2.3 Green Enterprise Architecture

A Green Enterprise Architecture (GEA) considers the multiple existing systems and packages used by an organization in running its business. A GEA also provides basis for defining, assessing, measuring, analyzing, reporting, and monitoring the green IT systems and processes. Furthermore, a GEA results in the development of common terminologies that bring clarity, understanding, and consistency to the green enterprise initiative.

Following are the activities resulting from a green enterprise architecture for green information systems in an organization:

- ❖ Integration of the new CEMS (Carbon Emission Management Software) with existing organizational systems (typically ERP packages, CRM) using SOA-Web Services interfaces

- ❖ Modification of existing data structures to accommodate new carbon data elements and related contents

❖ Data conversion to enable use of that data in calculating carbon emissions

❖ Populating parts of data and systems with external carbon data (such as regulatory requirements/standards /benchmarks)

❖ Evolution of carbon data through to information, knowledge and environmental intelligence

❖ Evolution of existing decision support and knowledge management systems to environmentally intelligentsystems

❖ Creation of a suite of green services using service oriented architecture (SOA) and Web Services (WS)

❖ Application of mobile technologies to provide location-independence and personalization to the green information portals that facilitate collaboration.

❖ Quality assurance and testing of Green IT systems

Figure 6: views of a Green enterprise architecture

Green Information Architecture

The GIA provides the basis for using enterprise applications, processes, and contents. The semantics for the master data including the green data are defined and the operational and analytical information is modeled in this architectural space. The requirements that influence the information architecture come from the business, information, and enterprise domains. This information architecture provides the context for facilitating integration across various applications. The information architecture also outlines the processes for capturing and modeling requirements. The information architecture also contains a repository of overall applications and their interrelationships. A good understanding of this interrelationship can help eliminate redundancy and eventually also contribute to the reduction of resources.

❖ Green customer requirements that are based on the demands of the customer for green products andservices.

❖ Green marketing requirements that promote the organizations green products and services.

❖ Green supply chain process requirements that interface with the suppliers systems.

❖ Green technical requirements that are specifying the technologies that are needed to handle the Green IT initiative.

❖ Green facilities management requirements that describe the building and facilities infrastructure and the approach for measuring and reducing their carbon.

❖ Green metrics and measurement requirements that specify the elements to measure and report.

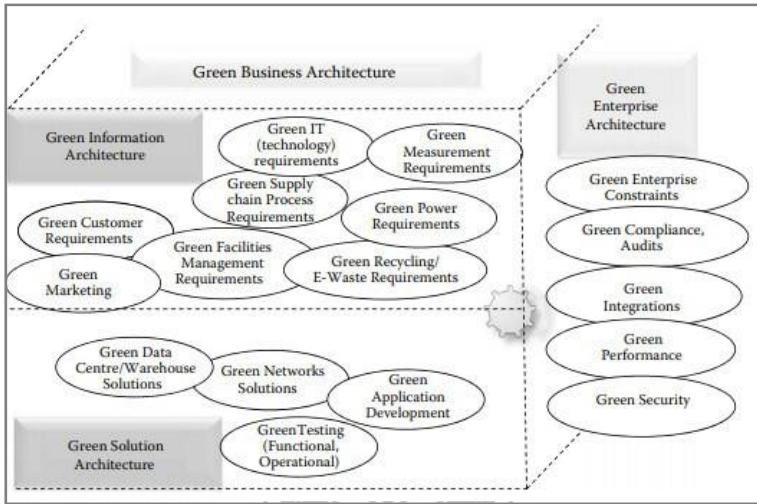❖ Green recycling and e-waste management requirements that deal with the one-off disposal of assets

Figure 7: Categories of requirements of various GEA

A good GEA is a mechanism to incorporate the changes associated with Green IT transformation on the right in Figure 8 into the systems and processes on the left.
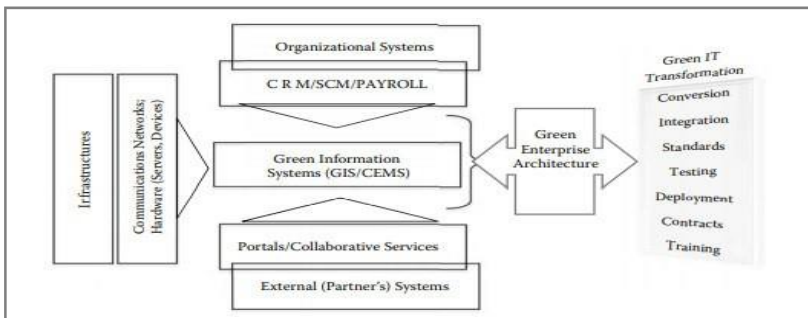

Figure 8: Green enterprise architecture impact

✳ **Organizational Systems -** These are the core systems that are primarily internal to the organization.

✳ **External Systems -** These are not just systems external to the organization, but also external interfaces of the organizational systems.

✳ **Infrastructure -** These are the communication Networks and Servers.

Green Solutions Architecture

✳ **Data:** changes here deal with creation of new carbon data and modification of existing enterprise data.

✳ **Services:** These include the functions, applications, and their use in analyzing green data. Services plot trends, estimate emissions, enable reporting, and create opportunities for collaboration.

✳ **Interfaces:** These are primarily the display mechanism of the services and applications. Figure 9 shows three interfaces as graphic user interfaces (GUI), the reporting and related physical interfaces, and the web service interfaces. They form the front-end of the GSA and enable personalization of services.

Figure 9: Fundamentals of GSA

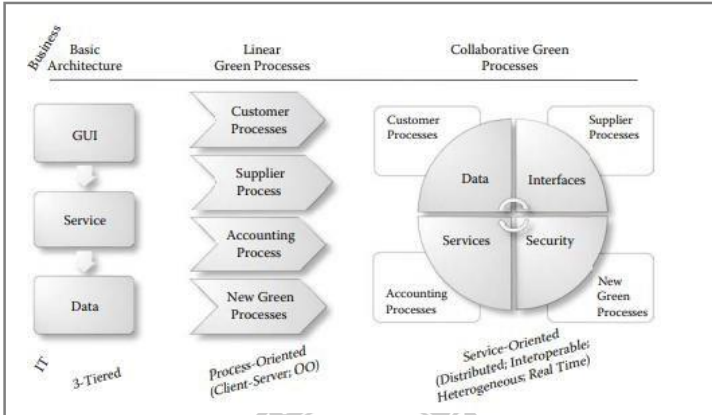## Evolution of Green System Architecture (Basic through Linear to Collaborative)

Figure 10: Evolution of Green System Architecture

❖ A GEA has evolved from a basic base 3-tiered architecture, to a collaborative green processarchitectures.

❖ The data, services, interfaces, and security apply to existing and new green processes in a collaborative manner.

❖ Figure 9 shows a basic architecture which has evolved as shown in figure 10 (collaborative green process) that makes use of concepts of SOA (service oriented architecture) and WS (web services).

❖ The linear green processes would be the typical business processes such as customer, supplier, and accounting.

❖ Linear processes also include totally new green processes within the organization such as counting carbon PPM.

❖ The collaborative processes on the right will include the data, services, interfaces, and security that encompass all the aforementioned processes that are now interconnected through WS.

❖ These collaborative processes are both internal and external to the organization.

Aspects of Green Solutions Architecture

❖ The Green IT solutions deal with internal carbon recording, reporting of carbon externally, implementation of SaaS-based solutions, collaborativegreen services and also technology-based opportunities for new green services.

❖ In order to deal with the aforementioned impact, the solution space of the enterprise uses many technologies.

❖ GEA facilitates incorporation of technologies in the Green IT solutions by providing the right interfaces and models.

❖ Figure shows these technologies as virtualization, Cloud computing, real-time decision making, smart network management, self-healing, alignment, integration, and optimization.

❖ The solutions space has its own internal Green IT framework that encourages the solutions architects and the systems analysts to continuously identify new and emerging technologies, model them to examine their repercussions, and eventually incorporate in the overall architecture of the organization.
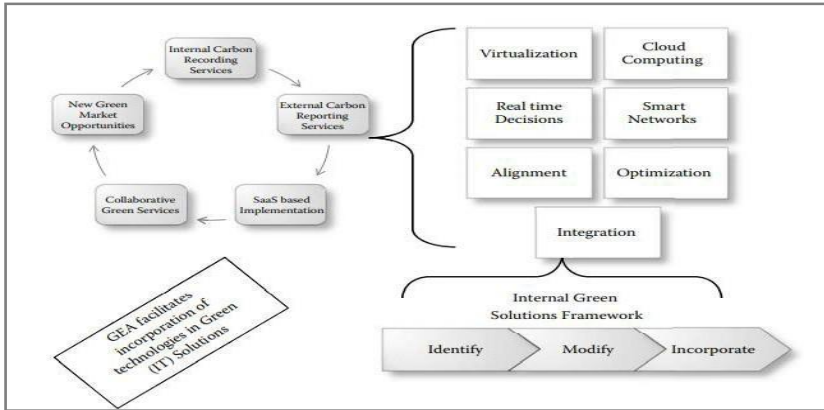
Figure 11: Various aspects of a Green solutions architecture