Reciprocal Innovation in Modding Communities as a means of Increasing Cultural Diversity and Historical Accuracy in Video Games

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ABSTRACT
Due to the growing power and versatility of home hardware and software, the participatory design and modification, or modding, of commercial video games has become increasingly common. This paper examines and defines emergent features, the tendency of modders to inject aspects of themselves in the game, to advertise their outside interests, and to increase the historical value of the game by dramatically altering previously unimportant game features. The production process for emergent features tends to generate multiple, equally viable user-modifications which often serve mutually exclusive purposes. The paper concludes with the educational implications of reciprocal innovation.

Author Keywords
New Roles of the Instructor & Learner, Collaborative Design, Emergent Features, and Reciprocal Innovation

1. INTRODUCTION

Though often depicted as passive consumers of entertainment, more and more video game players demand the opportunity to modify and personalize their gaming experience. Video game companies realize that users appreciate the opportunity to generate their own content, and commercial products have begun to include authoring tools [14]. In 2003, eight of the top ten selling PC video games included bundled editors which allowed the user to manipulate triggers, create in-game characters, and generate new game worlds [8]. It is an industry wide belief that user-generated content is going to revolutionize game design, provided that "players' talents and creativity can be harnessed like it has [sic] been with …mods." [8] At the same time, interest in the educational benefits of modification has grown. [13].

Practically any game feature, even a relatively unimportant one, can be modified to increase the historical and cultural accuracy of a game. Therefore, educators and developers do not need to struggle to include game features that may be adapted for academic purposes.

This paper addresses emergent features, or previously unimportant features of a game engine that are modified by users for various purposes. The player flags in the turn-based strategy game *Civilization IV* serve as an exemplar of an emergent feature. By understanding the mentally complex process of flag conception, design, and implementation, educators can more easily examine existing games for features which may be modified to increase their educational benefit**.**

The process of mod creation encourages the conception and implementation of multiple, equally-viable modifications, in contrast to the thesis and antithesis used to create a single product. This paper provides reciprocal innovation as a theoretical framework for mod creation.

2. PREVIOUS RESEARCH

In this section I examine previous research related to the participatory design of educational video games, motivation related to video game creation, constructivism, constructionism, and digital existentialism.

2.1 Benefits of Participatory Design

2.1.1 Higher-Order thinking

An individual must engage in analysis, synthesis, evaluation and revision when she modifies an existing game and creates new objectives [3]. While creating a working artefact, students can receive continuous feedback from peers and experts [14]. Users establish abstract mental paradigms and develop meta-cognitive skills as they work to optimize functioning designs and to debug flawed designs [14]. Numerous educational researchers , following the creation of the Logo language in the 1960s, have studied the positive ways that programming computers impacts the mathematical, computational, and general thinking skills of the user [9, 16, 17, 18].

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2.1.2 Motivation in Game Design

Herz [5] found that the prime motivating factors for individuals who design and modify games are peer acknowledgement and group identity. Both the traditional educational extrinsic need to demonstrate competence and potent intrinsic factors motivate users to modify games [13]. Since game design is traditionally a group project, the sharing of knowledge, skills, and constructive abilities enables group members to feel acknowledged for their individual contributions [14]. At the same time, the finished product is played by non-group members, complimenting the entire design team[12].

Since the user wants to design something that she finds fun herself, elements of the motivation to play a video game are part of what motivates video game design. Denis [2] separates ludic motivation into three categories:

- Pleasure—which comes from fantasy, control, power, creation, social interaction, immersion and comedy, direct system response and experience of effectance
- Desire—which comes from curiosity, problem solving and competition, and escapism
- Ludic Tension—which comes from discovery, conflict, suspense and relief, learning, and surprise

Game designers therefore derive motivation both from the game design process and the final product itself [14].

2.1.3 Constructivist Environment

Game programming creates a constructivist learning environment. Gance [4] identified four main pedagogical components to constructivism, which are:

- An engaged learner who takes an active role in exploring her environment in order to discover new information.
- A hands-on pedagogy, learn by doing
- A social environment in which learners and mentors interact in a learning context
- A pedagogy that focuses on a realistic problem-solving situation.

Kafai [7] noted that students who authored their own games were likely to spend prolonged periods of time creating, evaluating, and revising their designs. This constant self and peer evaluation mandates constructivist discovery learning where learners seek ways to make a game better, test their ideas, discuss their ideas with peers and evaluate whether they have solved the problem [14].

2.1.4 Constructionism

Papert [16], the creator of Logo, used programming as an example of a larger learning theory called constructionism. Constructionism postulates that new knowledge can most effectively be mastered when people engage in constructing products that are personally meaningful. Children will consider their involvement in the creation of a video game to be meaningful since the video game industry now rivals Hollywood in scope [14]. In an attempt to increase undergraduate enrolment in computer science courses, numerous universities have included game design in their curricula. Moskal [6] found that computer science majors with an emphasis in game creation, when compared with traditional computer science majors, were nearly twice as likely to complete their degree. Constructionism, as expressed through game creation, marries the acquisition of fundamental skills with the personal motivation to learn [13].

2.1.5 Digital Existentialism

Modders frequently incorporate their belief system, personal preferences, or political opinions in their mods. Hooper [6] conducted a longitudinal study of software development in schools and concluded that students expressed notions of cultural identity in their programs. Students involved in the design process were able to engage in digital existentialism, creating an electronic version of themselves [13].

An example of both user agency and digital existentialism is the Chechen Republic Mod produced by Shqype [12]. Made for *Civilization IV* (in which users lead a civilization to world prominence), the mod creates a previously absent faction, the Chechens. Shqype researched this project while writing his senior thesis on the struggle for Chechen independence. He introduced a unique unit for the civilization, introduced a script for the name of its cities, e.g. renaming the city of Grozny (which means "frightening" in Russian and is considered offensive to many Chechens), and created a biography for the civilization's leader. Shqype chose to design this mod because he [13] "respect[s] their struggle for independence and viewed [sic] them as an ancient people that deserved recognition."

3. EMERGENT FEATURES

Users often modify games by creating an emergent feature, which involves adapting a seemingly unimportant aspect of the original engine. An example of this phenomenon is the introduction of player-produced flags into the turn-based strategy game, *Civilization IV*. In the following sections, flag changes are examined as a tool for improving historical accuracy, cultural expression, and digital existentialism.

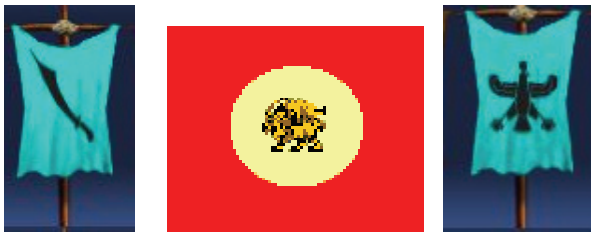
3.1. Flag Modification as Exemplar of Emergent Feature

3.1.1 Flags as simple Identification Tools

In the unmodified version of *Civilization IV*, a player's units are marked by a flag or standard. This allows the player to differentiate between her units and those of an opponent. Though a flag's color and graphic vary according to the civilization that the player has selected, these

variations communicate very little historically accurate or culturally relevant information [15].

For example, the flag for the Persian Empire is light blue and has a centered black sword. This choice of icon is difficult to understand, as the sword did not play a major role in any Persian flag until a lion holding a sword was introduced during the Qajar dynasty [19]. At best, the flag references a single element from an authentic Persian flag which did not come into existence until two thousand years after the fall of the Persian Empire [15].



Figures 1, 2, and 3 From left to right: The default flag for the Persian Empire in *Civilization IV*, the personal standard of King Qajar, the modder Rhye's representation of a historically accurate flag for the Persian Empire

3.1.2 Flags as means of improving Historical Accuracy

Almost immediately after the game's release, modders began creating flags which they perceived as more historically accurate than those packaged in *Civilization IV*. The process of creating a flag necessitates a great deal of historical research. For example, the user Strategyonly, created eight separate American flags because the flag used by the American civilization did not accurately represent the flags used by the irregulars of the Continental Army [15].

Figure 4: Eight different flags created for the continental army in *Civilization IV* created by StrategyOnly

The creation of different flags to be used by the same army presents game players and students with several higher order thinking questions. Beyond memorizing the different flags employed by the Continental Army, the student may question what each flag represents. Why for example, does one flag include a snake? And after the flags are examined and explained, the user might consider the implications of an army that used so many different flags. A lack of a uniform flag would naturally lead to questions about the lack of a uniform army.

The process of flag creation is more difficult when there is no historical record of an empire's flag. The user Bad_Ronald described this situation: "For some civilizations, I designed a flag from the perspective of 'if in the time this nation/leader existed, the modern format of flags was made use of, what might their flag look like?'" This process of evaluation and synthesis requires a user to create paradigms regarding a culture's use of color and iconography [15]. For the Chinese flag, Bad_Ronald chose to use the imperial colors of purple and yellow as well as the traditional imperial dragon. For the creation of the Roman flag, Bad_Ronald used blood red and a laurel crown centered over SPQR, the Latin abbreviation of the Roman Republic [15]. Each of these changes required knowledge of each culture present within the game, that culture's national religion, and its national icons.

Figure 5: Flags created by Bad_Ronald for *Civilization IV*

Note that the Persian flag now features a Faravahar, an individual guardian angel with a man's head and a hawk-like body, which is a Zoroastrian symbol used in the seals of Achaemenid kings [10]. To create this flag, Bad_Ronald had to identify the time period most closely associated with the Persian Empire, the state religion of that empire, and a suitable icon to represent that religion.

Modders frequently create more than one flag for the same civilization [15]. A choice of flags forces the user to recognize that the national character, or at least the national iconography, of the same civilization may change over time. It also creates additional learning opportunities as users request information to help them decide which flag to use. When constructing a scenario set in 1901, the user MaxRiga asked which flag should be used for the Prussians. User 0d1n3oo3Broad responded [15] "since in 1901 prussia [sic] was part of the Kaiserreich i [sic] would say flag 4, 5 or 6. and [sic] thanks that you use my flags in your mod."

Figure 6: Eight flags created by Od1n3oo3Broad for the German/Prussian faction in *Civilization IV*

Discussions on flag choice often evolve into greater debates over the names, units, tactics, diplomacy, and national character of different cultural groups. For example, the users Thamis and Spirit_Viriato discussed possible symbols to represent a newly created civilization, the Iberians. In the course of this discussion, Spirit_Viriato questioned the use of term Iberian, (suggesting that CeltIberian would be more correct), suggested that the "triskel" or "tetratraskel" be used as the symbol for the flag, commented on the difficulty of creating only one flag as the Iberian Tribes never united, and provided a list of CeltIberian cities. Thamis responded that the Triskel was too similar to the Celtic Knot, which was already used on the flag for the Gauls. This in turn led to a discussion on the diplomacy settings for the Gauls and Iberians. It was later decided that the flag should feature a vulture, horse, or wolf, as they regularly recur in Iberian art. The vulture was finally decided upon after it was determined that the horse would be better suited for the Scythians and the wolf for the Getae [15].

This dynamic conversation highlights the educational components of the flag creation process. In order to arrive at a satisfactory flag, users had to first consider the historical record. When no clear flag or forerunner to a flag was discovered, a new flag had to be constructed. After considering national symbols, the modders had to weigh the importance of historical accuracy against the importance of uniqueness in reducing a player's confusion [15]. By eliminating symbols which too closely resembled other icons already in use, the modders created a flag which performed its original purpose (as a tool for demarcation) while simultaneously communicating the national character of a cultural group.

3.1.3 Flags as Cultural Expression

A choice of flags also gives the player the opportunity to select the time period or cultural position with which she most identifies. For example, a player may select from three different flags for the Roman Civilization. The player may wish to emphasize the Christian characteristics of the civilization, and so she may choose to use the Labarum (the Chi-Rho symbol used by Christians and the Later Empire) rather than the default flag or the SPQR flag.

Figures 7, 8, and 9 From left to right: The default flag for the Roman civilization, Rhye's modified flag for the Roman republic and early empire, and Rhye's modified flag featuring the labarum.

Modders may create a set of flags in order to make a statement about the use of icons throughout history. Strategyonly created a collection of flags which featured the swastika. Along with the expected Nazi banners, Strategyonly also included a Hindu flag as well as the flag of the Kuna Yala, a semi-autonomous tribe in Panama. Strategyonly posted links to Wikipedia [15] to guide users in understanding the meaning of the swastika in its various cultural contexts.

Figure 10: Four flags created by StrategyOnly to demonstrate different uses of the swastika

3.1.4 Flags as Self-expression

User-generated flags also give game players an opportunity to identify their own personal interests outside of the scope of *Civilization IV*. These flags may reference a subculture which the creator considers herself part of, such as being a fan of *Star Wars*, or of *Batman*, or of a specific football team. Self-expression flags represent a larger trend in the modding community, which regularly references or wholly imports elements of other games and media. The melding of two cultural environments, be they fictional, as in the case of Warhammer characters designed for *Civilization IV*, or historical, such as the design of Russian tanks for a WWII scenario, allows users to seek out a friend base of like-minded individuals who share their own diverse interests [16, 19].

A modder may form a bond or recruit a programming partner by declaring her appreciation for another environment. In this way, though the end product may occasionally seem lacking in educational value, such as Civilization flags based on comic book villains, the process of collaborative expression creates an online community that is "vocal, influential, highly social and considers itself self-regulating and, to a certain degree, self-determining" [11a]. The result of this agency is a more diverse base of programmers who are eager to make games their own [13a]. This leads to the creation of speciality and niche games, which, according to Au [1a], feature "gameplay elements that the industry is too conservative to implement, or non-creative to come up with."

4. RECIPROCAL INNOVATION

Modding communities allow contradictions to flourish. A modification can function to both increase and decrease the reality of the underlying game, and indeed the same graphic modification can be used to accomplish both tasks. No hierarchy of modding exists; for example the user Woodelf has created a new graphic, the vulture. This user was not told to create this graphic nor does the user have a specific use for the graphic now that it has been created. Perhaps it will be incorporated as a unit, a food resource, or a background graphic with no explicit function. The final use for the graphic (if it is used at all) will be determined by each individual modder [15].

In the case of the vulture, the user Woodelf explained "I made these [vultures] in hopes that the [fantasy] guys would use them to represent corpses or piles of dead on the battlefield. I suppose they could be used for something else, but I don't exactly know what." The user Chamaedrys suggested that the graphic could work as a "bird's zoo". Woodelf commented that if the graphic was modified the vultures would look like eagles and could be used for "Halfling Eagle riders" or "goblin vulture riders". The user Ranbir made the suggestion that eagles would be a health resource, as they are trained to kill pests such as pigeons. Woodelf concluded that even vultures could act as a health resource, as they eat carrion.

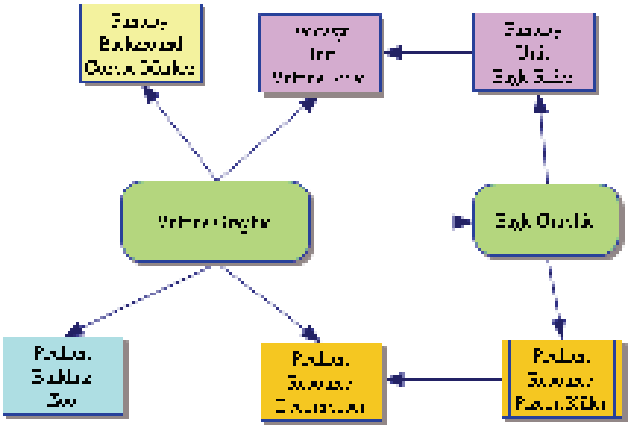


Figure 11: The proposals for different Uses and Graphic Modifications stemming from the Vulture Graphic by Woodelf

Instead of winnowing the uses of a modification for a single desired outcome, modders brainstorm all possible uses for the modification, some of which may be diametrically opposed. This leads to a separate paradigm, reciprocal innovation. A user may create a modification independently, share the code for her modification, which may inspire another user to adopt/adapt the modification, which will in turn inspire future modifications[15]. Therefore a single modification tends to beget multiple modifications, which may have been created to elaborate, redesignate, or balance the effects of the original modification.

4.1 Educational Implications

This paradigm has extensive educational implications since a single modification can stimulate the creation of multiple modifications. These modifications are asynchronous and modular, meaning that they can be implemented in any order and function independently from the original modification. To transport this to an educational setting, imagine a modding community with users from different school districts, centered around a simulation. If one student creates an artefact, say a graphic for a briefcase, that graphic can be applied in numerous ways for different purposes by other users. Another student may use the graphic to designate a unit's function (a business man) or may imagine an explosive device within the briefcase and assign that weapon to a terrorist unit. Yet another student may consider the briefcase similar to a carrying case for a violin and will modify the graphic to indicate this redesignation [15]. All of these modifications may co-exist in the community to be implemented (and possibly reinterpreted) by individual modders.

5. CONCLUSIONS

Modding represents an untapped educational opportunity. The features of existing games, even those features that may be considered unimportant by the game's original creators, can be modified to increase the historical accuracy and thus educational value of the product. This process offers the end user more chances to reflect on her cultural and sociological affiliations while alerting the entire game-playing community of her own interests. Innovative modifications pave the way for further modification**,** each of which is equally viable and potentially equally valuable. This process of divergent thinking creates a rich and diverse selection of game artefacts, concepts, and rule sets, which may be utilized by educational and commercial entities alike.

5.1 Questions for further study

Future studies may determine if the genre of the original game influences the creation of emergent features. The importance of communication networks and knowledge sharing structures within a modding community for the creation of emergent features should be examined.

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