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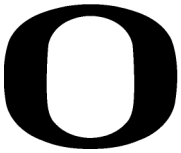

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Open Source Project Management: Applying Established Project Management Principles and Practices at the Mozilla Organization

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Introduction

Problem

As defined in The Wiley-Blackwell Encyclopedia of Globalization (Rey, 2012), in its simplest terms, *open source software* (OSS) is software composed of source code that is made public. As opposed to proprietary software, "open source software allows any developer, or group of developers, to freely repackage, remix, modify, extend, or augment the software in order to best customize it for their own purposes" (p. 1). Described by Rey (2012), OSS development is "closely linked to the phenomenon of crowdsourcing, whereby technology enables the distribution of complex tasks formerly done by paid professionals to (usually unpaid) amateurs, consumers, or freelancers" (p. 1). Conversely, "while proprietary software is centrally conceived and controlled, rigid, and discrete, open-source software, like many trends related to globalization, is fluid, ever-changing, and as localized as it is global" (Rey, 2012, p. 1).

The world's largest and most successful OSS organization is Mozilla, a community consisting of over 40,000 active contributors from across the globe (Mozilla, n.d.). Mozilla is a non-profit organization that sponsors OSS projects including the Firefox web browser, the mobile Firefox OS operating system, Thunderbird email client, and the Bugzilla issue-tracking application (Severance, 2013). As described on the organization website, "Mozilla is an open source project governed as a meritocracy. Our community is structured as a virtual organization where authority is distributed to both volunteer and employed community members as they show their abilities through contributions to the project" (Mozilla, 2013a, p. 1).

Due to the project-centric nature of the organization, Mozilla has a corresponding need for project managers and defined project management processes. This need is not unique to

Mozilla; the recognized need for project management across almost every industry is becoming ubiquitous (Kemp, 2010). Kerzner (2013) declares that:

> As we enter the twenty-first century, our perception of project management has changed. Project management, once considered nice to have, is now considered as a necessity for survival...During the past several years, management's knowledge and understanding of project management has matured to the point where almost every company and industry is using project management in one form or another. These companies have come to the realization that project management and productivity are related. (p. xix)

Project Management at Mozilla

Project management, as a formal organizational objective, is relatively new at Mozilla (Mozilla, 2012a). Currently, 38 project managers across Engineering, IT/Ops, Engagement Web Productions, Mozilla Developer Network, User Experience, Product, Security, Release Management, and other areas are included among the employed community members (Mozilla, 2013b). In the fourth quarter of 2011, Mozilla launched the Project Management Initiative to:

> evaluate how Mozilla internally plans and prioritizes projects to ensure high project success rates. It was determined that a majority of our projects require multiple teams to complete those projects and that Mozilla was growing at such a rapid rate that transparency and clear priorities were required to be able to achieve our goals. (Mozilla, 2012a, p. 1)

Further, it was also noted that:

> with each team tracking and managing projects differently, we don't get a big-picture view of where we can share resources, collaborate more and avoid duplicating efforts. Most projects rely on inter-team communication and coordination and that has proven to

> be difficult. We need a better way to track and prioritize projects across the entire organization so that projects can run more smoothly. (Mozilla, 2012a, p. 1)

To kick off the initiative, Mozilla project managers were surveyed on November 7, 2011 in order to "capture how Mozilla employees are managing their projects and tasks" (Mozilla, 2012a, p. 1). A few of the results of the survey reveal that:

- Many differing tools are used to communicate and track projects
- Half the respondents don't feel they have enough information to determine what needs to be done and to set priorities.
- Respondents say that project scope changes often.
- One third of the respondents feel the organization is lacking in their ability to plan upcoming projects.
- Over one quarter of the respondents feel their group is poor at accurately estimating the amount of effort to complete a project.
- There are multiple similar project management initiatives going on across the organization specific to their group. (Mozilla, 2012b, p. 1)

The Project Management Initiative was launched to address these challenges and "help to standardize Mozilla's approach on how project and resources are managed" (Mozilla, 2012a, p. 1). This effort includes routine project management meetings focused on proposed project management tools, strategies, approaches, and best practices (Mozilla, 2013c). In alignment with principles of transparency and self-governance, Mozilla project management meetings are publicly accessible and deliberated in public forums (Mozilla, 2013c). In addition to the survey results, project management challenges expressed by project managers in these public forums include: language barriers across and within teams; time zone differences; prioritization; holding

effective and adequate review periods; propagating policy changes into implementation across broad swaths of distributed workers; standardizing project management practices; maintaining transparency; handling proprietary vendor relations; and on-boarding new contributors (Mozilla, 2013c).

Purpose

Mendonca and Sutton (2008) emphasize the importance of the structures, policies, and procedures in community-based open source initiatives to meet the goals and strategic objectives of the organization. This directive aligns with project management standards provided by Kerzner (2013) who identifies "16 Points to Project Management Maturity" for organizations (p. ii). These principles are presented as hallmarks of successful project management implementation. Some of the points appear to align well with the decentralized OSS project development model, for example: "Cultivate effective communication, cooperation, and trust to achieve rapid project management maturity" (Kerzner, 2013, p. ii); "Focus on deliverables rather than resources" (p. ii); and "Focus on identifying and solving problems early, quickly, and cost effectively" (p. ii). Other points appear to be more difficult to align in a large OSS organization, for example: "Adopt a project management methodology and use it consistently" (p. ii); "Implement a philosophy that drives the company toward project management maturity and communicate it to everyone" (p. ii); and "Institute an all-employee training program with periodic updates based upon documented lessons learned" (p. ii). The problem with alignment and implementation of some of Kerzner's points is due to the "fluid, ever-changing" (Rey, 2012, p. 1) nature of OSS development priorities and the globally distributed and decentralized pool of contributors.

The purpose of this annotated bibliography is to present literature that identifies established project management principles that can be applied to the unique characteristics and challenges of the OSS development environment of Mozilla. Selected literature presents references that address two key areas: (a) traditional principles framed in the field of project management (Kerzner, 2013; PMI, 2013; Larson & Gray, 2011); and (b) unique OSS project management challenges (Mozilla, 2012a; Mozilla, 2013; Scavarda, 2012; Shapiro, 2013) including the challenges presented managing projects involving geographically distributed teams (Lepsinger & DeRosa, 2010; Mozilla, 2013a). Kerzner's (2013) "16 Points to Project Management Maturity" frame the traditional project management principles (Kerzner, 2013).

The goal of this annotated bibliography is to examine how to align traditional project management principles in relation to the OSS project development model within Mozilla so projects may better meet the strategic objectives of project management outlined by Mozilla's Project Management Initiative (Mozilla, 2012a; Shapiro, 2013). The primary objective of the initiative is not only to increase success rates but to find "a better way to track and prioritize projects across the entire organization so that projects can run more smoothly" (Mozilla, 2011, p. 1).

Audience

This annotated bibliography is written for program, product, and project managers and contributors involved with the Mozilla project. Although Mozilla is identified as the primary audience for this annotated bibliography, it may also be of interest to stakeholders involved in OSS projects outside of Mozilla who seek direction on how to apply traditional project management principles in an open source project development context.

A key goal in this annotated bibliography is to identify traditional project management principles that can be applied to Mozilla's community-based OSS development model (Mendonca & Sutton, 2008). de Laat (2010) defines the concept of *open-source communities* as "peers producing content together on a voluntary basis, without direction from markets or managerial hierarchy, and posting their created content in a virtual commons accessible to all" (p. 1). However, OSS project direction and success are increasingly influenced by a number of factors including market direction and how OSS development is managed (Ghapanchi, 2013).

Research Question and Sub-Questions

Main question. How can principles of traditional project management be applied to Mozilla's OSS development model in order to achieve the objectives outlined in Mozilla's Project Management Initiative?

Sub questions. What are the traditional project management principles? What are the unique aspects of the OSS project development model? Which project management principles are most closely aligned with objectives presented within the Mozilla Project Management Initiative?

Search Report

Search strategy. References on this topic are derived by utilizing search engines provided by the University of Oregon (UO) library, Google Scholar, and the Google search engine emphasizing open source and project management. Searches conducted using the index descriptors below guided refined searches using JSTOR and EBSCO. These two databases contain the most salient and qualified resources.

Established indexing descriptors. Project management is studied by a wide variety of scholars traversing many industries and applications. This annotated bibliography uses Kerzner

(2013) as an authoritative project management resource combined with open source documentation provided by Mozilla and scholarly literature on OSS management. Common keywords extracted from these sources include the following:

- project management
- product management
- program management
- open source
- community-based
- software development
- Mozilla
- collaboration
- crowd-source
- community management
- methodology
- governance
- open innovation
- OSS

Evaluation criteria. Creswell (2009), and Bell and Frantz (2013) are used to provide criteria for research guidance and reference qualification. This annotated bibliography is constructed following the seven steps outlined by Creswell (2009): (a) *identifying keywords*, (b) *searching the catalog for holdings*, (c) *locate about 50 reports of research in articles or books related to research on your topic*, (d) *obtain a sense as to whether the article or chapter will make a useful contribution to your understanding of the literature*, (e) *designing a literature map*, (f) *draft summaries*, and (g) *assemble the literature review, structuring it thematically or organizing it by important concepts* (p. 29-31). During the literature selection process, references are evaluated based on whether the articles are peer-reviewed, authoritative, objective, quality, current, and relevant according to the UO Libraries' Critical Evaluation of Information Sources (Bell & Frantz, 2013). Authority is determined by how often the work is cited in the literature and the qualification of the author. Objectivity is determined by whether the work considers differing views. Quality is determined by how thorough the analysis and evidence cited in

support of the claims made within the work. Currency is determined by setting publication date parameters to three years for periodicals with the exception of works involving theory or established practices, and five years for books. Finally, relevancy is determined by how well a reference supports the emerging narrative of the place of project management in OSS development.

Documentation approach. References are stored on the web using the Zotero database and add-on for Mozilla Firefox. These references are stored with notes, tags, and other identifiers and placed in the following categories: project management standards, OSS characteristics and challenges, and potential solutions. The most salient resources are ranked and selected for the annotated bibliography based on how closely they relate to the purpose statement and research questions. References are coded with tags demarcating date and subject category for future retrieval from the Zotero reference database.

Annotated Bibliography

The following Annotated Bibliography presents 13 references that examine project management practices and principles in both traditional and OSS contexts. References are selected to assist Mozilla product and project managers to identify salient traditional project management principles that can be adapted to community-based OSS software development in line with the objectives specified by the Mozilla Project Management Initiative. References are presented in three categories: (a) project management standard principles, (b) unique practices in the OSS project development model, and (c) project management principles most closely aligned with objectives presented within the Mozilla Project Management Initiative. Each annotation consists of three components: (a) the bibliographic citation, (b) an abstract, and (c) a summary. The summaries present an examination of established project management principles, OSS project management challenges, and proposed methods of implementing project management practices in an OSS context. Optimistically, the explication and alignment of established project management principles and practices could help Mozilla project managers address the challenges identified.

Category 1: Project Management Standard Principles

Kerzner, H. (2013). *Project management: A systems approach to planning, scheduling, and controlling*. Hoboken, NJ: John Wiley & Sons.

Abstract. This *Eleventh Edition* of the bestselling "bible" of project management maintains the streamlined approach of the prior editions and moves the content even closer to PMI's Project Management Body of Knowledge (PMBOK). New content has been added to this edition on measuring project management ROI, value to the organization and to customers, and much more. The capstone "super" case on the

"Iridium Project" has been maintained, covering all aspects of project management. Increased use of sidebars throughout the book helps further align it with the PMBOK and the Project Management Professional (PMP) Certification Exam.

Summary. This book is considered the authoritative resource on project management and is cited extensively in the Project Management Body of Knowledge published by the Project Management Institute. It defines “16 points to Project Management Maturity” and establishes project management standards and best practices. These standards have been established for use across industries but do not address OSS project management specifically. The work helps this researcher to identify key standard project management principles, and to illustrate how traditional project management principles may be applied to the unique characteristics of the OSS development model. The goal is to identify standard practices that can be implemented at Mozilla where they haven’t yet been put into practice on an enterprise level.

Larson, E.W. & Gray, C.F. (2011). *Project management: The managerial process*. New York, NY: McGraw-Hill.

Abstract. As the market-leading textbook on the subject, "Project Management: The Managerial Process, 5e" is distinguished by its balanced treatment of both the technical and behavioral issues in project management as well as by its coverage of a broad range of industries to which project management principles can be applied. It focuses on how project management is integral to the organization as a whole. The 5th edition reflects the latest changes found in the practice. Other texts discuss the topics covered in this text but they do not view oversight as the project manager's operating environment, as does

Larson/Gray. Resumes of managers will soon be primarily a description of participation in and contributions to projects.

Summary. This text emphasizes the importance of project management in a wide variety of organizations and provides guidelines on how to effectively manage projects in practice. It addresses project management in technology companies specifically, among other industries. It establishes key project management standards and how they can be applied in different settings. This source is used to identify established project management principles, practices, and tools that could be relevant to OSS development at Mozilla. Key principles include: (a) defining the project; (b) estimating project times and costs; (c) scheduling resources; (d) effective leadership and oversight; (e) building and managing teams and team performance; (f) conflict management; (g) managing virtual teams; (h) managing project risk; and (i) Agile PM.

Project Management Institute (2013). *A guide to the project management body of knowledge (PMBOK® guide)* (5th ed.). Newtown Square, Pennsylvania: Project Management Institute, Inc.

Abstract. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition provides guidelines for managing individual projects and defines project management related concepts. It also describes the project management life cycle and its related processes, as well as the project life cycle. The PMBOK® Guide contains the globally recognized standard and guide for the project management profession (found in Annex A1). A standard is a formal document that describes established norms, methods, processes, and practices. As with other professions, the knowledge contained in this

standard has evolved from the recognized good practices of project management practitioners who have contributed to the development of this standard.

The first two sections of the PMBOK® Guide provide an introduction to key concepts in the project management field. Section 3 summarizes the Process Groups and provides an overview of process interactions among the ten Knowledge Areas and five Process Groups. Sections 4 through 13 are the guide to the project management body of knowledge. These sections expand on the information in the standard by describing the inputs and outputs, as well as tools and techniques used in managing projects. Annex A1 is the standard for project management and presents the processes, inputs, and outputs that are considered to be good practice on most projects most of the time.

Summary. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) serves as one of the authoritative sources for established project management principles and practices. It is used in defining project management in a traditional context. The principles and practices outlined in this definitive guide are used to select potentially relevant and effective approaches in an OSS development context. These principles and practices include: (a) relationship between project management, operations management, and organizational strategy; (b) the role of the project manager; (c) organizational influences on project management; (d) common project management process interactions; (e) project management tools and techniques; (f) defining scope; (g) time management; (h) quality control; (i) communications management; (j) risk management; and (k) stakeholder engagement.

Category 2: Unique Practices in the OSS Project Development Model

Baker, M. (2006). The Mozilla project: Past and future. In C. DiBona, M. Stone, & D. Cooper (Eds.), *Open sources 2.0: The continuing evolution* (3-20). Sabastopol, CA: O'Reilly Media.

Abstract. The Mozilla project was launched on March 31, 1998. On this date, the source code for the Netscape Communicator product was made publicly available under an open source license, the "Mozilla Organization" was founded to guide the project, and development of the codebase began to move from a proprietary model into an open model coupled with commercial involvement and management practices. Of these three elements, the release of the source code is discussed in *Open Sources*. In summary, the source code was prepared for public release by removing all code that Netscape didn't have the right to license under an open source license, and then replacing those pieces necessary for the code to compile and run. At the same time, a new open source license—the Mozilla Public License—was written, reviewed, and accepted by the open source community, including the Open Source Initiative (http://www.opensource.org). The other two topics—the story of mozilla.org and the development of the Mozilla project—are the subject of this essay.

Summary. This essay provides a history of Mozilla and describes its evolution. Despite the fact that Mozilla has always put the user community at the core of its operations, Baker describes how commercial approaches to project management and people management within Mozilla have always been a given. She describes how the shift of authority from a commercial management structure (Netscape) to one based on open community is unexplored territory and identifies the many management challenges it presents. Specifically, Baker addresses how project management tools and techniques

that could be shared by multiple commercial and volunteer development teams are developed. The tools mentioned are Bugzilla, the open source issue-tracking software Mozilla developed for community OSS development and Tinderbox, a continuous software build system. A key project management technique that is mentioned is "working in the fishbowl" or out in the open, where decisions and project policy and direction changes are made public. Baker describes how working in the open and maintaining transparency poses challenges for project managers who may have a hard time adjusting to their work being visible at all times and for those who may have trouble sharing information within the project management group and with the organization and public at large. Further, she describes challenges involving confidentiality and privacy within a system in which everything is public by default. Of particular relevance to this annotated bibliography is the discussion about the tools and techniques that have been established to assist project managers in the unique OSS environment at Mozilla. Both commercial and open source community interests are intertwined and pose challenges in terms of proprietary vendor relations, transparency, and propagating policy and product decisions out to globally distributed contributors.

Mendonca, L. T., & Sutton, R. (2008, January). Succeeding at open-source innovation: An interview with Mozilla's Mitchell Baker. *CIO Zone: Network for IT Leadership* [website]. Retrieved from http://www.ciozone.com/index.php/Open-Source/Succeeding-At-Open-Source-Innovation-An-Interview-With-Mozilla-s-Mitchell-Baker.html.

Abstract. As companies reach beyond their boundaries to find and develop ideas, they are exploring new models to manage innovation. In projects that tap external talent, questions quickly arise about process management, intellectual-property rights, and the

right to make decisions. Some executives have been at this game longer than others. Mitchell Baker, chairman and former chief executive officer of Mozilla Corporation, has devoted the past ten years to leading an effort that relies extensively on people outside her company-not just for creative ideas, but also to develop products and make decisions. The result: Mozilla's Firefox browser, with 150 million users, has become a rival of Microsoft's market-leading Internet Explorer.

Summary. This article contains an interview with the Mozilla Foundation and Mozilla Corporation Chairperson Mitchell Baker. The interview addresses topics unique to OSS development and managing OSS innovation. Key challenges are identified including onboarding external talent, managing differing levels of technical competency and skill, transparency, and project management related to processes and decision-making in an open environment. The interview describes the need for effective project management in Mozilla and what has been tried, what succeeded, and what failed in relation to OSS development. Baker addresses the following unique aspects of the OSS project development model: (a) building participation, (b) creating frameworks for decentralization, and (c) providing a sense of project ownership among contributors. She also identifies key challenges of implementing established project management principles within this context including (a) maintaining transparency, (b) achieving stakeholder buy-in , (c) balancing commercial and community interests, and (d) managing strategic decisions between the community and the organization.

Sandred, J. (2002). *Managing open source projects: A Wiley Tech brief*. New York, NY: John Wiley and Sons, Inc.

Abstract. With the phenomenal success of Linux, companies are taking open source business solutions much more seriously than ever before. This book helps to satisfy the growing demand for guidance on how to manage open source enterprise development projects. Expert Jan Sandred explores the open source philosophy, describes current software tools for managing open source projects, and provides expert guidance on how to organize and manage open source projects using the Internet as a collaboration tool. With the help of several fascinating and instructive case studies, Sandred explores practical concerns such as building, motivating, and managing virtual teams; structuring tasks and meeting deadlines; establishing trust; project management software tools; maintaining project security; and more.

Summary. This book emphasizes the need for effective project management for enterprise OSS projects and the unique project management tools and techniques that have been used. The brief is categorized in this section of the study for its analysis of how to apply traditional project management principles in an OSS environment. The analysis describes the open source philosophy and traditional project management principles, and identifies challenges with applying these principles to virtual teams of volunteer contributors. Sandred describes OSS characteristics in commercial and community-based business models and addresses how OSS philosophy and implementation influence the role of project management. More specifically, the brief addresses global virtual teams, the importance of leadership among project managers, trust among volunteer contributors, principal differences among commercial and community-based organizations, necessary competencies of the OSS project manager, and tools that can be used for effective OSS project management.

Shaikh, M. & Cornford, T. (2009, May). *Innovating with open-sourcing: Governance concerns for managers*, *26*(3), 309–316. University of Limerick Institutional Repository. Retrieved from http://ulir.ul.ie/handle/10344/1843.

Abstract. Among various forms of innovation in industry structures and business models an increasing number of companies have shown interest in aligning themselves to an open source software model as a means to capture intellectual energy, productive software processes and relevant technical skills. This is evident both within small and niche businesses, but also within the largest companies – a phenomenon known as open-sourcing. This paper presents findings from a field study of open-sourcing of software development within two large, global technology companies. It reports on the ways in which open-sourcing is accommodated within the corporate context, and assesses the innovative strategies managers use as they engage with this phenomenon and seek to work cooperatively with open source communities. The analysis focuses on three primary areas that emerge from the data and which are seen to require particular attention in such organizations; license and IPR regime; community approach; and a modified development process.

Summary. This article addresses the tensions between community and corporate development environments and the challenges presented when straddling the two. It addresses both transparency and proprietary vendor relation problems that have been expressed in the Mozilla Project Management Initiative and project management meetings at Mozilla. The community approach and modified development process described is particularly relevant to the challenges that Mozilla faces and speaks to a broader audience of project managers including any who are involved with OSS and

proprietary vendors or commercial products. In particular, OSS project managers are advised to achieve a balance of control of company confidentiality and product while allowing open innovation to occur organically among contributors. The article is selected for its analysis of the broader shift from a proprietary to open business model and identifies relevant traditional project management principles in an OSS environment.

Shapiro, L. (2013, June 18). Product management in the open (source): Community and direction [lecture]. *Open Source Bridge: The conference for open source citizens.* Retrieved from http://opensourcebridge.org/sessions/1085.

Abstract. Product Management is a generally well-defined discipline inside large corporate organizations. But how does it work in the open source world? Do we need it? How does product consensus happen in open source?

Summary. This lecture was given at an Open Source Bridge conference by Larissa Shapiro. Shapiro is a Senior Program Manager for Product Management Operations at Mozilla. In the lecture, she addresses what product management is and the role of the product manager in open source. Shapiro describes product management as creating a vision and developing roadmaps for products and managing the product lifecycle based on user data. Shapiro is involved in the Project Management Initiative at Mozilla and regularly attends the program and project manager meetings. In this talk, she shares her experience at a few of the open source organizations at which she has worked as a product manager and addresses how *product consensus* occurs in open source. Shapiro emphasizes the importance of keeping product users at the center of innovation and the decision-making process. Issues that she addresses relate directly to project management at Mozilla since project managers are tasked with soliciting feedback from project teams

and to keep projects in scope with product roadmaps. A large majority of Mozilla project contributors are both users and developers. Shapiro advocates utilizing user and developer data to inform what direction a product should go and describes the role of project managers in managing resources effectively in a community-based environment. This lecture is selected primarily for the discussion around maintaining project scope in open source and keeping projects on track according to product roadmaps. These tactics are identified in traditional project management best practices and are uniquely challenging in an open source environment due to the difficulty of propagating information about policy and project scope parameters across globally distributed teams. The importance of acknowledging user contributions in projects is discussed and could be considered a necessary function of Mozilla project managers.

Category 3: Project Management Principles Most Closely Aligned with Mozilla Project Management Initiative Objectives

Baysal, O., Holmes, R., & Godfrey, M. W. (2013, July-August). Developer dashboards: The need for qualitative analytics. *IEEE Computer Society, 30*(4), 46-52. http://doi.ieeecomputersociety.org/10.1109/MS.2013.66

Abstract. Prominent technology companies including IBM, Microsoft, and Google have embraced an analytics-driven culture to help improve their decision-making. Analytics aim to help practitioners answer questions critical to their projects, such as "Are we on track to deliver the next release on schedule?" and "Of the recent features added, which are the most prone to defects?" by providing fact-based views about projects. Analytic results are often quantitative in nature, presenting data as graphical dashboards with reports and charts. Although current dashboards are often geared toward project

managers, they aren't well suited to help individual developers. Mozilla developer interviews show that developers face challenges maintaining a global understanding of the tasks they're working on and that they desire improved support for situational awareness, a form of qualitative analytics that's difficult to achieve with current quantitative tools. This article motivates the need for qualitative dashboards designed to improve developers' situational awareness by providing task tracking and prioritizing capabilities, presenting insights on the workloads of others, listing individual actions, and providing custom views to help manage workload while performing day-to-day development tasks.

Summary. This work draws upon interviews with Mozilla developers and makes the case for the implementation of developer dashboards. The article draws comparisons among companies that use analytics to drive decisions and specifically outlines how Google has been able to use analytics to improve developer communication and project management. It presents dashboards as a potentially effective tool that can be used to aid in software development and management at Mozilla. This analysis and subsequent recommendations focus specifically on the need for qualitative and quantitative analytics in addition to situational awareness as it relates to policy and procedure decisions across the Mozilla enterprise. Challenges identified by the Mozilla project manager survey include: (a) differing tools to communicate and track projects, (b) respondents feeling like they don’t have enough information to determine what needs to be done and to set priorities, (c) project scope changes often, and (d) respondents feeling like their group is poor at accurately estimating the amount of effort to complete a project. These challenges

could be addressed by using developer dashboards allowing project managers to propagate project and policy changes across development teams.

Lee, M.R. (2013). *Leading virtual project teams: Adapting leadership theories and communications techniques to 21st century organizations*. New York, NY: Auerbach Publications.

Abstract. In a 1945 speech, Winston Churchill stated, "We are shaping the world faster than we can change ourselves, and we are applying to the present the habits of the past." Was Churchill predicting the future of project management? Have we changed how we communicate and lead projects? Have leadership and management theories and models evolved to keep pace with today's business environment?

Leading Virtual Project Teams: Adapting Leadership Theories and Communications Techniques to 21st Century Organizations addresses the challenges the virtual project management environment poses to traditional methods of leadership and communication. It introduces new approaches for adapting existing leadership theories to e-leadership as well as progressive tools and techniques to improve virtual project communications.

The book begins by examining the factors affecting the movement from traditional work environments to virtual organizations. It considers the challenges of leading multicultural, global organizations and reviews what e-leadership means. Illustrating the application of both traditional and new leadership models and theories to virtual project management, the book includes best practices for:

- Managing and motivating the multicultural team
- Communicating in a distributed work environment
- Avoiding social isolation

- Cyber-bullying in the virtual environment and e-ethics
- Cultural management issues

Explaining how traditional leadership theories and models can be applied to contemporary projects, the book details methods virtual project managers can use to enhance virtual communications. The final chapter describes the e-leadership skills and competencies project managers will need to ensure sustainable success in today's competitive business environment.

This book provides the virtual project manager with the tools and techniques to improve e-leadership and communications. Complete with case studies that illustrate real-world applications to the virtual challenges presented in each chapter, the book is a suitable text for educational institutions looking to increase understanding of project management leadership and communications outside the traditional project environment.

Summary. This book addresses the challenges of leading in virtual organizations and serves as a guide in how to apply traditional project management approaches to contemporary virtual environments. Lee outlines several e-leadership models for virtual teams, examines methods for enhancing virtual team communications including cultural considerations, and defines virtual project leadership competencies. This work is selected to address some of the unique challenges facing Mozilla project managers in working with globally distributed contributors to Mozilla projects. These challenges include: (a) language differences and barriers, (b) cultural differences within and across virtual teams, (d) time zone differences, and (e) information and knowledge sharing within and across virtual teams. It identifies traditional project management principles that can be adapted to virtual project management and highlights best practices that can be used.

Lepsinger, R. & Derosa, D. (2010, October 19). *Virtual Team Success: A practical guide for working and leading from a distance*. San Francisco, CA: Jossey-Bass.

Abstract. This book leverages robust research studies and provides a practical resource for virtual team members and leaders. Based on a research study which is one of the most comprehensive studies ever conducted on virtual teams, this book offers a wealth of solid recommendations. To help organizations and leaders enhance virtual team performance, the book includes information on: key challenges, factors for success, characteristics of effective virtual teams, a model for success, effective practices, enhancing performance of low performing teams. The book also includes sections on future challenges and issues.

Summary. This book focuses on the unique management challenges posed by geographically distributed virtual teams. Drawing from several studies on virtual team performance, it establishes a set of best practices for effectively managing teams and improving performance. Key challenges faced by team members are addressed that closely align with the challenges faced by Mozilla project managers including the need to address (a) language differences, (b) time zone variance, (c) conducting effective virtual meetings, and (d) information sharing among team members. These needs align with the established principles of project management regarding effective stakeholder management and virtual team engagement.

Mozilla (2012). *Project Management Initiative*. Mozilla:Wiki. Retrieved from https://wiki.mozilla.org/Project_Management.

Abstract. Mozilla has a lot of amazing projects that aren't visible to the wider group. With each team tracking and managing projects differently, we don't get a big-picture

view of where we can share resources, collaborate more and avoid duplicating efforts. Most projects rely on inter-team communication and coordination and that has proven to be difficult. We need a better way to track and prioritize projects across the entire organization so that projects can run more smoothly.

Summary. This wiki page is dedicated to the official Mozilla Project Management Initiative. It demonstrates the recognition within the organization that (a) project management is necessary, and (b) standardization of project management practices and principles is a priority at Mozilla. Further, it includes a survey of project managers that identifies Mozilla OSS challenges to objectives that can be addressed by applying established project management principles derived from proprietary and more traditional corporate environments. Challenges identified by Mozilla project managers include (a) handling transparency and confidentiality, (b) on-boarding and training new contributors and employees, and (c) propagating information about policy changes across distributed workers.

Mozilla (2012, February 17) . *Project Management Survey*. Mozilla:Wiki. Retrieved from https://wiki.mozilla.org/Project_Management/2011_Q4/Meetings/Project_Management_Survey-2011-11-07.

Abstract. A survey was launched on November 7, 2011 to capture how Mozilla employees are managing their projects and tasks. This survey was created and launched quickly due to feedback from employees that the problem is growing worse and they want to give their feedback. The survey asked a few questions that would require the person to type in their response, but for the most part, the questions were multiple choice. The results of the survey will help answer the question about where we are at now and

how people think we are doing. A survey like this could be repeated in the future to determine if we are heading in the right direction. Another survey should be created to ask similar questions to our external contributors.

Summary. Based on the feedback from project managers across the Mozilla organization, this survey establishes the problem areas that project managers face and provides insight into practices that can be implemented in order to address them. Key problem areas identified include (a) the use of differing tools, (b) data on projects and tasks are not always accessible across groups, (c) respondents don't feel they have enough information to determine what needs to be done and to set priorities, (d) respondents feel their team is being asked to do more than what is possible with their given resources, (e) respondents say that project scope changes often, (f) respondents feel the organization is lacking in the ability to plan upcoming projects, (g) respondents feel their group is poor at accurately estimating the amount of effort to complete a project, and (h) there are multiple similar project management initiatives going on across the organization specific to their group.

The results of the survey inform this researcher as to the relevancy and potential of established project management principles and practices that can be applied to OSS development at Mozilla. Principles that appear to be most closely aligned include (a) Adopt a project management methodology and use it consistently by consolidating tools and standardizing project management approaches; (b) Implement a philosophy that drives the company toward project management maturity and communicate it to everyone by practicing knowledge sharing; (c) Cultivate effective communication, cooperation, and trust to achieve rapid project management maturity by centralizing information and

pushing it out to distributed teams via dashboards or other forms of communication; (d) Minimize scope changes by committing to realistic objectives to prevent teams from feeling like they are overwhelmed, and (e) Commit to developing effective plans at the beginning of each project.

Conclusion

Interviews with key executives and project managers at Mozilla reveal that (a) Mozilla recognizes the need for project management; (b) there are unique challenges to project management in an open source development environment; and (c) there are unique challenges in standardizing project management principles and practices across a large, open source, globally distributed enterprise (Mozilla, 2011; Mozilla, 2012a, Mozilla 2013a). While there are large bodies of literature dedicated to the study of project management, open source development environment, and virtual teams there is very little specific literature that examines the interrelationships among these three areas. This presents an opportunity to contribute to the project management literature by identifying relevant established project management principles that can be applied in the unique context of Mozilla OSS development.

Mendonca and Sutton (2008) emphasize the importance of the structures, policies, and procedures in community-based open source initiatives to meet the goals and strategic objectives of the organization. This directive aligns with project management standards provided by Kerzner (2013) who identifies “16 Points to Project Management Maturity” for organizations (p. ii). These principles are presented in this annotated bibliography as hallmarks of successful project management implementation.

PM Principles that May Align Well in the OSS Development Context

Drawing on the objectives outlined in the Mozilla Project Management Initiative (Mozilla, 2012a) and the project management challenges identified in ongoing Mozilla project management meetings (Mozilla, 2013c), particular established project management principles outlined by Kerzner (2013), Larson and Gray (2011), and the Project Management Institute (2013) appear to be salient candidates for adaptation and implementation. A few of these

principles include “Cultivate effective communication, cooperation, and trust to achieve rapid project management maturity” (Kerzner, 2013, p. ii); “Focus on deliverables rather than resources” (p. ii); and “Focus on identifying and solving problems early, quickly, and cost effectively” (p. ii). Principles are amplified below, by drawing upon the literature selected for annotation in this study.

Cultivate effective communication . . . . The need for effective communication, cooperation, and trust (Kerner, 2013) has been identified as an objective for the Project Management Initiative (Mozilla, 2012a). And while achieving this is a tremendous challenge considering the time zone variances, cultural and language differences involved with managing projects virtually across globally distributed and decentralized OSS development teams, it is none-the-less a principle that is well aligned with Initiative goals.

Focus on deliverables . . . . Mozilla exhibits project management maturity that could be further improved by applying Kerner’s points of focusing on deliverables rather than resources (Kerzner, 2013). Baker (2006) suggests that one way to do this is to source the majority of human resources needed for projects from volunteers.

Identifying and solving problems early . . . . Bugzilla, Mozilla’s open source issue-tracking software, can be expanded for use as a project management tool allowing project managers to identify and solve problems early, quickly, and cost effectively (Mozilla, 2010).

Implementing developer dashboards that relay key information about projects can help align Mozilla with Kerzner’s points to (a) eliminate nonproductive meetings by placing important information in front of developers in order to keep them informed of project and policy changes, (b) focus on identifying and solving problems early, quickly, and cost effectively by identifying problems using data and cost-effectively solving them by assigning tasks based on

the results, and (c) measure progress periodically by displaying information showing progress toward pre-determined project milestones and goals. Baysal and Godfrey (20130) concur, and support the strategic use of analytics and qualitative dashboards, designed to improve situational awareness and manage daily workload.

PM Principles that may Prove Challenging in the OSS Development Context

The traditional project management principles identified by Kerzner (2013) that may be challenging to apply in the unique environment of Mozilla OSS development (Scavarda, 2012; Shapiro, 2013) include "Adopt a project management methodology and use it consistently" (p. ii); and "Implement a philosophy that drives the company toward project management maturity and communicate it to everyone" (p. ii). The problem with alignment and implementation of these principles is due to the "fluid, ever-changing" (Rey, 2012, p. 1) nature of the OSS development context, including the globally distributed and decentralized pool of contributors.

Lee (2013) addresses some of the identified challenges of project management in virtual teams including: (a) language differences and barriers, (b) cultural differences within and across virtual teams, (d) time zone differences, and (e) information and knowledge sharing. Scavarda (2012) and Shapiro (2013) both suggest that it may prove challenging to translate tactical approaches to the obtainment of strategic objectives within Mozilla for this same reason, including cost and schedule management, selecting the right people as project managers, and measuring progress.

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