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Relation between Capability Maturity and Impact of Project Portfolio Management in Product Innovation: An Empirical Analysis

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Abstract: ***capability maturity models provide organizations with a comprehensive and applicable conceptual framework, within which specialized management processes can be optimized to efficiently improve the performance and increase the benefits of the companies' product innovation. The present study aims to evaluate and find the relation between the capability maturity and the impact of implementation with reference to performance and benefits of project portfolio management in manufacturing companies. This empirical analysis evaluates the objectives with the help of primary data that was collected from the selected of respondents of product innovation companies through a well- structured survey questionnaire. The data analysis was performed using correlation statistical analysis technique and concludes that there is a high positive correlation existing between the capability maturity and impact of implementation of project portfolio management. Further, the research suggests there is a need of improvement in the capability maturity in order to achieve the goals and to secure the strategic advantage of project portfolio as a part of strategic product innovation.***
Keywords: project portfolio management, capability maturity, product innovation, industrial engineering

I. INTRODUCTION

Today, in many industries, advance technology enables businesses to distinguish themselves from their competitors. Those companies that leverage cutting edge technological techniques for competitive advantage often differ from their competitors in two ways with respect to their organizations: they view new product innovation as a strategic business enabler, and they work to maximize the efficiency of their operations so that they can focus their resources on providing value to the business and respond to today's environment of dynamically changing business conditions. In recent times, as more businesses are recognizing the value of a PPM, project portfolio selection activity has become an important management activity of the organization. In general, organizations initiate portfolio management in order to maximize the value of products/projects in terms of a company objective such as profitability, to achieve a balance of projects or to ensure that projects align with the firm's business strategy. In addition to facilitating these goals, portfolio management offers the benefits of enabling decision-making based on strategic data; the practice can also reduce wasteful spending caused by inefficient allocation of resources or duplicate projects as well as providing a reasoned and fair process for justifying project decisions. Portfolio management can also yield a repository of project information to audit projects‟ progression and facilitate organizational learning from previous strategy decisions.

As manufacturing firms have begin adopting project portfolio management practices to help and support their charter, many are realizing that their organization needs a kind of maturity model to describe and assess the current level of their company's culture, capabilities, and processes and set realistic goals to maximize the value for organization. Project portfolio management (PPM) maturity model is one such model that is used to describe the state of an organization's effectiveness at performing PPM activities and mapping out the logical ways to improve an organization's services. According to Rajegopal et al., (2007), project portfolio management can be defined as the management of the project portfolio so as to maximize the contribution of projects to the overall welfare and success of the enterprise. PPM is the management of that collection of projects and programs in which a company invests to implements its strategy. A PPM process can utilize various techniques to provide tangible results for businesses, ensuring that project investments contribute directly to realizing the corporate goals. A good project portfolio management practice is expected to minimize product design, delivery delays, assist in risk mitigation, enable the best utilization of the organization resources and eventually ensure sustainability in market.

Capability Maturity Models (CMM) have become a popular way for organizations to build the capabilities ever since the Software Engineering Institute (SEI) introduced CMM Levels to measure the capability of Project Management practices

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of the organizations. Also, organizations use CMM levels to compare their capabilities with a standard and identify areas for improvement and development [Thomas et al; 2002] Capability Maturity Models are often derived from the best practice studies and are designed to reflect the practices that are in use. The proposition behind most maturity models is that organizations develop capabilities by achieving each level of capability in sequence across a range of capability dimensions. CMMs are applied to a wide range of capabilities from risk management and knowledge management to project management and project portfolio management [Walker et al., 2008]

Project portfolio management impacts the performance of the organization's strategic activities such as improving the projects value of each project in the portfolio, optimizing the investment and business strategy, delivering projects in on time, data availability for effective project evaluation. PPM methodology has a number of wide-ranging benefits including aiding organizations to invest in opportunities with the best return on investments, reducing expenditure, focusing on strategic value and therefore encouraging faster prioritization and resource allocation for the more valuable projects. According to Ian Hayes (2003), the benefits of project portfolio management are listed as:

A. The right mix of products/projects are in the portfolio to maximize overall returns

B. The risks posed by the projects in the portfolio are balanced

C. Resources are allocated optimally across those projects

D. Performance problems are corrected before they become major issues

E. Projects remain aligned with business goals throughout their execution.

F. Projects receive the support and oversight needed to be completed successfully.

In 1952, Harry Markowitz proposed a financial portfolio theory called Modern Portfolio Theory (MPT) which helps indetermining the specific blend of investments that generates the highest return for a given level of risk. Boston Consulting Group (1968) has developed a new perspective called „The Product Portfolio" which introduced the "growth-share matrix" to identify where different products in a given portfolio lay over two scales: market growth rate and relative market share. Farquhar et al., [1976] have proposed the Balance Model to evaluate portfolios of multi-attributed items. After a while, Markowitz"s Modern Portfolio Theory has been applied on I.T investments especially on I.T Projects to maximize the returns with possible minimum risks by aligning projects with business objectives of the company. McFarlan [1981] has introduced the concept of the selection for Information Technology projects in his article called Portfolio Approach to Information Systems (IS) in which he laid down the basis for the modern field of PPM for technology-enabled projects. Wheelwright and Clark [1992] have developed a framework for categorizing projects which they called Aggregate Project Plan. This framework can be used to identify gaps in the portfolio, or potential resource shortages. Over the last ten years, PPM has become an integral part of the business and mainly it supports for the future growth and profitability of most large IT based firms. Archer et al., (1999) proposed an integrated framework for the portfolio selection in the perspective of PPM. The task of selecting project portfolios is an important and recurring activity in many organizations. Cooper et al., (2000) have developed a portfolio management model, known as Stage-Gate model in which the project is broken down into several review phases called stages and the milestone between two successive phases is called a gate. Harvey A. Levine [2008] published an article: "From Project Management to Project Portfolio Management" and affirmed that "there isa paradigm shift in the management of projects as many firms, especially in the Information Systems and New Product Development disciplines, move from just managing projects to creating and managing portfolios of projects. This shift is bringing constructive change to the way that projects are selected, how they are managed, and how the firms are organized to bring direction, structure, and oversight to the processes".

The main objective of the study is to evaluate and establish the degree of relation between capability maturity and the impact of implementation of project portfolio management in the software companies.

II. METHODS AN RESEARCH METHODOLOGY

The current study is in the specialized area of project portfolio management (PPM) with special reference to the capability maturity and impact of implementation of PPM. This is an explorative research study on product innovation of manufacturing firms and the following sample design was used for the study:

Sampling Universe:	Management groups
Sample Frame and Unit:	PPM practicing companies

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Sample Size:	95 respondents
Sampling Technique Used:	Proportionate stratified random sampling
Sampling Procedure:	The study precisely selected the sample respondents in the approximate ratio of 1:2:6:4:1:2 from Corporate Executives Tier-II Project Management, Tier-III Project Management, Technology Management, Operations Management and Marketing/Sales Management Groups

The primary data was collected through a well structured survey questionnaire from the selected 95 employees of PPM practicing software companies in Hyderabad. The following management groups (see Table I) were selected as respondents with pre-defined ratio and also considered their other demographic factors such as years of experience, educational qualification and income of the respondents in the collection of data to endeavor the study.

TABLE I
CHARACTERISTICS OF RESPONDENTS GROUPS

Respondents Group	Frequency
Corporate Executives	6
Tier-II Project Management	12
Tier-III Project Management	35
Technology Management	24
Operations Management	6
Marketing/Sales Management	12
Total	95

III. RESULTS AND DATA ANALYSIS

The primary data that was collected through a survey questionnaire has been analysed using correlation statistical analysis technique in order to evaluate the objectives of the study.

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A. Capability Maturity and Performance of PPM

The data pertaining to Capability Maturity and Performance of PPM was collected in order to perform the correlation analysis to ascertain and establish the degree of relationship between the two concepts. The Karl Person's coefficient of correlation was calculated using the data and the test details are presented in the table II for further analysis.

TABLE III
COEFFICIENT OF CORRELATION-CAPABILITY MATURITY LEVEL AND PERFORMANCE

correlation analysis	capability maturity level	performance
capability maturity level	1	
PPM Performance	0.78426	1

The coefficient of correlation value of 0.784 indicates the high degree of positive correlation between the capability maturity and performance of PPM. Figure 1 represents the data in the form of a scatter graph and its interpretations confirm the same correlation.

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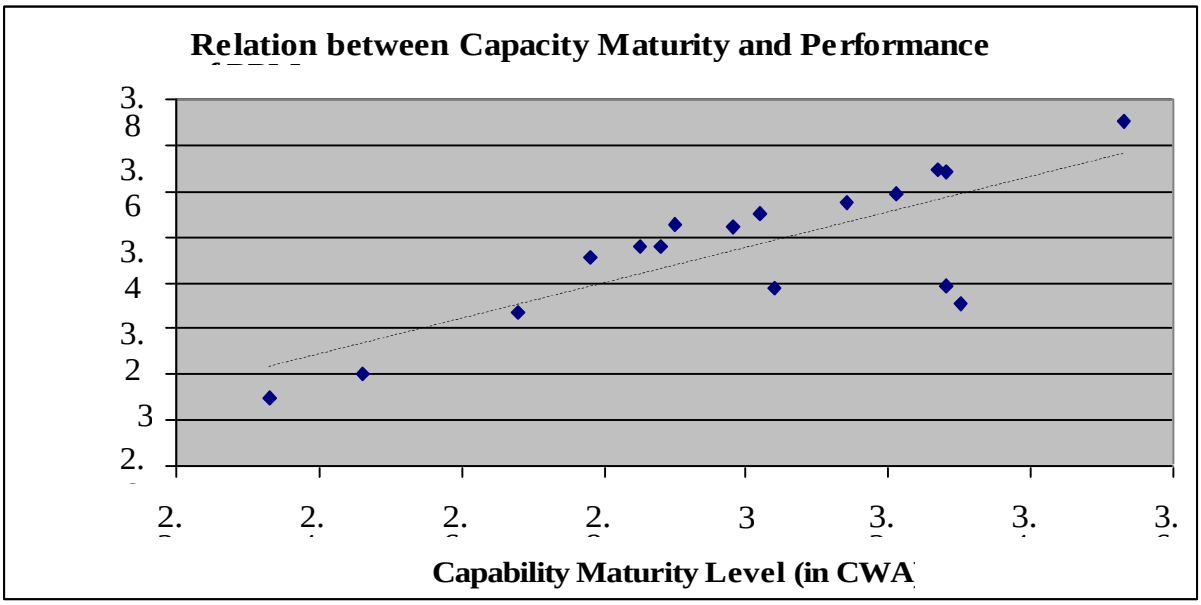

Fig. 1 Correlation between Capability Maturity and Performance of PPM

B. Capability Maturity and Benefits of PPM

The data pertaining to data pertaining to Capability Maturity and Benefits of PPM was collected in order to perform the statistical analysis to assess and establish the degree of relationship between the two concepts. The Karl Person's coefficient of correlation was calculated using the primary collected data and the results are presented in the Table III for further analysis.

TABLE IIII
COEFFICIENT OF CORRELATION-CAPABILITY MATURITY LEVEL AND BENEFITS

Correlation Analysis	Capability Maturity Level	Performance
Capability Maturity Level	1	
PPM Benefits	0.736262	1

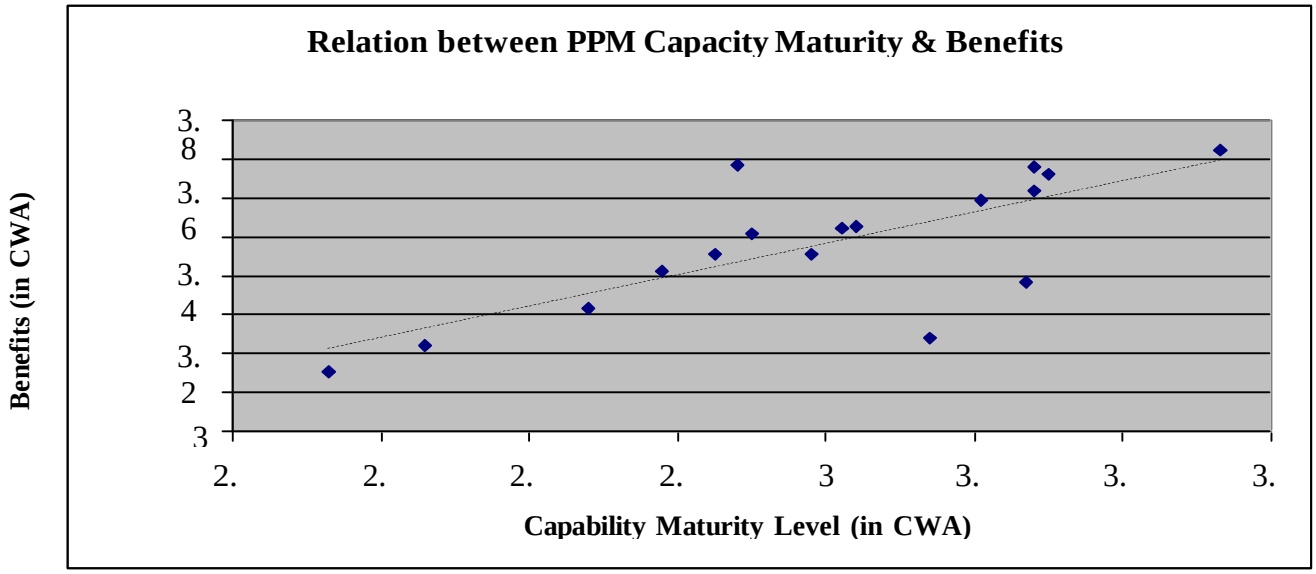

Fig. 2Correlation between Capability Maturity and Benefits of PPM

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The coefficient of correlation value of 0.7363 indicates the high degree of positive correlation between the Capability Maturity and Benefits of PPM. Figure 2 represents the data in the form of scatter graph and its interpretations confirm the same correlation.

IV. CONCLUSION

Karl Pearson‟s coefficients of correlation infer that there is a high degree of positive correlation between capability maturity and impact of implementation of project portfolio management. In specific, both capability maturity & performance and capability maturity & benefits have high degree of positive correlation. Therefore the analysis concludes that capability maturity has a positive impact on the performance and benefits of PPM. The study suggests that manufacturing firms as part of product innovation must improve their PPM capability to attain more performance and maximize the benefits. Although the capability maturity, performance and benefits are three different activities of project portfolio management, the study concludes that capability maturity and impact of implementation of project portfolio management has higher degree of positive correlation. In order to secure the strategic advantages and achieve the business goals of the company, the research further suggests that there is a need of improvement in the capability maturity.

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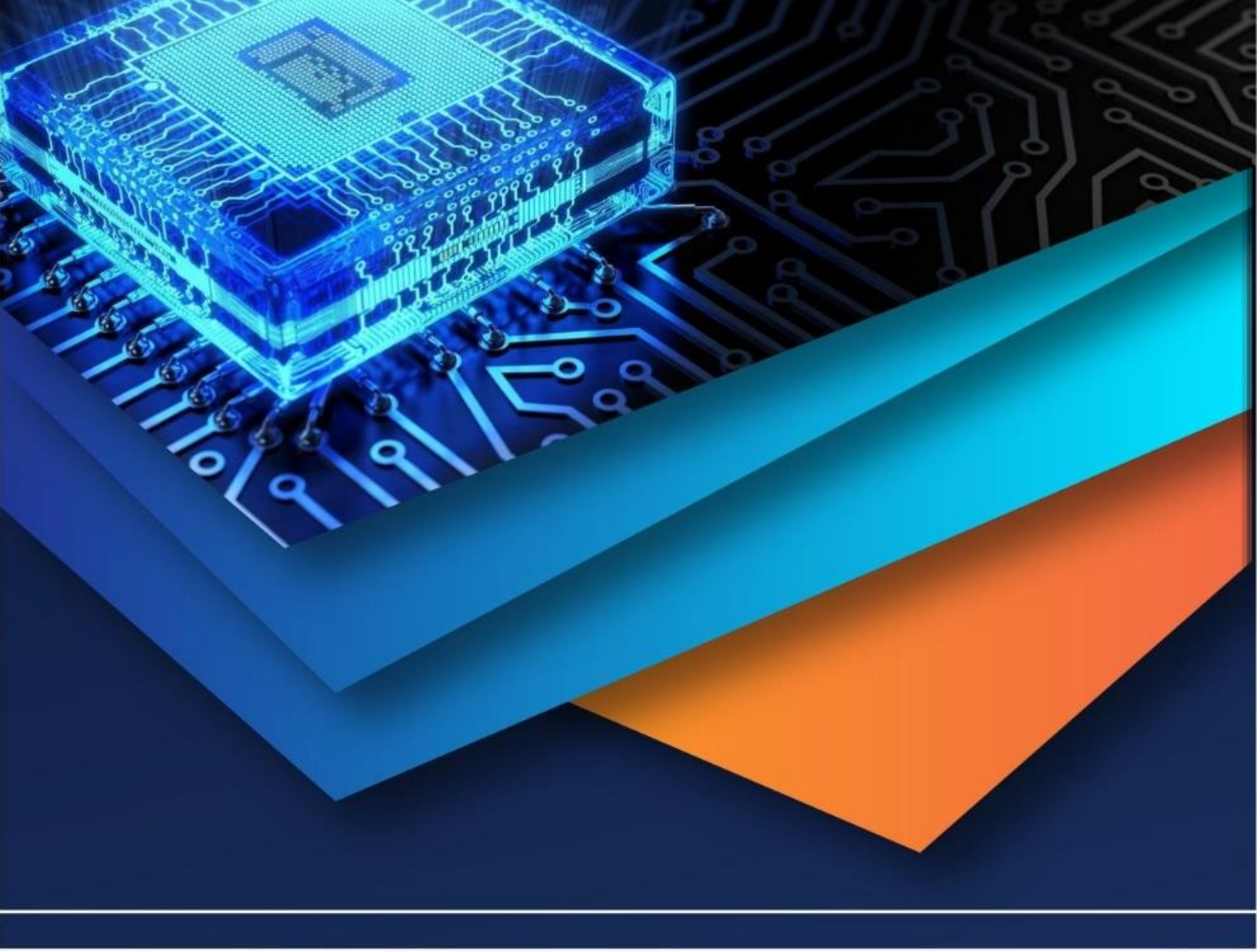

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