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Enterprise Crowdsourcing Modelsfor Software Development

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Abstract
Crowdsourcing refers to a mechanism of tapping into the collective power of people to perform tasks, solve problems and contribute to fresh ideas. Industry study gave us an insight that broader adaptation of Enterprise Crowdsourcing has been very minimal. Hence, a product-based Information Technology (IT) organization sponsored a research & forward-engineering activity to identify how an Enterprise could leverage the power of the crowd to develop software projects/programs that meet Enterprise norms. This paper talks about key challenges faced by organizations and how crowdsourcing as a solution can benefit the companies. Also talks about the key learnings from the organization's one-and-half year long research activity on how enterprises can adopt crowdsourcing as a mechanism to create or enhance Enterprise applications at a fraction of the cost, twice the agility and with minimal Total cost of ownership (TCO).

Keywords: *Crowdsourcing, Crowd Software Development, Software by masses, Rewarding crowd*

1. Introduction

The term Crowdsourcing is a combination of "crowd" and "outsourcing," devised by Jeff Howe and Mark Robinson and published in a June 2006(Jeff & Mark, 2006). In the same year, Amazon launched Mechanical Turk, a crowdsourcing platform, where people could sign up for tasks, work/deliver them and be paid for doing so. Since then, Industry has leveraged crowd successfully for a variety of purposes, ranging from content translation to vehicle design (Bastian, Shaun, & Peter, 2013). Though companies like Top Coder, Rent a Coder, eLancer etc have well established processes and a business model around crowd driven software development, they are not designed to cater to enterprise software application development.

Our research aimed at two primary aspects, (a) process to optimize utilization of permanent employees (developers), and also providing them with learning and networking opportunities (b) process to optimize utilization of contingent workers, plus a mechanism to create near-instant productive teams that could be assembled or disassembled at a short notice. Outcome of the research to find suitable models for implementing crowdsourcing in enterprise software development and show case how Crowdsourcing differs from traditional models.

2. Literature Review

The term Outsourcing discusses to the use of external individuals to achieve one or more organizational actions, reflecting a corporation contracting other firms to provide services that otherwise be completed by in-house workforces. In some people's opinion crowdsourcing as a Web 2.0 form of outsourcing platform, which highlights the worth of the Internet and interactive technology platforms (Diana, 2010).

Some concepts of the Crowdsourcing and Open Source are related but in reality, Crowdsourcing cannot be equated to open source (Rouse, 2010), as in crowdsourcing context an organization investing in the capital for feedback or solutions has the intellectual Property (IP) rights that is more private than opensource campaigns. Lakhani et al. explained as, in

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open source, satisfaction is in finding a better solution to a challenge and not the payments (Lakhani, 2005), whereas crowd contributors need to be paid in some ways. The items contributed by crowd members can be created without any dependency with others like in design contests or collaboratively such as Wikipedia whereas open source has dependencies with other contributors Malone et al. (Dellarocas, Malone, & Laubacher, 2010). Zhao and Zhu, defined components, processes and actions by explaining Assigner interactions with intermediate platform with certain rules to push tasks and pull the feedback as well as negotiations with individuals on the requests (Yuxiang Zhao & Zhu, Qinghua, 2012).

Crowdsourcing methods have been used for cracking various problems, Seltzer et al. (Seltzer, 2013) have reviewed twenty-four platforms for a diversity of applications such as: business, policy development, event outreach and city planning to . As described by Tarrell et al., Crowdsourcing.org has listed 2670 sites in 45 languages between 2011 and 2013 (Tarrell, 2013). Ghezzi et.al. interpreted their research on crowdsourcing as a framework of input-process-output method wherein first part as Input covering Problem/Task, second part as Process including technology, problem management, session management, knowledge management; and the third as Outcome as in completed task /solution, benefits for solvers and seekers' (Ghezzi, 2017).

3. Objectives of the study

3.1. The Challenge

Traditional Information Technology (IT) models of sourcing developers come with many limitations, when dealing with dynamic business conditions. IT Organizations generally adopt a yearly planning/resource-allocation process, wherein the developers are allocated to projects/programs at the beginning of the year. When new business requirements demand additional resources during the middle of the year, as IT would have not employees to spare, and hence, the project owners resort to contingent workers, or risk losing new business opportunity. It has been seen that contingent workers take significant time to get productive, are very not effective advanced software design/architecture and have a very little understanding of client's context. Added to that, sourcing contingent with the desired capabilities is a time-consuming process. Leveraging freelancers is completely ruled out, as organization could be compromising on security of the application.

IT has couple of challenges w.r.t resourcing, viz.,

Resourcing full time employees:Plan of Record (POR) based – not very effective in handling burst capability (handling dynamic business scenarios). In many cases, ramp times significantly higher than true development time.

Resourcing Contract Based Employees:Time consuming process - Securing a workplace either in Offshore Development Center or Company facility, badging, getting a laptop is in weeks, sometimes higher than true development time. Ramp time significantly higher – Understanding environment, minimal documentation etc.

Resourcing freelance employees;Confidentiality can be compromised

3.2. The Opportunity

The opportunity we had at hand was to identify a mechanism that would help us leverages the power of the crowd (internal as well as external), at the same time, have a clear focus to address associated risks.
Let us first look us at the crowdsourcing resourcing models.
(a) Leverage Employee Volunteers – Leverage the spare bandwidth of our developers to execute projects. It is run as a coding-contest.

(b) Leverage Strategic Vendors – Leverage strategic resources vendors to create pool at the vendor's end (c) Leverage Freelancers through an agency – Leverage freelancers through an agency.

Each of the mechanisms has their own advantages and disadvantages and those would be discussed in subsequent sections.
The vision of the Crowdsourcing for Software development program, as depicted in Figure 1, is to determine the processes and technology necessary to have a well-defineddevelopment ecosystem.Determine business and technical barriers, Evaluate the crowdsourcing landscape across various fields, Evaluate Internal opportunities , identify their potential value to organization, provide recommendations on how IT can effectively execute Crowdsourcing software development, in line with companies strategic objectives.

3.3. Key Concepts

Adaptation of Crowdsourcing involved couple of concepts that would be beneficial for enterprise application development. They include:
(a) Micro tasking - a process by which a project can be broken down into short, relatively-independent tasks that takes on an average of 4 to 6 hours to develop and unit-test.

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Research shows that smaller, independent tasks has a higher probability of being taken up by volunteers

(b) Reduced developer ramp time integration and ramp-time to a few minutes, in place of hours/days

(c) Make project planning an inclusive process, wherein the developer will be able negotiate timelines or rewards with the project owner

(d) encourage participation by assured rewards

(e) Developer need not understand the big picture, understand only the requirements of the micro-task.

3.4. Key Benefits

Some of the advantages that Crowdsourcing offer are (a) Provides us access to a Global workforce (b) Workforce that is available on demand (c) Offers significant advantage in the cost of execution and TCO (d) Micro-tasking offers significant reduction in point-of-failure risks (e) and with minimal operating overheads.

4. Crowdsourcing Models Explained

4.1. Crowdsourcing Models – Comparison

Different models of crowdsourcing have been proposed as a part of the solution that includes Internal Unmanaged Crowd, Internal Managed Crowd, Vendor Managed Crowd, Freelance Model (Ref: Figure 2). Internal Managed and Vendor managed crowd are chosen for the current scope of pilot projects during our research.

4.2. Ideal Candidates for Crowdsourcing

Not all projects are effective when it comes to Crowdsourcing. Some of the characteristics that make it suitable for Crowdsourcing are:

(a) Commonly available skillsets, which ensures a sizeable crowd
(b) Project can micro-tasked – ensures that tasks are not very lengthy which can make developers easily lose focus
(c) Developers not expend to understand the domain
(d) Well documented unambiguous requirements
(e) Minimal inter-dependency among tasks
(f) Technically not very complex

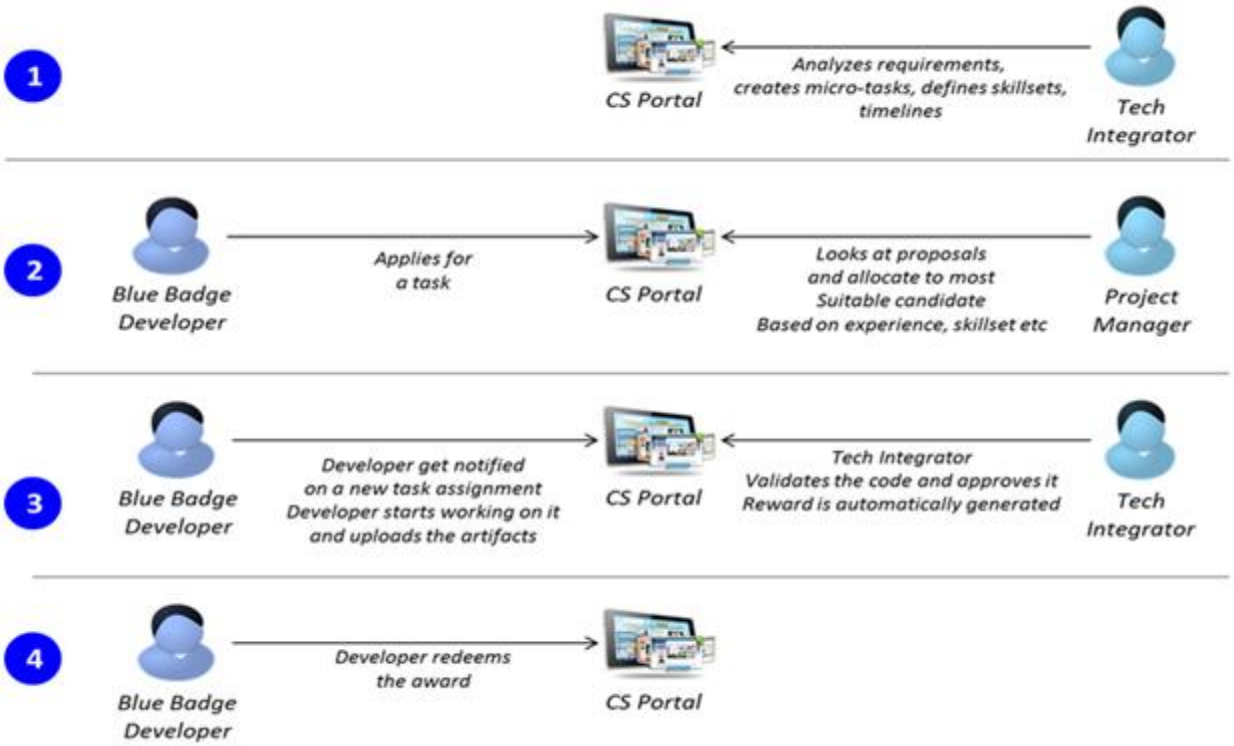

Figure 1. Key processes for Crowdsourcing internal managed crowd

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4.3. Rewards / Payments

These models of Crowdsourcing have different mechanisms for rewards or payment.

(a) Internal Employee Volunteers – A small monetary recognition, along with an endorsement from a senior management proved very fruitful. We referred them as blue badge employees in this document.

(b) Contingent Workers – Their employer was paid based on the hours spent by the Contract worker (Usually a discounted rate).

(c) Freelancers – The agency will be paid based on the hours spent by the Freelancer (Cheapest of the 3).

Though we mentioned three different rewarding mechanism, organizations may opt for hybrid approach to gain from combination of approaches. The respresentation shown in Figure 1, explains the key processes and activities performed by different stakeholders in a managed crowd.

5. Benefits andChallenges

5.1. Benefits of crowdsourcing solution

- Tapping into the collective power of organization's developer community to deliver projects that would otherwise haven't been possible
- Leverage the community's knowledge, skills, ideas/creativity to on projects that are beyond one's project/program/organization boundaries
- Enable increased interaction among developers, hence a better collaboration
- Learn or enrich one's skills
- Earn rewards for every successful submission!

Figure 2. Crowdsourcing Models

Legend:

- *Internal Volunteer Crowd – An unmanaged pool of employee volunteers*
- *Internal Dedicated Crowd – A managed pool of employees whose primary job is to work on Crowdsourcing*
- *Vendor Managed Crowd – A vendor-managed pool of contingent workers whose primary job is to work on Crowdsourcing*
- *Freelance Agency Managed Crowd – A pool of resourced managed by a freelance vendor.*

	Internal Unmanaged crowd (Blue Badge EEs)	Internal Managed crowd (Blue Badge EEs)	Vendor Managed crowd(External)	Freelance Model (Agency Managed)
Participation Model	Voluntary	Dedicated	Dedicated	Auction
Allocation of Task	Competition	Availability	Availability	Track Record
TTM Predictability	Low	High	High	High
Cost Effectiveness	Low Cost	Lower than traditional model	Far lesser than Outsourcing	Very Low Cost
Suitability	Small to Medium Sized Projects	Medium to Large Projects	Medium to Large Projects	Small to Medium Sized Projects

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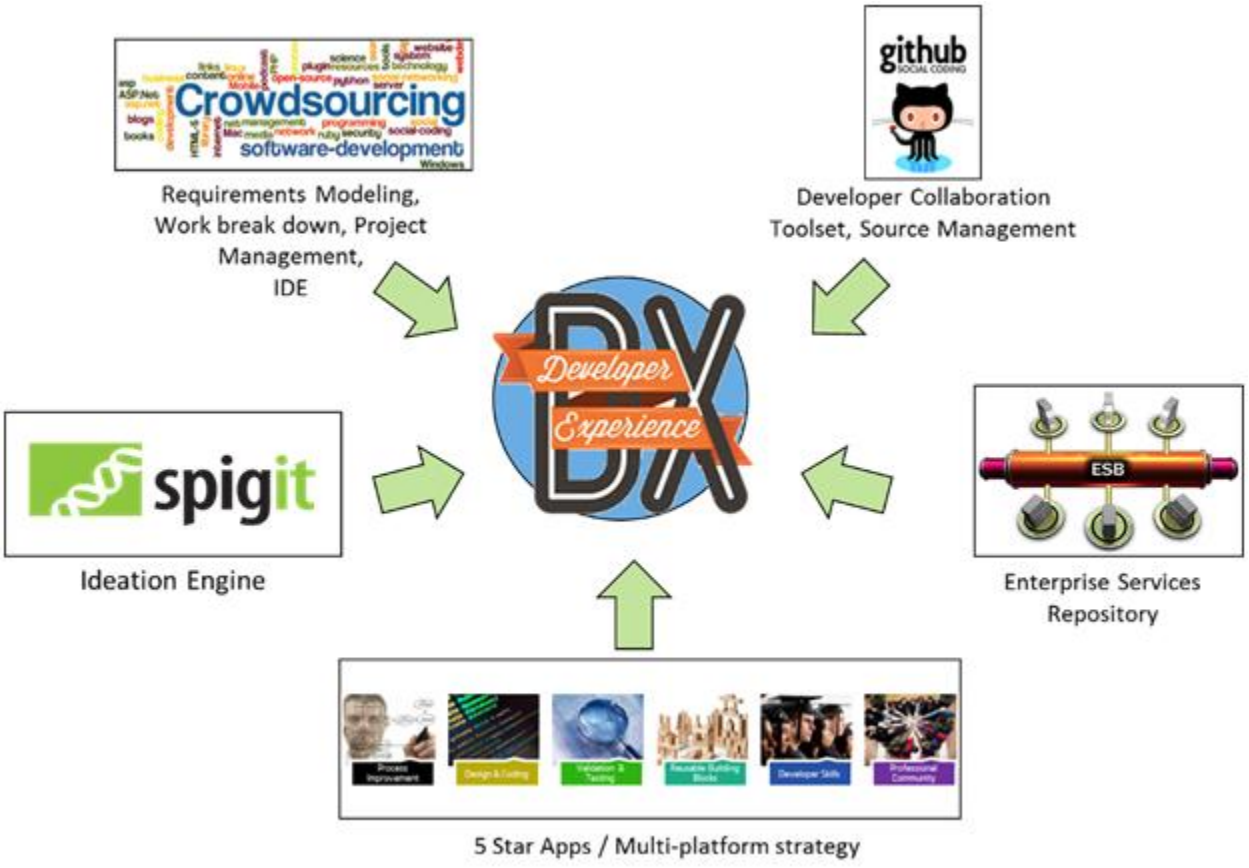

Figure 3. Pieces of the Puzzle

5.2. Challenges

When crowdsourcing doesn't work

- When it is difficult to break down effort into smaller micro-tasks
- Not intended to replace all categories of application development
- Where documentation is minimal
- Where business requirements change quickly
- Not enough coordinator bandwidth available

6. Results

6.1. Expected Results as follows:

- Quicker Ramp-up
- Faster time to market
- Cost reduction
- Improved Cycle time
- Continuous quality improvement
- Reduced public exposure of tasks

6.2. Pieces of the puzzle

Crowdsourcing, a way of tapping into the collective power of the crowd to create new products, services and breakthrough ideas. Where Crowdsourcing fits in the Developer Experience is shown in the Figure 3.

6.3. Acknowledgments

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