

A LEAN ENTERPRISE ARCHITECTURE FOR BUSINESS PROCESS RE-ENGINEERING AND RE-MARKETING

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Abstract: An agile enterprise is an organization that rapidly adapts to market and environmental changes in the most productive and cost-effective ways. To be agile, an enterprise should utilize the key principles of enterprise architecting enabled by the most recent developments in information and communication technologies and lean principles and. This paper describes a Lean Enterprise Architecture (LEA) to organize the activities for the transformation of the enterprise to agility. It is the application of systems architecting methods to design, develop, produce, construct, integrate, validate, and implement a lean enterprise using information engineering and systems engineering methods and practices. LEA is a comprehensive framework used to align an organization's information technology assets, people, operations, and projects with its operational characteristics. The architecture defines how information and technology support the business operations and provide benefit for its stakeholders. The architecting process incorporates lean attributes and values as design requirements in creating the enterprise. The application of the LEA is less resource intensive and disruptive to the organization than the traditional lean enterprise transformation methods and practices. Thus, it is essential that the merits of this process are re-marketed (communicated) to the stakeholders to encourage its acceptance.

1 INTRODUCTION

In order to effect a successful transformation to agility, an enterprise requires an integrated set of activities and support documents that execute their strategic vision, program concepts, transformation schedule, communications plan, and technology implementation strategy. To this end, the authors created the Lean Enterprise Architecture (presented in Figure 1). LEA is a structure to organize these activities for the transformation of the enterprise from a current state to a desired future agile state. LEA uses a phased approach structured over the life cycle of the transformation. It portrays the flow of phases necessary to initiate, communicate, sustain, and continuously refine an enterprise transformation based upon Lean principles, information technology architecture, and systems engineering.

The top of the illustration in Figure 1 represents the life cycle of the transformation. The bottom represents the architecture that is used to create the

life cycle. The architecture is comprised of three phases.

1. The first component is the Transformation Strategic Planning phase, which specifies the actions associated with the decision to adopt the architecture.
2. The second component is the Transformation Acquisition and Integration phase, in which the environment and conditions necessary for a successful change in the enterprise are created.
3. The organization is then prepared for the launch into detailed planning and implementation, which is the third phase, the Transformation Implementation phase, where the transformation of the enterprise is planned, executed, and monitored.

Each phase in this architecture creates the conditions necessary to put into effect the life cycle of the transformation. The description of each component of the life cycle is given in Table 1.

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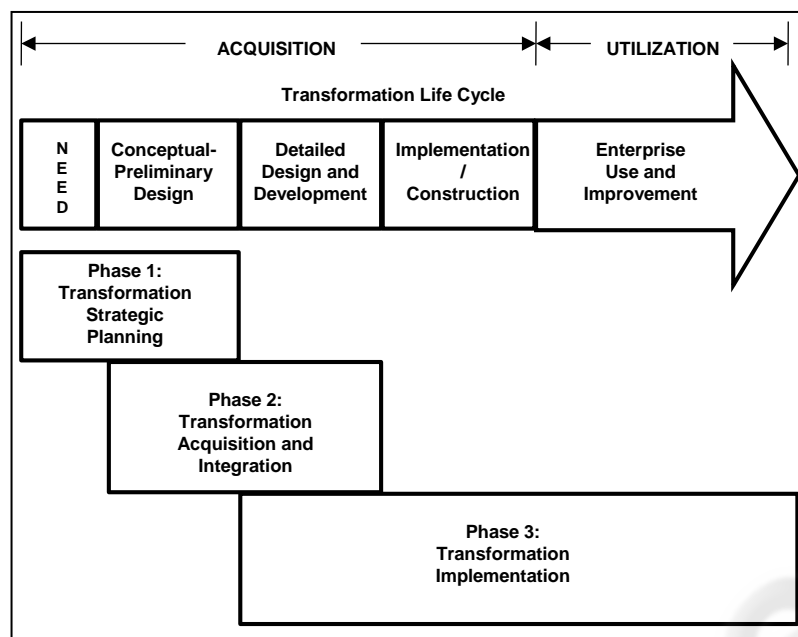


Figure 1: Lean Enterprise Architecture Phases.

2 THE LEAN ENTERPRISE ARCHITECTURE

The Lean Enterprise Architecture is an architecture framework for enterprise reengineering to design, develop, produce, construct, integrate, validate, and implement a Lean Enterprise using Information Technology and Systems Engineering methods. The design process incorporates Lean attributes and values as design requirements in creating the enterprise. This approach to transformation is a systems engineering method for a Lean enterprise transformation, as opposed to the standard incremental Lean methodology that uses a “Design-Build” and the “Cell-by-Cell” paradigm.

3 THE ROLE OF SYSTEMS ENGINEERING AND INFORMATION TECHNOLOGY

LEA is rooted in the foundations of Lean principles, information technology architectures, and systems engineering methods. Enterprise Engineering is defined as the “collection of tools and methods which one can use to design and continually

maintain an integrated state of the enterprise” (ISO WD 15704). Based on this definition, “Lean Enterprise Transformation Engineering” is defined to be a discipline that uses the tools of systems engineering and the management practices of Lean to organize all of the tasks needed to design, implement, and operate enterprise transformation change.

Lean Enterprise Transformation Engineering uses an Architecture Framework to define and describe enterprise design and implementation solutions. Architecture Frameworks describe basic concepts, descriptions and the related models (views) to provide a standard for enterprise engineering (IEEE P1471, 1998). There are four basic Enterprise Engineering frameworks. These frameworks are rooted in information technology architectures:

- a. Computer-Integrated Manufacturing Open System Architecture (CIMOSA)
- b. Generalized Reference Architecture and Methodology (GERAM)
- c. GRAI Laboratory Model (GRAI/GIM)
- d. Purdue Enterprise Reference Architecture (PERA).

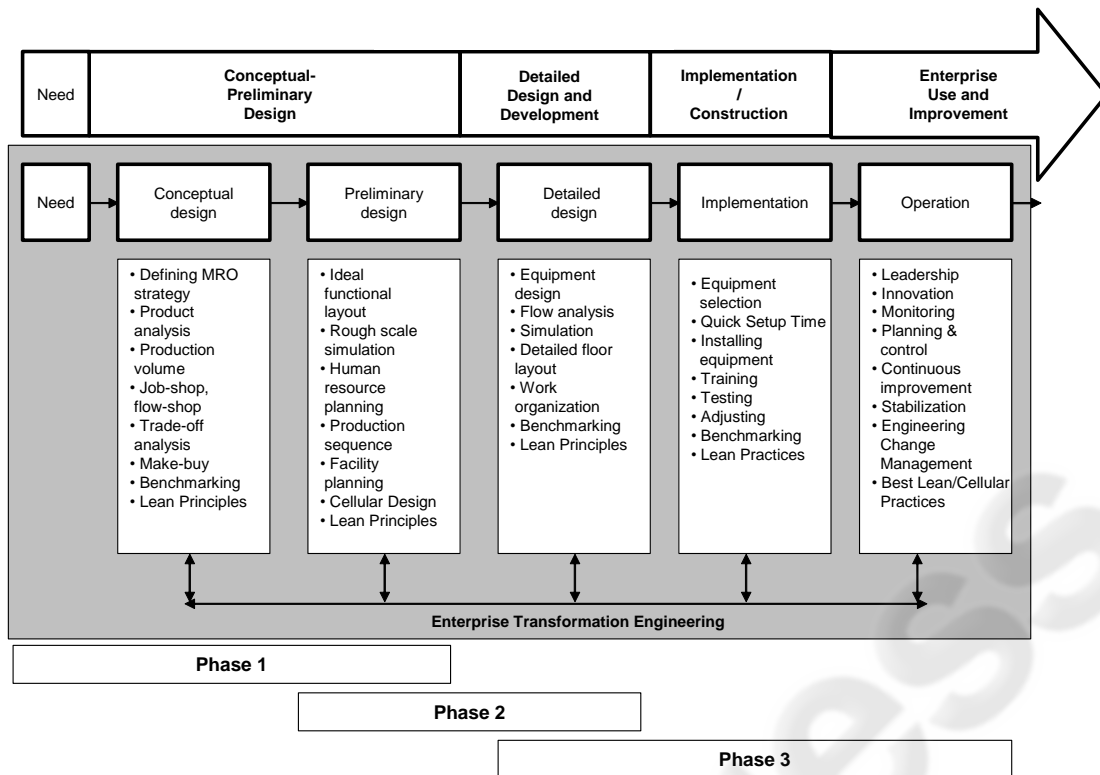


Figure 2: Lean Enterprise Architecture.

Table 1: Transformation Life Cycle Components.

Component	Description
Need	Wants or Desires for transformation of the enterprise, because of obvious deficiencies or problems.
Conceptual and Detailed Design	Market analysis, feasibility study, requirements analysis, enterprise system design and development, simulation, engineering prototyping, benchmarking, acquisition plans, trade-off analysis, and specifications development.
Implementation/Construction	Modify, communicate, procure, integrate, install, test, train, and implement the transformation of facilities, production systems, business systems, and policies.
Enterprise Use and Improvement	Operational use of the transformation, and continued review for improvement or modification.

Of these four, the Generalized Reference Architecture and Methodology (GERAM) framework was adapted as the Enterprise Transformation Engineering framework for the LEA architecture

4 LEAN ENTERPRISE TRANSFORMATION ENGINEERING AND THE LEA

Figure 2 shows how the Lean Enterprise Architecture and the concepts of Lean Enterprise Transformation Engineering work together to ensure an effective and successful transformation of the enterprise to agility. The top of the illustration in Figure 2 represents the life cycle of the transformation. The bottom of the illustration represents the three phases of the LEA. Each phase in the architecture creates the conditions necessary to put into effect the life cycle of the transformation. The middle of Figure 2 (shaded region) is the framework for the Lean Enterprise Transformation Engineering. This combination of Lean enterprise, IT, and systems engineering methodologies portrays

the overall flow of the action steps necessary to initiate, transform, sustain, and continuously refine an enterprise.

5 CONCLUSIONS

The Lean Enterprise Architecture (LEA) presented in this paper uses Lean enterprise, Information Technology architectures, and systems engineering methodologies to portray the overall flow of the action steps necessary to initiate, communicate, sustain, and continuously refine an agile enterprise. The architecture was developed from an enterprise perspective, paying particular attention to strategic issues, internal and external relations with all key stakeholders, and structural issues that must be addressed before and during a significant change initiative. LEA enables the enterprise to respond quickly to changes in the environment in which the organization operates. It serves as a ready reference to assess the impact of the changes on each of the enterprise architecture components. It also ensures the components continue to operate smoothly through the transformation to agility.

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