

Win in the flat world

Business Process Mapping for Enterprise Integration

- Atul Agrawal

Oil & Gas companies are seeking to improve the ROI of their existing IT investments. The enterprise integration paradigm is accepted as a necessary means to reach that goal. The refining and downstream business include many integration requirements within manufacturing management, supply chain management, supply chain integration, ecommerce etc. Furthermore, there are integration issues associated with data, applications, standards, methodology etc. These issues emerge continuously in the path of justifying integration investments or executing successful integration. In fact, most integration initiatives have not completely met their objectives. Business process mapping is one of the methodologies, which can help enhance the success of enterprise integration initiatives.



Downstream business process mapping

The use of business process mapping on a refinery/downstream enterprise integration project. Efficient documentation of all enterprise-wide activities helps to keep re-engineered processes in focus while identifying future scenarios

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Information technology (IT) has provided a tremendous boost to the productivity of the oil and gas industry. However, in the "eco-system" of IT solutions for an enterprise, say a refining company, there are many applications co-existing. Some of these applications are package-based and some are custom built. It has long been identified that it is not possible for one application or one system to meet all the requirements of an organisation. On the other hand, information needs to flow from one system to other to provide the better visibility of data as well as faster and accurate decision-making.

This objective can be met by making the different applications communicate with one other. The concept of information sharing by multiple applications for an enterprise is known as enterprise integration.

The need for enterprise integration has been universally recognised. However, enterprise integration has become something of a holy grail. Everybody talks about it. Everybody accepts the importance of enterprise integration. Everybody implements less or more of it. Still, all the implementations of enterprise integration have not really resulted in great successes.

One of the methods, which is being used increasingly to design and implement integration projects, is business process mapping. Business process mapping is the documentation or act of documentation of the activities, which the business users perform so as to execute a business operation.

The downstream industry is a complex business (Figure 1). The business consists of multiple businesses: automotive fuels, industrial fuels, petrochemical and feedstock, lubricant and feedstock, etc. There are critical application integration requirements in the downstream business. One such area is refining. It has been identified that if the refining applications are integrated, the decision-making in the refinery operation can be improved. The applications

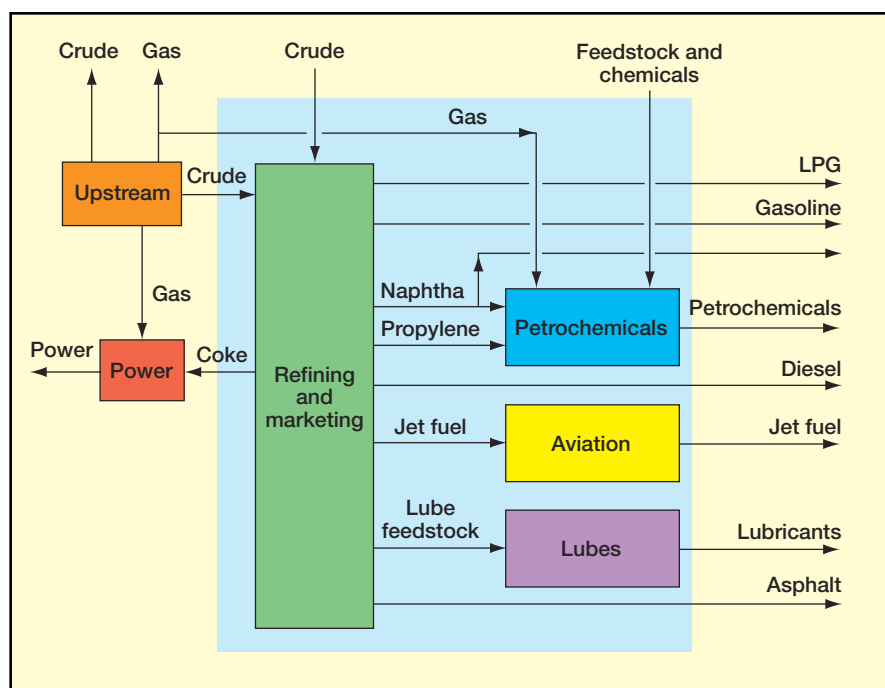


Figure 1 Downstream enterprise integrated complex

which need to be integrated for a such a scenario include online applications like control systems, plant information systems, data reconciliation, advanced process control, laboratory information, refinery optimisation, refinery scheduling and refinery planning and off line systems like steady state simulation systems, kinetic models etc. If these systems can communicate or "talk" to one another, the refinery operations can be improved significantly.

Another area is the supply chain, where integration is very important. Traditionally the complexity of the supply chain has resulted in defining and optimising localised supply chain processes. For example, the refinery processes are optimised for made-to-stock processes while the processes in the refinery businesses like aviation fuel etc, are optimised for order-to-delivery processes. However, it has been identified that to improve the profitability of refining and its downstream businesses,

the business process of make-to-order needs to be implemented. The IT applications are still implemented for the localised supply chain processes. In such conditions, enterprise integration becomes critical to implement the global supply chain process made-to-order. This is just one example of enterprise integration in refining business.

Integration scenarios

The refinery business integration imperative throws up multiple scenarios. Some of the scenarios are functional integration, geographical integration, business integration, supply chain integration etc.

The scenario of functional integration is like a vertical integration. For example, if we look at the manufacturing management for a refinery, there are various online and offline systems like distributed control systems (DCS), plant information management systems, laboratory information management systems, data

reconciliation systems, advanced process control, real-time optimisation, steady-state simulation models, reactor kinetic models, etc. These systems need to share a lot of information. An example of the functional integration scenario would be integration of all such manufacturing management applications.

Another scenario is that a refining company may have multiple refineries. These refineries might be using the same or different systems for the similar business processes and the consolidated information might be required at one or more places. For example, a refinery planning process, which may be carried out at the corporate office, would require operating as well as plant performance data from multiple refineries. This is a geographical integration scenario.

A refining company may have created multiple business units like manufacturing, retail, aviation, petrochemicals, lubes etc. These business units may be using different systems, for example, to meet their ERP requirements. Or even if they are using the same system, the business processes may be different. Still, their businesses are linked as their supply chains are linked. This integration scenario is an example of business integration.

The need to improve the supply chain performance brings cross company integration. A company may need to integrate systems with suppliers and/or customers. Typically, web commerce applications are example of this scenario.

Another scenario is integrating horizontal process integration. One such example is health, safety and environmental (HSE) integration. There are not many specific applications for health, safety or environment. Many of the existing applications take care of these as well. Like product safety information, features would be built into a production lifecycle management system or specific MSDS application. Equipment safety information is available in maintenance management systems. It is frequently required to integrate all this information from an assessment or reporting perspective.

Information availability

The essence of integration is in making information available across various applications. The information availability results in quicker and better decision-making and this brings benefit for the organisation. The actual act of integration is providing data movement from one application to another application. Functionally there can be three types of integration: data integration, user interface integration and business process integration. In a data integration sce-

nario, the data, which is being stored in one application may be required by other applications. The data in such cases would be replicated in more than one database. This is the most common scenario. The benefit of such an integration is that it can be implemented quickly. The disadvantage is that data needs to interchange many times and is stored at multiple places. The users can still access their system. Also it may not be adequate as all the systems cannot store all types of data. The data transfer from a DCS to a RTDBMS (real-time historian) is an example of one such integration.

User interface integration is mostly required to generate a uniform view, or to provide a common interface for the users to access data from more than one application. The advantage of this scenario is that it meets users' requirements, data transfers take place on a need basis or the user can access multiple systems. The disadvantage is that a lot of data needs to be processed before it can be used and the processing needs for different users would be different. For example, a trader may require looking at inventory positions as well as delivery schedules on a "same-user" screen. The user interface would access these data from more than one application.

The business process integration scenario is a more complex scenario. Many (in fact most) business processes are distributed across multiple applications, across multiple users and multiple companies. This looks at enterprise integration in a more holistic manner. In fact, most of the scenarios are business process integration scenarios and it pays to consider them as such. The data integration and user interface integration scenarios are built-in in this analysis. The advantage is that integration becomes smooth and durable.

Users can have access to business processes of other systems. The disadvantage is that it takes more effort and time to design and implement such integration. Also, it may need significant changes in the existing systems or applications. For example, a spare part procurement process would be running through a CMMS system, ERP system, an e-procurement system and ERP system of the vendor. A maintenance manager, procurement manager as well as the sales manager of the vendor use the sub-processes. In reality, a user is best served by considering the business process integration as the scenario.

Integration issues

Integration, though highly desired is not always successful. The issues can be grouped as data, application, automation, standards and methodology issues.

The data issues arise as data may need to be corrected/validated/processed before it moves from one application to another. Some of these issues can be easily resolved but some cannot be so easily resolved. For example, the issues related with real-time vs. transactional data. This is the challenge of integrating the operations data with business data.

The operational systems produce time-stamped data like rate of production while business systems need transactional data like production during a shift or a day. The time stamped data needs to be aggregated before it can be sent to business systems. A good yield accounting and data reconciliation system can be used to accomplish this. There still might be some issues. For example, in one such case the issue was that business systems needed the data for the complete transactions during the day while the yield accounting system was unable to provide such data.

The realisation of integration is through the integration of various applications. The application issue could be related to the first time implementation of integration, or integration continuity or life cycle. One of the common problems is that all the applications are not sufficiently open or have adequate interfaces so as to talk to other applications. The more complex integration issues arise when the applications are modified or upgraded. Any such activity is commonly done without considering the integration perspective.

With respect to automation issues, the reality is that not all business activities are fully automated. There are manual activities in any business process. The extent and type of manual activities differs among various applications.

There are standards issues related to the nomenclature as well as data attributes of various functions. For example, a standard item like a purchase order may contain different data fields in different applications. When the purchase order information moves from one system to another, there are data transformation issues.

Methodology issues are probably the most important issues. Most of the time, the methodology is very specific to the immediate integration requirement. Most often, the methodology achieves integration by data integration and does not pay enough attention to the business process integration. Many a time a methodology recommends modification or decommissioning of existing applications and implementation of new applications for the sake of integration. This increases the cost of integration project and makes justification more difficult. The methodology needs to take into account all the above issues

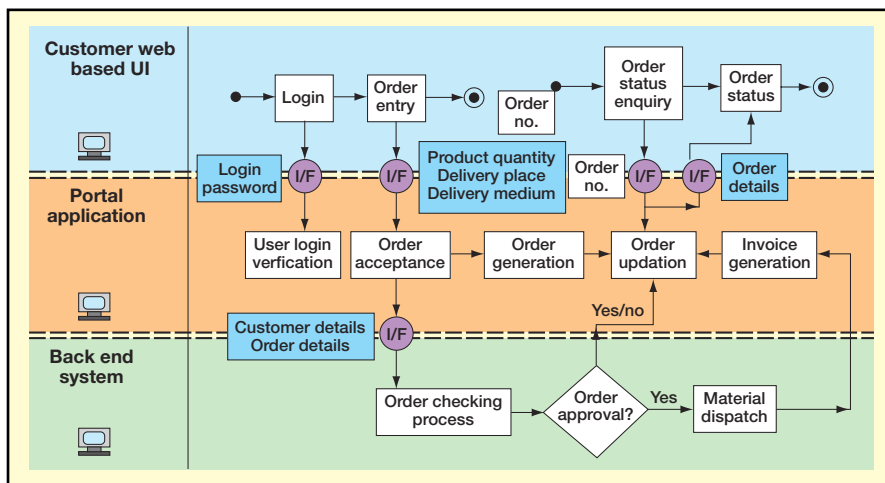


Figure 2 Example of business process mapping for an order-entry and status-checking process within an e-commerce scenario

as discussed above and need to consider the broader perspective in view of the life cycle of the integration itself.

Business process mapping

A business process is a set of activities which need to be performed so as to execute a business function such as a purchase order generation, customer order fulfilment etc. A business process can be very elementary, like a sales person taking a sales order or can be very complex (making an investment decision). A human being can perform these activities or they can be automated and performed by systems. In reality, all the business processes are linked together and most of the business processes run across users and systems.

The business process mapping exercise identifies and segregates business processes and documents them. A business process representation may consist of a start, a set of sub-processes or actions and an end. These sub-processes are transformation of data, decision-making etc. The sub-processes can generate other business processes and thus all the business processes get linked together. Figure 2 shows an example of business process mapping for an order-entry and status-checking process for an e-commerce scenario.

Methodology

The business process mapping methodology is now being extensively used for enterprise integration projects. The business process mapping can be used for the selection, design, implementation and maintenance of enterprise integration. The common business process maps can be used in the entire life cycle of the integration. As (and when), the scope of business changes, the process mapping may be revisited for the integration maintenance.

The methodology for creation of the

business process maps (Figure 3) for integration is as follows:

The first step is to identify the objective of the exercise – which business, systems or processes are the target of integration. The business processes for these should be mapped on a high level independent of the systems where they have been implemented.

The next step would be to generate more details of the business processes and create “swim-lane” diagrams across users and systems.

These detail processes should identify the sub-processes/activities, which generate or need data/information from the activities of other systems. These sub-processes may be termed as events

The next step would be to identify the data, which need to get transferred as well as the formats both on the outbound and inbound side. This would provide an opportunity for re-engineering. Once data integration requirements for activities for various users and systems are identified, the changes can be made in the business processes to meet these requirements in the optimum way. After the process re-engineering is done, the entire events and data interface can be identified and listed

The succeeding step would be to identify data transformations. This would complete the business process mapping.

In the integration project, these maps can be used for modification and selection of the business applications as well as the selection and design of the interface / middle ware. This article does not go

into the extensive methodology of carrying out the same.

Case study

An oil and gas company's downstream business has been divided into strategic business units: refinery and marketing, aviation and lubes. The aviation business is sales and marketing driven and the order is executed by the refining and marketing (R&M) business. The R&M group outsources logistics processes to a separate strategic unit who plans and schedules deliveries for both primary distribution and secondary distribution. The objective is to integrate the aviation business and to provide order fulfilment visibility to the aviation business user.

A business process mapping exercise was carried out for such a scenario. The scenario was a complex scenario. The aviation itself was a global business following uncommon business practices. It then had to obtain data from the R&M business as well as the logistics unit.

These units had multiple systems across multiple geographies. There were data issues, such as which data was more accurate. Automation issues were also present. For example, when to ascertain that delivery has taken place. There were standards issues as well, such as the contract format and customer order fulfilment terms. The methodology identified

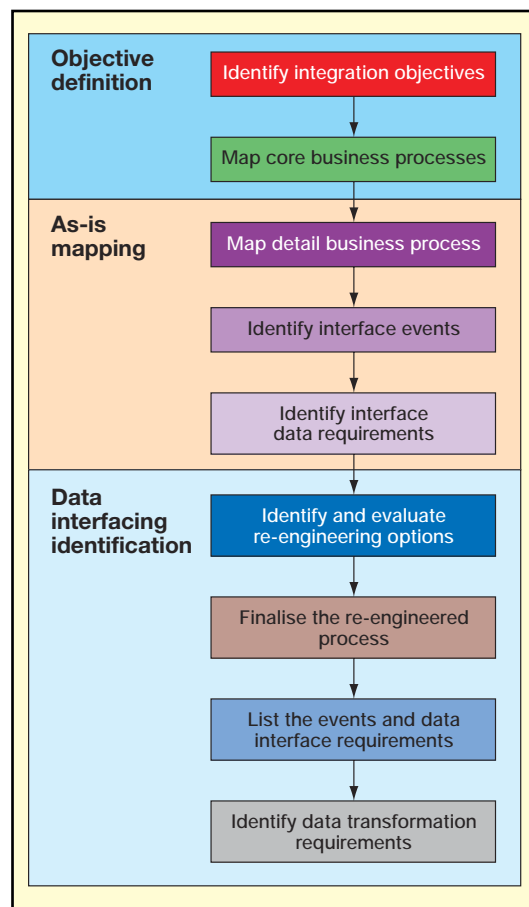


Figure 3 Methodology for creation of the business process maps

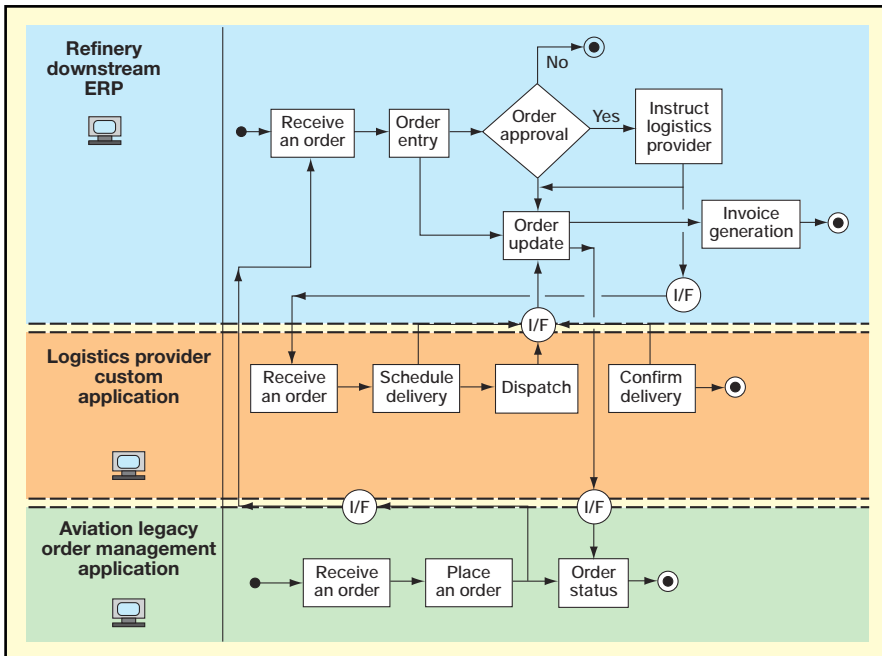


Figure 4 Refinery and downstream enterprise business process map

that the scope of the actual data integration is not large, it should be considered a business process integration exercise. It was also identified that the integration would not happen as a “big bang” project but it would be an ongoing exercise. It was identified that the business process mapping exercise would map the entire integration scope and when the specific applications integration exercise would happen, the business process maps would form the basis (Figure 4).

Framework

Infosys has created its own framework “influx” for business process mapping, which has been used for many projects. The framework uses five models (Figure 5): organisational model, locational

model, collaboration model, interaction model, workflow model and data-interchange model to carry out the business process exercise.

The organisation model is a view of various business organisations, departments within those organisations, their reporting structures, responsibilities etc. For an integration business process mapping exercise, it becomes useful to identify all the business involved and their internal structures and responsibilities.

The business location model provides a view of various geographies where the various business departments operate. In an integration exercise, this is used to identify locations of applications or systems where they are implemented.

Business collaboration models profile

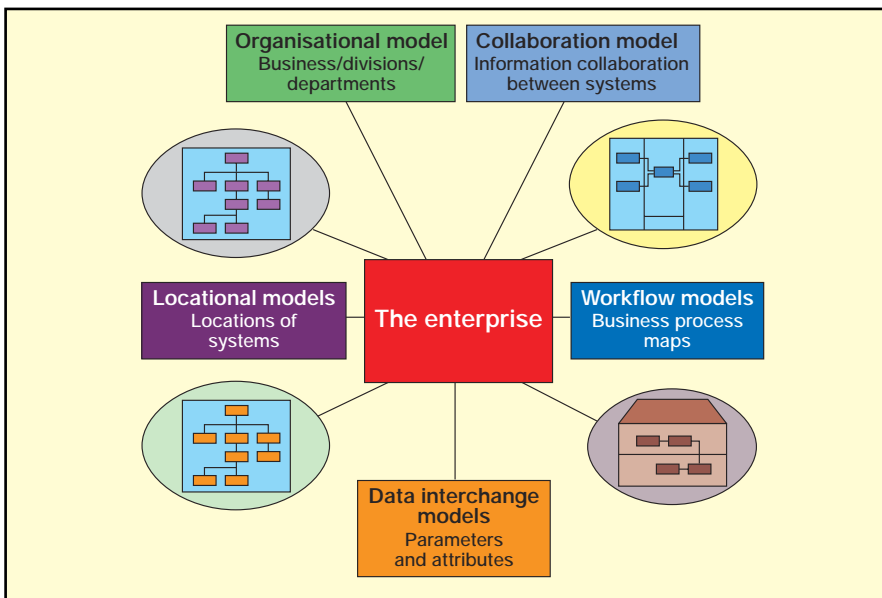


Figure 5 Framework for business process mapping based on five models: organisation, location, collaboration, interaction, workflow and data-interchange

a business domain showing interactions among business participants and business segments in which they operate. Here the systems, which need to interact with each other are identified including high level data transfer requirements. These models are the starting points for the work-flow models.

Business work-flow models are maps or depictions of business processes that show the sequence of constituent business activities and the participating systems where they are executed. All the activities performed by each participant are depicted in a swim-lane. These activities are linked together in the order of execution of the workflow. For an integration exercise, workflow models identify the data interchange points between various systems.

The data interchange model lists the data parameters and their attributes, which need to be transferred between different systems or users.

Benefits

The benefits of integration are considered to be a given and need not be enumerated here. The business process mapping methodology brings a lot of benefits for the integration projects and helps to ensure the success of the project. The key benefits can be listed as follows:

Integration success. The business process mapping methodology helps to clarify the scope of integration. It also keeps the focus on the business processes and business users and aligns the business objectives with the integration objectives.

Technology/platform independent. The business processing mapping methodology can be technology independent. Thus, the actual business users can map the processes, identify the integration requirements and recommend the functional specifications.

Minimising investment. The methodology provides an assessment for both business processes and integration scope. Thus, it provides an opportunity to identify the integration opportunity vis-à-vis existing systems, which are adequate in providing business functionalities.

Interface selection and design. There are many middleware/interfacing technologies available in the market and the right selection is not always easy. The business process mapping methodology helps to identify the functional requirements of the middleware technology.

Integration issues resolution. The business process mapping provides an ideal opportunity to identify or resolve integration issues. Thus, it helps to avoid issues, which may compromise the success of the integration project.

Incremental integration. Many times, it

is thought that a big bang integration approach is the most pertinent approach. This is not always the case. The business process mapping methodology provides an approach where integration requirements are identified on a holistic basis while the actual integration could still be incremental and partial.

Business solution. Integration is frequently considered a technical requirement and the technical solution becomes the basis for selection, design and implementation of integration. This does not take the business consideration into account. The need is to identify the business needs of integration and provide solutions for those identified business needs. The business process mapping methodology considers the integration issue as first and foremost a business integration issue on which the technology solution should be implemented.

Business process re-engineering. One of the key benefits of this methodology is that it identifies opportunities for business process re-engineering. An integration project in reality is successful if the users are able to execute the same business process in more efficient and productive ways. Thus, the success of the integration is inherent in re-engineered processes. The business process mapping methodology keeps the re-engineered process in focus and helps to identify and evaluate the to-be scenario after the integration project.

Conclusion

Organisations are looking at improving the return on investments on their existing IT investments. The enterprise integration paradigm is accepted as necessity to be able to achieve that. The refining and downstream business has many integration requirements in manufacturing management, supply chain management, supply chain integration, e-commerce etc.

There are integration issues related with data, applications, standards, methodology etc. These issues come in the path of justification for integration investment or success of integration. However, the integration projects have not always been their objectives completely. The business process mapping tool is one of the methodologies, which can help to improve the success of integration initiatives.

Business process maps provide a basis for scoping, selection, design, implementation and maintenance of the integrations through applications and interfaces. The benefits of use of business process mapping for integration projects include improved success changes, longevity and durability of the integration architecture, reduced total cost of ownership, incremental integration scenarios, focus on business solutions rather than technology solutions and implementation of business process engineering along with project integration.

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