

IMPLEMENTATION OF DIGITAL TRANSFORMATION OF ENTERPRISES BASED ON APPLICATION INTEGRATION

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ABSTRACT

Application integration is a key component of businesses' digital transformation. It not only optimizes internal operations but also enhances customer interaction and supports decision-making at various levels of management. Despite technical and organizational challenges, successful integration offers significant benefits, enabling enterprises to stay competitive in a dynamic market. To fully realize the potential of digital transformation, businesses must invest in both technologies and strategies for effective application integration.

KEYWORDS: digital transformation of business, application integration, system integration, corporate information systems

INTRODUCTION

Digital transformation is the process by which enterprises revise and adapt their business models to handle changing market conditions and technological advances. Application integration plays a key role in this process, allowing companies to optimize their operations, improve interactions with their customers and partners, and generally increase their efficiency.

The implementation of digital transformation in enterprises raises some questions: from where to start, what are the main objects, what principles should be taken into account and, perhaps most importantly, what methodology should be followed. The answer to these questions is not unequivocal, but the emphasis should be placed on the corporate information system used to manage the main activities of the enterprise and its specific production structures.

1. DIGITAL TRANSFORMATION

Digital transformation requires a strategic and systematic approach where application integration serves as a central component in changing business models to meet changing market demands and technological advances. Enterprises undertaking this initiative face critical questions about the scope, objectives, and guiding principles for implementation. Although the answers may vary, an enterprise information system remains a fundamental component supporting the management of core activities and specialized functions within an organization.

At the same time, it should be considered that modern corporate information system has to be oriented towards the successful completion of every business process rather than just particular tasks. The following distinctive characteristics can be outlined:

- focusing on the creation and effective use of corporate distributed processes to generate management decisions at all levels of the enterprise;
- systematic integration of internal information systems for analysis, evaluation, and forecasting

of all aspects of the enterprise's activity;

- integration and information compatibility with databases and file systems of "old" (legacy) information systems;
- ensuring the reliability and integrity of the data when exchanging information with the external counterparties and partners of the enterprise;
- integration with external information systems related to the enterprise;
- ensuring a high level of reliability in data exchange in online operation 24 hours a day, 365 days a year;
- high flexibility and mobility of applications.

In the present paradigm of digital transformation, the provision of full information support, as well as the extension of information and analytical capacities in the activity of each employee, workplace, department, or other structural unit in the enterprise's functioning, is crucial. As a result, when considering digital transformation processes, it is wise to keep in mind that the corporate information system manages business processes, information movement, personnel activity, and communication with counterparties, and thus forms both the enterprise's business architecture and its IT architecture.

Therefore, the methods for designing and implementing digital transformation must be defined and considered at the level at which the integration of all IT and business aspects is supported. It is determined that corporate information system integration is essential. Integration, often known as systems integration, or SI, is the process of integrating several software systems, their data, and/or components within an organization so that the systems work together as a single unit (Rouse, 2013).

Application integration involves connecting different software systems, platforms, and tools so that they work in sync. This allows:

- Automation of business processes: by automating routine tasks such as data processing and inventory management, enterprises can minimize the time and resources required for day-to-day operations.;
- Better communication: the usage of integrated applications improves the exchange of information between departments, which reduces the risks of errors and misunderstandings;
- Data analysis: the connection between different systems enables the collection of data from multiple sources, which improves analytical capabilities and supports the decision-making process;
- Flexibility and adaptability: the easy integration of new applications and technologies allows enterprises to respond quickly to business and market changes;
- Improved customer experience: the integration of customer relationship management (CRM), e-commerce, and marketing applications, helps companies offer personalized services and improve customer satisfaction.

2. ENTERPRISE APPLICATION INTEGRATION

In the context of the corporate information system, the term Enterprise application integration (EAI) is distinguished.

(Weske, 2012) discusses various EAI approaches. The most basic form of integration is known as point-to-point integration. This integration strategy involves creating connections (or interfaces) between all of the different systems that need to interact with one another.

According to Weske (2012), the next phase in EAI development is integration through a centralized intermediate application integration layer known as the Hub.

The advantages of this technique include a significant reduction in the number of required integration components. Each system that has to interface with the others via the centralized hub requires only one integration component (adapter).

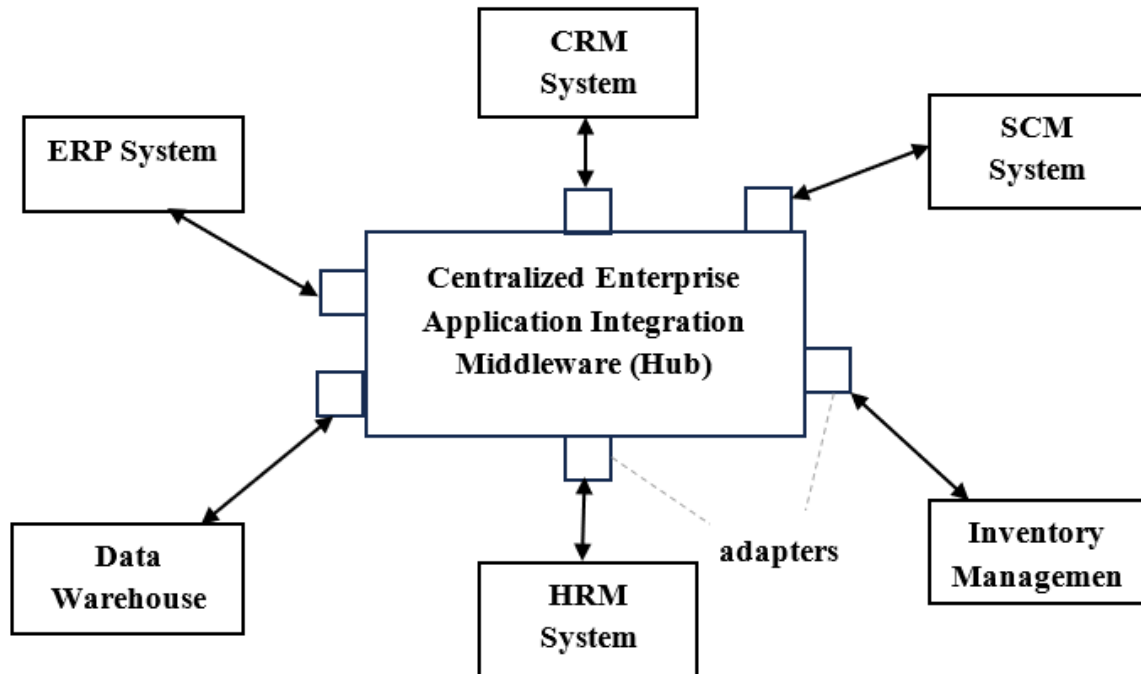


Figure 1. Application integration through a centralized EAI integration layer

Source: Adapted by (Weske, 2012)

The reduced number of adapters is an excellent solution, although it does have certain limitations. One option for improving the technique is to use a message broker. The Message Broker serves in place of a centralized Hub, distributing communication messages amongst various systems. Messages are dispersed depending on predefined rules.

The broker also transforms the sender's data in the messages to match the recipient's data structure. This requires the implementation of a specific transformation and mapping logic, as well as the maintenance of a common data model that allows transformations between and within distinct system models.

The next evolutionary phase is represented by the so-called Service Oriented Architecture (SOA). "SOA is a set of principles and methodologies for designing and developing software as interoperable services. Services are detailed business functionalities built in the form of software components (individual pieces of program code and data structures) that can be reused for different purposes." (Panagacos, 2012).

According to Weske (2012) "SOA is a software architecture that provides an environment for describing and finding software services, and for binding to services."

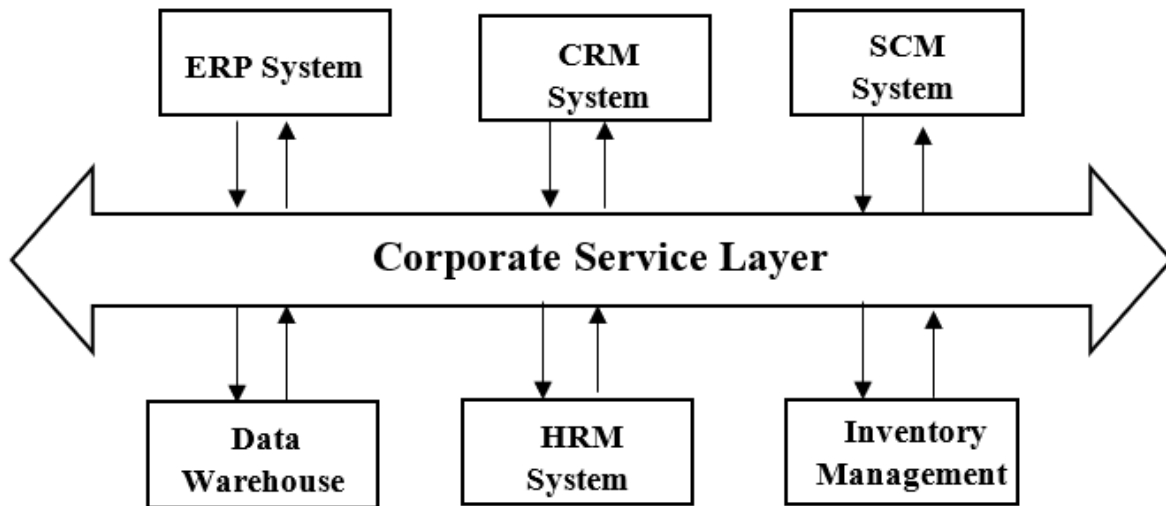


Figure 2. Application integration through a common enterprise services layer

Source: Adapted by (Weske, 2012)

SOA revolves around services. To implement the SOA integration method, the organization's individual corporate information systems must provide a set of services for all operations that other systems can use. This results in the addition of a new layer in corporate information systems: **the layer of corporate services**.

Implementing this method in enterprise systems integration expands the traditional model of using an enterprise middle layer (Barry & Dick, 2013). SOA introduces standardized interfaces for data transfer through services, resulting in the development of so-called open standards and enabling global application integration. In summary, the introduction of SOA enables the growth of business process systems from their basic versions to intelligent BPM platforms that work in full integration and serve as the foundation for the enterprise's digital transformation (Cummins, 2008).

As a result, intelligent business process management solutions are frequently used alongside SOA methodologies. This ensures the flexibility and independence of systems at all levels. The logic of each of the integrated corporate information systems, as well as their physical location, is isolated from the integration services, which allows for enormous freedom when making modifications.

Despite the undeniable necessity of application integration in the process of digital transformation, one must consider the fact that it may encounter numerous challenges:

- **Complexity of systems:** As the number of applications and platforms increases, managing and integrating between them can become complex. Complexity manifests itself in various aspects related to various technical, architectural, and organizational difficulties. The most common is that applications are developed with different technologies, programming languages, databases, and infrastructure platforms (on-premises or cloud). Interoperability between these technologies may be challenging due to protocol or API incompatibility. Another issue is that different applications utilize different data models, formats, and structures, making synchronization and transformation between systems complicated and requiring significant effort to harmonize them.
- **Data security:** The inability to implement sufficient security measures can increase the risk of cyber-attacks. Integration often involves the exchange of sensitive data, requiring the adoption

of strong safety measures such as encryption, authentication, and access control. Systems must comply with a variety of regulations and security standards, which increases their complexity.

- **Cultural change:** Application integration is a difficult process that involves both technological and human aspects. It frequently requires a redesign of existing work processes. This includes training employees to work with the new systems and modifying processes to fully utilize the new applications. They can automate tasks that were previously done manually, requiring additional training or even reassigning personnel to new roles.

CONCLUSION

In conclusion, implementing digital transformation through application integration is critical for optimizing corporate processes and increasing competitiveness. Key approaches, such as the centralized intermediate application integration layer known as the Hub, reduce system connections by centralizing communication, while Service Oriented Architecture (SOA) provides greater flexibility through standardized services that allow seamless integration across platforms. However, some challenges such as the complexity of systems, data security, and cultural change, need to be considered for successful integration. Overall, investing in effective integration strategies and technologies is critical for enterprises looking to maximize the benefits of digital transformation.

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