



## How re-designing teams and information access can affect Product design agility in tire industry: Barez Industrial Group as the case study

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### **Abstract**

In present fast-changing, uncertain competitive market, producing tailored products based on customer demands in the shortest possible time is a key ability to sustain and grow in an organization. The agility of R&D centers directly impacts the ability of organizations to produce innovative products in a timely and cost-effective manner. The tire industry is not exceptional and has to compete and adapt to swift vehicles transformation and provide new properties to protect the environment and satisfy the tailored request and safety of costumes. This article study presents the role of agility approach in the R&D center of Barez Tire Company as a case study. First, we review the framework of a normal procedure then establish the key factors that determine the agility attributes of the product design. Cross-functional team and information access are chosen and focused as the main priorities of agility principles to apply in the first steps of agile practice. A Knowledge management system was applied to clarify and make sharing information possible in all levels. The transformation of teams structure from waterfall to flat and cross-functional team are discussed. Findings reveal that time to market can be decreased by 20 weeks ; while it is indirectly impacted by the level of flexibility.

The results also support the speed, flexibility, task balance, team working and better results that shows organization agility.

**Keywords:** Agility, Flexibility, Organizational speed, tire industry, Cross functional team

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## **Introduction**

Dealing with unpredictable, dynamic, and constantly changing environments has been amongst those prevailing topics in industry and academia for a few decades. Besides the technology-related issues such as innovations and revolutions, there are so many other issues which the organizations must handle, for example, market competitive pressure, volatile markets, geopolitical uncertainty, increasingly complex demands from customers and staff and the like. All these factors compel the organizations to completely transform their structures, systems, and processes (1). Moreover, Employees also demand flexible working structures, with the right to decide about the time and place of the work. They expect a wide choice of projects to be available with opportunities for self-realization. Fulfilling these expectations can be a big challenge for the management board. Meanwhile, customers have their own expectations as well (2; 3). For instance, they expect that suppliers predict and understand all the changes and appropriately transform the former business methods according to the new requirements. In such an environment, how can organizations gain and keep a distinct competitive advantage? How can managers create an environment for all to work as peers rather than subordinates, as people who demand to work autonomously rather than taking and carrying out orders? How can write taken for granted catchphrases in the organization be transformed into real-life organizational practice?

Regarding all these issues, various solutions have been proposed such as networking, reengineering, employee empowering, establishing virtual corporations, providing modular organizations, providing flexible manufacturing and etc. In order to deal with uncertain and unpredictable environments, various solutions have been proposed amongst which the notions of “adaptive organization”, “flexible organization”, and “agile enterprise” are the most popular. Each concept has got various definitions which have to lead to confusion and ambiguity in this respect (4). Some scholars do not see any difference among these concepts, but on the other hand, some other scholars distinguish among these concepts. However, generally, it has been realized that all of them possess the ability to adjust the changes and also respond to them (5; 6).

### **What is Agility?**

According to investigating different definitions and considering some gaps, agility can be defined as the result of integrating alertness to changes (recognizing opportunities/challenges) – both internal and environmental – with a capability to use resources in responding (proactive/reactive) to such changes, all in a timely, flexible, affordable, relevant manner. These two features, namely alertness and response-ability, cannot lead to agility alone. In other words, both of them together are required for agility which needs to be timely, flexible, affordable, and relevant. The effective combination of the two features can lead to greater competitiveness. All the basic points which form the prior definitions, result in a relatively a comprehensive conception of agility (7; 8).

Agility is such a concept which is defined by both practitioners and researchers. In this regard, recently, competing within a state of dynamic and continuous change has been the main focus of this area. Advanced Research Programs Agency (ARPA) and the Agility Forum have defined agility as “the ability to thrive in an environment of continuous and often unanticipated change.” One of the recently developed domestic industrial visions is the concept of agility. In the past few years, some strategic organizational philosophies such as “Agile”, “lean” and “flexible” have been remarkably noticed. The following section provides a summary of these principles and their relative context.

*Lean manufacturing:* it consists of a set of practices in order to eliminate all the waste from the system and decrease used resources.

*Flexible manufacturing:* it is a structure which addresses a production line and gives us the capability of reconfiguring and customizing different products.

*Agile manufacturing*: it is a strategy which addresses the business enterprise world and includes lean manufacturing and flexible manufacturing together (9; 10).

According to these definitions, lean and flexible manufacturing fall within the scope of agile manufacturing, but some scholars have classified them as distinct and separable philosophies. Agility uses established, organized and regular techniques which require a strong commitment and motivating work environment to maintain the required impact. Reaching the purpose, the employees are responsible to lead this transformation, and managers must support the team to the final steps.

As it is the age of agility, being successful not only requires endeavor, but also requires speed, adaptability, and innovation. Therefore, it is so challenging for the organizations to provide all the required equipment and facilities to achieve desired results. So as to cope with this challenge, many organizations have turned to innovative methods. Innovative ideas are very common and consist of a wide range of approaches such as scouting teams, incubators, accelerators, and venture funds (11; 12).

### **Agile Enterprise Enabling**

The development of an agile framework presents a serious challenge. First of all, agility concepts are not yet clearly defined and conceptualized. Although the main and most important attributes of agility have been identified, those attributes are supposed to be applied to such complex structures as an enterprise (13). It has been proposed in the literature that, in reference to agility, the following components of the enterprise are most important: organization, people, and technology. Each of these elements is multidimensional and complex itself (14). Jackson and Johansson (15) divide agility capabilities into four main dimensions:

- (1) product-related change capabilities,
- (2) change competency within operations,
- (3) internal and external co-operation,
- (4) People, knowledge, and creativity.

The first dimension is related to the product-related strategies and operation needed to respond to the change and uncertainty of the market. The change competency within operations concerned with competencies, methods, and tools required managing long- and short-term changes within the production system. Cooperation refers to the ability of enterprise departments to cooperate with each other and the ability of the whole enterprise to cooperate with suppliers and customers. The final dimension relates to the need to place knowledge and ability of employees as a basis of all actions dealing with the turbulent market changes (14; 16).

### **Team building:**

The primary capabilities required for agility an agile corporation includes two levels of company level and individual level. The success factors gathered in the headings of sensing, securing, and shifting (Table1).

1. Table 1: Characteristics of the dynamic capabilities of an agile corporation

	<i>Sensing</i>	<i>Securing</i>	<i>Shifting</i>
<b>Company level</b>	<p><i>Startup ethos</i></p> <ul style="list-style-type: none"> <li>▶ Responsive to environment</li> <li>▶ Dedicated time and talent</li> <li>▶ Connected to internal and external</li> </ul>	<p><i>Purposeful experimentation</i></p> <ul style="list-style-type: none"> <li>▶ Bias to action and willingness to redeploy resources</li> <li>▶ Separation of the strategy from the structure</li> <li>▶ Freedom to test learn and develop ideas</li> </ul>	<p><i>Dynamic organization</i></p> <ul style="list-style-type: none"> <li>▶ Flatter, faster, simpler structure</li> <li>▶ Diverse, cross-trained and functional teams</li> <li>▶ Modular processes and change architecture</li> </ul>
<b>Individual level</b>	<p><i>Explorer behavior</i></p> <ul style="list-style-type: none"> <li>▶ Customer focused</li> <li>▶ Hunger to learn: inside and outside</li> <li>▶ Knowledge sharing</li> </ul>	<p><i>Leadership agility</i></p> <ul style="list-style-type: none"> <li>▶ Delegated authorities: bold decisions fast</li> <li>▶ Execution not delayed by politics</li> <li>▶ Bureaucracy aversion</li> </ul>	<p><i>Entrepreneurial mindset</i></p> <ul style="list-style-type: none"> <li>▶ Clear vision and mission</li> <li>▶ Ownership mentality</li> <li>▶ Working as a teammate</li> </ul>

2.

The development of a strategic architecture that presents a corporate-wide map of core skills may allow the organization to make rapid changes in focus and afford reconfiguration of the business when the window of opportunity opens. One of the attributes and practices that constitute the agile organization is team building (17; 18).

Based on the review of the demands of agile manufacturing determined some important attributes of agile workforce:

- (1) Attitude toward learning and self-development;
- (2) problem-solving ability;
- (3) Being comfortable with change, new ideas, and new technologies;
- (4) The ability to generate innovative ideas,
- (5) Accepting new responsibilities.

That's why so many corporations have invested heavily in innovation units as part of the solution to the agility challenge (14; 19)

### **Why Scaled Teams:**

First attempts to explain how organizations deal with the uncertain and complex environments were based on the concepts of requisite variety and isomorphism (20). The different conditions and elements in the organization's environment create pressure for internal differentiation. The differentiation is defined as the "difference in the cognitive and emotional orientation among managers in different functional departments". Internal differentiation allows different parts of the organization to specialize in

responding to different demands of the environment. In this way, internal differentiation increases the responsiveness of an organization to different elements of the environment (21).

Furthermore, the internal diversity of the organization has to fit the variety and complexity of the environment in order to successfully handle the environment. Based on the above arguments it was concluded that the diversity provides the requisite variety which is conducive for organizational adaptivity because it allows the pursuit of multiple courses of action and quick changes from one course to another as the environment changes.

The increased internal organizational differentiation increases the need for appropriate integrating mechanisms, but the integration is harder to achieve as differentiation increases. Integration was defined as the “quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment” (22).

Organizational adaptability can be increased when a highly differentiated organization has a low level of integration. Brown and Eisenhard (23) also showed that modular businesses with loose connections and a low level of coherency between them are most successful in achievement of adaptability in changing business environments (24).

This context leads to scaled teams to increase the external and internal differentiation and diversity and on the other hand, make possible to integrate the result in the lower level of coherency.

### **Cross Functional Teams:**

In an Agile organization, the cross-functional, real-time nature of the work and feedback helps ensure close strategic alignment and ownership by the main business. The fact that agile projects require cross-functional resources and sponsors helps align the efforts of the organization and reduces the likelihood of competing for innovation efforts being set up, thereby diluting the overall impact.

In summary, units using Agile methods can increase cross-functional working, reduce the risk of dispersion of innovation effort across the enterprise, and increase the likelihood of individual innovations being adopted across the wider organization (25; 26).

Cross-functional teams even can be effective in decision level and determining the priorities to keep the teams in right and focused aims and processes (27).

The empirical studies which tried to determine a framework for an agile method as project management an approach express that the

- i) agility should be considered a team's performance, rather than a mere adjective for practices and methods;
- ii) agility, as a performance, might be dependent upon a combination of organization, team and project factors;
- iii) The agility performance level can be measured within two main factors: rapid project planning change and active customer involvement (28).

### **Information Access:**

Some of the root that causes lie in slow decision making, conflicting departmental priorities, risk-averse cultures, and silo-based information. The success of an innovation unit, we believe, depends not just on the unit itself, but also on how the company, as a whole, functions (25; 29).

The reviewed theories and research suggest that flexible and adaptive organizations are characterized by clarity of purpose and low levels of formal regulation with respect to a job description, work schedules, and overall organizational policies. These organizations have fewer power differentials (fewer titles, levels, status dimensions, etc.) and rely on teams to perform the task (14).

The “island” situation mentioned by respondents refers to information silos and the failure to share information between business units. When information – or any precious asset, such as key talent – is hoarded within a unit and kept away from others, the company as a whole can suffer. Together with internal politics, the island situation may explain why some innovations, while successful within the unit, do not achieve scale in the main business (25; 30).

### **Why Agility in Tire Industries:**

With the high-speed growth and revolution in transportation technology and vehicles, tire industries have to adapt to these changes and costumers demands. It translated to faster product design and less time to market while improving the properties. Despite the familiar and simple shape, tires have composite material characteristics and influential role in vehicle performance and safety which turned the tire industry into a complex industry. In order to design and develop a new product, a wide range of different skills are required. On the other hand, the necessity of safety, quality, and optimized performance make various tests as indispensable parts of product development. Regarding all these features, the process can be sluggish and result in a long Time to Market (TTM) becomes. Due to the rapid change of vehicles and market, a long-term TTM does not justify the economic production of a product, so the life of product sale in the market drops sharply. Furthermore, based on the continuous process of tire production, the production line usually does not have enough flexibility, so the increase of diversity and change will increase waste and delays, and reduce production efficiency.

Applying lean management principles, as a well-known approach in most productive companies in designing, R & D and production besides the appropriate equipment can be a practical method to decrease and elimination of delays and waste. Lean management helps to balance responsibilities and increase efficiency (31). So, it can be perceived that the best way of achieving beneficiaries’ and customers’ satisfaction passes through applying lean management and establishing an agile system which leads to the reduction of design and production time, and enhancement of flexibility and production line efficiency.

### **Agility Implementation in BAREZ**

Barez Industrial Group as the biggest tire manufacturer in Iran should provide a wide range of products and services for car manufacturers (original equipment) and end users (aftermarket) who have their own expectations. Due to the production of various classes of tires (passenger car tires, light truck tires, truck and bus tires, agricultural tires, off the road tires and...) along with the customers’ needs; the design and production process of each class of products and the integration between different teams becomes complex, complicated and time-consuming.

With considering the need for adaption with internal and external stockholders, shifting to an agile approach in R & D considered as a solution to increase the flexibility and agility of organization.

Therefore, studying, analyzing and applying the principles of agile organizations, and adapting current activities with agile methods, and ultimately increasing the agility of R & D agility can be considered as a solution responding to the beneficiaries' and customers' needs and satisfaction.

In this regard, influential factors over the increase of the organization's agility were investigated and based on the current structure, possible risks were analyzed. In the first step, the availability of customer demands information, product design flexibility and information access were characterized as the most important factors and first priorities in implementation of agility in R&D. Processes were selected for preliminary and fundamental changes by which the best results could be obtained in the shortest time and at the lowest cost.

The essential parameters of a productive organization are as follows:

1. Organizational management agility
2. Product design agility
3. Product manufacturing agility (32).

In this stage, based on the purpose of reducing design time and product TTM, three influential factors have been investigated, namely availability of customer demand information, speed of product design, and product design flexibility.

Re-engineering: The Subsequent Move to Embrace Agility

### ***Information Access:***

Lack of access to customer expectation features was one of those factors in which many projects had led to reworks, delays, and waste of resources. This deficiency originates from specific technical requirements of customers in different shapes and formats. Occasionally, by presenting a competitor product, by introducing functional specification, or by using product's information sheet the requirements and expectations can be realized. Also, some expectations of customers and consumers can be discovered between their opinions. Therefore, in new design projects, the aims are not accurately determined, and in the middle of the project, due to some deviations, a lot of time and money are wasted. Accordingly, applying an appropriate approach to assure the accurate and expected information of customers, besides the continuous control of all stages in line with customers' requests and verifications can solve the problem. Hence, the presence of customer representative on behalf of customer service and after-sales service department in design team was determined as a necessary step, because it is the design team which is the medium and interface between team and customer.

In addition using the knowledge management system that is currently used in R&D helps us a lot to rapid access to information in all decision making steps and increased cross functional team speed.

- ***Cross-functional team***

The next factor is the low speed of design process. After the investigation of the design process, as illustrated in figure 1, it is obvious that one of the most important factors with technical essence is the sequence of design. Profile design, pattern design, component design, mold design, process design, feasibility study and etc exist in different parts of this process upon which traditional method spectrum

must be applied over the sequence. Moreover, the repetition of prototype manufacturing steps and the optimization of material and structure in the production stage are time-consuming.

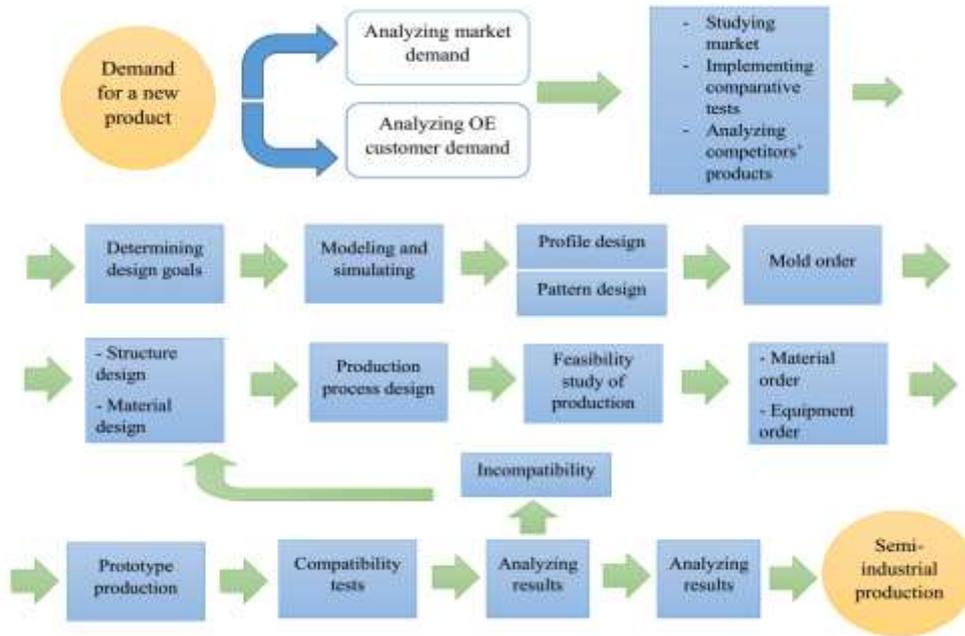


Figure 1: Primary Design procedure

So, in order to solve this issue, lean innovation principles were used to balance the activities and responsibilities of the team more accurately. The selection of cross-functional teams was in such a way that all the design process could be performed accurately in a parallel way by different members such as customer representative, test expert, design expert, material expert, process expert, production expert, procurement, a mold expert and after-sales service. Then simultaneously feasibility study of prototype production was applicable as well. The steps of making the mold and applying necessary modifications to the machines were simultaneously investigated and implemented. In addition, with the cooperation of simulation, test and design teams, the process of reaching the prototype and optimizing was minimized which had a remarkable impact on decreasing design time and speeding up the team.

The next factor was the flexibility of the design team. After investigating the design process and its various steps, those factors which lead to waste, delay, and rework were identified. Making mold, purchasing new raw material and producing a prototype were amongst those important steps which due to lack of flexibility prolonged the TTM process.

Negotiating with mold manufacturers to determine the required priorities and perform projects based on the organization and project team's schedule, negotiating with department of material purchase to prioritize out-of-process trial purchases (commonly time-consuming), and asking raw material companies to send the samples as fast as possible with technical specifications and suggestions related to the project's aims, requires more connections among the design team, procurement department, material suppliers and mold companies.

Moreover, in order to accelerate prototype construction and reduce construction process along with improving and establishing more coordination among production planning and production sectors, it was appointed that some people from these sectors join the team. Accordingly, by cooperating in the feasibility study and checking the compatibility of production line machinery with the new product, before the beginning of the construction process, can reduce delays and speed up the experimental production.

Therefore, this new team became a cross-functional team which simultaneously through holding coordinating meetings and dividing duties and responsibilities started to implement the design and production process. Consequently, a remarkable reduction of TTM was obtained.

However, besides the improvements, some new issues were rose amongst which the lead and control of the cross-functional team and project management were more important. Also, besides time and speed management, cost and risk management were rose as well which are influential factors over the implementation of projects and results.

So, R & D management for all aforementioned issues had to study, consult and model the agile organizations following which it was tried to improve the process, increase efficiency and reduce risks by designing and embedding proper systems. And hence it is out of the goals of this study, it can be addressed in further research. Figure 2, displays the flow diagram of the final decision of team structure and workflow.

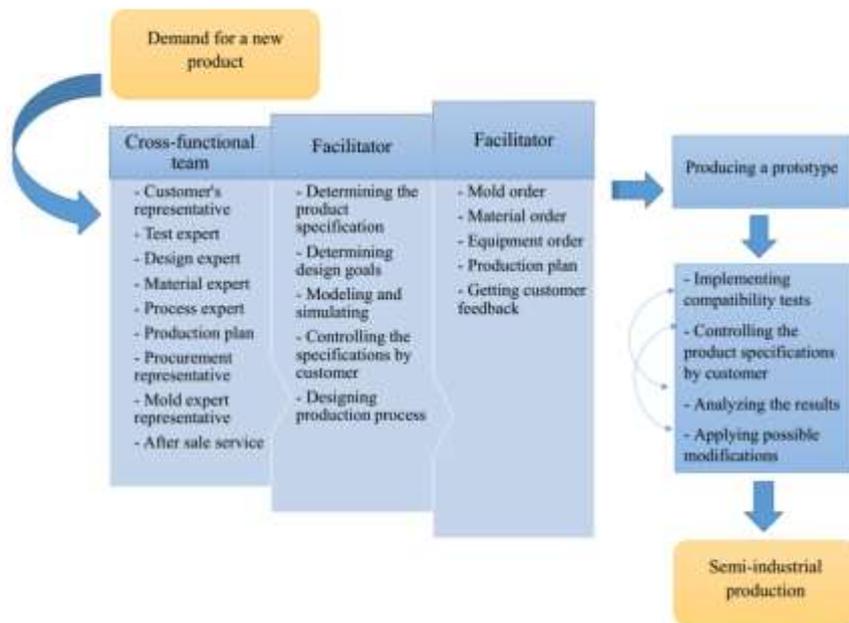


Figure 2: Design procedure with cross-functional team

### Performance changes

By this reorganization, the raw data was given to the cross-functional team so the requirements were determined simultaneously. As a consequence, ordering new material was done 5 weeks sooner. The information access save the time of communication between units and let the design team find the

proprieties as soon as possible and ordered mold 2 weeks faster than normal procedure. The cooperation with mold making company directly saved 3-4 weeks in the mold making process. The inner integration in cross-functional teams helped to avoid the parallel works and speeding up decision making by 2 weeks. The kind of inner compunction leads teams to establish a shared perspective and millstone. The results were so notable, especially in cooperation of compound design team and tire design team. The external interaction with stockholders, minimize the process errors and misleading, and as a result, producing the prototypes took 2-3 weeks less time. As final output, we could save about 17-20 weeks in various projects of product design, which is 30 to 35 percent of our TTM which is a valuable achievement.

It can be predicted by continuing the agile practice in our company and transform from practice to mindset and work- culture, along with improving and promoting of supervisory systems, controlling projects, managing cross-functional teams in a correct way, and defining goals, measures, and rewards, leads to a further improvement and reduction of production time. Agility practice also will increase the competitive strength and competitive values of the organization.

### **Conclusions**

Nowadays organizational agility is the only way of rescuing a productive organization from deterioration. Due to the growing speed of life, environmental changes and technology, people's tastes and needs are changing too; and those organizations which cannot adapt themselves with this speed are condemned to death. Organizational agility is a useful, comprehensive, pervasive and functional solution with helpful instructions, frameworks, and experiences. Designing agile organizations and or improving organizational processes in line with the aim of enhancing agility are fundamental and secure solutions. Meanwhile, the agility of new products design process has been studied in R & D department of Barez Industrial Group, and following the application of changes and enhancement of its agility, the design to production time was reduced 35 percent. By utilizing other agility parameters, changing agility of production, management and decision making, as well as precise planning for workforce and the agility of systems such as education, financial, human resources, strategy and the like, it can be hoped to maintain the survival of an organization in a competitive and accelerated environment.

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