

The Transformation from Physical Wargames to Grand Strategy Video Games, and the Opportunities for Deep and Efficient Historical Wargaming Experiences

Rhett Loban
Macquarie University

Online Publication Date: 14 September 2021

To cite this Article: Loban, R., (2021) The Transformation from Physical Wargames to Grand Strategy Video Games, and the Opportunities for Deep and Efficient Historical Wargaming Experiences. *Digital Culture & Education*, 13(1), 81–107

URL: <https://www.digitalcultureandeducation.com/volume-13>

PLEASE SCROLL DOWN FOR ARTICLE

THE TRANSFORMATION FROM PHYSICAL WARGAMES TO GRAND STRATEGY VIDEO GAMES, AND THE OPPORTUNITIES FOR DEEP AND EFFICIENT HISTORICAL WARGAMING EXPERIENCES

Rhett Loban

Lecturer, Macquarie University

rhett.loban@mq.edu.au

Abstract: *This article explores the evolution of wargames from historical tactical and abstract encounters to multivariable and complex historical representations often reflected in the video game genre of Grand Strategy. The article argues that, because of the increasing complexity of historical wargames, there is a need to shift the discipline to the digital space where such complexity can be retained and enable the player to focus on the game's content rather than the technical process of wargaming itself. Grand Strategy video games can alleviate several efficiency problems of physical wargames, while simultaneously providing historical breadth by depicting war and peacetime history, and depth in terms of historical narratives and details. Grand Strategy games also have the potential to support learning outcomes of history units in higher education and can be used as pedagogical tools for the exploration of historical worlds. Grand Strategy video games, and digital wargames more broadly, provide rich, accessible and active learning platforms that can enhance our experience with wargaming and history.*

Keywords: Grand Strategy, History, Political-Military Wargames, Black Boxing, Digital Wargames, Physical Wargames, Game-based Learning, Tabletop Wargames, Grand Strategy video game

Introduction

Within the discipline of history, there is a perceived disinterest in traditionally presented history such as written history (Chapman, 2016, p. 5-6). However, history is alive and thriving in digital media such as TV series, movies and games. While games have been used to teach history in formal learning contexts, this practice has often been in the form of physical wargames. On the other hand, digitised wargames have not been harnessed in the same way to enhance learning and engage students. This underutilisation is particularly the case in higher education (Reynaud and Northcote, 2014; Sabin, 2015a). Other contexts, such as in military, have realised the benefits of digitised wargames and have been using them to educate their servicemen in warfare (Frank, 2011; taffy3, 2013; taffy3, 2014).

However, universities and history departments have not utilised these electronic games to the same degree. This lack of uptake is lamentable as most digitised wargames, namely Grand Strategy video games, are centered on history, and engage history, in highly complex ways that physical wargames cannot.

Educators using physical wargames for history education will likely be required to perform the game mechanics manually and undertake numerous calculations, all while understanding and applying the intricacies and mathematics of the game rules. These protracted processes and dense details may have pedagogical implications by drawing out playtimes, disrupting the player's engagement in the historical game world, and ultimately adding another layer of mathematical and procedural expertise to access the game. These processes fall outside the game's historical content and do not add to the historical learning process. Alternatively, digital wargames streamline and internally process player inputs, rules and calculations instantaneously, fundamentally changing and expediting the wargaming experience. This streamlining of wargames shifts the focus back to exploring the game's rich and vast historical world.

Thus, this article argues that wargames have been enhanced by digitisation to the Grand Strategy video game genre. The article explores the use of wargames in a historical setting and the progression to their contemporary use, noting the emergence of the political-military wargame and then the subsequent transition to the more complex Grand Strategy video games. Grand Strategy video games reflect the complexities of both war and peacetime history as well as historical details and broader historical narratives. Next, the article argues that the digitisation of wargames and transition to Grand Strategy maximises the *time*, *expertise* and *resource* efficiencies that wargames all too often consume. The article will use *Europa Universalis IV* (*EUIV*) as an exemplar which has a large fan community and has been generally well received by the public. *The Europa Universalis* series has also been studied by other academics (Egenfeldt-Nielsen, 2005; Apperley, 2006; Apperley, 2013; Koabel, 2017). See Figure 1 for a screenshot of *EUIV*. The article also explores a small use-case to demonstrate how Grand Strategy video games could support history education outcomes in a higher education setting. Ultimately, Grand Strategy video games mitigate several efficiency issues related to physical wargaming and provide richer and larger historical simulations in which to explore historical narratives and content.



Figure 1: Full view of the World Map in the year 1776.

Grand Strategy and Wargaming

The term “Grand Strategy” is often used by the military in the field of Strategic Studies (Hart, 1967; Sayle, 2012). Hart (1967) defines Grand Strategy as a means to “co-ordinate and direct resources of a nation, or band of nations, towards the attainment of the political objective of the war” (pp. 335–336). Sayle (2012) questions whether war always needs to be the objective of Grand Strategy, and suggests there is a more inclusive definition that embraces considerations outside the realm of pure conflict. Luttwak (2009) further argues that Grand Strategy draws on a number of different factors, and can be understood as:

simply the level at which knowledge and persuasion, or in modern terms intelligence and diplomacy, interact with military strength to determine outcomes in a world of other states with their own “grand strategies” (p. 409).

Compared to Hart’s (1967) earlier definition, Luttwak’s (2009) definition is more specific in focusing on the types of resources a nation may use to achieve its objectives, with an emphasis on a higher and more abstract level of strategy.

Both Sayle’s (2012) and Luttwak’s (2009) understandings of Grand Strategy are closely aligned with Grand Strategy depictions in video games. Players in these types of games utilise all of a nation’s resources and powers to carry out the nation’s national objectives, from its use of military force to matters of diplomacy and economic development. Hence, this article defines Grand Strategy as a nation’s utilisation of all of its resources and powers to carry out its national objectives, from its use of military force to diplomacy and the operation of its economy. It thereby encapsulates non-war aspects of strategy. Figure 2 shows where Grand Strategy fits into other forms of policy, strategy and tactics, and how it operates within the higher levels of strategy and national engagement (Hart, 1967; USAF College of Aerospace Doctrine, 1997; Wong, 2006; Department of the Army, 2008;

Luttwak, 2009; Sayle, 2012;). In all Grand Strategy games, the player utilises a nation's resources to achieve in-game objectives or objectives set by the player themselves.



Figure 2. The different levels of strategy, showing Grand Strategy operating at a much higher level compared to other forms of strategy (Hart, 1967; USAF College of Aerospace Doctrine, 1997; Wong, 2006; Department of the Army, 2008; Luttwak, 2009; Sayle, 2012).

It should also be noted that many strategy games, including Grand Strategy, tend to focus on the Western and imperialistic views of history. Scholars such as Ford (2016) who studied *Civilization V*, LaPensée (2008) who studied *Age of Empires III: the Warchiefs* and Mukherjee (2017) who studied *Empire: Total War*, all describe how, through these various strategy games (especially 4X games), the player is required to act out imperial, Western and militaristic ideologies. These forms of gameplay are present in Grand Strategy titles, especially the *Europa Universalis* series, and have been discussed in other papers (Apperley, 2013; Apperley, 2018; Heiniö, 2019; Loban and Apperley, 2019; Lundblade, 2019; Miner 2020).

Nonetheless, Grand Strategy video games sit within a broader family of video games, Figure 3 illustrates this video game family, starting with generic video games and ending with Grand Strategy video games. Each new branch of sub-genre has new traits with the next sub-genre encompassing traits from the previous. Common Grand Strategy game traits can include:

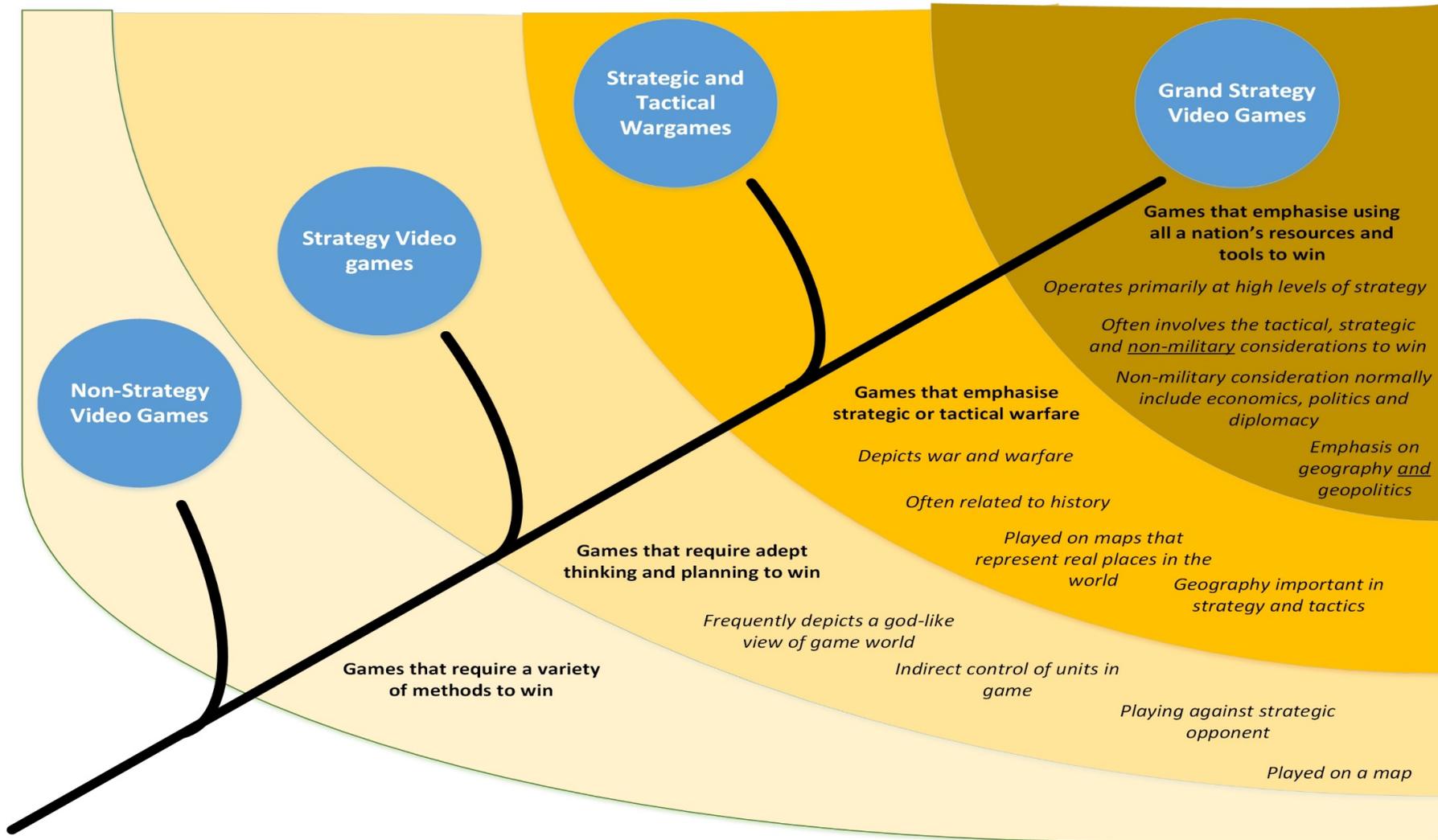


Figure 3. The sub-genre of Grand Strategy video games fits into a wider family of video games and is also a sub-genre of strategy games and wargames.

- Emphasis on high-level strategy, but often requires an understanding of the tactical-level strategy to win.
- Inclusion of both war and peacetime (inclusion of non-military consideration such as economics, politics, diplomacy, etc.).
- Importance placed on geography and geopolitics.

These traits appear to be consistent across the Grand Strategy genre and are found in several well-known titles from exploration of the battlefield and tactics in *March of the Eagles* (Paradox Development Studio, 2013b), to a detailed examination of a specific war, such as in *Hearts of Iron IV* (Paradox Development Studio, 2016), to a focus on historical governance over several centuries, such as in *EU IV* and *Victoria II* (Paradox Development Studio, 2010; Paradox Development Studio, 2013a). However, before examining Grand Strategy video games and their affordances in detail, it is important to understand the history of physical wargames and how wargames have evolved to become more complex over time and necessarily transitioned to the digital sphere.

The History, Transformation and Difficulties of Physical Wargames

Before exploring a brief history of wargames, it is important to examine several definitions of “wargame” to provide an understanding of the underlying concepts associated with the genre. Dunnigan (1997) believes a wargame is a combination of “game”, “history and science” and that it is essentially “glorified chess” (p. 13). Perla (1990) defines a wargame as “a warfare model or simulation, not involving actual military forces, and in which the flow of events is affected by and in turn affects, decisions made during the course of those events by players representing the opposing sides” (p. 274). Sabin (2015b) states that wargames have an “underlying mathematical model of reality” that simulates a war, and that wargames involve decision inputs to guide action of combatants in order to ‘win’ the game (p. 331). Gush and Finch (1980) argue that a wargame is at the very least “a competitive game, and a simulation of an actual or hypothetical “real-life” situation” that involves a high degree of chance (p. 13). Hence, this article defines a wargame as employing a combination of history, mathematics, science and chance to depict or model war in some form.

Early and Tactical Wargames

While the precise earliest purpose of playing wargames is unknown, there are several suggestions as to how wargames may have originated. Wargames have been used extensively during military operations, where they serve the purpose of assisting military personnel plan strategies, instruct illiterate troops, and emphasise troop movement, as well as acting as a symbolic device for re-enactments of war, for a religious purpose, for leisurely playful simulations, or for competitions (Weiner, 1959, pp. 2–3). Similarities between the play aspect of wargames and real wars are embodied in the notion of war as a “noble game” (Huizinga, 1949, pp. 101-104; Hugues and Hildenbrand, 2009, p. 19). This concept refers to the rules that combatants in a war are compelled to obey, which have influenced the formation of societies, international law, and are similar to the rules that govern wargames. However, Huizinga suggests the idea of the noble game cannot to any great extent depict

the bloodiness of war (1949). Nonetheless, wargames have been used throughout history to plan strategies and represent war and its complexities.

Many cultures have designed wargames using different systems and forms, each adding their own socio-cultural view and interpretation (Perla, 1990; Lastowka, 1999; Tzu, 2012; Setear and Mukherjee, 2015). It is unclear how long wargaming has existed, or when it was first invented (Perla, 1990). One belief is that Sun Tzu, author of the *Art of War*, invented the first known wargame, *Wei Hai*, which shares similarities to the older Chinese strategy game *Wei Qi* or *Go* in Japanese (Perla, 1990; Shotwell, 1994; Tzu, 2012). Some sources cite *Chaturanga* as the first wargame which was created in India during the 7th century and had pieces representing different divisions of ancient armies (Setear and Lastowka, 1999; Mukherjee, 2015). In Europe, the Romans played *Latrunculi*, which was also similar to chess and draughts. Other sources suggest the first documented wargame was *The Battle of Numbers*, which is still in existence (von Hilgers, 2012). *The Battle of Numbers* was created in Europe in around 1100AD with military etiquette and rules integrated into the game. For example, if the game unit, called the “pyramid”, was taken, all units under its control were deemed null (2012). This aspect of the game relates back to a chivalric notion whereby, if the standard-bearer fell in battle, all soldiers under the standard-bearer would surrender. While these games were abstracted, they reflected historical elements relevant to the period such as the chivalry code. These wargames were some of the original and basic forms of wargaming, each positioned within a particular culture and time. These wargames reflected tactics, low-level strategy, and simplified versions of the rules of warfare, which were then expanded upon in the development of later physical wargames.

Following the suite of ancient wargames came more complex variations that usually followed the pattern of chess. *Koenigspiel*, invented by Christopher Weikmann in 1664 in Ulm (modern day Germany) was an expanded version of chess (Setear and Lastowka, 1999). However, it was not until the German *Kriegsspiel* games (a modern variant of *Koenigspiel*) were created in the 17th and 18th century that wargames would transcend from operating within squares to realistic terrain, becoming games where a designated umpire and military experience determined the outcome. It was the Prussian Lieutenant Reiszitz who would truly develop a wargame for a practical military application that had more complex rules than those that had come before (von Hilgers, 2012). Wargames during this period evolved into more realistic and complex simulations of the battlefield, and representations of the historical period in which they were developed. However, this change also meant physical wargames became more cumbersome, mathematically involved and expanded the number of processes in-game.

Political-Military Wargames

During the Second Boer War (1899–1902) between the British and Dutch settlers in southern Africa, it was noted the British made use of wargaming to determine strategy, but quickly dropped the practice after facing the unconventional warfare methods of the Boers (Thomson, 1962; Kainikara, 2003). Following this decision, the British did not utilise wargaming again for nearly 50 years. In order to be useful in the new strategic world of modern warfare, which was less rule-driven than before, wargames needed to progress from

being purely tactical and operational to encompassing higher-level strategy (Perla, 1990; Caffrey, 2000).

After the German defeat in WWI and during the lead up to WWII, the German army used wargames to test military tactics and strategies. As a result, the military strategy of *Blitzkrieg* (“lightning war”) was created (Caffrey, 2000, p. 41), whereby a mobile army would overwhelm their enemy for a fast victory (Fanning, 1997). During WWII the Japanese used wargames that projected attrition with precision, but their games did not consider political factors and this impacted on the success of the translation from game to real warfare with Japan eventually surrendering to the United States (Caffrey, 2000). This example illustrates the changing features of wargames in WWII and the importance of factoring in both tactics and strategies into modern wargames.

While the Germans and Japanese experimented with wargames before WWII, it was not until the end of WWII that a new breed of wargames began to emerge, known specifically as Political-Military wargames (Perla, 1990). These were a response to the failings of previous wargames due to their primary focus on tactics and battlefield variables rather than the more abstract social and political aspects of strategy (Perla, 1990). Around this time the board game *Diplomacy* (Calhamer, 1959) was created, which was based around the conflict of WWI. *Diplomacy* incorporated elements of chess, negotiation, geopolitics and economic objectives (Calhamer, 1974), and reflected the changing nature of wargames, shown in Table 1 (Weiner 1959). This table lists the factors that began to be more widely considered in wargaming, including political and non-military considerations. Incorporating these high-level elements into wargames provided a rich understanding of the holistic context of war. From a historical pedagogical perspective, these elements also provide a greater insight into the historical context and considerations at the time.

In contemporary military contexts, wargames are used in two ways (Kainikara, 2003). The first is for high-level analysis, which is employed to help formulate and experiment with national security and defence policy before implementation (2003). The second use for wargames is to educate officers in high-level decision-making and to consider more unquantifiable factors such as social issues (2003). In these ways, wargames depict visual, strategic and interactive representations of war, and Grand Strategy games, which follow contemporary wargames, similarly depict visual, strategic and interactive representations of war and peacetime history that may be utilised to help players explore history.

Types of Factors Included in Simulation	Type of Conflict Simulation			
	Duel	Battle	Campaign	War
Resources	✓	✓	✓	✓
Objectives	✓	✓	✓	✓
Military Intelligence	✓	✓	✓	✓
Environmental Characteristics	✗	✓	✓	✓
Background Information	✗	✓	✓	✓
Logistics	✗	✗	✓	✓
Economic	✗	✗	✓	✓
Psychological	✗	✗	✓	✓
Political	✗	✗	✗	✓
Additional Sides	✗	✗	✗	✓

Table 1. Types of factors to consider in different wargames. Reconstruction of Weiner's (1959) wargames chart.

Grand Strategy Video Games and EUIV

This brief history has demonstrated the utilisation and usefulness of wargames in the military to train officers, formulate strategies and play out historical scenarios. However, Grand Strategy games extend further than Military-Political wargames and allow gameplay of peacetime history. For example, in *EUIV*, there are many viable peacetime strategies and gameplay options that different nations might utilise, some have a unique historical approach. For instance, Venice historically derived its power through trade and wealth (Lane, 1973; Rosand, 1993), rather than through military might. With this focus, a player who is playing as Venice might be better suited to developing provinces they already own or strategically conquering trade provinces rather than warring over large portions of land, which slows down production and hinders trade. Therefore, peacetime and its economic benefits are important considerations for gameplay when playing as Venice. In such situations war and expansion do not just relate to military might, but can occur through peacetime with the introduction of economic warfare, coercive diplomacy and espionage. In such circumstances, *EUIV* requires players to understand how economics relates to warfare, governance is connected to economic growth and technology assists military developments. Recognising the interconnectedness of these different elements of nation management provides the player with generalised insights into how nations may operate.

From a history education perspective, this gameplay provides a greater understanding of peacetime history that surrounds and impacts war history.

Further to peacetime history, the player encounters historical details and narratives, and develops a greater understanding of the time period. One example of historical narratives is the colonial nations system, which depicts the colonisation of the Americas and formation of new colony nations. For instance, nations that colonise the Americas will create new colonial subjects whenever they settle in provinces in certain regions (Paradox Development Studio, 2013a). The newly created subject nation (e.g. New Spain) is constrained diplomatically, economically and militarily by their colonising nation, and is thereby compelled to serve them. However, as a colonised nation's desire for liberty increases through certain events or increased tariffs imposed by the colonising nation, so too does the chance of them declaring independence. If their European rulers can placate the colonies, the latter will send large deposits of gold back to the Europe overtime via treasure fleets. However, these fleets can be raided by privateers and pirates, affecting the income of the nation receiving the treasure fleets. These historical elements can be seen in Figure 4, which reflects the colonisation of the Americas, imposed tariffs and subject liberty desire. In some simulations, ahistorical counterfactual scenarios will appear (Apperley, 2018). For example, Spain may colonise Canada and thus Spanish Canada will be created (Paradox Development Studio, 2013a). Despite this counterfactual rendering of history, the mechanics and details around these inaccurate reflections nonetheless still represent the broader historical themes of European colonisation of the Americas (Zimmerman, 1931: 439-440; Ward, 1976; Rodríguez and Guez, 1998: 7-8), the rise of piracy/privateering (Anderson, 1995: 193-194; Walton, 2002: 19), the creation of global trade (Buckman, 2005: 7-8) and the formation and independence of colonial nations (Rodríguez and Guez, 1998: 223; Webb, 1995: 5-6). These themes characterise some of the historical narratives of the Early Modern era. In this way, the player can explore historical narratives when situated in a specific historical context by experiencing a nation's historical opportunities, hardships and dynamics.



Figure 4. Subject Management Interface showing Spain's subjects, who are all distant colonial nations that normally provide income at tariffs of 67%. However, disloyal subjects will not pay tariffs and rebellious subjects may declare independence.

In *EUIV*, fine-grained historical details are represented through traditional table-top wargaming variables such as terrain and troop morale, but also through non-military parameters such as leaders, province details and Dynamic Historical Events (DHEs). For example, one DHE specific to the nation of France reflects the creation of the Mississippi Trade Company (Figure 5.) and can only occur within a certain timeframe and under specific conditions. DHEs tend to depict more factual or academic history compared to the rest of the game.



Figure 5. The Mississippi Trade Company event can only occur between 1700 and 1750 for players playing as France and with a colony in Louisiana.

Compared with other wargames, Grand Strategy games place greater emphasis on the important historical themes of the time period they depict, during both war and peacetime. The transformation of physical wargames to digital wargames and then to Grand Strategy video games shows how higher-level, complex elements of historical simulations can be utilised to create historically-rich gaming content. In physical wargames (Sabin, 2015b) and some video games (Kapell and Elliott, 2013), there is often a trade-off between accuracy versus simplicity, or historical details versus broader narrative. In contrast, the Grand Strategy video game *EUIV* embodies both aspects, providing *breadth* in terms of war and peacetime history, and *depth* in terms of broader accessible historical narratives and lower-level historical details. These two aspects are compared in Figure 6. The *breadth* axis covers small-scale tactical battles, entire wars, and peacetime events both before and after a war. The *depth* axis shows at its lowest level details of history similar to those found in tactical wargames and at its highest levels broader, less quantifiable concepts such as governance and diplomacy, often associated with peacetime. For example, the player may be affected by economic or trade issues, and may use war as a way of resolving or improving those issues. The player may then experience the economic and trade implications of the outcome of the war during peacetime. The *breadth* and *depth* axes thereby show how the transition between tactical wargames to Political-Military Wargames to Grand Strategy games

occurred, whereby each stage of the transition encompasses and emphasises more complex factors while retaining the characteristics of the previous stage. Grand Strategy video games such as *EUIV* can therefore reflect to some degree the complexities of both war and peacetime history (*breadth*), as well as historical details and broader narratives (*depth*).

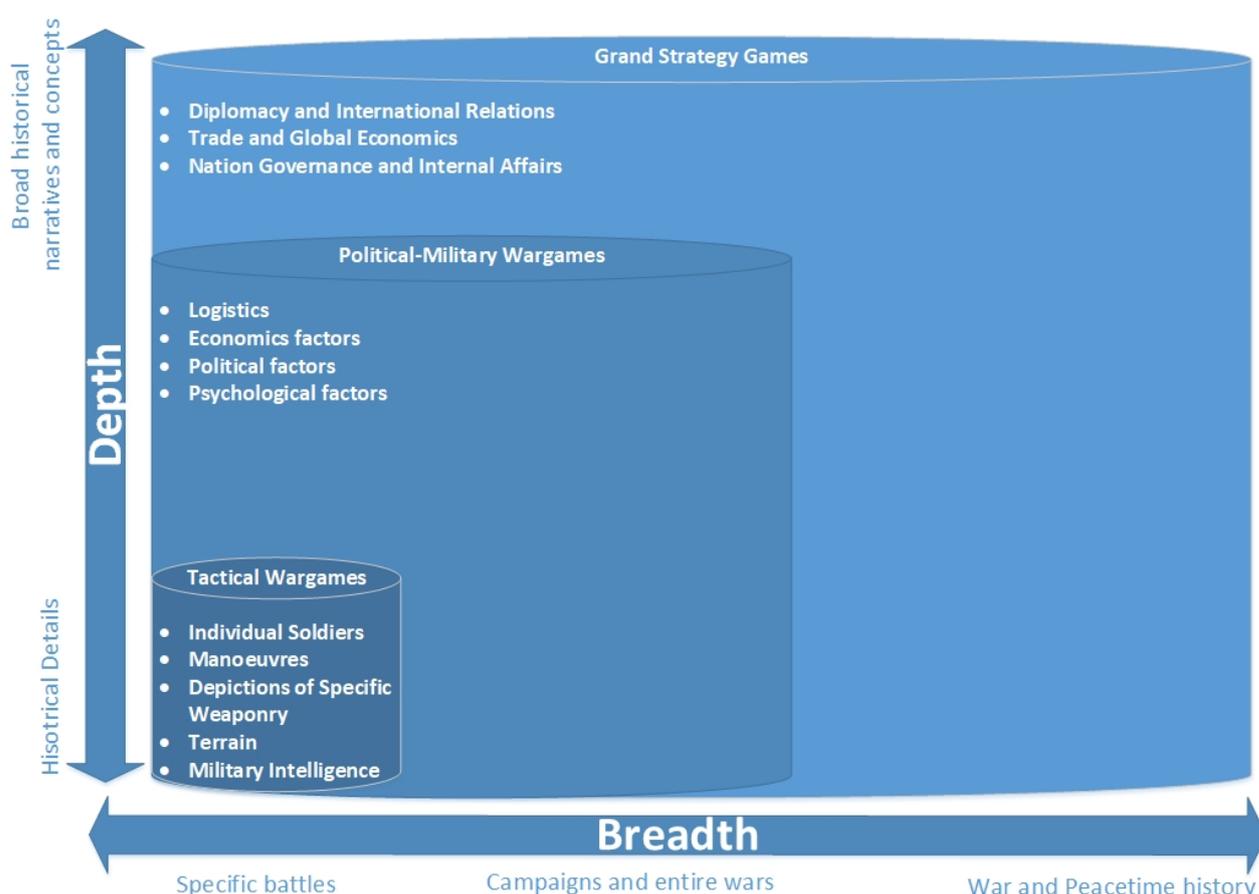


Figure 6. Historical breadth and depth of wargames with their associated characteristics

This short history of wargames has shown how they have evolved from elementary physical games using tactics to more complex, higher-level Political-Military strategy games that encompass a large number of variables and calculations. Even more complex variables and historical content have been integrated into Grand Strategy games. However, for the transition from tactical wargames to more complex Grand Strategy games to take place, a move from a physical to a digital platform needs to occur, as discussed in the next section.

The Complexities of the Physical Wargame and Improvements through Digitisation

As the previous section showed, there are benefits to using physical wargames to represent history, which may have significant outcomes for learning, including in higher education contexts. However, Sabin (2015b) identifies several problems with using physical wargames in higher education that relate to the *time*, *expertise* and *resources* needed to play a game.

Wargames consume a lot of *time* during gameplay, given the different phases of the game, including moving, attacking, mobilising defence, and general strategising. It is common for these games to take several hours or more to play. Sabin (2015b) suggests *expertise* is another issue as these games can become extremely complex given the rules and mathematical calculations used to determine the combat outcome. In the past, an umpire or expert was needed to guide the game (Gush and Finch, 1980). Sabin (2015b) notes *resources* such as gaming materials and maintenance as another constraint associated with creating and playing physical wargames. Sabin (2015b) proposes several ways to assist in this balancing act and alleviate the impact of some of the issues discussed above. These include:

- First, encouraging players to resolve the difficulties of some wargames by creating their own physical wargames, and building upon other wargame designs.
- Second, playing a variety of wargames to understand the primary operational and strategic aspects of wargames.
- Third, creating simple wargames so students will not need guidance or an umpire.
- Last, using digital non-wargame games, such as first-person shooters which are easy to learn and can convey the individual experience of battles.

Sabin's solutions are sound; however, he does not acknowledge that digital wargames could also be used to resolve many of the issues of physical wargaming (2015b). He considers digital wargames too complex for an educational setting, instead preferring smaller, more simple board wargames. He notes digital wargames do not offer a universal solution as computer programs are set in a particular context or could be complex to create and argues that it is better to focus on simple tailored physical wargames (2015b). Sabin believes there is a greater focus on computer graphics than content in commercial digital wargames (2015b), which he views as an issue in terms of its educational implementation (Sabin, 2015a). In contrast to his view, I argue that the translation of wargames to a digital platform has made many elements of wargames more efficient, providing a solution that reduces the expenditure by the players while achieving a desired pedagogical result, primarily through savings on *time*, *expertise* and *resources*. The next sections will address each of these factors and explore how the transition from more traditional wargames to digital Grand Strategy video games has improved the overall historical wargaming experience.

Time

Similar to physical wargames, digital wargames may require many dedicated playing hours during one sitting for noticeable progression. However, all moves, battle engagements, phases and outcomes are computer calculated, making the play much quicker. Pens, paper and calculators are not needed as battles are resolved in a matter of seconds with other useful data stored. Yet a digital wargame still maintains the tactical complexities of its physical predecessors, as shown in Table 2. taken from the *EUIV* Wiki (2021a). This table illustrates the complex mathematical formula used by *EUIV* to determine the winner of a battle between attacking and defending armies, which factors in leadership, terrain and army combat statistics. While not having manually calculate these factors, the player must still

understand the variables that contribute to combat, such as terrain, attrition and morale, otherwise they will be faced with defeat. Furthermore, the ability to save a game and then return to it at a later time means players no longer need to continue playing for extended periods or forfeit the game altogether. Thus, there is considerable time efficiency as large and numerous manual calculations are not required to play the game in these more complex yet digitised simulations.

$$D_{result} = D_{roll} + Ls_{Atk} + Up_{Atk} - Ls_{Def} - Up_{Def} - T_{mod}$$

Symbol	Variable	Description
D_{result}	Die results	The total calculation of the die roll results.
D_{roll}	Die roll	A random number between 0-9, rolled for each entire side at the beginning of each phase.
Ls	Leader skill	The leader skill for that phase (Fire or Shock).
Up	Attacking unit attack pips	Pips for the attacking or defending unit for the current phase, or Morale pips if computing morale damage.
T_{mod}	Terrain modifiers	Harsh terrain may give a penalty to the attacks of the attacking army.
Def	Attacking	Signifying the attacking player.
Atk	Defending	Signifying the defending player.

Table 2. Reconstruction of hidden equation in EUIV used to calculate dice roll results variable in battles (EUIV Wiki, 2021a).

The notion of the “black box” is a concept drawn from the technical and social sciences and can help us understand the temporal efficiencies offered by Grand Strategy video games. The term “black box” refers to:

a device or system that, for convenience, is described solely in terms of its inputs and outputs. One need not understand anything about what goes on inside such black boxes. One simply brackets them as instruments that perform certain valuable functions (Winner, 1993, p. 365).

In a similar process, Grand Strategy games take the important details, actions and strategies input by the player to produce an outcome and gameplay. The game “black boxes” the unnecessary and lengthy calculations, maths and measurements, streamlining the player’s wargaming experience (Winner, 1993). Through black boxing, the focus of a wargame shifts away from its mathematical and scientific origins (Dunnigan, 1997), and towards its subject matter. The player is then able to focus on making the more interesting and important decisions of strategy formulation and historical engagement. Black boxing can also be useful

as it hides information from the player which can better represent the conditions under which historical actors had to make decisions. These conditions can be useful for historical roleplay because they provide a historical perspective on the factors, environment and processes that led history down one path rather than another. Hence, in addition to time efficiencies afforded through digitising wargames, the black boxing approach of digital wargames shifts the attention away from the mathematical and procedural workings of the game to focus on the game's historically-related inputs and outputs.

An outcome of the black boxed history of Grand Strategy games is that greater emphasis is placed on the important features and broad narratives of the time period depicted. This broader narrative approach is pedagogically sounder than a focus on details as it aligns with the deep learning principle of focusing on central arguments or theories (Ramsden, 2003; Houghton, 2004). Deep learning promotes meaningful learning as opposed to surface learning which tends to focus on learning details, facts and specific instances. Physical wargaming tends to have a lot of details, rules, special situations, and mathematical calculations. The player needs to be aware of, and perform, these processes, which only serve to detract from the central historical themes of the game. Similarly, these details and calculations may also interrupt what Gee (2005) would call the player's projective stance. In short, a projective stance is the player's embodiment of a game character and the realisation of goals and desires of that character in their context. However, physical wargames could interrupt the player's projective stance as it adds another layer of labour and processes that are external to the historical roleplay and context of the game, and consequently external to the player's projective stance. As a result, physical wargames consume time for calculations, rule checking and other details that could otherwise be dedicated to focusing on the central historical gameplay or general situational-based learning within the historical world. Grand Strategy games bypass this issue of additional labour and allows more time to explore and learn in the game world by focusing on central historical concepts to solve problems within the game world.

Expertise

Challenging Sabin's (2015b) argument that players need to have programming skills to create varied digital wargame scenarios, there is evidence such skills may not be necessary for players to simulate different scenarios given the content and scale of some digital wargames. For example, *EUIV* covers over 350 years of history in detail, with its main focus being European history, showing great scope for many different scenarios (Paradox Development Studio, 2013a). If programming changes were required, the level of difficulty of the programming skills required to change the game depends on the game being modified (modded), with some games being easier to mod than others. Newer Grand Strategy games, such as *Hearts of Iron IV* (Paradox Development Studio, 2016), are very mod-friendly with guides from the developers and comprehensive community-produced wikis focused on how to mod the games. In these games, most content is produced in intuitive and editable formats (scripts) to make it even easier for players to mod the game (HOI4 Wiki, 2016; Paradox Interactive, 2016a). Furthermore, *Hearts of Iron IV* has a feature called 'modder mode' which enables in-game modding tools and displays additional information to further support modders. These in-game features are quite valuable for players as they allow them to easily create their own content, making the game highly customisable. As such, some

Grand Strategy companies have made it much easier for players to modify games and create their own content, while also providing support for ease of modding.

One typical characteristic of a Grand Strategy video game like *EUIV* is the steep learning curve or level of expertise needed to understand the game (Paradox Development Studio, 2013a). Given this, it could be argued that physical wargames, especially those Sabin (2015b) describes as “quick, simple and deliverable” wargames (pp. 338–340), are far more efficient as learning tools. However, *EUIV* could be likened to other complex software that requires a significant time investment yet ultimately yields greater benefits; for example, writing by hand versus writing in MS Word (Microsoft, 2013), or calculating statistics by pen and paper versus SPSS (IBM, 2015). Usually, once the intricacies of software have been learnt, the computerised equivalent for each process is typically more streamlined, efficient and accurate. Games can be seen as processes (Bogost, 2007), which can be learnt, repeated and internalised over time. Indeed, after a while a rhythm is developed, and working with the software becomes second nature. Consequently, the player can then focus on learning the historical complexity and richness a game like *EUIV* has to offer. Therefore, the effort required to develop this *expertise* can ultimately provide greater efficiency in rich historical detail over the long-term than physical wargames.

Similar to the pedagogical issues related to *time* and the requirement of extra labour, physical wargames require extra *expertise* or at least a working knowledge of the game’s calculations, rules and other details pertinent to the game. Physical wargames require expertise in the game’s mathematical and procedural information that lies outside the realm of history and the game’s central historical concepts. In this situation, either the player has to learn the required information, or have an experienced umpire oversee the game. These additional expert requirements are unrelated in regards to learning about history, and are in fact an extra expertise required to access the history of physical wargames. In Grand Strategy video games, this expertise is not required and are built into the game with the required expert actions carried out by the game’s internal algorithms. Thus, the player can instead build greater expertise in understanding the nation they play and its historical political, economic and military aspirations and challenges (Gee, 2005). Grand Strategy games encourage greater expertise in the historical game world and to look for meaning in the game’s thematic historical mechanics and connections between mechanics which are required to ‘win’ the game (Houghton, 2004; Ramsden, 2003). The expertise of mathematical calculations, rules and details required for physical games are not useful to learn about history and add another unnecessary expertise to access a physical wargame. Players would be better to avoid this unnecessary mathematical and process expertise, and instead master the Grand Strategy game mechanics which simulate important historical developments and issues of the period.

Resources

Digital wargames are less resource intensive and have a greater ease of access for the player than physical wargames because they utilise computers rather than boxes of models, boards

and rules. The physical space required to play and store the physical wargaming material is also vastly greater than the space a computer requires, which also has a multi-purpose function for both gaming and non-gaming purposes. Simpler wargames using only tokens and sheets of paper exist, but typically the rules and historical depiction will be simplified as well. Computers provide greater ease of access to *EUIV* and many other digital wargames that can be downloaded from Steam (Valve Corporation, 2003) (a computer game client) and other digital distribution systems. Certain computer hardware specifications are required for the game, and because technology can quickly become obsolete, upgrades are often required to play newer versions of games. However, Grand Strategy video games generally do not require high computer specifications (Paradox Interactive, 2016b) compared to the technical specifications of other contemporary genres of computer games, such as *Far Cry 5* (Ubisoft Montreal, 2018) a first-person shooter which places players in a highly detailed and visually impressive world (Ubisoft Support, 2018), thus making them more financially accessible. Further, the base game of *EUIV* is financially accessible at around \$50 AUD on release with additional expansions purchasable for affordable prices. The developers also frequently update *EUIV* at no additional cost. Thus, there is resource efficiency associated with Grand Strategy games like *EUIV*, namely in terms of cost, computing space and hardware, compared to the physical materials and space required for physical wargames. Moreover, there is also resource efficiency in terms of the distribution and replication of the software via computers and the internet compared to that of physical wargames.

Grand Strategy video games almost always contain an Artificial Intelligence (AI), meaning that the game can be played by a single player. In *EUIV*, AI components are computer-controlled players or nations that act as opponents in the game. In contrast, in a physical wargame, other human players are often required to play the role of other opposing nations. While single player physical wargames do exist, they lack the social element of multiplayer wargames and may not match the competitive experience of a real opponent (even if that opponent was a digital wargames AI). Grand Strategy video games, present a vast number of simulations throughout history with the many nations that existed within that time period can be played in a digital game. Tailor-made scenarios are not necessary as is the case in physical wargames. Mods also provide another massive pool of historical scenarios for the player to access. Thus, Grand Strategy video games are more efficient than physical wargames as they require fewer resources such as other players and physical materials. They are also more efficient because they provide more resources and increased accessibility with little effort or cost. A single game and mods can also efficiently capture a wide range of historical scenarios for the player to engage.

Pedagogically, the vast resources in the form of digitised historical content and AI actions afford Grand Strategy games countless complex learning scenarios that would otherwise be exceptionally difficult to replicate in physical wargames. The Activity Centred Analysis and Design (ACAD) Framework can help us understand how Grand Strategy game worlds can be seen as complex learning environments (Goodyear and Carvalho, 2014; Goodyear et al., 2021). The ACAD framework emphasises emergent activity and active learning (learning by ‘doing’) as a method for achieving learning outcomes. Games are excellent examples of

emergent activity as games allow freedom for players to operate and play within a framework. At the same time, players are guided to learn specific knowledge and achieve certain outcomes through the game content and mechanics. However, players can influence the learning experiences and outcomes they wish to achieve through alterations to the game set up and choices during gameplay. Grand Strategy games and their historical gaming experiences are highly customisable because they allow players to choose and play 100s of different nations in a vast number of historical start dates. For example, *EUIV* has over 900 playable nations with the option to begin the game at any date between 11 November 1444 and 1 January 1821 (Paradox Development Studio, 2013a; *EUIV* Wiki, 2021b). There are even further variations due to player and AI actions in-game, allowing for different historical and counterfactual learning outcomes. Indeed, the sheer variety of content and accessible resources in-game, allows a vast number of varied processes which can result in a multitude of differing outcomes for player exploration (Bogost, 2007). Each of these processes are embedded with historical themes and information which the player encounters in-game. By altering the different perspectives, timeframes and gameplay choices of each scenario within a single game, players are encouraged and can arrive at completely different outcomes with each playthrough, allowing for more numerous and varied historically infused processes and outcomes compared to a single physical wargame.

Overall Benefits of Digital Wargames for Learning

The previous sections have shown that in physical wargames there is a trade-off between accuracy and simplicity in terms of the time, expertise and resources required to undertake the game. In contrast, digital wargames such as Grand Strategy video games offer historical richness and complexity while automating and simplifying the protracted aspects of physical wargaming. Hence, Grand Strategy video games are more technically, financially, and physically accessible, which increases their potential for use in adult education. Table 3 illustrates the full advantages and disadvantages of both physical and digital wargames based on *resources*, *expertise* and *time*. As argued, Grand Strategy video games can mitigate several physical wargaming efficiency issues relating to *time*, *expertise*, and *resources*. The shift from physical to digital wargames is not just driven by a desire to reflect greater historical and strategic complexity, but by a need for greater practicality and efficiency. To further illustrate the pedagogical utility of Grand Strategy games, the article will briefly explore a use-case of how digital wargames could be implemented in a university history unit to support learning outcomes.

Characteristics	Physical Wargames	Digital Wargames
Easier to setup and play straight away	✓	✗
Modifiable without computer literacy skills	✓	✗
Removes player need to perform calculations and dice rolls (automated calculations)	✗	✓
Run complex simulations without need for calculation of large amounts of variables	✗	✓
No other human player required to run simulation while still playing against an opponent	✗	✓
Vast number of scenarios and content contained in a singular simulation	✗	✓
No simulation expertise or knowledge needed to play, manage or umpire game	✗	✓
Mobility and ease of access via the internet	✗	✓
Highly compact materials for storage	✗	✓
Overall more cost effective to setup, maintain and run	✗	✓

Table 3. Comparison between the characteristics of physical and digital wargames, showing the advantages and disadvantages.

History Unit Use-Case with a Grand Strategy Video Game

We can use learning outcomes of a university unit with a focus on the history of empire to demonstrate a Grand Strategy video game use-case. Generally, students completing such history units need to understand “major transitions, processes and developments” of modern empires as well as “important themes and issues in the history of empires” (Australian National University, 2021 , para. 2). Additionally, students also need to perform research and engage in “scholarly debates regarding empires in history” and “formulate logical arguments” with consideration to primary sources, while also communicating “ideas and arguments about the history of empires” (para. 2). The learning outcomes could be addressed through standard weekly lectures, tutorial activities and readings along with an additional central focus on weekly gaming workshops. Workshops could be dedicated to learning and playing *EUIV* with these workshops performed in a class or remotely at home. When not in a workshop, the students are able to take their game home and perform gameplay in their own time and at their own leisure. This learning approach would be very

difficult with physical wargames, and the advent of issues like COVID impose even more restrictions around physical and social player interactions and umpiring.

Part of the unit structure could follow a progression of the game's historical timeline which is divided into different Ages to demarcate different phases of history and their respective historical transitions and developments. There are four Ages in-game which are intended to represent the 'Age of Discovery' (Lewis, 1996; Matar, 2000; Lestringant, 2016), 'Age of Reformation' (Skinner, 1978; Harbison, 2013), 'Age of Absolutism' (Ranum, 1968; Vierhaus, 1988; Beloff, 2013) and 'Age of Revolutions' (Onuf et al., 1993; Armitage and Subrahmanyam, 2009; Hobsbawm, 2010). Each Age has different goals and mechanics which encourage the player to perform certain historical actions such as European nations being rewarded in-game for sailing to the American continent. This timeline would provide a logical progression through early modern history covering historically thematic narratives as well as peacetime history.

Historical themes and *EUIV* game mechanics are often highly intertwined and require the player to understand historical themes to use them to their advantage in-game. As a scenario, a student can play as Portugal in 1445 in the 'Age of Discovery' and, once familiarised with the base mechanics of the game, the student soon realises they can explore and best expand their powerbase outside of Europe. Through European empire management gameplay, the student will discover in-game historical European empire systems revolving around exploration (e.g. overseas voyages, the Treaty of Tordesillas (Duve, 2013), circumnavigating the world), colonial expansion (e.g. conflict with Indigenous peoples, developing colonies, setting up trade companies) and global trade (e.g. tariffs, piracy/privateers (Anderson, 1995; Walton, 2002), acquiring valuable goods such as spices, strategic trade locations). This 'Age of Discovery' gameplay provides overarching historical themes of exploration, colonial expansion and global trade along with other historical issues and details. As the student enters a projective stance (Gee, 2005) as the Portuguese nation in-game, these historical themes, issues and details become highly important as they are tools to be used, or problems to be solved by the player in order to 'win' the game. McCall (2012) would suggest these games are problem spaces where, for example, the Portuguese nation player explores a plethora of possibilities of the past while learning the constraints and affordances of their historical nation and, as a consequence, they develop strategic problem-solving skills relative to their historical position. Even mistakes and replays are encouraged, as part of the deep learning process, that help further internalise the game's historical themes (Ramsden, 2003; Houghton, 2004; Kuran et al., 2018). Here, the student is exposed to a vast amount of war and peacetime historically themed mechanics to be interacted with, which the student must use to 'win' the game. The amount of content in this single playthrough of one section of *EUIV* and its intricacies would be difficult to smoothly encapsulate in a singular physical wargaming playthrough.

After playing *EUIV*, students could then compare their historical game experiences with academic history (e.g. primary and secondary sources), looking for central historical themes, developments and issues between both historical gaming and academic sources (Ramsden, 2003; Houghton, 2004). Building on the gameplay, the student can then transition to

modding *EUIV* and choosing pivotal events or game content related to the historical themes, transitions and developments of the period. Modding *EUIV* research has shown to be successfully used within a higher education context where students could create their own mod about a specific history, but still have the freedom to integrate their own historical expertise, interests and arguments into the game (Loban, 2021). Students from a variety of disciplines, ages and levels of study were able to mod *EUIV* with relative ease, and they had opportunities to research and mod both historical narratives and details into the game. Though, there are limitations to modding as modders can only change more surface-level historical content and are still limited by the deep underlying colonial and imperialistic mechanics in *EUIV* (Loban and Apperley, 2019; Loban, 2021). However, this issue can be used as a point of discussion and the game's mechanics can be compared with historical materials from Indigenous, Asian, Indian, African, and other non-Western perspectives. Therefore, the student can mod their own historical arguments into the game with relative ease. However, there are limitations given the game's bias, which could be mitigated through exposure to non-Western historical perspectives.

After students have researched and conceptualised their historical argument, they could demonstrate and communicate their historical analysis and gaming experience of the Early Modern era in a number of ways. A reflective and comparative essay on their historical research and gaming experience are relatively straight forward avenues, however, students could present a created video of gameplay and commentary (Loh and Byun, 2009), mods they have created (Loban, 2021), After Action Reports (Apperley, 2013), blog posts (Kuran et al., 2018) and other gaming materials as supporting evidence, or as the primary method to communicate their historical argument.

Holistically, this brief use-case approach would support the understanding of “major transitions, processes and developments” of modern empires and “themes and issues” in the history of empires as students internalise the game's historical themes and developments through war and peacetime gameplay (Australian National University, 2021, para. 2). Concurrently, the student would also compare and contrast their thematic historical experiences in-game with external primary and secondary sources to better understand well established historical themes in-game, but also to challenge misconceptions perpetuated by the *EUIV* (2021). Building on the gameplay, gaming practices such as modding encourage more independent student-driven historical research (Loban, 2021). Students, through their comparative analysis and research, will have engaged in “scholarly debates regarding empires in history” and “formulate logical arguments” about the history of empire (Australian National University, 2021, para, 2). Students can then communicate their “ideas and arguments about the history of empires” through written work and various game-related outputs such as recorded gameplay or mods (para. 2).

Conclusion

In conclusion, this article has described the considerable benefits of Grand Strategy video games compared to physical wargames, particularly for the purpose of historical education. The article briefly examined the definition and history of wargaming, in particular the rise of the military-political wargame. Wargames then transitioned from the military-political to Grand Strategy games encompassing more complex and abstract factors into simulations as well as peacetime history. Additionally, Grand Strategy games contain historical detail and broader narratives that provide more diverse and richer historical content. The article then highlighted the advantages of Grand Strategy video games compared to physical wargaming, in terms of *time*, *expertise* and *resources* making the digital counterparts more technically, financially, physically and educationally accessible. The *EUIV* history unit use-case revealed how Grand Strategy games could support learning outcomes by exposing students to various historical themes and content while also providing them opportunities for deep, active and problem-based learning. Digital wargames would also provide students the opportunity to communicate their historical research through various game-related practices. Grand Strategy video games can afford a flexible, historically rich and independent approach to learning that would be difficult to achieve with physical wargames. Overall, Grand Strategy games can alleviate several efficiency problems of physical wargames, while simultaneously providing more historical *breadth* by depicting war and peacetime history, and *depth* by including historical narratives and details. For wargames to effectively and efficiently depict these historical complexities a transformation to the digital is crucial.

There is a clear use and opportunity for digitised wargames to be implemented in higher education, as was in the military. However, the learning benefits for higher education seem even greater given the historical foci of Grand Strategy video games. In a society that consumes digital media daily, the gaming medium offers students an alternative, accessible and interesting way to explore history. Although it is clear a tension still exists between the old and the new, the physical and the digital, the simple and the complex; the discipline of history may need to shift to the digital platform to reach the greater population and adapt to contemporary digital teaching contexts. Wargames face a similar challenge. Thus, the future of historical wargaming may well lie in the digital platform.

Acknowledgements

I would like to thank to both Dr Brigid Costello and Associate Professor Andrew Murphie for their feedback and supervisory support during my PhD from which this paper was derived. I would also like to thank my colleague Associate Professor Dorothy DeWitt for her comments and mentorship. In addition, I am indebted to Associate Professor Thomas Apperley for his supervision and support. I would also like to thank the Digital Culture & Education reviewers and team for their constructive feedback and support publishing the paper.

References

- Anderson, J. L. (1995) Piracy and world history: An economic perspective on maritime predation. *Journal of World History*. 175-199.
- Apperley, T. (2006) Virtual unaustralia: Videogames and australia's colonial history. *Proc. of Cultural Studies Association of Australasia's Annual, UNAUSTRALIA*.
- Apperley, T. (2013) Modding the Historians' Code: Historical Verisimilitude and the Counterfactual Imagination. *Playing with the Past: Digital Games and the Simulation of History*. 185.
- Apperley, T. (2018) Counterfactual Communities: Strategy Games, Paratexts and the Player's Experience of History. *Open Library of Humanities* 4 (1).
- Armitage, D. and Subrahmanyam, S. (2009) *The age of revolutions in global context, c. 1760-1840*. Macmillan International Higher Education.
- Australian National University (2021) *Empires in Global History: 1200 to the Present*. Available at: <https://programsandcourses.anu.edu.au/2021/course/HIST1214>.
- Beloff, M. (2013) *The Age of Absolutism (Routledge Revivals): 1660-1815*. Routledge.
- Bogost, I. (2007) *Persuasive games: The expressive power of videogames*. Mit Press.
- Buckman, G. (2005) *Global trade: past mistakes, future choices*. Zed Books.
- Caffrey, M. (2000) *Toward a history-based doctrine for wargaming*.
- Calhamer, A. (1974) The invention of diplomacy. *Games and Puzzles* 21.
- Calhamer, A. (1959) *Diplomacy*.
- Chapman, A. (2016) *Digital Games as History: How Videogames Represent the Past and Offer Access to Historical Practice*. Taylor & Francis.
- Department of the Army (2008) FM 3-0 Operations.
- Dunnigan, J. F. (1997) *The complete wargames handbook*. New York: William Morrow & Company.
- Duve, T. (2013) Treaty of Tordesillas. *Max Planck Encyclopedia of Public International Law*. 1-9.
- Egenfeldt-Nielsen S (2005) *Beyond edutainment: Exploring the educational potential of computer games*. Lulu. com.
- EUIV Wiki. *Land warfare*. Available at: http://www.eu4wiki.com/Land_warfare.
- EUIV Wiki. *Countries*. Available at: <https://eu4.paradoxwikis.com/Countries>
- Fanning, W. J. (1997) The origin of the term "Blitzkrieg": Another view. *The Journal of Military History* 61(2): 283.
- Ford, D. (2016) "eXplore, eXpand, eXploit, eXterminate": Affective Writing of Postcolonial History and Education in Civilization V. *Game Studies* 16(2).
- Frank, A. (2011) Gaming the game: A study of the gamer mode in educational wargaming. *Simulation & Gaming*. 1046878111408796.
- Gee, J. (2005) Pleasure, learning, video games, and life: The projective stance. *E-learning and Digital Media* 2(3): 211-223.
- Goodyear, P. and Carvalho, L. (2014) *The architecture of productive learning networks*. Abingdon: Routledge.
- Goodyear, P., Carvalho, L. and Yeoman, P. (2021) Activity-Centred Analysis and Design (ACAD): core purposes, distinctive qualities and current developments. *Educational Technology Research and Development*. 1-20.
- Gush, G. and Finch, A. (1980) *A guide to wargaming*. Taylor & Francis.
- Harbison, E. H. (2013) *The Age of Reformation*. Cornell University Press.
- Hart, B. L. (1967) *Strategy*. 2nd ed. London: Faber & Faber.
- Heiniö, O. (2019) *Europa Universalis IV and Fairly Radical History* (ing).
- Hobsbawm, E. (2010) *Age of revolution: 1789-1848*. Hachette UK.

- HOI4 Wiki (2016) *Modding - Hearts of Iron 4 Wiki*. Available at: <http://www.hoi4wiki.com/Modding>.
- Houghton, W. (2004) *Engineering subject centre guide: Learning and teaching theory for engineering academics*. Higher Education Academy Engineering Subject Centre, Loughborough University.
- Hugues, G. and Hildenbrand, K. (2009) *Images of War and War of Images*. Cambridge Scholars Publishing.
- Huizinga, J. (1949) *Homo Ludens: Study of the Play Element in Culture*. Oxon: Routledge.
- IBM (2015) *IBM SPSS Statistics 23*. IBM.
- Kainikara, S. (2003) *Effective Wargaming: Impact of the Changing Nature of Warfare*. Aerospace Centre.
- Kapell, M. W. and Elliott, A. B. (2013) *Playing with the past: digital games and the simulation of history*. Bloomsbury Publishing USA.
- Koabel, G. (2017) Simulating the Ages of Man: Periodization in Civilization V and Europa Universalis IV. *Loading...* 10(17).
- Kuran, M. Ş., Tozoğlu, A. E. and Tavernari, C. (2018) History-Themed Games in History Education: Experiences on a Blended World History Course. *2018 17th International Conference on Information Technology Based Higher Education and Training (ITHET)*. IEEE, 1-8.
- Lane, F. C. (1973) *Venice, a maritime republic*. JHU Press.
- LaPensée, B. A. (2008) Signifying the west: colonialist design in Age of Empires III: The WarChiefs. *Eludamos. Journal for Computer Game Culture* 2(1): 129-144.
- Lestringant, F. (2016) *Mapping the Renaissance world: the geographical imagination in the age of discovery*. John Wiley & Sons.
- Lewis, B. (1996) *Cultures in conflict: Christians, Muslims, and Jews in the age of discovery*. Oxford University Press.
- Loban, R. (2021) Modding Europa Universalis IV: An informal gaming practice transposed into a formal learning setting. *E-learning and Digital Media*. 20427530211022964.
- Loban, R. and Apperley, T. (2019) Eurocentric Values At Play: Modding The Colonial From The Indigenous Perspective. In: Penix-Tadsen P (ed) *Video Games and the Global South*. Pittsburgh, PA: Carnegie Mellon University: ETC Press.
- Loh, C. S. and Byun, J. H. (2009) Modding Neverwinter Nights into serious games. *Digital Simulations for Improving Education: Learning Through Artificial Teaching Environments: Learning Through Artificial Teaching Environments*.
- Lundblade, K. (2019) How the West (was) won: Unit operations and emergent procedural rhetorics of colonialism in Europa Universalis IV. *Journal of Gaming & Virtual Worlds* 11(3): 251-270.
- Luttwak, E. (2009) *The grand strategy of the Byzantine Empire*. Harvard University Press.
- Matar, N. (2000) *Turks, Moors, and Englishmen in the age of discovery*. Columbia University Press.
- McCall, J. (2012) Navigating the problem space: The medium of simulation games in the teaching of history. *The History Teacher* 46(1): 9-28.
- Microsoft (2013) Microsoft Word. Microsoft.
- Miner, J. D. (2020). Monitoring Simulated Worlds in Indigenous Strategy Games. *The Computer Games Journal*, 9(3), 311-329.
- Mukherjee, S. (2015) *Video games and storytelling: Reading games and playing books*. Springer.
- Mukherjee, S. (2017) *Videogames and Postcolonialism: Empire Plays Back*. Springer.
- Onuf, P. S., Onuf, P. S. and Onuf, N. G. (1993) *Federal Union, Modern World: The Law of Nations in an Age of Revolutions, 1776-1814*. Rowman & Littlefield.
- Paradox Development Studio (2010) *Victoria II*. Paradox Interactive,.
- Paradox Development Studio (2013a) *Europa Universalis IV*. Paradox Interactive.

- Paradox Development Studio (2013b) *March of the Eagles*. Stockholm: Paradox Interactive, Paradox Development Studio (2016) *Hearts of Iron IV*. Paradox Interactive.
- Paradox Interactive (2016a) *Stellaris Dev Diary #31 - Modding (Scripting Anomalies)*. Available at: <https://forum.paradoxplaza.com/forum/index.php?threads/stellaris-dev-diary-31-modding-scripting-anomalies.923348/>.
- Paradox Interactive (2016b) *Support*. Available at: <http://www.europauniversalis4.com/support>.
- Perla, P. P. (1990) *The art of wargaming: a guide for professionals and hobbyists*. Naval Institute Press.
- Ramsden, P. (2003) *Learning to teach in higher education*. Routledge.
- Ranum, O. (1968) *Paris in the Age of Absolutism*. Penn State Press.
- Reynaud, D. and Northcote, M. (2014) The World Wars through tabletop wargaming: An innovative approach to university history teaching. *Arts and Humanities in Higher Education*. 1474022214556899.
- Rodríguez, J. E. and Guez, J. E. R. (1998) *The Independence of Spanish America*. Cambridge University Press.
- Rosand, E. (1993) Venice, 1580–1680. *The Early Baroque Era*. Springer, pp.75-102.
- Sabin, P. (2015a) *Lost battles: reconstructing the great clashes of the ancient world*. Bloomsbury Publishing.
- Sabin, P. (2015b) Wargaming in higher education: Contributions and challenges. *Arts and Humanities in Higher Education*. 1474022215577216.
- Sayle, T. A. (2012) *Defining and Teaching Grand Strategy*.
- Setear, J. and Lastowka, G. (1999) *1a. A Brief History of Wargaming*. Available at: <http://faculty.virginia.edu/setear/students/wargames/page1a.htm>.
- Shotwell, P. (1994) The Game of Go: Speculations on its Origins and Symbolism in Ancient China. *Changes* 2008.
- Skinner, Q. (1978) *The foundations of modern political thought: Volume 2, the age of reformation*. Cambridge University Press.
- taffy3 (2013) MC War College WWI AAR. In: Available at: <https://forum.paradoxplaza.com/forum/index.php?threads/mc-war-college-wwi-aar.736522/>.
- taffy3 (2014) *2014 db@mcwar wwii aar*. Available at: <https://forum.paradoxplaza.com/forum/index.php?threads/2014-dh-mcwar-wwii-aar.770718/> (accessed 13/08/2015).
- Thomson, M. H. (1962) The Military War Game. *The RUSI Journal* 107(625): 50-54.
- Tzu, S. (2012) *The art of war*.
- Ubisoft Montreal (2018) *Far Cry 5*. Ubisoft.
- Ubisoft Support (2018) *What are the minimum requirements for Far Cry 5?* Available at: <https://support.ubi.com/en-us/Faqs/000033169/What-are-the-minimum-requirements-for-Far-Cry-5>.
- USAF College of Aerospace Doctrine RaE (1997) *Three Levels of War. Air and Space Power Mentoring Guide 1*.
- Valve Corporation (2003) *Steam*. Valve Corporation,.
- Vierhaus, R. (1988) *Germany in the Age of Absolutism*. Cambridge University Press.
- von Hilgers, P. (2012) *War Games: A History of War on Paper*, trans. Ross Benjamin. Cambridge, Mass.: MIT Press.
- Walton, T. R. (2002) *The Spanish treasure fleets*. Pineapple Press Inc.
- Ward, J. M. (1976) *Colonial self-government: the British experience, 1759–1856*. Springer.
- Webb, S. S. (1995) *1676: The End of American Independence*. Syracuse University Press.
- Weiner, M. G. (1959) *An introduction to war games*.

- Winner, L. (1993) Upon opening the black box and finding it empty: Social constructivism and the philosophy of technology. *Science, Technology, & Human Values* 18(3): 362-378.
- Wong, M. E. Y. (2006) Refocusing on the Operational Level of Pedagogy: A Military Analogy for Bridging Educational Strategy and Classroom Tactics.
- Zimmerman, A. (1931) Spain and its Colonies, 1808-1820. *The Hispanic American Historical Review* 11(4): 439-463