ABSTRACT

Quality management leaders have considered the role of knowledge in quality management. However, several researchers in the quality management field differ considerably when contemplating knowledge. In this paper, we propose an integrated perspective of quality and knowledge management. This integrated perspective helps clarify how Quality Management Practices (QMPs) can lead to effective Knowledge Integration (KI). This research argues that the implementation of QMPs lead to effective KI, which leads to better organizational performance. The expected results should contribute to the domain literature of QMP and KI by investigating the relationship between QMPs and KI and by providing a clear and precise definition of KI in the manufacturing context.

INTRODUCTION

Quality management (QM) research has reached a state of maturity. Most of the studies in QM field have focused on the relationship between quality management practices and operational or financial performance [35]. This study will tackle the relationship between QM practices and performance through the knowledge integration since knowledge integration improves the internal processes that are important to compete in the global market. Limited number of quality management researchers has considered the role of knowledge management on quality management practices [31].

Recently, knowledge management has become a growing field in business. It has been considered as a significant source of competitive advantage and important factor that could positively influence the business performance [9] and [16]. In the knowledge management process, knowledge integration has been considered as an essential component in developing new products [30]. Knowledge integration is a significant process by which organizations gain the benefits of Knowledge and create competitive advantage [24].

The concept of integration refers to “inter-organizational and cross-functional procedures”, which concentrate on two aspects: interaction and collaboration [25]. Interaction focuses on the exchange and use of communication between functional units. However, collaboration emphasizes the collective work across different departments [24]. Grant (1996) developed the theory of knowledge
integration to combine earlier knowledge management research, as he stated, “the primary role of the firm, and the essence of organizational capability, is the integration of knowledge” [20]. A firm’s knowledge integration capability can be determined by two critical mechanisms: direction and organizational routines. First, direction facilitates the communication between individuals by codifying tacit knowledge into explicit knowledge or rules. However, organizational routines could reduce the need for communicating the explicit knowledge [20]. It has been found that the existing internal capabilities of organizations and their interaction with the external knowledge sources will affect the level of innovation ability [24]. When the knowledge either tacit or explicit domains within the different organizations are incongruent, the results of cluster and collaboration will enhance the efficiency of knowledge utilization. Thus, inter-organization collaboration offers benefits of risk spreading when there is doubt over future knowledge needs [10] [39] [46]. The efficiency of knowledge integration is crucial for successful inter-organization collaboration.

If the integrators want the projects to be developed in effective way, they will face the inquiry that how to manage and organize the knowledge from other units in the organization. This paper proposes a framework synthesizing knowledge integration processes in the manufacturing context to examine the impact of some quality management practices on the knowledge integration processes and its impact on some outcome measurements to illustrate the importance of knowledge integration function.

The obtained knowledge should be integrated and applied into the development processes. Knowledge management literature focuses on knowledge sourcing, but pays less attention on knowledge assimilation and application [57]. Also, Oshri and Newell (2005) mentioned the importance of knowledge application which is useful to learning among projects [44]. Based on these arguments, the integrators must manage the acquired knowledge. The integration of knowledge can be considered as the internalization process of acquired knowledge into problem solving [6].

This paper will study the relationship between the implementation of certain QM practices and knowledge Integration (KI) and its impact on the new product development (NPD) and the firm’s performance (figure 1). Also, this study will help to explain how the implementation of some quality practices can lead to effective knowledge integration. The paper’s main objective is to find foundations in a knowledge-based view (KBV) that confirm the linkage between the implementation of QM practices and organizational performance through knowledge integration.

Figure 1
This paper investigates the problem of the relationship between some QM Practices and performance from a different perspective. Most of the studies in QM has been focused on the relationship between QM and business performance however, this paper will follow the same line but through the knowledge integration. It has been found that few studies examine the relationship between QM and K-Management [31]. Currently, the knowledge integration phenomenon is poorly understood both in the literature and practice. This study addresses the theoretical gaps in the literature on knowledge integration, specifically the lack of precise and clear definition of the most essential elements and processes that form the basis of knowledge integration phenomenon.

The knowledge perspective also provides insights into what it means to effectively deploy QM practices. Previous empirical studies noticed the importance of the effective deployment of QM practices, but provided little insights into what effective deployment means [35]. This study argues that QM practices facilitate knowledge integration processes, which leads to better organizational performance. Taking a (KBV) of the firm provides a deeper understanding of why some organizations are more successful at deploying QM practices than others. The QM field increasingly searches for new ways to improve organizational performance. An example can be seen when Taylor (1911) suggested that improvements occurred by standardizing workers’ tasks and providing incentives [35]. Therefore, QM practitioners seek to create change and improve organizational performance. After decades of various performance improvement initiatives, the question becomes what are the fundamental processes that govern performance improvement?

The purpose of this study is that integrating QM practices with organizational knowledge can provide perceptions into how QM leads to better organizational performance. Most quality improvement activities require knowledge for the organization. According to Deming (1994) [13] best efforts and hard work, not guided by new knowledge, only dig deeper the pit we are already in’. This suggests that the assimilation of knowledge should play a central role in understanding organizational improvement activities [31]. Thus far, the link between QM and knowledge has not been fully developed [31][35].

The capacities of the firm that provide a source of competitive advantage are based on the knowledge and knowledge integration in the firm [20]. Based on the (KBV), this paper finds knowledge to be a basis for explaining the firm’s competitive advantages over its competitors [20]. Thus the study follows the same line of QM research which is the searching for ways to improve the organizational performance. In spite of the importance of knowledge management within the firm [20], few empirical studies examine its relationship with QM. This study analyzes the influence of QM practices on knowledge integration processes, its impact on the NPD performance and the firm’s performance.

From the above discussion, we can see the importance of quality management practices, knowledge integration, and their impact on the organizational performance. However, current research has not investigated the linkage between these three important components. Therefore, we would like to address the research questions: “How can quality management practices enhance knowledge integration and new product development performance?” and “what are the critical factors that can form the process of knowledge integration?” A survey and in depth interviews will be conducted since they enable in-depth data collection and a complete understanding of all factors.
LITERATURE REVIEW

Quality Management and Knowledge Integration

Quality management (QM) is seen as a strategic tool to improve organizational performance. There are many definitions of QM. Flynn et al. (1994) define quality management as “an integrated approach to achieving and sustaining high quality output” [19]. Also quality management has been defined as an approach to management composed of a “set of mutually reinforcing principles, each of which is supported by a set of practices and techniques” [12]. From the pioneering works of [48], large number of studies has drawn on the literature of quality management to identify the key QM practices. Also, many studies in QM have developed measurement instruments to evaluate its implementation in the organization. Sousa and Voss (2002) Lakhal et al (2006), developed a review of these studies [50][28]. The studies demonstrate that QM includes improvement practices that influence both the firm’s internal and external environments. Likewise, it includes practices focused on social parts of the firm, such as teamwork, employee participation and recognition rewards [28].

Recently, academics have begun to relate knowledge management to quality management. The early work in QM research used analytic models to understand the link between quality and learning. Fine (1986) investigated one of the first studies that link quality and learning [18]. Basically he developed an analytical model that explored the relationship between failure cost and conformance cost, and discovered that the best quality level enhances over time because of learning. Then other studies investigate the impact of learning on quality control such as studies done by [8] [51]. Also, several researchers have developed conceptual works that link quality management to knowledge management [31].

Wruck and Jensen (1998) emphasize the significance of the scientific method and the allocation of decision rights in total quality management [55] [56]. They argue that centralized and decentralized decision rights allocation lead to suboptimal results. As an alternative, decision rights should be allocated based upon specific knowledge of organizational workers. Specific knowledge is defined as idiosyncratic knowledge that is hard and costly to transfer. However, this study explores the processes that lead to knowledge integration and how QM practices can support these processes. In investigating the problem-solving process at three automakers plants, [33] found that problems framed as learning opportunities had a positive impact on the improvement activities. [36] mentioned two types of learning in QM improvement activities, first, conceptual learning (know-why) and operational learning (know-how). Their concept of knowledge is based on the technical knowledge, which is defined as “understanding the effects of the input variables on the output” [4]. This concept of knowledge concentrates on the explicit knowledge. Recently, the same researchers [36] offered another study on the longitudinal impact of learning in activities of waste reduction at a manufacturing plant. They found that only the projects that had obtained know-why and know how positively produced improvement on waste reduction, however, other projects had no impact on waste reduction [29].

The literature on quality and knowledge has concentrated primarily on explicit knowledge, which tends to be simply shared and imitated. However, [14] noticed, “since the ultimate value of the firm depends on knowledge that cannot be imitated, it is reasonable to assume that knowledge which is tacit and not easily imitated, as opposed to explicit knowledge, will grow in importance. Based on previous arguments we may expect quality management practices will increasingly concentrated on tacit knowledge”. This suggests that it is significant to develop theories of QM that include tacit and explicit
knowledge. Nonaka theory of knowledge creation could be helpful in linking QM to knowledge management because it takes into consideration both tacit and explicit knowledge [40] [41].

Based on [28] and [35] studies of QM practices, we selected three QM practices that are expected to be significant in the process of knowledge integration. First QM practice is teamwork which refers to “the tendency to develop tasks in a group rather than individually” [35] [48]. Second, employee participation which is defined as an organizational process by which management shares impacts on decision making process with his/her subordinates, individually or group (Marin-Garcia et.al. 2008) (Dougerty 1995). Third selected QM practice is recognition and reward. According to Dale and Plunkett in 1990 “It almost goes without saying that an important feature of any quality improvement program is showing due recognition for improved performance by any individual, section, and department or division within the company”.

The primary objectives of knowledge integration and quality management are the same – create more organizational knowledge which will lead to improvements. Several quality management researchers have considered knowledge, but they have an incomplete understanding of what knowledge management means. Nonaka provides a valuable theoretical lens because it considers not only the individual and the organizational knowledge, but also tacit and explicit knowledge [40] [41]. As [14] suggested, the future of QM research will require a more understanding of the role of tacit knowledge. This emphasizes the importance of using knowledge frameworks that take into account tacit knowledge when understanding QM practices. Many studies have been made in the QM literature, but none of them explicitly consider both tacit and explicit knowledge. Since QM is an organizational approach to organizational improvement [37] it is essential to consider comprehensive theories of knowledge in understanding QM practices.

Prior research has only considered incomplete views of knowledge, often concentrating on only tacit or explicit knowledge and rarely considered the knowledge integration process. This study provides insights into what it means deploy QM practices in effective ways. Organizations maintaining a set of QM practices that support the knowledge integration processes should be more effective in deploying QM practices. This assists clarify what effective deployment of QM means. This study indicates that QM practices should be integrated with knowledge integration processes. Previous empirical studies have mentioned the importance of effective deployment of QM, but have not developed a comprehensive understanding of what effective deployment means. [31]

Knowledge Integration and New Product Development

Knowledge integration is defined as transferring, sharing assimilating and applying information and knowledge. Knowledge integration is the task of identifying how new and existing knowledge interacts while combining new information into a knowledge base [54]. Work groups generate the knowledge internally and often look for knowledge from external sources. Group members should combine their complementary knowledge into a new knowledge set. In order for a work group to be productive, the group members should have a deep knowledge of their own areas and an appreciation for the importance of their group members’ knowledge. Both external and internal knowledge should be integrated into group responses [1]. New product development needs the use of different skills and expertise, as well as the accumulated knowledge of the firm in order to enhance the performance of the new product development. The integration of all knowledge into the
business processes used by the different skilled and experienced employees has good potential to improve the new products’ performance [24].

The implementation of knowledge integration involves evaluating and identifying the interaction between the existing and new knowledge. Knowledge integration within the organization is the process of transferring the unprocessed knowledge into actionable knowledge by means of an understanding of the business context. Yang (2005) defined knowledge integration as a fundamental process by which firms gain the benefits of knowledge and create competitive advantage [57]. Integration of knowledge should be done between different specialized knowledge of different individuals. For example, if two workers have the same knowledge there is no gain from the integration however, if the workers have entirely separate knowledge bases, then the integration cannot occur beyond the most primitive level [20]. The knowledge-based theory (KBV) of the firm states that organizational knowledge is a resource with at least the same level of importance as capital [20]. March [34] suggests that because of the limited resources a firm should balance between exploration which is acquiring new knowledge and exploitation which means applying the lessons learned from knowledge.

Currently, the knowledge integration phenomenon is poorly understood both in practice and in the literature. Therefore, the question is how organizations can integrate knowledge to improve the effectiveness and the efficiency [11] [22]. By reviewing the literature of knowledge integration, various authors have come to define knowledge integration as a collection of many related and unrelated activities from k-creation to acquisition, storage, transfer, utilization and even maintenance of knowledge [57]. Integration is therefore performed when the organization is able to perform a task that it could not complete with existing knowledge alone. Table 1 highlights the main studies in knowledge integration.

Table 1

<table>
<thead>
<tr>
<th>Authors</th>
<th>Focus</th>
<th>Method</th>
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<tbody>
<tr>
<td>Ancona &amp; Caldwell, 1992</td>
<td>External team interactions with the environment</td>
<td>Empirical</td>
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<tr>
<td>Aoshima, 2002</td>
<td>Knowledge transfer across product generations</td>
<td>Empirical</td>
</tr>
<tr>
<td>Carlile, 2004</td>
<td>Knowledge integration across syntactic, semantic and pragmatic boundaries</td>
<td>Empirical</td>
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<tr>
<td>De Boer et.al, 1999</td>
<td>Knowledge integration as a function of organizational forms and capabilities</td>
<td>Case-study</td>
</tr>
<tr>
<td>Dyer &amp; Nobeoka, 2000</td>
<td>Knowledge integration through collective learning routines across organizations</td>
<td>Empirical</td>
</tr>
<tr>
<td>Edmondson &amp; Sole, 2002</td>
<td>Knowledge integration to bridge gaps across geographically dispersed IPT’s</td>
<td>Case-study</td>
</tr>
<tr>
<td>Authors</td>
<td>Focus</td>
<td>Method</td>
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<tr>
<td>Grant, 1996</td>
<td>Knowledge integration as the basis for the knowledge-based theory of the firm</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Grant, 1996</td>
<td>Knowledge integration as the means for evolving organizational capability</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Hansen, 2002</td>
<td>Knowledge integration across team boundaries in an organizational network</td>
<td>Empirical</td>
</tr>
<tr>
<td>Hoopes &amp; Postrel, 1999</td>
<td>Product development performance as a function of intra-firm KI integration</td>
<td>Case-study</td>
</tr>
<tr>
<td>Hung et.al 2007</td>
<td>An empirical study on knowledge integration, technology innovation and experimental practice</td>
<td>Case study</td>
</tr>
<tr>
<td>Linderman et.al 2004</td>
<td>Integrating quality management practices with knowledge creation processes</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Molina et.al</td>
<td>Relationship between quality management practices and knowledge transfer</td>
<td>Empirical</td>
</tr>
<tr>
<td>Nonaka &amp; Takeuchi, 1995</td>
<td>Creating new knowledge through a cycle of articulating, sharing, combining, absorbing</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Okhuysen &amp; Eisenhardt, 2002</td>
<td>Formal interventions for improving group flexibility and knowledge integration</td>
<td>Empirical</td>
</tr>
<tr>
<td>Szulanski, 1996</td>
<td>Impediments to knowledge transfer inside the organization</td>
<td>Empirical</td>
</tr>
<tr>
<td>Yang 2005</td>
<td>Knowledge integration and innovation: Securing new product advantage in high technology industry</td>
<td>Empirical</td>
</tr>
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</table>

In reviewing the knowledge integration’s theory ([40] [53] addressed the types and characteristics of knowledge in organizations. Also, the integration channels, strategies and mechanisms employed for knowledge integration in organizations are done by [20] [42]. The concept of knowledge integration is the basis for the emerging KBV of the firm [27] [20] [38] which concerns itself with the efficient appropriation of knowledge for production.

Knowledge acquisition strategies can assist to decrease the cost and risk of product, exploit scale economies, and shorten time to market (Tidd & Izumimoto, 2002). [52] developed a conceptual framework of new product development as a process of finding and solving problems. NPD project teams should both acquire and integrate ‘‘knowledge’’ to solve the problems that prevent them to reach their goals.
In general previous studies did not include the aspect of knowledge management as a possible success factor due to their broad research scope. However, there is a small number of studies investigating the relationship between the knowledge management process and new product development including those by [32] [45].

Following the resource-based view, “knowledge as resource” has been broadly recognized, as it addresses the linkages between knowledge integration and a firm’s performance [5]. The purpose of knowledge integration related activities in the firm is to manage and organize the whole knowledge processes to carry the right information to the right person at the right time, therefore facilitating the process of the right decision making [3]. Achieving the effective knowledge integration requires a complete understanding of how organizational characteristics and management practices impact the development and the use of knowledge [7]. Therefore, knowledge integration can be referred to as identifying the individual and collective knowledge in a firm to support the organization to be competitive, with an ability pertaining to knowledge transfer, knowledge sharing, knowledge assimilation and knowledge application [5].

New product development (NPD) is a significant and complex business process. NPD involves cross function integration, and complicated interdisciplinary activities that require many knowledge inputs to be able to generate a strong product solution in a competitive environment.

**RESEARCH MODEL AND DEVELOPMENT OF HYPOTHESES**

We have developed a research model and the relevant variables which include certain quality management practices (teamwork, employee participation, and recognition rewards), knowledge integration which includes the suggested processes (knowledge transfer, knowledge sharing, knowledge assimilation, and knowledge application), new product development, and business performance. all variables definition are listed in table 2. We developed five hypotheses relating the degree of the implementation of QM practices to the new product development and business performance through knowledge integration. The research Model is illustrated in Figure 2.

**Figure 2: Research Model**
QM Teamwork and Knowledge Integration

Structuring the firm into work teams is one of QM’s basic principles [35]. QM team effectiveness ‘‘consists of achieving quality goals in a timely manner and strengthening relationships both within and between the team and the rest of the organization’’ [12]. The fewer mediators in a relationship between two units that are not directly related, the better the knowledge integration [22]. Structuring the firm into work groups will shorten the communication chains between units. The current interest in team-based structures responds to the need to improve the integration of Knowledge [21]. Therefore, our first hypothesis is

\[ H1: \text{The degree of implementation of QM teamwork is positively related to knowledge integration.} \]

QM Employee Participation and Knowledge Integration

Wenger in (1998) stated that generation of knowledge in organizations occurs when employees participate in the process of problem solving and share the knowledge necessary to solve the problems. The most of a firm’s competitive advantage is embedded in the tacit (intangible) knowledge of its people (Dougerty 1995). Therefore, one of the most important ways to acquire tacit knowledge is the employee participation. According to Ardichvili in 2003, the successful functioning of knowledge sharing community of practice is not possible without an active participation of its members. This will lead to the second hypothesis

\[ H2: \text{The degree of implementation of QM employee participation is positively related to knowledge integration} \]

QM Recognition Rewards and Knowledge Integration

To effectively support organizations’ quality efforts, the management needs to implement an employee compensation system that strongly links the quality with pay (Brown et al., 1994). Supposing that to each task implemented there is associated a cost, each employee will try to maximize the net reward (reward less the cost of implementing a task). The organization, on the other hand, will try to maximize its net benefit function (benefit less the sum of compensations paid to the employees). (Tomasini 1978). Based on that our third hypothesis is,

\[ H3: \text{The degree of implementation of recognition rewards is positively related to knowledge integration} \]

Knowledge Integration and NPD

Technical knowledge is the key asset for NPD by technology-based businesses. For example, the effective utilization and application of this knowledge can assist to generate feasible design alternatives and assist the decision-making process, factors crucial for successfully developing a project (Hicks et al
NPD is “a complex innovation process, requiring the use of tacit and explicit knowledge in order to create and apply something that is new” [57]. Therefore, our fourth hypothesis is,

\[ H4: \text{There is a positive relationship between knowledge integration and NPD performance.} \]

**NPD and Firm’s Performance**

This relationship between new product development and the firm’s performance can be supported based on the fact that new product development success improves the firm’s average performance. To justify these investments in the integration of knowledge effort the expected value of the combined knowledge inflows and asset investment should exceed the expected erosion of advantages because of knowledge spillovers to competitors [17] [43] [49]. Benefits of NPD include the expectation of increased product sales and profitability, etc. [47]. Based on that our fifth and last hypothesis is,

\[ H5: \text{Improved new product development performance is positively associated with improved firm’s performance} \]

**Table-2**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>References</th>
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<tr>
<td>Teamwork</td>
<td>The tendency to develop tasks in a group rather than individually</td>
<td>[35] [48]</td>
</tr>
<tr>
<td>Employee Participation</td>
<td>Is defined as an organizational process by which management shares influences on decision making with his/her subordinates, group or individually</td>
<td>Marin-Garcia et.al. 2008</td>
</tr>
<tr>
<td>Recognition Rewards</td>
<td>The system that link quality improvement efforts with pay</td>
<td>(Brown et al., 1994)</td>
</tr>
<tr>
<td>Knowledge integration</td>
<td>The process of transferring knowledge, both tacit and explicit, across organizational boundaries, sharing it with individuals and teams at the recipient site, assimilating and applying the resultant knowledge to solve problems.</td>
<td>(Will 2007) [57] [54]</td>
</tr>
<tr>
<td>NPD performance</td>
<td>refers to a product’s successful production, launch, and market acceptance</td>
<td>Brand, 1998</td>
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<td>Sivadas &amp; Dwyer 1998</td>
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<tr>
<td>Firm’s Performance</td>
<td>the extend to which the project enabled (a) increased sales, (b) increased profit, and (c) increased return on investment.</td>
<td>[47]</td>
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</table>
METHODOLOGY

Sample and Data Collection

To test the hypotheses, an empirical study of large firms will be performed. The questionnaire will be specially designed to correspond to the relationship between quality management practices, knowledge integration and new product development. Both a mail and a web survey will be employed to collect data and test the hypotheses. In-depth interviews with CEOs or senior managers will be performed. We are planning to use senior managers as our key informants, because senior managers receive data and information from a wide range of individuals and departments and are therefore a very important source for evaluating the different variables of the firm. They also play an important role in modeling and forming these variables by determining behavior types that are supported and expected [2].

This study will examine a sample of high technology firms because they are knowledge-intensive firms and such firms provide an appropriate setting for research on knowledge management. A pilot study will be undertaken to ensure that respondents will have no difficulties in completing the questionnaire. Follow-up phone calls will be made to all potential respondents who have not returned the surveys after certain time [2].

Measures and Validation

Some items will be adapted & reworded to fit the research context. In order to provide subjective assessments of content validity, the survey instruments will be sent to several scholars who are familiar with the literature. A Likert-type seven-point scale (1 = “totally disagree” to 7 = “totally agree”) will be developed. The foundation will be provided by the scale developed by [26] as applied to, technological knowledge, knowledge on management and marketing-related knowledge. The scale will be planned to be applied to the firm’s relationships with any of the organizations it has relations with.

This study will concentrate on the knowledge integration within the firm’s departments and the main customer and supplier with which the firm with which the organization cooperates. The scale’s internal consistency and reliability will be analyzed. To assess the discriminate validity of multi-item measures, factor analysis will be conducted. In order to test the hypotheses, structural equation modeling for the measurement model and structural model will be performed.

Expected Results & Conclusion

This proposal studies the relationship between certain QM practices and knowledge integration. The expected results will show that the social aspects of QM imply that we have a set of practices with great impact on knowledge integration processes. The expected results will provide a theoretical support for the relationship between QM and firm’s performance. We can conclude that, QM will have a positive influence on knowledge integration which will affects the firm’s capabilities and resources, as well as the firm’s competitive advantage. For future study in this line of research, the relationship between knowledge creation and QM practices implementation has been studied before (Liderman et al., 2004), but empirical studies in this area are very few.

In summary, this proposal will assist in exploring the relationship between QM practices and knowledge integration aiming to explain how quality practices can lead to effective knowledge integration. Second, the relationship between the knowledge integration and new product development will be explored to provide effective performance measurements of knowledge integration. Also, this
study will bring practical benefits for the practitioners and researchers in the field of quality management, knowledge management, and new product development. Finally this study mainly aims to precisely define knowledge Integration in manufacturing management context since there is no agreement on consensus definition.

LIST OF REFERENCES


