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Toward a Theoretical Concept of E-Collaboration through Project Management in SMEs for Reducing Time and Cost in New Product: A Review

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Abstract: Reducing time and efficient project execution is an objective in many industries and project management is one of the important keys for lead the company to this allegation. The project manager needs some tools for lead the firm to the success. Collaboration is one way to success and collaboration has many types, one kind is electronic collaboration. On the other hand, small and Medium Size Enterprises (SMEs) are a part of manufacturing industries. Combining a literature review with our empirical experience we found that relationship between the project manager and related departments for production is essential for reducing time and cost in new product development. In this study, we describe about some definition of project management, E-collaboration, SMEs and new product and review some articles around this area.

Key words: E-collaboration, project management, SMEs, new product, reduces time, reduce cost

INTRODUCTION

Manufacturing industries play a vital role in many countries. SMEs are a part of manufacturing industries, but they have some limitation for attending and also for remaining in the market, especially in the global market (Mohammadjafari *et al*., 2010a). SMEs cannot compete with big companies, unless, they attend to customer needs. Small and medium size enterprises (SMEs) are the driving engine behind economic growth (Mohammadjafari *et al*., 2010b). SMEs play a very important role in national economies, providing job opportunities, act as supplier of goods and services to large organizations and any lack of product quality could adversely affect the competitive ability of the larger organizations (Deros *et al*., 2006). In this end, they need to increase new product but almost the time for new product is more than first estimation. One of the ways for reduces time and cost in new product is collaborative between different departments of one factory. By investigation in the prior studies, the author found four departments have a key role in SMEs, these four departments are; department of design, department of production, department of planning and department of procurement. Collaborative has many ways and many tools; one of these tools is E-collaboration. As some authors illustrated that the use of E-collaboration technologies is essential for supporting projects (Qureshi *et al*., 2005). Electronic collaboration technologies have created an information utility that is accessible, cost-effective and useful for a broad range of applications (Mohammadjafari *et al*., 2010a). E-collaboration can play a vital role in addressing many problems among the participating companies (Mohammadjafari *et al*., 2010d). Electronic collaboration technologies have created an information utility that is accessible, cost-effective and useful for a broad range of applications. On the other hand, in many industries, project management has become a way to better working (Mohammadjafari *et al*., 2009). Project management is a methodology for managing a project (Mohammadjafari *et al*., 2011b).

Project management is an integral part of human evolution and has been considered in many sciences (Mohammadjafari *et al*., 2010c). Project management can be defined as the process of controlling the achievement of the project objectives (Mohammadjafari *et al*., 2011a). In this study, we review and introduce E-collaboration, project management, new product and SMEs and describe about some study published about reduce time and cost.

METHODOLOGY

This review study is based on reliable publications. It covers aspects like SMEs characteristics, scope of reduce time and cost by E-collaboration through project

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management approach. The articles are collected from the famous journals and books related to the topic published since 1996.

There is a poor track record considering on the reduce time and cost by e-collaboration through project management with together. Just a few studies have been done around this subject. In order to prove this allegation, the distribution of published articles per year extracted from Web of Science database is demonstrated in Fig. 1 and 2. However, the tendency of publication has shown that E-collaboration, SMEs, project management and new product are an interesting topic. In order to prove this assertion, the distribution of published articles per year extracted from Web of Science database is demonstrated in Fig. 3-6.

Therefore, in order to find out formations, actives and management involvement in the field, we consider to a broader scale of literature. The used references contain approximately 55 articles out of 200 selected articles, which were taken out from 670 pre-investigated items.

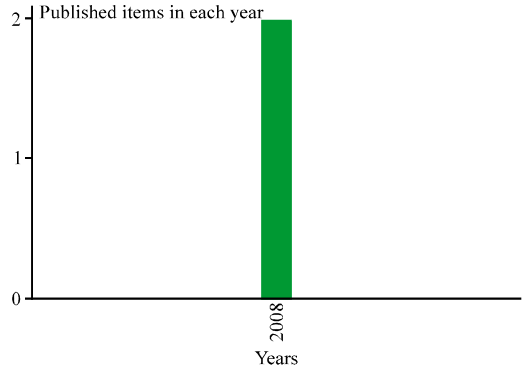

Fig. 1: Trend of E-collaboration, project management and new product (http://www.isiknowledge.com)

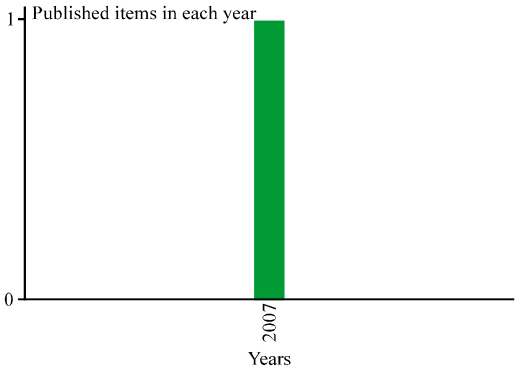

Fig. 2: Trend of E-collaboration, project management and SMEs (http://www.isiknowledge.com)

E-COLLABORATION

Concept of E-collaboration: For better understanding, the authors describe the meaning of E-collaboration. E-collaboration is collaboration among different

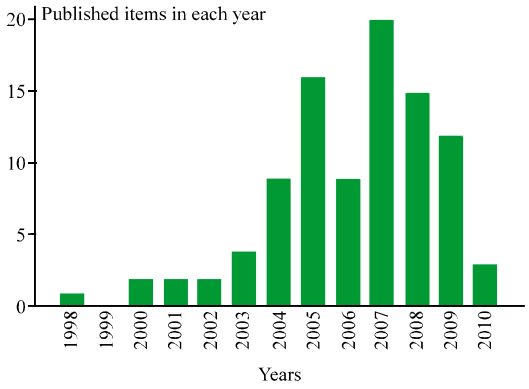

Fig. 3: Trend of E-collaboration (http://www.isiknowledge.com)

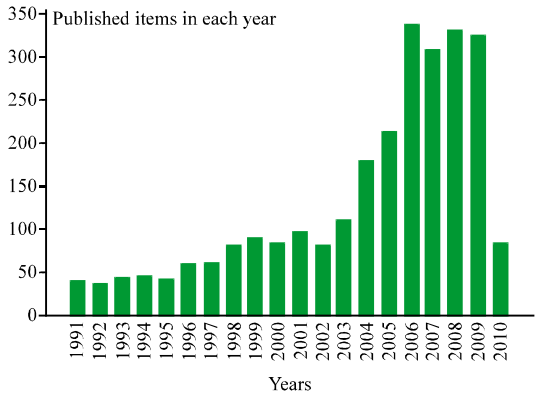

Fig. 4: Trend of project management (http://www.isiknowledge.com)

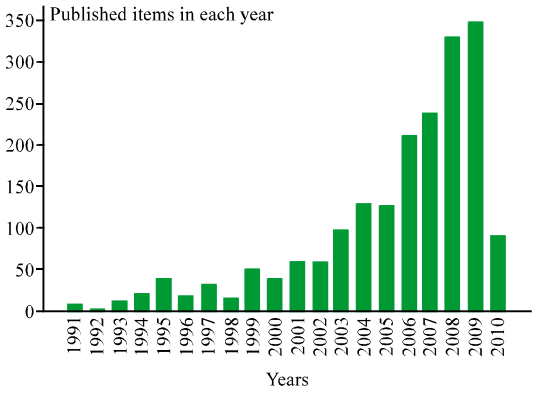

Fig. 5: Trend of SMEs (http://www.isiknowledge.com)

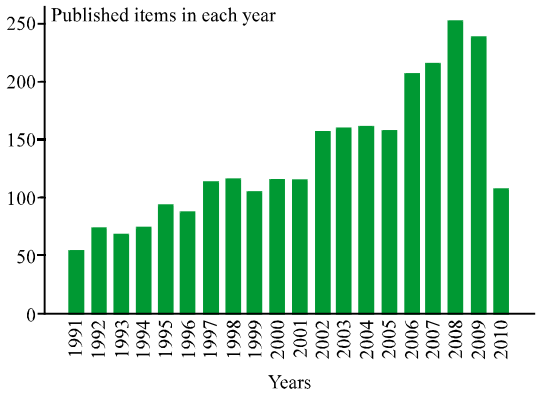

Fig. 6: Trend of new product development (http://www.isiknowledge.com)

individuals to accomplish a joint task using electronic technologies (Cai and Kock, 2009). The categories and tools of E-collaboration are different, as below:

Categories of collaborative tools: There are four categories of electronic collaboration.

Computer conferencing: Space for asynchronous and threaded discussions as well for real-time text talk and real-time discussions is provided and files and documents are shared. There is a possibility that users see and work on documents simultaneously, or on each other's screen, or on a whiteboard and mailing capabilities are also provided. Audio and video conferencing are quite common (Bafoutsou and Mentzas, 2002).

Electronic meeting systems (EMS): Meeting conduction is the basic functionality of the EMS category. Meetings can either be regular (same time, same place), synchronous (same time, different place), or asynchronous (different time, different place). Meeting participants are notified through email and have the possibility to chat, conduct real-time discussions, use audio and video conferencing facilities, write or draw in real-time on a blank slide, participate in surveys-anonymously if preferred-and make group decisions, share documents and files, show and annotate PowerPoint slides, share live software applications and even work simultaneously on documents. Apart from the work-centered activities, the team also engages in team-centered activities, including, greeting and seeking additional participants, introduction and parting. Finally, meeting-centered activities support the meeting process, including its set-up, maintenance of the agenda and minutes and distribution of the minutes after the meeting (Poltrock and Engelbeck, 1999; Bafoutsou and Mentzas, 2002).

Group file and document handling: The core functionalities of this category involve working with documents and files. In the simplest form, users only have a shared view of files/documents, while advancing; there is also a possibility for individual editing, document/file management and storing in a central database, as well as collective authoring and revision of documents. Synchronous work on documents can also be a part of a group document-handling tool. In addition, basic communication capabilities, such as e-mail notifications and e-mail, are provided (Bafoutsou and Mentzas, 2002).

Electronic workspace: The primary idea is to provide teams with a common space to coordinate and organize their work. Groups can centrally store documents and files, work with them, solve problems through discussion, keep to-do lists and address books with information about group contacts and even track project milestones and project interactions. There are workspaces for different groups and users may be members of several workspaces with each workspace corresponding to each project a user is involved with (Bentley *et al*., 1997; Bafoutsou and Mentzas, 2002). Table 1 shows this category.

In this study, the author used electronic workspace for the relationship between four departments and project management.

The value of E-collaboration: Collaborative in different industries is essential for supporting projects. E-collaboration and collaborative tools bring geographically dispersed teams together for virtual

Table 1: Gives a list of the systems examined as well as the category each tool belongs to Bafoutsou and Mentzas (2002)

	Categories			
Tools	Computer conferencing	Electronic meeting systems	Group file and document handling	Electronic workspace
Intranets	√			
Project place	√			
Team talk	√			
Web board	√			
Meeting place	√			
Same time	√			
Evoke collaboration		√		
Facilitate.com		√		
Meeting room		√		
Place ware		√		
Team now			√	
Common space			√	
Document			√	
Docu touch			√	
eRoom				√
Forum				√
Platform				√
Joint planning				√
Teamon				√
Team wave				√
Quick place				√

meetings across great distances. These results in tremendous time and cost saving, greatly decreased travel requirements, faster and better decision-making and improved communications flow throughout the organization (Bafoutsou and Mentzas, 2002). The field of collaborative computing encompasses the use of computers to support coordination and cooperation of two or more people who attempt to perform a task or solve a problem together (Borenstein, 1992).

PROJECT MANAGEMENT

Why does project exist?: For better understanding the concept of project management first, we express why the project exists. First, a project exists because there is something important and complex to be solved. Second, a project organization exists because there is a need for a purposeful organization effort and a high need of coordination in order to execute a number of tasks/activities (Soderlund, 2004).

What is project management?: Project management is a methodology for managing a project (Ramaprasad and Prakash, 2003). Project management, including the tools, techniques and knowledge-based practices applied to manage the creation of products and services, is becoming an increasingly accepted and applied discipline across industry sectors (Jugdev *et al*., 2007).

Project management is the manner of implementation, of expertise, paraphernalia, knowledge and modus operandi to an extensive range of activities for the fulfillment of prerequisite of the specific project (Qureshi *et al*., 2009).

Importance of project management: From many industries, project management has become a way to better working Like Filippov, S has illustrated project management has become a distinctive way to manage business activities nowadays (Filippov and Mooi, 2009). Project management is becoming a key strategy for managing organizational change in contemporary organizations, with corporations, government, academia and other organizations recognizing the value of common project approaches and of educated employees for the execution of projects (Van Rooij, 2009). Most of all, project managers are in the front-line when it comes to assuring customer satisfaction (Kirsila *et al*., 2007).

Project management area: Projects are typically part of an organization. The relationship between the project and organization varies and that relationship affects the scope of project management responsibilities. Although, the nature of project management responsibility varies by organization and by project within an organization, project management encompasses many areas. The Project Management Institute's (PMI) list of project management areas, summarized in Table 2, provides a sense of the breadth of the project management task. The Project Management Book of Knowledge provides the comprehensive description of activities associated with each area, the interaction of the areas with the key project management processes described earlier, available management tools and techniques for each area and input and outputs of each area (Jacobson *et al*., 2006).

DEFINITION OF SMALL AND MEDIUM ENTERPRISES

According to Ale Ebrahim *et al*. (2009) there are many accepted definitions of SMEs in addition the classifications vary from industry to industry and from country to a country, different countries accept dissimilar criteria such as employment, sales or investment for defining small and medium enterprises. In the absence of a definitive classification, a consensus has developed around the European Commission (EC) criteria for SME classification; this definition adopts a quantitative four approach emphasizing tangible criteria, employee numbers (Fewer than 250 employees), turnover (<50 million) and balance sheet statistics (<43 million) (Ale Ebrahim *et al*., 2009).

Import of SMEs: Small and Medium Enterprises (SMEs) play an important role to promote economic development (Ale Ebrahim *et al*., 2009). In most countries, small and medium enterprises (SMEs) dominate the industrial and

Table 2: Project management areas adapted from project management institute

Project management area	Description
Integration management	Unifying the activities and resources of the project to complete
Scope management	Ensuring that the project includes all the work required, but only the work required to meet the project requirements
Time management	Ensuring timely completion
Cost management	Ensuring that the project can be completed within the project budget
Quality management	Ensuring that the project product will satisfy the project requirements
Procurement management	Managing the purchasing and acquisition of outside goods and services required to complete the project
Risk management	Identifying and managing project risks
Communications management	Ensuring timely and appropriate project communication
Human resource management	Organizing and managing the project team

commercial infrastructure (Deros *et al*., 2006). SMEs play a very important role in national economies, providing job opportunities, act as supplier of goods and services to large organizations and any lack of product quality could adversely affect the competitive ability of the larger organizations (Deros *et al*., 2006). All firms are indeed the engines of global economic growth (Acs *et al*., 1997). SMEs play an important role in flows of foreign direct investment (Kuo and Li, 2003). SMEs also serve as the key engine behind equalizing income disparity among workers (Choi, 2003). Small and medium-sized enterprises are increasingly internationalizing their business activities (Beck *et al*., 2005).

Strengths of SMEs: For better understanding of SMEs actions, summary information of the SMEs characteristics is listed in Table 3.

NEW PRODUCT

New Product Development (NPD) is a business process for developing new products for a company, whether it is an upgrade of an existing product or a new concept (either for the company or for the customer). It includes all activities from the development of an idea or a concept for a product, to the realization of the product during the production stage and its introduction into a market place (Hohenegger *et al*., 2007).

New product development process: New Product Development (NPD) is a complex process. Unlike most business processes, each instance differs from the previous ones, its output is not clearly foreseen defined and many of the activities to be accomplished is knowledge intensive (Carbonara and Scozzi, 2006). Among them, idea generation, product design, prototype and engineering are the most relevant (Carbonara and Schiuma, 2004). NPD performance depends not only on the effectiveness and on efficiency of activity accomplishment, but also on the degree of integration among them. The integration requires the adoption of mutual adjustment coordination mechanisms, lateral communications and repeated problem solving techniques (Carbonara and Scozzi, 2006). Dougherty (1992) identifies three dangerous routines: actors' habit to work within their role and communicate with the same persons, the use of predefined definitions of the market/technology relationship and the use of standards and working methods (such as the payback period, return of investments, etc.) not coherent with NPD (Dougherty, 1992). The degree of integration among the different NPD activities is also related to the effectiveness and efficiency of the knowledge transfer processes activated within NPD (Carbonara and Scozzi, 2006). NPD can be improved by identifying approaches and tools to support the creation of shared mental models (Carbonara and Scozzi, 2006). In the literature, few studies deal with methods and tools to support NPD (Presley *et al*., 2000). Quality Function Deployment (QFD) and Design To Manufacturability Charts have been, for example, proposed to support the design of new products and, in particular, to take into account the needs of customers (upstream) and anticipate eventual problems with manufacturing (downstream) (Carbonara and Scozzi, 2006).

KEY FACTORS FOR REDUCE TIME AND COST

In order to succeed, companies must deliver projects on time and within budget and meet specifications while managing project risk (Raymond and Bergeron, 2008).The effective factors for reduce time and cost have been discussed by many researchers. In order to realize the objectives of the study, only four factors are used. These factors are design, planning, product, procurement, as shown in Table 4.

Design factor: Zhou *et al*. (2008) has supposed a WWW-based collaborative between designer and engineers in the different department is effective to reduce the amount of reworks and shorten the product development cycle. The author has developed a

Table 3: Strengths characteristics of SMEs

Strengths	References
Easily adaptive to new market conditions, flexible to change, developing customized solutions for partners and customers, dynamic in activities	Mezgar *et al*. (2000), Aragon-Sanchez and Sanchez-Marin (2005), Davis and Sun (2006) and Ale Ebrahim *et al*. (2009)
Knowledge creating	Egbu *et al*. (2005) and Ale Ebrahim *et al*. (2009)
Excellent at multi-tasking	Schatz (2006) and Ale Ebrahim *et al*. (2009)
Powerfully correlated and inter-related with respect to innovation	Huang *et al*. (2001), Jutla *et al*. (2002), Sharma and Bhagwat (2006) and Gray (2006)
Capable to answer quickly to customer requests and market changes, customers focused	Abdul-Nour *et al*. (1999), Kim *et al*. (2008) and Ale Ebrahim *et al*. (2009)
Quick decision making process	Lawson *et al*. (2006) and Schatz (2006)
Able of going global rapidly	Gassmann and Keupp (2007) and Ale Ebrahim *et al*. (2009)
Routine processes, flexible structures	Haga (2005), Sharma and Bhagwat (2006) and Gassmann and Keupp (2007)
Useful	Beck *et al*. (2005)

Table 4: The key factors for reduce time and cost based on literature review

Search result	Subject																							Performance effects				Research methodologies											Source information
E-collaboration	Project management	Manufacturing	Product	Design	Procurement	Planning	Quality control	Organization	Innovation	Process	Tool	Product complexity	Involvement of partners	Concurrent product	Team structure	Project strategy	Concurrent engineering	Training and rewarding	Simplification of structure	Lead user	Supplier integration	Virtual production	Time compression technologies	CDA technology	Setting buffer	Identifying critical chain	Development capacity	Techniques	Speed	Time	Cost	Quality	Variety	Other	Simulation	Process model	Theory-building	Framework	Case study (small n)	Empirical (large n)	Experiment	Math. modeling	www-based	Review	Statistical	Pattern maching	Prototype	Pilot type	Creative study	References
	✓	✓	✓									✓	✓																	✓														✓				Clift and Vandenbosch (1999)
	✓									✓					✓	✓												✓	✓														✓					Griffin (1997)
																														✓								✓									Carter (1997)
	✓				✓																									✓										✓							Hartley *et al.* (1997)
																							✓							✓	✓				✓												Kengpol and O'Brien (2001)
✓		✓	✓									✓																		✓	✓					✓				✓							Xie *et al.* (2002)
	✓																✓													✓	✓													✓			Kusar *et al.* (2004)
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✓		✓	✓	✓								✓																		✓	✓					✓				✓						✓	Zhou *et al.* (2008)
	✓												✓	✓														✓	✓	✓	✓									✓							Bashir (2008)
	✓				✓													✓	✓	✓								✓	✓	✓	✓							✓								Ahlemann (2009)
				✓																									✓	✓													✓			Selvaraj *et al.* (2009)
	✓					✓										✓									✓	✓				✓				✓						✓							Xia-Bao and Li-Xi (2009)
				✓																										✓	✓	✓									✓						Lifang *et al.* (2009)
✓				✓																				✓						✓	✓							✓									Vinodh *et al.* (2009)
	✓					✓																								✓	✓							✓									Hebert and Deckro (2010)
	✓	✓	✓	✓																										✓										✓						Romer and Ahmadi (2010)

www-based Collaborative Design and Manufacturing System (WCDMS) for integrated mould product development. However, in the injection molding enterprises, the product information, tool information and manufacturing information is the most important information to hold up the collaborative mould product development. Xie *et al.* (2002) has presented a www-based information management system for rapid and integrated mould product development. The system was built in two parts, information management system and an integrated platform. The first part includes distributed relational databases, STEP databases and knowledge bases, WWW Database Tool (WDT) and user interfaces for the different departments of the company, to manage the product information. The second part includes a collaborative communication tool, an information access tool, an Incremental Process Planning (IPP) user interface and a cost optimization model. This platform is developed by using current WWW development tools. The application tools are developed as agents that run in a distributed environment. Roemer and Ahmadi (2010) presented two advances that harmonize production streams through the manufacturing system for reducing manufacturing lead times. Selvaraj *et al.* (2009) has presented that one of the ways for reducing time and cost is design for manufacturing, the author sketch outs the DFMA considerations to sheet metal parts considering things such as homogeny of numerical profiles and integral part design through parts count reduction. M Roberts has defined the (SAE) service assembly environment including the design phase of a product is important for Improving product times and the author use the intelligent network's area (Roberts, 2006). Lifang *et al.* (2009) illustrated that modular component parts for designing product can develop time of new product ,the author prove this idea with mathematic model. Tan and Vonderembse (2006) has proved the use of CAD technology develop product development performance (development time, product quality and design productivity) and to reduce product costs.

Planning factor: Xia-Bao and Li-Xi (2009 has illustrated that four steps involved defining a project, identifying a critical chain, setting buffers and constructing the project plan, is important to set lead-time. For proving an approach the author uses a simulation experiment. Hebert and Deckro (2010 has proven by combining software project for planning like Microsoft project and traditional programming concurrently, the time and cost of construction projects decrease.

Product factor: Xie *et al.* (2002) has designed a Web-based information management system in the production line for rapid and integrated product development. Roemer and Ahmadi (2010) presented two advances that harmonize production streams through the

manufacturing system for reducing manufacturing lead times. Griffin (1997) has proved the cross-functional teams are important for development cycle time. Bashir (2008) has done a modeling of development time for hydroelectric generators. The model uses three factors, namely, product complexity, involvement of partners in the development process and generator speed. Building of the model is based on the use of past data from earlier finished projects.

Clift and Vandenbosch (1999) contrast the long and short cycle projects time, the short cycle complex projects run by leaders and use external sources of information also they were formal in their approach in NPD project management. However, in long cycle project leaders hold on to standardize and use less external sources of information. Finally, it is evidenced short cycle complex projects require a different type of management process.

Procurement factor: Langerak and Hultink (2008) has proven five factors is important for acceleration approaches on development speed, (i.e., supplier involvement, lead user involvement, speeding up activities and tasks, training and rewarding of employees and simplification of organizational structure). Petersen *et al*. (2005) has illustrated that the supplier integration is important for reduce new product time, increase cost and also better quality. Hartley *et al*. (1997) illustrated managing the buyer-supplier interface is important for on-time performance in product development.

CONCLUSION

In this study, we represented a number of definitions about theoretical of E-collaboration, project management, SMEs and new product. Our findings emphasis that SMEs cannot challenge in the market, unless they do their need customer, for achieving this subject, they have to reduce time and cost for production. Collaboration is one of the ways to success production in manufacturing. However, collaboration has some tools; one of these tools is electronic collaboration. This study is just a review about the importance of some departments in SMEs for reducing time and cost, these departments are design, planning, procurement and production. Future research can improve new product by this information in the manufacturing companies.

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