PLAY Your Way to PRODUCTIVITY. *PC World*, 32(7):100–106.

Strom, R. & Greathouse, B. 1974. Play and maternal self concept. *Theory into practice*, 13(4):297–302.

Suits, B., 1978. *The grasshopper: Games, life and utopia*. University of Toronto Press:Toronto.

Suits, B. 1988. Tricky triad: Games, play, and sport. *Journal of the Philosophy of Sport*, 15(1):1–9.

Sutton, R.I. 2001. The weird rules of creativity. *Harvard business review*, 79(8):94–103.

Sutton-Smith, B. 2001. *The Ambiguity of Play*. Harvard University Press: Massachusetts.

Sutton-Smith, B. 2006. Play and Ambiguity in *The Game Design Reader: A Rules of Play Anthology*, edited by E. Zimmerman & K. Salen. MIT Press: Cambridge:296-313

Sutton-Smith, B. 2008. Play theory: A personal journey and new thoughts. *American Journal of Play*, 1(1):80–123.

Sweetser, P. 2008. *Emergence in Games*. Charles River Media: Boston.

Sweetser, P. & Wyeth, P. 2005. GameFlow: a model for evaluating player enjoyment in games. *Computers in Entertainment (CIE),* 3(3): 3–3.

Sylvester, T. 2013*. Designing Games: A Guide to Engineering Experiences.* O'Reilly Media Inc.:California.

Taura, T. & Nagai, Y. (Eds). 2010. *Design creativity 2010*. Springer: London.

Teuber, C. 1995. *Settlers of Catan*. Kosmos: Germany.

Tharp, T. 2003. *The creative habit: Learn it and use it for life: A practical guide.* Simon & Schuster: New York.

Torrance, E.P. 1993. Understanding creativity: Where to start?. *Psychological Inquiry,* 4(3): 232–234.

Turner, M. 2014. *The Origin of Ideas: Blending, Creativity, and the Human Spark*. Oxford University Press: New York.

Turner, M. (Ed.). 2006*. The artful mind*. Oxford University Press: New York.

Unsworth, K. 2001. Unpacking Creativity. *The Academy of Management Review*, 26(2):289–297

Von Oech, R. 1990. *A whack on the side of the head: How you can be more creative.* Warner Books: New York.

Wallas, G. 1976. Stages in the creative process in *The Creativity Question*, edited by A. Rothenberg and C.R. Hausman. Duke University Press: Durham: 69–73.

Walz, S.P. & Deterding, S (eds). 2015. *The gameful world: Approaches, issues, applications.* Mit Press: Cambridge.

Wang, J. 2013. The importance of Aristotle to design thinking. *Design Issues,* 29(2):4–15.

Wang, K. 2014. Factors Influencing the Adoption and Effective Use of Creativity Techniques in Business Settings: An Exploratory Study. *Engineering Management Journal,* 26(4):29–37.

Ward, T.B. 2011. Problem-solving Play in *Encyclopedia of creativity 2nd Ed,* edited by M. A. Runco & S. R. Pritzer. Elsevier: London:238–243.

Warnock, M. 1978. *Imagination*. University of California Press: California.

Whitson, J., 2010. Rule making and rule breaking: game development and the governance of emergent behaviour. *The Fibreculture Journal*, 16.

Wilson, D. & Sicart, M. 2010. *Now it's personal: on abusive game design*. Paper presented at the International Academic Conference on the Future of Game Design and Technology, 6-7 May, Vancouver, Canada.

Wilson, L.O. 2013. *Sacred Rules of Creativity*. [O]. Available: file://localhost/Users/Morne/Library/Application%20Support/Zotero/Profiles/geak0b2u.default/zotero/storage/79MZ5XHF/sacred-rules-of-creativity.html. Accessed 5 May 2016.

Winnicott, D.W. 2005. *Playing and reality*. Routledge: New York.

Woods, S. 2012. *Eurogames: the design, culture and play of modern European board games.* McFarland & Company Inc: North Carolina.

Yilmaz, S. & Seifert, C. 2011. Creativity through design heuristics: A case study of expert product design. *Design Studies*, 32(4):384–415.

Young, J. 2003. *A Technique for producing ideas.* University of California Press: California.

Zagalo, N. & Branco, P. (Eds). 2015. *Creativity in the Digital Age.* Springer: London.

Zimmerman, E. 2009. Reconceptualizing the Role of Creativity in Art Education Theory and Practice. *Studies in Art Education*, 50(4):382–399.

Zittoun, T. & Cerchia, F. 2013. Imagination as expansion of experience. *Integrative Psychological and Behavioral Science,* 47(3):305–324.

Zwicky, J. 2014. Imagination and the Good Life. *Common Knowledge*, 20(1):28–45.