



Experiential Appraisal of Organizational Process Focus and Process Definition in Nigerian Software Companies

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Abstract Organisational Process Focus (OPF) and Organisational Process Definition (OPD) are two key process areas (KPA) of interest at the defined level of software process maturity. OPD and OPF are targeted at determining how well defined and focused the software process of an organization is. A lack or an inadequate definition of organizational software process has been identified as a key challenge to improving software process maturity in many organizations. The study was conducted to determine the extent of process definition and focus in software companies in Nigeria. A survey study was conducted covering 30 software companies. The study equally employed the action research approach with some of the companies selected as case studies for experiential appraisal. The study revealed a relatively weak performance of the key practices associated with the OPF and OPD key process areas.

Keywords Organizational Process Focus, Organizational Process Definition, Software Process, Software Industry, Nigeria Software Companies, Experiential Appraisal

Introduction

The Capability Maturity Model Integration (CMMI) is a world-class performance enhancement framework for viable organizations that want to accomplish high performance in their operations [1-2]. It is often the approach of choice for process improvement across several industries including information technology and engineering [3]. CMMI is often viewed in contrast to the Agile development, which denotes a method used especially for software development that is characterized by the splitting of tasks into short phases of work and regular reevaluation and adaptation of ideas. At its core, Agile is simply a set of prescriptive principles. It is now left to the organization to decide what practices and processes to employ in the bid of implementing those principles. While the study of Pikkarainen (2008) [4] considered the development of a framework that combined CMMI goals with agile practices, Glazer (2001) [5] explained that having a process does not mean sacrificing agility or creativity. A number of works including those of Mogre and Salunkhe (2014) [6] as well as Glover and Dennie (2017) [1] looked at implementing CMMI in an Agile environment, a view on how to be agile with CMMI. The CMMI is made up of 5 maturity levels namely Initial, Managed, Defined, Quantitatively Managed, and Optimizing. Each maturity level consists of Key Process Areas (KPA) which in turn consists of key practices. Organization Process Focus (OPF) and Organization Process Definition (OPD) are organizational KPAs at maturity level 3, managed [1, 7-8].

“The purpose of Organization Process Focus is to establish the organizational responsibility for software process activities that improve the organization's overall software process capability. The primary result of the Organization Process Focus activities is a set of software process assets, which are described in Organization Process Definition” [9].

Paulk *et al.* (1995, 1993) [9-10] expatiated on the different KPAs including OPF and OPD. OPF comprises creating and sustaining an appreciation for the organization's and projects' software processes and managing the series of events necessary to develop, appraise, improve and maintain the processes. The purpose of OPD is to



develop and maintain a functional set of software process assets that increase process performance throughout the projects and provide a basis for accumulative, lasting benefits to the organization. The software process assets provide a steady basis which can be institutionalized by means of mechanisms such as training. OPD typically entails developing and maintaining the organization's standard software process, together with associated process assets, such as explanations of software life cycles, process fashioning rules and conditions, the organization's software process database, and a library of software process-based documentation. OPF and OPD are two KPAs assigned to the organisational process category at maturity level 3 (defined) of the SEI maturity scale. The activities within these KPAs are focused on the organization and not on projects.

The studies of Wang *et al.* (2006) [11] and Wu *et al.* (2007) [12] discussed the impact of organizational process focus on project performance. Emphasis was placed on the cooperation among team members in a project team workplace. The samples for the study were collected from a variety of industries including manufacturing, communication, health, information service, electronic, transportation, automotive, banking, steel machine, and education in Taiwan. Results from the study indicated that organizational process focus had a positive influence on organizational learning, which in turn had a positive influence on project performance.

The study of Soriyan and Heeks (2004) [13] and Soriyan (2000) [14] gave a brief detail about the state of the Nigerian software industry. Nigeria was been described as having a strategic market for application software in Africa. The Nigerian software industry was equally recognised as having a strategic influence in West Africa with the bulk of her software companies located in Lagos. About 51% of the software companies have servicing of foreign applications as the major service they provide while 25% developed and serviced local applications. The remaining 24% performed a combination of both. Although showing a relatively healthy level of local application activities, it reveals that about 75% of firms relied wholly or partly on services such as installation or modification of foreign packages. There was also a sense of increasing infiltration of the market by foreign products that were dislodging locally developed ones. This has led a number of software companies to shift attention to other activities such as providing training and Internet-based services for survival. Most of the companies reported using formal software development methods developed in-house.

Research Methodology

A combination of three complementary approaches was adopted for the current study. These are the survey research, the case study and action research methodologies. The survey was performed across 30 different software companies in Nigeria. Some of these companies were selected as case studies within which an action research approach was adopted in eliciting further information and clarifying implicit details. The action research methodology was employed experientially by actual involvement in the companies' software development process.

An abridged version of the verified SEI Maturity Questionnaire [15] was adopted as the research tool for eliciting required information for the study. The questionnaire was completed based on the different approaches employed in the study. The questionnaire comprises of two major sections. The first sections comprises of questions regarding software process key practices within the organisation. The second section which is the response section consists of four response options namely "Yes", "No", "NA" for Not Applicable and "DK" for Don't Know. These four were the response options available to each respondent with regards to the organizations performance of the respective key practices in the questions section.

Results

The results of the current study are as shown in Tables 1 and 2. The results are equally graphically represented as depicted by Figures 1 and 2. The results are presented in percentages of actual responses. The averages for each response option are shown in bold at the last row of each table. Discussions and resultant conclusions from these results are presented in the subsequent sections.



Table 1: Organization Process Focus (OPF) Key Process Area

Questions (Key Practices)	Responses			
	Yes %	No %	NA %	DK %
A. Are the activities for developing and improving the organization’s and project’s software processes coordinated across the organization (e.g., via a software engineering process group)?	23	31	42	4
B. Is your organization’s software process assessed periodically?	31	27	38	4
C. Does your organization follow a documented plan for developing and improving its software process?	0	81	12	8
D. Does senior management sponsor the organization’s activities for software process development and improvements (e.g., by establishing long-term plans, and by committing resources and funding)?	35	12	46	8
E. Do one or more individuals have full-time or part-time responsibility for the organization’s software process activities (e.g., a software engineering process group)?	15	77	0	8
F. Are measurements used to determine the status of the activities performed to develop and improve the organization’s software process (e.g., effort expended for software process assessment and improvement)?	15	73	0	12
G. Are the activities performed for developing and improving software processes reviewed periodically with senior management?	27	23	35	15
Average	21	46	25	8

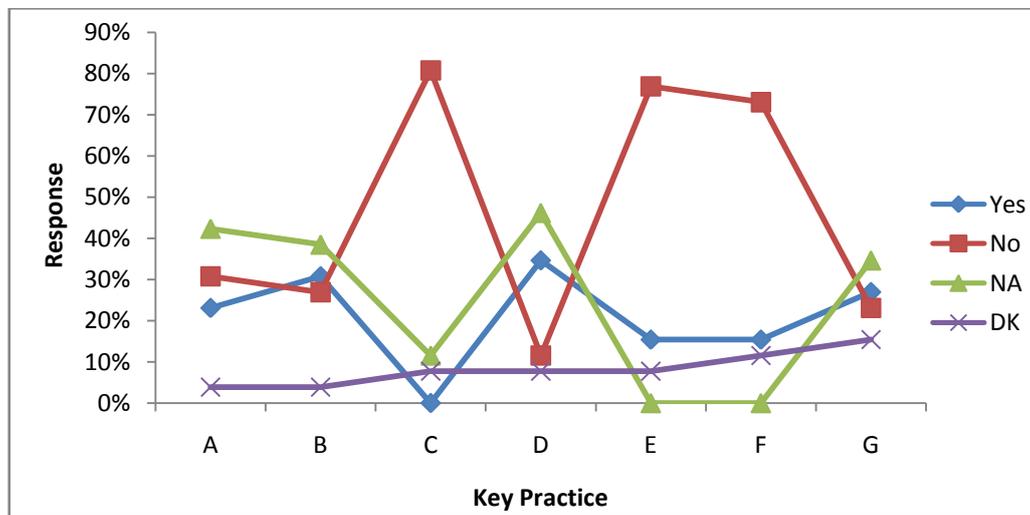


Figure 1: Chart of Key Practices for Organization Process Focus

Table 2: Organization Process Definition (OPD) Key Process Area

Questions (Key Practices)	Responses			
	Yes %	No %	NA %	DK %
H. Has your organization developed, and does it maintain, a standard software process?	4	54	31	12

I. Does the organization collect, review, and make available information related to the use of the organization's standard software process (e.g., estimates and actual data on software size, effort, and cost; productivity data; and quality measurements)?	4	81	8	8
J. Does the organization follow a written policy for both developing and maintaining its standard software process and related process assets (e.g., descriptions of approved software life cycles)?	4	88	8	0
K. Do individuals who develop and maintain the organization's standard software process receive the required training to perform these activities?	8	62	12	19
L. Are measurements used to determine the status of the activities performed to define and maintain the organization's standard software process (e.g., status of schedule milestones and the cost of process definition activities)?	4	77	4	15
M. Are the activities and work products for developing and maintaining the organization's standard software process subjected to SQA review and audit?	0	65	31	4
Average	4	71	15	10

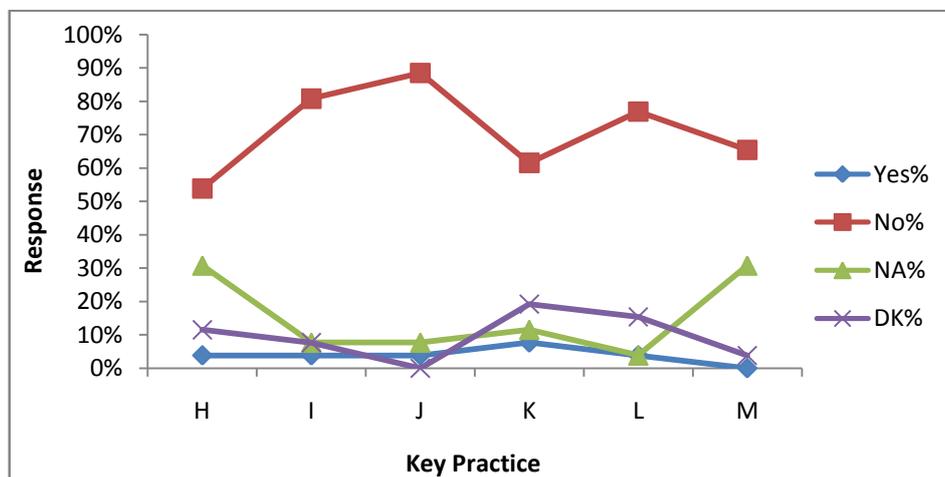


Figure 2: Chart of Key Practices for Organization Process Definition

Discussion

The results depicted in Tables 1 and 2 show a high degree of non-performance of key practices in the Organization Process Focus (OPF) and Organization Process Definition (OPD) key process areas (KPAs). These KPAs are associated with software process maturity level 3 (Defined) and could therefore account for its relatively low implementation since the Nigeria software industry is currently at maturity level 1 according to the study of Aregbesola and Akinkunmi (2010a; 2010b) [16-17] and Aregbesola *et al.* (2011) [18].

Since results from the study of Wang *et al.* (2006) [11] and Wu *et al.* (2007) [12] indicate that organizational process focus have a positive influence on software project team's performance, it follows that a weak implementation of SPF and SPD will have a negative influence the project team's performance. A goal is difficult to attain if it is not properly defined. Other studies about software process in the Nigerian software industry include those of Aregbesola and Onwudebelu (2011) [19], Aregbesola and Oluwade (2014) [20], and Aregbesola (2017) [21].

Conclusion

This paper has concentrated on the appraisal of the performance of two KPAs at the software process definition level of maturity, namely, organisation process focus and organisation process definition. By using survey, case



study and action research methods, it has been illustrated that the performance of these KPAs is weak in the Nigerian software industry. These KPAs should therefore be accorded the needed attention so as to strengthen them for optimal performance.

Since results from the studies of Wang *et al.* (2006) and Wu *et al.* (2007) showed that OPF have a positive influence on software project team's performance, it therefore follows that a weak implementation of OPF and OPD will have a negative influence on the project team's performance. These conclusions should help managers reexamine their priorities in terms of the relative efforts in OPF and OPD.

Improvements in the performance of key practices associated with these KPAs will go a long way in improving the software process maturity level of the Nigerian software industry.

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