An Empirical Investigation of the Determinants of Concurrent Engineering

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Abstract

Concurrent Engineering (CE) has been gaining an increasing attention in the last two decades. The increasing market competitiveness and the alarmingly high failure rate in introducing new products put organizations under a constant pressure to find more successful ways of developing new products. One of the most cited techniques for developing successful new products is CE. Many studies in the New Product Development (NPD) literature focus on investigating and presenting the positive effect of CE on developing new products. However, the factors that lead one organization to adopt CE while another doesn't remain greatly overlooked. This study closes the research gap and complements the current research by investigating the determinants of CE. Data from 218 organizations indicate that organizational culture, the type of new product under development, supplier involvement and the external environment have significant effects on the adoption of CE. The study benefits managers and practitioners by investigating the importance of fostering the right culture before attempting to adopt CE. It also draws the attention of practitioners to the importance of considering the external environment, and the type of product underdevelopment before deciding whether or not to implement CE.

Keywords: Determinants, Concurrent engeneering, Fostering, Testing.

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Introduction

Concurrent Engineering

Concurrent engineering refers to the bringing of the design and manufacturing engineers together early in the design phase to simultaneously develop the product and processes for producing the product (Stevenson, 1999). It is the early involvement of a cross-functional team to simultaneously plan product, process, and manufacturing activities (Hartley et al., 1997; Susman and Dean, 1992). CE is typically manifested through concurrent work-flows, product development teams, and early involvement of constituents (Koufteros et al, 2001).

The positive effect of CE on NPD performance is well documented. CE leads to the development of better, simpler, and cheaper products in less time (Pawar and Riedel, 1994; and Belson and Nickelson, 1992), brings manufacturability issues into light and reduce lead time from design conception to delivery of the product by involving manufacturing early in the design process (Dean, 1992), and improves the competitive capabilities of the firms (Stalk and Hout, 1990; Clark, 1989). Despite the immense interest in the effect of CE on NPD performance very few studies focus on studying the factors that lead to the adoption of CE. We believe that determining the factors that leads to the adoption of CE is the first step towards the successful implementation of CE. In this paper we will discuss and investigate some of those factors. In particular we will study the effects of organizational culture, the type of new product under development, the buyer-supplier relationship, the external environment, and R&D budget.

This paper is organized as follows: in section two we introduce the concepts of the independent variables. In particular we focus on organizational culture, buyer-supplier relationships, external environment, new product type, and R&D budget. Section three is the methodology section where we present the scale development and research design. Section four presents the computational results of the study. Section five presents the conclusion of the paper.

Definitions of Variables

Organizational Culture

The literature introduces numerous definitions of organizational culture. Robbins and Langton (2001) define culture as the system of shared meaning, held by an organization's members, that distinguishes the organization from other organizations. McShane (1998) defines culture as the basic pattern of shared assumptions, values, and beliefs governing the way employees within an organization think about and act on problems and opportunities. Pascale and Athos (1982) view culture as the philosophy that guides an organization's policies towards employees and/or customers.

In measuring the effects of organizational culture on other variables, researchers propose dimensions by which organizational culture can be quantified. Existing work includes that done by Shetriton and Stern (1997), O'Reilly et al. (1991), and Hofstede (2001, 1997). In this paper we rely on the work done by Hofstede. Hofstede's work has been chosen as the basis for this study due to several reasons; 1) Hofstede is one of the few researchers who introduced measures by which culture can be quantified and accordingly its effects on other variables can be studied. In order to study organizational culture and its effect on other variables, some sort of measure has to be developed. Measuring organizational culture is not easy, especially when it is regarded as shared values and beliefs that are taken for granted and thus not obvious even to organization members. Hofstede, unlike many other researchers, did not stop at defining culture, instead, he introduced several dimensions of organizational culture and provided measures by which those dimensions can be quantified; 2) Hofstede's models for organizational culture is among the most widely used models studies and used by researchers (see for instance, Yeniyurt and Townsend, 2003; Chang, 2003; and Swierczek and Onishi, 2003). His models are highly perceived by researchers and considered by many as global models for studying culture (Holt, 1998) and that his studies are among the most comprehensive studies in the field of organizational culture (Abdou and Kliche, 2004); 3) Hofstede is one of the first to

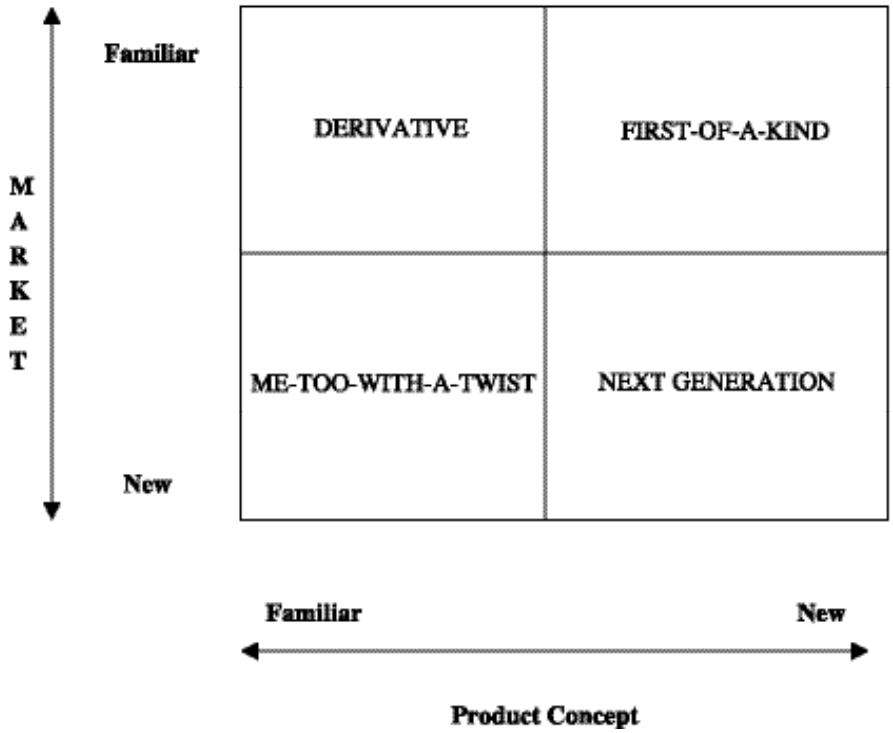
adopt a pragmatic problem-solving approach in the field of culture and related culture to management (Fan and Zigang, 2004); 4) the cultural dimensions introduced by Hofstede are still used to day and has evolved into a standard upon which to analyze alternative national approaches to value systems and applied beliefs (Beer, 2003).

Hofstede introduces six dimensions for defining the cultures of organizations; he suggests that organizational cultures could be: process oriented versus results oriented; employee oriented versus job oriented; parochial versus professional; open versus closed; loose control versus tight control; and normative versus pragmatic. For a detailed discussion of those dimensions we refer the reader to Hofstede's work. Hofstede also describes four dimensions for distinguishing between the cultures of nations. Hofstede differentiated national cultures by their degree of power distance, uncertainty avoidance, collectivism versus individualism, and femininity versus masculinity. We believe that those national cultural dimensions are applicable to organizations as well. Accordingly, we will use those dimensions (except femininity versus masculinity due to its inapplicability to North American culture) to measure organizational culture.

New Product Types

The outcomes of NPD projects can be differentiated based on the newness of the product concept (idea) and the newness of the market the product is introduced to. In their study, Booz Allen and Hamilton (1982) suggest four types of new products. (see also, Johne, 1995; Kmetovicz, 1992; Crawford, 1987). The four groups are given in Figure 1.

Figure 1: Different Types of New Products



Source: Booz, Allen and Hamilton (1982) New Product Management for the 1980s

The projects that belong to the first group deliver first-of-a-kind products is the most risky group since both the product concept and the market are new to the developing organization. First-of-a-kind products are also referred to as breakthrough innovations.

Next-generation products are radical developments aimed at the existing customer base. They are new product lines meant to replace an aging product family that has little room remaining for growth opportunities. According to Kmetovics (1992), next-generation product is a relatively easy task since prior product descriptions are already in existence and data has been collected from the marketplace over a

period of years. It is usually clear to the development team what has to be done, however, how to achieve it is usually not as clear.

Derivative products are familiar product concepts introduced to a new customer base. They are extended product development aimed at a new customer base. Derivative products give the developing team the advantage that a large percentage of the new product's design and processes already exist. Finally, me-too-with-a-twist are steady incremental improvements to the existing products. They are aimed at the existing customer base. Me-too-with a-twist is the most common outcome of the NPD projects.

Buyer-supplier Relationship

The relationships between the buyers and their suppliers are gaining increasing attention. A skilled and loyal supplier base can be a key source of competitive advantage (Cole and Yakushiji, 1984). As a result, firms today are aggressively reducing their total number of suppliers, increasing their reliance on the suppliers that remain (Lyons et al, 1990), and getting them involved earlier in their NPD process. The advantages manufacturers get from the early involvement of suppliers include more innovative products, faster product development, and lower development costs (Ragatz et al., 1997; Dyer, 1996; Helper and Sako, 1995). During the last decade Chrysler, for instance, has been able to reduce the time necessary for developing a new vehicle from 234 weeks to 160 weeks, and to drop the cost of development by 20% to 40%, by involving their suppliers at early stages of NPD.

Clark (1989) suggests that the early supplier involvement in product design is a key to Japanese automakers' edge in introducing new models both faster and with fewer total labor hours than their U.S. and European counterparts. Japanese automakers operating in the U.S. achieve $700 per-vehicle cost savings over their U.S. counterparts due to more supplier involvement (Dyer and Ouchi, 1993). Supplier involvement tends to have similar positive effects on NPD as those of CE (however, CE is usually focused on the formation of internal cross-functional teams), accordingly, we test whether or not there is an association between the adoption of both approaches. In other words, do

organizations that have higher levels of supplier involvement tend to adopt CE more than their counterparts with less levels of supplier involvement?

External Environment

The effects of the external environment on organizations cannot be understated. External environment determines to a great extent what organizations can and cannot do and how they do things. In this study we focus our attention on the technological and competitive environment. The level of uncertainty of these two types of environments is expected to have significant effects on NPD projects. The reason why we focus on these two particular types of external environment, rather than any other type of external environment, is their immediate effects on the performance of new product developments. The technological and competitive environments are expected to have the most direct effect on new product developments as compared to other types of external environment such as the social environment or economical environment, for instance. Despite the fact that these types of environments are also expected to influence new product developments, their effects would be indirect and would be through many other intermediate variables that are outside the scope of this study. The uncertainty of the competitive and technological environments in this study is determined by the frequency of technology changes in the industry, the frequency by which customers demand or expect new products, the frequency by which competitors change their product designs, introduce new products, and change their prices. When the competitive and technological environments are uncertain organizations are expected to respond to such uncertainty by searching for more efficient and effective means of developing their products. In such uncertain environments we expect organizations to pull all their resources together in order to be more competitive and reduce the risk they are facing. Hence, we expect organizations operating in uncertain environments to rely more on CE as a mean of reducing risk and staying competitive.

R&D Budget

The percentage of sales budget allocated to R&D reflects the orga-

nization's devotion and dedication to NPD. We are interested in investigating the effect of such dedication on the adoption of CE. Our expectation is that organizations more devoted to NPD would be more inclined to adopting innovative techniques such as CE.

Research Methodology

Sample

A sample of 1,000 U.S. organizations was generated using a direct mail collection procedure. The sample was selected from the Mergent Online database and from Fortune magazine's Fortune 500 list. Selected organizations were checked to ensure that they are involved in new product developments. R&D Managers in those organizations were asked to report on the culture of their organizations and on their usual practices for developing and implementing NPDs. The questionnaire was designed and tested using an iterative process that included expert validation and pretests involving a small number of business executives not included in the sample frame. The questionnaire was modified after feedback from both test groups was received. Multiple mailings were also used. Of the 1000 questionnaires mailed, 223 were returned, resulting in a response rate of 22.3%. Five of the questionnaires lacked critical information regarding the dimensions of organizational culture and were excluded from further analysis. This yielded a usable response rate of 21.8%.

Measurements of Variables

Table 1 describes the measures used to quantify CE. As presented in Table 1 CE is quantified using several measures describing the relationship between R&D and marketing departments -whether or not there is a give and take relationship between R&D and marketing departments, conflict between R&D and marketing is resolved at lower managerial level, and marketing department suggests possible product developments, and the involvement of the marketing and manufacturing departments in the different stages of product development. The different components of CE were measured using a seven-point-Likert-type scale, where 1 = strongly disagree and 7 = strongly agree.

Table 1 also provides the minimum and maximum values, means and standard deviations of those measures as well as Chronbach's alpha for the measure of CE.

Table 1: CE Descriptive Statistics

	Min	Max	Mean	Standard Deviation
Chronbach's alpha .84				
There is a give and take relationship between Marketing and R&D.	1.00	7.00	5.22	1.38
Conflict between marketing and R&D Are resolved at lower levels.	2.00	7.00	4.52	1.40
Suggestions for possible product developments Occur primarily due to market considerations	1.00	7.00	4.39	1.36
Total RD Marketing Relationship	**1.00**	**21.00**	**13.98**	**2.97**
Involvement in idea generation	1.00	7.00	5.68	1.21
Involvement initial screening stage	1.00	7.00	5.59	1.43
Involvement in the Preliminary assessment stage	1.00	7.00	5.48	1.37
Involvement in the concept stage	2.00	7.00	6.03	1.14
Involvement in the development stage	1.00	7.00	5.19	1.41
Involvement in the testing stage	1.00	7.00	4.63	1.67
Involvement in the trial stage	2.00	7.00	5.60	1.26
Involvement in the launch stage	1.00	7.00	5.85	1.63
Total Marketing involvement in NPD stages	**1.00**	**56.00**	**43.58**	**8.85**
Involvement in idea generation	1.00	7.00	3.39	1.67
Involvement initial screening stage	1.00	7.00	3.29	1.63
Involvement in the Preliminary assessment stage	1.00	7.00	3.87	1.76
Involvement in the concept stage	1.00	7.00	3.63	1.72
Involvement in the development stage	1.00	7.00	4.71	1.77
Involvement in the testing stage	1.00	7.00	4.87	1.74
Involvement in the trial stage	1.00	7.00	5.68	1.44
Involvement in the launch stage	1.00	7.00	6.19	1.38
Total Manufacturing Involvement	**1.00**	**756.00**	**34.47**	**11.30**

Few researchers offer dimensions for measuring organizational culture. Existing work includes that done by Shetriton and Stern (1997), who suggest five dimensions of organizational culture: hierarchical versus flat organizational structure, fragmentation versus cohesion, independence versus interdependence, competition versus cooperation, and tried-and-true versus risk taking. Using the Organizational Culture Profile (OCP), an instrument they developed, O'Reilly et al. (1991) identify seven dimensions: innovative, stable, respecting of people, outcome-oriented, detail-oriented, team-oriented, and aggressive. Hofstede and Hofstede et al. (Chatman and Jehn, 1994) propose a similar approach. Hofstede et al. introduce six dimensions for distinguishing between organizational cultures and four dimensions for distinguishing between national cultures. We believe that the national culture dimensions suggested by Hofstede are also applicable to organizations and accordingly are used in this study.

Table 2 describes the measures developed by Hofstede and used in this study. The various dimensions of organizational culture were measured using a seven-point Likert-type scale, where 1 = strongly disagree and 7 = strongly agree. It may be noted here that Likert-type scales are commonly used in cultural studies (Hofstede, 2001; Hofstede, 1997; Kolvereid and Obioj, 1994; Shane and Kolvereid, 1995; Shane, 1993). The dimensions of organizational culture were measured as Hofstede defined them in his study. The dimensions of national culture, however, used here to measure organizational culture, were modified to suit the nature of NPD projects. Table 2 also presents the means and standard deviations of those measures.

Table 2: Descriptive Statistics for the Organizational Culture Dimensions and Performance Measures Used in This Study

	Variable Names	Min.	Max.	Mean	Std. Deviation
Results Oriented	**TOTLRSLT**	**7**	**21**	**14.97**	**2.59**
Employees willing to exert maximal effort to get the job done	R1	1	7	5.47	1.03
Employees feel that each day brings new challenges.	R2	1	7	4.98	1.22
Employees feel comfortable in unfamiliar situations.	R3	1	7	4.52	1.28
Job Oriented	**TOTLJOB**	**10**	**23**	**15.48**	**2.70**
Employees experience strong pressure to complete the job.	JOB1	1	7	3.39	1.62
Employees perceive the organization as interested only in the work they do.	JOB2	1	6	2.67	1.15
Important decisions are made by individuals.	JOB3	1	7	4.51	1.62
Organization's norms cover employee behaviour at home.	JOB4	2	7	4.84	1.23
Parochial	**TOTLPAR**	**2**	**14**	**9.10**	**1.45**
Organization's norms cover employee behaviour at home as well as on the job.	PAR1	1	7	4.60	1.22
The company takes employees' social life and family background into account as much as their job competence.		1	7	4.50	1.13
Open	**TOTALOPN**	**5**	**21**	**12.12**	**2.82**
Employees often openly discuss job matters as well as personal issues with their bosses.	OPEN1	1	7	4.81	1.27
New employees need only a few days to feel at home.	OPEN2	1	7	4.35	1.46
Almost anyone would fit into the organization.	OPEN3	1	7	2.96	1.45
Tight Control	**TOTLTGHT**	**6**	**18**	**12.07**	**2.40**
Meeting times are kept punctually.	TIGHT1	1	7	3.99	1.33
Employees describe their work environment as cost-conscious.	TIGHT2	2	7	5.05	1.27
The organization has strict unwritten codes of dress and desired behaviour.	TIGHT3	1	6	3.03	1.40
Pragmatic	**TOTLPRAG**	**4**	**14**	**10.04**	**1.90**
Correct results are more important than correct procedures.	Prag1	1	7	4.52	1.28
The organization's major emphasis is on meeting customer needs.	Prag2	2	7	5.53	1.17
Employees are afraid to express disagreements with their bosses.	PWR	1	7	4.81	1.59
Risk Taking (Uncertainty Avoidance Inversely Measured)	**TOTLRSK**	**6**	**32**	**18.62**	**4.18**
Management provides employees enough incentive to work on new ideas.	RISK1	1	7	4.84	1.33
Management has a strong desire for high-risk, high-return projects.	RISK2	1	7	4.39	1.59
Management encourages employees to keep trying even if they fail in the process of creating something.	RISK3	1	7	4.94	1.41
Employees feel that company rules should not be broken even if breaking them is in the best interest of the company.	RISK4	2	16	4.45	1.83
Collectivism	**TOTLCLCT**	**5**	**14**	**8.65**	**1.64**
Whether employees would prefer to work with people who cooperate with one another rather than alone and with considerable freedom.	COLLCT1	3	7	5.07	1.02
Whether or not the organization encourages individual achievements and promotes individual competition.	COLLCT2	1	7	3.58	1.38

Wasti and Liker (1997) break down supplier involvement into three measurable elements: the extent to which the supplier influences decision-making during the early stages of product development; the amount of control the buyer retains over the design; and the frequency of design-related communication between the buyer and the supplier. We believe that the quality of relationship between the buyer and supplier is an important factor that should be taken into consideration when measuring buyer-supplier relationship. Accordingly, in this study we measure buyer-supplier relationship by variables that measure to what extent the buyer and supplier backs up each other technologically and financially, and the degree of involvement of the supplier in the different stages of the development process. Table 3 represents the variables used to measure buyer-supplier relationship. Table 3 also shows the mean and standard deviation of each of those variables, as well as Chronbach's alpha for the buyer-supplier measure.

Table 3: Buyer-supplier relationship

	Mean	Standard Deviation
Chronbach's alpha .7733		
The buyer backs up the supplier financially	2.76	1.47
The buyer owns shares in the supplier's company	1.72	1.03
There is a long-term contract with the supplier	4.27	1.81
The buyer assists the supplier with in reducing their costs	4.76	1.71
The supplier assists the buyer in reducing their costs	4.36	1.66
Involvement in idea generation	2.26	1.54
Involvement initial screening stage	2.50	1.60
Involvement in the Preliminary assessment stage	2.97	1.68
Involvement in the concept stage	3.04	1.75
Involvement in the development stage	4.05	1.79
Involvement in the testing stage	4.15	1.88
Involvement in the trial stage	4.68	5.68
Involvement in the launch stage	4.24	5.68
Total Buyer-supplier relationship	45.48	15.56

Three performance measures are used as a proxy for NPD performance: the commercial outcome of the project, the technical outcome, and the degree of customer satisfaction with the new products developed.

Computational Results

Regression analysis was used to test the effects of organizational culture, NP type, buyer-supplier relationship, the external environment, and R&D budget, on the adoption of CE. The Beta coefficients, t-tests, and p-values are presented In Table 4.

Table 4: Determinants of CE

	Beta Coefficient	t-test	p-value
TOTLRSLT	0.416	4.415	0.000
TOTLJOB	0.143	1.393	0.167
TOTALOPN	0.323	3.289	0.001
TOTLTGHT	0.356	3.670	0.000
TOTLPRAG	0.378	3.943	0.000
PWR	0.321	3.269	0.002
TOTLRSK	0.360	3.720	0.000
TOTLCLCT	-1.670	-1.628	0.107
NN	0.203	1.999	0.048
NF	0.262	2.613	0.010
FN	-0.052	-0.504	0.616
FF	0.033	0.317	0.752
TechEnv	0.262	2.616	0.010
CompEnv	0.257	2.565	0.012
Supplier Involvement	0.273	2.739	0.007
R&D Budget	-0.146	-1.348	0.181
R square 0.668	Adjusted R square .447		

As shown in Table 4, organizational culture, buyer-supplier relationship, NP type and the external environment significantly affect CE. Organizations that are results-oriented (beta coefficient = 0.416, p = 0.000), open (beta coefficient = 0.323, p = 0.001), tight control (beta coefficient = 0.356, p = 0.000), pragmatic (beta coefficient = 0.378, p

= 0.000), have a high level of power distance (beta coefficient = 0.321, p = 0.002) and Risk takers (beta coefficient = 0.360, p = 0.000) tend to adopt CE more than their counterparts. Also, organizations tend to be more inclined towards adopting CE when the product they are developing is new in concept (beta coefficients = 0.203 for new concept new market products and 0.262 for new concept familiar market products, p = 0.048 and .010 respectively). The type of market the product is introduced to seems to have no significant effect on the adoption of CE (beta coefficients = -0.052 for familiar concept new market products and 0.033 for familiar concept familiar market products, p = 0.616 and 0.752 respectively). Moreover, organizations tend to implement CE when the uncertainties in the external environment, technological (beta coefficient = 0.262, p = 0.010) and competitive (beta coefficient = 0.257, p = 0.012), are high. Last but not least, Organizations that tend to have higher level of supplier involvement tend to implement CE more often than their counterparts (beta coefficient = 0.273, p = 0.007).

The adjusted R square value indicates that organizational culture, NP type, external environment, and supplier involvement explain 45 percent of the variation in CE. In other words, 45% of whether or not organizations tend to adopt (or not adopt) CE is determined by those variables.

Implications

This study complements existing research by shedding the light on some of the factors that lead to the adoption of CE. While existing research is mainly focused on the effect of CE on NPD performance, this study adds to the literature by assessing some of the main factors that lead to the adoption of CE. By determining the factors that affect the adoption of CE interested organizations can assess their environment and create the right atmosphere first before attempting to adopt CE. By doing so, organizations can increase their chances of successfully implementing CE.

The study also benefits managers and practitioners. It helps them determine the right culture necessary for the adoption of CE. Managers

interested in adopting CE need to implement and create the right culture that would support the adoption of CE. Adopting CE without having the right culture might lead to the failure of the adoption process or make CE not as effective in enhancing NPD performance. In our sample organizations that tend to use CE are results oriented, open, pragmatic, less risk averse, and have tight control systems, high levels of power distance. Changing organizational culture is not easy. However, it is important for managers to realize its effects so they can do something about it. Although it is difficult to change the entire culture of an organization, small and gradual changes are possible. Managers should evaluate their organizational culture and see its appropriateness for CE adoption and implementation. If the culture is not appropriate for CE implementation (and managers are keen on implementing CE), managers should attempt to change the organizational culture dimensions that are most expected to hinder their CE implementation attempts. Managers can attempt these changes with the relevant departments (manufacturing, marketing and R&D departments) first. This will allow them to achieve a relatively fast, easy and effective change. Managers need to do these changes before they start implementing CE. Managers can also build temporary organizational structures (such as the project structure) that have the right culture for implementing CE. Using the project structure will allow managers to select people with the right culture and accordingly improve the chances of a successful CE implementation.

Managers also need to consider the type of products they are developing before deciding whether or not to implement CE. CE seems to be necessary when the product concept is new. In this case the company in dealing with a product that it is not familiar with. Pulling together many of the organizations' departments to insure successful products seems necessary in such case. When the product concept is not new, even when the product is being introduced to a new market, pulling together many of the organizations' departments and forming cross-functional teams does not seem to be as important. This result is in line with the findings of Handfield (1994) and AitSahlia et al.

(1995). Handfield (1994) and AitSahlia et al. (1995) suggest that CE might have negative effects on NPD performance if used with the wrong type of products.

Managers also need to consider the external environment. If the external environment is uncertain, managers might need to rely more on CE as a coping mechanism. CE will allow organizations facing such uncertainty to pull together all resources necessary for developing better and more competitive products. In a more certain environment implementing CE might not be as necessary.

Conclusion

Data collected from 218 manufacturing organizations in the United States is used to test the effect of several factors on the adoption of CE. The results suggest that organizational cultural, the external environment, supplier involvement in the development process, and product type significantly affect the adoption of CE. Organizations that are results-oriented, open, have tight control systems, pragmatic, have high level of power distance, and less risk averse tend to adopt CE more than their counterparts. Also, Organizations tend to adopt CE when they are developing new-concept products. When organizations are introducing familiar-concept products either to a new market or to a familiar market they tend not to rely on CE as much. Moreover, organizations tend to adopt CE when the uncertainty of the technological and competitive environment is high. Finally, organizations forming partnerships with their suppliers tend to be more inclined towards the implementation of CE more than their counterparts. R&D budget seems not to be an influential factor in determining whether or not organizations adopt CE.

References

Abdou K and Kliche S. (2004) The strategic alliances between the Americans and German companies: A cultural perspective. *European Business Review*, 2004, 16, 1, 8-27.

AitSahlia, F. Johnson, E. and Will, P. (1995) Is Concurrent Engineering Always a Sensible Proposition. *IEEE Transactions on Engineering Management*, 42, 2, 166-171.

Beer L. A. (2003) The Gas Pedal and the break…Toward a global balance of diverging cultural determinants in managerial mindset. *Thunderbird International Business Review*, 45, 3, 255-273.

Belson D. and Nickelson D. (1992) Measuring Concurrent Engineering Costs and Benefits. *Concurrent Engineering ASME*, 59, 443-451.

Booz, Allen and Hamilton (1982) New Product Management for the 1980s. Chicago.

Chang L. C. (2003) An examination of cross-cultural negotiation: Using Hofstede framework. *Journal of American Academy of Business*, 2, 2, 567-571.

Chatman J. and Jehn K., (1994) Assessing the Relationship Between Industry Characteristics And Organizational Culture: How Different Can You Be, *Academy of Management Journal*, 37, 522-553.

Clark K. (1989) Project Scope and Project Performance: The Effect of Parts Strategy and Supplier Involvement on Product Development. *Management Science 35*, 1237-1263.

Cole R. and Yakushiji K. (1984) The U.S. and Japanese Automotive Industries in Transition, Joint U.S.-Japan Automotive Study. Ann Arbor: Michigan.

Cooper R. G. (1979) Identifying Industrial New Product Success: Project New Prod. *Industrial Marketing Management* 8: 124-135.

Crawford C. M. (1987) New Product Failure Rates: A Reprise. *Research Management* 30: 20-24.

Crawford C. M. (1979) New Product Failure Rates: Facts and Fallacies. *Research Management* 22: 9-13.

Drennan D. (1990) Transforming Company Culture: Getting Your Company From Where You Are Now To Where You Want To Be. London: McGraw-Hill Book Company.

Dwyer L. and Mellor R. (1991) Organizational Environment, New Product Process Activities, and Project Outcomes. *Journal of Product Innovation Management* 8: 39-48.

Dyer J. H., (1996) How Chrysler Created an American Keiretsu. *Harvard Business Review*, July-August, 42-56.

Fan P. and Zigang Z. Cross-cultural Challenges when Doing Business in China. *Singapore Management Review*, 26, 1, 81-90.

Gupta A. K. (1984) A Study of the R&D Marketing Interface and Innovation Success in High Technology Firms. Ph.D. Dissertation, Syracuse University.

Handfield, R. B. Pannesi, R. T. (1994) Effects of concurrent engineering on make-to-order products. *IEEE Transactions on Engineering Management*, 41, 4, 384-394.

Hart S. (1995) Where We've Been and Where We're Going in New' Product Development Research, In: Bruce and Biemans (Eds), Product Development: Meeting the Challenge of the Design-Marketing Interface. Chichester: Jossey-Bass Publishers.

Hartley, J. L, Meredith, J. R, McCutcheon, D. and Kamath, R. R. (1997) Suppliers' contributions to product development: An exploratory survey. *IEEE Transactions on Engineering Management*, 44, 258-268.

Helper S., (1991) How Much Has Really Changed Between U.S. Automakers and Their Suppliers. *Sloan Management Review*,

Summer, 15-28.

Hofstede, G. (2001) Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations (2nd ed.). Beverly Hills: Sage Publications.

Hofstede, G. (1997) Cultures and Organizations: Software of the Mind, London: McGraw-Hill.

Hofstede G. (1991) Cultures and Organizations: Software of the Mind. London: McGraw-Hill Book Company.

Hofstede G., Neuijen B., Ohavy D. and Sanders. G. (1990) Measuring Organizational Cultures: A Qualitative and Quantitative study across Twenty Cases. *Administrative Science Quarterly*, 25: 286-316.

Hofstede G. (1980) Culture's Consequences: International Differences in Work-Related Values. Beverly Hills: Sage Publications.

Holt, D. D. (1998) International management: Text and cases. Fort Worth, Texas: The Dryden press.

Johne A. (1995) Evaluating Product Development Success Within A Business Development Context. In Bruce and Biemans (Eds), Product Development: Meeting the Challenge of the Design-Marketing Interface. Chichester: Jossey-Bass Publishers.

Johne F. A. and Snelson P. A. (1990) Success Factors in Product Innovation: A Selective Review of the Literature. *Journal of Product Innovation Management*, 5: 114-128.

Kluckhohn F. R. and Strodtbeck (1961) Variations in Value Orientations. CT: Greenwood Press.

Kmetovics R. E. (1992) New Product Development: Design and Analysis. NY: John Wiley and Sons.

Koufteros, X. A., Vonderembse, M. A., William J D. (2002) Integrated product development practices and competitive capabilities:

The effects of uncertainty, equivocality, and platform strategy. *Journal of Operations Management,* 20, 4, 331-355.

Kolvereid, L., and Obioj, K. (1994) Entrepreneurship In Emerging Versus Mature Economies: An Exploratory Survey. *International Small Business Journal,* 12, 14-27.

Lynn G. S., Valentine W. S. and Wright R. C. A. (1996) Benchcasing Study of New Product and Process Development. *Engineering Management Journal,* 8, 1-8.

Lyons T. F., Kracbenberg A. R. and Henke J. W. (1990) Mixed Motive Marriages: What's Next for Buyer-Supplier Relations?. *Sloan Management Review,* Spring, 29-36

McDonough E. F. and Barczak G. (1992) The Effects of Cognitive Problem-Solving Orientation and Technological Familiarity on Faster New Product Development. *The Journal of Product Innovation Management,* 9: 44-52.

McShane S. (1998) Canadian Organizational Behavior, Toronto: McGraw Hill Ryerson.

O'Reilly C., Chatman J. and Caldwell D. (1991) People and Organizational Culture: A Q-Sort Approach to Assessing Person-Organization Fit. *Academy of Management Journal,* 34.

Ouchi W. G. (1981) Theory Z. Reading. New York: Addison-Wesley.

Page A. L. (1993) Assessing New Product Development Practices and Performance: Establishing Crucial Norms. *Journal of Product Innovation Management,* 10: 273-290.

Parry M. E. and Song X. M. (1993) Determinants of R&D-Marketing Integration in High-Tech Japanese Firms. *Journal of Product Innovation Management,* 10: 4-22.

Pascale R. T. and Athos A. G. (1982). The Art of Japanese Management. N.Y.: Simon & Schuster.

Pawar K. S. and Riedel J. (1994) Achieving Integration Through Managing Concurrent Engineering. *International Journal of produc - tion Economics*, 34, 329-345.

Peters T.J. and Waterman R.H. In Search of Excellence: Lessons from America's Best-Run Companies. N.Y.: Harper and Row.

Quazi, A. M. (1982) An Empirical Test of a Cross-national Model of Corporate Social Responsibility. *Journal of Business Ethics* 25: 33-51 (2000).

Ragatz G. L., Handfield R. B. and Scannell T. V. (1997) Success Factors for Integrating Suppliers into New Product Development. *Journal of Product Innovation Management*, 14, 190-202.

Robbins S. and Langton N., (2001) Organizational Behaviour, Toronto: Prentice Hall.

Sathe V. (1985) Culture and Related Corporate Realities. Homewood: Richard Irwin. Inc.

Schein, E. H. (1990) Organizational Culture and Leadership. San Francisco: Jossey-Bass Publisher.

Shane, Scott, and Kolvereid, L. (1995) National Environment, Strategy and New Business Venture Performance: A Three Country Study. *Journal of Small Business Management*, 33, 37-50.

Shane S. (1993) Cultural Influences on National Rates of Innovation. *Journal of Business Venturing Management*, 8, 59-73.

Shetriton J. and Stern J. L. (1997). Corporate Culture team Culture. N.Y.: Amacom.

Souder W. E. (1987) Managing New Product Innovations. Lexington: Lexington Books.

Stalk, G., Jr., Hout, Thomas M. (1990) *Research Technology Management*, 33, 2, 19-29.

Susman, G., Dean, J. (1992) Development of a Model for Predicting Design for Manufacturability Effectiveness. In: Susman G. (Ed.), Integrating Design for Manufacturing for Competitive Advantage. Oxford University Press, NY, 207-227.

Stevenson, W. (1999) Production/Operations Management (6th ed). Boston: McGraw Hill.

Swierczek F. W. and Onishi J. (2003) Culture and conflict: Japanese managers and Thai subordinates. *Personnel Review*, 32, 1/2 187-211.

Wang X. (2001) Dimensions and Current Status of Project Management Culture. *Project Management Journal* 31: 4-17.

Wasti S. N. and Liker J. F. (1997). Risky Business or Competitive Power? Supplier Involvement in Japanese Product Design, International Journal of Operations and Production Management, 14, 337-355.

Yeniyurt S. and Townsend J. D. (2003). Does culture explain acceptance of new products in a country? An empirical investigation. *International Marketing Review*, 20, 4, 377-397.