Kaunas University of Technology

School of Economics and Business

Integrating Artificial Intelligence Into Creative Problem Solving in the Gaming Industry

Master's Final Degree Project

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Summary

This thesis examines the integration of artificial intelligence into creative problem-solving workflows in the gaming industry. High creative stakes, significant financial pressure, and rapid AI adoption characterise this industry. There is an observed lack of structured frameworks for AI-augmented creative problem-solving in game development, despite the high involvement of AI in this development by developers. This research addresses that gap by developing and empirically validating a conceptual framework for AI-augmented creative problem solving that preserves human creative agency while harnessing the productivity and ideation benefits AI offers. Drawing on qualitative data from industry practitioners and secondary industry sources, the study proposes an operationally specific framework structured around permission zones, defines human and AI roles at each stage of the creative process, and integrates risk mitigation measures. The outcome is a governance-first model designed to ensure AI augments rather than substitutes for human creativity in game development.

Aldric Shaun Rajesh. Dirbtinio intelekto integravimas į kūrybinį problemų sprendimą žaidimų pramonėje. Magistro baigiamasis projektas / vadovė doc. Vestina Vainauskienė; Kauno technologijos universitetas, Ekonomikos ir verslo fakultetas.

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Santrauka

Šiame darbe nagrinėjama dirbtinio intelekto integracija į kūrybinio problemų sprendimo procesus žaidimų pramonėje. Šiai pramonei būdingas didelis kūrybinis iššūkis, didelis finansinis spaudimas ir sparčiai diegiamas dirbtinis intelektas. Pastebima, kad žaidimų kūrimo srityje trūksta struktūrizuotų sistemų, skirtų dirbtinio intelekto pagalba vykdomam kūrybiniam problemų sprendimui, nepaisant to, kad kūrėjai aktyviai naudoja dirbtinį intelektą šioje srityje. Šis tyrimas užpildo šią spragą, sukuriant ir empiriškai patvirtinant koncepcinę sistemą, skirtą dirbtinio intelekto pagalba vykdomam kūrybiniam problemų sprendimui, kuri išsaugo žmogaus kūrybinę iniciatyvą, tuo pačiu išnaudodama dirbtinio intelekto teikiamus produktyvumo ir idėjų generavimo privalumus. Remdamasis kokybiniais duomenimis, gautais iš pramonės specialistų ir antrinių pramonės šaltinių, tyrimas siūlo operaciškai konkretų modelį, suskirstytą į leidimų zonas, apibrėžia žmogaus ir AI vaidmenis kiekviename kūrybinio proceso etape ir integruoja rizikos mažinimo priemones. Rezultatas – valdymo prioritetą teikiantis modelis, sukurtas siekiant užtikrinti, kad AI papildytų, o ne pakeistų žmogaus kūrybiškumą žaidimų kūrimo procese.

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Abbreviations:

AI – Artificial Intelligence.

CAGR – Compound Annual Growth Rate.

COFI – Collaborative framework. This is another name for cofi (collaborative framework), a collaborative framework introduced by Rezwana and Maher (2023) for modeling Human-AI co-creative interactions.

CPS – Creative Problem Solving. CPS is a structured approach to finding solutions to poorly defined problems that includes both divergent and convergent thinking. (Puccio, 2007).

GCI – Generative Collective Intelligence.

GDC – Game Developers Conference.

GenAI – Generative Artificial Intelligence.

GPT – Generative Pre-trained Transformers.

HAIST – Human-AI symbiotic theory.

HITL – Human-in-the-Loop.

IGDA – International Game Developers Association.

IP – Intellectual Property. Rights to creations of the mind, such as copyrights, trademarks, etc.

LLM – Large Language Model. LSG – Live Service Games.

ML – Machine Learning.

MOSAAIC – Managing Optimization toward Shared Autonomy, Authority, and Initiative in Co-Creation.

NLP – Natural Language Processing.

RHML – reciprocal human-machine learning. Te'eni et al. (2023)

RPG – Role-Playing Game.

RQ – Research Question.

Terms:

AAA – Triple-A. High-cost, big-budget video games made by major companies. AAA titles have a lot of money spent on them and, therefore, are very well marketed (Anantrasirichai & Bull, 2022).

Cognitive Laziness – The erosion of independent critical thinking, evaluative judgement, and creative effort that occurs when AI-generated outputs are accepted without active scrutiny.

Creativity – The ability to produce something novel and useful within a given framework (Runco & Jaeger, 2012).

Decision Fatigue – The deterioration of decision quality resulting from prolonged cognitive effort and repeated choices (Veríssimo et al., 2024).

Epistemic Debt – The long-term accumulation of unexamined AI-derived knowledge, decisions, and outputs that a team can no longer fully trace, justify, or independently reproduce — a structural dependency that compounds over time.

Tacit Knowledge – Informal, experience-based knowledge that is difficult to codify but critical to creative and design decisions (de Barros et al., 2025).

Introduction

In today's knowledge and innovation-intensive sectors, creativity is widely accepted as one of the important drivers of innovation and competitiveness in organisations. It is the foremost source of unique and valuable concepts and ideas that allow organisations to weather an ever-changing technological ecosystem and the uncertainty around operating in it (de Barros, Resende, and Pontes, 2025; Runco and Jaeger, 2012). However, with the growing complexity of the business environment, the effort that goes into creativity and creative problem-solving has increased, which accelerates the pressure on creative teams. The fine balance between creative, artistic, and commercial elements in an organisation is now being strangled and is slowly falling apart, raising the need for more research into how they can continue to develop successful products under these conditions (Veríssimo et al., 2024).

There is mounting research-based evidence suggesting many businesses have an extremely difficult time maintaining a consistent level of creativity across their business, even as they employ experienced and talented employees who utilize traditional tools for creativity. The primary issue that is preventing teams from fully exploring every approach or implication of a single concept is the structural barriers, such as strict and narrow project completion windows, overwhelming information, and a lack of team synergy. These barriers are most apparent with complex problem-solving projects, which require the repetition of testing to adhere to tight schedules and budgets within highly dynamic environments (Veríssimo et al., 2024; de Barros, Resende, and Pontes, 2025).

In parallel with these organisational challenges, AI has developed to the point that it offers the possibility to support creative work at several different levels. Recent advances in generative and data-driven AI models have positioned contemporary AI systems not merely as automation tools but also as tools that can enhance human creativity and decision-making (Holzner, Maier, and Feuerriegel, 2025). Studies indicate that AI can facilitate creative processes by expanding idea spaces, enabling evaluation, and simulating complex scenarios (Anantrasirichai & Bull, 2022). There is, however, no evidence that applying AI in creative contexts will automatically lead to enhanced creative outcomes. On the contrary, poorly integrated AI systems may hinder creative productivity by fostering creative fixations, loss of ownership, or overreliance on algorithmic results (Long and Magerko, 2020; Anantrasirichai & Bull, 2022).

The tensions described above belong particularly to the global gaming industry, which is a highly creative and financially substantial area of activity. Global game development requires collaborative interdisciplinary activities among designers, writers, artists and technologists, and takes place within the context of the rapidly changing nature of the gaming landscape (live service models require ongoing creative output following product launches) (Newzoo, 2024)According to reports about the gaming industry, there has been a rise in the cost of producing games, an increase in the number of developers experiencing burnout, and an increase in dissatisfaction for developers due to an increased burden of creativity and organisation pressure (International Game Developers Association, 2024). Therefore, it would be reasonable to view the gaming industry as an excellent case study for examining how AI affects human creative decision-making to improve resiliency and sustainability without diminishing human expertise.

The primary goal of this thesis is to create a research-based framework that guides the integration of AI into creative problem-solving workflows to help augment human creativity. There is existing

research regarding AI tools, co-creative systems, and individual creative workflows; however, there is a lack of frameworks that connect AI capabilities to organisational creative decision-making, particularly in industries where companies are operating under immense pressure and risk (Holzner, Maier, and Feuerriegel, 2025; Anantrasirichai & Bull, 2022).

Aim of the Research

The purpose of this thesis is to develop a framework in which AI can be systematically integrated into creative problem-solving workflows to enhance creative decision-making in organisational settings, specifically in the gaming industry.

Objectives of the Research

To achieve the stated purpose, the thesis will pursue the following objectives:

1) To identify the limitations of traditional Creative Problem-Solving methodologies in modern organisational contexts.

2) To develop a Conceptual framework grounded in theory that gives organisations a way to integrate AI into their creative workflows.

3) To develop a research methodology to find empirical evidence of AI in Creative Problem Solving in the gaming industry and to validate the developed framework.

4) To combine the theoretical and empirical findings and provide guidelines for organisations in the gaming industry to follow while they integrate AI in their workflows.

1. Limitations of Traditional Creative Workflows in Modern Complex and Dynamic Environments

When looking at companies that operate in a world of constant innovation, the value of creativity is becoming a key differentiator, and companies are turning to strategies that involve creative thinking and the ability to quickly respond to challenges. Something at the core of generating and sustaining value, according to research by Puccio in 2007. However, rigid manufacturing processes, time constraints, conservative decision-making, and exhaustion in creative minds crush innovative ideas (Puccio, 2007). We're seeing the unfortunate consequences of less efficient problem-solving, an area that's rooted in skills that are not well-supported by the organisation.

Meanwhile, the rapid progress of artificial intelligence, especially in the realms of machine learning, natural language processing, and generative models, has brought forth a new universe of possibilities to breathe life into the creative process in multiple corporate functions. This machine-induced capacity to churn out content, identify trends, run simulations, and return instant feedback makes AI extremely attractive as a partner in a variety of imaginative endeavors. As AI becomes more prevalent in the workplace, we also see several pressing problems spring up. Questions linked to the reduction of creative freedom, loss of human control, rigid norms, and being overly reliant on AI suggestions. It's these problems that this thesis plans to investigate.

We have not yet found an explicit and evidence-based framework that will effectively guide the process of integrating AI into Creative Problem Solving and have it work, instead of stifling or replacing human imagination. There is already a vast amount of research covering the advent of this technology. AI is highly relevant in the world of creativity, yet the methods through which these kinds of systems are brought to the fore in various creative activities. Particularly, in the gaming industry that presents a multi-dimensional array of imaginative elements intertwined with human thoughts, intuition, and partnerships, still need to be examined.

1.1. Limitations of Human-Only Creative Problem Solving

Over the last ten years, creative problem-solving in knowledge-based industries has been more complicated. The environment that organisations in industries like digital media, software, and interactive entertainment face is one of rapid change in technology, changing consumer expectations, and increased competition. In this case, creative decisions can hardly be isolated or linear. Instead, they are integrated into systems where technical, artistic, commercial, and user-experience issues always interrelate. It is this multidimensionality that adds pressure to creative teams, especially when they have to make decisions within time constraints and without much information (de Barros, Resende, and Pontes, 2025).

A prominent change is the shift from linear models of innovation to continuous, iterative cycles of production. In other places, like in the gaming industry, products do not cease to be finished at the time of their release. Live service, regular refreshes, and community iteration have evolved the creative approach to problem-solving into a continuous process, not a stage of development. Although this method allows being responsive to customer needs and remaining actively engaged, it also entails the constant pressure of decisions, as teams need to keep reevaluating the design options, balance quick-fix solutions with a long-term perspective, and react to instant feedback (Newzoo, 2024).

A new creative workflow can demand a high rate of processing a vast amount of heterogeneous information across a team at an accelerated pace. These are player analytics, qualitative feedback by online communities, monetisation metrics, technical constraints, and artistic coherence. Building up such inputs may also increase cognitive load, and in this regard, teams should not have formalised systems to prioritize, synthesise, and discover alternative solutions (Verissimo et al., 2024). Instead of fostering more creative thinking, an abundance of information can undermine the idea of becoming richer in creativity, as decision-makers resort to more common patterns or heuristics to address complexity.

Studies also indicate that when individuals are subjected to high-stakes creative decision-making, they become fatigued over time, thereby lowering the quality and originality of their solutions. This exhaustion can be observed in creative industries where iteration and revision are the order of the day, leading to conservative design, unwillingness to experiment, or a hasty focus on the so-called safe solutions (Ahmed, Ayentimi, and Sandow, 2025). The causes of these trends do not necessarily lie in a restricted ability for creativity, but instead in structural pressure, which is the limitation of the possible ways in which creativity can be applied in practice.

Under these conditions, traditional creative processes, which in many cases are incredibly dependent on people's intuition, informal brainstorming, and progressive approval systems, seem stretched to the limit. Although these strategies have been used in the past to facilitate creative excellence, they might not be able to scale in situations where there are:

- Continuous production demands
- Large, interdisciplinary teams
- High volumes of real-time data
- Shortened decision windows

This growing misalignment between creative demands and existing workflows sets the stage for examining whether AI-supported systems could help mitigate some of these pressures, particularly by supporting exploration, synthesis, and decision support without replacing human judgment.

1.2. Individual and Cognitive Constraints

In addition to environmental complexity, organisational creativity is also conditioned by structural and cognitive limitations that impact the processes of generating, evaluating, and implementing ideas by individuals and teams. These constraints can also act as inhibitors to the effective utilisation of creative talent, even in organisations whose talent pool is abundant with creative talent, especially in high-pressure production scenarios. (Puccio, 2007).

A drawback that has been quoted many times is the notion of decision-makers' limited rationality, how they are constrained by cognitive limitations, and thus are unable to understand information reliably. Bounded rationality may also help with creative fixation in creative problem-solving: creative teams can become stuck on their original ideas, known mechanisms, or existing design paradigms, although other solutions may be more effective (Benedek, Bruckdorfer, and Jauk, 2020). This fixation is not necessarily a failure of imagination, but rather a side effect of the limited attention, time, and high-risk sensitivity.

The interdisciplinary nature of the work is difficult when it comes to being creative. There are a lot of different people involved in each of the current creative project types, such as game development, from designers to artists to programmers to writers to data analysts to business owners.

The importance of time for creating something new can be critical. Time spent brainstorming or exploring new ideas and testing these ideas can take longer than organisations anticipate. However, business models have traditionally favored faster production times and more predictable results as opposed to more exploratory approaches. Therefore, many teams will struggle to balance the level of creativity they want to achieve against their desire to deliver quickly and efficiently. Teams may find themselves limited in terms of how much they can explore through solution selection because there are fewer risks associated with those solutions (Umayna et al., 2025).

Creativity can be further limited at the organisational level by risk aversion and innovation inertia. Empirical research indicates that as organisations expand, decision-making power tends to become more concentrated, and innovative decisions are likely to pass through multiple rounds of managerial validation. Although they are intended to minimize uncertainty, these structures can equally deter non-conventional thought or experimentation that is not associated with easily quantifiable returns (Indriani et al., 2025). This may result in creative industries that depend on existing franchises, existing mechanics, and incremental innovation rather than more radical departures from creative innovation.

The combination of cognitive and structural limitations leads to an inability by organisations to engage in effective creative problem solving despite having available resources and experts. The issue is therefore not that there are no creative minds; it is that humans have limited cognitive ability, organisational structures, and sophisticated creative problems to solve. Therefore, this viewpoint supports the study of AI-based approaches for facilitating creativity, not replacing it, but rather as a method to alleviate the burden on cognition, enable exploration, and support informed decision-making.

1.3. Gaming Industry as a high-risk, creativity-intensive environment

The video game industry is a unique type of business environment because of the large-scale financial risks involved with developing a video game; because of the cutthroat competition in terms of reaching the target audience, because of the enormous number of different creative and design requirements of the consumer base for video games; and because of the complete economic loss as a potential result of failure to meet the needs of the target audience. When a new game is released in an already saturated video game market (as is currently the case), it represents the culmination of years of hard work and creativity of the dozens of individuals who worked on creating the game as a writer, artist, coder, sound engineer, or designer, etc., and will be lost financially if the target audience does not embrace it.

1.3.1. Economic Scale and Competitive Pressure

In the global games market, the rate of growth is still going strong, but it makes the competition even more cutthroat. Market analysts predict the video games market will reach $197 billion by the end of 2025, driven by strong performances in PC and mobile games, which have become the backbone of the market. According to a PC Gamer report by Newzoo, the market is crowded despite the tendency of top titles to absorb all user involvement. Over the long term, projections show the sector will grow

to new levels. An estimate put forward by Games Market Research estimated that the sector could reach $490 billion by 2033, thanks to the explosive growth in mobile, cloud, and other emerging technologies.

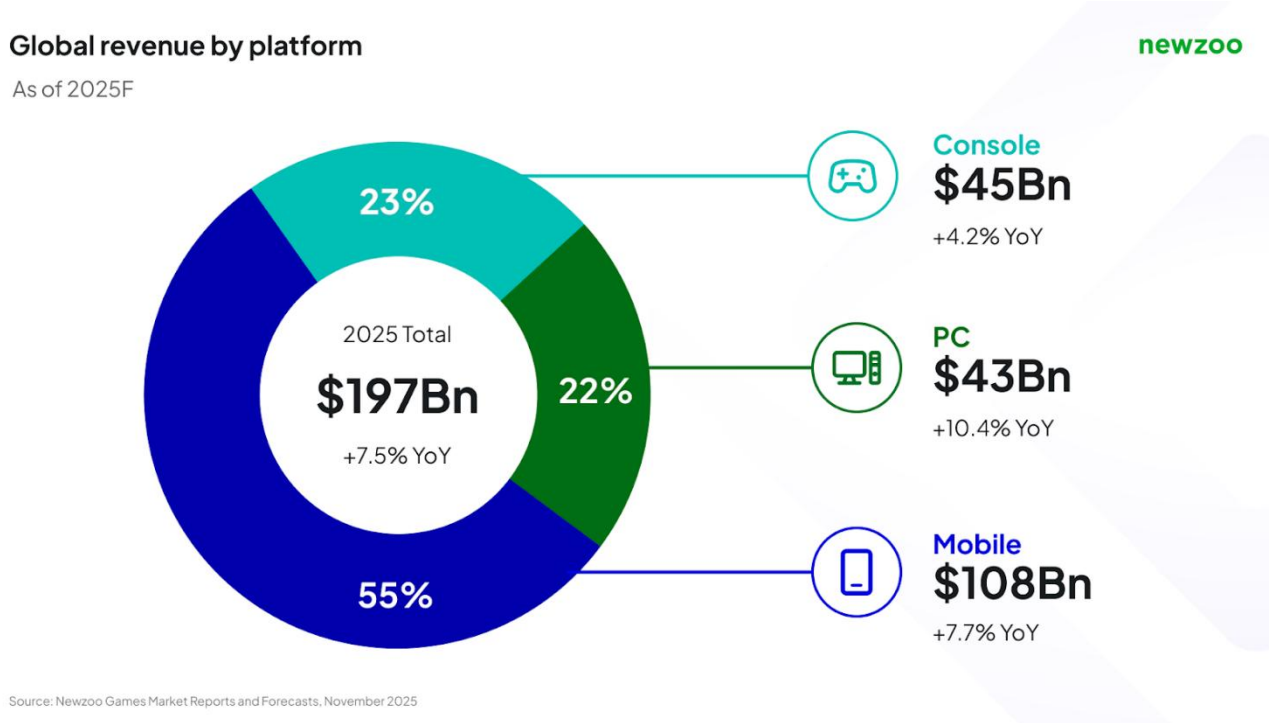

Figure 1. Global Revenue by platform in the Gaming Industry (Newzoo, 2024)

However, the revenue growth doesn't equate to a profit. The sheer amount of revenue obscures the extremely low profit margin that is common within this very competitive space. With development budget numbers at an all-time high ($80 million-$120 million) on AAA projects and some franchise names with higher than that, a developer can lose tens of millions of dollars on a project that may have moderately successful sales, but ultimately be penalized through lost future revenue and/or damaged brand reputation over time.

1.3.2. High Cost of Creative Failure

Unlike some creative industries where a low-performing product might be a modest setback, in the gaming sector, a failed title can have systemic consequences:

AAA game budgets rising faster than revenues have been noted by industry analysts. From 2017 through 2022, AAA development costs grew at ~6 % CAGR, projected to accelerate to ~8 % CAGR through 2028, while revenue growth slowed considerably. (Paizanis et al., 2024).

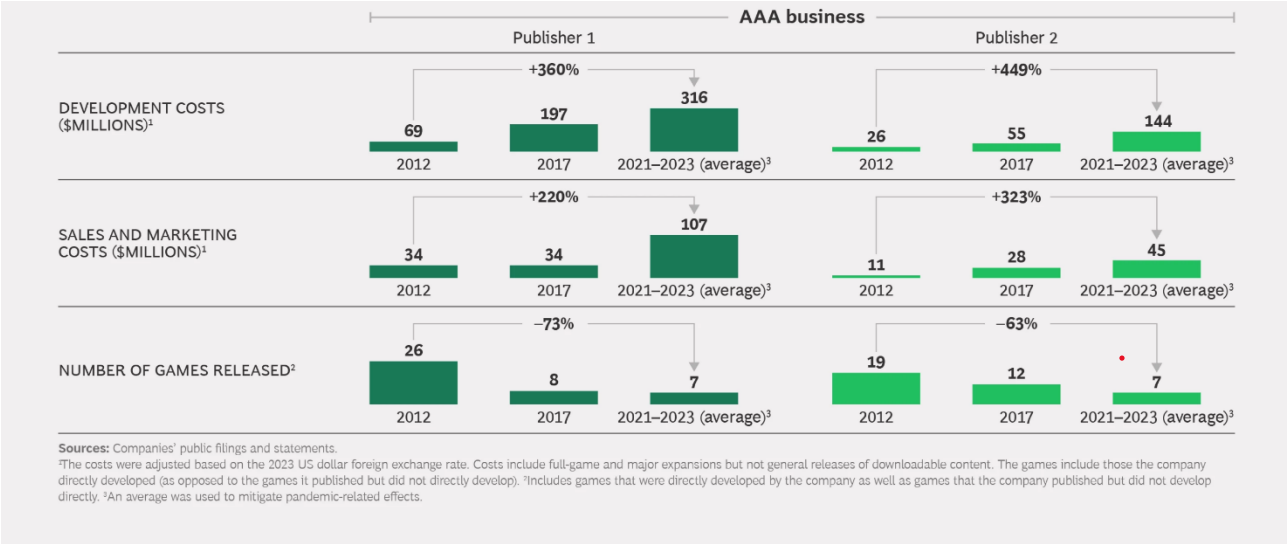

Figure 2. AAA Games Development Costs (Paizanis et al., 2024)

The threat of homogenised creativity is growing because studios are inclined to follow the old formula and treat it as a follow-up, rather than being innovative, just because the failure of one project can threaten further work and investment. This tendency has been recorded in the studies of AAA production strategies. These trends can explain why many large studios are increasingly placing bets on existing franchises or live-service models designed to generate additional income.

Titles of live-service games whose content is continuously updated rather than sold once occupy a large share of the market. Although live services such as Fortnite, Minecraft, and Valorant do not require long development times, they also place heavy loads on creative teams due to millions of active players. Live-service titles need content creation, a high rate of iteration, and ongoing community interaction, creative requirements that have no conclusion, compared to finite projects that have a definite launch and close.

When looking at the AAA game industry, a recent survey discovered that a considerable number of game creators are now hooked on live-service or live-ops, where the game continues to be produced and updated long after its initial release, much like the observations of the GDC State of the Industry Survey (2024). Live-service operations are different from the traditional approach by shifting from meeting a specific creative peak to generating a new wave of content and basically piling up the pressure of creating a single massive work; instead, studios sort out a series of different narrative lines, seasonal activities, and customer feedback loops to keep the game fresh.

1.4. Case Example: Where AI-Augmented Creativity Could Have Mitigated Failure of the Cyberpunk 2077 Release

The video game Cyberpunk 2077, launched in December 2020, is often cited as one of the most prominent examples of creative and managerial failure in the contemporary gaming sector. Even though the title was one of the most hyped of the decade, it was riddled with technical issues, especially on the outdated consoles, as well as unfulfilled expectations of the players in terms of scale and performance. Although the game later addressed the problems through massive post-launch updates, the initial release had significant financial, reputational, and organisational effects on the developer, CD Projekt Red.

Notably, the problem with Cyberpunk 2077 was not because the creative development did not live up to the expectations, or the team was not skilled enough to execute the creative vision of the creators. It is quite the opposite; in fact, based on the post-mortem reports, the failure was primarily an overestimation of the game engine's capabilities, platform limitations, and incorporating a complex world system in a constrained and rushed production window (Dring, n.d.).

1.4.1. Miscalculation of Technical and Creative Scope

CD Project Red's transition of their own engine from a third-person RPG to a first-person RPG using an open world design for multiple hardware generations simultaneously proved to be a larger task than initially anticipated, according to publicly released statements and information provided by investors. While the challenges associated with meeting these new expectations became increasingly apparent as production ended, the scope of creative ambition increased.

On the positive side, after release, CD Projekt Red stated that the game did not meet the standards that it had hoped to achieve in quality, particularly with regards to playability on previous generation systems, and cited internal problems with accountability and the test process (CD Projekt Red, 2021) as reasons for why they removed Cyberpunk 2077 from the PlayStation store.

When viewed through the lens of creative problem solving, this is a case of having too much commitment to an evolving creative vision and inadequate flexibility in evaluative processes. Choices related to the level of detail used in storytelling, the degree of environmental complexity, and the amount of complexity in each system were apparently made without consideration for how those factors would cumulatively affect performance across platforms.

1.4.2. Where AI-Augmented Creativity Could Have Added Value

This is not to say that AI would have improved Cyberpunk 2077; instead, AI-enhanced creative processes would have identified early warning signs of significant risks, enabling more informed decisions between scope and reality.

Potential spheres in which AI augmentation could have been used to assist the decision-making include:

- Scenario simulation at an early stage: Graphical fidelity, systemic complexity, and hardware constraints across different platforms can be simulated using machine-learning models trained on historical development data, which can inform previous scope changes.

- Recognition patterns in development bottlenecks: AI systems discussing bug reports, playtest data, and development velocity could have identified compounding technical debt earlier, avoiding the use of subjective optimism or informal judgment.

- Innovative constraint feedback: Generative and analytical tools might have served as creative limiters to help the teams visualise how incremental creative additions would influence stability and player experience over time.

Studies of AI-based decision-making indicate that the system should be especially helpful in areas marked by high complexity, lengthy feedback responses, and cognitive overload, which were present

throughout the development process of Cyberpunk 2077 (Boussioux et al., 2024; Holzner et al., 2025).

1.4.3. Human Factors and Organisational Pressure

The case also highlights how organisational pressure and optimism bias can distort creative judgment. Internal reports and public statements indicate that management confidence in post-launch patching may have overshadowed more conservative creative evaluations. AI-supported evaluative tools would not eliminate such pressures, but they could introduce counterfactual evidence and alternative projections, supporting more balanced decision-making under pressure.

In this sense, Cyberpunk 2077 illustrates how creative failure in gaming is often not due to poor ideas but to insufficient support for creative decisions within complex, high-stakes environments.

1.5. Synthesis of the Problem

The previous section shows how the creative industry and video games, in specific, are encountering challenges that create difficulties for traditional creative processes. Additionally, the mentioned challenges relate to each other, creating an environment where even well-trained groups are unable to continue making good creative decisions.

Traditional methods of creativity do not provide sufficient results in today's environment because many creative tasks rely heavily on tacit knowledge, informally formed judgments based on experience; iterative testing and feedback loops to judge ideas; and time-sensitive, limited resource evaluations made by humans. Historically, this method has been very successful at generating innovative solutions. However, recent studies suggest that the method is becoming increasingly brittle as the size of projects increases, the level of uncertainty in decision-making increases, and interdependencies among elements of the decision-making process grow (de Barros, Resende & Pontes, 2025). In addition to cognitive overload and coordination challenges, optimism bias can further impede a team's ability to evaluate the full range of potential consequences associated with the decisions made during the creative process, particularly when working in a live service environment or across multiple platforms.

However, there is also growing evidence indicating that simply adding AI to creative environments does not inherently lead to improved outcomes. Research conducted on human-AI collaboration indicates that poorly designed integration of AI can exacerbate fixation issues; reduce perceptions of ownership over content created using AI; and produce additional coordination problems depending upon the clarity of the roles and structure of interactions (Anantrasirichai & Bull, 2022).

If adopted in the absence of structured frameworks, the use of Artificial Intelligence may be more of a reactive measure than a strategic one, leading to inconsistent results and affecting idea quality. The outputs may also be trusted or dismissed irrationally. Lastly, human judgment may be either ignored entirely or underutilised, which could affect the integrity of human oversight in the project (Anantrasirichai & Bull, 2022).

This suggests that the issue lies not in the availability of AI technologies but in the lack of systematic guidance on how AI should support creative problem-solving across different stages and contexts.

Identified area of exploration

Despite growing interest in AI-augmented creativity, the literature reveals a gap at the intersection of creative problem-solving, organisational decision-making, and industry-specific applications. Existing studies often focus on isolated tools, experimental tasks, or individual creativity, rather than examining how structured human-AI collaboration can be embedded into real creative workflows, particularly in high-risk industries such as game development.

Therefore, there is a clear need for:

- Conceptual frameworks that align AI capabilities with creative problem-solving stages
- Empirical investigation into how human and AI roles can be balanced effectively
- Industry-grounded analysis that accounts for organisational constraints and pressures

This thesis is positioned to address this gap by examining how AI can be systematically integrated into creative decision-making processes to enhance, rather than replace, human creativity within the gaming industry.

2. Theoretical Findings of AI-Augmented Creative Problem Solving in organisations in the Gaming Industry

2.1. Creativity and Creative Problem Solving in Business

The dynamic nature of technology, unpredictability, and competition in the contemporary business world has generated a massive requirement for innovation and talents and skills provided by artists will no longer be enough. It is not easy to come up with new ideas that work, but that is basically the success of any company, as Runco and Jaeger have explained in their 2012 paper. The generally accepted definitions of originality and applicability are also considered to be the keystones of organisational innovativeness, since empty new ideas with no practical application aren't going to add to the bottom line of the firms. Managers now begin to regard creativity as a technique that can be taught, cultivated, and inculcated deep within the core of their corporations, and this has been reinforced by the fact that, according to Puccio (2007), creativity is not a mere accidental phenomenon but, in fact, a form of discipline and process.

They are in effect giving their people the room to do so, and they are backed by the highest level of leadership that drives change and has a plan in place and systems that allow experimentation and iteration in the event the company desires to innovate. It is a bottom-up approach where the creative output of a company begins with its individual staff, all the way to the team and the organisation.

The individual level well-known cognitive actions include the generation of ideas, connections, and perspective altering, but team creativity is the outcome of the people collaborating, exchanging various ideas and views, disagreeing on some, but never in a destructive manner. The effectiveness of the creative output of a company is determined by the style of the company leaders, organisational culture, and systems. These systems will either endorse or kill creativity, depending on them. Puccio (2007) argues that all these levels must be aligned to have an effective problem-solving process and that creative ideas may not stall in the process.

In this context, creative problem-solving is a systematic business process where sensitive issues are resolved by systematic search and evaluation of potential solutions. Creative problem solving is a combination of both analytical and imaginative thinking to come up with solutions that are beyond the abilities of the conventional brainstorming and intuition-based approaches. Organisations that control creativity as a deliberate process will ensure long-term market leadership since they are able to address challenging and unpredictable business issues (Runco & Jaeger, 2012).

2.1.1. Creative Problem-Solving Models

The creative problem-solving (CPS) process is known for being both a structured and flexible way of solving unstructured and ambiguous organisational problems. All industry-specific creative problems are different, but all CPS approaches use a common idea: the best solution arises from a back-and-forth process of divergent and convergent thinking rather than from a purely analytical or linear thought process (Puccio, 2007). As such, numerous frameworks have been developed over time that provide a unique method of framing, exploring, and solving creative problems.

Osborn-Parnes Creative Problem Solving (CPS) Model

Influenced significantly by the earlier work of Alex Osborn but subsequently expanded upon by Sidney Parnes the Osborn-Parnes model was one of the first and most influential frameworks of the early years of CPS development. Rather than treating creativity as an inborn gift, the model presents creativity as a deliberate, conscious, and teachable process. The Osborn-Parnes model has traditionally been presented by researchers in the form of six distinct phases: objective finding, fact-finding, problem-finding, idea finding, solution finding, and acceptance finding (Puccio, 2007).

A distinctive element of the Osborn-Parnes model is its separation of divergent and convergent thought processes through each of the model's phases. For instance, during the phase of 'idea finding', participants are urged to produce a large number of ideas with no judgment made on them until later when they are able to converge on viable ideas. The intention of separating the thought processes is to minimize the premature judgment of ideas and creative inhibitions associated with evaluating ideas at too early a point in the creative process. Nevertheless, some researchers have suggested that the model may become too mechanistic when it is implemented too rigidly, particularly in fast paced environments where the creative and evaluative elements of the creative process occur simultaneously (Puccio, 2007).

Despite its limitations, the Osborn-Parnes model has had a significant influence throughout the history of CPS, particularly in education and facilitation contexts, because of its clarity and accessibility.

Design Thinking

Design thinking is an iteration of CPS that developed in the past two decades, mainly due to organisations such as IDEO and academic institutions such as Stanford University's D'school. A key feature that differentiates design thinking from previous iterations of CPS is the importance it assigns to the user-centered empathetic perspective in the problem-solving process. The common iterations of the design thinking methodology include empathize, define, ideate, prototype and test. Each iteration emphasizes the need to have the designers engaged deeply with the end-user throughout the process and validate their assumptions about the end-users.

Unlike other methodologies, Design Thinking recognizes that the problem-solving process will be non-linear. Designers will often go back and forth between each stage of the design thinking process when they get new information during the prototyping and testing phases. In addition, this ability to cycle back and forth through each phase of the process allows designers to iterate quickly and respond to the ever-changing needs of the customers. However, design thinking has also received criticism for not providing enough analytical rigor and organisational constraint. Therefore, without proper structure, designers can create innovative ideas that may be difficult to scale or execute. Nevertheless, the focus on experimentation and learning of design thinking aligns well with current innovation strategies (Brown, 2009).

Double Diamond Model

The Double Diamond model, created by the UK Design Council, presents an advancement of the divergent-convergent process through a visually and conceptually structured approach. The Double

Diamond Model divides the creative process into two diamonds: one for problem exploration (discover and define) and another for solution development (develop and deliver).

This distinction in the Double Diamond Model is most notable in its explicit recognition of problem framing as a creative act in and of itself. In doing so, the model separates the definition of problems from the generation of solutions and thus aims to avoid having teams solve the Wrong Problem efficiently. This is especially important in organisational contexts where assumptions, biases, or insufficient information typically influence the initial problem statements.

Although the Double Diamond Model is useful in providing clarity at a high level, it does not provide guidance on micro-level creative techniques; therefore, it is frequently used in conjunction with other CPS tools, rather than being a stand-alone method (Tseng & Chang, 2025).

Creative Problem Solving (CPS) Version 6.1

Version 6.1 of Creative Problem Solving (CPS) was developed by (Treffinger et al., 2003), based on previous versions of CPS. They designed Version 6.1 to represent creative problem solving as a flexible and modular system, with less emphasis on a linear or sequential process, as seen in prior versions. Four main stages of this process include Clarify, Ideate, Develop, and Implement. Each stage has associated tools and mindsets.

An advantage of Version 6.1 is the recognition that the creative problem-solving process will need to adapt to context. This version of CPS encourages teams to work iteratively through the stages and to use both divergent and convergent thinking as necessary. Additionally, CPS 6.1 emphasizes the importance of creative leadership, stating that creative leaders should be actively managing the cognitive dynamics of their team, including risk tolerance, ambiguity, and motivation.

The flexibility of CPS 6.1 allows for greater relevance in complex organisational settings; however, due to the required adaptive nature of the model, there are increased facilitation skills required when using CPS 6.1 in comparison to more structured models(Treffinger et al., 2003).

Comparative Overview of CPS Models

Table 1. Creative Problem-Solving Phases

Model	Core Focus	Structure	Strengths	Limitations
Osborn Parnes	Divergent–convergent thinking	Sequential stages	Clear, teachable, systematic	Can feel rigid, less adaptive
Design Thinking	Human-centred innovation	Iterative, non-linear	Strong user focus, experimentation	Risk of vagueness, scalability issues
Double Diamond	Problem framing and solution development	Two-phase divergence–convergence	Strong emphasis on defining the right problem	Limited operational detail
CPS 6.1 (Treffinger et al., 2003)	Adaptive creative leadership	Modular and flexible	Context-sensitive, leadership-focused	Requires facilitation expertise

2.1.2. Creativity as a Source of Competitive Advantage in Creative Decision-Making

Organisational creativity is now being realised as a critical ability that assists the firm to increase its decision-making and problem-solving abilities. It is conditions of incomplete information that are also characterized by volatility, uncertainty, and rapid technological change in which firms are being forced to make strategic decisions. It is stated that organisational creativity enables the decision makers to look at various perspectives, rearrange issues, and devise certain distinct solutions. This allows creativity to serve as both a source of input of innovation outcomes, as well as a major process through which an organisation can enhance the quality and flexibility of its strategic choices (Indriani, 2025).

Relative to the source of innovative drive in a firm, a research discovered that organisational creativity is fundamentally essential. As (Ahmed et al., 2025) emphasized, smaller and medium-sized enterprises that are more inventive can take more flexible and more adventurous decisions, which subsequently trigger new product ideas. Creative minds can rethink the given problem entirely, and rather than having a single solution, they can end up having many ideas. Skilled Companies that can balance between numerous ideas can more easily adapt to the needs of their customers and the market changes.

With regards to decision-making, whether entrepreneurship or management, creativity has been identified to contribute to the feeling of generating new ideas and opportunities, which Indriani(2025) calls entrepreneurial creativity. This form of creativity, which is popularly recognized to facilitate innovation, is a competitive edge that assists in protecting and maintaining innovative ideas and, as such, has an extremely positive influence on the success of any business. Arriving promptly in another point of view, innovative decision-making enables companies to identify their peculiarities and develop plans that their rivals cannot imitate easily. Instead of relying on analytical thinking, creative approaches to issues cause organisations a journey of exploration and discovery where they are able to tap their intuition and learn to cope with experimental and learning processes in the face of cutthroat competition.

In a broad organisational sense, the systematic reviews of the literature on creativity and innovation point to the fact that the notion of creativity is central to the broad spectrum of approaches to innovation and problem-solving in different organisational settings, especially when organisations are dealing with complex and ill-formulated issues. (de Barros et al., 2025) make the point that creativity is always associated with effective problem-solving in various organisational settings. According to their analysis, the creative processes facilitate iterative decision cycles whereby the ideas are constantly being refined and modified as per the feedback, uncertainty, and changing constraints. This strengthens the perception that creativity also helps in competitive advantage at the quality of the decisions that are made in the long run rather than the isolated result of innovative decisions.

Organisational leadership and digital capabilities are other factors that determine the relationship between creativity and competitive advantage. It is seen by (Umayna et al., 2025) that in the face of digital leadership, creativity and innovation are more effective in worker competitive advantages. Digital leadership improves the capacity of organisations to incorporate creative know-how into the process of decision-making by permitting quicker experimentation, collaboration, and sharing of information. This implies that creativity can be transformed into a strategic resource whenever it is incorporated into organisational systems that promote adaptive decision-making and technological empowerment.

Lastly, the ability to be creative is most useful during situations that demand the use of complex problem-solving, in which case conventional methods of analysis might not suffice. Complex problem-solving is one of the major roots of competitive advantage identified by Verissimo et al. (2024) as organisations that can integrate creative thinking with systematic analysis processes are more likely to manage uncertainty and dependent variables of decisions. Such situations can be solved through creative decision-making, which enables organisations to develop and analyze other strategies, trade-offs, and develop creative solutions that competitors fail to notice.

In brief, creativity is a tool that brings a competitive advantage through increasing decision-making and problem-solving skills of the organisation. Instead of focusing on the generation of ideas, creativity allows firms to perceive and analyze a wide range of strategies and make informed decisions that can sustain innovation and differentiation. This view is very useful in analyzing how AI may further enhance the creative decision-making process, especially in those industries where innovation relies on the ongoing and complicated solutions (Verissimo et al., 2024).

2.2. Artificial Intelligence as a Creativity-Enabling Technology

Artificial Intelligence has become widely recognized as a disruptive technology that will continue to affect organisational environments, beyond the realm of just automating tasks, to enhance human imagination and problem-solving. The primary focus of AI adoption in organisations was initially to increase efficiency through predictive analysis, automate routine tasks, etc. Today, advancements in Generative Models, Machine Learning, and Natural Language Processing (NLP) have allowed AI to enter areas previously thought to be solely within the domain of humans, such as ideation, conceptualization, and creating creative content. This allows organisations to consider how they may extend their creative capacity through collaborative efforts with AI in creative workflows to navigate complex problems (Anantrasirichai & Bull, 2022).

The shift of AI from basic automation to enhancing human imagination represents a wider technological paradigm. Early AI systems were designed to replace repetitive human activities, while today's advanced AI platforms provide cognitive extensions by rapidly analyzing vast amounts of data, developing unique relationships or combinations of ideas which can serve as inspiration for human decision makers. A significant number of creative professionals are currently using generative AI tools in their workflow; according to an Adobe survey, 86% of professional creators reported using generative AI in their creative process, and 81% stated that it generated content that they would not have been able to create themselves. Organisations are now beginning to integrate AI into various aspects of their creative processes and are experiencing both positive quantitative and qualitative impacts on the way they innovate. Studies have demonstrated that teams utilizing AI to support their

ideation process can generate more innovative ideas at a faster rate than those who do not utilize AI. Additionally, studies demonstrate that teams supported by AI exhibit improved knowledge sharing and generate greater diversity in their ideation outputs when compared to non-AI-supported teams (Gindert & Müller, 2025). These shifts align with the broader view that AI functions not merely as a tool but as an enabler of creative exploration and decision support, particularly when combined with human insight and strategic framing.

However, the creative contribution of AI depends on human supervision, contextual interpretation, and integration into workflow structures that preserve originality and relevance. AI can accelerate pattern recognition and idea generation, but it cannot fully replicate human intrinsic motivation, contextual judgment, or emotional intuition, which remain critical to genuine creativity. Research grounded in human-machine interaction highlights the need to frame AI systems not as replacements for human creators but as collaborators that enhance human cognitive processes and support organisational innovation.

2.2.1. AI Technologies in Creative Problem-Solving Processes

Machine Learning for Pattern Recognition and Exploration:

At the core of AI systems are several different Machine Learning (ML) methods, which use data to find patterns, predict possible scenarios, and create a range of possibilities based upon those learned associations. In terms of creativity, ML may identify unobvious structural elements of very large data sets of things like design archives, user preferences, or historical innovation results, thus identifying opportunities that may not have been apparent to a human analyst. An overview of AI in creative sectors has found that there is widespread application of ML-based methodologies for generating content, extracting information from data, and enhancing data, particularly when there are extensive amounts of data (Anantrasirichai & Bull, 2022). By removing some of the mental processing burden associated with traversing an enormous space of ideas, ML systems provide support for people to explore and generate new ideas by focusing attention on more abstract decisions about how to interpret and refine generated ideas. Through the facilitation of enhanced machine-assisted exploration, organisations will have a better ability to discover other ways to accomplish goals, emerging trends and new combinations of conceptually related items that were previously unknown.

Natural Language Processing for Idea Creation and Narrative Aid:

The application of Natural Language Processing (NLP) includes algorithms designed to facilitate the conversion, generation, or modification of natural language text to be understandable to humans. Large Language Model (LLM) technology has been applied to develop the GPT-4 tool to assist in generating ideas using prompts to suggest possible ideas; create storyline concepts for creative writing; and provide a conceptual framework for writers to organize their thoughts while developing new ideas. Studies on Human-AI Collaborative Ideation have shown that including LLMs within Group Ideation processes (Brainwriting) will significantly improve the quantity of ideas generated during the Generation phase and evaluated during the Evaluation phase, with additional perspectives for users to consider when modifying or evaluating user-generated content. (Shaer et al., 2024). In addition, NLP technologies are enhancing the ability of organisation-based design teams to articulate their Design Rationale; effectively summarize large volumes of complex information; and quickly compare multiple alternatives based upon conceptual narratives created during group ideation rather than relying upon individual brainstorming. Ultimately, NLP technologies are increasing both the

Divergent Thinking/Phase of the Creative Problem-Solving process and the Convergent Thinking/Phase of the Creative Problem-Solving Process - resulting in increased quality of ideas generated.

Generative Models for Content and Concept Generation:

Generative A.I. systems, for example, Generative Adversarial Networks (GANs), and transformers are all examples of generative models that create new forms of content using patterns they learn from their training data. For instance, GANs have become popular in art and design to generate entirely new images, designs, and concepts; whereas transformer models create text, audio, or other multi-media formats. Both types of models provide a professional with many options and different versions of potential output that can be edited/curated per their specific goals. Research indicates that when an A.I.-augmented tool is properly utilized to guide A.I.-generated ideations, it will not only produce more ideas but expand the range of possible solutions (Ashkinaze et al., 2025).

Additionally, there is growing evidence that the use of generative A.I. enhances both team creativity and problem-solving ability within collaborative settings when working under structure; yet, continued research is being conducted into developing best practices for integrating these systems and interacting with them.

2.2.2. AI as Decision Support in Creative Problem-Solving

A lot of people who consider using artificial intelligence to improve their creative problem-solving skills think of AI tools as panaceas that will automatically come up with ideas or help identify options. While the role of AI is certainly nuanced, it can certainly aid in the creation of new ideas by rapidly generating alternatives, prompts or starting points that humans may not have conceived otherwise due to factors such as time, cognition or other constraints (Holzner, Maier & Feuerriegel, 2025). Thus, AI can act as a cognitive partner providing support during the divergent phase of creative problem solving.

Research on human-AI ideation has shown that combining human direction with AI's ability to generate new ideas can lead to greater quantities of ideas than a group composed solely of humans could produce, and possibly even lead to better overall creative performance if the collaboration is structured properly (Holzner, Maier & Feuerriegel, 2025). However, simply increasing the number of ideas generated does not necessarily equate to an increase in the quality or value of creative output. There is evidence that, although generative AI systems can produce a high volume of output quickly, they often lack the sophisticated evaluative mechanisms humans utilize to assess whether an idea is novel enough or valuable enough to pursue, particularly in complex decision environments related to creativity (Zhang et al., 2025).

In addition to helping to create new ideas, AI may also be able to provide assistance with evaluating ideas and simulating scenarios. With predictive modeling and simulation tools, AI can generate predictions about possible outcomes or allow designers to explore multiple design paths that may not be practical for them to mentally compute themselves. Surveys conducted among organisational leadership indicate that approximately 45% of respondents indicated they believe AI accelerates the idea generation process, and nearly 43% believe generative AI makes a positive contribution to problem-solving workflows (de Barros, Resende & Pontes, 2025; Ahmed, 2024). Survey Shows That Many Business Leaders Are In Favor Of Using AI For Creativity, 2024). These responses reflect a

growing trend towards confidence among practitioners that AI can accomplish more than just automating mundane tasks; it can, in certain contexts, contribute to the evaluative aspect of the creative process.

The concept of AI replacing human discernment in decision-making processes is typically exaggerated. Research examining the creative abilities of AI-based models has found that while they may produce a very large quantity of potentially useful outputs, they frequently have difficulty distinguishing between original and unoriginal ideas. One study found that generative AI struggled to differentiate highly original ideas from conventional ideas. This study reinforces the fact that human oversight is still needed to effectively evaluate ideas produced through AI (Frontiers Editorial, 2025). Studies like this highlight how well AI may perform in terms of identifying patterns and recombining them to create new possibilities, but it cannot currently replicate human-type strategic thinking and metacognition, two essential elements involved in effectively making decisions through creativity.

Therefore, instead of viewing AI as a replacement for human judgment when being used as a decision support tool, we should view it as complementary. When utilized appropriately within a workflow and combined with human reasoning capabilities, AI can expand our consideration of all possible solutions and reveal alternative approaches. The extent to which these advantages are realized however, depends upon both how the technology is applied and how humans choose to interpret its output, as well as how teams are able to merge computational suggestions with context-specific knowledge.

2.2.3. Risks and Constraints of AI in Creative Contexts

Despite its potential, AI adoption in creative work is not without risks and constraints. The most well-known limitation associated with AI is its ability to produce biased and homogeneous results. A primary reason for this is that many AI systems are trained on pre-existing databases created by humans. As a result, these systems may reproduce and even magnify cultural biases present in those databases. These biases will likely limit an AI's ability to produce novel creative works as opposed to reproducing common and traditional patterns found in its training dataset. (Holzner, Maier & Feuerriegel, 2025; Ashkinaze et al., 2025)

Evidence supporting the likelihood that AI systems are capable of producing similar output due to their propensity for homogeneity includes findings from experiments indicating that while using AI-generated ideas collectively may increase overall diversity, it does not necessarily support individual innovation. Furthermore, excessive reliance on AI-generated ideas may cause creators to generate similar types of ideas repeatedly instead of generating new and different types of ideas. Therefore, this trend raises significant concerns regarding whether AI systems provide innovative and creative capabilities or if they simply redistribute the same space of ideation to statistically common ideas learned from previous training data.

A second constraint facing the widespread use of AI in creative applications is the dependence upon the technology and the possible degradation of essential human-based creative skills. Many experts believe that as creative professionals increasingly rely on AI for idea generation and drafting, there exists a substantial possibility that critical human skills, including divergent thinking, evaluating ideas critically, and defining problems deeply, will gradually deteriorate. Although research in this area is

ongoing, several recent studies indicate that relying extensively on AI to perform routine creative tasks may decrease creative professionals' level of engagement during exploration-based tasks. Consequently, researchers have raised serious concerns related to the loss of independent creative abilities. These concerns are consistent with larger theoretical models of cognitive offloading wherein individuals utilize external tools to assist in managing complex tasks. However, when used excessively, these tools may ultimately diminish human skills.

Legal and ethical considerations represent yet another layer of constraint. Legal uncertainties surrounding copyright law, authorship rights, and governance models exist in many industries where creative products have both economic and cultural significance. For example, lawsuits have been filed against companies whose AI systems were trained on copyrighted material without permission. In addition, the lack of clear regulatory policies governing the production and distribution of AI-generated content has led to numerous public debates surrounding the legal implications of utilizing AI for creative purposes.

In addition to reducing diversity and increasing stereotypical representations, the biases contained within an AI system's training database can also negatively impact society through unethical representation.

Ultimately, the last barrier is at the organisational level. Organisations need to develop formalized procedures for evaluating the contributions made by AI systems to the creation process, attributing authorship credits appropriately to contributors based on varying levels of involvement and clearly outlining acceptable uses and liability for organisations that choose to utilize AI systems in the formal creative process. Without established mechanisms for creating transparency regarding AI usage in creative processes, there is a strong potential that an organisation's reputation could be damaged by distrust among internal and external stakeholders.

2.3. Human AI Collaboration and Co-Creative Systems

The literature regarding Human-AI Collaboration in Creative Work has grown substantially in recent years, with the development of numerous frameworks intended to define how Humans and AIs will collaborate as part of Joint Creative Processes. These frameworks are based upon a wide range of assumptions. The units of analysis also differ. Finally, these frameworks take different normative positions concerning where Authority should reside. Therefore, before developing an applicable Conceptual Framework for the Gaming Industry, it is necessary to do more than simply review existing literature. Rather, it is important to identify those areas of convergence among theoretical positions, those areas of meaningful divergence, and whether there exist components of each position that could be usefully integrated into a single theoretical framework.

The three theoretical issues addressed in the current research include: how the relationship between humans and AIs should be conceptualized (i.e., where authority/agency resides); under what design conditions collaborative creativity can occur; and how learning/adaptation contributes to the sustainability of human-AI collaborative relationships.

2.3.1. From Supervision to Symbiosis: How the Relationship is Conceptualised

The very first form of divergence among scholars concerned the modeling of the human-AI relationship. Historically, the Human in the Loop (HITL) approach has modeled the human-A.I. relationship statically, where a specific distribution of role responsibilities was assumed to remain largely unaltered over time. However, López et al. (2025) challenged this modeling approach directly, stating that in an actual collaborative scenario, neither humans nor machines can assume a fixed role. Instead, collaboration is often characterized by dynamic, mutual dependence, and dependency upon organisational context. López et al. (2025) argued that humans uniquely contribute ethical judgment and contextual interpretation, which become especially important during ethically ambiguous or highly complex decision-making scenarios; however, these contributions are often obscured when the relationship is viewed as one of supervision versus partnership. Morello and Chick (2025) extended this line of argumentation through their Human-AI Symbiotic Theory (HAIST), which views the human-AI relationship as being structurally interdependent. Thus, new adaptive patterns evolve from the iterative nature of interaction itself, and unique creative solutions arise from the combined efforts of each partner as opposed to either partner attempting to complete them individually. Additionally, Morello and Chick (2025) emphasized that both technical A.I. systems and social/organisational systems in which they exist must be aligned for collaboration to occur in practice; a requirement that significantly increases the practical feasibility barrier to implementing such collaborations.

Thus, these theoretical perspectives are not interchangeable. The HITL perspective views the human-AI relationship as a control problem; the dynamic collaboration perspective views the relationship as a coordination problem; and Morello & Chick's (2025) HAIST perspective views the human-AI relationship as a systems integration problem. While I do draw heavily from López et al.'s (2025) dynamic collaboration perspective, I also emphasize the importance of socio-organisational alignment as a prerequisite for successful collaboration in practice; which is consistent with the empirical realities of how game development workflows typically unfold.

2.3.2. What Enables Productive Co-Creation: Trust, Transparency, and Role Clarity

The second form of divergence pertains to what design conditions make co-creation productive. Three interrelated conditions recur across the literature: trust, transparency, and role clarity.

Vössing et al. (2022) claim that transparency is not only an issue of technical design, but rather one of structural preconditions for sustainable collaboration in areas where human judgment has implications for decisions made by technology. As such, users require some form of access to information regarding the rationale behind an AI suggestion if they wish to use the output produced by the AI system. In addition to this, Hao, Demir & Eyers (2019) have expanded upon this aspect using the term 'sensemaking'. Sensemaking refers to the ongoing process whereby people interpret and utilise their interpretation of AI output while maintaining their own epistemological authority. Both authors agree on the importance of providing explanations to enable meaningful control over AI-based outputs. Therefore, explainability provides the basis for meaningful authority over AI output as opposed to merely nominal.

Rezwana & Maher (2023) developed the COFI model to provide a systematic way of describing interactions in terms of establishing co-creative roles based on three key parameters: turn-taking,

contributions, and communication channels. Issak, Rezwana & Harteveld (2025) furthered the development of this area by developing the MOSAAIC model. This model describes the autonomous dimension of partnerships and allocates four dimensions independently across all parties involved. These dimensions are optimisation, autonomy, authority, and initiative. The main difference between COFI and MOSAAIC models lies in the focus of each model. COFI focuses on how interaction occurs at the surface level, whereas MOSAAIC focuses on allocating agency.

Therefore, a productive view of both models is that COFI and MOSAAIC represent two differing levels of abstraction and therefore should be used together rather than competing against one another. COFI outlines how decisions are implemented at the surface-level (i.e., who will respond first and/or in what manner via what means), whereas MOSAAIC outlines what is being allocated at a greater level of abstraction (i.e., autonomy, authority, etc.). Thus, a conceptual framework for utilising AI to support creative problem-solving requires both: clear definitions of who determines what (this is contributed by MOSAAIC), and clear procedures outlining how those determinations occur during interaction (the contribution provided by COFI). This thesis uses both COFI to outline the principles for interaction contained within the collaborative hub and MOSAAIC to outline the assigned roles and authorities between humans and AI throughout each phase of the creative process.

2.3.3. Learning, Adaptation, and the Question of Symmetry

The existing literature shines a light on three primary dimensions regarding human-AI evolutionary dynamics. The first dimension is about whether AI can substitute for human judgment in making decisions. The second dimension pertains to the extent to which AI complements human judgment. The third dimension addresses how collaboration between humans and machines may evolve.

Te'eni et al. (2023) proposed a new approach called reciprocal human–machine learning (RHML). In RHML, both humans and machines engage in iterative learning. Humans guide the behavior of the machine using instructions and feedback, while humans modify their own thinking processes based upon insights and patterns generated by the machine. Kehler et al. (2025) developed a new approach called generative collective intelligence (GCI), which views AI as a member of a group engaged in collaborative problem-solving. GCI frames collective cognitive activity as a distributed cognition process where individual contributions made by both humans and machines are combined to produce solutions that could be generated individually.

Both RHML and GCI incorporate elements related to learning and adaptation; however, there is a substantial difference between them regarding the concept of symmetry. RHML implies reciprocity in terms of learning between both parties; whereas GCI is more neutral about symmetry, it focuses on the outputs produced collectively by the system. (Luan et al., 2025) provided some empirically based evidence supporting the reciprocal conceptualization of learning by demonstrating that creative quality was improved in GenAI Human co-creation when feedback and refinement loops were designed into systems as ongoing activities, rather than being viewed as discrete events.

Luan, Kim & Zhou (2025) identified longer timescales for collaborative activities through which humans and GenAI can positively impact each other. The authors concluded that there is a need for the existence of decision-making frameworks for human-AI collaboration beyond the relatively short timeframe.

They indicated that the evaluation of long-term operational cost and strategic objectives are required for the evaluation of human-AI collaboration. This Thesis has used RHML as the major Learning Mechanism within this framework; however, it is aware that reciprocal learning is a normative aspirational condition, and therefore not an inherent property of all human-AI systems. As the results show, practitioners have evaluated reciprocal learning as valid when creative authority has been structurally maintained at all stages of the process. This finding is supported by (Hao et al., 2025), who were critical of static authority models applied to collaboration, and tempered by RHML's implications for symmetry as described in its stronger forms.

Likely, whether AI may operate as a co-creative partner in a project will relate to how much content generation occurs vs. how much support exists for the exploratory dialogue process. However, research shows that simply pairing humans with AIs does not directly create creative value; instead, it is the mechanisms that provide feedback opportunities for reconsideration and continued engagement that allow value creation to occur (Luan et al., 2025).

Therefore, the role of AI should not be viewed as an Independent Idea Generator, but rather as a Catalyst for Introducing New Perspectives and Associations or to Induce Discoveries in Unexplored Domains.

The models surveyed in this chapter may be considered separate from one another based upon the level at which they are applied, or by virtue of their application to a differing aspect of the same issue. This paper views human-AI collaborative engagement in creative processes as an example of a multilayered phenomenon. At its base, it represents questions regarding the distribution of authority and agency for decisions made during the creation process, a question addressed by both dynamic collaboration and the MOSAAIC framework. A second layer relates to the design of interactions and the extent to which those interactions are transparent. Those issues are addressed by COFI and other research related to explanation. A third layer concerns how the relationship developed over time between humans and AI systems is affected by learning and adaptation. Research concerning RHML, GCI, and wise decision-making represents research focused on this third layer.

A layered interpretation provides a clear outline for a conceptual model established in the following sections. In terms of allocating agency, this model uses explicit role clarity and designated human authority as anchors. In terms of operationalizing human-AI interaction, this model incorporates transparency and structured flexibility. Finally, in terms of sustaining the human-AI relationship over time, this model utilizes reciprocal learning within the workflow. Each component has roots in distinct theoretical traditions; however, the primary contribution of the conceptual model is in providing a synthesis of each component in a manner that addresses the unique structural constraints associated with creating games in a context that increases the challenges inherent in each of the three layers of human-AI collaboration, as demonstrated in the subsequent chapters.

2.4. Creative Problem Solving in the Gaming Industry

As stated earlier, the Gaming Industry is one of the most creatively intensive parts of the overall Digital Economy; Typically, game development involves the creation, testing, and improvement of new ideas in the areas of artistry, technology, and commerce continually throughout its life cycle. Game Studios are usually working with many different variables of uncertainty, rapidly changing player expectations, and changing technologies at an incredible rate, making Creative Problem-

Solving both highly desirable and critical to long-term success and innovation within the industry (Newzoo, 2024).

The creative decisions made during the game development process are rarely done alone; they occur after the collaborative efforts of multiple groups, including designers, programmers, artists, writers, producers, and now even Data Analysts, who each bring their own unique set of perceptions, limitations, and heuristics to the table.

As a result, creative problem solving tends to be more iterative and negotiated among all involved parties and less likely to be sequential, previous studies have indicated that collaborative work among inter-disciplinary teams will produce better creative results, however, there are also potential drawbacks in terms of coordinating the activities of team members, communication between team members and cognitive overload, especially in larger teams or distributed teams (IGDA, 2024).

From a business standpoint, creativity in gaming is directly related to market position and competitiveness. While game development concepts, mechanics, stories, and visual identities cannot be protected by patents and other formal methods of protection, developers use speed, originality, and experiential differentiation to maintain their competitive advantage.

Therefore, the industry creates a particularly relevant environment for studying how artificial intelligence-based creative problem-solving can aid in augmenting human creative decision-making processes rather than replacing them.

2.4.1. Creative Processes in Game Development and How AI Can Help Augment Them

Game design and ideation are exploratory and experimental areas of development. The first stage of development is where designers will develop and explore mechanics, rules, player interaction, and play loops; they do so using brainstorming sessions, quick sketches, and/or paper prototypes. The nature of ideation is characterized by divergent thinking, ambiguity, and constant reinterpretation of the problem space. Studies of developer workflows have shown that ideation bottlenecks exist, as well as that developers' ideation processes are often hindered due to either revisiting previous genre areas or pressure from the marketplace to limit the amount of risk being taken (IGDA, 2024).

In terms of developing and applying AI to support ideation, we see AI as a tool to serve as a cognitive scaffold to support the designer's exploration of ideas as opposed to creating new ideas autonomously. Generative systems can be applied to provide designers with alternative mechanics to consider, create new combinations of previously established design patterns, or identify novel combinations of design elements that designers may not naturally consider. The output of generative systems at this stage of development will likely act as stimuli or provocations to encourage designers to think expansively about possible design choices and will still leave the evaluation of those choices up to the designer.

Similarly, narrative design and world-building are both iterative and complex. The narrative design writers/creators have the challenge of creating a cohesive narrative while building an emotional relationship with the player, allowing the player to create their own agency within the world, all while managing the constraints created by the production process. With the ever-increasing size of game worlds comes an exponentially greater need to develop lore, dialogue and environmental storytelling, thus increasing the time-consuming task of developing large amounts of information for developers. Industry reports indicate that as players become more engaged in the gameplay experience, the

number of hours spent engaging in gameplay continues to increase, resulting in increased demand for more deep and responsive narrative experiences (Newzoo, 2024). In order to reduce some of the burden associated with developing complex narratives and/or storylines, natural language processing (NLP)-based AI can provide assistance through many means. These include assisting in writing an initial draft of the narrative, providing alternative versions of dialogue, and helping to explore various paths available through a storyline. NLP-based AI should never be used as sole-authoring agents; rather as tools designed to help writers evaluate the numerous possible options for a particular storyline or character at a much quicker pace than was previously possible. Thoughtfully utilizing NLP-based AI will also allow the developer's creativity to focus upon higher levels of consideration, such as theme and emotional pacing etc., eliminating repetitive tasks that were traditionally performed manually. However, concerns exist regarding whether the use of AI could result in original ideas being produced, maintaining consistency throughout the story, and who owns the rights to the story/content developed, suggesting that there will still be a requirement for human oversight.

Finally, the creation of visual and technical assets is one of the greatest creative bottlenecks in game development. Visual designers/artists and technical designers must produce vast quantities of characters, environments, animations, effects, etc., under extremely short deadlines. Advances in generative models have allowed for AI-aided concept art, texture generation, and animation prototyping. While these AI-assisted tools can potentially speed up the early stages of production (Anantrasirichai & Bull, 2021), from a problem-solving standpoint, they can also allow development teams to examine a greater number of design options prior to investing significant time and resources into full-scale production. Therefore, while AI cannot replace the artist/designer, it can act as an engine for rapid iteration, allowing creative professionals to evaluate a variety of stylistic directions and improve their creative vision more quickly. However, studies have indicated that risks include homogenization of visuals and standardization of style if generated assets are adopted without critical review. Thus, there is a requirement for thoughtful integration strategies and clear creative direction.

Game development is an iterative process, with prototype games being developed, tested, discarded, and rewritten repeatedly. Feedback collected during playtesting produces a substantial quantity of qualitative and quantitative information, which must then be interpreted and translated into design decisions. This interpretive work can be mentally taxing, especially when the feedback is ambiguous or conflicting.

AI-based analytical and simulation tools may aid in this regard by identifying trends and patterns in player behavior, predicting potential imbalance issues, and simulating gameplay scenarios at scale. In doing so, these types of tools can support designers in making creative decisions by providing a narrowed-down set of potential design adjustments, rather than recommending specific changes. As a result, AI can assist designers in structuring the problem space, allowing them to make value-laden judgments about what players find enjoyable, fair, and engaging.

2.5. Conceptual Framework for Integrating AI into Creative Problem-Solving Workflows

In order to be successful in integrating Artificial Intelligence (AI) into the Creative Problem Solving Frameworks within organisational Settings, one must consider AI as a collaborative Partner within a human-centered structured process rather than as a Standalone Generator of Output.

The framework for AI and the integration of AI within organisations, as outlined above, is a synthesis of current research in the areas of Human-AI Collaboration and Co-Creative Systems & Workflow

Design, combined with empirical evidence of how AI impacts the ability to creatively perform. The framework outlines the different process stages and principles for interaction, as well as governance conditions that together form a configuration to facilitate improved Creativity and Innovation whilst maintaining human agency.

Grounding Principles: Artificial Intelligence is an Augmentation and Not a Replacement.

One of the principles is that AI must be deployed to support human creativity and not displace it. More recent studies postulate that positioning AI as an enhancing partner, who helps in ideation, pattern recognition, amplifying variations, and simulating scenarios, is more effective in creating inventive results than AI appearing as a creative agent (Boussioux et al., 2024). It is true that, according to systematic reviews, human-AI teams are better than humans alone in creative tasks, particularly in ideation support, whereas generative AI alone is not better than human creativity in isolation (Holzner et al., 2025). As such, AI is treated in the conceptual framework as a cognitive partner that augments human abilities in a non-replacing manner that does not replace strategic judgement and contextual interpretation.

2.5.1. Process Stages in Creative Problem Solving and AI Integration

There are several commonalities in the way that many Creative Problem-Solving Processes develop. They begin with some form of problem identification and framing. Then they involve some form of divergent ideation. Following that process is usually some form of convergent refinement and evaluation. The final stage is usually some form of implementation or prototyping. For an AI-augmented workflow to be beneficial, AI support needs to follow the same stages. It also needs to provide the appropriate technological aids at the correct time, to allow the humans working in collaboration to continue making decisions about the problem that are important to them.

Problem Identification and Framing

When individuals are first beginning their creative problem-solving processes, they are identifying the problem space, establishing what type of innovation they want to achieve, and defining the parameters of their problem space. As such, AI can help support the initial stages of a creative problem-solving process by using natural language processing, and/or data analysis tools to compile and synthesize a large amount of information (e.g., data related to a customer, data from prior research in a specific domain) so that the team has a clearer understanding of the environment in which they will be doing their ideation (Boussioux et al., 2024; Yang et al., 2025).

Divergent Ideation and Exploration

For divergent ideation, the goal of the ideation process is to generate many different possible ideas, while avoiding too much focus on the early ideas that come up during ideation. Prior studies have shown that when humans and AI systems collaborate to create new ideas, the effectiveness of the ideation process depends heavily on how well the interaction between the two parties is structured. That is, the interaction between the two parties needs to be structured to facilitate exploration of many different ideas, without prematurely focusing on the first few ideas that come up (Yang et al., 2025).

Additionally, structuring the interaction between humans and AI systems to include both divergent and convergent ideation can prevent "fixation" on the first few ideas that emerge, and can increase the likelihood that the ideas generated by the human-AI system will reflect the true intentions of the

humans who are collaborating with the AI system (Wen et al., 2025). Studies like those referenced above indicate that AI is most effective when used to enable fluid transition between exploration and evaluation phases of the problem-solving process, rather than being used to simply provide a rigid "black box" source of suggestions.

Convergent Refinement and Evaluation

Once a broad set of ideas has been generated, creative teams need to refine and evaluate potential solutions. Research indicates that human-AI collaborative refinement benefits from explicit feedback loops, where each party informs the other's next action. Humans refine based on AI suggestions, and AI recalibrates output based on human responses (Luan et al., 2025).

2.5.2. Implementation and Prototyping

In later stages, such as prototyping and testing, AI can accelerate simulation, modelling, or asset generation, reduce manual effort while preserving creative direction. For example, generative models can produce visual and textual iterations that humans evaluate and curate, speeding up production cycles without displacing the creative control of the team (Holzner et al., 2025; Boussioux et al., 2024).

Mechanisms Augmenting the Developed AI-CPS Framework

The most significant component of the framework is understanding the mechanisms of collaboration between AI and humans. There are two mechanisms specifically: reciprocal learning and generative collective intelligence.

Reciprocal Learning: Te'eni et al. (2023) proposed the concept of reciprocal human-machine learning (RHML), which implies that both humans and AI should learn from one another over time. While humans provide direction and shape the development of the AI model, they also receive additional insights based on the patterns identified through AI's capabilities. RHML supports adapting workflows, particularly in rapidly changing environments, as well as evolving domain knowledge.

Generative Collective Intelligence: Kehler et al. (2025) described the generative collective intelligence (GCI) framework as an example of AI not being limited to being simply a tool or a single input in a social and cognitive environment, but rather it is a social/cognitive system that combines both human and machine inputs to develop solutions that would be impossible for either to develop independently. GCI emphasizes structured collaborative processes that use group reasoning, comparative judgment, and minimum regret principles to support joint problem-solving. Therefore, this model has relevance when there are many stakeholders, and their perspectives need to be

integrated into workflows that require combinations of various knowledge domains.

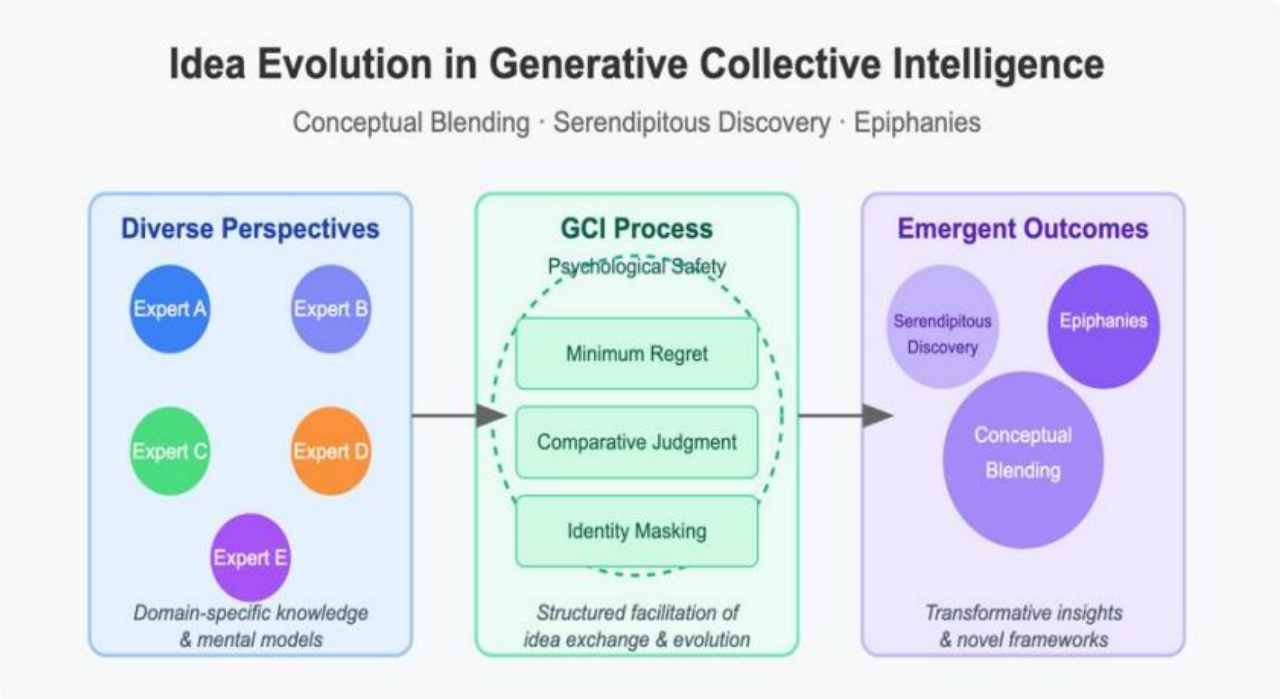

Figure 3.Interaction Principles for Effective AI-Enhanced Creativity (Kehler et al., 2025))

AI augmentation is more effective when guided by certain interaction principles:

- Structured flexibility: Workflows should allow humans to shift flexibly between AI-suggested pathways and human-generated insight, enabling iterative refinement rather than linear progression (Yang et al., 2025).
- Transparency and explainability: Users need to understand why AI responses are offered to appropriately accept, reject, or modify them (Boussioux et al., 2024).
- Feedback loops: Continuous evaluation and response between humans and AI fosters mutual adaptation, improving joint creativity over time (Luan et al., 2025).
- Role clarity: Clear delineation of where AI provides support (e.g., pattern detection, prompt generation) versus where humans drive strategy and judgment enhances workflow efficiency and preserves human agency.

2.5.3. Organisational Conditions for Successful Integration

Beyond process design and interaction mechanics, successful integration requires organisational support structures:

Training and skill development: Teams need both AI literacy and domain expertise to interpret, contextualise, and effectively utilise AI support.

Governance and ethics protocols: Policies regulating data use, intellectual property, and ethical boundaries help maintain trust and accountability.

Tool integration: Seamless integration across platforms (e.g., design environments, documentation systems) prevents workflow fragmentation and supports sustained creative engagement.

These organisational conditions ensure that AI use does not become siloed or disruptive but rather complement existing creative competencies.

2.5.4. The AI Augmented Creative Workflow

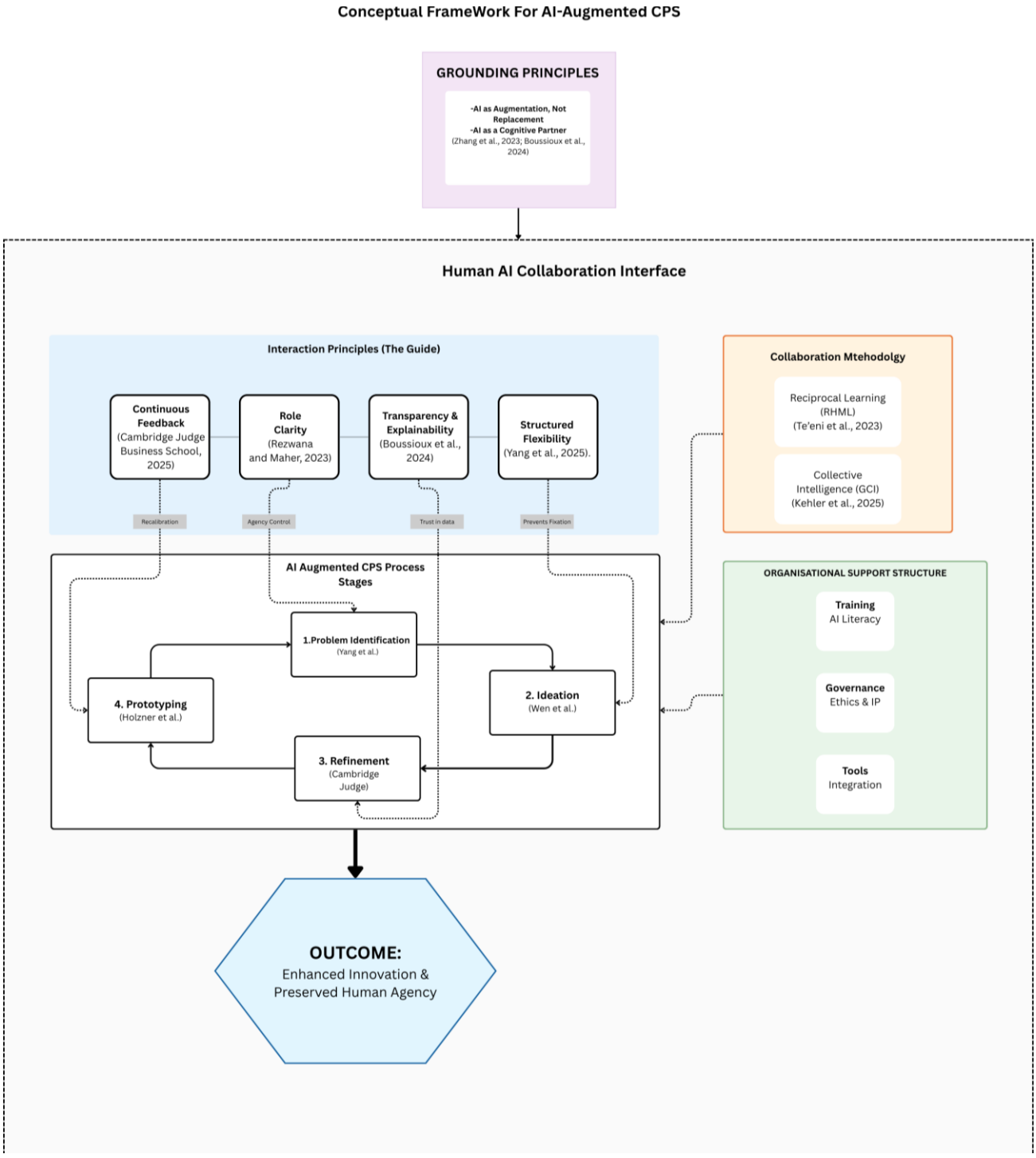

Figure 4. AI Augmented CPS Framework and Support Mechanisms

There is a central Human AI Collaboration Interface, where all interactions take place. The Interface contains two categories, or forms, of processes: Interaction Principles and Collaborative Mechanisms.

Interaction Principles are guidelines; these include role clarity, continuous feedback, structured flexibility, and transparency. These four guidelines help facilitate the relationship between humans and AI and support the collaboration between humans and AI throughout the entire creative problem-solving process. Role clarity helps avoid confusion among humans about what tasks were assigned to which agent, so as to minimize the likelihood that an AI contribution is perceived as a command.

Transparency and explainability can help create trust, while also enabling humans to critically analyze AI suggestions (Boussioux et al., 2024). Continuous feedback loops allow for both humans and AI to adapt to each other during the interaction, improve alignment, and reduce fixation on a single point (Luan et al., 2025). Structured Flexibility allows for changes to occur when necessary, in order to maintain the best possible fit of how humans interact with machines. In addition, the interaction principles support the collaborative mechanism of reciprocal human-machine learning and generative collective intelligence. Reciprocal Learning provides flexible workflows where human input affects the behavior of the machine and where AI-generated insight affects the knowledge base of the humans (Te'eni et al., 2023). Generative Collective Intelligence takes this dyadic approach further by allowing multiple human and machine agents to collaborate to solve complex problems in multi-stakeholder environments (Kehler et al., 2025).

2.5.5. Stages Supported Through AI-Augmentation

Through the collaborative environment we describe, the process of creative problem-solving occurs in stages. These stages are, Problem Identification, Ideation, Refining Ideas, and Prototyping. We represent these stages as iterative rather than in sequence and with feedback mechanisms that allow for ongoing adjustment and reformulation of the problem-solving process at multiple junctures.

Within the stage of problem identification, the AI will assist with the process of making sense of the data that has been collected by aggregating and analyzing large datasets and pointing out patterns within those datasets that might be difficult or impossible for human teams to see (Yang et al., 2025). However, it is important to note that the AI does not independently define the problem; rather, it helps to define the parameters of the problem and extend the boundaries of the problem space.

During the stage of ideation, the AI can generate many options, multiple perspectives, and potential paths of investigation that would not exist without AI (Yang et al., 2025). For the AI to be effective during this stage, the design of the interface should be structured so that transitions from divergent thinking to convergent thinking are facilitated, and that interaction design principles are applied to preserve the intent of the human.

In the refining ideas stage, the exchange of feedback is reciprocal. During this stage, the human reviews and evaluates the alternative solutions generated by the AI, while the AI uses the feedback provided by the human to adjust its outputs based on the criteria for preference and constraint established by the human. Research has demonstrated that such a feedback loop is essential to provide the scaffolding for improving creative output (Luan et al., 2025).

Finally, in the stage of prototype/implementation, the AI significantly facilitates iteration through the generation of simulations, models, and assets, while the human maintains control over the curation and assessment of those prototypes/assets (Holzner et al., 2025). Therefore, this stage emphasizes the need to preserve human agency as the process becomes increasingly productive due to the use of AI.

2.5.6. Outcome Orientation

Ultimately, the end of the workflow is a hybrid strategy that will balance the benefits of increased innovation by using technology and increase human control. The proposed methodology will establish a set of common or aligned grounding principles, design an optimal user interface for interaction, and establish organisational conditions as a way to minimize the risk associated with unplanned use of AI in organisations (i.e., fixation, over-reliance on AI; loss of skills) while increasing the creative potential throughout all aspects of the creative problem-solving process.

The overall structure of the proposed methodology creates a structured yet flexible model for incorporating AI into the creative problem-solving process. It reflects the iterative nature of creative processes and recognizes the social-technological realities that exist within most organisational environments.

3. Research Methodology

An inductive qualitative methodology was used in this study to explore how artificial intelligence may be strategically incorporated into creative problem-solving workflows within the video gaming industry. This approach was selected for this study because it focuses on understanding the complexities of people's subjective experiences, perceptions, and decisions during creative problem solving (Creswell & Creswell, 2018). The exploratory nature of the research question required an in-depth examination of practitioners' experiences in creating and using creative workflows, as well as their perceptions of using AI to augment those processes.

This research is grounded in an interpretive philosophy, which states that "knowledge arises from the interpretation of data by researchers" (Saunders et al., 2019). This philosophy was especially applicable to this research, as the creative decision-making involved in developing games is heavily based on implicit knowledge, intuition, and specific contextual practices. The research design employed a case-based approach, focusing on the video gaming industry as a bounded system for this investigation because it is representative of an industry characterized by extremely high levels of creative intensity, considerable financial risk, and ongoing cycles of iterative production.

3.1. Research Questions to be addressed

The research strategy will revolve around addressing some key research questions to help us understand the practicality of the developed framework while also understanding the status quo in the industry currently. The questions that we will address are as follows,

1. Which areas of Creative Problem Solving in game development are most viewed as highly impactful by AI augmentation?
2. What are the types of interactions organisations expect to have while collaborating with AI?
3. What are the boundaries or lines that are viewed as important or detrimental to retaining human creative agency?
4. What are the main risks and concerns related to AI involvement within these workflows?

Answering these questions will help us understand where exactly to include AI and where it absolutely shouldn’t be involved, the guardrails to have in place to make sure we don’t cross any ethical or creative boundaries, and what organisations need to do in order to integrate AI into their workflows.

3.2. Research Strategy and Data Collection Method

To ensure comprehensive framework validation and enhance the trustworthiness of findings, this study employed three complementary data collection methods:

- Semi-structured expert interviews,
- free-text questionnaires,
- secondary data analysis.

This triangulation approach aligns with methodological recommendations for qualitative research, where combining multiple data sources strengthens the credibility and depth of insights (Flick, 2018).

3.2.1. Semi-structured expert interviews

Semi-structured interviews were used as the main way to collect data. The semi-structured interview format was selected because it offers enough formality to allow for a systematic comparison of all participants' experiences and yet it allows for the flexibility to pursue emerging themes as they arise (Brinkmann & Kvale, 2015). All the interviews were conducted online via a video conferencing platform for 45-60 minutes. These longer remote interviews allowed for a wider geographic range and made it easier for participants to schedule an interview at a time that worked best for them.

The interview guide was designed through an iterative process based on the specific objectives of this research project and the theoretical model being tested. The questions within each interview guide were organized into four general areas related to creative problem solving and workflow in game development.

- current creative workflow and pain points
- AI supports potential across CPS stages,
- collaboration principles and human-AI boundaries,
- concerns and organisational context

The questions were constructed to be open-ended to discourage participants from giving answers based on preconceptions and to elicit rich, detailed descriptions of their professional experiences.

All interviews were audio-recorded with explicit participant consent and subsequently transcribed verbatim to preserve the richness and nuance of participants' language.

3.2.2. Free-Text Questionnaire

Free text questionnaires provide an opportunity to expand on samples and collect data from professionals who may not be able to participate in interviews. Free-text questionnaires are useful in qualitative research when seeking a balance between depth of response and breadth of participation while maintaining the exploratory nature of the research (Braun & Clarke, 2006).

The free text questionnaire consisted of 11 open-ended questions that could systematically cover all main components of the framework while reducing participant burden. Each question was designed with multiple validations in mind to ensure thorough coverage of the framework without being too long. The estimated time for completing the questionnaire was 15-20 minutes. The questionnaire was organized into six sections similar to those of the semi-structured interview:

- current creative workflow and pain points
- AI supports potential across CPS stages
- collaboration principles and human-AI boundaries
- concerns and organisational context

The free-text format was selected over Likert-scale questions because this research aimed to validate a novel conceptual framework, which requires understanding nuanced perspectives and contextual factors that closed-ended questions cannot capture (Reja et al., 2003). The questionnaire was

distributed electronically via Google Forms to approximately 30-40 potential participants, with an expected response rate of 20-30%, yielding 8-12 completed responses (Baruch & Holtom, 2008).

3.2.3. Secondary Data Analysis

To place the results of the primary study in relation to current industry trends and to test the validity of the proposed model through real-world applications, secondary data analysis will be used as a supplementary methodology. Secondary analysis of qualitative data has been well established in social science research and allows researchers to analyze similar phenomena across multiple contexts; this enables researchers to provide external evidence to support or reject their emerging theories (Heaton, 2008).

Three categories of secondary data were analyzed:

1. Industry conference presentations from the Game Developers Conference (GDC) addressing creative workflows and AI integration.
2. Published developer interviews and case studies in industry media.
3. Industry reports such as the GDC State of the Game Industry Survey provide data on AI adoption patterns and developer perspectives.

Secondary data was examined by applying the same thematic coding system used for the primary interview and survey data. This allowed for an immediate and comparative analysis between the data sources as well as a means of triangulating the results from multiple sources. Instead of conducting a full systematic review of all literature on secondary data, relevant secondary data were selectively chosen to contextualize industry trends, identify any agreement or disagreement in views expressed by participants, and provide "real-world" examples of how developers have integrated AI into their games to help refine this study's framework (Johnston, 2014).

All secondary data examined in this study were publicly accessible and were made available with the intention of being shared among game development professionals. All secondary data sources received proper citation and attribution consistent with the principles of academic integrity.

3.3. Research Instruments

Two methods of collecting primary data were created: an interview guide that was semi-structured, and a free-text questionnaire. Both tools allow us to collect systematic validation on the proposed framework; in addition, they allow us to receive comments or opinions from the participants as to what has not been previously considered. Although both tools are structured similarly, starting with questions that are descriptive about their current practice to questions that evaluate the framework, the interview guide is the first of two tools to be used by the researchers (Brinkmann & Kvale, 2015).

3.3.1. Semi-structured Interview Questions

Organising the interview questions around themes rather than sequential order allows for flexibility during the interview while still providing coverage of all relevant topics. This thematic organisation of the interviews will provide participants with an opportunity to think about their real-world practices outside of the normal workflow and capture tacit knowledge, informal decision-making, and

experiential learning. The second half of the interview will introduce the conceptual framework for this study, and several hypothetical scenarios that relate to the conceptual framework, and ask participants to critically evaluate if the conceptual framework is realistic, applicable, and provides value to their organisation. This format will support the generation of exploratory insight from the participant group, as well as validating the conceptual framework through a theoretical lens.

Table 2. Semi-structured Interview Questions

SECTION A: BACKGROUND & CONTEXT	
Rationale of the question	Question
Establishes participant context	How do you typically approach creative problem-solving in your current projects or workflows?
Establishes participant context	What types of creative decisions are you typically involved in?
SECTION B: CURRENT CREATIVE WORKFLOW	
Rationale of the question	Question
Understanding existing problem identification methods	When starting a new design challenge, how do you understand and define the problem you're solving?
Understanding existing ideation methods	How do you generate potential solutions or creative directions?
Understanding existing evaluation and refinement methods	How do you decide which direction to pursue?
Understanding how ideas are tested and validated	How do you test and refine ideas?
SECTION C: PAIN POINTS & CONSTRAINTS	
Rationale of the question	Question
Validates pain points (decision fatigue, creative fixation, information overload, time pressure)	What are your biggest frustrations or bottlenecks in creative decision-making?
	When under tight deadlines, how does that affect creative decision quality?
SECTION D: FRAMEWORK VALIDATION - AI Support Scenarios	
Rationale of the question	Question
Validates the use of AI in the problem identification phase	Scenario: AI synthesizes player feedback, analytics, past projects, and documentation, and presents key patterns and insights. You interpret and define the problem. Would you trust it?
Validates the use of AI in the Ideation phase	Scenario: AI suggests variations, surfaces design patterns, and highlights implications. You evaluate and choose. Helpful or noise? How do you distinguish AI vs. team suggestions?
Validates the use of AI in the Evaluation/Refinement phase.	Scenario: AI simulates outcomes, identifies risks, and shows alignment with design pillars. You decide. Would this influence decisions? When most useful?
AI for Continuous Design Memory	Scenario: AI tracks decision evolution, flags conflicts with past choices. Helpful or micromanagement?
SECTION E: INTERACTION PRINCIPLES	
Rationale of the question	Question
Validates interaction principles (Transparency, Role Clarity, Structured Flexibility, Reciprocal Learning)	How important is it that you understand why AI makes suggestions?

	Where should the line be between AI involvement and human decision-making?
	How important is it to easily ignore or override AI suggestions?
	If AI learned from your decisions over time, useful or invasive?

3.3.2. Free Text Questionnaire

The questionnaire consists of 12 open-ended questions organized into six sections that parallel the interview structure:

1. background and context.
2. current workflow and pain points.
3. AI support potential.
4. Collaboration principles.
5. Concerns and organisational context

Questions were designed to elicit 2-5 sentence responses, balancing depth with efficiency.

Table 3. FreeText Questionnaire Questions

SECTION 1: BACKGROUND	
Rationale of the question	Question
Establishes participant context for interpreting responses	Please describe your current role, years of experience in game development, and the types of creative decisions you're typically involved in.
SECTION 2: CURRENT CREATIVE WORKFLOW & PAIN POINTS	
Rationale of the question	Question
Maps to 4 CPS stages: Problem Identification → Ideation → Refinement → Prototyping	Briefly describe how you typically approach creative problem-solving in your work, from understanding a design challenge to implementing a solution.
Validates pain points: Decision fatigue, creative fixation, information overload, time pressure	What are the biggest frustrations or bottlenecks you encounter during creative decision-making? (e.g., time pressure, information overload, difficulty evaluating options, team coordination)
SECTION 3: AI SUPPORT POTENTIAL	
Rationale of the question	Question
Validates Problem Identification stage support + Transparency principle	Imagine an AI tool that could quickly analyze and synthesize information from multiple sources (player feedback, analytics, documentation) when you start a new design challenge. It presents key insights and patterns, but you interpret and define the problem yourself.

	Would this be valuable in your workflow? Why or why not?
Validates Ideation stage support + Role Clarity principle	During brainstorming, an AI could suggest variations of your ideas, surface relevant design patterns from other games, or highlight implications you might not have considered. You still evaluate and choose which ideas to pursue. How would this kind of AI-assisted ideation fit into your creative process?
Validates Refinement stage support + Structured Flexibility principle	When choosing between design options, an AI could simulate potential outcomes, identify risks, or show alignment with your game's design pillars, but you make the final decision based on your creative judgment. Would this type of analysis influence your decisions? In what ways?
SECTION 4: COLLABORATION PRINCIPLES	
Rationale of the question	Question
Validates Transparency & Explainability + Structured Flexibility principles	For AI tools supporting creative work, how important is it that: (a) You understand WHY the AI makes suggestions, and (b) you can easily ignore or override those suggestions?
Validates Role Clarity principle + Human Agency preservation	Where should the line be between AI involvement and human decision-making in creative work? What types of creative decisions should never involve AI, even as a suggestion tool?
SECTION 5: CONCERNS & ORGANISATIONAL CONTEXT	
Rationale of the question	Question
Identifies risks framework must address homogenization, ownership, over-reliance, and job security	What are your main concerns about integrating AI into creative game development workflows?
Validates organisational Support Structure: Training, Governance, Tools	If AI tools like those described became available, what would need to be in place at your organisation for you and your team to actually use them effectively?
SECTION 6: IDEAL STATE	
Rationale of the question	Question
Final framework validation: Do they naturally describe something resembling the proposed framework?	If you could design an AI assistant specifically for creative work in game development, describe what it WOULD DO and what it SHOULD NOT DO.
Captures unexpected insights and themes not covered by structured questions	Is there anything else about AI in creative work that you think is important but wasn't covered in this questionnaire?

Braun and Clarke's (2006) six phases of thematic analysis were used as the principal analytical approach to analyze the data:

1. Become familiar with the data.
2. Create preliminary codes.

3. Search for themes.
4. Review themes.
5. Define and name themes; and
6. Write the report.

Coding was systematic, and MAXQDA software was used to help manage and retrieve coded segments while allowing for visualizing the coded segments.

A hybrid approach to coding was taken that provided a balance between being grounded theoretically and open to emergent results (Fereday & Muir-Cochrane, 2006).

Potential themes were developed through organizing initial codes into larger meaning-based categories (patterns of meaning across the data set). Iterative reviews were completed to refine themes, ensuring that coded extracts formed meaningful patterns and represented the overall pattern of meaning across the entire data set. The final stage of the analysis process was to select representative data extracts to represent each theme and develop a cohesive storyline connecting themes to research questions and theoretical frameworks.

3.4. Sampling Method

Purposive sampling is used to select participants with appropriate expertise and experience. The focus is on individuals who are responsible for creative decision-making processes or who significantly impact the creative workflow processes within game development organisations.

Examples of potential participant profiles include:

- Game designers and lead designers.
- Creative directors or art directors.
- Technical leads or engine specialists.
- Narrative designers or world-building specialists.
- Product managers or producers who are involved in coordinating creative aspects of product development.

It is expected that participants will have at least 3-5 years of professional experience in the video games industry or a closely related creative-technological discipline.

The desired sample size is up to 5 Interviews and/or 10 Qualitative survey respondents, along with data from numerous developer conferences and testimonies. This sample size is considered minimum for achieving thematic saturation in qualitative research and is practical to complete as part of a master's thesis. The actual sample size may need to be adjusted based on the quality and consistency of the data collected during the study.

3.5. Data Analysis Methods

MAXQDA software will be used to analyze the interview and free-text questionnaire data. The data will undergo several stages of analysis prior to conclusions being drawn:

Familiarization with the data by repeatedly reading the transcripts

- Preliminary coding of meaningful sections of the transcript relative to creative processes, decision-making, and interactions with AI
- Grouping the preliminary codes into larger themes relative to the research goals
- Refined and interpreted themes considering the proposed conceptual framework

Themes are anticipated to emerge surrounding issues such as creative uncertainty, evaluation bottlenecks, cognitive overload, trust in AI output, and allocation of roles between humans and AI systems. The analysis remains open to unanticipated findings that may modify or expand the initial assumptions of the study.

3.6. Validity, Reliability, and Ethical Considerations

The reliability of this study has been enhanced by a variety of methods, including:

- The involvement of professional industry practitioners as participants
- Transparency regarding the documentation of the interviews and the analytical process
- A careful distinction between participant views and researcher interpretations

The reliability of this study is supported by the consistency in the use of the interview guide and the systematic coding. Although the findings from a qualitative study cannot be statistically generalized, the detailed descriptions of the context allow readers to assess whether the findings can also be applied to other creative or innovation-based sectors.

The ethical principles were upheld for the duration of the research. All participants had the option to participate voluntarily and were informed about the purpose of the research, what would be done with their data, and their right to withdraw from the research at any time.

To ensure anonymity and confidentiality of the participants, the following steps were taken:

- Participant identities will be protected through anonymity
- Participating organisations will not be identified (without explicit permission) to protect the identity of the participants
- Data will be stored safely and used only for this academic study

Due to the competitive environment in the gaming industry, extra precautions are taken to protect any commercially sensitive information of the participating companies.

3.7. Limitations of the methodology

This study has limitations in its methodological approach. Due to the qualitative nature of the study, the findings are subjective and context-specific. Participants' views may reflect either personal experience or organisational culture and therefore may not represent industry-wide practice. Furthermore, participants' views of Artificial Intelligence may be shaped by current trends or media representations of AI rather than empirical evidence over time.

Despite these limitations, the methodological approach chosen for this study is deemed suitable for achieving the exploration objectives of this thesis and for generating grounded knowledge to inform future empirical or quantitative studies.

4. Results of the Empirical Findings of AI-Augmented Creative Problem Solving in the Gaming Industry

This section presents the empirical findings derived from the qualitative data collection, which included semi-structured expert interviews, free-text qualitative surveys, and secondary data analysis from industry professionals. The analysis employs a thematic approach to explore how artificial intelligence is currently perceived, utilized, and constrained within the game development industry. Crucially, the findings are structured to critically examine and justify the proposed Conceptual Framework for Integrating AI into Creative Problem-Solving (CPS) Workflows, particularly the interaction principles and organisational conditions required for effective human-AI collaboration.

The sample size in this study may be considered small compared with many other studies, but the study's methodology relies on triangulation based on an integration of three structurally independent data streams; therefore, the validity of the study does not rely on sample size per se, as much as it does on the findings being consistent among all three data streams. In accordance with Flick (2018) and Guest, Bunce & Johnson (2006) thematic saturation in focus qualitative studies are demonstrated when there is evidence of convergent themes found amongst qualitatively distinct methods; whereas in this study, themes such as Resistance to Player-Facing Assets, Cognitive Laziness, Human Creative Control and Productivity Enhancement were consistently found across interviews, free-text survey responses from practitioner participants who have worked in various aspects of video game development and secondary data collected from senior creative directors or well-recognised industry analysts provide the empirical basis for which the author asserts validity of this study. A quantitative generalization of this study requires additional research specifically designed to do so, which is also recommended in the Future Research Directions section of this thesis

4.1. Data Collection Breakdown

The table below outlines the different sources from which the qualitative data were collected. A varied range of industry experts participated and provided some valuable information.

Table 4. Data Sources Breakdown

Title of the Source	Brief Summary of Who or What it is	Classification
Interview Number 1	A primary discussion with an industry professional outlining the practical impacts of AI, such as AI note-takers for meetings, the potential for job displacement, and concerns over cognitive laziness.	Semi-Structured Interview
Qualitative Survey Responses	Text-based responses detailing workflows, frustrations, and perspectives on AI from various gaming industry practitioners. The participating roles include: • Game Producer • Developer • Technical Artist • Tools Programmer • Gameplay Programmer • Systems Designer • 3D VFX Artist • Creative Director	Survey / Free-Text Questionnaire

Creative Future with Artificial Intelligence	A presentation discussing how AI can alleviate the "blank canvas" fear for artists, automate mundane tasks, and jump-start imagination through live demonstrations.	Secondary Data / Conference Transcript
The Future of Gaming Supported by AI: How Xbox Empowers Players and Creators	A Microsoft presentation exploring how tools like Copilot can be integrated into games and development workflows to boost productivity while keeping the creator in control.	Secondary Data / Conference Transcript
How AI is ACTUALLY used in Game Development	A media piece or video transcript analyzing the realistic limitations and practical applications of AI (e.g., formatting story beats, generating placeholder narrative assets, and jump-starting concept art) rather than generating full games.	Secondary Data / Media Transcript
Game Industry Experts Interview	A collection of perspectives from industry leaders discussing AI as an amplifier of human vision, the importance of "intent-based literacy," and the democratization of game development for smaller teams.	Secondary Data / Published Interview
Impact of AI on Game Development by Gaming Professionals at GDC 2025 (Gridly)	Short insights gathered from developers at the 2025 Game Developers Conference discussing AI as a tool for initial concepts, coding prototypes, and general inspiration.	Secondary Data / Conference Interviews

Data from semi-structured interviews, free-text surveys, and secondary sources were systematically analyzed using MAXQDA after the data were entered into the program. A hybrid approach to coding was employed; deductive coding (derived from the conceptual framework) included CPS stages, interaction principles, and organisational conditions; in addition to these deductive codes, inductive codes based on emergent themes found within the data, such as "cognitive laziness", "epistemic debt", and participants' resistance to player-facing AI, were also employed.

After establishing an understanding of the database based on preliminary readings of all qualitative transcripts and quantitative surveys, prior to conducting thematic analysis using Open Coding, Open Coding was performed for all sources of data. This approach allowed meaningful segments of the data to be coded based on pre-existing codes that had been previously established in addition to identifying new emergent codes that were not accounted for in the original theoretical framework.

In order to identify patterns and relationships among the data sets, visualizations were created using MAXQDA's visualization tools. Specifically, the "Code Frequency Analysis" tool provided a quantitative measurement of the occurrence of themes and categories associated with each of the stages of the CPS model, as well as other themes across all sources of data. Furthermore, the "Code Relations Browser" tool was used to examine code co-occurrence patterns that were relevant to the interactional principal codes, such as transparency and role clarity. By examining these interactions at different times throughout the interviews, it could be determined if there were common combinations of concept references made by participants. Finally, the "Proximity Analysis" function available via the "Code Map" tool in MAXQDA was used to visually illustrate sequences in which participants discussed structural pressures (time constraints, budget limitations, etc.) and how these discussions are proximally related to discussions regarding AI adoption, thus providing evidence to support the causality identified in the study findings.

The final step of thematic data analysis involved comparing responses across participant roles using the "Summary Grid". This grid provided a means to determine whether or not certain themes (human creative boundaries etc.) appeared across professional and organisational level differences (producer,

artist, game designer etc.). Quotes representative of each theme were selected to provide empirical evidence to support the findings. Preference was given to those quotes that best represented the argument being proposed as opposed to merely representing the frequency of reference to those quotes.

4.2. Understanding the Key Creative Problem-Solving Areas, experts view the most AI impact

Upon doing code frequency distribution, as seen in Figure 5, we were able to analyze the areas of game development that are seen to have the most benefits from AI impact. It has been viewed as a revolutionary tool for generating ideas or brainstorming and largely for improving productivity while decreasing the amount of time required for creating new ideas (i.e., creative workflow). As one industry professional captured it plainly, AI functions by *"<…> concising a lot of the data into structures and points which I can use to talk to my teams and give them the highlights of certain things that worked, didn't work in a prototype <…>"* (Interview 1). The most significant advantage of using AI appears to be reducing the overall time associated with organizing multiple ideas, making this beneficial for people who attend many meetings and/or need to analyze large amounts of complex data to communicate with their teams and make decisions.

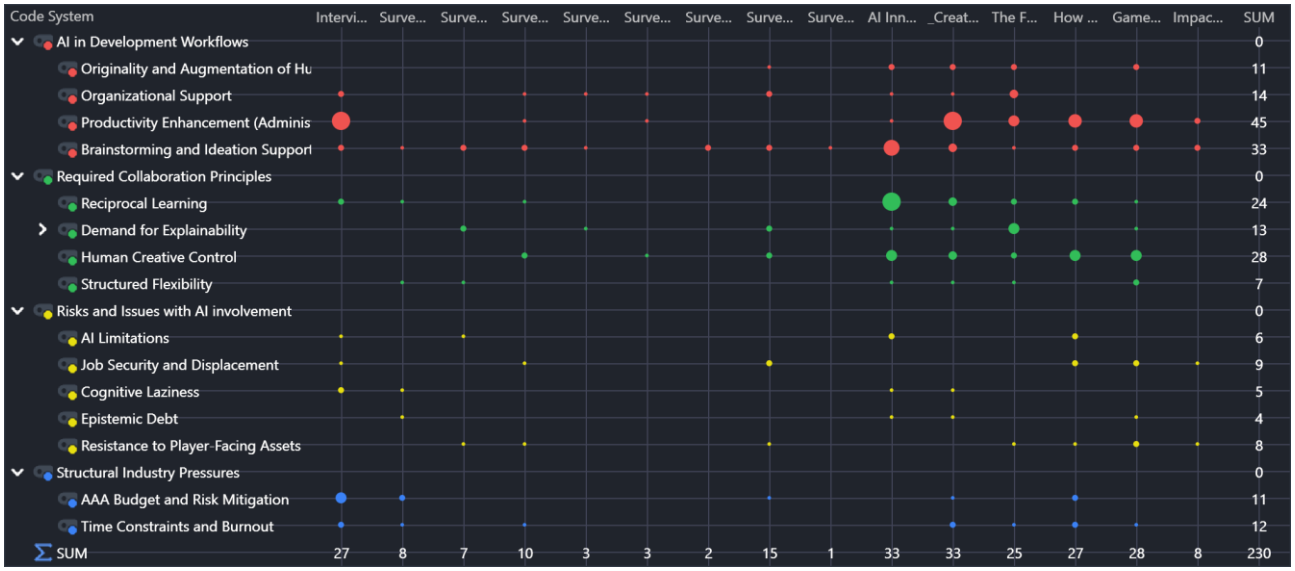

Figure 5. Category and Code Distribution

Another very positive aspect of AI, which the participants of the research all believe and can be observed in the table, is the rapid formatting and organisational capabilities of the program, for example, the creation of a story beat outline for games, and the creation of basic code for prototype design, etc. Survey respondents echoed this, with one noting that an AI synthesis tool *"<…> would streamline the initial stages of tackling design challenges by providing crucial insights, allowing me to focus more on formulating creative solutions rather than sifting through vast amounts of data <…>"* (Survey Response 3) All these features will greatly enhance the iterative nature of developing prototypes, thus allow teams to test and refine their ideas at a greater frequency than without the assistance of AI.

Table 5. AI in Productivity Enhancement

Source Type	Category	Code	Segment

Interview – Interview Number 1	AI in Development Workflows	Productivity Enhancement (Administrative and Operational)	*"<…> That's like seven and a half to 10 hours of my time spent in meetings. And I don't have the time to go on and read through all the notes. So having an AI that can consolidate these things, bring all the points together, make my job easy <…>."*
Qualitative Survey – Response 3 (Developer)	AI in Development Workflows	Productivity Enhancement (Administrative and Operational)	*"<…> An AI tool that synthesizes information would be immensely valuable in my workflow. It would streamline the initial stages of tackling design challenges by providing crucial insights, allowing me to focus more on formulating creative solutions rather than sifting through vast amounts of data <…>."*
Secondary Data – Creative Future with Artificial Intelligence	AI in Development Workflows	Productivity Enhancement (Administrative and Operational)	*"<…> It doesn't just have to focus on your core expertise if anything it's fantastic at the things that you don't want to do, that are not your core expertise, because those are the ones you usually procrastinate most on <…>."*
Secondary Data – Game Industry Experts Interview	AI in Development Workflows	Productivity Enhancement (Administrative and Operational)	*"<…> Used correctly, AI is a game-changer. It removes friction, accelerates iteration, and allows small, focused teams to achieve things that previously required industrial-scale production <…>."*
Secondary Data – Game Industry Experts Interview	AI in Development Workflows	Productivity Enhancement (Administrative and Operational)	*"<…> AI is critical here because it can strip away some of the heavy technical weight and investment that can bury great ideas, and sets us up to find the fun or test market-fit far quicker than traditional cycles allow <…>."*

It is interesting to note from the table that most of the creative fatigue experienced by professionals in this industry, as indicated in the table, could be attributed to the burden of all the organisational and procedural tasks related to the workflows of game development. Having an AI assist you in managing and evaluating ideas and utilizing more data will enable you to evaluate and develop ideas at a much faster pace than previously possible.

One prominent area that was observed as impactful through AI augmentation is the brainstorming and ideation phase. GPT tools, after synthesizing the relevant data, could provide many different versions and/or examples, which may help generate new ways of looking at things and assist with finding a good balance when performing stress testing. Additionally, it may aid in teaching new programmers how to explain complex ideas/concepts.

Table 6. AI in Brain Storming and Ideation Support

Source Type	**Category**	**Code**	**Segment**
Qualitative Survey – Response 7 (Game Producer)	AI in Development Workflows	Brainstorming and Ideation Support	*"<…> The biggest frustrations I would say are organising all the ideas in one place… each person interprets the data and idea differently and that overall boils down to miscommunication when one idea is chosen, but everybody has their own understanding of it <…>."*
Qualitative Survey – Response 3 (Developer)	AI in Development Workflows	Brainstorming and Ideation Support	*"<…> AI-assisted ideation would fit into my creative process as a complementary tool. During brainstorming sessions, the AI could offer variations and relevant examples from other games, helping us to consider new angles <…>."*

Secondary Data – How AI is ACTUALLY used in Game Development	AI in Development Workflows	Brainstorming and Ideation Support	*"<…> Saves you a bunch of time… AI acts like a hammer while you provide the nails and wood… together you're building a chair. AI is not creating the information here, all it's doing is organising it <…>."*
Secondary Data – Game Industry Experts Interview	AI in Development Workflows	Brainstorming and Ideation Support	*"<…> Once you get the hang of communicating well with your agent, it truly makes the iterative game development process fun. The amount of time I spend testing my game has gone up manifold, since I'm afforded so many more iterations. It's a bit of a golden age for designers <…>."*
Secondary Data – Creative Future with Artificial Intelligence	AI in Development Workflows	Brainstorming and Ideation Support	*"<…> You always jump-start your imagination, you're never at a blank slate. And I feel like that is the right way to look at generative AI: we don't have to start everything from scratch at all times <…>."*

Artificial intelligence will be able to open up barriers to entry in terms of the cost of developing games, as well as the scale needed to produce them, which could enable smaller-sized teams to develop the same quality of game product, with the level of production output associated with large-scale industrial efforts. Additionally, artificial intelligence will help determine what is considered "fun" within video games and help determine whether a specific type of video game or design will be successful before it can even enter the marketplace. As one source put it, *"<…> Saves you a bunch of time… AI acts like a hammer while you provide the nails and wood… together you're building a chair <…>"* (Secondary Data How AI is ACTUALLY used in Game Development). A metaphorical representation that clearly describes the human-artificial intelligence collaborative approach to game development that this thesis proposes. Technology is therefore expected to significantly affect all areas of game development while eliminating barriers to entry and increasing efficiencies to drive operational excellence.

4.3. Required Collaboration Principles: Expected Interaction Types in AI-Augmented Creative Workflows

The analysis concerned with the types of interactions practitioners expect when collaborating with AI was conducted using two complementary visual tools in MAXQDA: the Code Relations Browser and the Code Map. Together, these tools reveal not merely which interaction principles were most frequently coded, but which principles practitioners mentally connect to a distinction that carries significant analytical weight for understanding how human-AI collaboration is conceptualised in game development contexts.

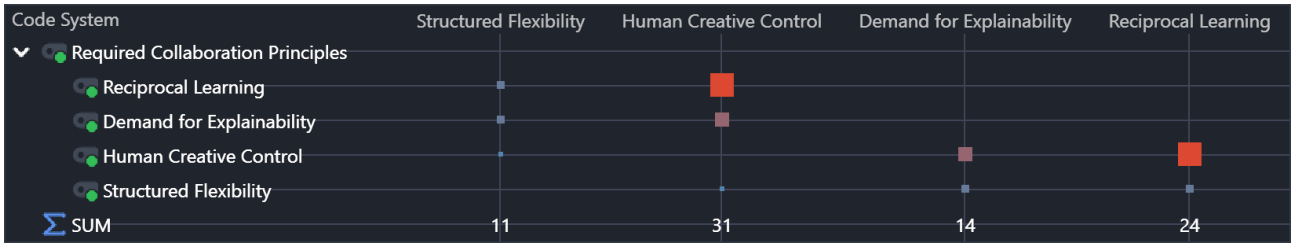

Figure 6. Relationship Between Different Interaction Principles

The Code Relations Browser, run at paragraph proximity across all sources, produced column sums of 28 for Human Creative Control, 24 for Reciprocal Learning, 10 for Demand for Explainability, and 7 for Structured Flexibility. The dominant co-occurrence pairing in the matrix was between

Human Creative Control and Reciprocal Learning, indicating that practitioners discuss iterative human-AI adaptation most consistently in the same segments as discussions of human creative authority. The Code Map (Figure 6) makes this spatial relationship visually explicit: Human Creative Control and Reciprocal Learning form a proximate, bidirectionally connected cluster at the centre of the map, while Demand for Explainability sits at a significant distance in the upper right, connected to the cluster only through a single long line to Human Creative Control. Structured Flexibility, with a coded segment count of just 7, occupies an isolated position in the lower right with no connections to any other principle, the most structurally peripheral finding in the entire interaction principles analysis.

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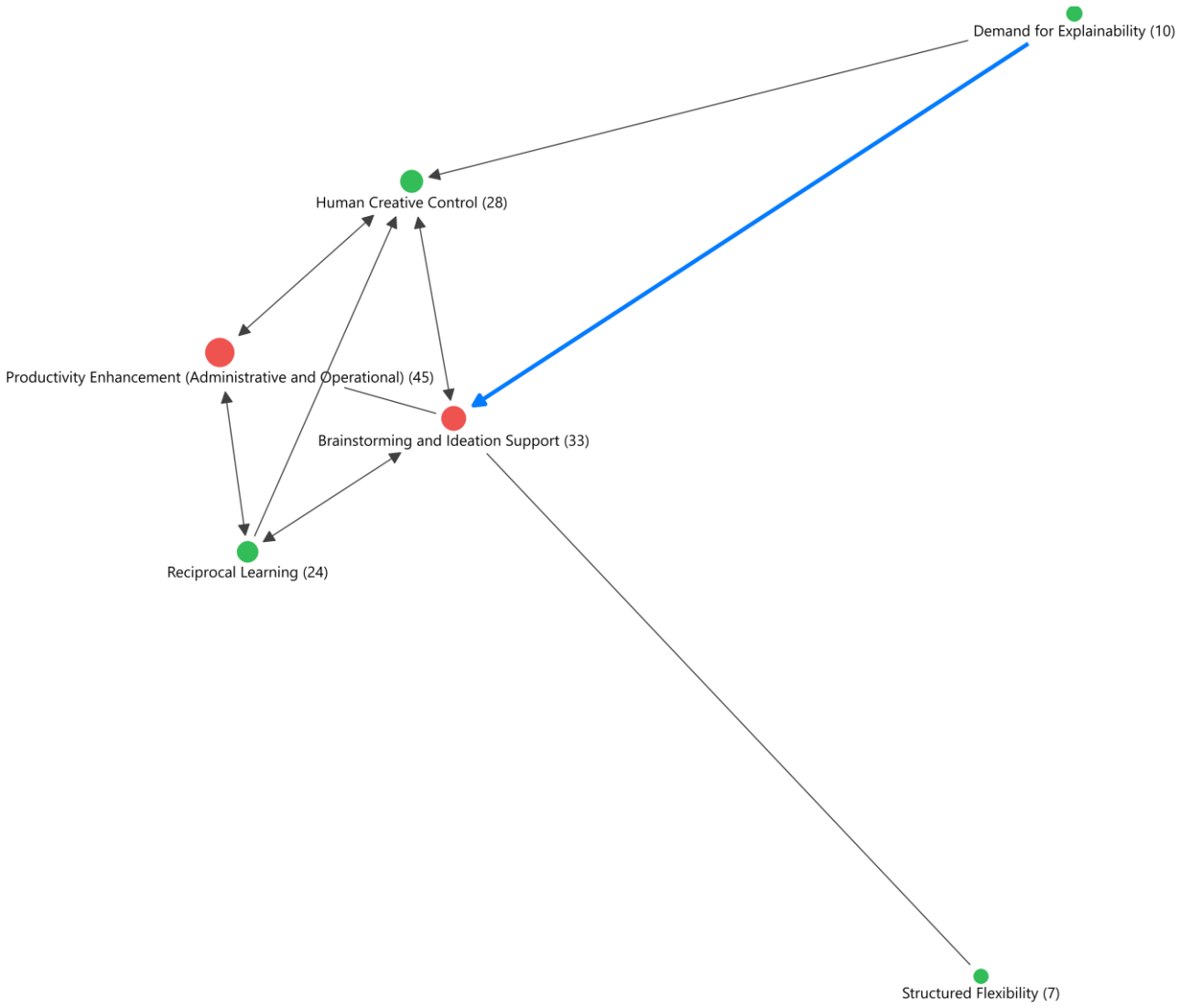

Figure 7. Interaction Principles occurring alongside Development Areas

These two visual outputs, read together, yield the central argument for the research question of what kind of interactions organisations expect to have: practitioners do not experience the four interaction principles as equally weighted or structurally equivalent. Rather, Human Creative Control functions as the gravitational centre of the interaction model, with Reciprocal Learning as its primary satellite and Demand for Explainability as a secondary, more distant concern. Structured Flexibility, while present in the data, operates independently as a workflow preference rather than a governance principle.

The co-occurrence of Human Creative Control (Σ=28) and Reciprocal Learning (Σ=24) as the strongest pairing in the Code Relations Browser, confirmed spatially by their proximity and bidirectional link in the Code Map, reflects a core practitioner expectation: that human-AI collaboration is only considered viable when human creative authority is structurally guaranteed throughout the iterative process. Practitioners across roles and source types consistently resist any framing of AI collaboration as a symmetrical exchange. As one game producer stated directly, *"<…> decisions will always be made by a human or somebody who is in charge or who is part of the team. AI will only be in an augmenting, support role that is there to make things easier for us and make it easier for us to make our decisions <…>"* (Survey Response 7, Game Producer). This framing of AI as support infrastructure rather than creative peer recurs across the dataset and defines the expected interaction model.

The bidirectional arrow between Human Creative Control and Reciprocal Learning in the Code Map is analytically significant. It does not merely indicate that these codes appear together, but that the relationship runs in both directions: practitioners who discuss human authority also discuss iterative learning, and vice versa. This suggests that conditional logic in the data reciprocal learning is not rejected, but it is framed as contingent. The iterative adaptation of human and AI to one another is acceptable precisely because the human retains the final word. Industry expert commentary in the secondary data reinforces this, noting that AI should function to "<…> empower human vision, enabling more singular voices, more experimentation, and more unexpected ideas to reach players <…>" (Game Industry Experts Interview) amplification of human intent, not replacement of it.

Table 7 . Human Creative Control and Reciprocal Learning

Source Type	Category	Code	Segment
Qualitative Survey – Response 7 (Game Producer)	Required Collaboration Principles	Human Creative Control	*"<…> Everything creative should be going through a human being. Everything. Anything design-related that actually impacts the final product should go through a human being <…>"*
Qualitative Survey – Response 3 (Developer)	Required Collaboration Principles	Human Creative Control	*"<…> This control ensures I can maintain creative authority while also adopting useful AI insights when they align with my vision. I believe the line between AI involvement and human decision-making should be clear <…>"*
Secondary Data – Game Industry Experts Interview	Required Collaboration Principles	Human Creative Control	*"<…> AI doesn't decide what matters. Humans do <…>"*
Secondary Data – Game Industry Experts Interview	Required Collaboration Principles	Reciprocal Learning	*"<…> Once you get the hang of communicating well with your agent, it truly makes the iterative game development process fun. The amount of time I spend testing my game has gone up manifold, since I'm afforded so many more iterations <…>"*
Secondary Data – AI Innovation for Game Experiences (Microsoft)	Required Collaboration Principles	Reciprocal Learning	*"<…> We were able to tease out some key requirements the ability to iterate, to not have something that regenerates from scratch every time, but something where you kind of have that continuous interaction where you tweak, where you make sure that it is exactly the way that you want it to <…>"*

The most structurally revealing finding from the Code Map is the complete isolation of Structured Flexibility (Σ=7) in the lower right of the diagram. It shares no proximity connections with any other principle, which indicates that practitioners do not mentally associate their preference for configurable, node-based AI tools with the broader governance and learning concerns that dominate the cluster. This has a precise analytical meaning: Structured Flexibility is a workflow preference, not a collaboration principle in the same sense as the others. Practitioners want customisable tools because they improve efficiency and reduce friction, not because configurability is understood as a mechanism of creative control or a condition of reciprocal learning. As one creative director stated, *"<…> this specific AI adding value depends on if it's node-based or a generic chatbot. I would prefer the node-based one as I get to have more customisation <…>"* (Survey Response 2, Creative Director). The preference is real, but its isolation in the Code Map suggests it operates at a different level of practitioner concern than the Human Creative Control and Reciprocal Learning cluster.

Table 8. Structured Flexibility

Source Type	Category	Code	Segment
Qualitative Survey – Response 2 (Creative Director)	Required Collaboration Principles	Structured Flexibility	*"<…> This specific AI adding value depends on if it's node-based or a generic chatbot I would prefer the node-based one as I get to have more customisation <…>"*
Qualitative Survey – Response 1 (3D VFX Artist)	Required Collaboration Principles	Structured Flexibility	*"<…> As a creative work, anything looks interesting even if it's not what you had planned before, people tend to change their initial design ideas to go along with what they found half the way <…>"*
Secondary Data – AI Innovation for Game Experiences (Microsoft)	Required Collaboration Principles	Structured Flexibility	*"<…> We were able to tease out some key requirements the ability to iterate, to not have something that regenerates from scratch every time, but something where you kind of have that continuous interaction where you tweak <…>"*
Secondary Data – Game Industry Experts Interview	Required Collaboration Principles	Structured Flexibility	*"<…> We've layered AI on top of our human-designed systems, not to replace the designer or artists they are integral to this but to empower the player <…>"*

From the participants' responses visualized by the code map, organisations can derive an unambiguous, coherent picture of how they expect to interact with AI through their answers, which can be analyzed. Practitioners expect to collaborate with AI using a single main interaction model. In this model, Human Creative Control represents the principal or sole non-optional element; Reciprocal Learning is the primary companion (and most often discussed) to Human Creative Control, while Demand for Explainability is the secondary technical expectation. Although flexibility in how interactions are managed is important to many practitioners, it exists at the periphery of the expectations associated with the core roles and responsibilities. The hierarchy of practitioner interaction expectations supports the framework's focus on establishing role-based definitions and human-in-the-loop governance mechanisms as fundamental design aspects. Furthermore, these findings suggest that there will not be widespread adoption of the reciprocal learning aspect of the proposed AI-Augmented CPS framework until both of these foundational elements are clearly demonstrated.

4.4. Boundaries and risks around preserving Human Creative Agency with AI Augmentation

The RQ3 analysis was performed using MAXQDA's Code Co-occurrence Model (figure X) with paragraph-level proximity weighting. The figure illustrates the relational structure among the central boundary code within the data set Resistance to Player-Facing Assets and the three risk codes identified as being most consistently mentioned by practitioners, along with their job Security and Displacement, Epistemic Debt, and Cognitive Laziness. Each of these codes captures different concerns that arose throughout practitioners' accounts of their experiences working with AI.

Resistance to Player-Facing Assets represents an ongoing boundary against AI involvement in final creative outputs that players, such as player-facing assets, mechanics, and narratives, experience. Practitioners have expressed job security and displacement fears about the impact of adopting AI on employment opportunities, specifically the notion that increased productivity through automation would result in fewer personnel rather than better work environments for employees.

Cognitive laziness refers to the long-term loss of developers' own critical thinking, evaluation, and creativity as they rely upon accepting AI-generated output without actively scrutinizing them a short term cognitive risk to developers who rapidly shift from thinking critically themselves, to heavily relying on AI to do the thinking for them. Epistemic debt builds upon this by referencing the long-term accumulation of unknown AI-generated knowledge, decision-making processes, and outputs that the development team cannot accurately determine, support, or recreate independently, and a slowly growing dependence on the team's ability to generate new outputs, similar to how technical debt grows in software over time.

Together, these four codes illustrate the primary concerns voiced by practitioners regarding the boundaries beyond which AI-generated output impacts human creative agency. The relational connections illustrated in the figure also show how each of these concerns relates in practice.

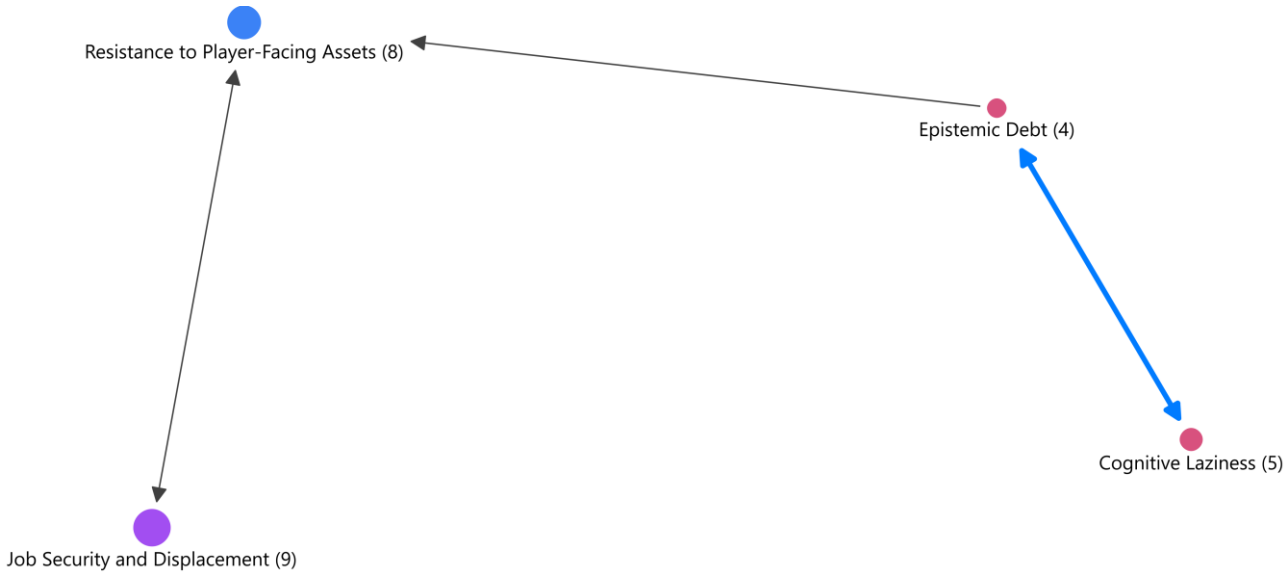

Figure 8. Areas of Risk with AI Augmentation

The structural pattern evident in Figure 8 shows an important relationship. Resistance to using player-facing assets in game development does not exist independently as a singular design choice. Rather, it is connected to two different risk paths: A worker path with job security and displacement (two-

way line), and an epistemological path that includes epistemological debt (one-way line). Inside this epistemological path, there are many strong relationships. However, there is a very strong relationship between cognitive laziness and epistemological debt as evidenced by the large bidirectional arrow connecting them. This indicates that developers perceive both cognitive laziness and epistemological debt as being closely related to each other. Importantly, while cognitive laziness does connect to the boundary, it connects to the boundary through epistemological debt and not directly. This suggests that developers conceptualize the process of how they relate to the boundaries created around player-facing AI use through a sequential logical reasoning approach.

In terms of reframing the central claim made about RQ3, the boundary that developers create around their use of player-facing AI is not based upon purely aesthetically driven concerns nor solely on concerns of quality. Rather, this boundary represents the intersection of two separate fears. Developers fear that the inclusion of AI in final products will undermine the existence of humans who provide the identity for the video game industry. Additionally, developers also fear that relying too heavily on AI in key decision-making processes can lead to long-term negative consequences for teams' creative judgment abilities.

The bidirectional connection between Cognitive Laziness (Σ=5) and Epistemic Debt (Σ=4) is the most visually pronounced relationship in the diagram, and it has direct evidential support in the coded data. As one industry interviewee articulated with notable self-awareness, *"<…> I personally feel could be an issue, is an over reliance on AI. It might dumb us down to the point where we just can't think for ourselves in certain aspects <…>"* (Interview 1), and in the same segment, *"<…> My cognitive thinking is reducing. I'm not spending enough time, energy, resources from myself to make this thing work <…>"* (Interview 1). What this captures is the mechanism that the diagram visualises: cognitive laziness, sustained over time, is precisely how epistemic debt accumulates. A 3D VFX artist surfaced the same dynamic from the opposite direction: *"<…> now everyone wants AI to be available just like oxygen in the air. so everyone can stop thinking much and let the AI do everything, including decision making <…>"* (Survey Response 1, 3D VFX Artist).

The relationship between Epistemic Debt, Resistance to Player-Facing Assets, and the link from Epistemic Debt to Resistance to Player-Facing Assets (the line at the top of the diagram) completes the players' cognitive path. Designers define the player-facing boundary for several reasons. One reason is that designers know that if you allow epistemic debt to build over time, then by the time the designers who are creating the player-facing elements of your game can create them independently again (i.e., with their own judgement), there may be a significant problem.

Table 9. Cognitive Laziness and Epistemic Debt

Source Type	Category	Code	Segment
Interview – Interview Number 1	Risks and Issues with AI Involvement	Cognitive Laziness	*"<…> I personally feel could be an issue, is an over reliance on AI. It might dumb us down to the point where we just can't think for ourselves in certain aspects <…>"*
Interview – Interview Number 1	Risks and Issues with AI Involvement	Cognitive Laziness	*"<…> My cognitive thinking is reducing. I'm not spending enough time, energy, resources from myself to make this thing work <…>"*
Qualitative Survey – Response 1 (3D VFX Artist)	Risks and Issues with AI Involvement	Cognitive Laziness	*"<…> AI took it's place to stop humans from using their brains and analyse how and why. Mostly human is expecting magic from AI infact <…>"*

Qualitative Survey – Response 1 (3D VFX Artist)	Risks and Issues with AI Involvement	Epistemic Debt	*"<...> now everyone wants AI to be available just like an oxygen in the air. so everyone can stop thinking much and let the AI do everything including decision making <...>"*
Secondary Data – Game Industry Experts Interview	Risks and Issues with AI Involvement	Epistemic Debt	*"<...> and the generation of busywork for humans to fix whatever AI generates <...>"*

The structural position of Resistance to Player-Facing Assets in the diagram connected to both the cognitive and workforce pathways establishes it as the central boundary code through which both risk concerns are channelled into a concrete creative position. Practitioners articulate this boundary across roles and source types in language that is remarkably consistent. As one creative director stated, *"<...> AI's suggestions are welcome for a concept or for generating references and styles but not on the final final outcome <...>"* (Survey Response 2, Creative Director). A developer drew the line in similar terms: *"<...> these creative aspects require a human touch and should never be fully delegated to AI, even as a suggestion tool <...>"* (Survey Response 3, Developer), while a game producer made the boundary fully explicit: *"<...> The player facing aspect of games like assets, like core mechanics, these should never have direct involvement with AI <...>"* (Survey Response 7, Game Producer). Industry-level voices confirm the same boundary from a market perspective: *"<...> I think GenAI art will be kept out of the best games from genres and developers where quality and craft are valued by players <...>"* (Game Industry Experts Interview).

What the diagram allows us to see, beyond the language itself, is *why* practitioners hold this boundary so consistently. The convergence of two distinct risk pathways at this single code position indicates that the player-facing boundary is doing protective work along two axes simultaneously, cognitive and economic, which is precisely what makes it the most stable and cross-sectionally agreed-upon line in the entire dataset.

Table 10. Resistance to Player-Facing Assets

Source Type	Category	Code	Segment
Qualitative Survey – Response 2 (Creative Director)	Risks and Issues with AI Involvement	Resistance to Player-Facing Assets	*"<...> AI's suggestions are welcome for a concept or for generating references and styles but not on the final final outcome <...>"*
Qualitative Survey – Response 3 (Developer)	Risks and Issues with AI Involvement	Resistance to Player-Facing Assets	*"<...> these creative aspects require a human touch and should never be fully delegated to AI, even as a suggestion tool <...>"*
Qualitative Survey – Response 7 (Game Producer)	Risks and Issues with AI Involvement	Resistance to Player-Facing Assets	*"<...> The player facing aspect of games like assets, like core mechanics, these should never have direct involvement with AI <...>"*
Secondary Data – Game Industry Experts Interview	Risks and Issues with AI Involvement	Resistance to Player-Facing Assets	*"<...> I think GenAI art will be kept out of the best games from genres and developers where quality and craft are valued by players <...>"*
Secondary Data – GDC 2025 (Gridly)	Risks and Issues with AI Involvement	Resistance to Player-Facing Assets	*"<...> we already using some AI tools just for checking some stuff internally we still don't use for art creation or anything <...>"*

The last pathway visible in the diagram runs between Resistance to Player-Facing Assets and Job Security and Displacement (Σ=9), with a bidirectional connection on the left side of the map. This

relationship indicates that practitioners' resistance to AI in player-facing assets is not separable from their concerns about workforce displacement; the two co-occur in the same segments because they are linked aspects of the same underlying anxiety: that the role of human creative labour in shaping the final product is being eroded.

The interview data captures this directly. As one respondent stated, *"<...> if that happens, there's going to be a big amount of layoffs for the artists within the industry. Even if the AI is making its own unique take on certain things, I don't think it's going to be sustainable for the game industry from a human resource standpoint <...>"* (Interview 1). A game producer reinforced the same logic from a planning perspective: *"<...> the main challenges are how much time the AI is going to be saving us. In a large AAA industry context, this will definitely lead to mass layoffs in different departments across all sorts of fields <...>"* (Survey Response 7, Game Producer). Crucially, secondary data showed that this concern is treated as a moral threshold by industry voices, not merely a labour issue: *"<...> universally we should all draw a line in the sand for what constitutes moral use. And for me, that's people. To me, if the use of AI is going to put a developer, artist, engineer out of a job, then it shouldn't be used <...>"* (Secondary Data – How AI is ACTUALLY used in Game Development).

This pathway clarifies an important dimension of the player-facing boundary that purely aesthetic readings would miss. Practitioners are not simply protecting the visual or narrative quality of their games; they are protecting the conditions under which human creative labour remains economically viable in the industry. The boundary functions as a workforce safeguard as much as a quality safeguard.

Table 11. Job Security and Displacement

Source Type	Category	Code	Segment
Interview – Interview Number 1	Risks and Issues with AI Involvement	Job Security and Displacement	*"<...> if that happens, there's going to be a big amount of layoffs for the artists within the industry. Even if the AI is making its own unique take on certain things, I don't think it's going to be sustainable for the game industry from a human resource standpoint <...>"*
Qualitative Survey – Response 7 (Game Producer)	Risks and Issues with AI Involvement	Job Security and Displacement	*"<...> the main challenges are how much time the AI is going to be saving us. In a large AAA industry context, this will definitely lead to mass layoffs in different departments across all sorts of fields <...>"*
Qualitative Survey – Response 7 (Game Producer)	Risks and Issues with AI Involvement	Job Security and Displacement	*"<...> what a team of 10 people could do can now be narrowed down to maybe five and get a similar or even better output with a lot less work <...>"*
Secondary Data – How AI is ACTUALLY used in Game Development	Risks and Issues with AI Involvement	Job Security and Displacement	*"<...> universally we should all draw a line in the sand for what constitutes moral use. And for me, that's people. To me, if the use of AI is going to put a developer, artist, engineer out of a job, then it shouldn't be used <...>"*
Secondary Data – Game Industry Experts Interview	Risks and Issues with AI Involvement	Job Security and Displacement	*"<...> AI should be seen as a tool to augment talent, not replace it <...>"*

The Code Co-occurrence Model illustrates how, when it comes to using AI in game development, professional barriers aren't simply a matter of aesthetics; they're the ultimate end point of two separate paths of risk. The first path, the cognitive one, goes from cognitive laziness to epistemological debt to the barrier to the player, and is meant to capture the long-term anxiety that teams experience with respect to their reliance on AI diminishing their ability to make independent creative decisions. The second path, the workforce one, moves back and forth between fears of job displacement and the same boundary. This second path captures the short-term anxiety that an AI's role in creative production results in the elimination of human jobs which create such products.

That these two paths converge at Resistance to Player-Facing Assets makes this boundary (the most cross-sectionally stable position in the data), where all the professionals in this study will concur. This is due to this boundary being engaged as a means of protection on several dimensions simultaneously. Therefore, this research has clear implications regarding what would need to be implemented by any applied version of the proposed AI-Augmented CPS framework. In order for the framework to be successfully implemented, each of the two paths of risk previously described needs to be addressed. Transparency and explainability of tools are related to addressing the cognitive pathway, and reinvesting efficiencies gained through the use of AI into employee welfare is related to addressing the workforce pathway. If neither path of risk is adequately addressed, then the boundary remains nominal.

4.5. Updated Empirically Grounded Conceptual Framework for AI-Augmented Creative Problem Solving

Based on the empirical evidence gathered from various sources, we can now focus on updating the conceptual framework to reflect what industry professionals want from AI augmentation and to develop a framework that supports that vision.

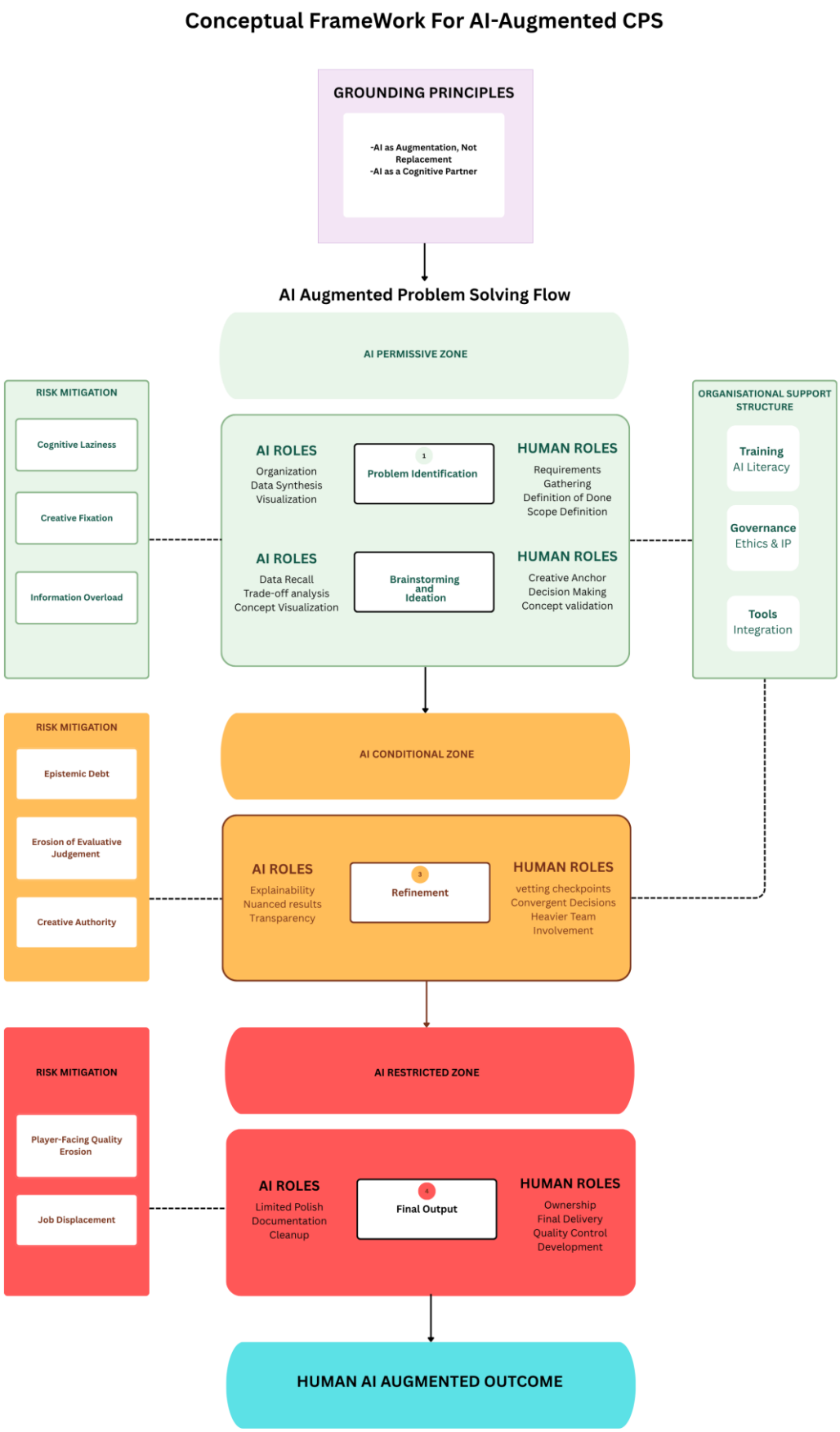

Figure 9. Updated Empirically Grounded Conceptual Framework for AI-Augmented Creative Problem Solving

The conceptual structure shown in Figure 9 constitutes a substantive redefinition of the theoretical structure described in chapter two, based on empirical evidence derived from this project. The original structure identified the relationship between grounding principles, the Human AI Collaboration Interface, and creative output. Empirical results indicated that the relationships between roles assigned to both humans and AI in the creative process are far more complex, structured, and conditional than initially thought by the authors of the original theory. Based on empirical results from Research Question 1 and Research Question 3, it became evident that developers do not see AI as equally acceptable at every phase in the creative process. Instead, they draw distinct lines of increasing restrictions as work progresses from ideation to final, user-facing products. As originally defined, the four CPS process phases were depicted as one linear process with equal levels of AI participation throughout the four processes. However, the new structure depicts AI participation as tapering off over time across the four phases as follows:

- Green AI Permissive Zone (problem identification/brainstorming and ideation)
- Amber AI Conditional Zone (refining concepts)
- Red AI Restricted Zone (finalizing output)

This addition to the structure addresses the player-facing boundary that emerged as the most widely agreed upon among the cross-sectional sample. The second major addition to the original theoretical framework is the definition of AI roles and human roles at each CPS process phase. The original theoretical framework referred to the CPS process interaction principles (continuous feedback, role clarity, transparency/explainability, and structured flexibility) as general enablers to be located within the Human AI Collaboration Interface. These roles were neither specified nor operationalized at any phase of the CPS process.

The empirical data collected in this project demonstrated clearly that developers describe concretely the contributions of AI (synthesis of data, evaluation of trade-offs, visualization of ideas/concepts, etc.) and equally concretely the responsibilities of humans (anchoring creative solutions, making decisions regarding which solution to pursue, validating concepts before finalization of delivery, etc.). Therefore, the revised theoretical framework defines both AI and human roles explicitly at each phase of the CPS process. It transforms the theoretical framework from a theoretical abstraction to an operational guide for practice.

The third addition to the original theoretical framework refers to the organisational support structure. In the original framework, this was situated as a separate column linking into the hub. The revised framework places training (AI literacy), governance (ethics/IP), and tools (integration) as cross-cutting enablers that link into refining the zone that empirical data demonstrate requires organisation-wide scaffolding for AI to participate conditionally rather than unconditionally. This placement is consistent with recommendations developed from the empirical data, which emphasized that:

- Training practitioners to understand their intention-based use of AI literacy
- Establishing governance policies surrounding ethics and intellectual property related to practitioner use of AI

- Integrating existing tools to enable the integrated use of multiple sources of creative content generated by practitioners and AI represents a critical factor influencing whether practitioners will allow AI to contribute to the creative solution during refinement.

Finally, the revised framework's outcome statement has been narrowed from the original broad statement that human-AI collaboration would produce a "human-AI collaborative outcome" to a more narrow statement of what the framework should produce if properly used: a human-AI augmented outcome produced by a human-AI augmented creative process that is differentiated by role, structured, and zone aware. This narrowing reflects the central theme that emerged across all four research questions that human-AI collaboration in game development will only create value for designers and practitioners when practitioners have purposefully and empirically grounded control over where, how, and by whom AI participates in creative problem solving.

4.6. Recommendations to the organisations considering AI Augmentation in Creative Problem Solving

Based on the empirical results of this research, effectively implementing AI as an organisational resource in high-stakes, knowledge-intensive environments, such as those found in game development, is contingent on more than merely supplying a team with technology. The empirical evidence clearly demonstrates that although AI may provide substantial improvements in both productivity and ideation, when not properly controlled, there is potential for significant risk regarding the quality of products created by teams using AI, the morale of the workers using it, and the degeneration of cognitive skills among those same employees.

To strategically manage these complexities, organisations will need to establish a governance-first approach to AI-augmented CPS. These in-depth recommendations were developed based on empirical evidence to assist organisations in developing best practices related to how humans can work collaboratively with machines.

Establish Strict Boundaries: Target Operational Friction, Protect Creative Sovereignty.

The empirical evidence strongly suggests that practitioners see AI first and foremost as a means to address the structural pressures of their industries, namely time constraints and cognitive overload, and secondarily as a self-sustaining source of creativity. Therefore, it is essential for organisations to formally define how much of the AI will be used in the CPS workflow.

- Deploy AI for Synthesis and Ideation**:** AI implementation should occur in the earliest stages of the creative process. Use Natural Language Processing (NLP) and Generative Models to take large amounts of raw data and produce synthesized data, meeting summaries, formatted documents, and quick prototypes of possible versions (brainstorming mockups, story beats, etc.). These are the most common areas of operational friction where Human Cognitive Bandwidth can be maintained.

- Create "No-AI" Zones for Player-Facing Assets: As stated above, if you want to ensure high-quality products and protect your brand’s reputation, organisations need to establish clear boundaries around what is considered "final." The data collected from this study clearly

indicates that there is strong resistance to allowing AI to create the final artistic element(s), core gameplay mechanic(s), or nuanced narrative elements. organisations must create formal policy guidelines that state that all final, player-facing elements have intent, taste, and lived experience; all things that only humans can provide.

Mandate Tool Transparency to Combat Cognitive Laziness:

A critical risk identified in the research is "cognitive laziness" and the accumulation of "epistemic debt," the danger that developers will over-rely on algorithmic outputs and lose their own critical evaluation skills over time. organisations cannot afford to implement "black-box" systems.

- Require Explainability: organisations should focus on acquiring or developing internal AI tools that have "critical transparency". As such, all tools will need to provide reference-based (grounded) explanations of their recommendations. This will enable developers to validate that the system is not generating random/ hallucinated content and enable them to evaluate the reasoning behind the recommendations made by the tool.

- Prioritize Structured Flexibility: The survey results indicate a significant preference among developers for highly customized, node-based AI platforms compared to general-purpose conversational chatbots. Developers want to be able to customize and influence the parameters of the AI system they are using to ensure humans are actively participating in the creation of the content. Therefore, organisations must develop their own custom AI platforms that can be configured by the developers and limit what is generated by the AI platform. This ensures that the human remains in control of the creative output.

Formalize "Human-in-the-Loop" Governance:

The strongest operational principle identified in empirical research is the absolute necessity of human creative control. Productivity enhancements were only deemed viable when human authority was unquestioned.

- Implement Mandatory Human Checkpoints: organisations must implement policies into their development pipeline that require all AI-generated creative content to go through a human reviewer before it is considered complete. In other words, "everything creative should go through a human being." Furthermore, organisations should implement policies that make clear that while an AI may propose several options for a piece of content, the final decision-making authority must always rest with a human leader/director.

- Shift from Automation to Amplification: organisation leadership must view and assess AI implementation as augmentative to human development capabilities rather than substitutive. Ultimately, the objective of implementing AI in game development should be to create additional resources for human developers to utilize while simultaneously providing them with increased iterative speed.

Invest heavily in organisational Support and Psychological Safety:

The conceptual framework's goal of "Reciprocal Learning," where human and machine adapt to one another, is impossible to achieve if the workforce views AI as a threat to their livelihood. The empirical data highlight a deep-seated fear that efficiency gains will be translated into mass layoffs.

- Address Job Security Transparently: organisations need to establish a strategic intent for AI. If the purpose of using AI is to decrease crunch, decrease burnout for developers, and increase work-life balance (which was shown through the time constraint data), then organisations must ensure that the efficiencies generated from AI are reinvested back into product quality and employee welfare instead of being used to justify cutting employees.

- Provide Systemic Integration and Training: AI cannot exist in isolation or simply as an additional tool outside of your organisation's current digital infrastructure. To allow AI tools to be fully integrated into your organisation, you must commit to a long-term investment in integrating the engines. In addition to this commitment, you must also require all new hires to complete mandatory training. The mandatory training should include "intent-based literacy". Training developers to understand when to use AI tools and when they can't. How to correctly train AI tools. And how to verify if the output from an AI tool is correct.

By implementing these recommendations, organisations can safely harness the productivity and ideation benefits of artificial intelligence while actively shielding their workforce from burnout and preserving the uniquely human core of creative problem-solving.

Future Research Directions: Following from the findings in this study are several potential avenues for subsequent research. Most directly, there is a need for longitudinal testing of the developed framework in at least one (and ideally multiple) professional video game development studios that currently utilize AI in their creative process. This will provide direct evidence of whether the conceptualized permission zones, assigned roles, and implemented risk mitigation strategies function in practice. A second area of comparison is the applicability of the framework in other closely related creative disciplines (film production, advertising, animation, architectural design), which similarly are likely to experience similar conflicts of interest about the use of AI in the creation of products intended for external audiences; however, due to differences in labor practices and creative norms across each discipline, the conflict resolutions are also expected to differ. A third (and perhaps most urgent) area of inquiry is the previously mentioned cognitive risk pathway (cognitive laziness/epistemic debt). While both were found to be relatively strong in the empirical results, it has yet to be empirically demonstrated when, how much, and how the two accumulate over time, manifest in creative output at the team level, and what interventions may reduce their accumulation. Therefore, by pursuing all three areas of research together, this thesis's conceptual contribution would evolve into an operationally tested and cross-industry validated model of human-AI augmented creativity.

Conclusions

1. The goal of this research was to identify a systematic way of integrating AI into creative problem-solving processes within the video game development space. The focus of this research was to determine if integrating AI would ultimately lead to dehumanizing the creative process. To establish how game development professionals view AI as an asset, we used several methods, including qualitative analysis of interviews and open-ended survey results with game development professionals, and secondary data from other industry experts. We found that while many game development professionals are very interested in using AI, they have defined limitations. Game developers see the most potential benefit of AI when it takes over the workload associated with operations and administration; additionally, AI is also seen as being beneficial during the initial stages of idea generation. In these two areas, AI is viewed as a means of enabling human thought and organisation. Therefore, any type of framework developed for integrating AI into a business model or process will need to be based upon this understanding.

2. The empirical results demonstrate that Practitioners are unwilling to treat the aspects of collaborative work between humans and AIs as synonymous. Therefore, they view Human Creative Control as the non-negotiable anchor of all collaborative interactions and see Reciprocal Learning as the most important accompanying aspect and the one having the greatest tendency to occur together. While the demand for Explainability represents an additional technical element, Structured Flexibility remains in structural isolation as a choice regarding how workflows should be structured, but not as a choice about what should be allowed in terms of governing principles. The specific implications of this hierarchical structure can therefore be drawn as follows: Practitioners will not use features enabling adaptive iterations between humans and AI systems, nor any collaboration-related features until their creative decision-making authority have been protected through structures. The revised model expresses these same notions by placing explicit definitions of human roles into each phase of the creative process; thus, collaboration is defined within each phase to be based on human authority, not symmetry.

3. The proposed conceptual framework provides a working conceptualisation that operationalises the findings above. There are three zones for permission on AI, which are indicative of how there is a planned reduction in the role of AI as a creative work develops towards its end-product. The Explicit AI Roles and Human Roles have been designated for each phase in the creative work process. Risks empirically found are incorporated into the logical structure of the conceptual framework, so it both protects and produces. These findings give rise to three more general implications. Firstly, the successful implementation of AI in creative organisations will depend upon governance, i.e., determining when, how, and by whom AI can contribute to processes in such organisations. Secondly, human creative agency will be preserved due to the inclusion of structural aspects within the organisation's workflow, tools, and policies, not because of good faith or individual judgement. Finally, those risks associated with the use of AI in creative work, namely, cognitive laziness and epistemic debt, are those that are less observable; take longer to materialise; and thus are most probably going to be consistently underestimated by organisations affected by them.

4. This study contributes to the existing literature in three ways: it extends creative problem-solving theory into a high-stakes, knowledge-intensive creative industry context, it develops and empirically validates a framework that operationalises human-AI collaboration principles into

structured, role-differentiated guidance, and it surfaces the risk pathways through which AI adoption can undermine rather than enhance the human creative core. Future research should pursue longitudinal validation of the framework within studio environments, comparative application across adjacent creative industries such as film, advertising, and animation, and dedicated empirical investigation of the cognitive risk pathway, a threat that this study identified with notable strength, but whose long-term trajectory remains an open question.

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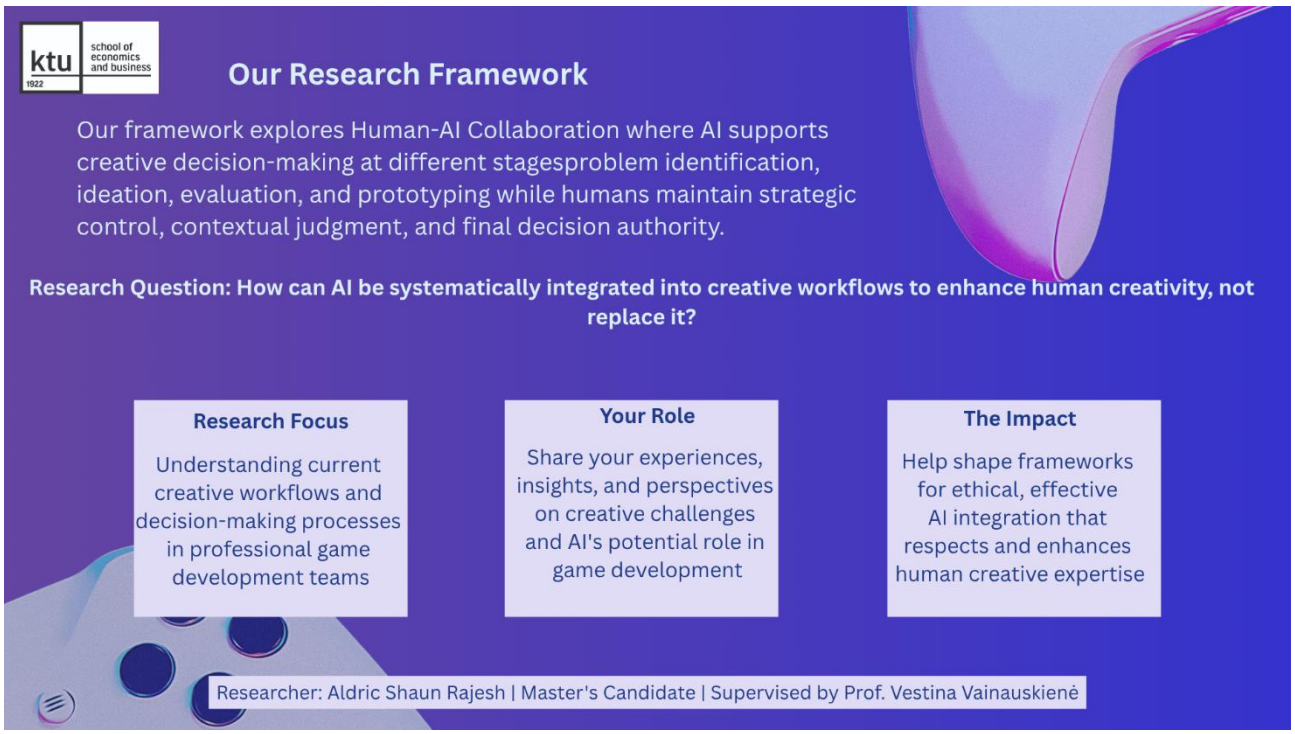
Appendices

Appendix 1. Link to Primary and Secondary Data Transcripts

https://drive.google.com/drive/folders/1T2dt98y6tDS4A8PuBf3SNb4632TBSmbC?usp=drive_link

Appendix 2. Primary Data Collection Proposal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Our Research Framework
Our framework explores Human-AI Collaboration where AI supports creative decision-making at different stagesproblem identification, ideation, evaluation, and prototyping while humans maintain strategic control, contextual judgment, and final decision authority.
Research Question: How can AI be systematically integrated into creative workflows to enhance human creativity, not replace it?
Research Focus
Understanding current creative workflows and decision-making processes in professional game development teams
Your Role
Share your experiences, insights, and perspectives on creative challenges and AI's potential role in game development
The Impact
Help shape frameworks for ethical, effective AI integration that respects and enhances human creative expertise
Researcher: Aldric Shaun Rajesh | Master's Candidate | Supervised by Prof. Vestina Vainauskienė


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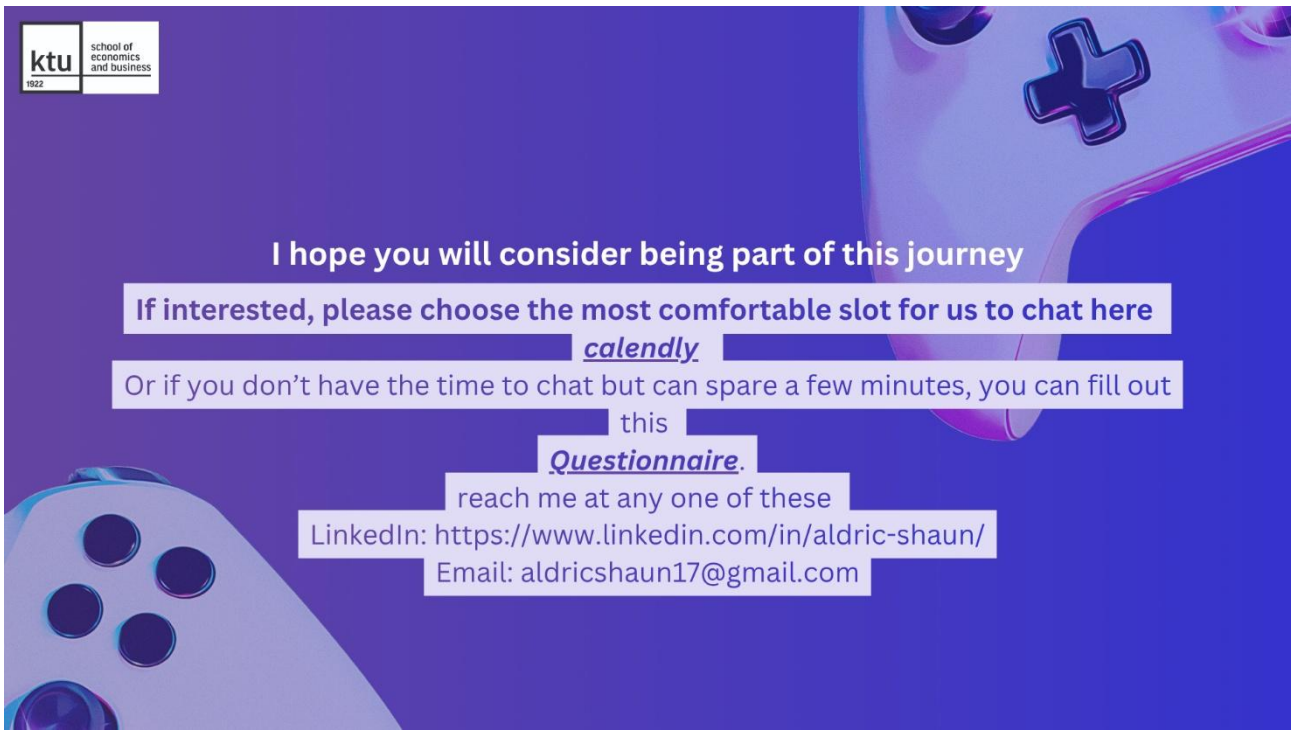
What We'll Discuss & Participation Details
Interview Topics
During our conversation, we'll explore:
• Current Creative Workflows: How you and your team approach creative problem-solving, ideation, and decision-making in game development
• Challenges & Constraints: Obstacles you face/faced: time pressure, information overload, team coordination, balancing creativity with constraints
• AI Tool Experiences: Your experiences with or perspectives on AI tools in creative contexts what works, what doesn't, and concerns
• Framework Discussion: How structured AI support could potentially enhance (not replace) your creative processes.
Format: Remote video call (Google Meet)
Scheduling: After hours on weekdays (I don't want to disturb your workday) and any time during the day on weekends, you can click the Calendly link to book a slot that works for you.
Duration: 45-60 mins max
Whats in it for you?
• Structured Reflection on your past experiences
• Contribute to potential future applications in the industry
• Fully Anonymous and GDPR compliant
• Sharing the outcomes and credit (with consent)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I hope you will consider being part of this journey
If interested, please choose the most comfortable slot for us to chat here
calendly
Or if you don't have the time to chat but can spare a few minutes, you can fill out this
Questionnaire.
reach me at any one of these
LinkedIn: https://www.linkedin.com/in/aldric-shaun/
Email: aldricshaun17@gmail.com