Exploring the possible usage of agile games in project teams' productivity

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Abstract— **The escalation of productivity is a key issue in IT based organizations, where the major drivers are lower cost and shorter time-to-market. In this paper we investigate possible usage of agile games and their possible usage which can impact productivity of Project teams. This research defines a set of greatly interactive games and actions that inspire partnership, communication, and proficiency thus ultimately increasing the productivity of the team. Defining the metric for productivity remained a controversial issue; however we defined it as ratio of output (implemented features) to input (effort time). So our definition states Higher Productivity is more scope delivered within the same time frame. We conducted two case studies in IT industry of Pakistan and examined data from two projects that we followed for six weeks. The teams were subjected to various agile games. As a tributary finding, we also ranked the agile games in terms of their efficacy. Although some acknowledged influences still sway project teams' productivity, new dynamics arose from the interviews as potential productivity factors impacting project teams.**

Keywords—*Agile games; project teams; team productivity, IT based organizations*

I. INTRODUCTION

Lower costs and shorter time to market are key issues in an IT industry. Resultantly, numerous studies have been carried out to address these concerns by propositioning and scrutinizing processes, methods, tools, and best practices; however conveying on time and at budget are particularly meager; and productivity has not presented much development over time. Defining the metric for productivity remained a controversial, however we defined it as ratio of output (implemented features or maybe lines of code) to input (effort time). So our definition states Higher Productivity = More scope delivered within the same time frame. There is a lot of mental work involved in any IT organization in which knowledge is used as a dominant part of the work. Therefore, the concept through we interpret productivity may be even more different since knowledge creation is a very tedious task in itself. Project managers are nowadays more conscious of the significance of elements that effect team productivity in projects. To manage productivity in IT industry, it is imperative to recognize the most relevant complications and cultivate policies. Agile processes adapted across the world evolve as approaches that simplify the development process.

The agile methods aim to abbreviate the development time vis-à-vis deal with the foreseeable deviations resulting from market dynamics. Therefore, there is an acute need to adapt such procedures which have been tried and tested successfully across the globe, in IT industry of Pakistan too. Our research paper aims to prove this fact in this geo-political setup of Pakistan.

II. LITERATURE REVIEW

The review of literature considered for conducting this research work was primarily focusing on the following areas.

- What are agile games?

- Is there any existing literature that explains specific studies concerning teaming and productivity in projects?

- Are there any studies that explain usage of agile games in productivity?

According to Pikkarainen et al., (2008), agile development is a common terminology in the field of IT and software. It actually works on the foundation of a conceptual framework which enhances the adaptive learning, incremental development, iterative software releases, and rapid responses to change. Agile methodology was espoused by carbon five because it is a vigorous, efficient process that can be adapted well as per the needs and requirements of different clients and projects. West & grant (2010), concluded that the term "Agile" might be used to express a general sense but it has variety of flavors. Schwaber and M. Beedle (2001), defines a game as a "problem-solving activity, approached with a playful attitude.

Bohem (1987), concludes that in the context of work, games can offer an alternative to traditional processes that do not typically optimize for collaboration and transparency. Hence the game "rules" codifies new behaviors and reinforces organizational best practices. Additionally, the playfulness endemic to games can help make these practices easier to introduce and institutionalize. A. Trendowicz and J. Munch (2009), describes that Redefining the Agile activities as "games" increases the likelihood that these practices will be used, allowing anyone inside the organization to suggest their "play."

A hyper-productive team is a phrase often used in literature (Simon, 2010) to identify those project teams that have attained a state of ownership, commitment and collaboration that actually makes them more productive and efficient in creating "product value" on a regular basis. According to M. R. S. Wagner (2008), a Hyper-productive team is not a simple term to define. You can't define it, but you know it when you see it". Hyper-productive teams are not only talented; rather they are the biggest contributors towards the creation of a hit game.

Dyba and Dingsoyr (2008), investigates the benefits, limitations and the strengths of using agile methods. They also identified four studies drawing a comparison between the productivity of the agile teams and teams using conventional development methods. Three out of those four studies revealed that using the agile games increases the productivity of the project teams to a high level. Hannay and Benestad (2010), conducted a research regarding productivity threats in a large scale agile development project and revealed ten hidden productivity threats as assumed by the project team members. While describing the productivity factors, Petersen (2011) recommends that new productivity factors should be considered with the updating in the developing software, and with reference to a new context, old productivity factors should be re-evaluated in order to enhance the project team's productivity.

These reviews from the literature are entirely based on the most relevant sources and included only those factors that had some empirical work studying the effect of the factor on productivity of the project teams. We did not include studies that do not provide novel findings on productivity factors, such as work factors without any new insight, or essays discussing productivity factors without any empirical evidence. Moreover, as we are considering team productivity, we will not discuss factors influencing individual or organizational productivity.

III. RESEARCH METHODOLOGY

Before This research focuses on the succeeding research questions (RQ):

• RQ 1 What is the possible usage of Agile games in increasing productivity Project teams pertaining to IT sector of Pakistan?

• RQ 2 Which agile games may be deemed as most effective in increasing the productivity in Project teams of local IT industry?

To riposte our research questions we executed two case studies in the local IT industry. The criteria for case selection were IT companies in different business segments, geographical location, size, structure, culture and areas. The unit of analysis is a set of two development projects, one company each. We chose to follow the teams for six weeks because of limited number of time available to us. All projects had begun and were in advanced stages. Moreover, we signed up a non-disclosure treaty with companies regarding nature of projects. This step was vital to institute a proper link between us the researchers, and companies; and certify data discretion.

Axact is a large financial corporation with more than 3000 IT employees who had previously used plan-driven development processes. The company managers decided to adopt agile to increase team productivity. Project 1 is a re-development of an existing system for the financial market involving several institutions. The project started in December 2013, and is estimated to last for one year. Multilynx is recognized as an icon in Pakistani IT Sector for more than fifteen years now. It employs approximately 800 developers. Project 2 is a new development of an ecommerce system in a market with other competitors. The project January 2014 but does not have a specific deadline, although a careful study of OPAs suggest that it should conclude by the end of same year

A. Data Analysis through Experimentation

Our data analysis phase of the research comprised of experimental study of our Hypothesis that agile games {independent variable (IV)} impact on productivity of Project teams {dependent variable (DV)}. As the most rigorous test of a hypothesis which specifies that changes in IV cause changes in DV. The fundamental requirement of an experimental design is that the researcher has some control over the variation in IV and can control the influence of other variables. Every game used, had a set of pre-defined objectives and checklist, explaining when the game had to be played, who all would play the game, the duration of the game, the equipment to be used for the game, rules and alternate rules for the game.

B. Standing daily

It was a short game for highlighting the project status. It was a planning meeting for the entire project team that was highly structured, short and fast paced. The meeting was less onerous than a typical meeting. The team players stood in a circle. It was aimed at building a strong sense of team collaboration and to achieve a high level of transparency and accountability in the work of every individual team members.

The primary objective was to maximize communication between team members whereas secondary objectives included the early identification of risks and bottlenecks, ensuring equal contribution from every team member and to deliver the work on time while having an element of fun at the same time.

The meeting took place daily at 10:05 am and had the complete project team, including the designer, developers and product owner, as the participants of the meeting. Usually the meeting prolonged for 15 minutes and no particular equipment was necessary to play this game, but standing in a circle around an empty space was preferred.

The game proceeded either clockwise or anti-clockwise thus depending upon the preference of the team members. Upon the turn of every player, the member had to describe, that what he/ she had done yesterday, what he/ she planned to do on that day, what was creating a hurdle in his/ her performance and any bottlenecks in the assigned tasks.

C. Mad-lib stories

The specification for the units of work performed by the team members is called a story in agile development. This story can be thought of as equivalent to a "use case" or a feature with a limitation, that a story is always explained in terms of its benefits to the end user. Every feature that is shown in the final product starts its life as one of these stories. These stories are written in the form of fill in the blank mad lib, a technique that is used to encourage good story design.

The primary objective of the mad lib was to highlight discrete features that were going to be made for the project. Secondary objective was to avoid over specifying the features and keep the stories in the frame of their value to the end user. It was part of the planning phase and lasted for about two weeks. All the important stakeholders of the project team were present in it.

An hour per week was dedicated for story writing by the project teams and it ensured that the planning of the project was done regularly and organically throughout the course of project. Two to five minutes were given to write a single story. The stories were written either on index cards or sticky notes.

The game used to start off with the basic rule:

As a [role], I can [action] so that [goal].

Action was the performance or the task, whereas goal was the "why" of the story.

D. Planning Poker

Another agile game which we used for experimentation was planning poker which was played in the experimentation session in the project teams to calculate approximately the level of endeavor for doing the work needed to turn the stories which were created in the last game into features.

In this game playing cards were being used by the developers of the project teams to indicate that how hard it will be to craft the individual stories. The objective for using this game in the experimentation was to plan precise level of endeavor and difficulty for executing the stories in the project. This estimation was done on a relative level of effort which helps our project team to avoid getting draped on time-commitment based estimation.

Planning poker was played by the project team once a week after prioritizing the stories and they were also played by the team whenever the team members wrote a new story. It helped the team to identify the risks and project blockers. The average time to play the game was 30 min. the measurement unit used in the game was in points. '0' was trivial, '1' was easy, '2' was normal, '4' was hard and '8' was epic. A three point story was understood to be thrice as hard as a one point story.

To start off, the team members selected a baseline story which was relatively a clear-cut story with no exceptional questions, but it should be of average size. The team members then assigned numbers to the story. After selection of the baseline story, the team lead reads the story to the opinion of the entire team. The team then discussed the story for about

two to three minutes and team members then from their desk pick the card with estimated number for the story to assign the level of difficulty. Then the value on the cards assigned by the team members were compared and if all the cards are one of two potential values then higher value was assigned to the story. But there were few cases when there was a widespread in the values, then the team used to discuss the discrepancy and the outliers usually argued that why they think that it is less or more difficult than the other. After this, the entire project team replays the estimation game to find the consensus immediately.

IV. FINDINGS AND RESULTS

After the experimentation, results were ascertained through semi-structured interviews and informal face-to-face discussions with the team members. The interviews were semi-structured to comprehend the aspects impacting project productivity in the team's perception and how they impacted. One researcher conducted the interviews. Every interview was aimed at gathering opinions of different stages of the project. Each lasted approximately one hour, and the interviewees were informed about its importance to the study. We interviewed seven team members, including developers, project managers and product owners, bearing in mind diverse experience profiles.

All of the three games contributed significantly in increasing the productivity of project teams. Table 1.1 is tabulated in light of the results achieved in both projects after experimentation:

TABLE 1.1

Project Variables	Company / Project	
	Axact / Project 1	*Multilynx / Project 2*
Scope Adherence	Yes	Yes
Deadline Met	06 months before deadline	5-6 months off expected deadline
Within budget	Yes	Yes
Customer Satisfaction	High	Very high
Team members response	Motivated Burden free Did not get pushed to the limits.	Enthusiastic No signs of stress

Furthermore, the expert panel was also asked to rank the agile games in order of efficacy in increasing the productive output of teams. Each agile game was graded from 1 to 5 on a scale where 1 depicts of no use and 5 showing highly useful. After initial analysis from the interview, statistical analysis tools of median, standard deviation and mean were calculated. In order to analyze the stability and consistency in the response, Delphi method was used. Multiple iterations of response from experts were collected by using the Delphi Method. Delphi method is usually described as interaction with expert panel and anonymous responses followed by multiple rounds of questionnaires resulting into a statistical pattern.

As suggested by the Delphi Method, experts were again put to questions in second round and third round of interview. However, in following rounds experts were briefed about the summary of trend in answers generated so far. The experts were given an option to revise their opinions in light of the trend generated so far. However, while apprising them the trend analysis, the sources of the answers were kept confidential in order to mitigate "Halo Effect". The range of answers converged and certain stability was evident in Delphi method iterations. The process was considered conclusive when the answers trend in a specific iteration is consistent for more than 75 percent. Table 1.2 depicts agile games ranked in terms of efficacy as deemed by expert panel.

TABLE 1.2

Agile Games	Standard Deviation	Mean
Standing daily	0.68	4.12
Planning poker	0.78	3.84
Mad-lib stories	0.84	3.78

V. DISCUSSION AND CONCLUSION

Our results show that not only is productivity a diffuse notion but also it remains very much associated with quantity. We defined team productivity as the ratio of outputs by inputs. For instance in case of the agile game Mad Lib stories; the story points delivered are the output and the time spent to deliver the story points is the unit for the input. It was evident from the findings that the concepts of timeliness, budget constraints and customer satisfaction are strong indicators of increased productivity as duly prioritized by Agile Manifesto. Similarly the team member response towards these games was also very pleasant. Agile games like Standing daily impose a healthy pressure on team members thus ensuring the timely completion of projects and subsequently avoiding un-humane working pressure which is normally exhibited as the project deadlines draw closer in traditional plan-driven approaches. These agile games also optimize the effort required to meet the deadlines and that too is achieved in a fun environment. In the context of work, games can compromise an alternate to traditional processes that optimizes teamwork and transparency. Hence the game implies new behaviors and reinforces organizational best practices. Additionally, the playfulness prevalent to games can help make these practices easier to introduce and institutionalize.

VI. LIMITATIONS

Our study was restricted to participants of two companies and two projects. The two projects had diverse features, helping to overcome some concerns with generalizability of our results. In the projects, we were cautious to interview fellows playing dissimilar roles on the team, so we could acquire diverse perspectives of productivity. The differences between our results and ones annotated in Literature review emphasize the need for additional research to examine impact of agile games on productivity in widespread organizations and team settings.

An additional restraint of our study is that we trusted upon interviews to derive our results. The dearth of standardization that it infers certainly raises apprehensions about reliability. To lessen some of these apprehensions, we deliberated and upgraded the interview procedure iteratively before data collection.

VII. FUTURE RESEARCH

This study was focused on exploring the possible impact of agile games on the productivity of Project teams in IT industry of Pakistan. As mentioned in limitations section, we confided to two organizations and their two projects due to paucity of time. Although, the research sample was enough to ascertain the trend, but evaluating more projects based at different geographic locations worldwide may conclude different results. So a future research may be ventured by increasing the number of sampling data from diverse locations.

Acknowledgment

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BIOGRAPHY

Ammar Asghar is a student of Master of Science in Project Management in the Engineering Management Department at the CASE University, Islamabad, Pakistan. He earned B.S. in Aeronautical Engineering from National University of Sciences and Technology, Paksitan. Ammar has done research projects for both the academia and the industry. His research interests include 'Productivity Enhancement', 'Strategic Management', 'Six Sigma' and 'Project Management'. He is currently working on his Masters thesis that focuses on Eliciting information from the experts who refrain to divulge.

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Dr. Ali Ahsan uniquely specializes in field of management of 'Information and Communication Technology' (ICT) based organizations in Pakistan. Essentially a core software engineer, Dr. Ahsan earned his Masters and Doctorate degree in the field of 'Engineering Management' with focus on 'Software Engineering and related fields', 'Technology Management', 'TQM', 'Productivity Enhancement', 'Strategic Management', 'Project / Product Management', 'Industrial Psychology', 'HRM', 'OD' and 'Management'; all in relation to ICT industry. Dr. Ahsan has extensive managerial and technical experience. Over the years; Dr. Ahsan had the opportunity of working for both the academia and the industry. He had the opportunity of enjoying core strategic positions within ICT sector of Pakistan. He is one of the few researchers who are continually working for the betterment of ICT sector of Pakistan, with specific focus on soft issues. Dr. Ahsan is a consultant to many ICT based organizations within and outside Pakistan. He has research publication in various national and international conferences and journals. He is member of IEEE (USA), SEI (USA) and IIIS (USA). Dr. Ahsan has implemented and completed major ICT based projects in Pakistan. His major contributions include his Doctorate thesis that focuses on revitalization of ICT sector of Pakistan using OD as an improvement technique, PTCL Billing and Customer Care project, CMMI certification of various ICT based organizations in Pakistan, human resource development for ICT sector of Pakistan, completion of some critical ICT based projects and various research outputs addressing applied issues concerning ICT industry of Pakistan. Dr. Ahsan is a gold medalist and has represented Pakistan and many ICT organizations at many national and international forums. Other than his consultancy work with various government and private institutions, Dr. Ahsan is currently the CEO of The WISSEN GROUP (www.wissengroup.com), Associate Professor and Chairman of Faculty of Engineering Management at CASE (www.case.edu.pk). Dr. Ahsan is also an HEC approved PHD supervisor.