

Full Length Research Paper

Assessment of organizational agility in cement industry

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Uncertainty/Change in the business environment has been a major topic in conducting research for a long time. This critical situation has led to a major revision in the business priorities, strategic vision, and viability of conventional and even relatively contemporary models and methods developed so far. Hence, one way of responding to organizational change is agility. Agility, indeed, is a new paradigm of competition for engineering organizations and enterprises. The purpose of this research is assessment of agility in Qaen Cement Company, Iran. Knowing agility need level and current agility level, helps managers for better performance and success of their company. The research methodology is based on statistical methods and chi-square test. Datas are collected through questionnaires and analyzed using SPSS software capabilities. The results of this research indicate that Qaen Cement Company, Iran, has the ability to achieve organizational agility.

Key words: Agility, capabilities, business strategy.

INTRODUCTION

Change in business environment and uncertainty have entered management studies and research for a long time. Thompson (1967) argued that one of the most important tasks for organisations is to manage uncertainties. Drucker (1968) described the concept of entrepreneurial task as the search for change, response to change, and exploiting change as an opportunity. As Hayen (1988) believes, there is nothing new about change.

Turbulent times and uncertainty in the business environment have been recognised as the cause of most failures in manufacturing industry (Small and Downey, 1996). Fast and dramatic changes in technology, especially in the world of electronics, were the core concerns in late 1960s and during 1970s, which then extended to other aspects of scale and scope of business economy in the past two decades. These aspects include market, competition, customer requirements, social factors, etc., that have been subject to relentless and overwhelming changes. Such changes, which had

already resulted in frequent evolution of business systems and the creation of new manufacturing and management philosophies, are shown to be occurring faster and more unexpectedly in recent years than ever. The perceived radical trend of change has made ground for some new suggestions about the emergence of a new business era beyond the traditional systems such as mass production or even lean production.

Globalization of markets, development of information technology, computer networks etc., made fundamental changes in public organizations and technical environments which have led to the appearance of new ways of economical and social competition and management of emerging organizations (Jafarnejad and Zareei, 2005).

Change and uncertainty in business environment have entered the studies and researches of organization and management. Nowadays, few organizations can be found which have not experienced a three-to-six-month or even a year-period of changes in their environment (Jafarnejad and Shahaei, 2007). Today in organizations and businesses, the term "change" refers to various cases, which sometimes means external change in technology, customers, competitors, structure, market, or social and

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political environment.

Richard Beckhard as a pioneer in the field of organizational changes says that: "People do not resist against changes but they resist against applying changes" (Sangeh and et al., 2007). However, today's changes are increasingly made faster than ever.

Changes and uncertainty in business environment have become the main reason for failure in the small industries (Small and Downey, 1996).

An increasing trend in the business has paved the way for a new kind of business far from the traditional area business like mass production and pure production. This new production paradigm which is called "agility" is suggested as a strategy to make active production companies to maintain their position in the contemporary age by using their competitive advantages (Sharifi and Zhang, 2000).

Also, this paradigm primarily is related to organization's ability for dealing with unexpected changes, eliminating unprecedented threats of work environment and using changes as opportunities (Goldman et al., 1995). But it should be noted that agility and achieving agility is not a purpose but according to Jackson and Johansson (2003), it is an essential tool for maintaining competition in the market through uncertainty and changes.

Therefore, the problem that has occupied the minds of managers of each organization, especially production organizations in private sectors is how agility can be achieved in organizations. In order to answer this question, managers should have adequate knowledge about the ability level of their organization and tools which creates these abilities. In this research, with purpose of helping managers of Qaen Cement Company, Iran, we assessed organizational agility in order to provide a better guideline for managers in solving organization problems.

LITERATURE REVIEW

Agility concept and agility production

From late 1980s to middle of 1990s, following broad political and economical developments all over the world, there have been many efforts and actions for recognition of effective factors on new global business principles. United States as a country, that for the first time found a considerable record in global business share, especially in the field of production, became the leader of this movement.

In 1991, a group of industrial experts observed that the rate of increasing changes in the business environment is faster than the ability of traditional state agencies for its compatibility (Hormozi, 2001). Therefore, for the first time after many meetings of academic and implemental experts of industry, a new paradigm provided by Iacocca Institute was introduced to the public as "Manufacturing

enterprise strategy in the twenty-first century: industrial experts view". Immediately after that, the expression "agility production" was used jointly with the releasing of this report to the public.

Webster's Dictionary has defined "agility" as "fast and agile move" and "quick ability of thinking with a smart approach". The root of organizational agile word is agile production which was introduced for reaction to business environment changes and using those changes as opportunities. Kidd (2000) said that agile production can be considered as a structure in the company which has the ability of product developments and some business methods. Maskell (2001) said that three main components of agile production are customer's growth and flourish, compatibility of individuals and information, cooperation and change ability.

Yusuf et al. (1999) considered agility as successful use of competitive principles (speed, flexibility, innovation, quality, profitability) through integration of reversible sources and best applications in an environment with rich knowledge for providing joint products and services in the variable market environment.

Sharifi and Zhang (1999) defined agility as the ability of dealing with unexpected challenges against unprecedented threats of business environment and achieving advantage and profit resulting from changes in opportunities. According to Gunasekaran (1999), agile production is a new production model resulting from changes in environment which links innovations in production, information technology and communication by fundamental organizational redesigning and new marketing strategies.

Torn Lin et al. (2006) considered changes as the most important stimulative factor of agility and represented these changes mainly in customer needs, competitive measures, market, technology, and social components. While many definitions of agility exist, none of them are opposed or contradictory to each other. These definitions mainly represent the idea of "speed and change in business environment".

Agility is a business-wide capability that embraces organizational structures, information systems and in particular, mindsets (Christopher, 2000). Agility means using market knowledge and virtual corporation to exploit profitable opportunities in a volatile marketplace (Mason-Jones and Towill, 1999). Table 1 provides various ways in which agility has been defined in literature.

Assessment of organizational agility

Different approaches are provided in order to evaluate and measure production agility by researchers. Sharp et al. (1999) conducted a research for agility of the England superior companies. The basic principle of their suggested model was designed based on working level and pure production. Implemental model of these

Table 1. Definition of agility.

S/N	Authors	Definition of agility
1	Goldman et al. (1995)	Agility means delivering value to customers, being ready for change, valuing human knowledge and skills, and forming virtual partnership.
2	Fliedner and Vokurka (1997)	Agility is an ability to produce a broad range of low-cost, high quality products with short lead times in varying lot sizes, built to individual customer specification.
3	Katayama and Bennett (1999)	Agility relates to the interface between the company and the market. Agility acts as a pillar to improve competitiveness and the business prospects.
4	Christopher (2000)	Agility is defined as the ability of an organization to respond rapidly to changes in demand, both in terms of volume and variety.
5	Mason-Jones et al. (2000)	Agility means using market knowledge and virtual corporation to exploit profitable opportunities in a volatile market place.
6	Tolone (2000)	Agility implies effectively integrating supply chain and forging close and long term relationship with customers and suppliers.
7	Van Hoek et al. (2001)	Agility is all about customer responsiveness and market turbulence and requires specific capabilities that can be achieved using 'lean thinking'.
8	Aitken (2002)	Agility is an ability to have visibility of demand, flexible and quick response and synchronized operations.
9	Stratton (2003)	Innovative products and unstable demand typify agile supply drivers.

researchers helps organizations to be always aware of their level of development, towards an agile organization. Gunasekaran (1999,2001) based on four domains of strategy, technology, stuff and system suggested a conceptual model for designing of agile production systems. He believes that much of agility literature is concerned with strategies and technologies but there is little attention to integration of these aspects.

Bustelo and Avella (2006) provided a new attitude for agile production based on case studies on four production plants in Spain. These researchers were looking for main components of agile production model. Results of this analysis indicated most of the factors related to displacement of the old production system with agile production. All efforts aimed at agility improvement based on four main production factors (strategies, technologies, organization, human sources).

Hillegersberg et al. (2005) paid attention to agility concept in service organizations. Notable point in the investigations of this group is that they did not consider companies and organizations as separate entities and each company was considered as a part of working network which influences the agility level of other

companies.

Ambrose and Morella (2004) in a research work considered designing of agile organization as contribution to balance between order and change in the business environment. These two researchers performed different case studies, investigation among producing companies, service distributor companies, financial service companies, main companies in providing new technology and so forth. They considered general principles of designing agile organization as 7 issues (gathering resource allocation strategies, resource management, establishment and enforcement of competence, training and recognition of leaders, central process, structure establishment based on information system, coherence and order in readiness for change).

Sharifi and Zhang (1999) provided a conceptual model for agility performance in industry and they also provided a methodology with different supporting tools in order to help production organizations to make strategic decisions for searching about agile production. This model consists of three major stages:

1. The determination of a company's agility needs and its current agility level.

Table 2. Agility drivers, agility capabilities and agility providers.

Organizational agility	Criteria
Agility drivers	<ol style="list-style-type: none"> 1. Changes in market; including items such as: growth of the niche market, national and international political changes, increasing rate of change in product models, product lifetime shrinkage. 2. Changes in competition criteria; including items such as: rapidly changing market, increasing pressure on cost, increasing rate of innovation, increasing pressure of global market competition, decreasing new products time to market, responsiveness of competitors to changes. 3. Changes in customer requirements; including items such as: demand for individualised products and services, quicker delivery time and time to market, quality expectation increasing, sudden changes in order quantity and specification. 4. Changes in technology; including items such as: introduction of more efficient, faster, and economic, production facilities, introduction of new soft technologies (software and methods), inclusion of information technology in new hard technologies. 5. Changes in social factors; including items such as: environmental pressures, workforce/workplace expectations, legal/political pressures, cultural problems, social contract changes.
Agility capabilities	<ol style="list-style-type: none"> 1. Responsiveness: Which is the ability to identify changes and respond quickly to them, reactively or proactively, and recover from them. This has been itemised as follows: sensing, perceiving and anticipating changes, immediate reaction to change by electing them into system, recovery from change. 2. Competency: Which is the extensive set of abilities that provide productivity, efficiency, and effectiveness of activities towards the aims and goals of the company. Following items form the capability structure: strategic vision, appropriate technology (hard and soft), or sufficient technological ability, products/services quality, cost effectiveness, high rate of new products introduction, change management, knowledgeable, competent, and empowered people, operations efficiency and effectiveness (leanness), cooperation (internal and external), integration. 3. Flexibility: Which is the ability to process different products and achieve different objectives with the same facilities. It consists of items such as: product volume flexibility, product model/configuration flexibility, organisation and organisational issues flexibility, people flexibility. 4. Quickness: Which is the ability to carry out tasks and operations in the shortest possible time. This will include items such as: quick new products time to market, products and services delivery quickness and timeliness, fast operations time.
Agility providers	<ol style="list-style-type: none"> 1. Organization: Characteristics such as organizational support, training, career development opportunities, work schedule, role conflict, and ambiguity. 2. Technology: Any technological devices such as machines, computers, or software that influence the job. Technology can lead to the need for new skills, fear of job loss, changes in workload, or increased feedback about the work. 3. People. 4. Innovation.

2. The determination of agility capabilities required for the company to become agile; 3. The identification of business practices and tools which could bring about the recognised capabilities for the company (Table 2).

The graphical form of this methodology is depicted in Figure 1. According to this model, since organizations face different changes and pressures, their required agility level may be different. Required agility level is a function of different factors such as turbulent market environment, competitive environment, company properties and external stimulations like customers expectations, technology and social factors. Once agility level is determined, evaluation and analysis of current organization agility level will be determined. Difference between current level and required level can be considered as basis for future decisions. In the next part

for improving organization agility condition, the measurement of available capabilities and finding lost abilities should be placed on the agenda, (Figure 2) It requires identification and classification of changes and organizing environmental pressures and also analysis of the effects of those changes on organization. Final step in this conceptual model is finding agility facilitating factors, their performance and determination of obtained agility level by function evaluation process and performing corrective actions.

RESEARCH HYPOTHESIS

Sharifi and Zhang agility operational model has been applied in this research in order to determine the agility

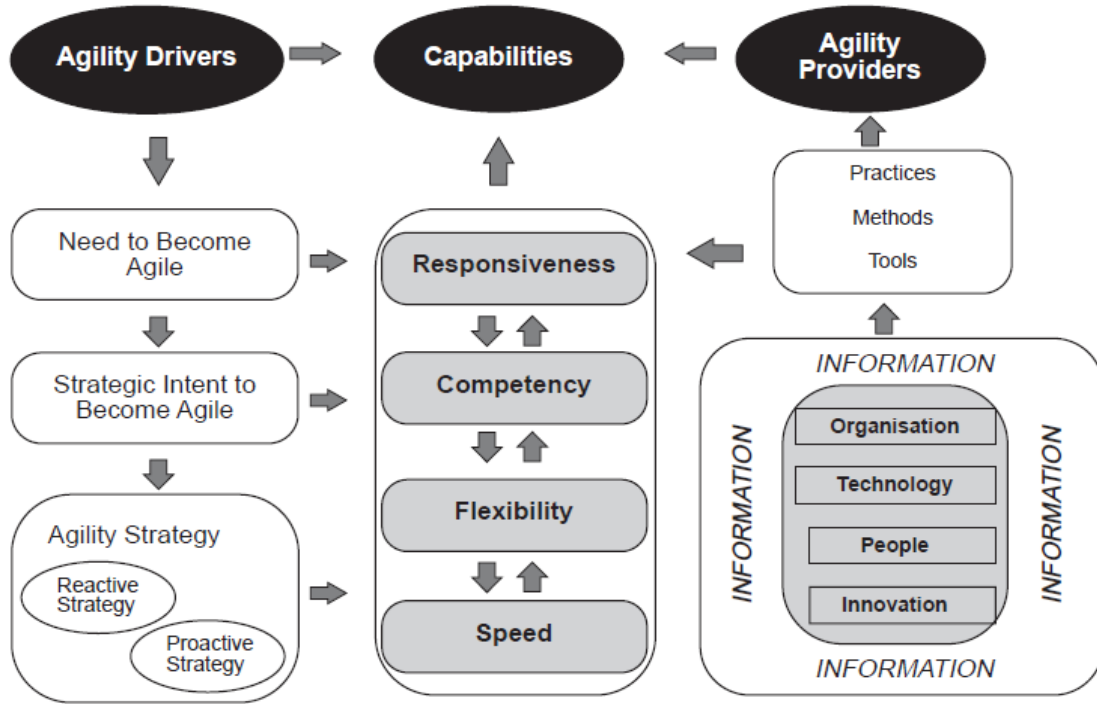


Figure 1. The conceptual model for implementing agility (Sharifi and Zhang, 2001).



Figure 2. Organizational agility.

Table 3. Distinction of the research questionnaires.

S/N	Questionnaire number	Evaluation criteria	Number of questions
1	Evaluation of agility drivers.	Change in: Marketplace – competition - customer requirement – technology - social factors	28
2	Evaluation of extra organizational agility capabilities	Responsiveness- flexibility- competency- speed	10
3	Evaluation of intra-organizational agility capabilities	Responsiveness- flexibility- competency- speed	14
4	Evaluation of agility providers	Organization- people- technology- innovation	20

Table 4. Reliability statistics.

S/N	Questionnaire number	Cronbach's alpha
1	Questionnaire number 1	0.769
2	Questionnaire number 2	0.729
3	Questionnaire number 3	0.854
4	Questionnaire number 4	0.831

level of organizations. This model is the best and most important methodology for agility creation in all private organizations; all other models of agility have been proposed based upon it. The best method to start a research work is to propose the research plan in the form of an initial question. For this question, the researchers attempt to comprehend better what they want and to state it in the predicate of an initial question as precisely as possible (Kivi and Campenhood, 2009). Thus, the principal question of this research is proposed as follows: "What is the current status of Qaen Cement Company regarding agility?"

A hypothesis is a proposition stating the relation between two terms, which by case may involve concepts and phenomenon. Therefore, a hypothesis is a temporary proposition, or an assumption which must be considered (Kivi and Campenhood, 2009). In other words, a hypothesis is a kind of subtle guess about a solution to a problem. A hypothesis can be obligatory relation between two or more variables which are introduced based on questionable phrases (Danaeifard et al., 2009). Therefore, the hypotheses of this research are:

H₁: The environmental variations surrounding the Qaen Cement Company, Iran, are unstable.

H₂: Qaen Cement Company, Iran, has the required capabilities for reaching the organizational agility.

H₃: Qaen Cement Company, Iran, enjoys the needed facilities for reaching the organizational agility.

RESEARCH METHODS

The method of carrying out this research is descriptive surveying. Descriptive in a way that it describes and interprets what exists and pays attention to present relations or conditions, common beliefs, current processes, and evident signs with processes under

development (Best, 2005), and surveying in a way that the scholar surveys a sample or a whole community in order to define theories, thoughts, behaviors or traits of the community (Danaeifard et al., 2009).

The researcher in this study, utilizes two data collection methods: Library study for gathering the history of the subject and literature review, and field study. Subsequently, four questionnaires totally containing 72 questions were designed so as to evaluate the research level. Table 3, illustrates the distinctive questionnaires and their evaluation criteria.

Following the confirmation of questionnaires and necessary amendments by respectable consulting and advising professors, their validity and reliability were investigated. The reliability coefficient was calculated using Cronbach's alpha and SPSS software as described in Table 4. The researcher then applied arbitrary sampling method to gather the data for questionnaires. There were totally 162 analyzable questionnaires. Table 5, indicates the sampling society of each questionnaire.

Data analysis

The scholar, after defining his research problem and after passing the stages of research method definition, specifying suitable tools for data collection and utilizing them, now needs to analyze the collected data in order to define probable and uncertain predicates. In order to analyze collected data and convert them to data capable of testing the hypotheses, a collection of rules must be obeyed and suitable statistical data techniques and tactics must be employed (Best, 2005).

A decision maker is always inclined to ensure that all his decisions will obtain anticipated results. In order to ensure this, the hypothesis in question needs to be statistically analyzed. Sometimes, we may need to figure out the relationship between two variables or their independence from each other. This problem can be validated using a non-parametric test such as, the Chi-square test (Sekaran, 2002). Therefore, in this research for data processing and proof of hypotheses, the Chi-square test was carried out using SPSS software. A summary of these results are given in Table 6. The obtained information from analysis of research hypotheses suggests that 95% of the respective hypotheses are confirmed.

Table 5. Sampling society of each questionnaire.

S/N	Questionnaire number	Sampling society
1	Questionnaire number 1	3 managerial levels of the company
2	Questionnaire number 2	Cement sellers of city
3	Questionnaire number 3	All the company people
4	Questionnaire number 4	All the company people

Table 6. The result of research hypothesizes.

Hypothesis	N	Mean	Chi-square	df	Sig*	Confirm / Reject
First hypothesis	756	3.1296	125.64	4	0	Confirm
Second hypothesis	1004	3.0209	294.396	4	0	Confirm
Third hypothesis	1180	2.972	256.72	4	0	Confirm

* $\alpha = 0.05$.

Table 7. Results of first hypothesis (Agility drivers) (Output of SPSS Software).

	Observed N	Expected N	Residual
1.00	55	151.2	-96.2
2.00	191	151.2	39.8
3.00	213	151.2	61.8
4.00	195	151.2	43.8
5.00	102	151.2	-49.2
Total	756		

Table 8. Results of first hypothesis (test statistics) (Output of SPSS Software).

Agility drivers	
Chi-square(a)	125.640
df	4
Asymp. Sig.	0.000

a-0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 151.2.

Tables 8 to 11 are related analyze of first hypothesize. Tables 11 to 15 are related analyze of second hypothesize, and Tables 16 to 19 are related analyze of third hypothesize. Summary Tables of 8 to 19 are given in table 7.

CONCLUSIONS AND RECOMMENDATIONS

The intention of this research was assessment of agility in Qaen Cement Company, Iran. We needed a methodology and evaluation method to accomplish this investigation; for this purpose operational model of Dr. Hossein Sharifi and Prof. Zhang was chosen after studying all the available approaches in this area. The research hypotheses were verified and confirmed using

Chi-square test. Consequently, it is concluded that Qaen Cement Company, Iran, has the potentials and capabilities for reaching the organizational agility. In other words, Qaen Cement Company is an agile organization. For improvement of the current agility level of this organization, the following recommendations are presented by the researcher to the company's managers so as to enable them to resolve the organizational problems:

1. The organization management shall present a vivid and clear definition of the responsibilities and authorities of the staffs.
2. The organization management shall benefit from the

Table 9. Results of first hypothesis (one-sample statistics) (Output of SPSS Software).

	N	Mean	Std. deviation	Std. error mean
Agility drivers	756	3.1296	1.15162	0.04188

Table 10. Results of first hypothesis (one-sample test) (Output of SPSS Software).

Test value = 3						
	t	df	Sig. (2-tailed)	Mean difference	95% Confidence Interval of the difference	
	Lower	Upper	Lower	Upper	Lower	Upper
Agility drivers	3.095	755	0.002	0.12963	0.0474	0.2119

Table 11. Results of second hypothesis (Agility capabilities) (Output of SPSS Software).

	Observed N	Expected N	Residual
1.00	87	200.8	-113.8
2.00	215	200.8	14.2
3.00	382	200.8	181.2
4.00	230	200.8	29.2
5.00	90	200.8	-110.8
Total	1004		

Table 12. Results of second hypothesis (Test statistics) (Output of SPSS Software).

Agility capabilities	
Chi-square (a)	294.396
df	4
Asymp. Sig.	0.000

*a 0 cells (0%) have expected frequencies less than 5. The minimum expected cell frequency is 200.8.

Table 13. Results of second hypothesis (One-sample statistics) (Output of SPSS Software).

	N	Mean	Std. deviation	Std. error mean
Agility capabilities	1004	3.0209	1.07197	0.03383

Table 14. Results of second hypothesis (One-sample test) (Output of SPSS Software).

Test value = 3						
	t	df	Sig. (2-tailed)	Mean difference	95% Confidence Interval of the difference	
	Lower	Upper	Lower	Upper	Lower	Upper
Agility capabilities	0.618	1003	0.537	0.02092	-0.0455	0.0873

Table 15. Results of third hypothesis (Agility providers) (Output of SPSS Software).

	Observed N	Expected N	Residual
1.00	120	236.0	-116.0
2.00	280	236.0	44.0
3.00	416	236.0	180.0
4.00	241	236.0	5.0
5.00	123	236.0	-113.0
Total	1180		

Table 16. Results of third hypothesis (Test statistics) (Output of SPSS Software).

Agility providers	
Chi-square(a)	256.720
df	4
Asymp. Sig.	0.000

*a-0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 236.0.

Table 17. Results of third hypothesis (One-sample statistics) (Output of SPSS Software).

	N	Mean	Std. deviation	Std. error mean
Agility providers	1180	2.9720	1.12496	0.03275

Table 18. Results of third hypothesis (One-sample test) (Output of SPSS Software).

	Test value = 3					
	t	df	Sig. (2-tailed)	Mean difference	95% Confidence interval of the difference	
Agility providers	Lower	Upper	Lower	Upper	Lower	Upper
	-0.854	1179	0.393	-0.02797	-0.0922	0.0363

Table 19. Results of Third Hypothesis (One-Sample Test) (Output of SPSS Software).

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
	Lower	Upper	Lower	Upper	Lower	Upper
Agility Providers	-0.854	1179	0.393	-0.02797	-0.0922	0.0363

ideas and suggestions proposed by the employees and customers.

3. The organization shall devote more time on dealing with the requests of the customers and staffs.

4. The organization shall promote its speed and efficiency for responding to ambient variations.

5. The staffs' decision-making ability and knowledge level shall be enhanced using the necessary trainings.

6. A comprehensive system for the transfer of required data between the staffs shall be designed.

7. The efforts must be increased for creating an effective and efficient communicative network among the

organization members.

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