PROCESS-ORIENTED METRICS FOR APPLICATION DEVELOPMENT OUTSOURCING. A PRACTITIONER'S APPROACH

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ABSTRACT. The paper proposes a framework (Process-Oriented Metrics for Application Development Outsourcing – POMADO) which aims to provide numeric scores characterizing the performance of application development (AD) of the outsourcing process. The purpose of this framework is to obtain knowledge in order to gain increased insight in how to intervene in the outsourcing process. The research is aimed at both the scientific and practicing communities, giving two purposes. (1) Further the modeling of application development outsourcing process and its formal/quantitative characterization; (2) Provide practical guidelines on how to design metrics that become useful for quantitatively managing AD outsourcing process. Data on which the proposed metrics are based have been acquired through informal discussions with project managers from five companies involved in software development outsourcing, post delivery assessment of project results and available literature.

Keywords: Process Metrics, Measurement, Outsourcing Process Management, Application Development, Improvement.

1. INTRODUCTION

One of the most important issues in outsourcing process is assessing the quality of the process, both qualitative and quantitative. The two stakeholders (Partner and Vendor) involved in the outsourcing process usually have different views and expectations.

The basic idea of this research is to identify meaningful measurements of the outsourcing process so that both major stakeholders (Partner and Vendor) pinpoint problem areas and take converging corrective actions if needed or take action to improve the process.

The biggest challenge in establishing an effective metrics program in the outsourcing process has on one side to do with the formulas, statistics, and analysis but the real difficulty lies in determining which metrics are valuable to both organizations involved in the process, and which procedures are most efficient for using these metrics.

Data on which this research is based was provided by Infopulse, an organization of five companies specialized in AD and outsourcing services. Infopulse has successfully implemented an outsourcing process metrics program and provides

quality outsourcing services to several EU based companies (i.e. the collection, interpretation, distribution, and usage to optimize cooperation). Although the limited number of companies and available data represents a limitation of the research, we are strongly encouraged by the organization's success.

The research was organized as a practical project at Infopulse and a research project at Petru Maior University of Tirgu Mures.

2. Methodology

The steps we considered in this research are [7]:

(1) Stating the goals of the metrics (e.g. assessing the quality of a request for proposal, assessing the effectiveness of communication, use of statistical data for planning);
(2) Detailing a clear model of the AD outsourcing process;
(3) Identifying the meaningful elements to be measured (directly or indirectly);
(4) Analyze the measurements using a Performance Analysis Model;
(5) Validate the metrics.

The present paper addresses the first three steps.

3. Goals of POMADO

The goal of the proposed framework is to quantitatively manage the AD outsourcing process to achieve the established quality and outsourcing process-performance objectives.

Although the overall process performance is characterized by both outsourcing process measures and delivered product measures the focus of POMADO is on the process.

The benefits of POMADO are:

- Helps the stakeholders (Vendor and Partner, respectively supplier organization and outsourcing organization) predict whether the outsourcing project will be able to achieve its quality and process-performance objectives;
- Helps the project managers understand the nature and extent of the variation experienced in the outsourcing process performance, and recognizing when the project's actual performance may not be adequate to achieve the project's quality and process-performance objectives;
- Determine whether the outsourcing processes are behaving consistently or have stable trends (i.e., are predictable);
- Aware that Vendor and Partner have sometimes conflicting interests (e.g. time related, financial related, human resource related) POMADO focuses only on metrics acceptable by both parties to quantitatively characterize the outsourcing process.

4. The AD Outsourcing Process Model

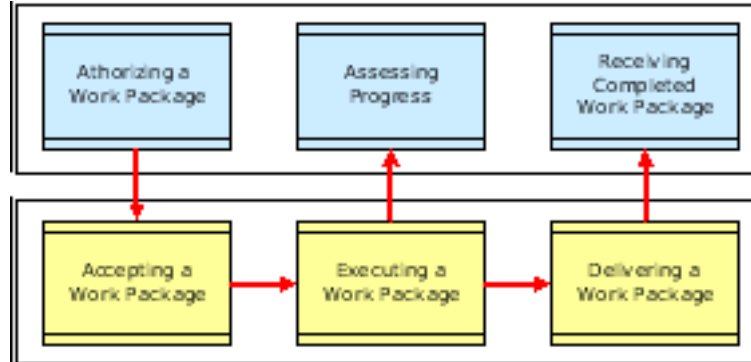The process model is depicted in Picture 1 [2]

FIGURE 1

The upper level relates to Partner workflow, the lower level relates to Vendor workflow and the arrows depict the complex interfaces between phases within Partner's or Vendor's organization or the complex interaction between Partner and Vendor (e.g. syncron/asyncron exchange of information, change requests, etc.).

Executing a work package in AD is largely covered by different models which could be roughly described as: waterfall, incremental and iterative AD models.

The Waterfall Model (Picture 2) is mostly used when the requirements are known from the beginning and are not changed very often [3].

The Incremental Model (Picture 3) is reducing risks by incrementally assessing progress and taking corrective actions, increasing the success rate for medium to large projects.

The Iterative Model (Picture 4) is associated with large projects, changing requirements, incremental deliveries.

Although there is no consensus for such a classification, for practical purposes, the size (time and effort) of a project is usually described as: large, medium, small and very small (Picture 5) and different AD models are recommended (Table 1) [4].

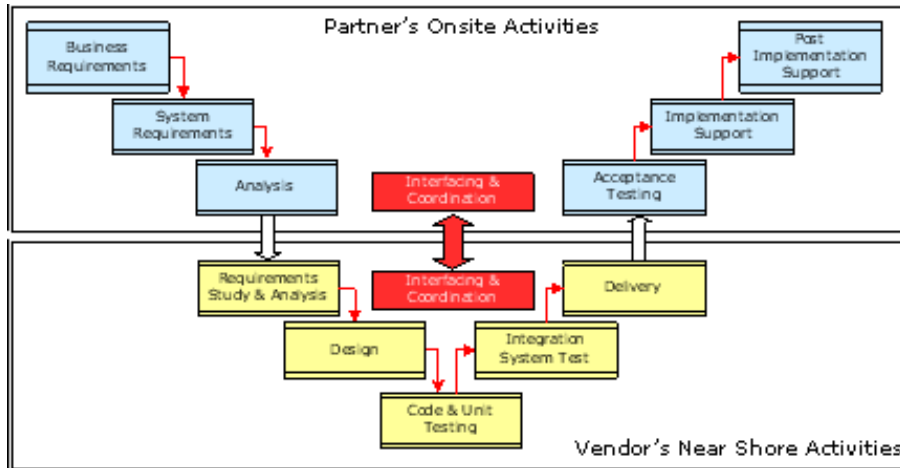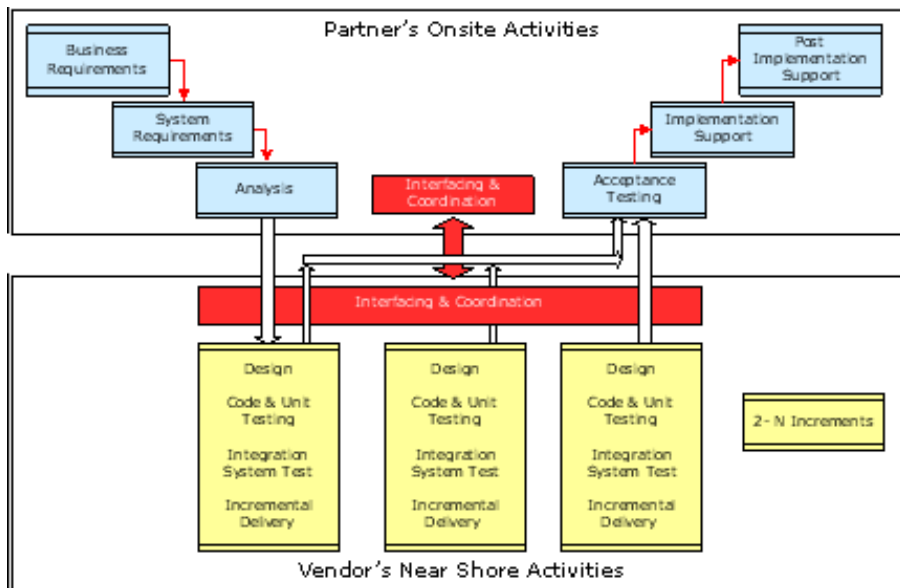| Project Size	Waterfall	Iterative	Incremental
Large	If duration > 3 months, splitting into increments / iterations suggested	√	√
Medium	√	√	Not recommended
Small	√	Not recommended	Not recommended
Very Small	√	Not recommended	Not recommended

FIGURE 2

FIGURE 3

Although Infopulse Group was involved in large projects spanning over several years, availability of consistent data restricted our research to very-small, small and medium size projects.
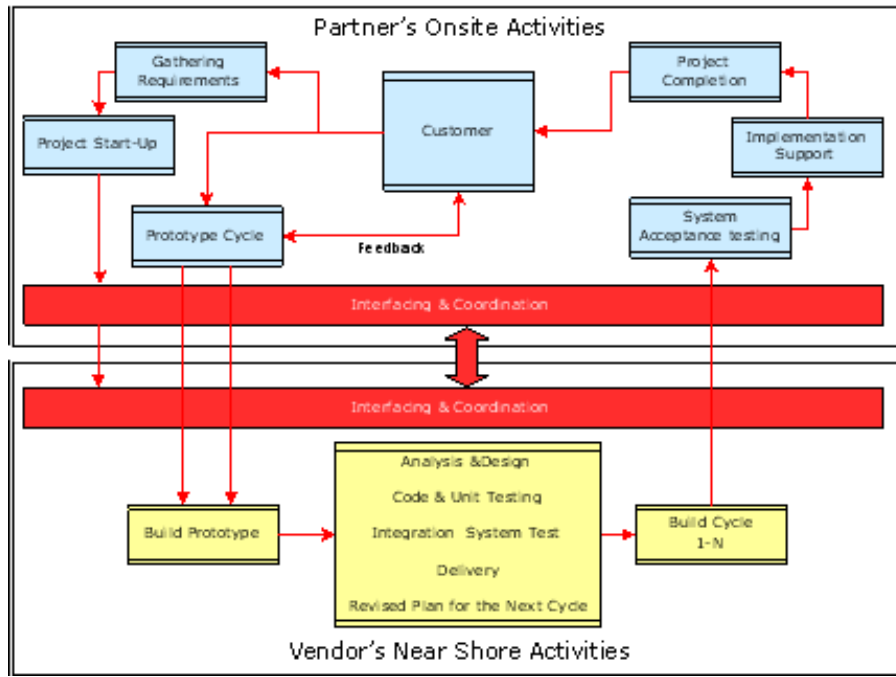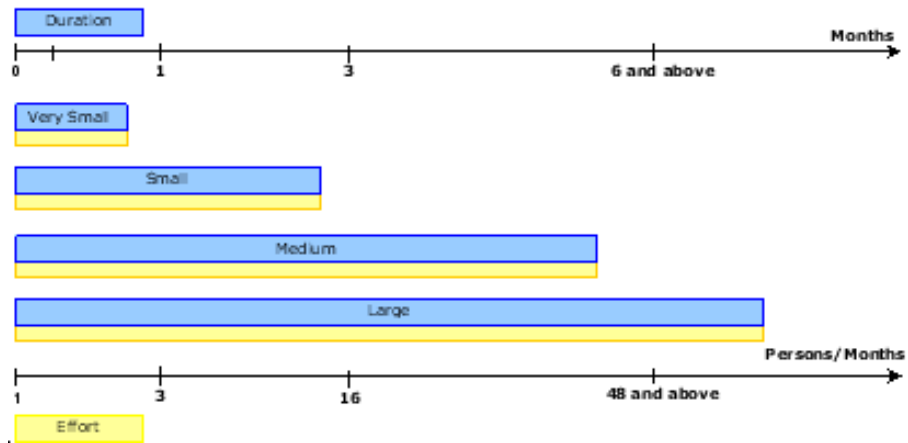
FIGURE 4

FIGURE 5

5. POMADO Direct Measurements

POMADO first aim is to provide numeric scores to characterize the performance of application development (AD) of the outsourcing process. Unlike AD development within organization, outsourcing means two stakeholders (Vendor and Partner) with partly conflicting goals. Both direct and indirect measurements proposed by the framework are focused on improving Partner-Vendor co-operation by pinpointing problem areas so that remedies can be developed and the outsourcing process can be improved. Therefore the criteria used in selecting metrics relate only to usefulness for both parties in managing and improving AD outsourcing process.

The criteria we considered are:

- Collected data must be relevant for the interaction between Partner and Vendor;
- Collected data must cover the interaction between Partner and Vendor;
- Collected data should be validated by Partner and Vendor;
- Collection process should be economic (i.e. maximum benefits/minimum effort);
- Partner and Vendor although with different views on the process must agree on the interpretation of metrics (before the collection) for this will determine the relevant areas for joint intervention (e.g. Communication between the two organizations);
- A key area in the outsourcing process (near-shore or off-shore delivery model) is communication (synchron/asynchron).
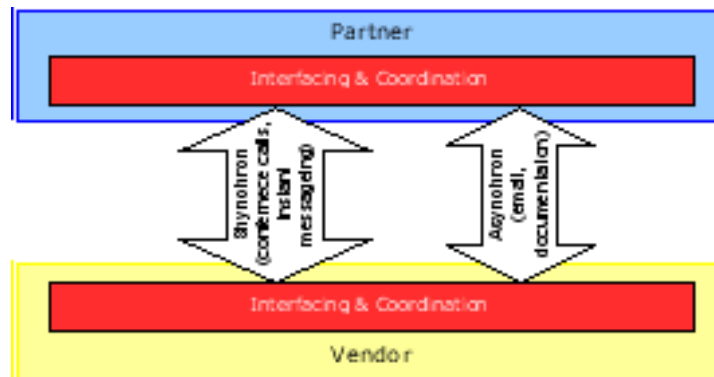

Figure 6

Asynchron communication always produces artifacts (i.e. documents, e-mails). By synchron communication we understand conference calls (video, phone), voice over IP and even Instant Messaging. POMADO direct measures are depicted in Table 2.

Direct Measures	Units	ID	Description
Definition (RFP, PDP, BR, etc)	LOD (Line of documentation)	O1	Refers to the number of lines needed for Work Package definition. E.g. Request for Proposal (RFP) Project Development Proposal (PDP) Business Requirements (BR) Functional Requirements (FR) Risk Assessment (RA) Object Model (OM)
Status Report	Nr of reports/month	O2	The frequency of the Status report indicates the transparency of the project.
Change Requests	Nr of requests	O3	The number of functional point changes requested by the partner or vendor
Early Change requests	Nr of requests	O4	The number of changes requested during the project analyzes.
Questions & Answers	Nr of questions & Answers	O5	Represents the number of questions necessary to understand, clarify the requirements or proposals
Response time	Minutes	O6	Represents the elapsed time between posting a question and receiving the answer
E-mails	LOE (Lines of emails),	O7	Represents the amount of information sent trough email
	Nr of emails	O8	The number of the emails sent.
Response time	Minutes	O10	Represents the elapsed time between sending an email with questions and receiving the answer. This is important also for the emails marked as High importance.
Conference calls	Minutes	O11	The conference call can be a phone-, a video-, a voice over IP conference. The duration of the conference is measured.
Instant messaging	Minutes	O12	Duration of the communication
Project Size	MD (ManDays, ManHours)	O13	Project Duration
Functional Points (FP)	Number	O14	The number of Functional points of the Work Package

6. POMADO INDIRECT MEASURES

INPUT (AUTHORIZING & ACCEPTING)
Work Package Accuracy
Work Package Stability

Work Package Definition Level (LOD/FP)

AD CYCLE (EXECUTING & ASSESING)

Average Delivery Time

Change Request Density

Q&A Density

Average Response Time

OUTPUT (DELIVERING & RECEIVING)

Acceptance Criteria Definition

Work Package Accuracy

This metrics characterizes Partner's project documentation. An ideal documentation (WPA = 1) requests no clarification questions (assuming there's business knowledge and technical knowledge at the Vendor's end). A less ideal documentation means WPA approaching zero or even worst, taking negative values for a poor documentation.

$$\text{WPA} = 1 - \frac{\text{questions}}{\text{FP}}$$

Work Package Stability

This metrics characterizes the quality of the project definition: correctness of the requested functionalities, understanding client business requirements, quality of the analysis, design and RFP. Ideal stability means that no change requests are made after the work package has been accepted by the Vendor.

$$\text{WPS} = 1 - \frac{\text{change requests}}{\text{FP}}$$

Work Package Definition

$$\text{WPD} = \frac{\text{LOD}}{\text{FP}}$$

Average Delivery Time

ADT represents the time elapsed from meeting entry criteria to meeting exit criteria for a Functional Point

$$\text{FPAT} = \frac{\frac{\text{project size}}{\text{resource number}}}{\text{FP}}$$

Change Request Density

$$\text{CRD} = 1 - \frac{\text{change requests during execution}}{\text{FP}}$$

Q&A Density

$$\text{QAD} = \frac{\text{questions}}{\text{LOD}}$$

Average Response Time

$$\text{RAT} = \frac{\sum \text{response time}}{\text{questions}}$$

7. Further study

Many companies have implemented metrics programs to support the managers in their decision yet nearly 80% of software metrics programs fail within the first two years [1]. The reasons range from difficulties to collect reliable and useful data to the lack of a Performance Analysis Model to provide answers to product, process or overall project related questions.

The success of a Vendor-Partner relation relies both on managing the process and improving it. It implies agreement of how to quantitatively answer questions like:

- How large is the process interference generated by Change Requests?
- Is the Partner's response time compatible with project constraints?

To consistently answer such questions a performance analysis model - based on interdependencies of project data - is required. This provides the first of the two fundamental characteristics [5], a sound conceptual, theoretical basis. The second one is a statistically significant validation.

Acknowledgments

References

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