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Enterprise Architecture Reference Model by Auto Parts Makers in Iran

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ABSTRACT

It will impossible to attain competitiveness capability without using IT and communications; thus enterprises require redefining what they are as regards this technology and finding a new architecture for their own organization. The country's auto part manufacturing industry needs a model whereby various aspects of enterprise architecture are appropriately expanded and upon which suitable strategies for implementing an integrated system is created. This paper seeks to offer a reference model for preparing and formulating an appropriate enterprise architecture regarding the implementation of integrated systems in auto parts manufacturing firms. To design model, principles of Axiomatic designing and generalized enterprise reference architecture and methods are applied. With the identification of 120 pieces of requirements and conversion of them to business capabilities, the recommended reference model, based on a service-oriented architecture consists of 6 layers of architecture, 17 components and 71 business capabilities.

1. Introduction

The strategic car industry is the largest industry in the world and is the second major economic activity after banking, which during the past 130 years ago has seen a sale of one trillion dollars and while accounting for 3.7% of the total value of the world productions, has employed over a hundred million people, which ranks third in terms of employment after steel and oil (1). The biggest capital digit in Research and Development in 2006 (around 70 billion dollars) has been invested in the car industry (2). In Iran, around 400,000 jobs have been created in car manufacturers and around 380,000 people are also active in pre and post processing industries. This is while from among the top ten companies across the world, in terms of financial indices, five cases of which are car producers and from among top 100 Iranian companies, 14 car factories or their affiliates are seen (1). This industry which is called the industry of industries, due to having close relations with other economic sectors is regarded the embodiment of industry's competence in any country and immense investment has taken place there, while being at the focal point of countries.

A car is constituted of over 20,000 parts (3). These parts are in various forms and sizes and produced by various parts makers. Existence of car parts industry is one of the prerequisites for acquiring privilege in then car industry. In fact, car manufacturing is deemed to be the Locomotive of the country; however, this locomotive is on the move on the railway of another industry called parts manufacturing (4).

Business processes in the car sector is complex and a high number of enterprises are engaged through the cycle of providing car parts. At the top of this cycle, stand main producers and in the following, stand a large set of producers ranked 1-4 which have complicated relations together, thus forming a network of various ranks in interaction with each other. Parts makers, through learning process, equipment of sources and increasing managerial capacity can move and be promoted from rank 4 parts maker to some strategic partners. Within traditional provision cycles of designing and production of a full car, three years was needed and the system and relations between members of the cycle did not allow for a higher maneuverability. However, in recent years, thus industry has seen fundamental changes; intense increase of competition and continued change of customers' tastes and the need for producing various products being appropriate to clients' tastes have all raised the need for agility in this industry. Car producers tend to cede their own responsibilities to their own strategic partners within the first rank of provision. This issue has increased the need for coordination among the members of the cycle and creation of a flexible structure for supporting effectiveness and efficacy of business processes within the cycle's members more than ever before. It will impossible to attain competitiveness capability without using IT and communications; thus enterprises require redefining what they are as regards this technology and finding a new architecture for their own organization.

Various challenges exist in the county's car area. Various environmental pressures and requirements are seen which compel car makers and various parts makers-which are usually situated in various places- to establish integrated software management systems within their own organizations and to establish electronic communications with each other (5). For instance, since several years ago, Iran Khodro and Saipa Car manufacturing companies began establishing some management systems of organizational sources in their own organizations. Sapco and Saze Gostar Saipa Companies which are parts makers of these two large car makers have advised their own parts makers being in contract with them to both establish integrated systems in their own organizations and to

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prepare for information electronic exchange. These two companies have also recommended a series of strategies for this issue to parts makers. Undoubtedly, these advices will be compelling in a near future and the parts makers which cannot observe these requirements will be removed from the cycle of providing car parts of large auto maketrs of the country. These cases along with permanent problems of parts makers like the problem of providing liquidity, lower productivity and innovation, and not so satisfactorily quality of productions are assumed as fundamental challenges in the course of development for this industry.

The mentioned situation accompanied by the loss of sufficient experience in the country in the area of executing integrated IT systems, lack of experience of car parts producers in preparing and executing strategic plans of IT and enterprise architecture and the diversity of parts makers and various conditions of their activities necessitates the formulation of activity patterns, especially in the area of IT more than ever before. In this regard, there is a need for a united framework so that all manufacturers can follow that and upon which increase their own productivity and organization their own electronic communications with main producers optimally. Enterprise architecture reference model will in fact provide this united framework and gives this assurance to main producers and parts makers to make use of any strategic management pattern and any kind of software within their own systems; thus they can easily operationalize their own strategies and exchange knowledge and information wit6h higher coordination. On the other hand, this framework could be also used by Management Counseling Companies and Integrated Software Designers and thus, minimum standards in designing and implementing such systems can be focused attention.

By the same token, the current paper seeks to formulate an enterprise architecture reference model for implementing integrated systems in car parts making firms so that these firms can implement and excuse their own appropriate strategies.

2. Review of the literature and history of the subject

Enterprise architecture is about identification and understanding various elements which constitute an organization and also shows the way these elements are internally related (6). Enterprise architecture components are highly varied and diverse and its analysis involves a complicate process. One of the ways for properly classification of organization's information is using a reference architecture and model (7). Reference model is a final standard document and a presentation of perceivable picture of the enterprise and its stages. The reference model in the organization, under enterprise architecture not only introduces necessary components of an organization, rather it specifies their relations to some extent.

In this area, the Institute of Electrical and Electronics Engineering (IEEE) began working in this area more than other international assemblies. This institute designed the first formal standard in the area of software architecture in 2000 with the heading of A recommended Practice for architecture description of software-intensive systems (8). This framework was recognized by the International Organization for Standards within the form of ISO/IEC 42010:2010 (9). This standard is a framework for describing architecture which has been drawn based on a systemic concept.

One of the major points in relation to ISO standard 42010 and conceptual model of architecture description is that the position of enterprise architecture framework has not been specified in it. This issue has also been focused attention by various researchers (10, 11, 12) and also international standard institute and also IEE. Also, various measures have taken place for reviewing the current standard edition of this standard and preparing a new version (13). It is predicted that in late 2011, the new edition of this standard is going to be published and in it, position of enterprise architecture framework has not been specified clearly. In this regard enterprise architecture framework TOGAF has begun using ISO standard 42010 and architecture description conceptual model and has also elaborated adaptation with this model in its documents (14, 15).

Figure 1, has been prepared based on an initial version of the new edition of standard ISO 42010. In this form, position of the organizations, organization's architecture framework and enterprise architecture reference model and the way they interact have all been shown together:

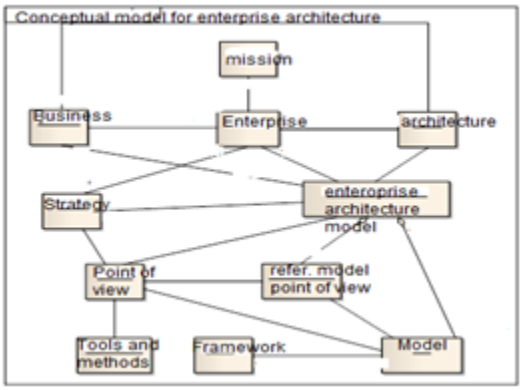

Figure 1. Enterprise architecture conceptual model (8).

From the mid-80s onwards, various strategies have been recommended for implementing integrated systems in enterprises and they have been used in various operational levels. With the development of the notion of enterprise architecture, these efforts have been concentrated in form of offering an enterprise architecture reference model.

Some enterprise architecture frameworks like the Federal state enterprise architecture framework, U.S. Defense Ministry enterprise architecture framework and Group architecture framework have their own reference models (16). In addition to this, some other efforts have been made to formulate enterprise architecture reference models. International Federation of Automatic Control (IFAC) and International Federation for Information Processing (IFIP) (17) created a joint committee on Architecture for Enterprise Integration IN 1990. The goal of this task force or committee was defining and assessing enterprise reference architecture. This task force, by considering various enterprise architectures and diverse reference models, defined in 1996 the Generic Enterprise Reference Architectures and Model (GERAM). This model was revised in later years. In 2000, this model was updated and published as a part of ISO standard 15704 (18). Also, given expanding service oriented architecture, presenting an enterprise architecture reference model has been at the focal point (19). In many of the cases, the above model has been used as a basic for designing enterprise architecture reference model in various industries.

Additionally, some researches have been conducted with the goal of integrating and creating electronic communications among various production units. In some of these researches, an appropriate model for the enterprise architecture of producing companies which want to have electronic exchange

together has been addressed (20) and in some others, product process has been focused and such researches have been conducted with the goal of presenting a process-oriented enterprise architecture framework (21). In other researches, relationship of enterprise architecture and integration has been focused attention (22) and in some other researches, offering a Lean enterprise architecture for supporting the implementation of principles and frameworks of lean production in manufacturing units has been attended to (23). Also, various researches have been carried out with the goal of organizational integration and the role of enterprise architecture in this process (24 and 25) and of course, in one research, guidelines of integrating technology and service strategies in the post-sale service sector have been dealt with (26).

In Iran, in the area of enterprise architecture, several M.A. theses have been written; but only one case of which has dealt with reference architecture and that was in the area of software architecture (27). The rest cases have also addressed other discussions in the area of enterprise architecture. Except for these cases, some other researches have addressed reference architecture. In one research, a technical reference model for expansion of IT for Iranian universities has been offered (16) and in another research, a reference model of enterprise architecture for telecommunication firms has been provided (7).

In the area of country' car industry, some researches have addressed angles of integrated systems. In some researches, the way information structure of product structyure is implemented as well as material planning has been addressed (28 and 29). These two discussions are subsets of integrated systems each and the mentioned researches have only been carried out in car manufacturing industries like Iran Khodro and Iran Khodro Diesel. In two more researches, the quality of implementation of management information systems in two car parts makers such as Sapco and Behengam Afarin has been addressed (30 and 31). In another research, 18 factors were identified as affecting the preparation of car industry for implementing ERP system (Enterprise Resource Planning) (as a special kind of integrated system) (32). In another research, the likelihood of implementing the ERP system in the car industry as well as factors needed for its implementation with emphasis on car making companies has been addressed (33).
As seen from these researches, issues under study have been more in the areas of subsets of integrated systems and these cases have also been existent in car manufacturing companies and those providing such parts rather than companies making car parts. On the other hand, in these researches identification of factors and strategies for implementing these systems has been focused attention other than operationalizing strategies. In other words, in these researches, a reference enterprise architecture model and a usable pattern for implementing strategies relating to expanding integrated systems in part making companies has not been extracted.

Totally, and based on previous experiences and researches, it can be said that at the world level, creation and expansion of enterprise architecture reference models have been focused. The rapid trend of business environment changes has resulted in emphasis on formulating more atrial models applied for a special industry, besides formulating general reference models which are applied for all industries. Besides, organizational integration and organizational architecture support for creation of integration within organizations and specially creation of integration between IT strategies and business processes strategies and also creation of integration among production enterprises and fostering inter-organizational communications have been intended by researchers.

3. Research methodology

This research has been conducted based on some enterprise architecture reference model or gram architecture with the help of Axiomatic designing method. Gram architecture includes methods, models and instruments which are required for creating and maintain an integrated organization. In designing enterprise architecture based on Gram Architecture, one of the most important activities is identification of entities, for this purpose, entity life cycle has been introduced in this standard. This cycle involves steps of identification, concept, requirements, designing, implementation, execution and renewed missions for an entity (18). Various phases of life cycle are indicative of all activities relating to one entity within its life in the enterprise.

Axiomatic designing provides a framework for elaborating designing components which involve all different parts issues relating to designing. Hence, various designers will be able to rapidly comprehend relations between internal performance of one part and tools or objects by which it can be attained. Professor Nam Suh from the University of MIT has invented this method (7). Axiomatic designing framework is constituted of four parameters: customer parameter, functional parameter, physical parameter ad process parameter (figure 2). Left side parameters are related with those in the right (7).

Designing a system or an enterprise starts with understanding needs and expectations of customers. When designers define customers' needs perceived and specify they need to translate these needs to functional requirements, the designers, via moving and returning between functional, physical, and process parameters will begin analyzing designing issue. The result of this cross move is the creation of a hierarchical tree for both requirements and designing parameters.

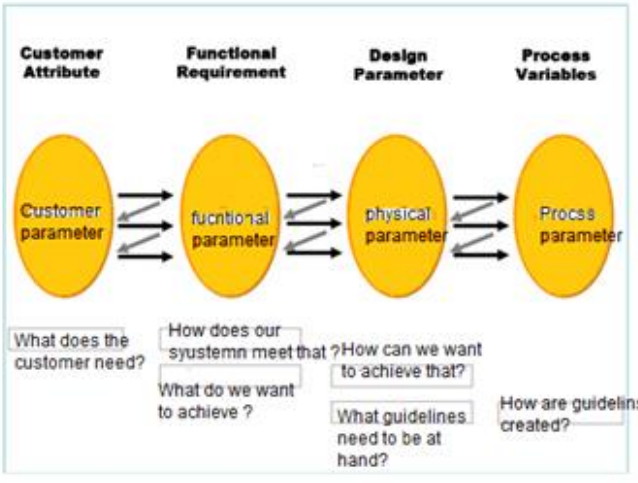

Figure 2. Parameters and variables of axiomatic designing.

Gram method tells us that designing an enterprise architecture reference model requires identification of entities and the axiomatic method shows us how to attain these entities based on the customer's needs. According to the axiomatic designing method, the requirements of the customers in the area of car parts production must be at first identified. The requirements for formulating an enterprise architecture reference model could be considered as involving a set of requirements by all beneficiaries participating in the value

cycle of the enterprise in order to create and present business services. In this relation, as series of factors affecting the identification of enterprise architecture reference model could be categorized as wants of beneficiaries of car parts production firms, the trend of market's move and the need for interaction with markets as well as international car producers, expansion of needs and customers' wants, enterprise expansion requirements and sector's structure, trend of technologies' development and series of rules and regulations pertaining to IT sector and car production sector (Abtahi, 89). After identification of customers' needs, designing requirements will be determined with a cross move. It should be noted that physical and process requirements are out of reference model realm and hence, in this research, they are not addressed; however, they can be used in operationalizing the reference architecture.

The question that arises in here is: what is the best pint for starting enterprise architecture and business architecture and what components need to be focused attention in designing a reference model?

In responding to this question, one can refer to research results by credible institutions in recent years. According to the Forster company' viewpoint, capabilities are sustainable components f a business model (340 and preparing the map of business capabilities could form the enterprise business architecture and it is a confident method at the hand of architects for attaining such architecture (35). In modern business world, where enterprise business processes and strategies are constantly changing, enterprises are in need of coordinating diverse needs of the market and those of the customers; the map of business capabilities could better than other common tools like Strategy map (13) and Business processes Modeling, help enterprises understand their own abilities and aligning IT capabilities as well as business goals (34). Wholly, it can be said that business capability is believed to be a key sector for the business architecture (36) and could even be a better and more appropriate foundation for the enterprise technology strategy (37).This instrument could very well fill the communication gap relating to IT activities business strategies (38). Ina addition to this, capabilities map could be raised as a guide and a framework of investment in the area of enterprise information technology and help effectively with the software basket as required by the enterprise (39).

In a general definition, the degree of ability of an entity (e.g. organization, organizational unit, individual and system) for attaining their goals, particularly in relation to the hidden mission of the enterprise can be defined as capability (40). Contrarily, business process lays emphasis on the way organization's goals are attained. Capability refers to those things for which the enterprise needs some goals (i.e. concentration on what instead of how) (41).

As an instance, a bank must have the capability of lending and collecting some saving; while this capability could be performed in a different form in a y period of time, in a period, it can be done by way of paper and in another period this can be done via the internet and in the least time possible. Generally, what is expected from a bank (i.e. capability) has not changed during time, however operational process of this expectation during the time has faced with fundamental changes. In order to identify business capabilities in the car parts manufacturing business and to present an enterprise architecture reference model, requirements of high level rules and regulations of the country (including the next 20 years development horizon, strategic document of the IT system, Regulation on promotion of quality of heavy machinery, parts and series related and executive regulation of the law on supporting cars consumers), requirements of internal and external car manufacturing companies (ISO/TS 16949 standards, special requirements of SAPCO, SAPCO logistic requirements, SAPCO, safety parts instructions, SAPCO IT requirements, special requirements of the quality management system of Saze Gostar providers, Instruction on evaluating Saze Gostar IT, international car manufacturer requirements have been done based on IBM studies (2006) (42) , (2008), (43 and 44), (2009) and (45) and studies (46)), requirements for modern technology development, (service oriented architecture service oriented enterprise architecture, customer's communications management, business process management, enterprise service passage, knowledge management service, web meaning network architecture, messaging systems and cooperation and security systems), car business models (five conceptual models of bus1iness, modeling business parts (CBM) by the IBM company for car manufacturers, architecture methodology of Microsoft service (MSBA) for producers and framework of classifying processes (PCF) and (APQC) for car manufacturers) have been analyzed (Abtahi, 2010).

4. Findings

Totally, with the identification and analysis of 120 requirements and conversion of them to business capabilities at an enterprise, a reference model has been designed for Iranian car parts makers which will be introduced later in this section.

4.1 Identification of customers' needs

Customers' needs have been categorized in form of 6 components and 23 subcomponents. From these components, 4 components are related with internal needs and include "business strategy", "sources and infrastructure", "product" and " cooperation and survey". Two other components belong to out of organization needs and include "market and client" and "providers and partners". After examining the above 120 needs and categorization of them in 6 components expressed, the needs will be compared together and common cases will be eliminated and some other cases will also integrated so that in the end, 23 needs of customers are identified as elaborated in the Table 1:

4.2 Translating customers' needs to functional needs

In this step, all activities needed for describing car parts manufacturing firms requirements should be determined for accounting to customers' needs. In case, customers' identified needs should be divided into more partial needs and there is one requirement identified for one requirement.

4.3 Enterprise architecture reference model of Iranian car parts makers

In designing a reference model, the following several points are intended:

- Based on various studies, the most appropriate pattern for crating integration in the organization is to apply a service oriented architecture; thus, in designing te recommended reference model for this research, service oriented enterprise architecture is considered as the recommended architecture foundation;
- As stated in the previous sector, business capabilities are found to be more sustainable components in comparison to business processes. Since this research seeks to offer a general and pervasive framework for car parts manufacturing companies, hence, business capabilities have been applied in

Table 1. Customers' needs (CA) in the Iran's car parts production industry.

Row	component	Customer's needs
1	Business strategy	Using IT as an integrating tool (CAI)
2		Creating relationship and alignment between business processes ad IT (CA2)
3		Creating relation between business processes and service (CA3)
4		Providing service oriented requirements in the enterprise (CA4)
5		Establishing quality management system (CA5)
6	Product	Increasing quality of products (CA6)
7		Survey and controlling production process (CA7)
8	Resources and infrastructure	Using IT and communications as a promoting source in the enterprise (CA8)
9		Providing security of Information area (CA9)
10		Providing and promoting competent human force (CA10)
00011		Expanding systems of controllable and accessible systems (CA11)
12		Establishing a financial system being controllable (CA 12)
13		Reducing costs and controlling price finished (CA13)
14	Cooperation and survey	Using IT as a main tool for coordinating internal and external organization (CA14)
15		Tracing products and services(CA15)
16		Testing products and services (CA16)
17		Sharing information in the enterprise (CA17)
18	Customer and market	Using IT as a facilitating tool of interaction with clients (CA18)
19		Orientation towards foreign customers (CA19)
20		Maintaining and drawing attention of customers (CA20)
21		Offering post-sale services and guaranteeing quality of products (CA21)
22	Providers and partners	Expanding interactions and communications based on IT (CA22)
23		Expanding co-op with internal and foreign partners (CA23)

Table 2. Mapping customer needs (CAT) to functional requirements (FR).

Row	component	Customers' needs	Functional needs
1	Business strategy	Using IT as an integration tool (CA1)	Integration process and service (FR1) Testing processes with the help of IT (FR2)
2		Creating relationship and alignment between business processes ad IT (CA2)	Preparing business capabilities (FR3)
3		Creating relation between business processes and service (CA3)	Preparing business capabilities model (FR3)
4		Providing service oriented requirements in the enterprise (CA4)	Defining service in interaction with enterprise processes (FR4) Managing service execution (FR5)
5		Establishing quality management system (CA5)	Quality strategic management (FR6) Documents management (FR7) Product management (FR8) Infrastructure management (FR9) Products improvement (FR10)
6	Product	Increasing quality of products (CA6)	Products improvement(FR10) Designing product based on customer's needs (FR11)
7		Survey and controlling production process (CA7)	Managing production process (FR12) Products quality engineering (FR12)
8	Resource and infrastructure	Using IT and communications as a promoting source in the enterprise (CA8)	IT services management (FR13)
9		Providing security of Information area (CA9)	Information security management (FR14)
10		Providing and promoting competent human force (CA10)	Human force management (FR14) Managing motivation and promoting human force (FR16)
11		Expanding systems of controllable and accessible systems (CA11)	Managing documents (FR7)
12		Establishing a financial system being controllable (CA 12)	Financial management (FR17) Managing finished price (FR 18)
13		Reducing costs and controlling price finished (CA13)	Expanding inter-organizational communications (FR19) Distributing information and knowledge in the enterprise (FR20)
14	Co-op and survey	Using IT as a main tool for coordinating internal and external organization (CA14)	Product tracing management (FR21)
15		Tracing products and services(CA15)	Product improvement and survey management (FR10)
16		Testing products and services (CA16)	Distributing information and knowledge in the enterprise (FR20) Expanding interactive infrastructures in the enterprise (FR22)

Row	component	Customers' needs	Functional needs
			Reactions and decisions management (FR23)
17		Sharing information in the enterprise (CA17)	Managing relations with customers (FR24)
18	Customers	Using IT as a facilitating tool of interaction with clients (CA18)	Managing relations with customers (FR24) Product quality engineering (FR27)
19		Orientation towards foreign customers (CA19)	Customers' satisfaction survey (FR25) Identification and management of customers' needs (FR26)
20		Maintaining and drawing attention of customers (CA20)	Post –sale management of service (FR26)
21		Offering post-sale services and guaranteeing quality of products (CA21)	Managing realitons with partners (FR28)
22	Providers and partners	Expanding interactions and communications based on IT (CA22)	Managing realitons with trading partners (FR29)
23		Expanding co-op with internal and foreign partners (CA23)	Managing realitons with trading partners (FR29)

the components of recommended reference model architecture and realm of business processes have not been dealt with;

- In designing recommended reference model parts, car industry business models have been adopted and these models have been focused as much as possible.

According to this, a higher level of the recommended reference model for the car parts industry has been offered which is shown in figure 3 and the lower levels details will be in accordance with Table 3

Three layers of business architecture, service architecture and technology architecture have been observed in all service oriented enterprise architecture patterns; hence in this research they have been focused. Intelligent enterprise architecture guarantees creation and survey of integration in all various levels of the enterprise. Security architecture layer is also the foundation of certain activities in the field of business based on IT. Given the fact that, today, accomplishment of enterprise integration is impossible without IT technology, attention to security dimension and its management is necessary in all the enterprises.

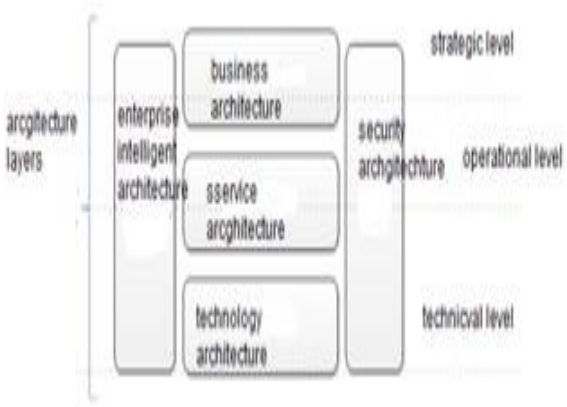

Figure 3. Level one of the reference model by Iranian car parts makers.

Later, constituting components of reference model layers in levels 2 and 3, reflecting functional requirements in the enterprise are offered:

Table 3. Constituting components of reference model layers in levels 2 and 3.

Row	Architectural layer	Level 2	Relevant capabilities	Number of requirements related with function
1	Business architecture	Business management	Strategic management	6 and 9
2			Management of business rules and regulations	3
3			Spiritual ownership management	7
4			Human resources management	9 and 15
5			Financial management	9 and 17
6			Investment and risk management	17 and 18
7			Cost management	9
8			Project management	1 and 16
9			IT services management	9
10			Infrastructure management	8, 10 and 11
11		Product designing	Designing and expanding new products/ improving existing products	8
12			Designing products' production process	8
13			Designing/ choosing production tools	8
14			Planning and pilot production of product designed	8, 11
15			Life cycle of product management	11, 24 and 25
16		Products production	Adaptation with contract	25
17			Orders management	11
18			Management and timing production	10
19			Formulating and executing production style	10
20			Producing product	12 and 27
21			Controlling and guaranteeing quality	21
21			Identifying and tracing products	12
22			Repairing and maintenance	25
23		Logistics	Planning demands	21
24			Management, identification and tracking	9

Row	Architectural layer	Level 2	Relevant capabilities	Number of requirements related with function
			and controlling contracts	
25			Providing resources	10
26			Managing the stockpiles	10
27			Transportation system management	24
28		Relation with customers, partners and providers	Marketing, planning sale and awareness raining	27
29			Predicting and analyzing demands	24, 25
30			Exchanging designing information and product with the customer	27
31			Requirements management and customers' requirements	29
32			Management of relation with trading pattern	24
33			Management of relations with customers	28
34			Managing providers	26
35			Post-sale service management	1
36		Co-op management	Coordinating strategies of the enterprise	1
37			Working planning co-op	1, 19
38			Operation coordination	19
39			Coordinating business process	1
40			Creating interaction and co-op with working teams	4, 5
41	Service architecture	Service planning	Relation with business capabilities	4
42			Services coordination	5
43			Using services again	1,5
44		Service implementation	Executing services	1
45			Interaction between services	1
46	Technology architecture	Technology management	Message management	1
47			Integration	9
48			Utilization of software	9
49		Technology provision	Laying the ground	23
50			Infrastructure	10
51	Intelligent enterprise architecture	Survey	Analysis and reporting based on indices	2
52			Analyzing situation	2
53			Analyzing enterprise efficacy	23
54			Analyzing enterprise effectiveness	23
55		Sensitization	Real world analysis of the events	20
56			Registering successful and unsuccessful experiences	22
57			Sharing and contributing information	1
58		Timely decision making	Time of short awareness of event incidence	19
59			Integration and access to information	20
60			Storing and retrieving information	19
61		Enterprise learning	Sharing and distributing information	24, 25
62			Interaction between experts of any area	10
63		Intelligent communications	Testing interaction with the client	28
64			Testing the product and production process	14
65			Testing providers	14
66	Security architecture	Security management	Managing continuation of business	14
67			Security policies	16
68		Security survey and test	Controlling and assessing security	14
69			Access security	16
7			Protecting from customers' information	14

5. Conclusion

Car manufacturing is considered one of the major industries in the country and its expansion has also been at the focal point of country's decision makers. Acquiring a competitive privilege in this industry requires expansion of part manufacturing and creation of integration and coordination within the value cycle of car manufacturing. Shortage of implementing integrated system s and beside that requirements of presence in the world markets and programs of the two biggest car makers of the country have manifested the necessity of designing patterns and models of expansion of integrated systems in this industry.

This research has been conducted or accounting this need and with the goal of designing an enterprise architecture reference model car parts makers in the country. This reference model supports creation and expanding integrated systems inside and outside of car parts makers and car manufacturer during the cycle of supply. In designing e model, various requirements beneficiaries of car makers have been considered. This reference model has 5 layers of architecture, 17 components at level 2 and 71 business capabilities in level 3. This model is understandable easily by various beneficiaries.

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