

Identifying the critical success factors of agile NPD process in Iranian Manufacturing Enterprises

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ABSTRACT

In response to dynamic and turbulent customer needs, shortening the cycle time, technological changes and volatile global markets, agile new product development (NPD) is a focus of manufacturing enterprises. This study aims to identify the critical success factors of agile NPD to help NPD managers to obtain a better understanding of issues surrounding the agile NPD process and to facilitate their decision-making in the condition of unanticipated changes. As a useful methodology explanatory factor analysis is used for identifying these critical success factors and is based on the results of a study which has done on 264 NPD projects in Iranian manufacturing enterprises. The results of this study show that among the factors affecting the responsiveness power of the NPD process, 6 most critical ones are identified. These factors are using advanced manufacturing techniques, customer design and development, adaptation to changes and minimizing uncertainty, information-driven and virtual integrated processes, market testing and responsiveness, and collaborative relationship and participating management styles.

Keywords: new product development; agility; critical success factors; explanatory factor analysis

INTRODUCTION

New product development (NPD) is one of the most critical tasks in the manufacturing process. Every company develops new products to increase sales, profits and competitiveness. Although NPD as a multidisciplinary process is dynamic in nature (Song & Noh 2006), this process has never been more challenging or rewarding than it is today. Pressure of global competition, fragmentation of markets into smaller segments, rapid and never-ending changes in technological aspects and flexible production force NPD teams to

introduce new products to the markets as rapidly as possible. In response to these uncertain and unanticipated changes, some methods and techniques, such as total quality management (TQM), Business process reengineering (BPR), concurrent engineering, and risk and change management, have been suggested and used to shorten the lifecycle of a new product's development process (Cooper & Kliensmith 1998,, Ribbens 2000, Cooper 2003). However the high speed of transformation, using such methods neither sufficient nor effective anymore, therefore the concept of agility has been introduced.

Agility as defined by Adrian *et al.* (2002) is the capability to grow and prosper in an environment of continuous and unanticipated changes driven by customer-designed products and services. D'avani (1999) defined agility as the ability to predict opportunities for innovation and to seize competitive market opportunities by assembling requisite assets, knowledge and relation with speed and surprise. As it can be seen in these definitions, reducing cycle time is only one of the aspects of the agility concept. Moving quickly is not sufficient for being agile, but moving fast and lean towards the main targets is essential. As Christopher (2000) mentioned, there is a clear distinction between the speed (meeting customer demand in the context of shortened delivery lead times), and agility (responding quickly to changes in terms of both volume and variety). Therefore, using the agility concept and its four main dimensions in the NPD process and extracting the critical success factors of agile NPD could enhance the power of responsiveness to unanticipated changes.

The critical factors of successful new product development and the ability of reducing the cycle time in NPD process have been viewed as the key factors in order to ensure innovative success and profitability in manufacturing enterprises (Gupta *et al.* 1992, Cohen *et al.* 1996, Griffin & Hauser 1996, Calantone & Di Benedetto 2000, Kessler & Bierly 2002, Swink *et al.* 2006). However using the agility concept and its special dimensions in the NPD process has not been considered extensively.

In this study, the concept of agile NPD and its main items and attributes are extracted by using the agility dimensions in each of the stages of the NPD process. After identification of these main items, critical success factors of agile NPD process are extracted based on the empirical study which has been done on the NPD projects in Iranian manufacturing enterprises using the explanatory factor analysis method.

The rest of the paper is organized as follows: In Section 2, the theoretical background of the agility concept and its dimensions in the manufacturing enterprise and the necessity of making the agility concept in the NPD process are investigated in details. Research methodology, the survey, explanatory factor analysis and its use in identifying the critical success factors are discussed

in Section 3. In Section 4, the results and validation of these CSFs are investigated in detail. Conclusion and some suggestions for future research are also presented.

AGILITY AND NPD

The development and launch of a successful NPD is one of the most challenging tasks for managers in manufacturing enterprises, from the generation of new and innovative opportunity in the market to the launch and commercialization of a new product. This multidisciplinary process is based on a series of development stages. Cooper & Kleinshmidt (1987) and Crawford & Di Benedetto (2003) found that defining a structure for the NPD process, including idea generation, screening and evaluation, market testing development and launch, could enhance the profitability of the NPD process. Hauser (1993) and Peters (1999) introduced generic models for management of new product design and development process. In all these models, six major stages can be seen. The stages are including: strategic planning or opportunity detection, idea generation and screening, concept development and screening, product design and development, marketing tests, and launch of the new product to the market (Tzokas *et al.* 2004).

Considering the complexity and uncertainty of the NPD process, new product managers need to apply some techniques and methods for planning, development, deployment and control of the necessary competencies to make the NPD process more successful and profitable. On the other hand, rapid technological improvement, volatile markets, never ending customer needs and innovative products make the NPD process turbulent and unanticipated than before. Increasing the speed and shortening the cycle time in the NPD process is considered in many articles (Kessler & chakrabarti 1999, Tomkovick & Miller 2000, Menon & Chowdhury 2002, Nambisan 2002, Cooper 2003, Lukas & Menon 2004). Although this aspect (reducing cycle time) is essential to achieve the success in NPD process, it is not sufficient to respond to unanticipated changes. Responsiveness requires speed and a high level of maneuverability, which is also termed as agility. Agility means a firm's nimbleness to quickly reassemble its technology, employees and management via a sophisticated communication infrastructure in a deliberate, effective and coordinated response to changes of customer demand in the market environment of continuous and unanticipated changes (Kodish *et al.* 1995). In the other words, as Zhang & Sharifi (2000), pointed out, it is a necessary ability in the revolutionary turning of the business environment into a turbulent place of competition. For a manufacturing company this concept is to capture operating profitably in a competitive environment of continually changing customer opportunities (Goldman *et al.* 1995). In all of these definitions the power of exploring and responsiveness to the environmental

changes are vital factors. To achieve these goals, it is essential to consider four major dimensions of agility. These four dimensions include enriching the customer, leveraging the capabilities, cooperating to enhance competitiveness, and mastering the change (Mates *et al.* 1998).

In order to introduce the agile NPD items, the agility concept should be used in the stages of the NPD process. Figure 1 illustrates a conceptual model of using agility in the NPD process. As Zhang & Sharifi (2000) pointed out, there are three parts for agility in a manufacturing firm: agility drivers, agility capabilities and agility providers. Agility drivers drive the company to the near position of taking advantage of the changes in a business environment; these changes are related to customers, competitors, knowledge, new methods of technology, social conditions and unanticipated occurrences.

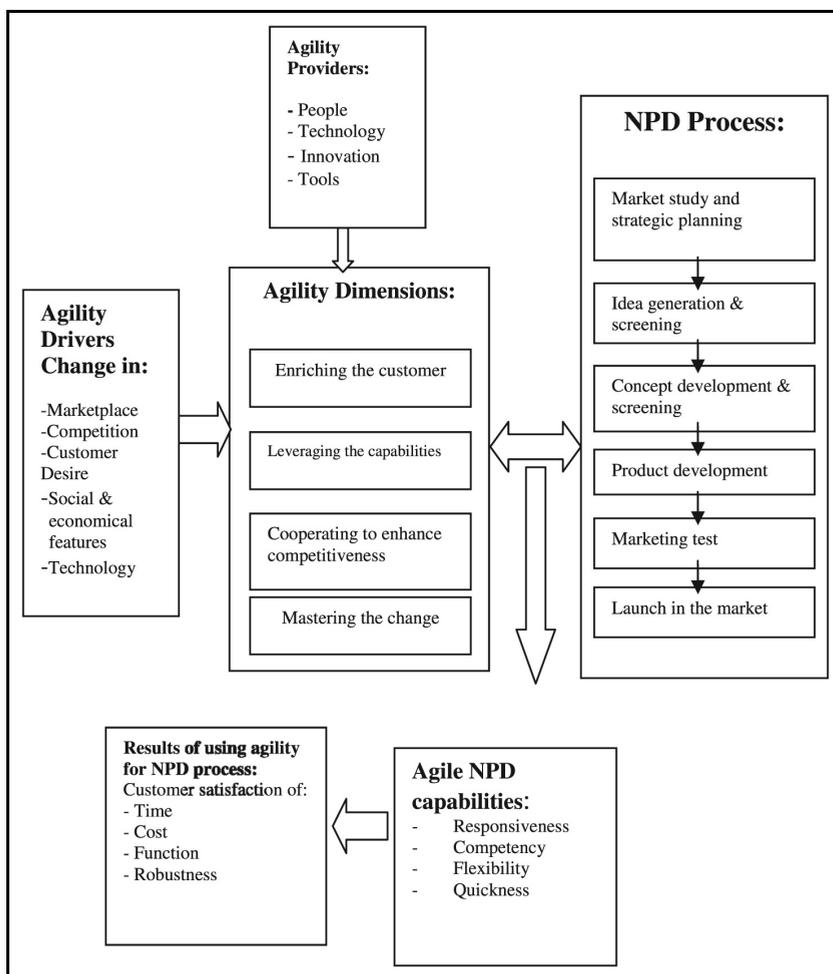


Figure1: Using the agility concept in the NPD process

Agility capabilities are the essential abilities that would provide the required strength for responding to changes and finally, the agility providers are the means by which so called capabilities could be achieved by some providers Zhang & Sharifi (2000), refer to providers as People, technology, innovation and tools. The utilization of agility in the NPD process is the use of each dimension of agility in every stage of the NPD process. The results and benefits of this utilization are responsiveness, speed, competency and flexibility.

METHODOLOGY

To identify the critical success factors of the agile NPD process in Iranian manufacturing enterprises, two main steps should be carried done. First, the main items related to the agile NPD process should be extracted. As mentioned before, these items should be extracted by using agility dimensions in every stage of the NPD process and the t-test is used for extracting the main items of the agile NPD process in Iranian manufacturing enterprises. Secondly explanatory factor analysis is used to identify the main factors of the agile NPD process based questionnaire responses which illustrates the NPD experts' opinions in Iranian manufacturing enterprises about the importance of the items related to the agile NPD process. These two parts are investigated in detail in the following sections.

Extracting the Main Items of Agile NPD Process

As mentioned earlier by using the four main agility dimensions in the stages of the NPD, 34 main factors were extracted and introduced. These items are illustrated in the Table 1. A questionnaire was designed and developed based of these studies to identify the main factors affects on the responsiveness power of a NPD project. The Questionnaire was designed and developed based of these 34 items, which are shown in Table 1 to identify the critical factors. 15 NPD managers and 10 academic experts reviewed the pre questionnaire to improve clarity, to identify and to resolve any unfamiliar or misunderstood wording.

Table 1. Main items of agile NPD process in Iranian manufacturing enterprise

Agile NPD Factors	P_value
Using the agility dimensions in Phase 1(Strategic planning):	
1 - Market & customer oriented rather than profit oriented strategies	0.00
2 - Clearly defined target market	0.00
3 - Top management support of innovation strategies & risk in new product development	0.00
4 - Organizing multi-functional teams to detect and solve managerial and critical problems	0.00
5 - Make close relationship with customers & suppliers to find new strategies	0.00
6 - Making inter-firm collaboration by IT Facilities like local area network (LAN) and electronic data interchange(EDI) between employees & managers to make the best strategies	0.00
7 - Concentrating on the opportunities and strategies with value added for customers	0.00
8 - New product strategies are frequently reviewed and revised	0.017
9 - Rapid recognition of new opportunities in the market	0.02
10 - Making dynamic, active, shared & configurable policies	0.004
11 - Rapid response to competitors' actions	0.00
Using the agility dimensions in Phase 2 (Idea generation and screening):	
12 - Choosing the customer focus idea with ethnography and customer historical analogy	0.001
13 - <i>Using benchmarking techniques as a basis for finding the best new ideas</i>	0.326*
14 - Choosing global & international-oriented ideas and concepts according to world class manufacturing (WCM) criteria.	0.00
15 - Close relationship between R&D teams and innovation clusters to achieve the best new product ideas	0.00
Using the agility dimensions in Phase 3 (Concept development and screening):	
16 - Doing the customer value determination (CVD) process & customer value chain (CVC) process to test the concept of new products	0.016
Using the agility dimensions in Phase 4 (Product design and development):	
17 - Using quality management techniques like total quality management (TQM), quality function deployment (QFD), and failure mode and effect analysis(FMEA) for meeting customer needs	0.002
18 - Meeting customer needs in design prototype & operations	0.029
19 - Sharing information of process between team project members	0.023
20 - Using flexible manufacturing systems	0.001

Agile NPD Factors	P_value
21 - Product line synergy & integrated product	0.00
22 - Using concurrent engineering	0.00
23 - Using JIT flow	0.022
24 - Applying computer aided design (CAD) and computer aided test(CAT) to facilitate adoption change in designing and operation of new product	0.005
25 - Using rapid prototyping techniques	0.005
26 - Using robotics techniques	0.007
Using the agility dimensions in Phase 5 (Market testing):	
27 - Emphasizing accurate marketing tests like pre-use testing, alpha, beta and gamma tests after designing the product prototype	0.005
28 - Empowering the cooperation between R&D and marketing teams to evaluate the results of marketing test	0.00
29 - <i>Using product data management systems for market testing</i>	0.234*
30 - Meet market share goals	0.00
31 - Concentrating on early use testing after the production of new products	0.00
Using the agility dimensions Phase 6 (Launch of the new product in the market):	
32 - Providing and considering rich data about partners and competitors to make new (launch) strategies	0.00
33 - Accurate forecast of market change to determine the right launches time and new product commercialization by using IT facilities	0.00
34 - Using ERP systems to conquer geographical, cost and structural barriers in order to catch the markets	0.00

The questionnaire was provided in Persian and sent via e-mail to the 324 NPD project managers, NPD consultants and executive managers in Iranian manufacturing companies, who are the leaders in their business, profitable and innovative in comparison with similar firms this deemed them as suitable starters in the NPD process. After finishing the determined time (three weeks), only 280 Responses were returned by e-mail and 264 completed ones were chosen for analysis. The characteristics of respondents are illustrated in Table 2. Since the data in this research was mostly qualitative rather than quantitative, the Likert scale is used in analyzing the data. The survey asked the respondents to rate these items on a 5-point Likert scale, with 1 being the lowest rating (strongly disagree). The number of responses was sufficient for our survey because they are more than the necessary data for doing T-test analysis. To analyze the questionnaire the statistic package of SPSS 13 for Windows Software was used. The reliability of the questionnaire was tested by using Cronbach alpha. The result shows that the amount of alpha for the questionnaire is (0.81), which is more than adequate in terms of its reliability.

As it can be seen in the Table 1, two factors including factor 13 and factor 29 have the P-values more than 0.05. So these factors can not be considered as the important factors in the agile NPD process in Iranian manufacturing companies. As Table 1 shows only 32 factors can be considered as the important ones affect on the agile NPD process in Iranian manufacturing enterprises.

Table 2. Demographic information of respondents

Type of NPD project:		Percent
Chemical	49	0.185
Automobile	34	0.128
Pharmaceutics	39	0.147
Detergents	48	0.181
Food and beverage	52	0.196
Industrial equipment	42	0.159
Total	264	100
Respondents' responsibility in NPD project		
NPD project manager	106	0.401
NPD consultant	66	0.25
NPD executive manager	92	0.348
Total	264	100

Using Explanatory Factor Analysis to Identify the Critical Success Factors of the Agile NPD Process in Iranian Manufacturing Enterprises

Responses of the 32 main items which have been extracted by using T-test analysis in the previous stage were subjected to the explanatory factor analysis solution. The main reason for using this method was to reduce the dimensionality of attributed data and cover a smaller number of underlying factors that account for a major amount of variances in the original measurements. In the other words, the factor analysis method can identify the smallest number of common factors (the most parsimonious factor model) that can best explain or account for the correlation among the indicators (Sharma 1996).

In order to determine whether the partial correlation of the variables was small, the authors used the Kaiser Meyer Olkin Measure (KMO) of sampling adequacy and Bartlett's Chi-square test of Sphericity before conducting the factor analysis. The result was a KMO of 0.837 and the significance is zero, which was less than 0.05 for the Bartlett test. These results showed a good correlation among the factors.

Among the general methods of factor analysis, the explanatory Factor Analysis method was used in this paper by applying the statistic package SPSS 13 for Windows Software. This study also adopted the internal consistency method to test reliability because of its ease of use its general form of reliability estimation. The Explanatory factor analysis was performed on the 32 items to identify the most critical success factors of agile NPD and to reveal any underlying patterns of responses. By using the Principal Component Analysis technique as the extraction method and Varimax with Kaiser Normalization as the rotation method, six critical success factors were identified based on the Eigenvalue criterion. Table 3 shows the Varimax rotation of the critical factors of the agile NPD process in Iranian manufacturing enterprises.

Naming a particular factor is determined by the response variables that load on that factor. In other words, names have been given to the factors which reflect the essence of the factor from the agile NPD project managers' perspectives in Iranian manufacturing enterprises. Names, which have given to these six factors and also the correlation of the items to each factor, are shown in Table 3.

Table 3. Varimax, rotation matrix, Eigenvalues and Cronbach alpha for agile NPD CSFs

Factor	Item	1	2	3	4	5	6	Alpha (Cronbach)
1- Using advanced manufacturing techniques								
	20	0.806	0.164	0.212	-0.300	-2.03E-2	1.23E-2	
	21	0.747	0.201	0.274	-0.336	-0.112	8.12E-2	
	22	0.788	0.194	0.170	-0.161	-8.56E-2	1.26E-2	
	23	0.683	0.161	0.165	-0.256	-7.49E-2	0.104	0.89
	24	0.805	0.139	0.185	-0.301	-0.180	0.113	
	25	0.859	0.136	0.167	-0.316	-9.93E-2	0.109	
	26	0.772	0.174	0.277	-0.298	-0.103	3.93E-2	
2- Customer-oriented design & development								
	1	0.127	0.686	-0.583	0.255	0.106	2.86E-2	
	7	0.183	0.661	-0.508	0.211	0.131	-8.1E-2	
	12	7.69E-2	0.623	-0.491	0.121	6.73E-2	0.101	
	16	0.246	0.707	-0.448	0.263	8.76E-2	-6.3E-2	0.92
	17	0.155	0.768	-0.430	0.151	0.176	7.87E-3	
	18	9.77E-2	0.696	-0.540	0.267	6.18E-2	-3.77E-2	

Factor	Item	1	2	3	4	5	6	Alpha (Cronbach)
3- Adaptation to changes & minimizing uncertainty								
	9	-0.290	0.489	0.661	0.133	-4.16E-2	-3.53E-2	
	10	-0.429	0.454	0.660	0.130	-0.100	-5.49E-2	
	11	-0.362	0.503	0.659	9.19E-2	-8.27E-3	6.79E-2	
	3	-0.516	0.523	0.631	7.54E-2	-6.8E-2	2.03E-2	0.93
	8	-0.290	0.575	0.659	0.178	-129	-693E-2	
	14	-0.297	0.511	0.608	0.154	3.11E-2	-7.46E-2	
4-Information-driven or virtual integrated process								
	6	0.369	-0.272	0.174	0.829	1.40E-2	5.51E-2	
	34	0.358	-0.240	0.172	0.819	8.06E-2	0.103	
	32	0.367	-0.258	0.182	0.736	3.96E-2	0.260	0.95
	19	0.398	-0.187	0.150	0.721	-6.09E-2	0.158	
	33	0.412	-0.228	0.112	0.796	-1.44E-2	8.48E-2	
5-Market sensitivity & responsiveness								
	2	0.138	-4.93E-2	0.119	-0.125	0.756	-0.122	
	30	0.173	9.13E-2	0.214	-2.30E-2	0.808	-0.145	
	31	7.34E-2	-6.97E-2	0.185	-8.91E-2	0.775	-0.145	0.87
	27	0.134	1.60E-2	0.123	9.42E-2	0.684	-7.16E-2	
	28	7.99E-2	-3.38E-2	0.239	-0.113	0.736	1.54E-2	
6-Collaborative relationship & participated management style								
	4	-0.232	1.09E-2	8.43E-3	-9.54E-2	0.229	0.740	
	5	-0.219	0.116	-2.01E-2	-0.171	0.108	0.749	0.78
	15	-0.324	9.28E-2	-8.59E-2	-0.186	8.93E-2	0.767	
Eigenvalues		6.045	5.04	4.505	4.202	3.144	1.98	
Percentage of variance explained		18.86	15.733	14.389	12.872	9.791	7.44	
Cumulative percentage of ariance explained		18.86	34.21	48.59	61.46	71.25	78.64	

DISCUSSION

The results of explanatory factor analysis reveal 6 critical success factors of agile NPD. These critical success factors are using advanced manufacturing techniques, customer design and development, adaptation to changes and minimizing uncertainty, information-driven and virtual integrated process, market testing and responsiveness and collaborative relationship and participating management style. Figure 2 illustrates these CSFs.

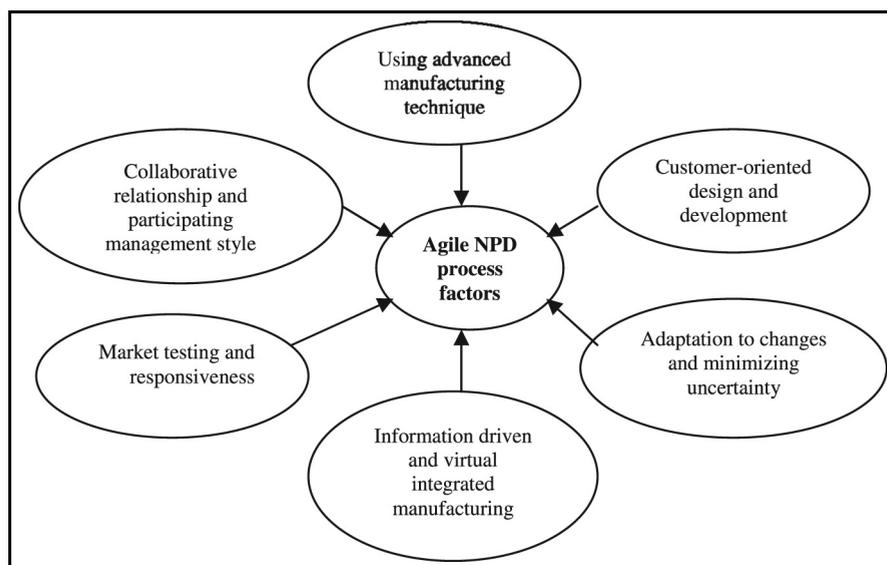


Figure2. The critical success factors of the agile NPD process

Table 3 shows “*applying advanced manufacturing technologies*” as the most important factor to make the NPD process in Iranian manufacturing enterprises more agile than before. While the total variance is 78.64%, this factor fully explains 18.86% of the total variances. This factor reflects using some advanced manufacturing techniques during the new product development process. These techniques are shown in the 7 items which constituted this factor with loading factors greater than 0.6.

Factor 2 has been termed the “*customer-oriented design and development.*” Six items with factor loading above 0.5 constitute this factor.

The results of this research also reveal the factor of “*adaptation to changes and minimizing the uncertainties*” as one of the most important and critical aspects of the agile NPD process in Iranian manufacturing enterprises. Eight items constitute factor 3.

The fourth critical success factor is called “**information-driven and virtual integrated process.**” Six items with factor loading above 0.6 constitute this factor. Three features load into factor five named “**market sensitivity and testing.**” The amount of factor loading for all these three items is more than 0.6, which reveals the importance of this factor in the agile NPD process.

The last factor, named “**collaborative relationship and participating management**” is one of the most important factors in agile production, and the results of this study show the importance of this factor for the agile NPD process. The items, which constitute this factor, have a loading factor of more than 0.7.

Four methods are identified for assessing the reliability of identified factors. These are 1) the retest method, 2) alternative form method, 3) the split halves method and 4) the internal consistency method (Lattin *et al.* 2003), the internal consistency method that is used to estimate reliability. Cronbach-alpha is used as a reliability coefficient in the evaluation of the degree to which all the items related within the subset are homogeneous. Typically, a reliability coefficient of 0.7 or more is considered adequate (Lattin *et al.* 2003). Table 3 indicates the original items that make up each of six factors along with their internal consistency. The alpha values for the six factors ranged from 0.8 to 0.95 with the project management’s principles being the most consistent.

CONCLUSION AND FUTURE RESEARCH

Better understanding of the agile NPD process and realizing the importance of factors that have effects on the agility and the responsiveness power of the NPD process are the main implications of this study. These can be useful and applicable for NPD managers to make better decisions with unanticipated changes of volatile markets.

This research has found that six factors are the most important and critical ones in making the NPD process more agile than before. These main factors are using advanced manufacturing techniques, customer-oriented design and development, adaptation to changes and minimizing uncertainty, information-driven and virtual integrated manufacturing, market testing and responsiveness and collaborative relationship and participating management style. The most important factor of the agile NPD process in Iranian manufacturing enterprises is called “using advanced manufacturing techniques.” It reflects using some manufacturing techniques such as concurrent engineering, CAD, CAT, JIT, FMS, robotics and rapid prototyping in the NPD process. The amount of the reliability coefficient reveals the consistency of the items in the subset.

Explanatory factor analysis performed in this paper reveals “customer-oriented design and development” as the other main and critical factor of the agile NPD process in Iranian manufacturing enterprises. In general, this factor means meeting customer needs during every stage of the NPD process, from making strategy to the launch of a new product on the market.

“Adaptation to change and minimizing uncertainty” is the third critical factor of agile NPD production. Making dynamic, active shared and configurable policies, rapid recognition of the new product opportunities, also rapid response to competitors’ actions can help to increase the adaptation to changes in the phase of strategic planning of the new product development process. Managers’ supports of innovation strategy and choosing internationally oriented ideas are another aspect of minimizing the uncertainty in the new product development process in Iranian manufacturing enterprises.

Information technology has always had a very critical role on agility in manufacturing organizations (Yusuf *et al.*1999, Zhang & Shrifi 2000, Adrian *et al.*2002, Norizan & Zain 2004, Fathain & Fekri 2006). The study revealed the “information driven and virtual integrated process” as one of the most critical success factors of the agile NPD process. This factor reflects using information technology facilities and techniques in every stage of the NPD process. The empowered IT facilities in every form, such as EDI, LAN, ERP, make managers and employees aware of organizational core competencies throughout the NPD process, from making the best strategies to detecting the right time for launching a new product. It can also help them to make appropriate decisions at every stage during the NPD process. Furthermore, information technology can facilitate the communication between the NPD team members and suppliers, other innovation systems, customers and marketing teams.

Clearly defined target markets, applying marketing tests such as alpha, beta, gamma, pre use and early use testing are very important steps in the NPD process. A close relationship between the R&D and marketing teams is also crucial for the success of the NPD process (Blundell *et al.*1999, Griffin & Hauser 1996, Olson *et al.* 2001, Song & Noh 2006). According to the empirical test and interviews done with the NPD managers in this study, this factor (marketing sensitivity and responsiveness) could be considered one of the most critical factors of an agile NPD process.

The last critical factor of the agile NPD process is “cooperative relationship and participative management techniques.” This aspect can be achieved by making a close relationship with customers and suppliers, organizing multifunctional teams in solving critical and managerial problems throughout the NPD process, making the employees aware of organizational competencies

and cross communication with R&D managers, and innovation clusters to achieve the best ideas in NPD process.

Although this study has just been done in the Iranian manufacturing enterprises, but the study methodology and results are applicable to other countries manufacturing enterprises.. Applying these factors in the NPD process and investigating the impact of these critical factors on the implementation of NPD projects, the cycle time, new product performance, quality and cost could be studied in future researches. Also, finding the relationships between these critical success factors could also be the focus of future research in order to introduce the model of an agile NPD process.

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التعرف على عوامل النجاح الحاسمة لعملية تطوير المنتجات الجديدة السريعة في المؤسسات الصناعية الإيرانية

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خلاصة

استجابة لاحتياجات الزبائن المتغيرة والسريعة، واختصارات للوقت والتغيرات التكنولوجية وتقلبات الأسواق العالمية، فإن تطوير المنتجات الجديدة السريعة هي مركز اهتمام المشاريع الصناعية. تهدف هذه الدراسة للتعرف على عوامل النجاح الحاسمة لتطوير المنتجات الجديدة السريعة لمساعدة المدراء للحصول على فهم أفضل للظروف المحيطة في عملية تطوير المنتجات الجديدة ولكي يتسنى لهم اتخاذ القرار في ظل الظروف المتغيرة غير المتوقعة. لقد استخدم تحليل العوامل التفسيرية كطريقة مفيدة للتعرف على عوامل النجاح الحاسمة. وذلك بناء على نتائج الدراسة التي أجريت على 264 مشروع في المؤسسات الصناعية الإيرانية.

أظهرت نتائج الدراسة أن هناك 6 عوامل حاسمة من ضمن العوامل المؤثرة على قوة استجابة تطوير المشاريع الجديدة.

وهذه العوامل هي: استخدام تقنيات صناعية متقدمة، التطوير والتصميم بناء على رغبة الزبائن، التأقلم للتغيرات، تقليل الريبة، عملية تكامل المعلومات، تجربة المنتج في السوق وعلاقة التعاون والاستجابة وإسلوب الإدارة المشتركة.

