

The Value of Game Prototyping Projects for Students and Industry

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ABSTRACT

Game prototyping projects and various types of game development events teach different skills important for working in industry. This includes aspects such as advancing development and project management skills, but also improved effort estimations, first prototypes for portfolios, and strengthening networking and communication skills. Other prospects of such efforts can also be support for and the strengthening of local industry by connecting and training new talents, opening recruiting possibilities, and building a vivid and strong local developers network. In recent years, we have run different types of game prototyping projects in different settings at Graz University of Technology. These have included traditional digital 48-hour game jams, analog jams, development projects running for some months, and projects with an interdisciplinary and international setting. Each format supports different learning goals and has different potentials to bridge industry and academia. In this paper we summarize different benefits of the different formats and compare their potential to support (computer science) students in learning different aspects important for their future career and discuss general aspects related to game jams with potential for strengthening the local industry.

CCS Concepts

• **Applied computing** → **Computer games** • **Applied computing** → **Education** • **Software and its engineering** → **Rapid application development**.

Keywords

Game jams; learning; industry; game development.

1. INTRODUCTION

Game development is still one of the most challenging software development processes because of facets such as its multidisciplinary character and different technological and design-based challenges. However, game development projects are also a highly engaging experience combining innovative technologies with creative designs and ideas. This makes them to an excellent and intriguing teaching tool combining creative thinking and technological aspects [1].

The objective for community events, educational venues, and curriculum design is not to develop final games, but playable game prototypes. This development process is also called game prototyping. The goal is often not the final game, but the opportunity to experience an entire development cycle and to learn the associated skills and know-how. Game prototyping is based on software prototyping methods and is a tool to quickly create a first and cheap playable version of a game to visualize and simulate gaming behavior and enabling first playtests [2]. Game prototyping projects have potential to strengthen the know-

how of the software engineering process such as working as an interdisciplinary team (programmers, artists, audio engineers, project management, design, or quality assurance) in a short time span. The educational value of such game prototyping projects in different settings, such as game jams or as part of the curriculum has been presented and discussed by several authors. Developing games as part of the computer science (CS) curriculum, for instance, is a valuable opportunity for students to advance specific CS skills (AI, networking, computer graphics) and programming skills in an engaging way but also to enhance their project management, collaboration, and communication skills [1][3]. Interdisciplinary projects and events, such as game jams add additional learning factors including independent working in multidisciplinary teams and creative and problem-based thinking. Adding time constraints to such projects (e.g. 48 hours for a typical game jam) additionally teaches time management and rapid prototyping techniques [4][5][13]. Game jams are events outside of a curriculum where students would meet (game) industry professionals, amateurs, non-industry experts and would collaborate [17]. Game jams are an essential asset to strengthen the local developer community, which can provide indie developers with emotional and motivational strength [12]. Networking, the desire to learn, and new engagements due to social aspects make jam events important and valuable occasions, of real significance for the local community [16]. The immense growth of game jam events in recent years [14] also draws the attention of local industry to game jams as connecting and recruiting opportunities.

Some views from outside academia have also been presented on the benefits of the game jams. Develop Online, one of the leading game industry publications, writes about game jam participation benefits such as networking and recruiting, teamwork skills, time-boxing skills, testing new ideas, building portfolio pieces, and rediscovering passion by senior developers [6]. In one of the featured articles from the community of game developers, Gamasutra.com, presents a similar account of the benefits: better estimation of timed tasks, improvement in development "speed", enjoyment, improvement in prototyping skills, lowering the fear for experimentation, completion of a prototype (after a jam), improvement of "overall game development skills", networking, and cutting features [7]. Along these lines, Vungle, a game advertising company writes in its blog about advising game development teams to use game jams since these are: great for getting inspiration, they force the team to focus, can provide the opportunity meet and work with lots of new people, mobile games are perfect for game jams, and that it's a useful team building activity according to their view [8]. In summary, game prototyping projects and game jam events have high potential to connect learning with industrial relevance. But what kind of game prototyping formats would support what kind of skill-

development? How do students experience such prototyping events with regard to career relevance? In the following case of CS education (master’s level) at Graz University of Technology, we have introduced different approaches of game development projects as part of our CS curriculum or in the form of events to connect to the local game developer community. Comparing the numbers of participants in the single efforts and events it is quite obvious that the number of people interested in this field is growing. As the number of participants in these events grows, the number of participants in local community meet-ups would also grow. Different game development projects support different forms of learning and can connect participants to industry partners, support new forms or career development, or provide platforms for innovation.

2. GAME PROTOTYPING FORMATS

While traditional game development processes focus on developing a game, which follows coding standards, and design requirements such as flexibility, reusability, usability, or efficiency, game prototypes have the main goal of visualizing and simulating gameplay and mechanics and enable first test sessions [2]. A simple game development process can be structured in different steps. The most basic illustration of such a process can be summarized as (0) idea development, (1) design phase, (2) development, and (3) testing and gameplay and (4) release of the final game prototype (see Figure 1). In an iterative development process, one would cycle steps 1 – 3 and constantly add new elements after the design phase [12]. While rapid prototyping strategies in e.g. game jam situations would allow only one iteration of such a process, projects with a longer time-span (e.g. student projects) allow several iterations.

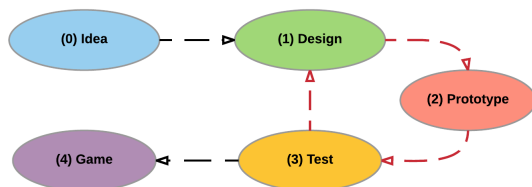


Figure 1. Iterative game prototyping process.

The number of iterations (thus also the time span) is extremely relevant for the quality of the game project and can influence the learning aspects. In particular in game jam settings this process can vary [15]. In the following section different prospects of game prototyping with a focus on educational settings are discussed.

2.1 Categorizing Game Prototyping

Several authors discuss different forms of categorizations, in particular for game jam settings with one form of game prototyping. Game jam events can be different with various focuses and based on different philosophies. Goddard et al. categorize them based on the targeted participants (e.g. indie jams, industrial jams, or academic jams) [11]. Fowler et al. categorize game jams based on their regional affiliation (e.g. local vs. global events), the setting (in a train, on a plain,...), technologies (tools and technologies to be used), career advancement (competitions and jams organized by industry), social/charitable topics, or other specific challenges [10]. Kultima discusses the potential of categorizing game jams in terms of durations, source and types of constraints, social context, rules, targeted participants, goals, and similar factors [9]. While these categorizations are very specific for game jam events, we intend to introduce a framework for categorizing game prototyping efforts with a focus on the

educational context and with more flexibility regarding the time span. We use three main dimensions to describe this framework:

- **Participants:** In the context of computer science (CS) education, for instance, the main participants of game prototyping events (game jams) or game prototyping projects are CS students. In curricular-specific projects, they would work solely in groups with other CS students, whereas, in public game jam events they would be able to work with people from all different fields (e.g. typical game design/development fields such as art or audio). Thus, the first dimension contains the (targeted) participants.
- **Time span:** While typical game jam events are usually set for a rather small timeframe and most often following specific time constraints, other game prototyping projects can also run over several months. Thus, time span is identified as an essential dimension for this framework.
- **Setting:** The setting refers to collaboration efforts of the prototyping team. This can either be a team working together locally, or in a remote setting (e.g. international setting).

Figure 2 illustrates the framework for categorizing game prototyping formats, the three dimensions, and demonstration values.

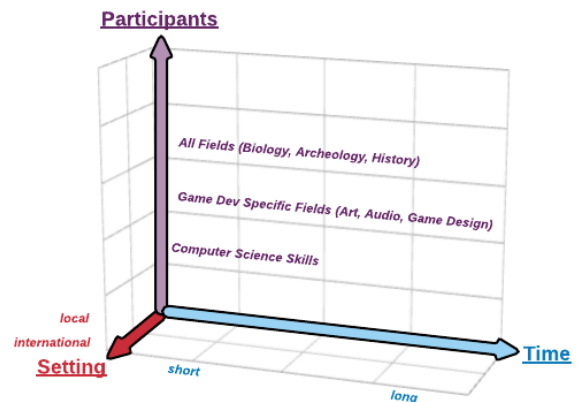


Figure 2. Framework for categorizing game prototyping formats.

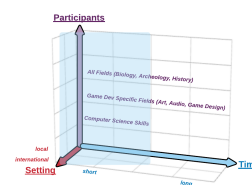


Figure 3. Game jams in the framework for categorizing game prototyping formats.

Figure 3 illustrates a sample categorization of game jam events in this framework (colored in blue). In the following section we describe different formats introduced at our university combined with a first study on benefits for career development and industry.

3. FORMATS & RESULTS

In the following section we describe the case of computer science (CS) education (master’s level) at Graz University of Technology. In the past few years we have introduced different game prototyping formats to strengthen the game development education, the local developer network, and the connection between students and professional developers and industry. The

most recent events/projects include (1) a 48-hours game jam event (the Global Game Jam 2016), (2) a local 3-month game prototyping project for CS students, and (3) an international game prototyping project with a final game jam setup for CS students working together with students from all other disciplines. We have asked the participants of these projects/events to complete a post-survey containing questions focusing on questions rating the potential for specific skill development, for personal career development, and for local industry.

3.1 48-Hour Jams

The Global Game Jam (GGJ) is a jam event constraint to a 48-hour timeframe and a specific theme. In the local setup, participants from all different fields can work locally together to develop games in small groups. After the GGJ 2016 we sent a post-survey to 50 Austrian participants. 25 (1 female) took part in the survey. They were aged between 19 and 35 (AVG=25.96; SD=4.79). 17 of them are currently studying (15 a CS related field). Most mentioned an improvement of their programming skills or their game design skills. Specific improved skills mentioned are experience of “fail fast and early”, teamwork, soft skills, time management, communication, workflow, rapid prototyping, project management, and creative processes. As specific CS skills, participants mentioned subversion systems (git, svn), and software architecture. On a Likert scale between 1 (not at all) and 5 (very important) they rated the importance of such events for their future careers as the arithmetic mean 3.71 (SD=1.08). 14/24 participants answering this question rated the importance as important or higher. They mentioned the following aspects of game jams relevant for the future career development and for industry aspects: networking, teamworking, coordination and project management, rapid prototyping, idea finding and conceptualization, outcomes as part of the own portfolio, working with strangers, time management, and effort estimation. They rated the importance of such events for local industry as the arithmetic mean 4.04 (SD=1.08). 17/24 rated this as “important” or higher. Comments mentioned the potential of jams for networking, marketing, connecting, and recruiting. They also mentioned jams as places to present and connect indie developers and draw more attention to indie development and smaller game-related companies.

3.2 Game Development Project

The course “Game Design and Development” is part of the curriculum for master students of CS. They have 3 months to develop a game (a first prototype presentation after 1.5 month). After the course we asked the students to participate in the survey. 18 students (1 female) aged between 19 and 27 (AVG=23.33; SD=1.97) took part in the survey. None of them had experience working in games industry. 50% have developed a game before. Improved skills they mentioned include teamwork, working in large groups, project management, requirement analysis, idea finding, communication skills, resource management, planning process, and testing. Specific CS skills include working with design patterns, clean coding, subversion systems, programming skills, testing (with humans and not only unit testing). Participants rated the importance of such courses for their future career as the arithmetic mean 3.19 (SD=1.17). They mentioned the following aspects of the game development project as relevant for future career development and for industry aspects: completion of an entire project/game, teamwork, practice, and working in a team. *“We need a lot more courses like this at this university. Developing something collaboratively as a team, although sometimes difficult, is a great experience. In contrast to other*

courses, in this one the students are given a lot of freedom as to what games they want to develop.” They rated the importance of such courses for the local industry as the arithmetic mean 3.94 (SD=1.21). 12/18 answering this question rated it as “important” or higher. They mentioned the potential of this project for engaging more students in game development, interesting for recruiting, and engaging more indie developers. *“The aspect of the project to learn that the beginning is often hard is well taught. It’s important to try things out, see what happens and learn from mistakes.”*

3.3 International Game Development Project

In the framework of an international game development project we introduced a combination of remote working, followed by an international on-site game jam [18]. CS students would work together with students from other countries and from a wide range of different fields (e.g. biology, law,...). First, they would work on the idea and a first design remotely. After this phase, they would meet locally and develop their game in the form of an on-site game jam event. Of the 15 local CS students participating in this project 6 (all male) answered the questions in the post-survey. These students were between 23 and 30 years old (AVG=26.5; SD=2.22). Skills they thought to have been improved include teamwork (in an international and interdisciplinary setting), remote project management and international team organization. Specific CS skills include software tools for project management and advancing programming skills. Participants rated the importance of such courses for their future career as the arithmetic mean 4.00 (SD=0.89) and mentioned aspects such as international teamworking, working with new technologies, working on a project from the design process to a first prototype, and creative working relevant for the future career. The importance of such project for the local industry was rated as the arithmetic mean 3.33 (SD=1.21). Aspects mentioned by students include specifically more interest in the game industry.

3.4 Implications and Discussion

Students mentioned many advantages of such efforts also discussed in the literature (academic and views outside academia). According to the study comments, jam events seem to be important for learning rapid prototyping technologies and working with according tools. The potential for industry partners (networking, recruiting, publicity) is also mentioned several times. Compared to jams, students also mention the learning of other development-related aspects, which would require more time (testing, quality assurance, and planning processes). While the GGJ participants rated the importance for industry of such events as being very high, participants of the international setting would rate the importance for their personal career as high, while they did not see a great deal of value for industry. The international project seems to be rated as a particularly interesting experience for inclusion on the students’ CV. Aspects such as remote collaboration and international communication seem to be important aspects assessed by students in the context of their future careers. Figure 4 illustrates a comparison of the different results of the importance ratings.

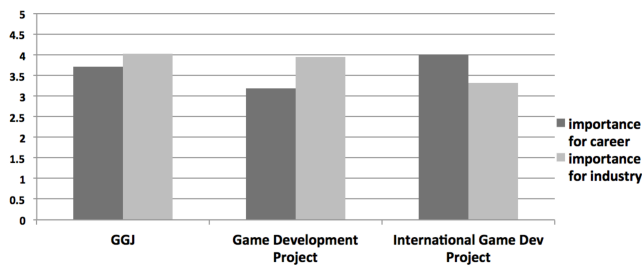


Figure 4. Results of three game prototyping efforts.

The surveys give first interesting insights, despite the survey still having many design limitations. A small number only participated in the survey. Additionally, most of the survey participants were males. For future research it will be crucial to obtain more data on a wider and more differentiated basis.

4. DISCUSSION

In summary game jams and game prototyping projects are not only important tools for learning and teaching computer science related skills, but also for building many other skills of all kinds including industry-relevant skills and a portfolio for a future career. They are also an opportunity for industry to connect with young developers. Traditional 48-Hours Jam forms have a high potential of connecting industry and academia. In particular the participation of developers from industry is interesting for both students, and industry partners to strengthen the network and connect the community. Game projects with a longer time span have a high potential to cover additional development phases (e.g. creative processes, testing, QA) and learners can also focus on specific technological requirements (code reusability, software architecture, design pattern). International game development projects are in particular interesting for students to enhance different skills important for the future career. This includes working with international and remote teams and the ability to collaborate with colleagues from different countries and cultures. It is important to note, that the development of expertise cannot lie solely in the formal education. Game jams are places where participants can connect with other hobbyists interested in game creation, nurture their skills and learn from each other as well as establish connections important for future endeavors (such as establishing start-up companies) and network of shared expertise. National support systems should also cover hobby activity outside formal education systems mimicking such internationally thriving examples such as the Finnish [19] and Nordic game industries [20], heavily rooted in the late 90's demo scene hobby. The highly competitive landscape of game development not only requires quality from the educational systems, but also a broader perspective in lifelong learning. Game jams can cater for all of these purposes at once: supporting the hobby scene, supplementing formal education and also bringing inputs to the lifelong learning of established game developers.

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