

Game Jams: A New Form of Rapid Prototyping

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ABSTRACT

Military training software development traditionally used slow-moving approaches such as the waterfall model, but in more modern times, rapid prototyping methodologies such as Agile have emerged as an effective way to achieve working solutions quickly. Military training and gaming are closely connected, and an additional form of rapid prototyping from the game development industry is being explored for military software development. “Game jam” events started in 2002, where game developers meet for a short, intense time frame – usually 48 hours - and make a game based on a theme. In November 2021, a game jam focused specifically on prototyping military training solutions for cybersecurity, PTSD, and other challenges. This paper will explore using the game jam process for rapid prototyping of military training solutions to accelerate the initial concept and design phase.

A significant benefit of a game jam is a tangible, playable product in a short time. Within days, teams collaborate, focus on a specific need, and produce a functional piece of software to be evaluated. If multiple teams are given the same challenge, they will create different solutions, providing numerous perspectives/options for the customer. Game jams have been shown to teach not just “hard” skills such as planning and debugging but “soft” skills such as communication, teamwork, and respect. This paper will outline several game jam successes, where jam experiences later developed games into full-fledged commercial products. It will describe the pros and cons and use cases where the game jam process will be valuable. Finally, it will explore the Agile methodology, how it relates or compares to game jams, and how the military simulation industry can use game jams in conjunction to accelerate change in the military training software development industry.

ABOUT THE AUTHORS

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INTRO

Rapid prototyping is one of the best ways to determine if something *is* worthwhile, before spending more than necessary to find out it is *not*. It is a method that is becoming more and more popular for software, including military training software, to replace the waterfall software development approach. One of the more popular rapid prototyping methodologies is Agile, which started in 2001 (Varhol 2019). However, as early as 2002, years before the gaming industry became a cousin to the military simulation industry, a new game development methodology was born: the “game jam.” Fast forward to the present day, and while the military has strong ties with the gaming industry, they have not yet adopted this secret weapon.

A game jam is a short, time-boxed event in which small teams of programmers, artists, designers, and various other contributors, make a game. How short of a time box? Game jams are usually 48 hours, but some run less, and others run more. In contrast, the current source selection and waterfall development process can take years before a tangible product can be seen, tested, and refined; this process needs to be accelerated. What better way to do this than to shorten the initial design process while producing a tangible, playable product instead of a white paper? The important thing to realize about game jams is that through what seems like voodoo magic, a product can be completed in a very short amount of time. This paper will describe how the process works, why it works, and what possibilities it holds for the military training community.

WHAT IS A GAME JAM?

A game jam is an event where game creators collaborate in groups or solo to envision, create, and construct a working version. Over its history, jams have been both in person and virtual. There is value in participating in both; they provide unique challenges that can be overcome. A jam can be a variety of lengths of times. The average is 48 hours, but they can last as long as a decade, as little as a few hours, span weeks, or even months (Dictionary, 2022). Normally, a jam is centered around a focus or a theme; it can be as specific or ambiguous as the jam would like. Some legacy themes that the Global Game Jam (GGJ) had were: “Extinction,” “Ritual,” and last year's theme of “Lost and Found” (Edwards, 2021). As the development schedule is usually very accelerated, the tools and technologies used tend to focus on easy-to-learn game engines such as Unreal, Unity, or Game Maker. A team can use any tools unless the theme or diversifiers express otherwise. Other key tools that have been used in the past are Visual Studio, Photoshop, Trello, Hansoft, Excel, Perforce, Jira, and more. Anyone can attend a jam; there is always something a participant can do to support. They can always aid other teams, whether they are tiny or huge. In fact, in most jams, participants are encouraged to aid other teams. If a team is ahead of schedule and they spot someone with a problem they can assist with, their assistance will go a long way toward completing someone else's project.

History

Most of the early jams were fairly unstructured, with no clear organization. Things did not begin to take shape until later years. Sean Barrett and Chris Heckler launched the 0th Indie Game Jam in March 2002 (Chen, 2017). In the first year, they attracted a select group of developers focused on innovation and experimentation. In later years of the Indie Game Jam, they imposed restraints and limitations on participants' projects. The first virtual game jam, Ludum Dare, was established the following month. This jam was focused on the community; they decided the judging criteria, themes, and any other constraints they wanted to impose (Chen, 2017).

One of the largest early jams was the Nordic Game Jam. This jam was originally started in 2006 by the International Game Developers Association (IGDA), IT of Copenhagen, and several game companies in Denmark. A unique

element in this jam is that the secret theme is not given to the teams until they are formed. This way, it can even out the playing field so that no one gets an advantage during planning (Chen, 2017).

After the success of the previously mentioned game jams, a select group of individuals led by Susan Gold came up with the Global Game Jam (GGJ), a game jam participated in by the entire world. Over 13 years later, they have had 316,742 participants and over 57,045 games and are now the world's largest game creation event ever. Before the COVID-19 Pandemic, the GGJ had over 934 locations in 118 countries (Edwards, 2021).

In 2014, the Indie Galactic Space Jam (IGSJ) was a game jam centered on bringing together space coast industry professionals with experienced game developers to create fun games that generate excitement among the public about space travel and exploration. The jam's theme is space, but allows for creative freedom in the developers' creation (Patel/Hoover, 2014).

Following the success of the Indie Galactic Space Jam, the Orlando community chose to attract another key industry in the medical sector in 2018. The key end goal was to help promote interest in "STEAM" education to the generations that will carry these concepts into the future. The MeGa Health Jam is a healthcare-themed game jam delivered by a collaborative effort between the Orlando game development community, Florida Health Innovators, and sponsorship by the Florida Hospital. Unlike IGSJ, the MeGa Health Jam not only had a core theme but also a series of challenges or categories to help bring awareness and find creative solutions to problem areas (Patel/Hoover, 2018).

The growth of simulation in the city was a natural next step. In 2021, the first ever Armed Forces Jam was held at the Central Florida Tech Grove, a simulation industry innovation facility located in Research Park, to unite branches of the military and Department of Defense clients with development teams to address the problems they are currently facing. Its mission was to develop and build rapid prototype games and simulations for the Armed Forces. All five military branches supported the event and offered challenges for the teams to solve complex problems to improve training and simulations (Orlando, 2021).

GAME JAM SUCCESS STORIES

Many successful independent games started from game jams. Game jams allow developers to be experimental and try something new or take their existing pipeline and stress test it during a short timeframe. Having to target the jam's specific requirements while also managing a team of developers to create a successful product by the event's end can be stressful. However, many attest that the stress on the production during these events forces the teams to find innovative methods to the scope and develop their game properly.

The Global Game Jam alone boasts nearly 30 popular titles released as full-featured games or demos (GGJ, 2017). One particular title from the Global Game Jam is Surgeon Simulator 2013, created by Bossa Games. Initially developed during the jam's 48-hour period, it was later developed over 48 days to create the final commercial product. After its commercial release, the game sold over two million copies and was well received due to its comical gameplay antics. Since the release of Surgeon Simulator 2013, the studio has spun off several successful titles.

Not all game jams are limited to the 48-hour time constraint, though this timeframe is popular due to its short impact on time and resources. The 7 Day First Person Shooter Game Jam (7DFPS) issues a game development challenge of creating a first-person game in seven days. SUPERHOT spawned from this event in 2016 and saw immediate success during its release. The game swiftly received the go-ahead from Steam Greenlight, reached its Kickstarter goal of \$100,000 within 23 hours of its announcement, and has since sold more than two million units across multiple platforms.

While game jams are traditionally public events that invite developers from different industries and backgrounds, they can also be run internally at a studio level. After completing Sanctum 2, Coffee Stain Studios held an internal game jam to develop prototypes. Goat Simulator, a product developed at one of these events, was never meant to be released as a commercial product but was greatly enjoyed by the team that would play it. After its release to market in 2014, the game generated more than \$12 million in revenue, which oversold their other releases, Sanctum and Sanctum 2, by nearly six times their revenues (10 Awesome Game Jam Success Stories, 2016).

Surgeon Simulator 2013, SUPERHOT, and Goat Simulator are only a few success stories from game jam-developed products. While their jam's constraints may vary, they all follow the same core concepts: a quickly developed prototype that proves a concept through techniques and strategies commonly used within game development. These same skills can be applied to military simulation applications through agile and rapid prototyping to create a proof of concept that can be iterated during the development phase. Game Jams are not only gaming-focused, though they heavily focus on the use of gaming technologies. Orlando is home to several industry-related game jams that partner a target industry with the growing developer network to address problem statements by developing solutions during these weekend events. These events invite space, healthcare, and military industries to participate, with subject matter experts from each industry working with development teams directly to create solutions.

During the 2018 MeGa Health Jam event, there were 17 entries from teams ranging from 6 challenge categories, with products developed for mobile, computer, augmented reality, and virtual reality devices. The developers of Boo Boo Snap took first place for developing an augmented reality application that features 3D models and animations that can be activated by scanning an image tracker bandage. Their goal was to create an engaging way for children to become more involved in the care of their bandages through fun and educational experiences. For winning the events, the team won free booth space at local tech events, legal and medical consulting services, and access to office space to continue the development of their product (Dudenhoefer, 2018). Their application was also covered by Fox 35 Orlando, drawing attention to the viability of the application not only for children but for tracking injuries and treatments in the healthcare industry as a whole (Orlando, 2018). Second place went to Zen Bloom for their interactive VR meditation game and third place to bARk, a distraction therapy and anxiety-reducing app for children and adults. It featured an augmented reality dog named ARchie.

The 2021 Armed Forces Jam was met with support from major simulation community actors and military officials, who are utilizing the growing development community to fulfill the industry's demand. Speaking at the event was Capt. Dan Covelli, Commanding Officer of the Naval Air Warfare Center Training Systems Division (NAWCTSD) who noted, "The Navy and other military branches need the simulations they use to train service members to be higher quality, more accessible, and more frequent to keep up with competitors. Tapping game developers in the private sector is key to doing that." (Soderstrom, 2021). The first place winning team developed the Small Arms Collaborative Training Environment (SACTE), a use of force training simulation with fully rigged characters, built for virtual reality headsets, and networked for multiple users to train collaboratively. Following the event, the team brought their game to the Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) to demonstrate their product and capabilities at the Central Florida Tech Grove booth and their own booth. This exhibition of rapid prototyping on emerging technology opened the door for several contract opportunities and partnerships with the team.



Figure 1. Small Arms Collaborative Training Environment

The event also featured a special challenge sponsored by Amentum, which was awarded to Hat Trick, virtual reality, and a computer local multiplayer game. Using a PC-controlled drone to target individuals without hats, the virtual reality player must navigate a bustling environment and adorn people with fancy headwear as a form of nonviolent training. The jam was important not only for the developers but also for solutions experts. John Cunningham, head of government solutions at Unity stated, “Game Jams are a great way to connect to our ecosystem. For Unity, it helps us to better understand our customers and solve some very important problems while having fun.” (Orlando, 2021).



Figure 2. Hat Trick

These connections to the ecosystem, as Cunningham mentions apply to the military industry in addressing major problems in simulation and planning. For the Air Force Research Laboratory, the challenge was directed to the game development industry to submit their solutions to their program titled “Fight Tonight.” During the Air Force Research Laboratory’s Information Directorate in Rome, New York, vendors were asked to submit white papers to augment the human decision-making process in the planning cycle required to produce a Master Air Attack Plan (MAAP) by partnering artificial intelligence and gaming technologies to reduce the timeline to create a MAAP from 36 hours to four. Using artificial intelligence to shorten the planning process while allowing human interference for assessing difficult factors was not the only topic addressed in this request, it was the gaming industry’s years of experience visualizing data for players that the Air Force was interested in employing. Jeffery Hudack, the Fight Tonight technical director, explained, “You can’t just hand over a bunch of spreadsheets and say, ‘Here’s all the data you need to make your decision.’ ... The gaming industry has decades of experience designing user interfaces that take you right to the high-level information you need and then allow you to drill down into the finer-grained data.” (McCullough, 2021). Embracing the gaming industry’s techniques and pipelines also drew great appeal by allowing the foundational systems to be visualized in accelerated time through real-time gaming technologies.

The Fight Tonight BAA was not the first time rapid development was considered for military training. In 2015, the TALOS Time Hack Rapid Prototyping Event (RPE) was held in Tampa/St. Petersburg, Florida for further development on the TALOS Integrated Helmet Prototype with a focus on Visual Augmentation Systems, Bio-Sensor Infused Cooling Base Layer, C4I, and Situation Awareness (SA) technologies. In 2021, SOFWERX, in collaboration with USSOCOM PEO-SOF Digital Applications (PEO-SDA) created the Rapid Integration of Artificial Intelligence (AI) Event. The event included nine subject matter experts to be paired with teams to participate in sprints for integrating AI and AI-enabled technologies into modular, open software-intensive system components. (Rapid Integration of Artificial Intelligence (AI) Event, 2021). These collaborative events provide a means for crowdsourcing solutions for integrating existing technologies and innovating new resources by addressing the concerns and needs of the industry by funneling a range of skill sets and capabilities from the community.

GAME JAM TRADE-OFFS

The game jam process, like any strategy, has strengths and weaknesses depending on its use. For example, a game jam would lose its effectiveness if the software already exists and just needs to be polished. On the other hand, if there is a challenging problem and it would help to have multiple options and perspectives, a game jam would be very effective. Another case where a game jam would be effective is when the amount of time needed to complete the project is unknown. In this case, taking a step toward completion (i.e. a prototype) could help the developers determine how long it would take to develop the various project pieces. Below are various pros and cons of using the game jam process and which situations would benefit the most.

Speed of Execution

A military customer may have various reasons for wanting a rapid prototype. One reason is to address challenges for specific applications, such as command and control across a vast terrain, converge effects from multiple domains, and common situational understanding in multi-domain operations. However, accelerated prototyping in some cases can take up to 18 months (U.S. Army DEVCOM Army Research Laboratory Public Affairs, 2020). The benefit of game jams is that the time to completion can be compressed down to a significantly shorter time.

To first-time attendees of a game jam, making a game in 48 hours sounds like an impossibility. The reason why games can be created so much faster is related to several factors, including the built-in functionality of game engines such as Unity and Unreal Engine. Another reason why a game can be made in such a short time is that several underlying factors are not needed in the initial prototype: for example, accurate ballistics or stochastic damage. Finally, while some valuable initial planning is done in the beginning, there is something to be said for the motto “Just Do It” - the plan can be revised after the prototype is played.

Multiple Solutions for Comparison

Game jams can be run in many different ways. Usually, the participants are given a “theme” that needs to be represented in their game. However, sometimes, it can be more of a “pitch-based” jam, in which a specific idea or ideas are presented. Combining methods, jams can present a specific challenge and invite multiple teams to try and solve the same challenge. The benefit of this style is that each team will solve the challenge differently. This is a live version of a “request for proposal” in which multiple teams are evaluated; instead of evaluating a paper, the customer can have hands-on prototypes to compare.

Source Selection

Source selection is a key phase of the acquisition life cycle and is frequently used for military development. The traditional process for source selection involves the customer writing and publishing a Request for Proposal (RFP) and then bidding on them by writing and submitting proposals. The process can take almost a year; for example, the Air Force acquisition process, as shown in Figure 1, can be 308 days if discussions are needed (AFLCMC/AZ, 2019):

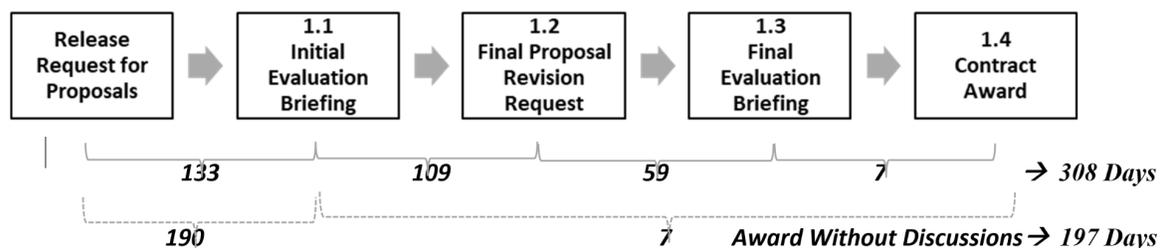


Figure 3. Air Force Acquisition Process

In contrast, a game jam could replace this process by the developers producing a playable prototype instead of a white paper. As shown in Figure 2 below, many related elements exist.

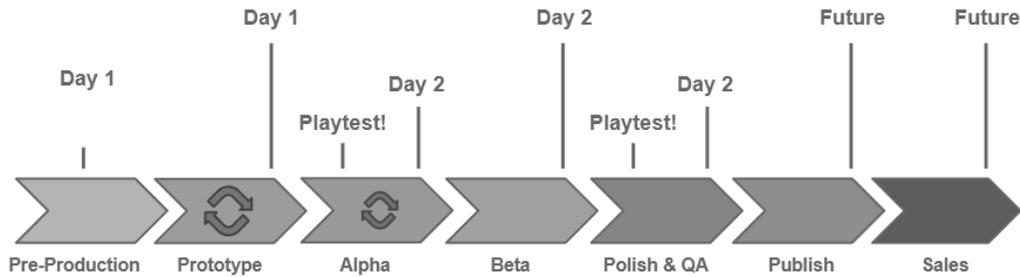


Figure 4. Standard Life Cycle of a 48-hour Game Jam Experience

The game jam’s “Pre-Production,” which happens as soon as the theme is announced, would coincide with the source selection’s “Release Request for Proposals.” Since the customer ideally would be present during the entire jam, the source selection’s “Initial Evaluation Briefing” and “Final Proposal Revision Request” would happen naturally, as the customer could interact with the developer in real-time to help them adjust the prototype to match the customer’s expectations. The source selection’s “Final Evaluation Briefing” and “Contract Award” could happen during the jam after the “Publish” phase, or it could happen at a later date after the customer has had time to review.

Software Quality

Writing software for military simulation has several challenges. One of the biggest challenges could be the complexity of the system. Once the source(s) are selected, and the contract(s) are awarded if using waterfall, the next step is a System Requirements Review (SRR), followed by a Preliminary Design Review (PDR), followed by a Critical Design Review (CDR), and after implementation, a Test Readiness Review (TRR). The amount of “gates” in place for software development would seem to ensure a quality product. However, due to tight deadlines, sometimes quality is lessened (Blanchard, J.E., & Kloepping, P.J. & Vogt, D.E., 2016). The problem of tight deadlines reducing quality should be more evident when a deadline is compressed into 48 hours. So how is this mitigated?

When building a game during a game jam, the developers can use the same quality principles used in long-term projects. For example, a game jam always starts with a design phase; this is crucial to success. Also, things like code reuse and clear comments could still be used. In other words, good developers will make a quality product whether they have two years or 48 hours. Also, in those instances where there just is not enough time, the mitigation is to have a “clean-up” phase between the end of the jam and when the prototype is published or taken further.

Keep in mind that while high-caliber developers will make a good quality product in a short period, there is still value in a rapid prototype even when the quality is not there. Whether something is polished or not, if it gets the main point across, it can be used by the customer to determine if they want to take it further or not.

COMMONLY USED GAME TECH

When discussing game engines and their importance in simulation and data visualization, it is important to remember that there are many platforms available for developers. However, not all of them are best suited for the military. Most notable engines include CryEngine, Amazon Lumberyard, GameMaker: Studio, Godot, and most commonly used Unity and Unreal Engine. Custom engines can be used in place of a third-party engine, though they require development support and maintenance, which can increase the overall budget and timeline. Out of the listed platforms, Unity and Unreal Engine stand out because they are both dominating market share, have many similarities, and are both easily accessible and viable for development.

Platform support is vital when determining the release targets for the product. 60% of AR/VR content and 50% of mobile games are made with Unity’s engine. However, both engines have the capabilities to support mobile, AR, and VR products (Gajsek, 2022). While both have their frameworks for supporting XR, integration methods and features may vary depending on the resources available per platform. These resources include access to

documentation, APIs, and community support which can be pivotal when working with emerging technologies. For development teams equipped for it, Unreal Engine is also an open source engine, which allows developers to change the source code of the engine to fit their specific needs. Unity allows its source code to be viewed but requires special licensing to edit it, which must be accounted for in the product's overhead. Both platforms are self-sufficient and do not require frequent maintenance or support, making access to the source code more of a preference than a necessity.

Both engines feature a bulk of resources, forums, assets, plugins, and customizable tools. Both are used in AAA and indie game development. Due to their ability to produce high fidelity rendering and rapid, iterative development, they have now been adopted by many business-oriented solutions (Gajsek, 2022) for healthcare, real estate, attractions, and other industries. When comparing these engines with a custom engine, the accessibility to these features are not readily available, and the engine's owners assume support. Game engines not only boast a vast amount of free support but being readily available to the community allows developers to be onboard faster to the platform, which results in shorter development timelines.

AGILE IN RELATION TO GAME JAMS

When it comes to game or simulation development, there are many different ways to accomplish the project, and waterfall has been the way of choice for many years. Although waterfall is still widely used today, it has some challenges. The biggest risk involved with the waterfall approach is not identifying problems early on. In general, the customer does not get to see the project until it has moved to the testing phase when it is much more difficult to make changes (Kramer, 2018). This is compounded by the fact that the schedule, usually an Integrated Master Schedule (IMS), is based on initial discussions and leaves no room for adaptation once more information is found. This leads to frustration both on the part of the customer (not getting their expectations met) and the developers (not having realistic goals).

Over the last decade, the rise of Agile Methodology has influenced industries across the globe. Agile is more of a framework than a true methodology. Its elements are meant to be used in capacities that help teams accomplish their goals. Different teams require different production methodologies. Agile works for a game jam because of one of its biggest strengths: working software over comprehensive documentation. Ideally, a game jam experience involves one or two mechanics or ideas. The team, which can vary from two to ten on average, must be focused and well disciplined. A key element to consider throughout the jam is collaboration and response to change. As other teammates or users are testing what is being built, the team might find something off or broken and iterate on that particular element to improve or fix it.

The benefit of methodologies such as Agile is more flexibility to focus on the most important features. A game jam takes this concept further in that both the customers and developers, in a matter of days, can get an idea of both the project's level of difficulty and what the finished product could look and feel like.

WAYS TO APPLY THE GAME JAM PROCESS

Currently, game jams are used in various ways that can be leveraged for rapid military prototyping. To determine various uses for game jams, it helps to determine what their potential goals are. Usually, some game jams with younger developers are focused on learning, while others, with ties to various industry partners, are focused on solving problems. Another goal could be to promote various software tools. The goal that seems most appropriate for military training is the "problem solving" goal.

Several jams have been held to solve a particular problem where the format is different from the traditional "make a game based on a theme." Instead of the actual developers pitching their own game or idea, others are brought in from specific industries where they present a need. This could work very well for rapid military prototyping in multiple ways:

- 1) A single customer could present a single idea, and multiple teams could attempt to prototype it. This has the benefit of competition between teams, similar to a request for proposal, with immediate results.
- 2) Multiple customers could present various needs, and a specific team signs up with each customer to produce the prototype. The benefit of this approach is that multiple customers can get their needs met at the

same time. Putting on a game jam takes time and resources, so the more customers involved, the more cross-collaboration could occur.

- 3) Keeping with the more traditional game jam, a game jam could be presented by a specific military branch. All games need to be related to this military branch, and as a result, some of the ideas that come out of it can be pursued further if desired.
- 4) One of the best ways to serve our military is by providing the soldiers with either entertainment or services. A jam could be put on where soldiers themselves pitch ideas for games they would like to see or for a need that they have.

CONCLUSION

A game jam works because *limitation* breeds *innovation*. When a group of developers has a very short time frame, they are forced to focus on what's important. This paper has shown how products that focus on one particular thing have become popular or useful. This paper has also shown that game jams are more useful for up-front design so they can be used as a tangible blueprint for a more fleshed-out and detailed product.

This paper aims to encourage military customers to start to adopt the game jam process as ideas and prototypes are being sought after. Whether they hold events simply to see what people come up with, or use game jams to target specific ideas, this next step in the collaboration between the gaming and military training industry could accelerate change in the traditional source selection process.

The next steps for the military customer would be to reach out to their colleagues in the game development industry and simply ask, "I have a need. What would it take for us to collaborate on a game jam?"

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