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ASSESSMENT AND IMPLICATIONS OF APPLYING CMMI AT A SAUDI PUBLIC ORGANIZATION

Abstract: *Due to complexity of software and its related development activities, it has become difficult for software organizations to deliver high-quality products under low-cost budget constraints. Many software developments firms around the world have resorted to The Capability Maturity Model Integration (CMMI) to establish continually improving standard software development processes. Aligning software development practices with state-of-the-art standards in software development will consequently improve the quality of the resulting products and place the organization at a higher level of software development maturity. In this research, we assess the extent of applying CMMI at a Saudi organization and analyze provide an analysis based on a survey study.*

Keywords: *Software Proces, Assessment, Maturity Capability, CMMI, Saudi Public Organization.*

1. Introduction

Nowadays, software organizations aim to increase customer satisfaction by delivering their products faster with high quality and less cost. Achieving this goal become more difficult due to the rapid and complexity of developing these products. Hence, organizations should have the option to manage and control this typical development and support the procedure with the help of capability improvement (Team C. P., 2010).

The initial step is to start an ascendable solution that identify the critical capabilities of an organization. Adopting a capability improvement program enhances the organizational picture and business operations. This improvement includes the nature of individuals, processes, and innovation used to obtain, create, keep up with, and advance those capacities (Team C. P., 2010).

As organizations advances in their capabilities and productivities, higher levels of accomplishments are sought by further improvement in the business production process. And by addressing such areas, and coordinating process improvement in the entire organization (Team C. P., 2010).

By applying Capability Maturity Model Integration (CMMI), software organizations can indeed reach higher levels of maturity (Team, C. P. 2010). CMMI is a complete ramework for improving the process of development (Team C. P., 2010). It provides work activates that help organizations to follow their management, improvement, and assessment of the software development processes (Sommerville, 2011). It shows a visible path for this improvement using five different maturity levels as depicted in Fig.1 (Chrissis et al., 2011).

To an organization, CMMI is the opportunity to follow a clear path to improve the maturity of the production process and hence improve the overall production quality. CMMI

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comprises best practices that handle the product advancement exercises applied to processes and products. Furthermore, it addresses processes that effect product's lifecycle from being thought all through maintenance and delivery (Team C. P., 2010).

Figure 1. Maturity Levels

Accordingly, the importance of constructing the CMMI that is able to improving/managing software development processes, so that improving aim to increase customer satisfaction by delivering their products faster with high quality and less cost. For this paper, it assesses the extent of applying CMMI at a Saudi organization and analyzes its weaknesses based on survey study. Section 2 presents an overview about Saudi Public organization and Software Processes Assessment followed by Capability Maturity Model Integration (CMMI) section. In Section 4, it mentions some other efforts in applied CMMI and evaluated. Section 4 and 5 describe the methodology and analysis of survey study. Finally, Section 6 presents conclusions.

2. Background

According to Abdul Rahman et al., organizations in Saudi Arabia are performing poorly due to poor leadership styles. Researchers outlined leadership styles as a key area that can be used to improve management in public organizations (Abdul Rahman et al., 2014). In another study, it was found that leadership styles and organizational culture in Saudi Arabia greatly impacted the implementation of e-services in public organizations (Alomiri, 2016). The two studies revealed that many public organizations were striving to adopt the best practices in leadership for better service delivery (Abdul Rahman et al., 2014; Alomiri, 2016).

Public organizations in Saudi Arabia have undergone a number of changes over the years. The changes have been guided to achieving high levels of performance, efficiency, and organizational excellence. In this study, it has been found that despite the increased adoption of technology in major public organizations, there is a number of factors that need to be addressed to ensure the IT infrastructure drive efficiency in operations. It has analyzed how computerized systems are increasingly being used in public organizations to enhance business performance. With the increased technology use in managing public organizations, new methods to assess efficiency in service delivery are increasingly being adopted (Al-Maliki, 2013).

For any organization, employees have an important role in determining the success of it. Therefore, employees can be engaged in evaluating whether a new leadership style or organizational culture, it is positively impacting the performance of the organization. Alharbi determined the success of new criteria to evaluate performance in public organizations, he found that most employees were dissatisfied with the model as it was inaccurate and the evaluation process was flawed (Alharbi, 2018).

2.1 Software Process assessment

Due to the complexity of software development processes, there should be a defined way to assess them. Software processes assessment is the foundation for providing high-quality software with minimum cost and time. It detects the expanding of achieving goals that set in the planning phase Sommerville (2011). A Successful process assessment depends on complete understanding and proper documentation of the process. It is essential to enhance the software quality which depends on the software process quality (Beth et al., 2006; Pfleeger & Atlee, 2010).
Assessment techniques are set up to assess software advancement measures rely upon estimation, through which a bunch of cycle-based attributes are evaluated and observed. (Pfleeger & Atlee, 2010; Pressman, 2005; Humphrey, 2009).

2.1.1 Assesment Model overview

Following an assessment software process model is a guarantee that these processes are following the software engineering standers. The software processes evaluation considers all process details as activities, tools, and methods. It has defined intensity and difficulties of every phase in the development and determined the strategy for progress. Also, it detected the extent of achieving the goals and objectives of software activity (Team C. P.,2010). To have a successful process assessment, understanding and documentation of a process are very important.
Basically, applying it true to form will give more powerful and proficient software advancement measures. Be that as it may, this change requires solid hierarchical responsibility. Additionally, there are numerous models were set up to assess software advancement measures that will be referenced in the following subsection Pfleeger & Atlee, 2010; Beth et al., 2006; Asadi et al., 2021; Ijaz
et al., 2016).

2.1.2 Type of assessment tools

Different assessment tools are designed to collect and analyze data to enhance the quality and timely delivery of applications. In the beginning, there were many models as CMM, Trillium and ISO 9000 (Peldzius & Ragaisis, 2014). ISO 9000 was an alternate arrangement of general norms for quality administration. Though ISO 9001:2008 is the most recent one, yet there are no large contrasts, minute changes were recorded and given by ISO itself. In another hand, Ijaz et al. has found the ISO standards do not suit

much to the software organizations (Ijaz et al., 2016).

SPCE (Software Process Improvement and Capability Determination) is a structure that is usable with ISO/IEC 15504. It is utilized to further develop the product advancement measure and decide the capacity of the cycle (Ehsan et al., 2010). This model gives a full system containing measure the board model guidelines for the process and rating the interaction under thought, development, determination, utilization of tool devices, and preparing for evaluators. It is considered as a kind of perspective model to develop the cycle improvement in five levels: Performed, Managed, Established, Predictable, and Optimization (Ehsan et al., 2010).

CMMI is a process that assesses the maturity capability of an organization and awards a maturity level in a scale of one to five. An appraisal is done to determine the best practices used in different departments of an organization. CMMI thus provides certain operational practices that can be used to standardize activities in organizations. Assessment tools are designed to collect and analyze data to ensure compliance with given reference frameworks. CMMI is one of the standard frameworks that was widely used as an assessment tool in the world. Certified assessors use different tools to assess whether an organization can be CMMI appraised. Table 1 shows the comparison between SPICE and CMMI.

Table 1. Comparison between SPICE and CMMI

CMMI	**SPICE**
Free	Not free
Prepared assets and qualified experts are accessible.	Prepared assets and quality experts are extremely uncommon.
Easy to call the appraisal	Not easy to call the appraisal
Much awareness in the industry	Not much awareness in the industry

In this study, the CMMI is chosen to assess the public Saudi organization. There were studies have been conducted to determine how organizations can use CMMI to assess their performance. According to a study made by Alshammari and Ahmad (2013), researchers found that the understanding factors affecting CMMI transition in Saudi can be important in identifying new strategies that can be used in the implementation of CMMI in the public sector.

3. The capacity maturity model integration CMMI

SEI (The Software Engineering Institute) at Carnegie Mellon University found five central confusing principles within the assessment practice of software development processes (McGraw & Blash, 2009):

- Planning, following, and schedule management.
- Requirements definition and design control.
- Process evaluation.
- uality estimation and persistent improvement.
- Evolutionary improvement.

The Capability Maturity Model (CMM) provides organizations with a roadmap to improving their process McGraw & Blash, 2009). In 1987, the model was published as maturity framework with five maturity levels. At that time, the model guided software engineering practitioners.

In 1993 McGraw and Blash (2009) Muhammad et al. (2020), Humphrey (1989), the version released was 1.1 followed by a version 1.2 in August 2006 then in November 2010, version 1.3 become a life, which supports agile software development. The model integrated Variety models in one framework to develop the usability. CMMI divided into three critical areas (Team, S. U., 2001; Paulk, 2009; Alghamdi, 2020;

Herbsleb & Goldenson, 1996)

- Product and service development - CMMI for Development (CMMI - DEV).
- ervice foundation, the board - CMMI for Services (CMMI - SVC).
- Product and administration obtaining - CMMI for Acquisition (CMMI - ACQ).

Table 2. Process Area and Maturity Levels Team C. P., 2010)

Process Areas	**Maturity Level**
Causal Analysis and Resolution (CAR)	5
Configuration Management (CM)	2
Decision Analysis and Resolution (DAR)	3
Integrated Project Management (IPM)	3
Measurement and Analysis (MA)	2
Organizational Process Definition (OPD)	3
Organizational Process Focus (OPF)	3
Organizational Performance Management (OPM)	5
Organizational Process Performance (OPP)	4
Organizational Training (OT)	3
Product Integration (PI)	3
Project Monitoring and Control (PMC)	2
Project Planning (PP)	2
Process and Product Quality Assurance (PPQA)	2
Quantitative Project Management (QPM)	4
Requirements Development (RD)	3
Requirements Management (REQM)	2
Risk Management (RSKM)	3
Supplier Agreement Management (SAM)	2
Technical Solution (TS)	3
Validation (VAL)	3

CMMI can be used as an appraisal framework to determine maturity of software development processes. Maturity levels start from level 1 until level 5 with 22 process areas; no one of them belong to Maturity level 1. That implies the organization doesn't give a steady environment to help processes and its prosperity which relies upon representative effectiveness as displayed in Table 2 (Team, C. P., 2010; Alshammari & Ahmad, 2013).

4. Related work

Khraiwesh (2017) focused on one process area in CMMI which is configuration management. He studied common measures for the three specialized goals and related seven individual procedures this development area using Goal Questions Metrics (GQM) model. The research recommended to define and implement the measures to have a valid perspective into the tasks related to configuration management process. Moreover, it used to manage and assess software processes and products.

Salmanoğlu et al. (2017) main contribution is a suggestion of an estimation ability model with its assessment technique. Organizations can utilize this model to decide the ability of their actions, to recognize improvement openings, and to further develop their estimation arrangements.

Serrano et al. (2013) fundamental objectives were to comprehend the obstacles in carrying out CMMI and further develop measures following the model. The study was directed in an organization in the North of Portugal, following three stages: (1) discover the organization (2) assessment gathering through polls and (3) reimplementation of CMMI. The investigation of the polls demonstrated that executing CMMI is tricky because of administration and the absence of itemized protocols. In light of the troubles experienced, the specialists created itemized documentation with standard cycles where the business played a more conspicuous part in controlling the cycles. The adjusted CMMI was then once again introduced in a similar organization. At last, connecting

discernments and results from the reimplementation, the analysts considered their work was crucial as great utilization of CMMI to guarantee proficient creation.

In Ardana (2017) study, CMMI-Dev (CMMI for Development) variant 1.3 continuous representation is utilized as a source of perspective in Software Development Company with restricted assets to work on the nature of the product created. SCAMPI-C with PST Tool was utilized to direct the appraisal of the 5 (five) measure spaces of CMMI level 2. Information was gathered by meetings and perceptions of task documentation and the course of software advancement. Unapplied practice from evaluation then, at that point is dissected utilizing Ishikawa Analysis; to discover the base of the issue alludes to the SPF (Software Process Framework) and accordingly use Pareto Analysis to decide the upgrades need. The cycles which were at that point great were in the process region PP (Project Planning), CM (Configuration Management), and the vast majority of the cycles in the space of PMC (Project Monitoring and Control). Programming advancement measures that should have been improved were in the process region with need PPQA (Process and Product Quality Assurance), REQM (Requirements Management), and afterward PMC (Project Monitoring and Control). The earlier improvement from the SPF class was in the request for method classification and afterward measure class.

In the current modern environment, enormous organizations have supported development-driven cycle improvement endeavors. The greater part of these efforts has been motivated by development models like the CMM (Capability Maturity Model) and have been directed by the space of Software Process Improvement (SPI). The development of an association's cycles is estimated through its development level. An association at a high development level, implies, that it has mature cycles, and it is more dependable. In this point of view for an impromptu association with no experience of doing SPI and CMM, the endeavors have for the most part been drawn out, costly, and not frequently conveyed the impacts back to the associations in similar measurement as examinations. In this paper, we examine the job of development as a driven cycle improvement in the business. To overcome this problem, an investigation was done to gain from the experiences of organizations that have encountered development-based cycle improvement (Shaikh, 2019).

Risk is intrinsically connected with every single element of this universe and programming isn't a special case for this reality. Risk can be whatever unfavorably influences the advancement (during improvement) and accomplishment of programming after arrangement. It can happen because of erroneous evaluation of client prerequisites, misleading appraisals of generally improvement cost, inappropriate undertaking timetable, or quality particulars that are out of reach inside the product explicit requirements. However, riks are implied in each period of programming improvement life cycle (SDLC) and it has been all around conceded that testing stage burns-through huge piece of SDLC. Testing stage is the weakest one and represents an incredible danger to the acknowledgment just as to the post organization accomplishment of programming. This work presents the potential outcomes of including hazard the executives exercise at the absolute first degree of CMMI only for little programming enterprises (SSI) like new businesses. In view of these results a cycle improvement model for SSI is additionally proposed in this paper (Sharma & Dadhich, 2020).

Further studies explored the connection between Capability Maturity Model Integration (CMMI) ability of the merchant and client framework achievement insight in IT re-appropriating projects. Connection among trust and the CMMI-framework achievement discernment relationship was likewise explored. Information was gathered

from experts with foundations in both CMMI and IT re-appropriating. Results uncover that while CMMI no affected a client's framework achievement insight, the trust did fundamentally cooperate with the connection between seller CMMI ability and client framework achievement discernment (Dutta & Omolayole, 2021).

A contextual analysis is presented that conjectures what undertaking group culture in computer programming associations means for Capability Maturity Model Integration (CMMI) execution from a hierarchical culture viewpoint. It battles that the achievement of CMMI execution is emphatically identified with project group culture alongside the six parts of hierarchical culture: position on change, centralization and coordination, position on joint effort, judiciousness and truth, inspiration, and position on task. This work utilizes a subjective way to deal with lead semi-organized meetings and plays out a substance examination of the deciphered meeting related information from case convention to break down the accumulated data. The outcomes show the degree for the effect group culture has on CMMI execution and propose the potential for CMMI executions to achieve changes in authoritative culture, which can uphold the mix of software into an organization. Likewise, this study promotes a social development that shows the parts of culture that best work with a solid undertaking group culture in CMMI execution. It broadens the hypothesis in regard to the effect of culture on CMMI execution and gives a hypothetically grounded premise to future exploration (Tsai, 2021).

As of late, Agile Development has arisen as an elective methodology in computer programming and software development. The Agile Software Development (ASD) measure furnishes the capacity to adapt to consistently evolving prerequisites. Then again, the Capability Maturity Model Integration, one of the Software Process Improvement Framework, is generally used to give programming advancement associations construction and steadiness in their product interaction. It empowers associations to create programming measures with better quality programming, the usefulness increment of the improvement group, and negligible danger of disappointment.

The work show that the principle challenges concerning joining CMMI and Agile are the absence of significant information and experience and the way of life of CMMI, Agile, or once in a while both. The restricted extent of Agile itself represents another significant test. Nimble spotlights on programming advancement projects, while CMMI has a more extensive territory, from project-level advancement to association level cycle improvement. This survey additionally tracks down that Agile Development is viable with CMMI at a development level of 2 and 3. Future investigations ought to decide the ideal strategy for conquering the impediments related with consolidating CMMI and Agile (Ferdinansyah & Purwandari, 2021).

5. Methodology

In this study, the CMMI application will be assessed in a Saudi Public Organization. Processes areas of Level 2 will be analyzed and the relationship among them are understood to the software development industry. CMMI provides a wide range of areas each of which includes many activities and is the international reference for standard software development processes. At this stage of the research, the researcher is assessing the extent of applying CMMI at a Saudi organization and analyzing their weaknesses.

5.1. Research Hypothesis

H0: Saudi Public Organizations satisfy CMMI level 2
H1: Saudi Public Organizations do not satisfy CMMI level 2

5.2. Survey design

Sample

It is selected based on the IT department in Saudi Public organization. The population sample included people who are involved in developing software in the Deanship of Information Technology at King Abdulaziz University.

Survey questions

The web service forms (WSFI) is used to get the survey responses. This tool has been chosen because of the exclusive attributes of the study population and the efficiency of data collection. The closed-ended questions are used in survey, formulated based on the objectives, research question, and the hypothesis of this research.

The survey was designed of two groups: the first group contained 9 demographic questions, followed by 52 questions organized into 8 sections about CMMI and specially Level 2.

Table 3. Likert categorical scale

Weighted Mean	Answer	Capability Level
From 0 to 0.83	I don't Know	Incomplete
From 0.84 to 1.66	Strongly not applied	
From 1.67 to 2.49	Not applied	
From 2.50 to 3.32	Neutral	Performed
From 3.33 to 4.15	Applied	Managed
From 4.16 to 5	Strongly applied	Defined

A multiple choice type format was used to measure the respondents. To score each question, the Likert categorical scale was used. The possible answer choices were from (1-5), where 5 means strongly applied. Based on the mentioned scale that used (5/6) to give a weight for each answer sorted from low to high as shown in Table 3.

5.3. Data collection

The responses of the survey were collected from the period between 6 December 2018 until 6 February 2019. The Statistical Platform for the Social Sciences (SPSS) spreadsheet was used to organize those responses with the code sheet that has been improved relying on the Likert categorical scale, to evaluate the attitudes from the data of the survey results. The answers were organized into separate rows and columns with the allocated attitudinal score as mentioned previously in this chapter. The answers to each question have been assigned with numerical values for the data analysis.

5.4. Data analysis

The SPSS was used to analyze of the survey data. The statistical analysis that have been implementing includes overall multi-dimensions of each process area, regression statistic, and parametric test. To determine the Reliability of the survey the ALPHA kurnbach and Split-half were used. While evaluating Validity Pearson product-moment correlation coefficient is used. The line charts are provided for the clarification Percentage of Frequency and predict the relationship between each process areas. Some information were organized in the pie chart.

6. Analysis of the study

Demographic Question's Result

Information systems development is a complex industry comprising technological expertise, analytical and designing methodology, as well as issues of project management and process improvement. In order to evaluate the readiness of Saudi public organizations to satisfy CMMI, a survey with 56 questions was carried out. The survey was divided into two categories.

The first category included nine preliminary demographic questions, whereas the second one includes forty-seven questions associated to the process area of CMMI maturity level 2 (Managed). 124 responses were received; 13 non-IT employees' responses excluded. The second section of the questionnaire was addressed the demographic questions offered personal questions such as gender, age, and education. Other questions related to the job such as department, type of work and years of experience. In addition, there is one more question about participant's possible experience with some particular aspects such as (Cost overwhelms, Missed or close cutoff times, Poor confidence, Quality issues, Rework because of client grumblings and the powerlessness to rehash past triumphs).

According to the statically analysis, percentage of male's participants is (82.88%). This percentage represents the mentioned percentage in General Authority for Statistics in Saudi Arabia says that (97.88%) of the IT employees are male. Also, (68.47%) of participants are less than 39 years old; that means the ability of learning among this group of age is high, according to the study that mentioned the ability of younger workers to learn and deal with change is positive attributes (Brooke & Taylor, 2005). Accordingly, the expectation of resistance of change is (31.53%) from employees whose up than 40 years old. With regard to participants' education, it is found that most of them have high degree and (90.09%) of their degrees are related to IT When the survey asked about the participant IT daily job, it was found that software development achieved the highest percentage (36.04 %). Moreover, (53.16 %) had less than 10 years of experience, which supposed they have readiness to change. As such, there is (68.47%) in the range between (6-20) years old that is considering they have a good knowledge about the organizational processes. The work profile departments in the organization have lack of specialization, duplicated and tasks overlap, the departments processes had no control and integration. Although, there are various area of work, which include (Programmer, Web Developer, Servers Administrator, and Project Manager...etc.). This diversity in area of work helps the organization to build department specialization. Numbers of participants have experienced one or more of the following (Missed or close cutoff times, Poor spirit, Quality issues, Rework because of client grumblings, Cost overwhelms and the failure to rehash past triumphs). It was found that at least 66 of participants missed or close deadlines. In addition, at least 44 of participants have poor morale and at least 38 of participants have quality problems. In addition, at least 28 of participants were reworked due to customer complaints. Those numbers show the needs of applying CMMI in the organization.

The second section of the questionnaire addressed the key process areas of the CMMI, which were used as the indicators for assessing the maturity levels in this research. The survey showed interesting results and analysis of the company's readiness to adopt the CMMI Level-2 model (methods and practices) in Saudi public organizations. The most important finding was majority of the employees (80%) believe the necessity of adopting CMMI to identify capabilities in their organizations and to enhance the organizational overview. Summary of the descriptive statistics for the set of questions designated for this study; categorized according to CMMI processes are shown in Figure (1). From the Table 4, it can be noticed that the means and standard deviations of the question categories vary slightly; therefore, a deeper look at individual questions for each category is required.

CMMI maturity levels (Levels-1 through Level-5) can be characterized by the activities performed by the organizations to present a software and its related tasks for each project. In order to study the measure of adequacy in Saudi public organizations in managing the prerequisites of the venture's

items and item parts, and to recognize irregularities between those necessities and the activities plans and work items, including both technical and nontechnical requirements, in order to that requirement imposed by the organization on the project. Questions (Q3 through Q6) measure whether public organizations in Saudi Arabia do requirements analysis practices and ensure they are aligned with project plans and working products. These sorts of questions have got the highest mean ranged from (3.36) to (3.65), this is indicating that requirements managements are a major concern in Saudi public organizations. Consequently, the capabilities level of REQM is Level-2 (Managed).

Table 4. Capabilities level of processes areas of Managed Level

PA	PA Mean	Result
REQM	3.51	Managed
PP	3.36	Managed
PMC	3.27	Performed
SAM	3.10	Performed
MA	3.19	Performed
CM	3.22	Performed
PPAQ	3.21	Performed

Public organizations in Saudi Arabia are kenning in laying out the goals of the project and the phases a given project has to take in order to satisfy its stated goals. This is obvious according to respondents of questions (Q7 through Q17). such questions got high means ranged from (3.15) to (3.56), which is indicating that public organizations in Saudi Arabia organizations strive for having clear goals and objectives for IT projects, based on at tasks and activities will be clearly set at the planning phase. This implies that the capabilities level of PP is Level-2 (Managed)

Concerning Project Monitoring and Control (PMC) practices, questions (Q18 through Q25) measure the capability of public organizations to understand the project progress to guarantee that suitable restorative moves can be made when the presentation of the project is considerably diffracted from the plan. These questions got low means ranged from (3.03) to (3.38), which demonstrates that few Saudi public organizations set proactive activity intends to expect blunders, to keep an acknowledged proportion of mistakes, or forestalling them. This infers that the capabilities level of this process is Level-1 (Performed).

The improvement of the products purchasing process and the enhancement of the delivery of services are measured using questions (Q26 through Q29). These questions got low means ranged from (3.01) to (3.15), this implies that many organizations may experience the ill effects of major issues with the market like missed responsibilities and late conveyance to the market. In addition, they internally suffer from quality problems, as a result, this may have reflected negatively with customer satisfaction. Consequently, the capabilities level of SAM is Level-1 (Performed)

In order to measure whether public organizations in Saudi Arabia use specialized systems for data gathering and analysis required for the support of management information needs to get benefits of such systems to produce high quality products, questions (Q30 through 37) were introduced. Such questions have low means ranged from (3.14) to (3.26). So, little number of organizations know how to use them in an effective manner. As a result, the capabilities level of MA is Level-1 (Performed).

The aim of CM (Configuration Management) is to set up and maintain the work products integrity using configuration identification, configuration control, configuration status accounting, and configuration. Questions (38 through 42) measure practices regarding baselines such as creating or release baselines and identifying configuration items. These baselines were not used properly; in addition, respondents had negative feedback about controlling configuration items,

tracking changes to project, and controlling configuration items. These questions low means ranged from (3.1) to (3.29), as a result, the capabilities level of CM is Level-1 (Performed).

Among the Process and Product Quality Assurance (PPQA) practices questions (Q43 through Q46) got the highest means ranged from (3.16) to (3.26), this indicating that most surveyed organizations processes are partially evaluated against relevant cycle depictions, norms, and methods, likewise, quality issues are discussed, and the decision of nonfulfillment matters with the employees and managers are ensured. The answers show an average tendency for companies to implement quality management practices. Consequently, the capabilities level of this process is Level-1 (Performed).

Table 5 illustrates the correlation among processes areas. This correlation explains the processes areas relationship in the second level (Manage). The correlation among processes areas is completely positive.

Table 5. Correlation between All Processes Areas

PA	REQM	PP	PMC	SAM	MA	CM	PPQA
REQM	1						
PP	0.737	1					
PMC	0.628	0.809	1				
SAM	0.526	0.725	0.731	1			
MA	0.673	0.849	0.834	0.776	1		
CM	0.654	0.814	0.789	0.794	0.878	1	
PPQA	0.622	0.766	0.726	0.697	0.845	0.835	1

7. Conclusion

Many organizations are unaware of the CMMI and its potential benefits. This study utilizes the CMMI constructs in assessing IS maturity of public organizations in Saudi Arabia and analyzes their weaknesses based on survey study. This research has shown that public organizations are lateness behind CMMI adoption, indicated by the amount of public organizations that attained only lower levels of maturity.

The results show that only REQM and PP process areas achieved the capabilities level-2 (Managed), the rest processes achieved the capabilities level-1 (Performed), which means the Maturity level of the organization is level 1(Performed). Consequently, Saudi Public Organizations do not satisfy CMMI Level-2, indicated by the number of public organizations that attained only lower levels of maturity.

This study concludes that in order to make software development industry in Saudi public organizations further competitive on a worldwide scale, Saudi public organizations should increment the attention to CMMI approach and its advantages at their administrative level through improving staff technical knowledge as well as their understanding of the business. In addition, they should enhance the communication skills with stakeholders to understand their needs.

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