Rethinking Economy-Building Video Games

How might designers inspire new economic models through video game mechanics?

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Abstract

This study investigates how economic ideas are manifested in the gameplay mechanics of economy-building, strategy, and management video games (in the vein of *SimCity*). The study investigates the possibility of influencing paradigmatic thinking of wellbeing, growth, and circularity (among others) through the economic models of games and their procedural rhetoric. It explores the assumptions, biases, and ideologies that this subgenre of games expresses as well as the influence this has on players, and future possibilities for integrating pluralist economics, including ecological economics, into gameplay mechanics. This exploration was achieved through eighteen interviews with game designers as well as players with experience in economics. The final synthesis of this study is a prototype toolkit to facilitate game designers' systematic evaluation of some of the assumptions behind their work in support of efforts to create engaging and entertaining economy-building video games based on some key ecological economics and other new economics themes.

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And, to the people making open and free content about how to make games (making this an exciting time to learn to create in this medium) – I salute you!

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Section 1:

Introduction

Introduction

This research project explores the video game genre of economy-building games, their economic models, and the environmental implications communicated to players through their mechanics. An economy-building game typically encompasses some or all components of the city-building, management, and strategy game genres, is usually played on a PC, and is best described by what the player does in the game. For example, in *Anno 1800*, a 2019 video game from global games giant Ubisoft, the player starts (with a God-like perspective) by controlling a small island settlement in a 19th century themed world and can build simple huts and farms for a small population of farmers. As the game progresses, wealth increases as new classes of population move to the island and product diversity grows. Slowly, the player moves from growing potatoes for schnapps to producing steel, sewing machines, and automobiles. Wooden ships are initially produced for the player to expand to and trade with other islands for more diverse resources, but by the end of the game the player will be sending steel cargo ships to their islands around the diverse game worlds to feed the complicated supply chains for busy cities - that might even include skyscrapers, universities, and museums.

Anno 1800 is a good example of an economy-building game; one where the player typically develops an economy from the ground up (Adams & Dormans, 2012), often controlling and making decisions about supply chains, production, and meeting extensive consumer needs. Something that is notably missing from the base game of *Anno 1800* in its industrial frenzy is the impact on the environment and ecology of the islands that the player builds an economy on. For visual purposes, animals and trees are represented to add flavour to the game world. Pollution even affects the player's populace to an extent. But all in all, no matter how powerful the player becomes, they will always be able to keep growing (unless they overspend and go bankrupt, that is).

In the spring of 2021, Ubisoft announced that it was participating in the United Nations Environmental Program (UNEP) Global Green Game Jam (a game design competition) with the *Anno 1800*. The competition was about creating 'green activations' (UNEP, 2021) in games, whether they be environmental themes in new maps, modes, storylines or more. In July 2021, Anno 1800 would win the UNEP choice award in the game jam for a highly replayable in-game experience (or, mode), parallel to the main experience described above, in their game. The new mode, just released in December 2021, requires the player to balance the economy, ecology, and environment of an island in the new world to succeed. The case of *Anno 1800* is an example of how games can portray economic models in a

different way to change the discourse of an economy's impact on the environment going forward.

The economies of Massively Multiplayer Online Games (MMORPGs) and other multiplayer games, like *World of Warcraft* and *EVE Online,* are frequently studied. This study focuses on the economic assumptions, biases, and ideologies (intended or not) portrayed in single-player economy-building games like Anno 1800. Video games are played by billions of people each year for increasing amounts of hours (*Nielsen*, 2020). While single-player games focusing on economic simulation are an even smaller subset, it is estimated that 40 million people had played the latest mobile version of Will Wright's *SimCity* alone by 2015 (Newman, 2016). Recent articles and social media threads explore the impact and influence *SimCity* and other economy-building games have had on politicians and city planners (Roy, 2019)(Gray, 2020)(LGR, 2021)(Twu, 2021). Therefore, it is important to further explore the design, impacts and influences of single-player economy-building games and considerations for representing the economy-environment relationships.

Recent research suggests that people playing games are influenced by the procedural rhetoric (both intentional and unintentional) of game mechanics, alongside the narrative themes common to other media (Anderson et al., 2019). Procedural rhetoric refers to the art of persuasion by rule-based representations and interactions rather than spoken or written word (Bogost, 2007). Single-player economy-building games could be seen as persuasive interactive economic models. For example, in games like SimCity, the economic models portrayed, as well as the economic elements evidently included and excluded (like waste) could be internalized in players' minds about how an economy does or should function.

If single-player economy-building games can influence how gamers understand economic models and processes, it is important to analyze how the games can prompt reflection and simulation on current economic topics. One of those current economic topics, and one of the main concerns of this research, is the relationship between economies, the environment and climate change.

The most recent United Nations Intergovernmental Panel on Climate Change report (2021) estimates that human activities have already caused approximately 1.0C of global warming above pre-industrial levels and predicts that warming could reach 1.5C between 2030 and 2052 at the current rate. The risks are substantial for the natural and human world alike. The report discusses emission pathways and system transitions consistent with 1.5C of global warming, and how economic and industrial systems would be required to change to keep warming to a less dangerous level (IPCC, 2021).

In a global context of climate change, biodiversity loss, and wealth inequality, where large-scale systemic change is required, creating mainstream, large-audience games that

represent alternative models of economic and environment flourishing that suggest action on climate change in their mechanics and design, while preserving fun and engagement, could be beneficial. Conversely, by omitting the representation of the environmental impact of economic models, existing games could be reinforcing harmful systemic understandings about the relationship between economies and the natural world. Creating new pathways for games to express ecological economic models could be one way, among a wide range of media, to support the paradigm shift required to address the climate emergency.

This research explores future opportunities for the single-player economy-building game genre through the following research question:

> *"How might popular single-player economy-building games build circularity, planetary limits, wellbeing, or other ecological economics concepts into their mechanics?"*

To answer this question, I first explored key concepts on game design, procedural rhetoric, ecological economics and their key overlaps in the literature. Those concepts are explained in Section 2: Key concepts. Then, I conducted interviews with players, economist-players and designers, and applied the key insights in a prototype toolkit for designing single-player ecological economies-building games. In Section 3 I explain the methodology used in the study. Section 4 provides a discussion of the primary research analysis and the key insights identified. Finally, Section 5 presents the prototype toolkit that synthesizes the research.

Section 2:

Key Concepts

Key Concepts

This section presents background information on the subject matter based on a literature review about game design, procedural rhetoric, and pluralist and heterodox economics as well as these topics' interdisciplinary overlap.

2a. How are economies represented in games? Economic Simulation in Game Design.

Video games simulate or approximate a large range of phenomena to create play spaces through the design of game mechanics. Game designer Robert Zubek identifies simulations in the basic model of "mechanics and systems -> gameplay -> player experience" (Zubek, 2020). Games take real-life concepts and experiences like gravity, military tactics, and corporate advancement, and distill them into playable mechanics. Physics, progression mechanisms, tactical maneuvering, and social interactions are all examples of game mechanics that are commonly used (Adams & Dormans, 2012). We can think of examples of physics simulations in game mechanics, as simple as a bouncing ball that must be caught by the player, or as complex as in the 2007 videogame *Portal*, where test courses must be navigated through the placement of mind-bending two-way portals. Tactics and strategy are simulated in games like 1999's *Age of Empires II*, where a rock-paper-scissors approach corresponding to the relationships between melee, ranged, and cavalry units are simulated to create fun tactical scenarios.

Of interest to this research is how economies and environmental impacts are represented in video games; what is selected to be simulated and what is not. A broad definition of the word 'economy' in video games is "any kind of system in which resources, of any type, can be produced, exchanged and consumed […]," including information, markets, and political economy (Adams & Dormans, 2012). As you will see through this report, there is a significant degree of latitude in interpreting and designing these types of games.

This section reviews how general economic concepts are constructed in the video game design literature, as a baseline for understanding why video games represent economics the way they do. Adams and Dormans (2012) discuss 6 basic elements of game economies: resources, entities, sources, drains, converters, and traders.

- **Resources** are what all economies revolve around. They refer to any concepts that can be measured numerically. These could be money, energy, time, or other units

under the player's control. These resources can be tangible or intangible, and they can make abstract resources in our reality, like happiness, concrete.

- **Entities** are where specific quantities of resources are stored. There can be simple and compound entities that store either one or multiple resources respectively.
- **Sources** create new resources out of nothing, either operating under certain conditions or continuously;
- **Drains** are the opposite of sources, taking resources out of the game and removing them permanently;
- **Converters** turn resources of one type into another;
- **Traders** move a resource from one entity to another, and another resource back in an opposite direction.

According to Adams and Dormans (2012), the last four elements (sources, drains, converters, and traders) represent mechanics of transference of and between resources and entities.

It should be noted that for the elements of sources and drains to work in games according to Adams and Dormans' (2012) description, there needs to be an open system where there is potentially limitless resource inflow and outflow. Adams and Dormans (2012) provide and example of drains: food feeding a virtual population and then fully disappearing with food waste therefore not represented in the game. We can already see that conservation of mass, maybe for simplicity and gameplay's sake, can get ignored. And understandably, not everything can be modeled. That said, the elements of game economies can still be used to simulate complex systems as game designer Will Wright, creator of *SimCity* suggested at the Game Developers Conference in 2003 (Wright, 2003). According to the late Polish-American scientist and philosopher Alfred Korzybski, "A map is not the territory it represents, but, if correct, it has a similar structure to the territory, which accounts for its usefulness" (Korzybski,1933). This is the map-territory relation, interpreted here as: while abstraction is necessary the structure of the abstraction must still be accounted for its input and impact.

Adams and Dormans (2012) then discuss potential uses for internal economies in games:

- To *complement physics* or using a scoring or points system;
- To *influence progression* or using a power up system to resolve deadlock in gameplay;
- To *add strategic gameplay* or to reward planning and long-term investments;
- To *create large probability spaces* or to increase replay value.

It is important to note that in non-educational games, the uses of internal economies in games are intended to drive fun and engagement for players, more than accurately

reflecting real economies or being explicit teaching moments. As the legendary game designer of *Civilization,* Sid Meier, said, "gamers play to win", and expect their game systems to be fairly balanced along the thrill of "almost winning", which he described as the "Winner Paradox" (Meier, 2010). To ensure fun and engagement in an economy-building game, Adams and Dormans (2012) provide the following advice: "Don't introduce all the player's building blocks at once, be aware of the meta-economic structure, and use maps to produce variety and constrain possibility space." These three recommendations refer to evolution of complexity in a game by progressively unlocking more complex economic components, using positive and negative feedback loops that change play dynamics each time a player engages with the game, and designing the play maps to create unique constraints and challenges.

A good example that illustrates that the elements of game economies, the potential uses for internal economies in games, and the recommendations for ensuring fun and engagement described are embedded in game design is in the software *Machinations*. *Machinations* is a game design tool which labels itself as "The Game Design Platform: design, balance & handoff game systems" (Machinations, 2021). Game designers can use the platform to dynamically map and then simulate their game's internal economy. Figure 1 is a screenshot from the Machinations software, where I mapped economic planning as a gameplay mechanic. The image is an example of how Machinations directly uses the concepts of sources, drains, converters, and traders for designers to prototype how resources and information flow through their games.

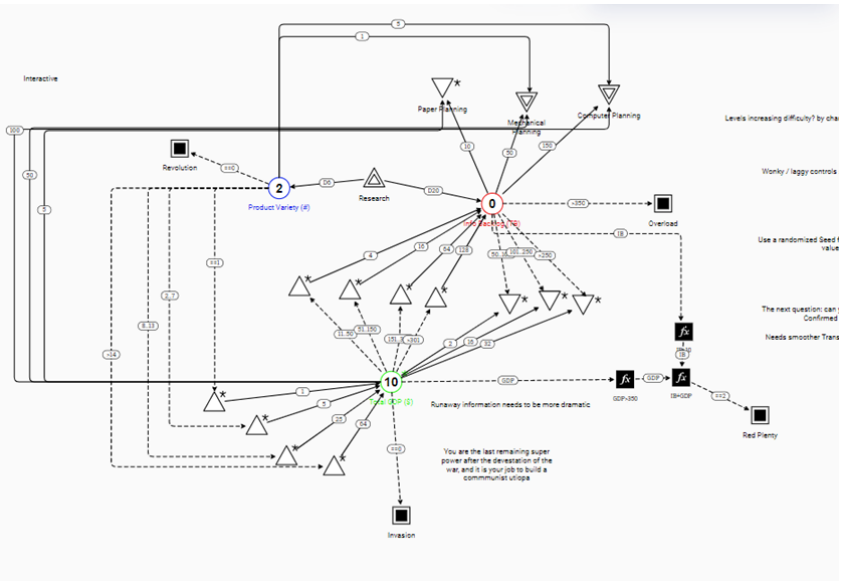

Figure 1. Game mechanic design for a simple economic planning game "CyberSoviet" in Machinations (Evamy Hill, 2021).

So much of games can be understood in economic terms and it seems that economics is a key part of designing games, whether designers understand the conventional, real-world counterpart or not. Chess was likely not intended to be designed with economics in mind, but it contains economic dynamics through play (Adams and Dormans, 2012). Does that mean the mechanics carry thematic commentary weight? This will be explored in the next section.

2b. Why do the mechanics of economy-building games matter? Procedural Rhetoric

In this section, we will explore the aspects of influence and bias of video games and computer software more broadly. We start with the concept of procedural rhetoric, which explains how people learn through the authorship of rules or processes (Bogost, 2007). This key concept forms the foundational lens for this research project.

Procedural rhetoric, a concept coined by Ian Bogost (2008), refers to "the practice of using processes persuasively, just as verbal rhetoric is the practice of using oratory persuasively and visual rhetoric is the practice of using images persuasively". In other words, procedural rhetoric means persuasion through processes (Bogost, 2008) or in video games: gameplay mechanics. As Bogost (2008) suggests, "procedural rhetoric affords a new and promising way to make claims about how things work". In other words, games can persuade players about how the world works, mainly through the mechanical models they have constructed alongside their narrative and visuals. "Models of all kinds can be thought of as examples of procedural rhetoric; they are devices that attempt to persuade their creators or users that a machine works in a certain way" (Bogost, 2008). Because procedures are a symbolic medium, procedural rhetoric can also represent and make arguments about conceptual systems like consumer capitalism (Bogost, 2008). Therefore, Bogost (2008) argues, procedural literacy and approaching games with a critical eye is important to understand implicit themes.

But is there a psychological basis for the impact of this kind of rhetoric - persuasion through processes? A few recent studies from both the United States and The Netherlands in the psychology domain give us insight into this and form the basis of this research. These empirical studies found that there is indeed a basis beyond a lens for critical interpretation of procedural rhetoric and lay a foundation of how we can understand one aspect of the influence of games that is relevant to considering economic models.

The US study comes from researchers at the University of California Santa Cruz in 2019. "The Psychological Reality of Procedural Rhetoric" explores the concept of procedural rhetoric in an experimental psychology study with controls. It finds that there is in fact a psychological basis for procedural rhetoric. In the laboratory study, they found "players accurately [understood] that two games trialled were meant to have arguments have them, and the purely abstract game we included did not" (Anderson et al., 2019). This supports the idea from an empirical basis that procedural rhetoric does have an influence by itself: players can detect when game designers make procedural arguments through gameplay mechanics alone. However, they also found that the understanding of procedural rhetoric in games is strongly shaped by accompanying media - the more abstract the game, the less well understood the procedural rhetoric was. Finally, they identified that even when

players understand the goal of a procedural rhetoric argument, the impact on their thoughts and feelings may not share the author's intent.

The researchers make a note about the authorship of what gets included in a simulation. While omissions may lead players to understand the limitations of a computer model, they may also be understood as making an argument about what aspects of a situation or system are most important, or how they work. They raise the cognitive bias identified by Daniel Kahneman of "answering an easier question", or substitution bias, saying that it could lead to a situation where a player internalizes a simplified model of a complex system, and then uses that model as a cognitive shortcut when trying to reason about a complex system (Anderson et al., 2019) (Kahneman, 2011). This would suggest that there is a risk of communicating faulty models that players might use in their daily life (Kahneman, 2011), that could be referred to also as the "*SimCity* Effect" or "incrementally building a model of the system's internal processes based on experimentation [with the simulation]" (Wardrip-Fruin, 2007). Procedural rhetoric is most effective "when supported by other ways of conveying meaning, and that understanding the psychological impact of game mechanics requires paying attention to the moment-to-moment choices that players make within a game." (Anderson et al., 2020) This suggests that procedural rhetoric is indeed a persuasive communications tool, especially when complemented with other forms of rhetoric.

A subsequent 2021 study from the Netherlands, "Procedural Arguments of Persuasive Games: An Elaboration Likelihood Perspective" studies the effects of persuasive games to understand the psychological processes involved in persuasion. Their results corroborate "a long-standing supposition in game studies that procedural rhetoric can act independently of verbal arguments, by letting players act within a system to reach their own conclusions about the real-life processes it simulates" (Jacobs et al., 2021). It found that procedural rhetoric strength added to persuasive effects regardless of the cognitive load on participants. This was achieved, in experimental psychology laboratory conditions, using a custom-made analytical game design.

Gameplay experiences can be persuasive and influence how people build their mental models about complex phenomena, and this can influence how they behave. The concept of procedural rhetoric, and subsequent studies which show its basis in psychological reality, leads to questions about the importance of authorship of models (in other words: what gets put in and what gets left out) as well as the ethical responsibility of designers and their potential bias. This will be an aspect explored in the discussion section.

2c. What are alternative approaches to economics? Economic Pluralism and Heterodox Economics

The study of economics in video games typically focuses on multiplayer economies - in other words, games where many human players partake as agents in the game world together. From Edward Castranova's seminal book *Synthetic Worlds* (2004) to current research focused on measuring inflation in online worlds using deep learning (Stephens & Exton, 2021), the dynamics of massively multiplayer online economies (like *World of Warcraft* or *EVE Online*) is well covered. While certainly not impossible, it is more challenging to come across work in the single-player space that this research pertains to.

The focus of this research, as outlined in the last section, is to explore the procedural rhetoric of single-player gaming experiences - where the gamer plays with or against the computer, purely alongside the rules of the computer and not the emergent interactions with other players. I argue that the player is instead interacting with an economic game mechanic model of the designer's creation. Since this project is an exploration of the economic mechanics that creates those experiences, this section will provide a short background into the relevant economic and ecological concepts necessary for building an understanding.

Economics in single-player economy-building games is well represented by discussing the application of economic models. Economic models are "when economists make a number of simplified assumptions about how the economy, or some part of it, behaves, and then see what this implies in different scenarios" (*The Economist*, 2021). The purpose of the primary research in this study is to explore to what degree designers simplify, create models of their own, or pull inspiration from economics for their games.

There is a great diversity of vantage points from which assumptions can be made about the economy from the diverse schools of economic thought (Chang, 2014). In contrast to the mainstream of the discipline, pluralist economics also embraces heterodox schools of thought. From Marxist, to Developmentalist and Austrian to Keynesian – heterodox economics has many diverse conceptual modelling paradigms. Even in a single-player experience, there are potentially many diverse ways to portray economy-building game models. In a conversation with the primary supervisor for this research regarding a forthcoming paper, Peter Jones identified at least 10 new schools of economics, ranging from Post-Keynesian, to feminist political ecology, to complexity economics, and over 25 economic perspectives to accompany them. He noted the importance of interdisciplinarity, pluralism and an appreciation for complexity in approaching an understanding of economic phenomena. Any of this new economic thinking "could be a model or a chosen bias in a

world building game" (Jones, 2021). Of particular interest to this study, given the environmental focus, is ecological economics.

Ecological economics is a discipline that deals with the environment as central to the economy. It is a transdisciplinary alternative to mainstream economics that views the economy as a subsystem of the environment. It deals with things like sustainable scale, just distribution and efficient allocation in the economy as well as emphasizes material and energy throughput. Overall, ecological economists would posit that given scarce resources and unmet needs, society should strive to achieve the greatest welfare obtainable from finite stocks and flows of matter and energy, without threatening the welfare of future generations (Costanza et al., 2015). This integrative approach allows for a comprehensive view and analysis of the economy and the environment.

Dr. Jones outlined some core principles for working with ecological economics that are both positive and normative. These are that economies have fundamental limits to growth, that human derived capital depends on nature, and that economies should be designed to be circular and regenerative (Jones, 2021). Some key concepts that have arisen in this literature review relevant to game models are the ideals of circular economy, wellbeing, and degrowth. A circular economy is a concept that is still vague (de la Torre et al, 2021) but at its core has to do with industrial production flows that turn outputs back into inputs in a sustainable manner. Wellbeing, while a school of thought on its own, is included and well illustrated in Doughnut Economics. Doughnut Economics is an alternative indicator to gross domestic product (GDP) that organizes itself around not overshooting planetary boundaries while achieving social foundations on a variety of measures. (Raworth, 2017) Cities like Amsterdam and Barcelona have adopted it as a model. (Barcelona, 2021) Degrowth is an ongoing proposal for radical change that, alongside recognizing the need to limit the scale of the economy within planetary boundaries, also emphasizes "self-limitation and voluntary simplicity, equality, global social justice and end to the exploitative relations of capitalism" (Hanacek et al., 2020). The current landscape of alternative economic thought is ripe with diverse approaches.

Ecological economics, due to its broad scope as a transdiscipline offers a potential meta-paradigm for understanding the economy (Costanza, 2020). Its richness offers a broad viewpoint, relevant to our times in environmental crisis, through which to analyze and synthesize economic ideas. This forms a basis lens through which environmental themes in economy-building games could be explored.

2d. Interdisciplinary Overlap - *Heterodox Economics, Procedural Rhetoric and Game Design*

This section will discuss a few papers identified that explore the overlaps between the areas explored in brief above. De la Torre et al. (2021) explore the role of simulation and serious games in teaching concepts on circular economy and sustainable energy. It notes the sketchy and variable definitions of circular economy from which to work. Their paper reviews the main trends and challenges relating to circular economies in games. Their findings show that the implementation of teaching circular economics using games is not widespread. The work indicates that there is potential for teaching with circular economy games, but that this has not even been well integrated into the academy, let alone in the mainstream. In a more targeted exploration, Bereitschaft (2016) explores city-building games specifically, like *SimCity,* reflecting whether they are a helpful introduction to urban systems. He argues that while games have great potential, they are constrained by the developers "assumptions and biases regarding how cities ought to look and function" (Bereitschaft, 2016). This appears to be a limiting factor in game design in terms of the scope of economic themes represented.

Alenda Chang has been working on ecology and games. A 2017 paper with her and John Parham finds that games can offer "deep, affective opportunities for environmental mediation" and encourage an exploration of transmedia storytelling or worldbuilding (Chang & Parham, 2017). John Majewski, in a 2021 social media analysis, explored how players learn history from *Sid Meier's Civilization VI.* He observes that players develop an immersive critique of the game - gaining some knowledge while "readily articulating its flaws" (Majewski, 2021). These suggest that there are opportunities for learning about new concepts in the environmental-political-economic domain through the immersion of video games.

Many of the most interesting sources in this area are not necessarily academic papers. Molleindustria (aka Paolo Pedercini, a game maker and professor at Carnegie Mellon University) presented at *Games For Cities* in Rotterdam in 2017. Key ideas from this talk include the idea of rhetorical scope, or, "the limits of a playable system" (Pedercini, 2017). In his words: "Everything is interconnected but you cannot put everything in a game" (Pedercini, 2017). He argues that the biggest fallacy of a city simulator is to "try and present itself as an all-encompassing system" and the better alternative is to develop different simulations with different assumptions and embedded values. The idea is that "we can use [games] to think about the city's past, present and future" (Pedercini, 2017). He advocates for a non-all-encompassing approach to modelling and subject matter of games.

By exploring the overlap of the three main domains of this study, we complete the contextual overview necessary for reviewing the primary research.

Section 3:

Methodology

Methodology

This major research project focuses on the following question:

> *"How might popular economy-building games build circularity, planetary limits, wellbeing, or other ecological concepts into their mechanics?"*

To answer that question, I conducted a literature review to explore and define the three domains which I had identified through preliminary expert interviews to be relevant to this work. First, an overview of some key texts on game design and economy-building games was conducted. This research was to set the context for how economy games sit in the broader category of video games regarding economic dynamics. Second, the concept of procedural rhetoric was defined, especially giving focus to current research that provides a psychological basis for its existence and therefore an added impetus for the purpose of this project. Third, key themes in ecological economics were defined. Overarching ecological economics literature was explored that overlapped with relevant aspects of economy-building games and procedural rhetoric. Finally, a section was added representing literature that had overlap of all three areas. The purpose of this literature review was to define and situate the primary research process and provide a high level and broad context, particularly for designers using this research. The literature review included academic papers, journals, books, textbooks, recorded lectures, and blog posts.

The literature review informed the primary research that was conducted through expert semi-structured interviews. Semi-structured interviews use an interview question guide but allow some flexibility in asking questions separate from that script. In general, the semi-structured interview format was selected as it allows for some flexibility in the questions being asked, letting the interviewer dive deeper in places of interest, while maintaining a level of standardization between interviews. Specifically, semi-structured interviews with game players aids in the discovery process of gaining insights into the types of economic ideas and memes present in both a wide range of economic themed games, and in a specific subset of games chosen for direct comparison.

18 interviews were conducted in all; 6 interviews conducted with designers of economy-building games, 4 with a variety of pluralist economics experts who were game players, and the rest (8) with experienced economy-building game players. The game designers were from both major and independent (AKA indie) studios from around the world, while some were more focused on educational games. From the economist pool, PhD level economics practitioners were interviewed, as well as others from relevant adjacent disciplines. The game players came from diverse backgrounds and had experience playing

economy-building games ranging from *Starcraft* to *Factorio* to *Cities: Skylines.* Some of the players review games on a professional basis as well, though they were not necessarily economics focused in expertise. Most did have academic or personal interests in economics and political economy. Originally, only 8-10 players (both general and economist) and 4-5 game designers were targeted for this study. There was enthusiastic uptake that surpassed expectations leading to the final count of 18 interviews.

Recruitment was targeted at people aged 18+, who identify as professional or academic economists (including students) who play games, as well as people aged 18+ who have at least 5+ hours of experience in specific games (confirmed by the researcher) and who have an interest in economics. These participants were recruited through re-shareable posts made to LinkedIn, Twitter, Facebook, and a Google Group. Direct email and LinkedIn message invitations were sent to game designers as well, given the specific niche of the target interviews. Snowballing invitations (including re-shared of recruitment materials) recruited some interviewees who had heard of the study from word-of-mouth.

A screening questionnaire was first used to identify if prospective interviewees were appropriate for the study, to respect their time. This webform asked for basic relevant demographic questions to ascertain which category of interviewee they were part of, if they had experience with economics, and if they had experience playing economy-building games as well as the times they had available to be interviewed. Preference was given to those that fell in one of the three categories, and who had more experience with the games or with economics. An invitation was then sent via email, collected on the form, to set up an interview time. A letter of consent was sent to the interviewees at least 24 hours before their respective interview that was to be signed before the interview start time.

The interviews were conducted online on the Zoom platform. The interview lengths were as short as 30 minutes, with a maximum cut off time of 1 hour, and an average time of about 45 minutes. The interview process began at the beginning of August 2021 and ended in mid-September 2021. Audio recordings were taken for transcription purposes, with informed consent. Notes were also taken during the interviews of salient points for future reference. An interview guide (appendix A) was created with the following categories - economist gamer (14 questions), gamer with interest in economics (15 questions), and game designer (15 questions). A general set of extra questions (7 questions) was also provided in case more time was available, or if extra prompts were needed. Not all questions were asked in all interviews. Common questions across categories related to ideology in games, ecological economics in games, and experiences playing games relating the two. Designers were asked about specific video game design concerns (but not relating to their studio's specific intellectual property), like the challenges of design.

In October 2021, data analysis was conducted of the interviews. Transcriptions of the interviews were produced using a subscription to the service Dovetail. Using Dovetail and

Miro, a reflexive thematic analysis was conducted. Reflexive thematic analysis purpose is “to identify patterns of meaning across a dataset that provide an answer to the research question being addressed” (Braun et al., 2019). The overall purpose was to identify themes, through coding and analyzing and aggregating those themes, to find points of intervention for different economic ideas to be integrated with game design. As part of this, sections of text were assigned codes that could be summarized in less than 6 words in most cases. These were then analyzed to develop 48 overall themes from hundreds of codes. A table of themes is provided in appendix B. The full list of themes was subsequently analyzed to develop the 7 overarching themes seen below

A toolkit for assisting in the economy-building game design process was synthesized from this primary research (appendix C). The main limitation of this study was that the toolkit was not tested with an audience of designers and revised based on feedback. Due to time and privacy concerns and constraints, a prototyping workshop was removed. Therefore, a next step to test the validity of this toolkit from the research is to iterate through a workshop or follow up interviews. This research was approved by the OCAD University Research Ethics Board (approval number: #2021-44).

Section 4:

Findings

Findings

To identify the most significant considerations for the design and future of economy-building games I performed a thematic analysis of interviews undertaken between August to September of 2021 with game designers and players with varying degrees of economics experience. Fifty-one initial themes resulted from the first round of analysis. After review, those initial themes were synthesized into 7 overarching major categories:

a) The Influence of Economy-Building Video Games
b) Representing Reality in Video Games
c) Economic Concepts in Economy-Building Games
d) Alternative Economic Ideas for Economy-Building Games
e) Overall Game Design Considerations for Economy-Building Games
f) Relevant Game Mechanics for Economy-Building Games
g) Ideas for the Future of Economy-Building Games

In the following subsections, I provide a description of each theme's results with quotes interspersed.

5a. The Influence of Economy-Building Video Games

Economy-building games can be a powerful communications medium, especially about economic ideologies and models. Even when games are not designed to be explicitly educational, much learning can potentially occur from their embedded processes - their procedural rhetoric. By speaking with participants in this study, surprising insights were gained into how these types of games influenced their thinking on real-world topics. Influence includes the power of a communications medium, the potentially diverse audiences, learning and ideology.

Interviewees saw video games as a powerful, and potentially increasingly powerful communications medium. They saw the communications strength of economy-building games as that of simulation. Multiple interviewees noted that economy-building games allow players to see the cause and effect of events happening over long time scales and large geographical scopes – beyond human perception and lifespans. They saw these types of videogames as a potential demonstration tool for complex concepts that are hard to visualize - like the effects of climate change, for instance.

When discussing the influence of video games, interviewees also commented on the audience of economy-building games, who are then prone to games' influence. While the economy-building genre was seen to be in the realm of more experienced players, there was a note that there could be a potential influx of gamers to PC and console titles from the mobile realm. On the other hand, some designers interviewed noted that this was more viable in regions where mobile gamers had greater access to more powerful computer hardware.

It was noted by numerous participants that many players are demanding greater levels of complexity and realism in their games. One designer said that "the market for economy games is changing because people - maybe it's just our niche - don't want simple abstractions anymore." Another designer reiterated this, saying that people "expect more complicated games and that in future they will continue their expectation for very complicated games".

To consider the influence of economy-building games, interviewees also mentioned the importance of considering the learning curves and learning experiences behind them. The learning curve of a game is something that takes time to understand (let alone, master) and learning new play styles and strategies can take a particular type of patience and focus. *YouTube* was noted on numerous occasions by designers and players alike as a platform that encourages a "learning by watching" approach that allows gamers to quickly grasp games in a way that allows them to enjoy them. Popular games, like *Minecraft*, that act as platforms for many other types of mini-games, modifications or scenarios are a

useful tool for rapidly bringing new and old players on board to a new experience within that platform. The ubiquity of games like *Minecraft* adds familiarity for a broad range of players for them to onboard onto new experiences that are iterations of the concept very quickly. Lastly, the difference between educational and entertaining games was a key theme of these interviews. It had to be reiterated that of interest to this study was purely entertaining games, perhaps with influence from educational ones, to understand how to influence the cultural dialogue on climate change and the environment more broadly.

Ideology and the influence of video games on players' real-world thinking were key themes. Games have the potential to shape the politics of players, especially at a young age. A player spoke about their experience playing *Zoo Tycoon* and *Rollercoaster Tycoon* as a child. The player said that these games "had very much informed [their] view of economics like, how 'you should be spending on things that there's a proven rate of return, or by spending on that thing, you're going to incentivize for the rates of return.'" They found the question about the influence of games on economic thinking interesting regarding "how it might have shaped … my politics and view of economics". This player capped off by discussing how playing video games might have been influencing how they interpreted platforms and politics in the latest Canadian election:

> "It's interesting because we're actively in an election right now. And, you know, I've been reflecting on, like, the different party platforms and what I'm concerned about and that type of stuff. And then it's like, you come along with this question, I've been thinking about this a little bit more and, you know, there are some issues that video games might have shaped or informed how I sometimes look at the world and think of it."

This was the most exceptional example of introspection amongst participating interviewees on how the ideology of video games might have influenced their thinking. I believe it indicates a basis that this is a worthwhile area of continued further study for the genre of economy-building games.

Overall, the other participants noted that there was a supremacy of mainstream economics or a reflection of the current economic system and order either implicitly or explicitly present in the games. One interviewee who is very well versed in economics, with advanced education in the field, discussed how games were often near perfect simplified models based on the concept of supply and demand. They said that with their economics education and the limitations of the simulation, they could easily exploit the systems at play. A designer summarized the ideological bias as such:

> "[There is a] Western perspective of economics and understanding of property and law based on a bunch more market-based capitalist system. Like, and whenever

> people try to do a representation of, of whatever communal system, you want something that's a bit more socialist. If you want an actual communist government, if you want the “non-enlightened” nations' pre-colonial development, it is usually a gross simplification or only seen [from their understanding].”

It is worth noting that designers who I spoke to did all acknowledge the use of assumptions and presence of bias in the games they make. Ideology present in games is a function of inclusion, exclusion, assumptions, and biases in the model of reality it represents for entertainment.

> “It's more of what biases and assumptions do [games] make, because you have to, you have to make a set of assumptions in any economic game. This equals this, where's your valuation? Is it resources, capital, labor? How does trade work? Is it a non-zero sum or a zero-sum game?”

The above quote indicates some of the key considerations for inclusion in the game model. This is the basis for looking at ideology in games and will be discussed in the next section.

5b. Representing Reality in Video Games

Respondents seemed to agree that no form of expression can or perhaps should even attempt to portray a 1:1 re-creation of reality. This also holds true for video games. This section highlights how players and designers think about simplifying the real-world into something that can be portrayed in a game while maintaining the purpose of the game - to be fun. A few overarching examples of key things that are typically represented in the economy-building genre of games are discussed here - growth, domination, and people.

The main theme here was highly philosophical, it involved discussion about the nature of modelling and complexity. Both players and designers talked about the believability of the game economy and how complexity added interest. A designer noted that "you're looking at [modelling] economies that are going to shore up your fantasy." Another designer said that they "try to inspire by reality, but the problem is you cannot make reality into the game." Choosing what to put into the game is necessarily a simplification of reality. In entertaining games, it is a simplification guided by knowledge and assumptions of what would be fun for the player and what would be saleable. Assumptions about reality were a keynote here, with one designer talking about the challenges of making a city-building type game:

> "We were not really modeling a city at all, but we have to pick and choose the systems that we think will make you believe that you're running a city without actually getting into the detail of like, it's not really being a simulation of a city."

It was interesting to note that this same designer had the insight that a city-building game is not so much about being a simulation but more about being a puzzle game, despite the genre becoming touted for its educational potential due to the representation of reality. Does this difference of interpretation (an economy-building game being of a puzzle rather than a representation of reality) shape how people imagine economic outcomes to happen? This seems to be an important idea that warrants further exploration.

The key themes in modelling and complexity as they relate to economy-building games were discussed by interviewees. A player summed up the representation of growth in games by saying "I don't think games offer enough challenges beyond pure growth right now." The consensus was that in these games there always is, and (possibly) necessarily must be "a next". Maximization is a typical gameplay mechanic, alongside achievements that give players a sense of progress and of becoming more powerful - an increase of agency. A designer summed it up as such:

> "There are many, many, many games always about growing, just throwing you things, players, which they have to learn or can experience. And I think that kind of

> typically leads to growing an economy. [However] I would say that I don't think it's impossible to have an economy which is more circular or confined in its resources and design space."

While the designer here suggested that there are possibilities beyond growth as the primary mechanic portrayed (which will be the subject of the latter part of this discussion section), many of the interviewees asked: what is the point of a game without growth?

Conquest and domination were other themes raised about the representation of reality. Domination of nature or of other players (whether artificial intelligence or human) is often a key mechanic. This domination can happen through violent means or otherwise. While this was identified as a design bias of representation, players often agreed that having someone to fight against was fun.

The representation of people in games as characters or agents was seen as a key consideration for the future of representing reality in games. Interviewees thought that happiness and other hedonic measurements are and could be an interesting aspect to include in economy-building games. The possibilities for simulating people from the bottom up, in the form of agent-based modelling, was also seen as a powerful (and unpredictable) gameplay element. One designer indicated that there are challenges designing with agent-based models for people - the unpredictability can make other aspects of balancing and designing gameplay aspects difficult. Overall, interviewees showed a concern for representing quality of life and wellbeing in games. Games that include these ideas/metrics and even operate on smaller scales, like *The Sims* (regardless of its emphasis on consumerism), were seen as intriguing.

Representing reality in games is something that is mostly intentional, and certainly up for interpretation. However, interviewees acknowledged that some of their own unintentional bias can present itself in game mechanics, and that the players interpretation of mechanics can be unpredictable. As with any model or map, not everything can be included or else it would be unmanageable. These themes are what stuck out as the key considerations and biases of current and past economy-building games and form a rich basis for future research.

5c. Economic Concepts in Economy-Building Games

Economy-building games distill some measure of economic concepts to represent a facsimile of reality. Over the course of the eighteen interviews, these were the main concepts that have recurred. All these concepts were mentioned in the interviews, but particular emphasis was put on the concepts of extraction, resources, and markets.

Economic memes are distinct as they refer to concepts that are reshared over the internet typically in popular reference to the games. These include “build more pylons” from the game franchise *StarCraft* and “just one more turn*”* and “tall versus wide” from the game franchise *Civilization.*

Following up from the previous section, a few assumptions and biases appear to show up in games that also show up in economics. For instance, according to interviewees there appears to be a gender bias towards men. This was mostly represented in the form of who was represented on screen and who had the “best opportunities” in the game economy. There was also a consistent agreement of a typical bias against cooperation and diplomatic options in these games. Usually the options and mechanics, as mentioned above, are about domination of some form or another. Interestingly, the other mention was of quality. Quality of goods, for instance, is often not something represented. Typically, it is more about quantities or volumes rather about different qualities or grades of resources or workers.

Overall, players saw that there is a certain superficiality of the political economy represented in economy-building video games. There were several points that will illustrate the nature of representation. A player noted that: “it's interesting how some of those models reflect on games that have like older models or mentalities of things that affect the economy”. Is there path dependence in the game design field that has led to the current representations of economics in games?

It was useful to understand the typical economic memes and tropes that players identify in these games. These were:

1. *One more Turn:* always having the next thing to do, keeping you at the game
2. *Tall vs Wide / Coverage vs Intensity:* the balance between vertical development and horizontal growth
3. *Guns vs Butter:* the balance between military and domestic productivity

These typical memes were identified across all eighteen interviews and asked in the very early stages of the interview. They are consistent across a broad range of games. It was later in interviews that the broad range of economic concepts were discovered.

The concepts of extraction and resources was a consistent topic of the interviews. The dichotomy between resource scarcity and abundance was identified as a key mechanic in these games, with the arc of the game being one of moving from scarcity to abundance through player action. Alongside this is the concept of resource efficiency. Oftentimes it is critical for players to be incredibly efficient with their resources at the beginning of the game, and as the game goes on there is more room for deadweight in the internal economy. Some interesting points from this section were about the geography of resources determining what economy you have, and the possibility that a game could track all resources in a closed system.

Players and designers alike saw production as the overarching force in current economy-building games. They said that "production is king" and determines the velocity of decision making in the game. Alongside this is the concept of supply chain management. Bottlenecks are something to overcome in the pursuit of production. Also, a player must decide to what extent a supply chain might be vertical or horizontal. Players noted in this regard that it might be fun to have more decision-making flexibility and options on the verticality or horizontality of supply chain design. Since these types of games are often focused on the creation of cities and regions, a few interviewees indicated that the views on urbanism embedded in these games were quite "old-school". This was in the sense that they reflected older, often superseded or antiquated, ideas in urban development.

Markets and supply and demand were of great interest. Games with a trading component were noted as lively and replayable, but players and designers alike both saw the potential of the creation of more dynamic markets. This could be through more sophisticated design and AI, or multiplayer or online component as is experimented with in some games like *Planet Zoo*. Money was another aspect. A theme that emerged was that money was a key driver of player action. This could be because it is really the key indicator that is present in most of these games. In any event, the pursuit of money often leads to having too much money than one knows what to do with by the end of the game.

Economy-building games often represent business and management concepts. Things that were evident were the emphasis on entrepreneurship: bootstrapping a new business instead of taking over an existing business. Players desired the opportunity to take control of different forms of business organizations, such as cooperatives. Players also indicated that a key economic concept they learned or practiced from games was the idea of opportunity costs. Strategizing over investments and understanding compound interests are key aspects of decision making in many games. Managing cash flow in this context is

something that happens and can be fun. Overall, there are many trade-offs to consider in an economy-building game.

5d. Alternative Economic Ideas for Economy-Building Games

Some new economic concepts, as referenced in the context section of this study, recurred over the course of the interviews. These were mostly in response to question prompts but summoned some good discussion. The key insight in this section is that despite being a realm of fiction, economy-building games rarely try to portray other radically different forms of economic systems. This is particularly missing in terms of procedural rhetoric or mechanics, though sometimes these are portrayed through written or visual rhetoric. Key themes here were circular economies, degrowth, representation of the physical world, and Indigenization.

Circular economies were seen to be an interesting concept for the future of economy-building games, while players and designers alike were skeptical about the game-ability of potential games that used degrowth as a mechanic. Reaching equilibrium or a steady state in an in-game economy was seen by most interviewees as an endgame point that might lead to the end of novelty in a playthrough. As mentioned, there is typically "always a next" in the games, and so the idea of managing something to maintain an equilibrium or balance, at least in an economy-building game, was not seen as being as interesting. An exciting idea that resonated with at least a couple interviewees was that of circular economies or degrowth as building self-sufficiency from other players or entities in the game. For example, a player with economics experience suggested:

> "Even within some traditional video games, you could build in [a system], like where, if you're dependent on sort of the outside world for resources and you can build in some sort of circular economy into your own sort of empire type thing or whatever, then you reduce that sort of external dependency."

This gives a goal and purpose to the kind of work that a circular economy could take to construct these types of games. Some players saw the opportunity of a circular economy model to be a sort of rogue-like, or iterative experience through challenging gameplay where the player is meant to fail, retry and learn - like Ubisoft's *Anno 1800* game mode discussed in the introduction. A player suggested that:

> "That's the game. It's a loop used to keep playing the same game, fighting and fighting mostly the same enemies, but coming up with novel approaches. And I think that's a, that's a space that's worth looking at for inspiration on how to approach the sustainable game."

Another player reiterated this by saying "So it's a limited amount of resources and you're just creating these cycles that you can and use them more efficiently." This player further

reiterated that by highlighting the relationship between inputs, outputs and subsequent inputs in video games as realistic:

> "Then you would have to take [the material] and cycle it back through the system. That's how I think of a circuit, like if you were to make the whole economy a circular economy, which I think is unrealistic in real life, but yeah, you would essentially just reuse the garbage and then there's no input output. It's all just one, one cycle. That's actually probably not so hard to make actually,"

Several players were disappointed in the representation of alternate forms of economic systems in video games. Interviewees generally agreed that the narrative and mechanics of video games perpetuated ideas about the workings of the current economic system. In relation to circularity, a player with significant economics background suggested that there could be strong impact on players by including ideas of circularity:

> "[Video games] also tell the user how the world works. So if by not emphasizing the circularity aspect of the economy, that's still not visible and present, but nonetheless, very, very important it sort of is the current system. It legitimizes the current system because the propose any alternative, and he doesn't challenge the user to think about any alternatives about circularity. So really what's missing is circularity, the notion that we use a resource and somehow individually, or as a society, we need to deal with it. We need to recycle, reuse. We can create alternatives to, to make the best use of the, the, the, the finite limited resources that we, that we have as human beings leaving it closed."

A designer had an interesting perspective on the ubiquity and the elevation of economic thinking as a problem in the representation of ideas in games. They said that:

> "But to say that economics is somehow superior to other ways of understanding our world. I don't understand it from a philosophical level. Right. Like from a cultural level, the way we value things is through money. It's the only way we value things. Right. So we say, somebody's good because they're rich, which is total insanity. Like just because you're born rich doesn't mean you're born good. Right. Yet we have this idea, right, *that economics somehow trumps other ways of thinking about the world*. "

There is a possibility that the supremacy of economics as a way of thinking must be reconsidered when thinking about how to make more ecologically focused economy-building games. This could be a new paradigm to consider.

Other themes that were considered here revolved around the natural and physical world. In terms of nature, the lack of peaceful interactions with animals was often discussed by interviewees. Whether hunting animals in *Age of Empires* or exterminating the local flora and fauna in pursuit of an ever-larger factory in *Factorio* - there is often a domination mechanic over animals. Also, ecosystem services are often not represented in games - for example, the cleaning of water through wetlands or trees providing shade to reduce energy dependence in hot weather. One designer noted that even if games become more successful in representing ecologies, *an emphasis must be placed on getting players into real-life nature to increase their appreciation of the natural world*.

Energy and thermodynamics were interesting gameplay mechanics, especially considering closed systems and the preservation of matter and energy. There was an interest in having systems in games that track these flows. On the material side, there was interest in the contamination of the map through player action, and the representation of waste instead of its destruction or disappearance. Rethinking the lack of representation of waste in most games was seen as a design and gameplay opportunity.

Finally, there was seen to be a lack of Indigenous perspectives in how an economy is run in these games. This lack of Indigeneity and decolonization accompanies the general lack of other economic paradigms and perspectives in economy-building games. An interesting idea came from a designer who encouraged thinking about the 7 Generations model in their educational games. Games offer an opportunity to simulate generational changes and long time scales, so they can be used to help players visualize their actions across 7 (or even more) virtual generations, as per a variety of North American Indigenous worldviews.

5e. Overall Game Design Considerations for Economy-Building Games

The overarching insight here was that all games, of every genre, have some kind of economy in them. This was a point made by numerous interviewees. However, it was recognized that the focus genre of economy-building games is a particular beast unto its own. This section discusses some of the design considerations and player responses to those considerations. A theme that arose during these interviews was the idea of the "wonder to meta" pathway of experiencing these games. This refers to the learning curve of things like being distracted by (seemingly) superfluous figures or mechanics in a complex game, to eventually fully understanding the mechanics and learning the optimal strategies situated within the complexity of the mechanics. This section will lay out key processes for designing the types of ecological focused games and give insights into what a toolkit could look like.

Many interviewees mentioned that they felt that every game had an economy in it. Whether the player is managing a character's inventory or deciding the budget of a city, they are managing some sort of economic system. A question is "whether the economy is an engine for racking up points or dollars, or a foundation for creating flourishing outcomes for the players' worlds?" (Jones, 2021). A designer stated: "I would put forward an argument that essentially all games have some form of economy. It's the one extent and what are they valuing is, is the question." Further to this, several designers mentioned that games, at the end of the day, are a form of computation and the games are not as fluid as they seem. Some of the designers conceptualized economy-building games as an illusion of "grids" or, fundamentally, a "spreadsheet" and even described a city-building game as essentially "a puzzle game, not a city simulator". Designers interviewed were all aware that there is opportunity for design bias. A designer mentioned that to avoid this, fundamentally "the biggest skill to make designers do [design] well is knowledge of where they're ignorant or knowledge of". Research to create realistic systems was emphasized in its importance, including reading from a wide range of sources and gaining a wide range of perspectives. Also, according to a couple designers: "Wikipedia is always the greatest first source of truth. It should never be the only one, but it's, it, it shows you where else to go." This is a useful insight for considering what could be useful tools for the futures of economy-building game design.

From an insider perspective, economy-building games are expensive to make - especially when they are made primarily for the PC. This explains why there is beginning to be a trend or preference to economy-building games on mobile devices. There are also constraints of game design on hardware. Economy-building games have a potential to become computationally intensive and expensive on the player's side as well, especially in the late-game of certain games (imagine, when a virtual city grows very large). This can put limits to the imagination of what designers can simulate on screen. According to the

designers, making these types of games is already a challenging process - especially in terms of fairness and balance of the systems at play. For example, games cannot necessarily jump to final conclusions and gameplay states - intermediary steps and actions must be thought up for the player for paths of action that make sense. As a designer said, “history doesn’t change in a day” so players must be able to take paths that make it feel realistic to players. One tool that is useful, according to a few designers, is *Machinations* that was mentioned in the *Key Concepts* section of this report. This tool helps the designers to prototype system flows of experience. It was noted by one designer that this would be useful for modeling and experimenting with circular economy systems in games.

All designers, and several players, spoke about the importance of the ethical and moral responsibility of the designer in the games that they make. Since games have an impact on millions of players worldwide, the design choices must be considered. In the words of a designer who is personally concerned about the global situation:

> “People assume that because our current world functions this way, [it must be] the way all economies function. [It is] just insane because the way our current world functions is killing us, like literally we can't even house people with our current economic situation. Like how is the current economy anything you want to base anything off of? It's a disaster… We make games with the assumption that it ought to operate as a hyper capitalist market in a seemingly post scarcity world in which we are not living… Take that, planet earth will kill you first.”

A player discussed how a more ethical game does not necessarily need to be one with a lot more work:

> “I think the responsibility falls on the game designers, but that doesn't mean that they have to do more work than they're already doing. You just have to do careful work. They just have to choose carefully whether they are going, what the scope of their project is going to be. If it's going to be, to try to, in some sense, approximate reality, then it must do that either through the mechanics or the aesthetics, and that if it's not going to do that, that it should do it in a way that is conscious.”

One designer suggested that it might be a worthwhile trend for designers to simply refuse to design or mimic destructive systems. Overall, the designers and players deeply recognized the need to elevate design ethics and reduce design bias through whatever tools could be available.

In terms of how players experience game design, there were a few key themes. Players were satisfied when they had a tangible impact on the game world. They liked the idea of having benchmarks or progress incentives that were familiar and understandable. They

liked the opportunity to set their own vision and goals of how to move forward, and to be able to play with an iterative process. Players saw the benefits of these types of games, even despite the potential time commitment that they may represent.

An interesting theme emerged over the course of the interviews. This was the idea of "*wonder to meta*", or the evolutionary experience of learning, playing and grasping this genre or even individual games in the genre over time. Players generally agreed that at a young age, or even when they just started to play a complex game, the options presented to them (even if superfluous) often seemed vast and perhaps unpredictable. But over time, a player is often able to see through the simulation to understand meta strategies, and perhaps even exploits. It was described by one player as "[from being] lost in the mechanics to really understanding and optimizing with the mechanics". The insight is that the sweet spot for most players may be between wonder and meta; both the constant learning of new systems but also the overfamiliarity with old systems can be boring. This experience deserves further examination and could be an area of design exploration. For instance, randomization and procedural generation was seen as an opportunity to increase the amount of time that a player can stay in a "sweet-spot" zone between wonder and meta.

5f. Relevant Game Mechanics for Economy-Building Games

Economy-building games are made up of many diverse and unique features and mechanics. Interviewees, players, and designers alike, produced a long list of some of the most salient of those features and mechanics. Given the topic of the interviews, these items can be thought of as key design considerations for making future economy-building games that are the most fun and engaging for players.

Economy-building games typically occur in a play space known as a "map". The map could be the plot bounds of an urban zoo, the political boundaries of our current globe, a fantasy region, or even a galaxy. But what brings maps together in common is that the geography or spatial features, as well as overall size, can determine the game play. The bounds can have different impacts on the type of faction the player plays as, and the features and resources can determine the strategy or the economy. Another important note of how the player interacts with this map is the perspective he or she takes. Player agency in an economy-building game is typically defined by the "God-game" perspective, where the player is an omnipotent executive, director, or dictator in terms of their ability to manipulate and be aware of matter, energy, and information. A player with a significant economics background put it this way: "So part of the fun of these economy games is that you are the central planner, right." Indeed, in games like *Workers and Resources: Soviet Republic* this is literally the case.

Of particular interest was the theme of information representation and measurement within these games. Can games portray uncertain information, or should information about a player's economy be transparent, accurate and precise all the time? The same goes for thinking about interacting with other players or AIs (artificial intelligences/opposing players). Players also wanted to see online enabled components and some aspects of procedural generation to add more interest, complexity, and flavour to the game world economies. With regards to information, measurement was an important theme that repeated through the interviews. For instance, alternative indicators for progress or success excited players. Some players were aware of Kate Raworth's *Doughnut Economics*, for instance, and desired an alternative to measuring their economy's success like in terms of happiness or something other than money. Other interviewees were concerned with information transparency and the recording of in-game data. A player put it this way:

> "[In most games], it's almost like there's not enough opacity to the data that you just get like this dashboard with all kinds of great information. And then the real world, like building a dashboard with great information, takes a hell of a lot of time and work. And [in games] … there's no cost to you and the game to do that. So it seems like there's that assumption you can just get like perfect data on a whole bunch of things without, with no cost, which I think sort of seems silly."

It seems that there is an opportunity to add uncertainty, or at least a cost to information. This idea was tempered by the note from a few of the designers interviewed that it could cause frustration for the player. However, this could still be an area ripe for gameplay experimentation.

Technological progression is a common feature of economy-building games and has recurring mentions in the research. Players noted that the phases of technology deployment are typically not represented in games. A player noted the complexities of rolling out a new technology in the real world and how that could be an interesting dimension of a video game - referencing the economist, Mariana Mazzucato. Another interest of players was in asymmetric technology trees depicted in games amongst different factions, and the necessity of trade between those factions that difference creates. Finally, unpredictability of technological innovation was something players desired to be represented. Technology might be hard to predict in its progress, and unexpected outcomes might occur. Some players desired that this be represented as a mechanic in economy-building games.

AI to play and compete against is seen as something exciting in economy-building games. Interviewees saw diplomacy as a fun and potentially even more fun gameplay option. It was noted that diplomacy with other players or opponents was something typically missing. A couple interviewees noted that customizing the abilities and difficulty AI players to their heart's content was something that made the game more fun to their skill level and potentially more playable. Overall, the ability to customize the difficulty level of the game made it more approachable for players of all levels. Having different unique and potentially asymmetric AI factions is something that also can create more interest in the game world. AI does not necessarily need to be another player. Fond memories of "advisors" from city-building games in the past led to the indication that feature was preferable. Numerous interviewees suggested that having AI advisors that provide potentially different or conflicting perspectives could lead to some divergent gameplay choices to the player they may not have considered.

Interviewees spoke about balance and allocation. The balance between macro and micro play, or strategy and tactics, was seen as a typical and perhaps essential aspect of the genre. Allocating resources and making opportunity cost and investment payoff decisions is another central tenet. Also, considering limiting factors to production and constraints are critical and beloved aspects. Interviewees spoke of gameplay loops that they enjoyed. The simple idea of inputs becoming outputs was also seen as an essential tie-in for thinking about circular economies and ecological economics in games. Some players spoke of exploiting edge cases and bounds of the game systems to achieve what they would like outside the rules of the game. They considered it always possible to press a game system

to its limits and to find exploits, and this potentially being a fun aspect of any game to its players in and of itself.

The rest of this section will essentially be about replayability, which was a large part of the discussion during interviews. One of the main distinctions that players and designers alike made was that between sandbox and scenario modes. There was little agreement about which one was more challenging and fun and which more repetitive and tiring - this was all about preferences. However, numerous interviewees suggested that scenarios were a potential solution to including more ecological concepts because of the potential for more specific games goals. These two different modes both offer replayability in their own way: sandbox because of the infinite potential, scenarios because of the "par" to beat.

Interviewees saw different stages of games affecting their replayability. A few interviewees discussed typical genre features of the transition of the game in the mid-game. What was meant by this is typically the beginning of a playthrough in an economy game is marked by scarcity, while the latter half is marked by conditions of abundance (at least if one succeeds). Players reported being motivated by what the end game is, and some reported getting end-game fatigue which led them to be aimless and to move on to other games. However, a player familiar with economics said:

> "When you get to the end of one of these kinds of games, then you just are making, you know, a hundred thousand dollars every second, and it only takes you, you know, five seconds to save up, to buy the most expensive thing in the game. Right. It's kind of like playing on 'God mode', people like that."

Perhaps many of these mechanics are a factor of personal preference. For instance, the scenario described in the quote above made another interviewee quite bored with their game. It seems players choose the games that they invest (potentially) hundreds of hours in based on their preferred dynamics. That said, interviewees suggested that perhaps a way to satisfy all players is the inclusion of many sorts of win conditions or goals that offer different parallel challenges for the player. This seems to be an important aspect of replayability.

Randomization, customization, and online components were powerful themes in how to make a game more replayable and may have impacts for thinking about ecological economics themes in games. Randomization and procedural generation were seen as a tool that could have people come back to the games through the automatic production of novel content. There were also concerns that this content might not be meaningful, and that it would be technically hard to produce in terms of quality. There were also concerns from some players that randomness could be frustrating and feel like just that: random. User customization and user content is already an immensely popular feature of many

economy-building games in terms of mods (modifications) or workshop items. It offers an alternative to randomness. A designer envisioned the future of games as such:

> "The game will not use the graphics from the artist, but all the, all the stuff in the game will be created from within the game. Like, so you give the players only something like an engine and those players will… make this game on [their] own."

There is immense opportunity with a platform and collective intelligence/crowdsourcing approach to game design. A few interviewees noted that, in addition to modifying their game by downloading models off of a content workshop, that it would be most interesting to be able to play with the mechanical assumptions of the game and tweak the economic parameters and assumptions. This would certainly mean not only opening the "black box" of game design but making it accessible to a greater diversity of players.

Finally, while this project is focused on single-player games, there was discussion of online enhanced single player experiences. Online markets give the opportunity to create interesting dynamics either through the participation of other players or from more powerful computers crunching numbers for a simulation elsewhere. In the case of a dynamic market with other players, it was noted that these solutions often require moderation of the developers - in the form of a central bank! If there is some form of online ability activated, players desire the ability to visit each other's worlds and even walk around and explore in them.

5g. Ideas for the Future of Economy-Building Games

This theme is a catch all for specific gameplay or toolkit ideas that were presented by the interviewees. These ideas generally fell under game or gameplay ideas, and design tools. This section is to provide some key interesting insights in the interviewee's own words.

In terms of game design ideas, a multitude of concepts were discussed. These were generally categorized below as coming from either designers, players, or players with significant economics background. Some designers felt that it would be interesting to place more emphasis on scarcity and limitations of resources in the game world. One designer said:

> "So you say, okay, this game has this amount of resources and you cannot go over this. You just have to redistribute, you have to reuse, you have to do it in a different way. I think it can be an interesting game."

This designer also stated came up with the idea of balance as an overarching game mechanic, that:

> "But you could also think about a real game where, where the goal is to not to be dominant or all ruling in the end, what most of those games are. But rather that you, as a player, you have to keep a balance with others, other factions, something like that."

Many of these ideas came in this flavour. Players had numerous ideas for what they would want to see in these types of games. Players discussed how they would like to see games focus more on people's lives and a bottom-up approach. One player suggested a different level of perspective to change up the *SimCity* style:

> "If you're not approaching it from like, how do you build and grow a city if you're taking it instead of the angle from like, let's make a different kind of city game, let's make a city game where we're focusing more on people's lives and how it affects communities like that kind of bottom-up approach to how things work. I don't know exactly what that would look like, but I think it would be fascinating to make a *SimCity* game that takes place on say like the level of a community organizer, or I think it would, it would approach even if you have the same concepts, even if it was still some of the same, you know, parks going this place, buildings going this place. I think it would just be fascinating to approach it from a different angle. I think just as you're making a game like that, you'd be forced to approach concepts differently from the sort of, you know, the hand of God approach that a lot of simulation games have."

The relationship between computer inputs and outputs and a circular economy were noted by multiple players. This quote from another player was highly relevant in this regard:

> "Maybe having you play one part of the circular economy might be interesting and then the sort of trick to the game would be to do really well. You actually have to help the other sort of parts of the circular economy. Because your outputs influence your inputs in a circular economy. And then if it's a multiplayer game, then sort of like that idea of driving collaboration would be sort of fascinating because like your outputs are for inputs in a circular economy. So like helping the other people who are sort of your suppliers or customers succeed actually is probably something you'd want to do in a circular economy. Because if they have bottlenecks in their processes, then you know, you're going to have a limit on either what you can receive in or what you can push out."

Further, another player highlighted possible mechanics behind a circular economy in an economy-building game as being as such:

> "And then the whole thing you're doing is recycling. And then at a certain point, you're just taking those same resources and just trying to make them more optimal, go through their own process a little bit more. That will be a very cool idea for a game. I would love to play that game. I bet you could do that, but you could just monitor again, like if you had *Factorio* like that, and then you had a limited amount of resources on the map, but then the science turned it back into the raw resources."

Information uncertainty, as noted earlier, was discussed. This quote from a designer stood out:

> "And in a way maybe that's what makes for an interesting game mechanic where like your ability to even know, not even about the enemy, just even about your own sort of economy or whatever, what the heck is going on."

Several players discussed the gameplay concept of inheriting an existing economy, or a phase transition point from growth to optimization or circularity, as a potential gameplay concept. For example, a player came up with this idea:

> "Inheriting Detroit in the [1990s] or something like that… and then so you've managed it for a century and let's say you've made some really smart and logical decisions and you've mitigated climate change, and you've done this and you've done that. And you create this utopia where, you know, everything's automated and

> people can just, you know, live their lives and do whatever kind of leisure they want."

Further to this, the use of procedurally generated content to facilitate this transition is noted here by a player:

> "You know, procedurally generated content to create an organic set of new needs and new interests that will only be able to be attained if, as a collaborative effort, the people within the world of that game have reached a certain milestone of sustainability, where it's like, if you reach too far to keep pushing, you will collapse because you haven't set up a foundation that is, that is worthy now."

The persistence of resources and waste was raised by a player with an economics background:

> "So for example, I would like to introduce… that things don't vanish. To make it more realistic, that's the resources that we used. And after using them there, they're there. And we have to, as a society, even as, even as a nation that wants to exploit other nations, we have to deal with [the waste]."

Long-term decision-making, and impacts were ideas that interested economics-minded players:

> "But I also think there's an opportunity for some sort of city building game that is more around simulating the development impacts of clearing a forest, changing a river flow, destroying wetlands, that kind of stuff. I would love to see something that creates that sort of incentive versus disincentive of like, you're not, you're not going to realize you caused an issue until like 10 years in game time into the game. When all of a sudden you get a massive flash flood in the wetland or the wetland that was there that would have absorbed that flash flood is no longer there. In a perfect world, I'd love to see these like more hidden game systems come into play of the player doesn't the player knows about, but it it's, there's too much of an incentive to not, you know, do the wrong thing."

Finding balance in a playthrough was a topic of interest for game designers. Balance and different goals in the game are well encapsulated in this quote from a player:

> "So like, you know, and, and you can just assign numbers to these, but you're definitely not thinking of the ultimate goal is the, the highest number of like money or size it's about achieving another. And, and maybe it's, it's a balancing game too. Like you start severely unbalanced. And the, and the goal of the game is to achieve

> that balance where you're balancing waste and pollution and, and, you know, your resources with, you know, your, your, your welfare or your like wellbeing, you know, success productivity. And if it's like a progressive game to start just imbalanced, and the whole goal of the game is to like, achieve that, that balance. And you could loop back and forth until you eventually [find] a balanced point. “

As one can see from this section and the previous sections, there are a lot of ideas for gameplay mechanics and concepts. However, *how might we facilitate the generation and implementation of these new ideas in games from the industry?* In terms of tools for designers, numerous ideas were generated.

Key tips and an interactive process for going through them were discussed as useful design tools from the perspective of a player:

> “This is distilled down to as few important tips as we can, what sort of things they should be designing for from day one?... Even a list of ideas”

The idea of a kind of “Socratic dialogue” for designing game systems was raised by some interviewees, namely this player:

> “Someone can use, maybe what we're looking at is something that's structured, almost like a, like a nested frequently asked question [FAQ], you know, where, where it starts with something like three key, high level notes … about how you could possibly improve the design of a game… And if somebody clicks on one of them, it expands to show maybe three different ways that that could be done. And if you click on one of those that seems to appeal to you so on, and you end up getting into sort of game design, minutiae of actual mechanics that could be implemented along one of these lines. So it's almost like an environmental economics “choose your own adventure” tool.”

This raised the idea for a toolkit that designers could use at different stages of the design process. One designer noted that physical whiteboards are still often used, and sometimes digital ones like *Miro*, so that it would be useful to have something that could be ported over to that. An aspect of a toolkit was to amplify an ability one designer said game designer must have, “the biggest skill is to know what they don’t know”. This must be a tool to “amplify curiosity”.

A guidebook or wiki for best practices with diverse economic concepts for games was raised as well by a player:

> “Like this is distilled down to as few important tips as we can, what sort of things they should be designing for from day one? … I think it's a good idea to start with the concept that you're, or the ideal you're trying to achieve, whether that'd be sustainability or constant, uncontrolled and undirected growth or military [production] or whatever, and then look, look at how those are achieved in the real world and kind of almost go with like the *CliffsNotes* of it.”

Further, a game designer described their needs in this regard:

> “So what are the concepts that are currently up to standard? Let's say ideas on how to solve this. How should the economy look like? How should an ecological economy look like? So what are the ideas? I would definitely look at this and then, try to come up with a concept based on these ideas. So it's really about [the] general ideas.”

In terms of a circular economy from a designer:

> “A high level write up about these ideas... So just what ideas are floating around to alternate concepts on how economics work. I think that that area itself would be worth a lot then, I mean, just in general prototyping tools help… So talking about a circular economy, you probably want to find out what does it actually mean? Because it's not [discussed] so often. I'm not sure I have the feeling [this write up] should have been done before, but maybe it's not. Do you want to prototype it fast to see, if I, as you proposed, if I have some goods that produce this ways that you have to recycle, what does it mean for the year, the amount of goods in total?”

And lastly, from a designer:

> “I want to have these ideas to draw from. I think that's good [to have a] very specific toolkit to say, I don't know, economics work like this, and this should always happen if this happened or something like that. I don't think that can work too much. There are probably some basic rules that are, that are always present.”

Finally, an economics engine, analogous to a graphics engine, that could be shared amongst developers and designers to allow for the generation of even more creative games in the genre to be produced. A similar tool that already exists, mentioned above in the context, *Machinations*, was referred to multiple times. However, this reference is a somewhat different suggestion from a player:

> “I would say probably an economics engine, like, cause right now I think most of it is just based on a math equation or just, or just, you know, a couple of models. But

> then if you have this ecological economics engine, right. Designers can just say, okay, here are the variables that I want to include checkbox here, here are the weights that I want to use, you know, click a few check boxes and then you can just plug that engine into the game. And then, then that would all be. That would all be necessary. Cause I know like there are graphics engines, like Unreal is an engine that I think is a graphics engine or a game engine that's right. And so having an economics engine that would be much easier because now you can just, you know, use what you want from that engine instead of building it all yourself. Cause if you build it all yourself, then you have to deal with all sorts of edge cases. You have to figure out everything from scratch. But if you have this economics engine, you can just plug it in and use whatever you want from it. “

In other words, by another player:

> “It's like, if you want to make *SimCity*, you have to invent the universe, right? Like every time you're making these games, you're building a whole thing from scratch…. So people, so, you know, a small, independent developer at a, you know, a game school program somewhere, it doesn't have to build an entire thing from scratch. What if you could just like the same way you can get assets for unity? What if you could just get a city [simulation] for Unity and build off of that? I think that would be incredible.”

From this, we can see that the idea for an economics engine that is perhaps open source could help to make developing and designing in the genre more accessible. This could help developers design the types of game experiences that players demand (and that could fulfill other communications goals) with a head start - not from the ground up.

5h. Overarching Insights

Overall, a comprehensive set of ideas across seven main categories were found through this research of concepts relevant to economics in single-player games. Key takeaways from this primary research were synthesized into a toolkit in the next section. But first, the overall insights are discussed here. One was that the influence of economy-building games (5a) has the potential to be significant across a broad and diverse audience, especially as mobile games are factored in. People seem to want sophisticated, and fun, simulations of recognizable real-world phenomena. The medium has a potential to tell stories of change as well, especially over long time scales. Overall, economy-building games are a genre ripe for influencing people's mechanical views of the world.

How designers represent reality (5b) in an economy-building game was an area of exploration through these interviews. There will always be something left out, so considerations of what is put in must be made. Common themes included in these games - like representation of growth, domination, and people - were discussed as primary considerations for inclusion that were also ready for disruption. Next, economic concepts in economy-building games (5c) were explored from a heterodox perspective. While political economy and economics certainly influences the models of the games, they are inspirations and not textbook blueprints. Games take from a wide variety of inspirations, and it would be wrong to paint them purely of economics simulators when at best they are artistic portrayals of political economy. Here there are opportunities to introduce other perspectives as fun and entertaining themes in these economy-themed games.

As such, alternative economic ideas (5d) in economy-building games were explored. There seem to be significant opportunities for representing circular economies in the game world. Designers saw opportunities for design tools to help inspire and balance these types of models to make for entertaining games, and players were full of ideas on themes and gameplay experiences that could be possible through this perspective. Here it was also noted that radically different worlds could be imagined, not just in terms of aesthetic theming but also in terms of mechanics, including by taking further inspiration from Indigeneity and traditional knowledge. This led to a variety of overall game design considerations (5e) where most interviewees discussed that economics pervaded game design across genres and were not exclusive to economy themed games. Design considerations to boost engagement were discussed, including the ability of a player to have a tangible impact on the game world. Players and designers agreed that there were ethical and moral considerations in making and distributing any types of games.

Relevant game mechanics for economy-building games were explored (5f) where replayability, information availability and representation, as well the map of a game world were all discussed. These generally could be grouped into the insight that variability leads

to an exciting playthrough and the potential for multiple playthroughs, increasing the potential exposure of the game itself to an audience. Finally, ideas for the future of economy-building games (5g) gave comprehensive game ideas from the interviewees in their own words, capturing their insights from the various prompts.

Section 5:

Synthesis – Prototype Toolkit

Synthesis – Prototype Toolkit

How might designers best use the knowledge that was generated through this study? Given the significant amount of feedback produced in the interview and analysis process, I prototyped a toolkit that synthesizes the ideas from the interviewed players and designers with the concepts from the context literature review. The toolkit has eight prototyped activities. Specific recommendations for integrating game design and heterodox economics were not explicitly provided. Rather, the intention is that the best course of action for designers is to read the results and discussion of the interviews and use the toolkit as a process and prompt to develop their own recommendations, and as a springboard for conversing and ideating amongst their teams and colleagues.

The purpose of this prototype toolkit is to allow designers to explore some of the assumptions behind their work systematically to create engaging games based on some key ecological economics and other heterodox economics themes. It is a series of eight exercises meant to encourage idea generation and recalibration of their economic modelling meant for entertaining experiences. This is meant to be a group activity, completed in person or over a digital whiteboard software like *Miro,* but can also be explored individually.

The user journey is supposed to be one of deconstruction of existing ideas, introduction of ideas from this report, and reconstruction towards new concepts, themes, and mechanics. Users will go through the modules to complete this process, and instructions are provided at each module. The purpose and clear instructions are separated for understanding. The toolkit will systematically guide the thinking and creativity of the designer or team of designers so they may uncover new possibilities for their work.

The toolkit will help designers action the suggestions and ideas that were surfaced in this research, and those that they surely receive from their own player bases. The eye is towards integrating ecological economics into economy-building games but is free-form enough to fold in many different ideas in economics. Overall, the idea is to make these games not necessarily reflect reality more precisely, but to be able to choose from a broader set of economic phenomena (and perhaps a more socially responsible set) in the inspiration and creation of fun and engaging gameplay mechanics and game concepts.

This is a prototype that requires refinement through feedback and testing with potential designer-users. I hope that it could be useful with some adaptation for teams of all sizes, and perhaps individual designers/developers. Please note that it is open source, creative commons use as per the license of this document. Please let me know of any changes,

adaptations, or improvements you have made so that I can make sure it gets integrated and shared. I look forward to receiving feedback on these tools.

The toolkit has seven activity modules. Modules 1 - 2 will help to deconstruct design ideas, 3 - 4 will introduce new ideas, while modules 5 - 8 will help to reconstruct new ideas with the insights of this project. They are as follows.

1. *Economy Design Causal Layered Analysis pt.1 (deconstruction)*
2. *Economy Design Influence map*
3. *Economy Design Canvas*
4. *Ecological Economy Design Prompts*
5. *Economy Design Causal Layered Analysis pt. 2 (reconstruction)*
6. *Ecological Economics Game Mechanic Card Deck*
7. *Four Futures*
8. *Snowball Effect Activity*

NOTE: The full prototype is available in appendix C.

Module 1: *Economy Design Causal Layered Analysis pt. 1 (deconstruction)*

Related Concept:

Representing Reality in Video Games

Structure:

Identifying:

1. Gameplay Events
2. Mechanical Causes
3. Design Worldviews
4. Myth/Metaphor

Purpose:

This is based on an important futures tool that has been adapted to help designers turn their games "upside-down" from an economy-design and economy portrayal perspective. Causal Layered Analysis or CLA is a tool developed by futurist Sohail Inayatullah (Inayatullah, 1998) to describe why a system works in its current state. Imagine an iceberg, with the smallest part above water (gameplay events) and the largest centre of mass well below the waterline (myth/metaphor). CLA analysis helps designers to understand a system and uncover its potential alternate states. CLA has been adapted for this exercise to understand the relationship between the events that happen to or because of the player in a game in relation to the overall ideological paradigm the game exists within through the intermediary steps of mechanical causes and design worldviews.

The activity is to better understand the essence of what a game is and does for the player and its influence by understanding the depth of its underpinnings.

Module 2: *Economy Design Influence map*

Related Concept:

The Influence of Economy-Building Video Games

Structure:

Identifying:

- *(What are) Influences ON the creation/design*
- *Participant's creation/design*
- *(What is) Influenced BY the creation/design*

Purpose:

Inspired by mind-mapping and connection exercises (sqrone, n.d.), this activity will help participants to uncover as many obvious and, hopefully, non-obvious connections and implications to their game and work. They will identify what sources or experiences influenced their work, and who or what might be influenced by their work. This activity will make these influences transparent and explicit for the team, so they can be sure to take inspiration thoughtfully, and manage influence of their mechanics and themes even more responsibly.

"What is the lineage of your work, and how will it have an impact in the future?"

Module 3: *Economy Design Canvas*

Related Concept:

Economic Concepts in Economy-Building Games

Structure:

Identifying factors and relationships in a game economy within:

- *Core loops*
- *Progression Dynamics*
- *Meta Layer of game design*

Purpose:

This canvas is meant to represent the different themes that were raised through the interviews conducted for this research. The tool is meant to help designers surface assumptions about the structures of their game dynamics and speak about them openly. It is meant to elevate some key relationships that seem to be consistent across a wide variety of types of games. In summary, it synthesizes what is written in the discussion section of this report into a usable activity and design canvas.

Module 4: *Ecological Economy Design Prompts*

Related Concept:

Alternative Economic Ideas for Economy-Building Games

Structure:

Discussion about:

- *Realism*
- *Waste*
- *Circularity*
- *People Simulation*
- *Interaction with Others*
- *Economic Assumptions*
- *Designer Ethical Responsibility*

Purpose:

Seven questions have been generated as overall summations of this research for discussion as a reflection point in the toolkit.

Module 5: *Economy Design Causal Layered Analysis pt. 2 (reconstruction)*

Related Concept:

Representing Reality in Video Games

Structure:

Identifying:

1. (new) Myth/ Metaphor
2. (new) Gameplay Events
3. (new) Mechanical Causes
4. (new) Design Worldviews

Purpose:

Following up from the first activity, with the adapted myth and metaphor headline in hand, participants will use it to brainstorm new design worldviews, then new mechanical causes, and finally new gameplay events, to explore a new possibility space for their games with the results of this research and the other activities in mind.

Module 6: *Ecological Economics Game Mechanic Card Deck*

Related Concept:

Relevant Game Mechanics for Economy-Building Games

Structure:

Card deck of 25 prompts and questions.

Purpose:

25 cards of key concepts from this research project are provided to prompt thinking about different possible mechanics that could be used in economy-building games. This is to provide users with a reference point for thinking creatively about their games' design within the context of the findings.

Module 7: *Four Futures*

Related Concept:

Overall Game Design Considerations for Economy-Building Games

Structure:

Complete: 2 matrices of four generic futures for ideating mid-game and overall game flow.

- *Continuation*
- *Limits and Discipline*
- *Decline and Collapse*
- *Transformation*

Purpose:

This activity is meant to outline the overall game dynamic over time. It is inspired by Jim Dator's "Four Alternative Futures". Jim Dator is a professor and Director of the Hawaii Research Center for Futures Studies in the department of political science at the University of Hawaii at Manoa. His model synthesizes those narratives about the futures and social change can be classified into four groups of images, stories or policies regarding their effects (Foresight University, 2021). This framework is mostly useful for thinking about the shifts that might happen in the mid-game to the endgame of an economy-building game and the overarching mechanical and thematic flow of the game.

Module 8: *Snowball Effect Activity*

Related Concept:

Ideas for the Future of Economy-Building Games

Structure:

Idea generation worksheet

Purpose:

This is the final activity and can be used alongside any of the activities in the toolkit. It is about idea generation, and the combinatorial nature of innovation. It is from the Less (Bad) Design: Toolkit for Ethical Ideation by Matthew Manos (CC) (Manos, n.d.). The toolkit is about ethical ideation, uncovering "the new problems our 'solutions' might generate; questioning our own perception of the problems we seek to solve in the first place" (Manos, n.d.) It encourages you and your team to make unforeseen connections to help generate actionable ideas that reflect the kind of thinking behind this research paper and toolkit.

Section 6:

Conclusions and Further Research

Conclusions and Further Research

The intention of this work was to develop an understanding of the influence of persuasive models that popular single-player economy-building games have about economics. It is equally about developing constructive ideas for new models that communicate an emphasis on people and planet. The research question that was best answered by this study was:

> *"How might popular single-player economy-building games build circularity, planetary limits, wellbeing, or other ecological economics concepts into their mechanics?"*

The overall finding was that there are diverse and significant answers to this question that are best addressed through a reflection and new practices on process. While suggestions and topics were raised in the findings through the interviews, the answer is best represented in the process behind completing the prototype toolkit - there is no one 'best' way to approach this. The most surprising and interesting aspect of this study was the emphasis by interviewees on the philosophical issues and criticality of the interpretation and representation of reality in video games. This suggests that this is a deep subject, even in exploring the specific subgenre of economy-building games and deserves further exploration.

This research project included a literature review to contextualize current knowledge in this space and the subsequent results of an interview process that was conducted. Interview results were thematically analyzed and presented with an eye to key themes and considerations for game design and the interpretation of economy-building games. A prototype toolkit for designers of economy-building games was synthesized and presented.

In terms of further research, I had two main ideas that I was not able to explore fully due to time limitations. First is the idea of doing a detailed comparative game analysis of the in game economic portrayal and mechanics to better illustrate the concepts and issues behind this work. I had considered and started doing this with the games *ANNO 1800* from Ubisoft*, Workers and Resources: Soviet Republic* from 3Division and *Cities:Skylines* from Paradox Interactive but was not able to go into the depth necessary to appreciate the subtleties of a full analysis. The purpose of doing this would be to further demonstrate the typologies and influence of economic representation in games and the vast diversity of concepts that are either purposefully or subconsciously represented. This would help to further build the case for this area of study. In addition, it would be ideal to conduct a social media analysis of ideas that players present and discuss on the various forums (like *Reddit)* where economy-building and strategy games are discussed. This would help to identify further concepts and potential design processes that could help in the creation of these games. Finally, a full strategic foresight study including a horizon scan to assess the full range of potentialities of the economy-building game genre with trends and scenarios of future states would likely be helpful for the overall vision of applying this research.

Further, the ideas of eco-econ-game-design wiki and an economic engine for designers of economy-building games were not fully explored in the scope. The wiki would be meant to be a collection of case studies and best practices of video game economies, meant to be interpreted from a wide variety of perspectives. Most importantly, it might include entries about different economic concepts from a wide variety of diverse viewpoints in the economics fields. These entries would provide inspiration for the implementation of different, and perhaps ground-breaking, economic inspirations for economy-building game mechanics. An economic engine for video games, ideally open source, is very much at the concept stage and was raised through the interviews. Essentially, this would be an engine that could be plugged in or be the transparent basis to reduce barriers for a diverse variety of designers to create economy-building games. This engine would be analogical to the *Unity* or *Unreal* engines in the sense that they give a basis and industry standard for others to build on. In addition, due to time limitations, the toolkit activities could not be explored with designers or verified with any participants. Consider the activities an open source (creative commons) first draft of activities towards games that fit the goals of this project that require testing!

Through this study, there was potential to integrate literature and flag the importance of this topic by building an understanding of what is salient to gamers and feasible for game designers. The emphasis was on mainstream, popular games but the results would likely have implications for serious and educational games as well. It was also intended to be interesting to those concerned with reforming other forms of media to better reflect the precarious global climate situation. I personally look forward to seeing the ways designers can use and build upon this open-source prototype toolkit.

Finally, there are implications of this work for the use of video games in economic simulation. Next steps could involve the use of economy-building games for crowdsourcing economic system design potentialities and solutions among a variety of stakeholders. Findings from this research could be used in the design of these. A simplified simulation played by dozens, or hundreds of stakeholders could generate future-focused ideas within parameters and given realistic feedback from the simulation. End states (both preferable and not), as well as transition sketches, could be crowdsourced. For example, *Fold.it* is a protein folding crowdsourcing game to help scientists identify novel and useful proteins for new drugs. There is potential that this work could be useful for the field of immersive, participatory futures in strategic foresight in other domains like open strategic planning. What is important to remember is that our assumptions, biases and ideologies can be baked into these “consumer-grade simulations”. I look forward to seeing how this work inspires others to think about these insights.

Section 7:

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Section 8:

Appendix

Appendix A

Overall Interview Guide

Building a toolkit for designing new economic models into single-player economy-building games
Semi-Structured Interview Questions

Thank you for participating in this research project on exploring the economic models present in video games, and opportunities for designing new economic models.

The interview should last about 45 minutes to one hour - I have about 18 questions that are intended to facilitate a discussion.

Participation in this study is voluntary. If you wish, you may decline to answer any questions or decide not to participate in any component of the study.

The interview session will be audio/video-recorded to facilitate analysis and transcription. The information you provide will be confidential. Quotations from the interview will not be attributed to you without your permission. If you would like these notes emailed to you for your review and editing prior to inclusion in the study, please email: geoffrey.hill@student.ocadu.ca.

Semi-Structured Questions - Adults 18+

1. What is your current role? (Title, industry). Also, is this the most pertinent job to your video game experience? If not, what was?
2. How long have you been working in this industry?
3. What did you study in post-secondary education?
4. ***CONFIRM CATEGORY BASED ON SCREENING QUESTION FOR NEXT QUESTION SET***

Question Group 1 - Economist Gamer

5. What economy-building games did you grow up playing? What do you continue to play?
6. How have the economy-building games you have played shaped your views of economics? How has your view of economics shaped the way you play the game?
7. What are the range of economic ideas present in the games you play? What is your favourite meme or trope?
8. How do these economic ideas work as gameplay experiences? In other words, what actions must the player take and what are the results?
9. What are the most fun and/or engaging economic gameplay ideas? Why?
10. Can you identify any typical or archetypal biases, assumptions, values, or ideology in the economic ideas of games you are experienced with?
11. Given this, are their ways in which these may have possibly shaped your views of economics?
12. In a perfect world, what economic idea is missing from economy-building games that you would like to include?
13. Have you encountered the ideas of ecological economics before? If so, what do you think?
14. What would an economy-building game without growth, or with a circular economy, or with more credence to the environment or human wellbeing, look like?

Question Group 2 - Gamer with interest in economics

15. What economy-building games did you grow up playing? What do you continue to play?
16. What are the range of economic ideas present in the games you play? What is your favourite meme or trope?
17. How much have you played [target case study game]? Why?

(Questions to be specifically tailored to the Case Study Games TBD)

18. How has [game] shaped your views of economics? How has your view of economics shaped the way you play the game?

19. How do these economic ideas work as gameplay experiences in [game]? In other words, what actions must the player take and what are the results?
20. What are the most fun and/or engaging economic gameplay ideas in [game]? Why?
21. Can you identify any typical or archetypal biases, assumptions, values, or ideology in the economic ideas of games you are experienced with?
22. Given this, are their ways in which these may have possibly shaped your views of economics?
23. In a perfect world, what economic idea is missing from this [game] or economy-building games in general that you would like to see included?
24. Have you encountered the ideas of ecological economics before? If so, what do you think?
25. What would an economy-building game without growth, or with a circular economy, or with more credence to the environment or human wellbeing, look like?

Question Group 3 - Game Designer

26. For how long have you been designing or developing economy-building games?
27. What inspires you to create these games? What got you started?
28. What economy-building games did you grow up playing? What do you continue to play?
29. What are the biggest challenges to creating these types of games?
30. What are the biggest opportunities in the field, as you see it?
31. What kind of specialized knowledge helps you to create these games well?
32. Where do you go to research the creation of mechanics, narrative or art relating to the economy of your game?
33. Can you imagine any tools or resources that would make it easier to design and develop an economy-building game?
34. How is the market for economy-building games growing or shrinking, why?
35. Have you encountered the ideas of ecological economics [explanation of the field] before? If so, what do you think?
36. What would an economy-building game without growth, or with a circular economy, or with more credence to the environment or human wellbeing, look like?
37. Can you imagine any tools or resources that would make it easier to design and develop an economy-building game?

General Questions

38. How have the economy-building games you have played shaped your views of economics? How has your view of economics shaped the way you play the game?
39. What are the range of economic ideas present in the games you play? What is your favourite meme or trope?
40. How do these economic ideas work as gameplay experiences? In other words, what actions must the player take and what are the results?
41. What are the most fun and/or engaging economic gameplay ideas? Why?
42. Can you identify any typical or archetypal biases, assumptions, values, or ideology in the economic ideas of games you are experienced with?
43. Given this, are their ways in which these may have possibly shaped your views of economics?
44. In a perfect world, what economic idea is missing from economy-building games that you would like to include?

Please contact Geoff Evamy Hill if you would like a copy of the recording, or an update on the research report.

The interview is now complete. Thank you for your time and sharing your opinions, knowledge and experience.

Appendix B

List of Themes from Interviews

- Influence of Games
    - Games as a Communications Medium
    - Player Audience
    - Ideology
    - Learning
    - Influence on Real World Thinking
    - Ethics
- Representing Reality
    - Growth/Progress
    - Complexity + Modelling
    - Representation of People
    - Conquest and Domination
- Economic Concepts
    - Extraction/Resources
    - Money
    - Urbanism
    - Opportunity Costs
    - Economic Memes
    - Assumptions/Biases
    - Business/Management
    - Supply Chain Management
    - Markets, Supply and Demand
    - Production
    - General Economics and the Real World
- Alternative Economic Ideas
    - Waste
    - Ecological Economics
    - Indigeneity and Decolonization
    - Alternative Economic Systems
    - Nature
    - Circular Economy + Degrowth
    - Energy and Thermodynamics
- Game Design
    - Game Design Ideas
    - How Games are Played
- Game Mechanics
    - Measures and Information
    - Online Components
    - Exploits/Edge Cases/Boundaries
    - Stages of a game/replayablity
    - Technology Trees
    - The Map
    - Randomization

    - Customization/User Content
    - Interaction with AI/Other Players
    - Gameplay Loop
    - Balance/Allocation
    - Difficulty Level
    - Player Agency
    - Playing Scenarios
    - AI Assistance
- Ideas
    - General Ideas
    - Design/Project Output Ideas
    - Economist Ideas

Appendix C

Prototype Toolkit

This is a brief toolkit for designers of economy-building games. The purpose of this prototype toolkit is to allow designers to explore some of the assumptions behind their work systematically to create engaging games based on some key ecological economics and other new economics themes. It is a series of exercises meant to encourage idea generation and recalibration of their economic modelling for entertaining experiences. This is meant to be a group activity, done in person or over a digital whiteboard software like *Miro,* but can also be explored individually.

The user journey is intended to be one of deconstruction of existing ideas, reintroduction of ideas from the *Rethinking Economy-Building Video Games* report by Geoffrey Hill (2021), and reconstruction towards new concepts. Users will go through the modules to complete this process, and instructions are provided at each module. The purpose is to systematically guide the thinking of the designer or team of designers as users to uncover new possibilities for their work.

The toolkit has seven modules. Modules 1 - 2 will help to deconstruct design ideas, 3 - 4 will introduce new ideas, while modules 5-8 will help to reconstruct new ideas with the insights of this project. They are as follows.

1. ***Economy Design Causal Layered Analysis pt. 1 (deconstruction):*** *You will break down an existing game into its constituent macro, micro and paradigmatic parts*
2. ***Economy Design Influence map:*** *You will situate this game in the broader context of the genre and media*
3. ***Economy Design Canvas:*** *You will build your understanding of the economic components of the game*
4. ***Ecological Economics Design Prompts:*** *You will expose yourself to themes in heterodox economics and alternative game design*
5. ***Economy Design Causal Layered Analysis pt. 2 (reconstruction):*** *You will start to reconstruct the game with these ideas in mind*
6. ***Ecological Economics Game Mechanic Card Deck:*** *You will consider different mechanics for the game*
7. ***Four Futures:*** *You will rethink the overarching structure of the gameplay*
8. ***Snowball Effect Activity:*** *You will generate a basket of new ideas for this game or a new game concept*

Toolkit modules

1. Economy Design Causal Layered Analysis (CLA) - Part 1

This is an important futures tool that in this case has been adapted to help designers turn their games "upside-down" from an economy-design and economy portrayal perspective. Causal Layered Analysis or CLA is a tool developed by futurist Sohail Inayatullah to describe why a system works in its current state. Imagine an iceberg, with the smallest part above water and the largest centre of mass well below the waterline. This is how CLA analysis works to understand a system and its potential alternate state. This has been adapted for this exercise to understand the relationship between the events that happen to or because of the player in a game in relation to the overall ideological paradigm the game exists within.

The definitions of each layer are as follows:

1. **Gameplay Events:** what is visible from players' perspective from experiencing the game (tip of the iceberg)

2. **Mechanical Causes:** explanations for the visible activities from the processes/mechanics of the game (rules of the game)

3. **Design Worldviews:** underlying beliefs guiding the design of the game and therefore the processes

4. **Myth/Metaphor:** a ***headline*** describing stakeholder and broader system participants perceptions of the above three layers (bottom of the iceberg)

The activity is to better understand the essence of what a game is and does for the player and its influence by understanding the depth of its underpinnings. So, an individual designer or team will complete this activity, working from the tip of the iceberg to bottom, filling in each category serially. For example:

1. **Gameplay Events** might describe: conflict for resources, trade, extraction of certain categories of resources, production of certain materials, etc. (tip of the iceberg)

2. **Mechanical Causes** might describe: what mechanics, from the designers perspective, were specifically included to create an experience for the player that produces those gameplay events

1. **Design Worldviews** is a more challenging category where introspection is required: for instance, why was the design decision made that are items bought with money in the game? No holds are barred: break down the assumptions that guided the design of your game and discuss (if appropriate, and respectfully) the backgrounds of colleagues that might have influenced the design.

3. **Myth and Metaphor** involves a reflection on what has been brainstormed above. It is a time to create a catchy headline that captures the essence and spirit of the game: the good, the bad and the ugly. (bottom of the iceberg)

With the myth and metaphor headline in hand, now it is time to reflect on it, adapt it to what you want to express in your game, and then turn it upside down. In part 2 of this activity (module 5), you will start with the myth/metaphor headline at the top, and use it to brainstorm new design worldviews, then new mechanical causes, and finally new gameplay events, to explore a new possibility space for your game with the results of this research and the other activities in mind.

2. Economy Design Influence map

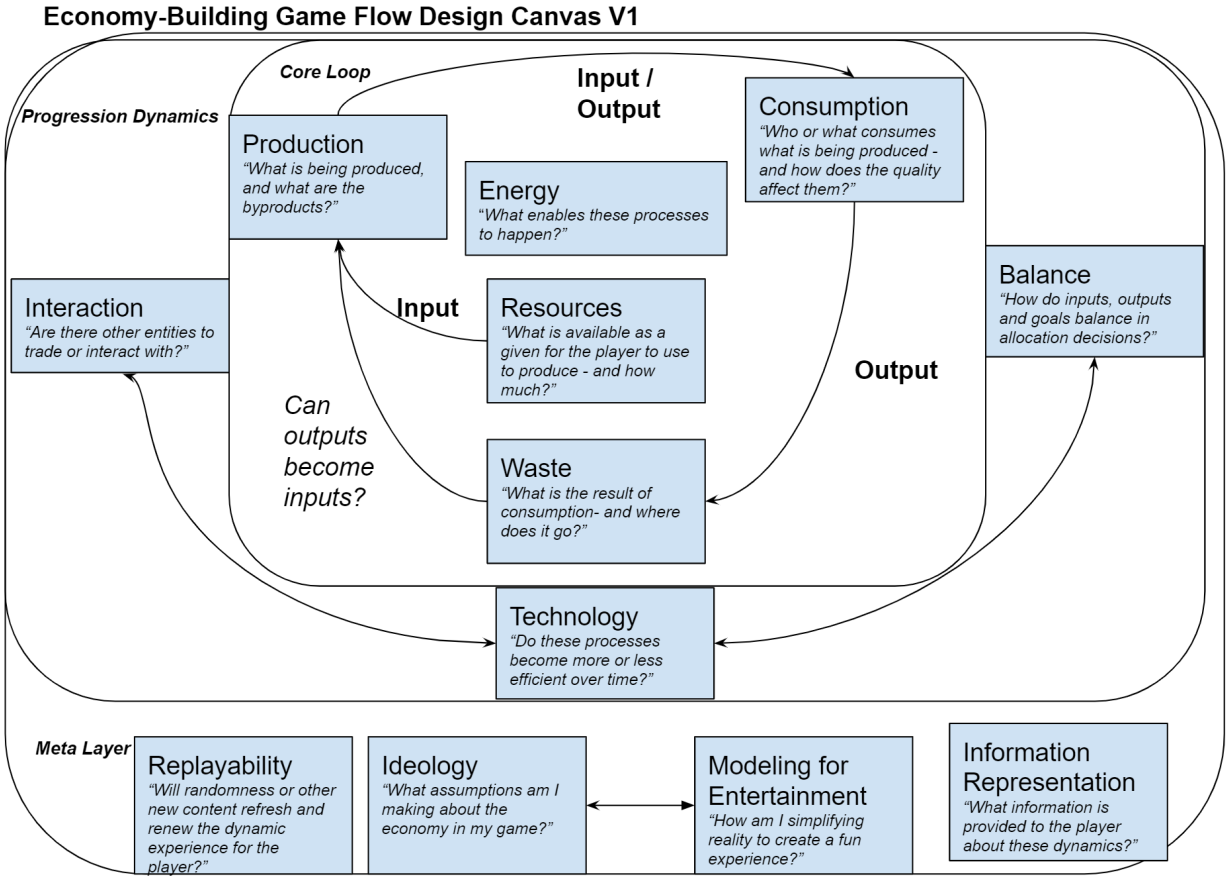
This is a brainstorming worksheet activity that helps to situate the design of you or your team's economy-building game in the larger context. It was inspired and adapted from the *Understanding and Managing Bias Toolkit* created in collaboration by the innovation firms Sqr One and verynice. This is an excellent toolkit if one wants to explore bias in design in general. The purpose of this activity, inspired by mind-mapping and connection exercises, will help you to uncover as many obvious and hopefully non-obvious connections and implications to your game and work. This will make these influences transparent and explicit for the team, to be sure to take inspiration thoughtfully, and manage influence of mechanics and themes more responsibly.

What is the lineage of your work, and how will it have an impact in the future? To complete this activity, write your name or your studio's name in the centre of a blank page. Then, set a timer for three minutes, and write down as many of your works' influencers and as many of the people or entities your work might influence as you can. You may mind-map from you (in the centre) outward (toward influences and influenced) or vice versa. Then, make connections from first order influences or influenced to subsequent knock-on people, groups, influences or implications (ie *SimCity* influences *Cities:Skylines*; parents influence children (and vice versa) etc.).

Not enough space? Feel free to complete this activity/mindmap on a larger board. Want extra challenge? Add a 3rd order - what is the chain of influences and influence?

3. *Economy-Building Game Flow Design Canvas*

This canvas is meant to represent the different themes that were raised through the interviews conducted for this research and their key relationships. The tool is meant to help designers surface assumptions about the structures of their game dynamics and speak about them openly. It is meant to elevate some key relationships that seem to be consistent across a wide variety of types of games. In summary, it synthesizes what is written in the discussion section of this report into a usable activity.



The activity would be conducted by teams working through the above (blank) canvas twice. Once from the outside (larger frame or meta layer) inwards, and the other from the inside (inner frame or core loop). This dual process is meant to surface key dynamics that the designers wish to explore with the player as a gameplay loop, while working through the larger implications of the design - and vice versa. Question prompts are provided to help in filling out the sections.

4. Ecological Economy Design Prompts (7)
Seven questions have been generated as overall summations of this research for discussion. They are provided below and are meant to generate discussion and prime the group for the full toolkit of activities. These are meant to be a discussion icebreaker into the next set of activities.

1. **Realism:** Who is your audience, and do they prefer verisimilitude or approximation?
2. **Circularity:** How could outputs become inputs? Can circularity be achieved?
3. **Waste:** Where does the waste from in-game processes go? Is it represented?
4. **People Simulation:** How are people represented? How are they cared for? What do they care about?
5. **Interaction with Others:** How will my player interact with other players or entities?
6. **Economic Assumptions:** What economic paradigm or ideology do my mechanics support?
7. **Designer Ethical Responsibility:** Is my/our game responsible to the people who could spend many hours playing it?

5. Economy Design Causal Layered Analysis (CLA) - Part 2
With the myth and metaphor headline in hand and the other activities completed, now it is time to reflect and then turn the CLA upside down to "reinvent your game". This requires you and you team to brainstorm and develop a new, aspirational, myth/metaphor from which you might work. It might not be what you finally use for your game.

Start with the evolved myth/metaphor headline at the top of your diagram and use it to brainstorm new design worldviews, then new mechanical causes, and finally new gameplay events in the upside-down iceberg. This will help you to explore a new possibility space for your game with the results of this research and the other activities in mind. From working through this layered process, this exercise is intended to generate new discussion and thinking about alternative gameplay events and player experiences from a paradigmatic level outward.

Remember:

2. **Myth and Metaphor** involves a reflection on what has been brainstormed above. It is a time to create a catchy headline that captures the essence and spirit of what you now want the game to be and communicate: the good, the bad and the ugly. (bottom of the iceberg)

3. **Design Worldviews** is a more challenging category where introspection is required: for instance, why are items bought with money in the game? No holds are barred: break down the assumptions that guided the design of your game and discuss (if appropriate, and respectfully) the backgrounds of colleagues that might have influenced the design.

4. **Mechanical Causes** might describe: what mechanics, from the designers perspective, were specifically included to create an experience for the player that produces those gameplay events.

5. **Gameplay events** might describe the player experience: conflict for resources, trade, extraction of certain categories of resources, production of certain materials, etc. (tip of the iceberg)

6. Pluralist Economics Game Mechanic Card Deck

25 cards of key concepts from this research project are provided below to prompt thinking about different possible mechanics that could be used in economy-building games. This is to provide users with a reference point for thinking creatively about their games' design within the context of the findings.

1. Ecological economics: *how might the game's economy be related to the game's environment?*
2. Doughnut economics: *how are outputs, goals, needs, or wants in the game being measured?*
3. Feminist economics: *how is the game's economy inclusive and focused on wellbeing, or not? Are diverse people, and their wants, needs and beliefs represented?*
4. Creative destruction: *how is technological change represented in game?*
5. Behavioural economics: *how are the agents in the game represented? What is the scope (and bounds) of their rationality?*
6. Institutionalist economics: *what is the relationship between the agents in the game and the economic structures the player creates?*
7. Finite vs infinite resources: *will resources have limits or will they be from limitless sources?*
8. Resource efficiency: *what is the gameplay arc of resource efficiency?*
9. Resource distribution: *what impact will geography have on the player's economy?*
10. Financial freedom vs scarcity: *will there be a point in the game where they player has limitless resources? Or vice versa, extremely limited resources?*
11. Opportunity cost and cash flow: *how will the player make decisions about their investments, and their return?*
12. Tall vs Wide: *how will the player decide between the vertical intensity and horizontal coverage mix?*
13. Guns vs Butter: *in a game with warfare represented, how will the player balance the domestic needs vs warfare needs?*
14. Business structure diversity: *are alternative economic arrangements represented, like cooperatives?*
15. Supply and demand: *how is supply and demand generated? What assumptions are made about the existence of an equilibrium? How is it portrayed from a user interface perspective?*
16. Production imperative: *what in the chain will the game emphasise: production, consumption or waste? Is production "king", always driving a next?*
17. Waste and recycling (+ reduce & reuse): *where does the production output go once consumed? Is waste represented on-screen or through a gameplay mechanic?*
18. Contamination: *will the map become contaminated with pollution and waste if not dealt with?*
19. Thermodynamic Laws: *how will energy be represented in its production or consumption?*
20. Decolonization and Indigenization: *what perspectives from Indigenous peoples globally could be included in the game's economic portrayal in a respectful fashion?*
21. Alternatives to capitalism: *could completely different economic arrangements to capitalism be represented in the game?*
22. Ecosystem services: *what role does the ecosystem have in the functioning and existence of the economy portrayed?*
23. Steady state economy: *could there be an in-game economy that doesn't rely on growth?*
24. Circular Economy: *could outputs become new inputs in the game economy?*
25. Marxist political economy: *to what degree are social class relations represented in the economy?*

7. Four Futures

This activity is meant to outline the overall game dynamic and flow over time. It is inspired by Jim Dator's "Four Alternative Futures". Jim Dator is a professor and Director of the Hawaii Research Center for Futures Studies in the department of political science at the University of Hawaii at Manoa. His model synthesizes those narratives about the future and social change can be classified into four groups of images, stories, or policies regarding their effects.

Is your game flow or theme of your game about growth, collapse, transformation or limits and discipline? These break down as follows:

1. Continuation: status quo growth, business as usual
2. Limits and Discipline: adapting to social or ecological limits
3. Decline and Collapse: system degradation or failure in response to crisis
4. Transformation: new technology, forms of social organization, or cultural shifts that "change the game"

With the seemingly limitless possibilities facing the player at the beginning of a game, a gameplay experience always has a "future". This framework is mostly useful in thinking about the shifts that might happen in the mid-game of an economy-building game. The consensus in this research seemed to be that typically these games are about continuous growth, especially in the early game. What became clear in this research is that there can be a shift in feeling and tone of gameplay in the mid-game. This is typically when players have more experience with the systems, and typically have secured enough of a cash flow in the games economy to stabilize and do what they want. Therefore, it was identified that there is the potential for a mid-game "inflection point" where shifts in gameplay are possible - with regards to this research, towards an ecological or environmental gameplay theme or procedural rhetoric.

This short activity is simply this: to discuss how a new game design concept or an existing franchise would look like under these different modes of "futures" or endgames. Take some time, given this information and prompt, to discuss what a game might look like from the midgame onward under different set up assumptions about end game flow. Then, once finished that initial process, redo the activity while thinking about the entirety of the game with that trajectory. To complete this activity, draw two 2x2 matrices with one of the four futures written in each quadrant.

Four Futures Exercise - Mid-game "Inflection" Transition

- What mechanics could support each future?
- Do they fit with the overarching theme of the game?
- Would an alternative future support new gameplay elements that could be fun and engaging?
- Would an alternative future tell a different story? Would it be more responsible to the player?

Four Futures Exercise - Whole Game Flow

- How does the whole game change when any future is its designed end state?
- Could multiple futures be used?
- For existing franchises or IPs: how might the player base respond?

8. Snowball Effect Activity

This is the final activity and can be used alongside any of the activities in the toolkit. It is about idea generation, and the combinatorial nature of innovation. It is reproduced in brief for reference below from the *Less (Bad) Design: Toolkit for Ethical Ideation* by Matthew Manos, published by Reginald. The toolkit is about ethical ideation, uncovering "the new problems our 'solutions' might generate; questioning our own perception of the problems we seek to solve in the first place." It encourages you and your team to make unforeseen connections to help generate actionable ideas that reflect the kind of thinking that this research paper and toolkit are supposed to spur.

Follow the instructions below and use a separate sheet to both keep track of the ideas generated and summarize them when finished. This is meant to be a quick activity, and perfectly imperfect!

1. Generate an idea for a game or game mechanic (set timer for 30 seconds): (1)
2. Now, generate another game or game mechanic (set timer for 30 seconds): (2)
3. Generate and idea for a game or game mechanic that combines ideas 1 and 2 (set timer for 60 seconds): (1 + 2 = 3)
4. Do 3 again, generate another idea combining ideas 1 and 2 (set timer for 60 seconds): (1 + 2 = 4)
5. Now generate an idea that combines ideas 3 and 4 (set timer for 2 minutes): (3 + 4 = 5)
6. Do that again, generate another idea that combines ideas 3 and 4 (set timer for 2 minutes): (3 + 4 = 6)
7. Finally, generate the last idea that combines ideas 5 and 6 (set timer for 3 minutes): (5 + 6 = 7)
8. Before you forget, remember to write down a summary of what you were thinking from every idea from your notes.