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Micro Extended[X] Enterprises & An Ea Framework Best Suited For Them.

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ABSTRACT
"SMiXE's – Small & Micro Extended Enterprises", in automobile industry, though referred as Small & Micro, but forms a bulk or a huge base of the automobile Cluster/ Pyramid (see Fig 1 below) in terms of people employed, work done by them in tot up. It compliments the auto industry in absorbing the cost pressure and at the same time facilitates the auto industry in segregating the less efficient routine as well as menial work towards the bottom of the pyramid. Freeing the OEM to focus on their core activities. By their very "Nature & Need", SMiXE have to be very "Agile, Cost Competitive and Adaptive" by their "Nature", as all OEM's (Global & Local) are being forced to adapt new, improved, environment friendly and fuel efficient standards. The environment in which they (SMiXE) exist and to the very market ("Need") that they cater is very dynamic. Keeping the above mentioned points and the constraints mentioned below, in this paper we will be evaluating the best suited EA framework which will enable us in providing a viable EA solution for SMiXE's.

Keywords: *Automobile Industry, Enterprise Architecture, First Tier Supplier (FTS) , Job Work, Original Equipment Manufacturer (OEM), Second Tier Supplier, Subcontractors , TOGAF, Zachman Framework.*

I. INTRODUCTION

As discussed in our earlier paper "**Benefits of Enterprise Architecture for Small & Micro Extended[X] Enterprises (SMiXE)**" [1], the use of sophisticated IT systems is negligible in **SMiXE** as compared to **OEM's and FTS [6]**, who use world class IT systems and technologies in their organization, which are based on a well defined **Enterprise Architecture [2][3][4][5]** providing them an edge. Fig 2 lists, some of the constraints faced by **SMiXE,** which discourages use of sophisticated IT systems and technologies by **SMiXE**.

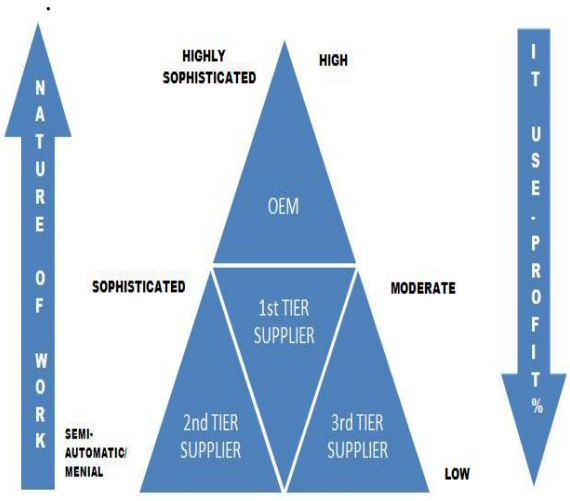

Fig. 1 Automobile Cluster/ Pyramid

Sr. No.	Constraints Faced By SMiXE while adapting EA based IT Solutions.
1	Cost of ownership, of these IT systems is very high.
2	Long and costly implementation required.
3	Dedicated IT team is required to manage it
4	Standard IT systems, have a highly process oriented approach, which acts as bottleneck for the SMiXE.
5	Adapting to changes in business environment or business process requires lengthy and costly IT time and resources.

Fig. 2 **Shows Constraints Faced By Smixe**

Comparing Fig. 1 & Fig. 2, justifies the IT & technology neglect by **SMiXE** as they are working at bottom of the pyramid where margins are the lowest, work pressure is high and the intellectual level of staff is also poor.

Above mentioned constraints make it extremely difficult for the **SMiXE** to go for the existing sophisticated IT systems, as by their very "**Nature & Need**", SMiXE have to be very "**Agile, Cost Competitive and Adaptive**" by their "**Nature**", as all **OEM**'s (Global & Local) are being forced to adapt new, improved, environment friendly and fuel efficient standards.

The environment in which they (**SMiXE**) exist and to the very market ("**Need"**) that they cater is very dynamic, that is changing every eighteen to twenty four months (Globally automobile manufacturers or OEM's launch new vehicles which cause turbulence in technology.

This has created a highly cost competitive environment in the automobile industry where cost cutting is the norm, in order for the OEM's and the FTS's to survive profitably, this cost cuts are forced down on the **SMiXE**, with not much of a choice.

Enterprise Architecture (EA) over last 25 years has evolved from being an IT centric function to becoming a "**Business Enabler**" and if used effectively can be a "**Business Differentiator**", giving SMiXE an "**Edge**" over it competitors. Achieving growth in SMiXE is the "Achilles Heel" for maximum number of enterprises, due to lack of following factors:

- Business Skills [From process point of view].
- Good Industry Practices.
- Quality & Standards.
- Inadequate Capital.

In Contrast, their desire for growth is tremendous and given the right platform for achieving "**Growth**", they can reach there. Our endeavour here is to analysis the benefits that an Enterprise Architecture (EA) can provide to SMiXE, for them to efficiently manage all the aspects of their enterprises using "**Technological Sophistication**" and will act as a "**Technology Enabler**" for them to grow their enterprise to the next Phase/Stage of growth.

II. SIGNIFICANCE AND CONTRIBUTION

A. Why Enterprise Architecture(EA*)*

Enterprise Architecture (EA) is the organizing logic for business process & information technology (IT) infrastructure, reflecting the integration & standardization requirements of the company's operating model [4]. EA provides a long term view of company's process, systems and technologies so that individual IT systems can build current and future capabilities for them and not just meet their immediate needs. These capabilities can be harnessed by them to achieve growth by overcoming the above mentioned factors (see Achilles Heel paragraph). IT system being based on Good Industry Practices and well defined quality & standards will also create a positive social impact on the society. Fig 3 shows a table comparing IT solutions which are developed and deployed across the automobile pyramid/cluster, based on different approach (which was a gradual evolution from Manual Systems to different kind of IT systems over decades).

Comparison Parameters	Manual System	Stand-alone IT Solutions	Loosely Integrated IT Solution	EA Based IT Solutions
Simplifies Operations	Low	Low	Medium	High
Integration	None	None	Low	High
Transparency	None	None	Low	High
Standardization	None	Low	Medium	High
IT Efficiency	None	Low	Medium	High
Operational Efficiency	Medium	Low	Medium	High
Functional Optimization	None	Low	Medium	High
Strategic Agility	None	None	None	High

Fig. 3 **Above table shows Benefits of Using EA**

The first column named "**Comparison Parameters**", of Fig. 3 table, lists all the comparison parameters that we have used while comparing different systems which are mentioned as subsequent column headings. Column 2, named as "**Manual System**" – represents the earliest or the first level of evolution in managing complicated enterprise level functions using pen, paper, folders, calculators…. Etc. Column 3, named as "**Standalone IT Solutions**" – represents the first level of standalone IT solutions, used like MRP solutions, inventory management systems etc. Column 4, named as "**Loosely Integrated IT Solutions**" – represents the next evolution in IT Systems, where systems were designed, developed and deployed based on well defined good industry practices and inter-departmental connected workflows. Lastly the Column 5, named as "**EA Based IT Solutions**" – takes the holistic view of the IT infrastructure as mentioned in above paragraph.

Low, Medium and High weight-age was assigned to each comparison parameters for each of these systems based on a detail analysis. Above shown Fig. 3 shows, the complete table with all comparison parameters assigned a weight-age for each and every system.

As discussed in our earlier paper "**Benefits of Enterprise Architecture for Small & Micro Extended[X] Enterprises (SMiXE)**" **[1]**, we compare three Enterprise Architecture (EA) Frameworks on following different criteria's shown below in Fig. 4. Comparison criteria are the same that have been discussed in detail in the following article "A Comparison of the Top Four Enterprise Architecture Methodologies – By Roger Sessions, CTO, Object Watch" [19].

Comparison Criteria	Criteria Explanation
Taxonomy Completeness	Refers to how well you can use the methodology to classify the various architectural artifacts.
Process Completeness	Refers to how fully the methodology guides you through a step-by-step process for creating an, enterprise architecture.
Reference Model Guidance	Refers to how useful the methodology is in helping you build a relevant set of reference models.
Practice Guidance	Refers to how much the methodology helps you assimilate the mindset of enterprise architecture into your organization and develop a culture in which it is valued and used.
Maturity Model	Refers to how much guidance the methodology gives you in assessing the effectiveness and maturity of different organizations within your enterprise in using enterprise architecture.
Business Focus	Refers to whether the methodology will focus on using technology to drive business value, in which business value is specifically defined as either reduced expenses and/or increased income.
Governance Guidance	Refers to how much help the methodology will be in understanding and creating an effective governance model for enterprise architecture.
Partitioning Guidance	Refers to how well the methodology will guide you into effective autonomous partitions of the enterprise, which is an important approach to managing complexity.
Prescriptive Catalog	Refers to how well the methodology guides you in setting up a catalogue of architectural assets that can be reused in future activities.
Information Availability	Refers to the amount and quality of free or inexpensive information about this methodology.

Fig. 4 Comparison Criteria **[19]** along with its explanation

Based on the comparison criteria's **[19]** mentioned above in Fig. 4, we compared the following three Enterprise Architecture (EA) Frameworks:

- Zachman Framework for Enterprise Architecture [2]
- TOGAF–The Open Group Architecture Framework [5]
- Enterprise Architecture Planning (EAP) [3]

Based on the comparison criteria and the information available about these criteria's usability and functional use in our endeavour to develop an Enterprise Architecture for SMiXE, both publicly and privately, was complied and the results where given weight-ages as follows:

- Low weight-age - indicates less usage of these criteria.
- Medium weight-age - Indicates moderate usage of these criteria.
- High weight-age - Indicates high usage of these criteria.

Following table Fig. 5 shows the results of our evaluation.

Comparison Criteria	Zachman Framework	TOGAF	EAP
Taxonomy Completeness	High	Medium	Low
Process Completeness	Low	High	Medium
Reference Model Guidance	Low	Medium	Low
Practice Guidance	Low	Medium	Low
Maturity Model	Low	Low	Low
Business Focus	Low	High	Low
Governance Guidance	Low	Medium	Low
Partitioning Guidance	Low	Medium	Low
Prescriptive Catalog	Medium	Low	Low
Information Availability	Medium	High	Low

Fig. 5 Evaluation results

Based on the evaluation results shown in Fig. 5, TOGAF [5] stands as a clear winner as it scores 3 High & 5 Medium weight-ages as per our evaluation results. Also, according surveys carried out by Infosys [20], in year 2008, TOGAF [5] has a much higher industry adoption rate than its peers. According to Infosys survey [20], TOGAF [5] has passed Zachman Framework [2] in terms of overall adoption ratio, where TOGAF [5] is used by more then 32% of the survey respondent and 25% of the respondent use Zachman Framework [2].

Using TOGAF [5] framework provided ADM (Architecture Development Method); we will be building an Enterprise Architecture (EA) for the SMiXE, which will help us in meeting our endeavour to built an Enterprise Architecture (EA) for SMiXE, which will help them to efficiently manage all the aspects of their enterprise using "Technological Sophistication" and will act as a "Technology Enabler" for them to grow their enterprise to the next phase/ stage of growth.

III. LITERATURE OVERVIEW

TOGAF–The Open Group Architecture Framework [5]:

Best known, by its acronym TOGAF [5], TOGAF [5] is owned by The Open Group and is one of the most widely accepted methods for developing enterprise architecture (EA). TOGAF [5] is an open framework providing a practical, definitive and proven step by step approach for developing and maintaining EA using its Architecture Development Method (ADM).

TOGAF [5] ADM is an iterative process, which provides step by step guidelines for defining business needs and developing an architecture that meets those needs using the elements of TOGAF [5]. TOGAF [5] supports four architecture domains that are currently accepted as subsets of overall enterprise architecture, all of which TOGAF [5] is designed to support, which are as follows:

1. **BUSINESS ARCHITECTURE** – Describes the process the business uses to meet its goals. It includes business strategy, governance, organization and key business processes.
2. **Data Architecture** – Describes how the enterprise data stores are organized and accessed. Including everything from an organizations logical, physical data assets and data management resources point of view.
3. **Application Architecture** – Describes how specific applications are designed and how they interact with each other. Provides a blueprint for the individual applications to be deployed, their interactions, and their relationships to the core business processes of the organization.
4. **Technical Architecture** – Describes the hardware and software infrastructure that supports applications and their interactions. This includes logical software and hardware capabilities that are required for deployment of business, data and application services. This includes IT infrastructure, middleware, networks, communications processing standards etc.

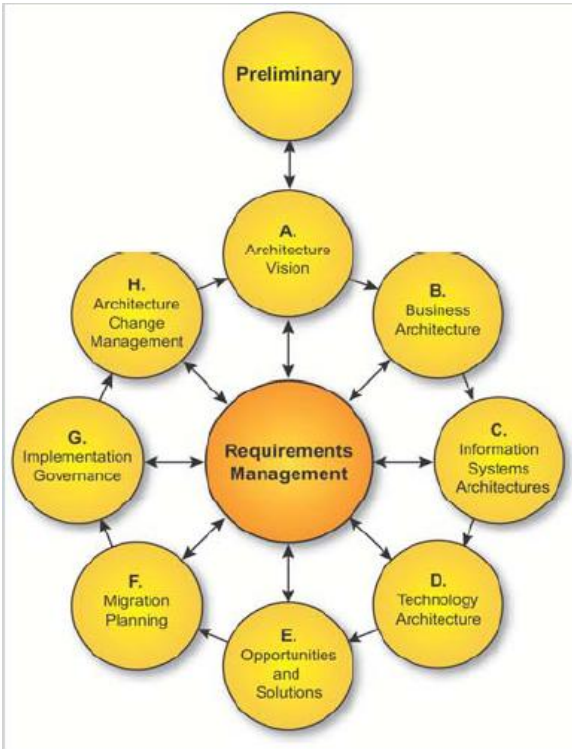

Fig. 6 TOGAF – Architecture Development Cycle

IV. DISCUSSION

Why use TOGAF [5] over Zachman framework [2] or EAP [3]? As per the comparison criteria mentioned in Fig. 4, the evaluation results are displayed in Fig. 5. Based on this evaluation result Fig. 5, Zachman Framework [2] scores high on Taxonomy Completeness whereas TOGAF [5] scores a high on the criteria of Process Completeness, Business Focus and Information Availability & a medium in Reference Model Guidance, Practice Guidance, Governance Guidance and Partitioning Guidance criteria as shown in Fig. 4.

TOGAF's [5] strength in above mentioned areas and shown in Fig 5 will help us in building a strong durable, yet elastic enterprise architecture for SMiXE, which will endure the test of time, both good and bad, in today's turbulent automobile industry, which is slowly but steadily transforming itself towards a highly globalised and widely interconnected world not by tar or concrete highways, but by fiber optic cables and nature provided radio wave frequencies. They will have to face challenges on emission standards, noise pollutions, environment hazards due to excessive use of rare earth metals/alloys and the biggest change in coming years may be owing a automobile personally will not be a necessity, where as using a automobile as a personalized service may be a much cheaper option with driver less cars/pods.

V. CONCLUSIONS

Using TOGAF [5] to build an Enterprise Architecture (EA) for **SMiXE,** will helps us collaboratively develop a strategic EA solution that will enable business and IT alignment. As business scenariors and technology changes keeps on pushing **SMiXE** to the edge of change. Our Endeavour will be the first such serious attempt, towards building a sustainable and cost effective Enterprise Architecture (EA) solution that benefits **SMiXE**.

Proposed Enterprise Architecture (EA) for **SMiXE** will benefit them by providing, a tight integration between business needs of **SMiXE** and their IT needs. Impact of which will be reflected positively on their Performance, Growth and Bottom Line.

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