The Nigerian Practitioners’ Perspective of the Agile Methodology for Software Project Management

Yerokun Oluwatoyin Mary¹, Anigbogu Gloria Nkiru²

²Department of Computer Science, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria.

Abstract—The challenges of software system developing are hinged on systems analysis and design principles switching from traditional methodologies towards the Agile method. Agile methodologies are relatively considered quick to meet the development needs of modern applications – making them more popular in recent times. This study suggests that the Agile method is indeed more effective in dealing with the complexity of modern software systems and the rapidly changing business environment. There is, however, less evidence on their usage among software practitioners in Nigeria. This paper empirically investigates the perceptions of Agile methodologies usage from software practitioners in Nigeria. The team presents practices in Agile perceived to deliver the most benefits. The team aim to provide awareness and knowledge about Agile methodologies to the practitioners in the country. This paper can serve as a reference to the early adopters who intend to use Agile methods in the future.

Keywords—Agile, SAD, hybrid

I. INTRODUCTION

AS system and IT professionals continue to evolve and change ways they manage projects in organizations, the processes, tools and methodologies for managing these projects are also constantly improving. Leaders thus, in the IT industry are poised and forced to invent, proffer different and more powerful ways to manage IT projects. Today’s answer to these demands, has consequently led to the advent of the Agile project management (APM) – aimed at meeting the demands of effective project management and deliver better results to end-user. The APM is based on proponents of the iterative and incremental development methods to include all aspects of the project delivery from business and solution analysis to quality assurance and testing. Agility is the ability to both create and respond to change in order to profit in a turbulent business environment [25, 26].

Our study investigates seamless hybrid method that flexibly combines components from both the traditional and APM methods, in order to manage IT projects more effectively as adopted by IT professionals in Nigeria. This hybrid method is successfully applied in several real-life industrial projects. Also, it makes the necessary organizational transition, required before switching from the traditional to the hybrid way in managing IT projects [24]. The ever-changing demand in the evolution of applications and the increasingly critical nature of software projects has continued to place even greater demand on project management. It has been noted that inability to deal with such increasing complexity in software system development increases the likelihood in failure of the project [1].
Many reasons have been cited by many studies as major pointers in the failure of software projects; Among them are:

(a) rapid changes in user requirements,
(b) lack of user involvement,
(c) poor planning,
(d) unrealistic expectations by developers,
(e) ambiguous communication of requirements, etc.

The evolution of software evolves in terms of complexity and saw a corresponding growth in the adoption methodologies for managing them. Methodologies such as the Waterfall, Spiral and others introduced to deal with the problems identified in development of software – have been found wanting in dealing with the issues of rapid delivery to market as well as the frequent changes required during the development and maintenance cycle.

With the recent introduction of APM methodologies such as Scrum, IT leaders argue that these problems can be overcome [2]. Thus, we are interested (particularly in Nigeria), whether a quantifiable improvement has been made with the transition into APM, which provides a methodology to develop software with large emphasis on people and their creativity [3]. Despite the benefits that APM delivers, little work has been published regarding its current usage in Nigeria [4]. If the methods are to be used, there is a need to understand how Agile methods are being practiced within Nigeria. How is the practice perceived by the practitioners in Nigeria? What challenges and benefits have they experienced when using APM? How they overcome those challenges? APM is not for every developer. Many have argued that when APM is not enough – developers will have to adapt as what works in one culture, will not necessarily work in other cultures. A team of developers agrees with this statement and intend to investigate the scenario in the country. Several studies stated that addressing cultural differences is important for the success of software development[26].

A. The Nigerian Practitioner’s Perspective: Importance of Software Industries and Software Process

The software industry is acknowledged worldwide to be the fastest growing sector. Over the last decade, there was a trend for the software industry to move from advanced high wage countries, towards low waged countries. Analysts suggest this trend will continue in the coming decade. The last decade saw countries like India, make the best use of the above scenario and did increase their software export considerably, achieving an annual growth rate of over 50%. Nigeria and Africa at large is lagging far behind in this; But, Nigeria has the potential to improve the enabling factors and make her software industry a main foreign exchange earner in a relatively short period. Realizing its important contribution of the software industry to the economic growth and how it can help the community, Nigeria must start focusing on it. This is important in order to transform the country into a developed and technological country [25]

In order to have smooth operation of software development and successful deployment of the industry in ICT, the needs of software processes are considered to be critical. The problems found from one study [22] show that Nigeria is still lacking the usage of software processes. Besides, the problems in terms of delivering quality products have also been identified [21]. In addition, recent investigation has discovered that companies in Nigeria do not have a clear methodology that shows how the requirements can be obtained [21].

The need for a good software process is important as it can help practitioners define their requirements. These problems have motivated APM to be introduced in Nigeria. It emphasizes on collaboration with customers and having to work iteratively and incrementally so as to reduce
associated problems in product delivery [21]. It is expected that the problems can be minimized with the application of the methods. To the best of the team member’s knowledge and based on a review of literature, the team found very little information and published studies about Agile methods used in Nigeria.

B. Motivations and Rationale for the Study
In this paper, several questions are addressed:

a. What do practitioners say about awareness of Agile in the country?
b. What are the reason(s) that is making them to start to use Agile methods?
c. What are the challenges they face when using Agile?
d. Despite the challenges, what are Agile Practices perceived to deliver the greatest benefits to them?

The study will seek to ascertain the perception of software system developers and practitioners in Nigeria in terms of APM, challenges they face, the benefits they achieve using the APM by: (a) presenting the challenges of using APM, which can serve as guidelines for software practitioners in Nigeria. It is hoped that the findings will help to reduce the difficulties encountered in the adoption/adaptation of APM. Also, it is expected to provide the empirical results of software engineering knowledge and software processes in terms of Agile methods usage. This is in turn expected to increase usage of the methods and at the same time create enough awareness of the Agile methodologies in Nigeria.

APM was established believing it yields faster results in developing software deliverables. Though, APM is not a silver bullet replacing traditional methods of software engineering, such as the Waterfall model. However, to get the best out of Agile, it must be adapted to the people and organization of the adopters. Agile has become the typical development method of software in Western nations (such as Europe, Australia and Northern America); this is however, not the case in other regions and countries such as Nigeria. For them, Agile is new and some have never heard of the method. Furthermore, with the importance of software industries to the country, it is necessary to provide baseline on how to use software processes that can be adapted to frequent change in the business environment.

This paper presents the perception from practitioners in Nigeria on the emergence of APM considering their awareness and challenges associated with the introduction of APM. Possible solutions will also be suggested by the practitioners. The practices perceived to deliver the most benefits are also presented. As qualitative study is always concerned with validity and reliability of the findings, these issues are discussed before the paper is concluded.

II. EXPERIMENTAL MODEL

A. Research Significance and Roadmap
Two methods were employed, initially conducting semi-structured interviews from each company and later collecting the team’s perception via an online survey. This facilitated the involvement of many team members, allowing the comparison of their opinions. At the same time, through these open-ended questions, it permitted maintaining a qualitative view on the project environment, without having to conduct interviews with every single team member.

A qualitative semi structured interview was conducted to understand perception of new adopters in Nigeria. As software development deals with human factors, a qualitative study therefore helps in understanding the respondents’ behavior, and to identify the unknown and never explored scenarios [22]. Unlike the quantitative approach, a qualitative study helped to describe what is actually happening when Agile methods was implemented [23]. Also, the systematic review also included qualitative and quantitative research studies, published up to and including 2013. Only studies
written in English were included. The search strategy included electronic databases and hand 
searches of conference proceedings.

B. Study Design

Questions in the interview were developed from findings obtained in the baseline study [7], which 
are localized to basic references. Hypotheses were created to investigate perception of software 
practitioners in using APM as a semi-structure interview. Thus, the questions were adapted to 
answers given by the participants as the interviews mainly focus on capturing the project specific 
demographics. The demographics include time and cost factors. This facilitated the research to 
gather answers not only for set of pre-defined questions, but also for some important hidden data. 
Then a preliminary questionnaire was designed to obtain relevant information for the research.

C. Participants

As a qualitative study, the participants are purposely chosen, rather than at random, based on the 
simple criteria of being a software practitioner. These include developer, tester, system analyst, 
business analyst and project managers involved in Agile project. The suggestion behind the 
qualitative study is to purposefully select participants. Taking benefits from their positions is 
consistent with the objective of the study. The benefit of this purposive sampling is to allow the 
researcher understanding the scenario from the right participants. The team conducted interviews 
with a software architect to collect in depth and detailed information.

D. Data Collection

Major software development companies in Nigeria were identified through the help of the Nigerian 
Computer Society (NCS) and the Computer Professionals and Registration Council of Nigeria 
(CPN). IT companies providing software development services were considered. E-mails were sent 
to these companies to inquire their ability to provide information for the above research. In lieu of 
the non-disclosure agreement reached with 5 companies that provided data, the data were all used but 
without disclosure of the companies’ names.

The data were collected from two software organizations, involving 61 software practitioners. The 
purpose and implications of the research were explained to the participants before the interview 
started. At the same time, consent of non-disclosure was sought from the participants by providing 
forms which they signed. This study has been granted an ethical approval under Nigeria Computer 
Society. The interviews were recorded using a voice recorder. Hand written notes were also taken 
while the interviews were recorded. This was important for reference and can be compared with the 
recorded data later at analysis stages. As already mentioned above, the research collected data not 
only through interviews, but also by providing questionnaires to QA leaders, Developers and Testers. 
The questionnaires were distributed mainly via e-mails and helped the research to obtain information 
from a large number of personnel.

III. DATA ANALYSIS, FINDINGS AND DISCUSSION

The data were transcribed and compared with notes taken during the interviews. It was ensured that 
only the relevant data were transcribed. The results were analyzed as: (a) classified roles, (b) 
respondents who adopt APM, (c) different APM used, (d) reasons for using Agile methods, (e) the 
different problems faced, (f) different benefits obtained, (g) developers who think APM is important 
and vice versa, and (h) reasons for considering APM as important and vice versa.
## Table 1: Participants’ category

<table>
<thead>
<tr>
<th>S/No</th>
<th>Participants</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tester</td>
<td>4</td>
<td>4%</td>
</tr>
<tr>
<td>2</td>
<td>Lecturers</td>
<td>12</td>
<td>13%</td>
</tr>
<tr>
<td>3</td>
<td>Development related</td>
<td>9</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>individuals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Quality Assurance</td>
<td>26</td>
<td>29%</td>
</tr>
<tr>
<td>5</td>
<td>System Architecture</td>
<td>8</td>
<td>9%</td>
</tr>
<tr>
<td>6</td>
<td>Software Developer</td>
<td>19</td>
<td>21%</td>
</tr>
<tr>
<td>7</td>
<td>Project Managers</td>
<td>12</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>100%</td>
</tr>
</tbody>
</table>

As Fig 1, out of 90 respondents 26% are quality assurance managers, 19% are software developers, 12% are both project managers and lecturers, 8% are system architects. It can be depicted that about 81% of the respondents are surely involved in software development processes. The balance 19% maybe or may not be involved in software development processes but definitely related to IT and software.

## Table 2: Adopted Methodology

<table>
<thead>
<tr>
<th>S/No</th>
<th>APM Adoption</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>51</td>
<td>57</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>Hybrid</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>
As in Fig 2, 57% of the respondents are currently using and involved with APM in their software developing process. 22% of respondents are not using APM in software development process; while, 21% are flexible in their adoption of the APM methodology in their software development processes. Consequently, the 51% of the respondents using Agile methodologies are classified as APM practitioners.

<table>
<thead>
<tr>
<th>S/No</th>
<th>Participants</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superior’s Orders</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>APM Benefits</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Trending</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>What works</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: Reasons for adopting APM.
As from data analyzed in fig 2, these practitioners were further studied by analysing the different reasons, which made them adopt APM methods. It was found that these were the reasons for their adoption of the APM methodologies: (a) to keep up with the trends and changing environments, (b) enforced by their superior, (c) whatever works for me while on a projects and at the time, and (d) the benefits accrued with and motivated by the APM. However, it was discovered that the methodology as “Enforced by their superiors” led with about 35%, followed by “What works for me at the time of projects” at 25%. Then, “Motivated by its benefits” was next at 24%; while “to keep up with the changing environment and trending” was the least used at 16%. This is seen in Fig 3, which shows the different reasons for adopting Agile methods.

<table>
<thead>
<tr>
<th>S/No</th>
<th>Methods</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scrum</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>2</td>
<td>Xtreme Programming</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Xtreme Testing</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Crystal Family</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>DSDM</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Hybrid</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>Others</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: APM methods adopted

The practitioners were further studied by analysing the various or different types of Agile methods that they use. It was found that “Scrum” was leading the way at 38%. This was followed by Hybrid (i.e. software developers and practitioners that used a hybrid of APM and other methods that works for them at the time) at 21%. Followed by others (those who used other APM methods not mentioned above) at 12%. Xtreme Programming is at 10% and Dynamic Systems Development Methods (DSDM) is at 5%. “Crystal family of methodologies” was the least used at 2%. However the results seem to be fragmented and Fig 5 shows that Scrum and hybrid methods were the most used and adopted Agile methods.
From fig 5, the challenges and main issues faced in adoption of Agile methodologies out of 78% of the respondents are “Costly” at 32%, “Insufficient team support” at 28%, “Poor Quality” at 13%, “Others” at 10%, “Time wastage” and “Repetition of work” at 8% respectively. This is depicted from this result that more importance should be given to cost management and team building activities.

**IV. CONCLUSION AND SUMMARY**

In this paper, the perceptions have been identified from their awareness, the way they introduced the method and the challenges they are facing. Lessons learnt about perceptions of software Agile method practitioners are important to serve as guidelines for the adoption of Agile methods in Nigeria. This study indicates a low perception from Agile users towards the methodologies and that there is difficulty of getting everyone in the team to take responsibilities. The findings also show that people need to be confident when trying to use Agile methods. This is so as they need to see something working and proven success stories from the Agile users.

The challenges are mostly found from the organizations having hierarchical approach. Here the management is expected to set the datelines and control the process, therefore Agile is hard to be accepted. It was found that the challenges from lack of documentation, organizational aspect, practical involvement, knowledge and culture are all based in or related to people factor where the mindset change is needed to overcome those challenges.
However, recent Google Trend Research show increasing interest of software development companies towards Agile based software development. This study adds evidence to the knowledge of software engineering and software process; at the same time it provides knowledge and reference about Agile methods to the country and the nearby region.

REFERENCES


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