Synthesized Essence: What Game Jams Teach About Prototyping of New Software Products

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ABSTRACT
The development of video games comprises engineering teams within various disciplines, e.g., software engineering, game production, and creative arts. Game jams are a promising approach for (software+) development projects to foster on new product development. This paper evaluates the concept of game jam, a community design/development activity, and its positive effects on new software product development with tight schedules in time-oriented, competitive environments. Game jams have received more public attention in recent times, but the concept itself has not been formally discussed so far. A game jam is a composition of design and development strategies: new product development, participatory design, lightweight construction, rapid experience prototyping, product-value focusing, aesthetics and technology, concurrent development and multidisciplinarity. Although game jams are normally used for rapid prototyping of small computer games, the constellation of the mentioned elements provides a powerful technique for rapidly prototyping new product ideas and disruptive innovations.

Categories and Subject Descriptors
D.2.1 [Software Engineering]: Requirements/Specifications—Elicitation methods; D.2.10 [Software Engineering]: Design—Methodologies; K.8.0 [Personal Computing]: General—Games

Keywords
Agile, game development, innovation, new product development, participatory design, prototyping;

1. INTRODUCTION
The development of complex (software+) systems, e.g., automation systems, within a heterogeneous environment requires a systematic integration of various disciplines, e.g., electrical, mechanical, and software engineering. Regarding new product development, we observed similarities to the video games industry, also including various disciplines, e.g., game production, creative arts, and software engineering. Based on these similarities, we see promising options to learn from video game development, e.g., game jams, for application in complex (software+) systems projects with respect to new product development.

Another motivation for looking for new approaches of prototyping software products lies in two yet unsolved conflicts. First, through the recent introduction of "App Stores" on many software platforms the trend to time-based competition strategies like fast-to-market and fast-follower has intensified and so requires a rethinking and innovation of established production and management approaches. Second, recent research indicates that the video games industry has still substantial problems in identifying key requirements of their products in early phases. Therefore we decided to critically examine the concept of game jam towards its potential of sketching interactive software prototypes within the least possible amount of time and if it would be reasonable to conduct further research on the topic.

We focus on the game jam approach because (1) the approach is now used in the field for over a decade, (2) there is a proven track of economically successful games that has originated out of game jams, (3) since last year there is an annual event named "Global Game Jam" that runs game jams for two days in locations around the globe and that collects and examines the results of all participating game jams. Based on these observations we were curious to see what elements precisely give game jams their accelerating effects on new product development.

Typically, game jams consist of a set of key rules that outline the general event dynamics:

1. The goal is to rapidly prototype tiny, experimental games and by doing so injecting new ideas into the games industry.
2. There is a general thematic focus that all created games must share.
3. Everyone who can contribute to the game's production can participate.
4. The event is time-boxed with 24 - 48 hours.
5. Ad-hoc team formation is encouraged and the team size should remain between 2 - 5 participants.

\textsuperscript{3}www.globalgamejam.org (last visited 3/1/2010).
6. The event is software and hardware agnostic, so every team can realize its vision on the platform and tools with which it is most proficient.

7. At the end of the event there is a public presentation where the best products are awarded by an expert judging panel and the audience.

Interesting aspects in these simplistic constraints lie in the hidden implications, as the following sections will show.

2. GAME JAM DISSECTION

In the following, we examine the concept of game jams on a macro and a micro scale. On the macro scale we characterize the game jam among other processes and techniques whereby on the micro scale we identify the structural components of the game jam approach.

2.1 Characterization

This section aligns the game jam towards other methodologies and processes in three steps.

Interaction Design Paradigms
The first step positions the game jam in the range of interaction design paradigms. The three design account categories of Fallman [7] serve as the basis for roughly positioning the game jam in the design space. Game jams as reflective team activity definitely refuse the romantic account of the lonely genius inventing ideas from scratch [9, 14]. In contrast to many software development approaches, game jams also refuse, as Fallman calls it, the conservative account, which sees the end product as a result of a rational, fully transparent search process which is structured by guidelines, design methods and scientific laws [7]. Due to its rules and the authors’ own experiences, the game jam fits more into Fallman’s description of the pragmatic account, an approach also used by innovation leaders like Pixar [4] and IDEO [13]. The pragmatic account sees design coming from a reflective, know-how bricoleur, self-organizing system whose strengths lie in compound seeing and experience. The end product is the result of an ongoing dialog, a reflective conversation that presents a solution to a unique, situation-based problem whose constraints are mainly defined by the designer [7].

Systems Engineering Process
The second step identifies the development process structures within the game jam. Since there are except the aforementioned seven rules no additional constraints, a game jam fits no known software engineering process. Therefore we extend our scope by examining if a game jam realizes a basic system engineering process (SEP) depicted in figure 1 including: requirement analysis, functional analysis/allocation, requirements loop, design synthesis, design loop, verification and balancing [16]. Like the SEP, the game jam realizes on the team level a comprehensive, iterative and recursive problem solving process. In a game jam, requirements and functional scope are balanced towards the remaining development time and the team’s tool proficiency. Design synthesis and requirement verification are achieved by applying techniques from agile testing like exploratory testing, scenarios and usability testing.

With respect to Crispin’s agile testing quadrants [6], testing during a game jam is mainly described as manual, business-faced and product-critic which is due to the end product evaluation (rule 7) and the low code complexity. It seems that the SEP maps the game jam production workflow rather well; however further study is needed to provide an adequate basis of proof.

Existing Collaboration Concepts
In the third and last step we express the concept of game jam with similar, already existing collaboration concepts with the goal to identify game jam-specific peculiarities. In order to develop a persuasive end product, teams require designers, artists and programmers causing game jam to be inherently multidisciplinary. A comparable cross-boundary collaboration strategy can be found in the spark summit concept of MIT’s Innovation Lab. The goal of a spark summit is to develop 1-3 “inventions” that could address a community-defined challenge [10] and is therefore rather identical with the game jam goal. The Innovation Lab summarizes the benefits for the participants of a spark summit as (1) offering a wider network of people with similar interests, (2) deeper appreciation of perspectives about technology and about strong community, (3) possibility to identify new opportunities for existing products [10]. The Innovation Lab is also very clear about team member requirements that are necessary for teams to be successful. The following participant types have been identified by the Innovation Lab as desirable: a good facilitator, a rapid prototyper, an issue holder and a boundary spanner (someone able to mediate between different disciplines) [10]. Although it is understandable that the game jam shares the same participant benefits, it would be interesting to see if these participant types can also be found within game jam teams?

Due to its rules, a game jam can also be understood as a type of a design game [1] with the difference that every team “plays” its own version of the game depending on the used platform, tools and modeled interaction aesthetics. By this a game jam realizes a form of current set-based development, since the sum of all end products represents a thorough approximation of the scenario that was set by the theme (rule 2).

Taking the previous paragraphs into account, a game jam can be summarized on a macro perspective as a pragmatic approach to sketch interactive software system with the goal to identify new product innovation opportunities.
2.2 Game Jam Elements

On a micro perspective we have decomposed the game jam into known techniques to get a better understanding of internal process dynamics. Figure 2 depicts the eight identified elements that will be discussed in the following.

New Product Development: A game jam as short term new product development activity contributes with its results to a knowledge basis for strategic portfolio planning. Decisions can be made on instant hands-on experiences instead of concept slideshows, since the created code artifacts are interactive executables.

Multidisciplinarity

Concurrent Development

Participatory Design

Lightweight Construction

Aesthetics & Technology

Rapid Experience Prototyping

Game Jam (Innovation Factory)

Product-Value Focused

Figure 2: The game jam as a mix of design and development strategies.

Participatory Design: Offering ideas is safe for anyone during a game jam. So the risk is reduced of slipping into a "not-invented-here"-attitude, that is avoiding the use of already existing knowledge because of its different origins. Hargadon notes that such an attitude is particular harmful for any substantial progress [9]. Since there are no prescribed team roles like designers or testers, risks are reduced that development decisions are made because of functional role or organizational hierarchy. Any idea that leads to an immediate increase of noticeable product value is favored over ideas that pay off only in the long run.

Lightweight Construction: Thomas Edison once said "to invent you need a good imagination and a pile of junk". A contemporary translation of this quote could be "... a pile of ready-to-use framework components". During a game jam, rapid prototyping is facilitated by using project templates, starter-kits and other instant executable code. More complex program behavior is mocked. Relying on prepared code reduces design task uncertainty, thus reducing product complexity and improving timeliness within aggressive development schedules as Swink [15] notes.

Product Value-Focused: Only those features are implemented that cause a noticeable product value increase. As time is the limiting factor, it is important to identify the smallest set of key product features that contributes to the largest utility gain from a customer’s perspective. The big amount of multidisciplinary input and the time limit often let participants slip into an "easy-come-easy-go" mentality, causing them rather to reject an idea and try a new path than to forcefully stick to an idea no matter the costs. There are indications that by this the game jam approach could be used to reduce the risk of feature bloat in early product development phases, that is adding functionality to a product that is actually not used by the customer [12]. This topic presents itself as an interesting starting point for further research.

Rapid Experience Prototyping: Based on their strong focus on interaction experience aesthetics, game jam end products resemble experience prototypes. Buchenau et al. [2] describe "Experience Prototyping" as explorative experiments with existing products or mock-ups with the goal to emphasize the subjective usage experiences. Game jams fulfill Buchenau’s description as they bypass technical obstacles by heavy usage of mock-ups or by modifying existing products and by favoring aesthetic integrity over technical qualities like scaleability or stability.

Aesthetics and Technology: The subjective usage experience is the main balancing factor between aesthetic necessity and technological feasibility due to the prescribed time limit. Pixar’s John Lasseter summarizes this trade-off as "technology inspires art, and art challenges technology" [4]. The end product evaluation is business-faced and product-critique, so it is not advisable to invest effort in areas like system architecture and code reusability, because these are no main criteria.

Concurrent Development: During a game jam teams between 2-5 people work on small game prototypes matching a given theme. Since each team can choose its tools and the distribution platform (PC, mobile device, video game console), game jam results can be regarded as a collection of solution sets that approximate a given problem domain. Game jams retrieve most of their innovation power, because of their set-based concurrent development (SBCD) nature.

Multidisciplinarity: A further factor that seems to let the SBCD approach perform well is that each team member comes from orthogonal knowledge domains e.g. programmer, graphic artist, audio designer but also with different experience levels. Students, professionals and hobbyists work shoulder to shoulder, thus bringing many different paradigms and experiences together and so increasing the likelihood of coming up with unexpected problem solutions. Collaboration is always safe for participants, because game jam rules cast an environment that differs from the daily work of e.g. a professional software developer. Therefore it is no shame if a professional is outperformed by a freshman student. Game jams are innovation sandboxes that stimulate explorative experimentation outside of daily communities.

On a micro view a game jam unveils itself as a collaborative, multidisciplinary, concurrent set-based development approach for experience prototyping. It is understandable why game jams gain increasing popularity among the interaction design community and trend to be favored among other design approaches.

2.3 Further Research

Critical observation of the game jam concept has shown that the approach indeed consists of elements that provide the preconditions for an increased innovation potential. Yet further research has to be done how such a potential can be integrated into requirement and design phases of existing software development processes. Also the concept has to be decoupled from the game context and transformed into a more generic form that we call "X-jam". Examples of a con-
crete X-jam instance could be an "Urban Service" jam where participants are invited to come up with solutions that make use of location-based services in the urban space. Another example would be a "Tablet" jam where participants should come up with software for unusual daily usage of tablet PC devices. The next step in our research is the data collection during the Austria game jam. During this 48 hours game jam we plan to answer the following research questions:

1. How does a development process (process steps, artifacts, role model) during a game jam look like?
2. Which rapid/experience software prototyping techniques are applied within time-oriented, competitive project schedules?
3. What elements hinder the current game jam concept from being applied in further domains?

In order to answer these questions we (1) conduct a participants survey before the start of the game jam, (2) run a constant observation report during the event, (3) study the process and project of a single team during the game jam in detail and run a retrospective interview with the team after the event.

In the long run we seek to retrieve more information about how the rule-set of X-jams has to be structured so that they can be used outside the interaction design domain and to identify a set of ready-to-use practices that support multidisciplinary rapid experience prototyping by observing the local rapid prototyping community in practice.

3. CONCLUSIONS

Game jams are a pragmatic approach on short-term, end-user focused experience prototyping that gain innovation momentum from concurrent development, cross-boundary collaboration within teams, time-boxing and by applying techniques for lightweight software development. They are a best-of compilation of flexible design and development strategies and can be of valuable assistance in clarifying key product features in early project phases within comparably less time. By transforming the game jam concept into a domain generic X-jam it would widen the audience for this concept and could present an potential enrichment of current software development processes. Based on these findings, the game jam concept can also support new product development of (software+) systems within an engineering team in a heterogeneous environment.

4. ACKNOWLEDGMENTS

This work has been partially funded by the Vienna University of Technology, in the Christian Doppler Laboratory for Software Engineering Integration for Flexible Automation Systems, and by the Austrian Federal Ministry of Economy, Family and Youth.

5. REFERENCES