

ArchiMetal case study

Technical report

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Aim of the ArchiMetal Case Study

Enterprise architecture (EA) is defined as a coherent whole of principles, methods, and models that are used in design and realisation of an enterprise's organisational structure, business processes, information systems, and infrastructure. This study illustrates the usefulness of EA instruments, in particular ArchiMate 1.0 modelling language, for the analysis and transformation of a fictitious company from metallurgic industry named ArchiMetal.

The fictitious company ArchiMetal used for this study is largely a simplification of what one would expect to see in a real-world enterprise. While reducing the complexity was required to keep the study simple and illustrative for the given goal, an effort has been made to keep the study as realistic as possible.

A scenario of the operational business improvement within ArchiMetal is discussed, and a number of models documenting current and target architecture is elaborated. Within this scenario, the focus is put on integrating and sharing the customer data across some key sales processes, with the aim of optimizing the coordination and decision-making across these processes. The redesign of several processes is suggested, and the rationalization of the application landscape discussed. These suggestions are not to be considered as the best practice, nor as the optimal solution for the described organisational situation. Instead, they only define the context in which the usefulness of EA is being illustrated.

Having the focus on a high-level architecture modelling, ArchiMate models enable better overview and understanding of the coherence between processes, applications and infrastructure in a given business context. The elaborated models can be used as a support for analysis, communication, decision-making and operationalization of the organisational changes.

Though the attempt has been made to understand the specificity of the business within the steel making industry, reviewed publicly available material was still not sufficient to design a domain-specific study. Hence the processes discussed are more or less generic business processes of any company. Additional reading and in particular work with domain experts would be necessary to make the study reflect the specificities of the metallurgic domain.

Background Information

ArchiMetal is a mid-sized European company whose core business activities consist in providing steel products for the construction sector (e.g. wires and wire products, pipes, shapes, rolled sheets, billets etc.). The Company has mastered the technology for obtaining high-quality flat steel products required by the automotive industry, and has recently joined this market. The management desires to develop Company's position on the market of automotive suppliers, and thus focuses on sales maximization and delivering of improved customer services.

Table 1 ArchiMetal's products

Market	Type of product
Automotive	Flat sheet
Construction	Wire, pipes, rods, bars, rolled sheets

ArchiMetal's operating model promotes great degree of the autonomy of its business units, which function as profit centres. The Company's business units include headquarter (HQ), one production centre (PC), and the network of distribution centres (DC) responsible for sales and providing services to customer. While the production is located in Poland, the sales/distribution network is located close to the customers: DC Spain and DC Benelux serve the Company's construction-sector customers, while DC East Europe in Romania covers the customers in the automotive sector, located mainly in Eastern and South-eastern Europe. HQ located in Luxembourg is in charge of the company management, finance, quality management, product development and HR.

Current business architecture and challenges

HQ (Finance) defines Company's pricing strategies, credit risk assessment procedures and rules. These have to be followed by all the DCs, for client contracting and selling of products, and also by PC, with respect to establishing prices by which final products are sold to Company's DCs.

DC's Customer relations function takes care of establishing and maintaining the relationship with the customer. Its responsibilities include: contracting and performing credit risk analysis of the customer, managing customer master file, handling customer claims and assuring the collection. The sales function is responsible for sales activities, including handling customer orders from their registration in the system until the invoicing, which is the responsibility of the Finance function. Distribution function is in charge of transporting the finished goods to the customer.

PC manages the procurement of raw materials, production, warehousing as well as the distribution to regional distribution centres. PC is selling Company products to its DCs, under the prices following the Company’s pricing strategy. The Sales function handles the orders from DCs, and shares this information with Manufacturing and Shipping functions. The sales function is also responsible for sales forecasting activity. The Procurement function regards processes related to supplier selection, negotiation and contracting as well as processes of planning, ordering and admission of raw materials to the warehouse. Its activities strongly rely on the information created by Sales and Manufacturing. The Warehousing function is responsible for maintaining both inventory of raw materials and finished goods. The scheduling, execution and controlling of production are the responsibility of the Manufacturing, and the fleet management, planning and realization of the transport of finished goods to DCs.

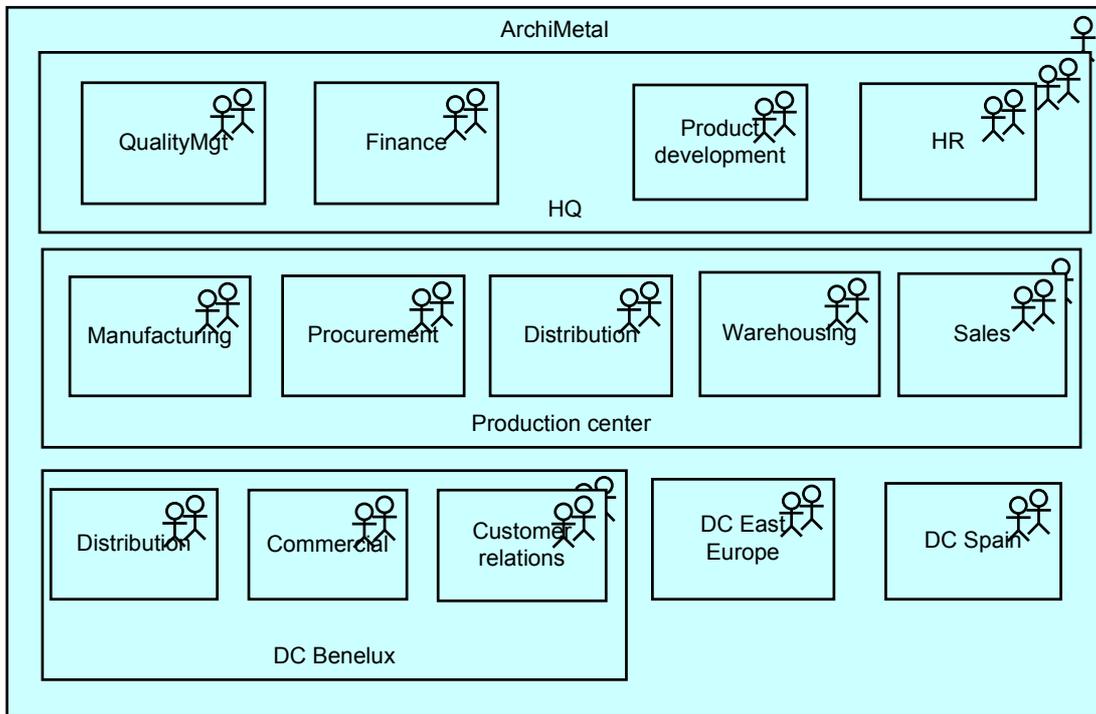


Figure 1 ArchiMetal organisation

Business challenges

The management desires to develop Company’s position on the market of automotive suppliers, and thus focuses on sales maximization and delivering of improved customer services. The management’s main concern regards the timely order fulfilment: some occasional cases of non-timely fulfilment are known in the past, in addition to failure to inform customers in timely and accurate manner about the causes of nonfulfillment, status of the order and adjusted delivery estimates. For these reasons, the analysis of the business has been performed, focusing but not being limited to the sales function. The major opportunities

for increased coordination and efficiency, and for improving customer services, discussed in the following text, have been identified.

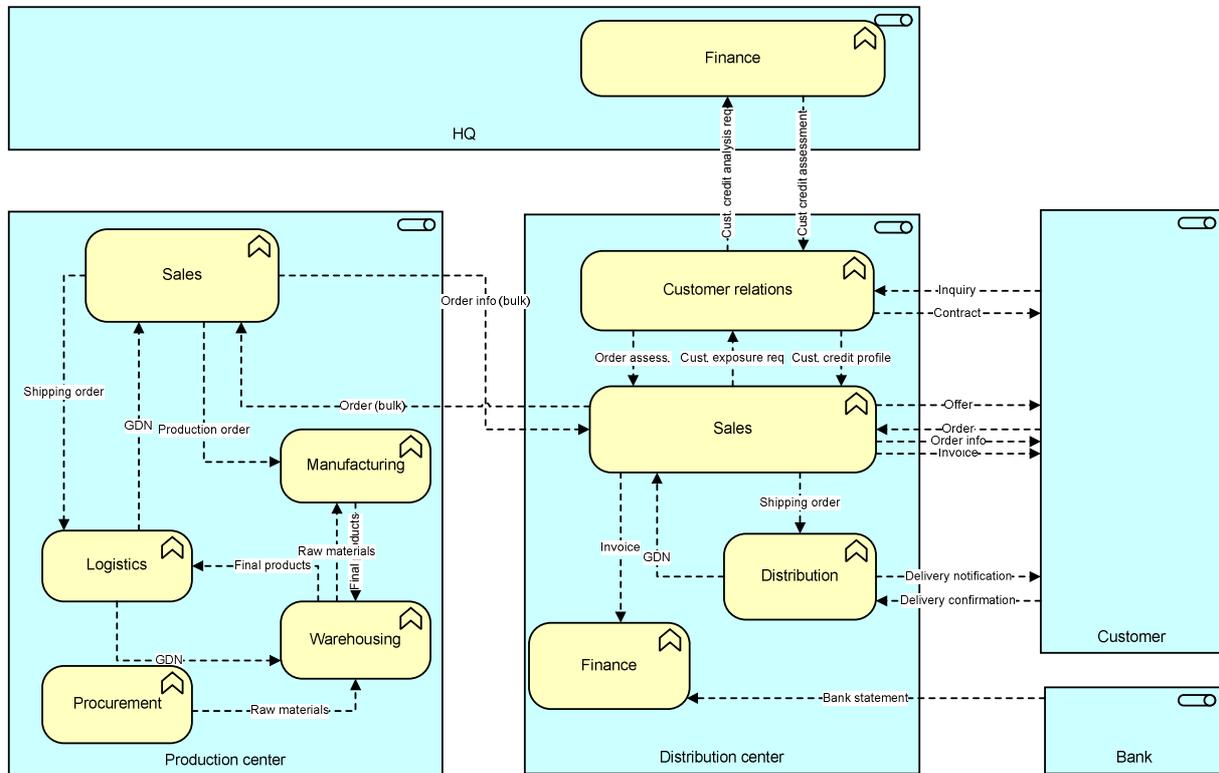


Figure 2 Relevant information flows between business units

Maximization of average revenue per customer

For optimizing the sales performance, and especially for effective market segmentation strategy, one of the important prerequisites for the Company is to have a global view over the customer. This enables to better know the customer, understand his needs and behaviour, and to effectively perform client profiling. Currently, however, the global view over the customer is difficult to obtain, because the **customer master file does not exist**, and there only exist regional customer databases and applications, not interfacing between themselves. In addition, the structure of these databases is not defined at the corporate level, but rather left to the decision of DCs, which means that potentially different data sets on Company customers are kept in DCs. This induces the risk that not all data important for decision-making in HQ be available in regional customer databases.

Furthermore, several sales processes in the Production centre do not have any visibility over the customer, as communication between distribution network and the Production centre relies on exchanging bulk orders, which group daily orders' products and quantities. These bulk orders do not share any information on the customer placing the order from DC to Production centre. As in addition there is **no defined rule**

for unique order identification across the Company, tracking and analysing customer's behaviour is very difficult. Altogether, this situation does not enable the Company to identify and timely prepare for the future demand of its most significant customers. Sales forecasting should be performed based on relevant, sufficient, accurate, and timely information.

Sharing integrated customer data company-wide creates the opportunity to **enhance the risk management** within the sales, in particular with respect to monitoring of the diligent application of credit risk policy, pricing policy, and collection processes by distribution centres. Current lack of single view of customer introduces the risk of unreliable credit risk assessment (e.g. one DC may accept the customer who already showed in the past the problematic behaviour in relationship with another DC, such as not paying his orders). In addition, each DC decides on the client acceptance on its own, the HQ is not able to control the application of credit risk policy, other than for the exceptional cases being raised up to the HQ (e.g. customers potentially exposing the company to the significant risk). Having the centralized customer master which includes all these relevant data would enable more transparency and better control of the application of these important policies.

Business processes coordination

As identified, better customer services should be developed on top of better coordinated processes, especially through increased data transparency and integration of applications supporting processes, in particular:

- When it comes to **order registration and processing**, several inefficiencies are identified. Bulk-orders based communication between PC and DCs does not include complete transparency over customer and customer order information. As a consequence, customer order is not visible in PC systems immediately after it's placed, and customer order data is partially duplicated in different order management applications, in DCs and PC. This lack of complete and timely customer order information may negatively affect the production scheduling, and subsequently the overall lead time to customer.
- The lack of visibility over customer and its individual orders content prevents PC's sales function from using historical data for the **forecasting** purposes in the most effective way: PC sales can't analyse which customers are ordering which products and can't predict based on the historical information which products would continue to be ordered, which products the customer may need in the future, or which ones may no longer be needed etc.). Likewise, this situation inhibits **effective marketing** and **customer management** to drive the sales (i.e. average revenue per customer). Furthermore, sales forecasting is done by the PC for the purpose of **production (and procurement) planning and optimization**. Currently the sub-optimal sales forecasting causes, on one hand, the ordering of raw materials by sub-optimal approximation of quantities. This leads to either exceeding minimal stock levels or not satisfying them. If too much of raw material is ordered, capital is tied. If not enough material is ordered, the production scheduling is affected and the overall lead time (to customer) is increased. On the other hand, optimized sales forecasting is necessary to eliminate the discrepancy between production and demand: based on

that forecast, the Company would be able to adapt its portfolio of products as well as the quantities of products being produced (optimization of the production), e.g. plan to stop producing products that are not being sold, plan to increase the production for those predicted to have the increased demand etc.

- Without unique view of a customer at the company level, it is difficult for the company to **monitor receivables per customer**. The information regarding total amount of placed orders per customer and total customer debt (for invoiced but still not paid orders) is only established locally by DCs, and HQ finance function does not have insight into customer analytics nor in the quality of receivables management activities. Risks arising from this are in the areas of enforcing company's credit policies, timely collection etc.

Customer service and relationship management improvement

In order to develop and keep the loyalty of its customers, ArchiMetal has to constantly improve its customer services. Besides sharing the customer data across the company, one of the key elements with this respect lies in better coordination of processes from the acceptance to delivery of the customer order. This would build the foundation on top of which advanced and innovative customer services could be developed, such as e.g. information services for real-time order status tracking, service for prioritized order placing and so on. As previously discussed, **the lack of company-wide visibility on customers and their behaviour** with respect to ordering, payments etc. prevents the company from building that foundation.

Relevant business processes and application usage

The schema below gives an oversight of the most relevant services ArchiMetal provides to its customers (through its distribution centres), and thus pinpoint the most relevant business processes for this analysis. In line with identified challenges, the analysis focuses on the processes covering “outward” part of the supply chain, that is, those relating to customer relationship management and order handling.

Because distribution centres act under profit centre principle, they have a good degree of the autonomy in executing the business. Their main capability resides in knowing the regional context, and thus having business processes adapted to regional specificities, while still respecting key rules and procedures of the Company. As a result, the business processes of DCs are not (fully) standardized, and some differences between them exist.

Throughout this study, the processes of DC Benelux will be presented and analysed. These processes would serve as the illustration/guide on designing and implementing the change in other DCs with the help of models. Where DC should appear on the models, it is to be read as DC Benelux.

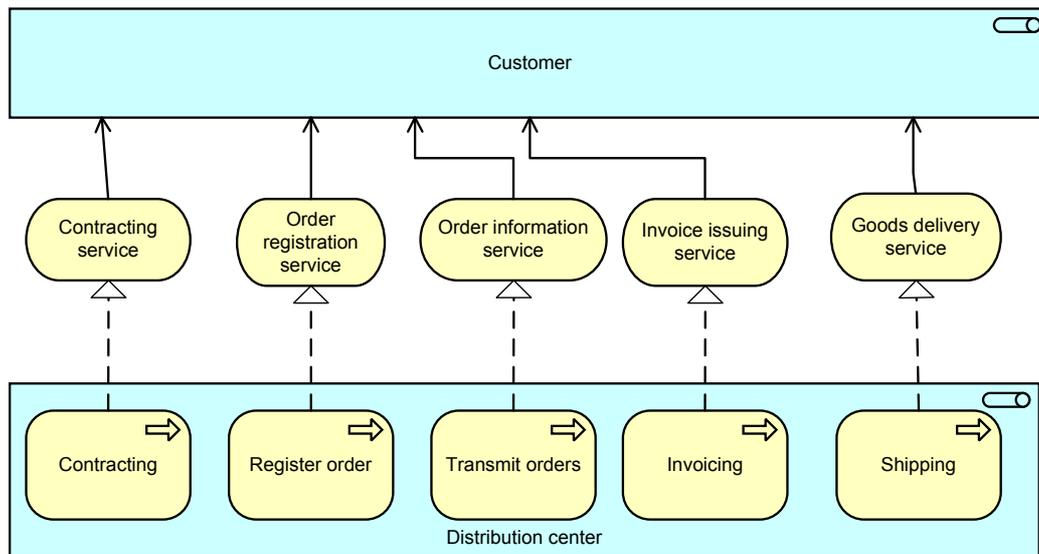


Figure 3 Customer services

Contracting

ArchiMetal's distribution centres have the autonomy in contracting with clients. They have to respect the company's credit risk policy, as well as the pricing policy, but both of these are designed to leave a good degree of the autonomy to DCs. Credit risk policy defines the conditions under which the client can be accepted without having to ask for the opinion of HQ, and the pricing policy entitles DCs to maximum of 5% discount mark-up when determining the pricing applied with the particular client.

Customer credit analysis is initiated in DC, which decides on customer's acceptance, under requirement that customer risk analysis is performed in accordance with company's credit risk policy. In particular cases defined by the company's policy, DC needs the approval of the HQ. (See Evaluate credit risk). The established customer credit profile and rating serve as the basis for defining allowed credit limit, payment terms and pricing policy to apply to the new customer, which is formalized in the contract with customer.

Each DC has its own applications and regional databases for customer information. On top of non-existence of customer master file, the structure of these regional databases is not standardized. Therefore potentially every DC maintains a different set of customer information, and there is a risk that the data important for decision-making in HQ may be lacking.

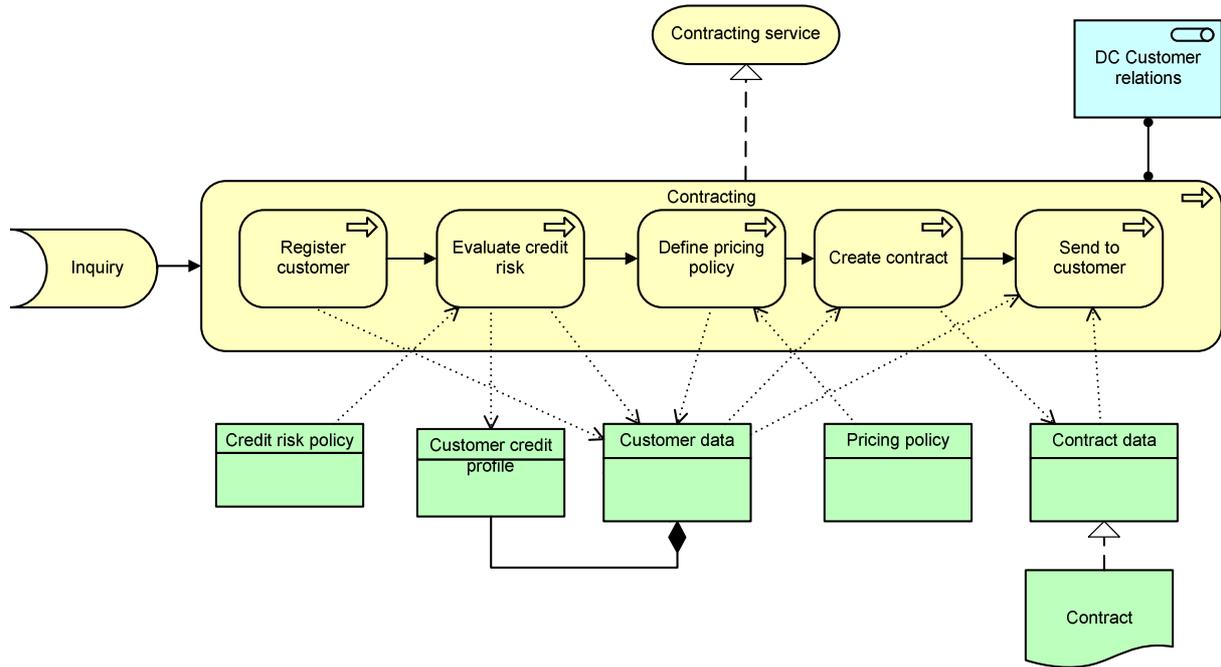


Figure 4 Contracting process

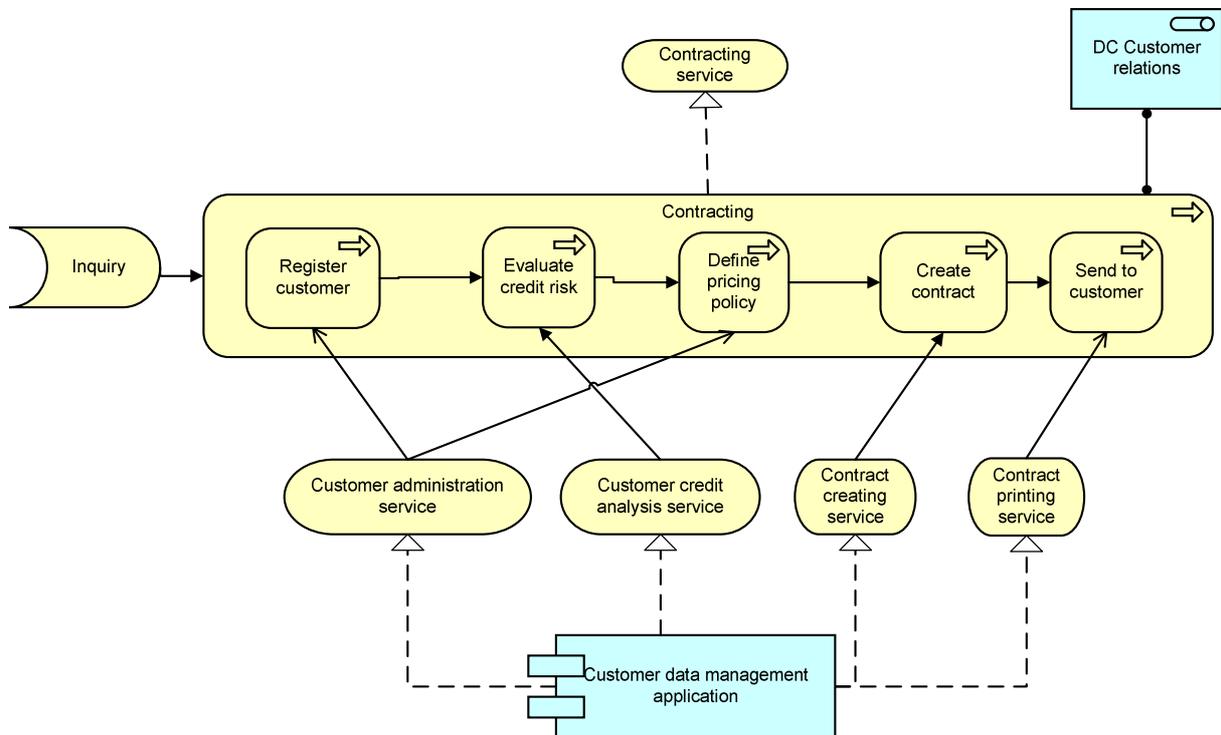


Figure 5 Applications usage by Contracting process

Evaluate credit risk

Customer credit analysis is initiated in DC, by establishing customer's initial profile, based on the available customer-related documentation. DC decides on customer's acceptance, under requirement that customer risk analysis is performed in accordance with the Company's credit risk policy.

However, as defined in this policy, DC needs the approval of the HQ in the case of risky customers and/or significant orders. In that case, the additional assessment and approval is asked from HQ.

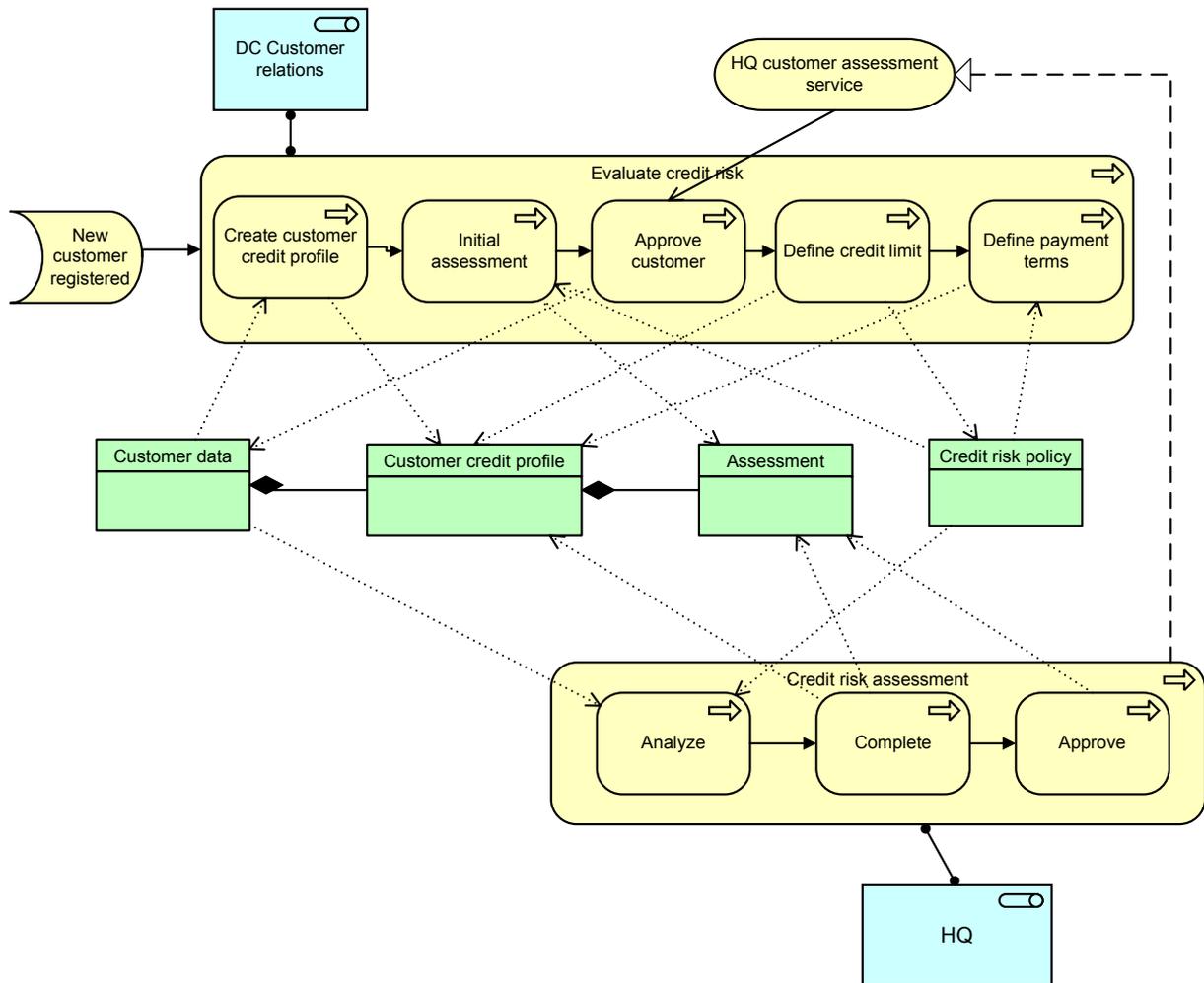


Figure 6 Evaluate credit risk process

Because DC manages the acceptance of clients autonomously, the HQ is not able to control the diligent application of credit risk policy, other than for the exceptional cases of potentially exposing the company to the significant risk (which are currently being risen up to HQ, respecting the applied procedure).

Register order

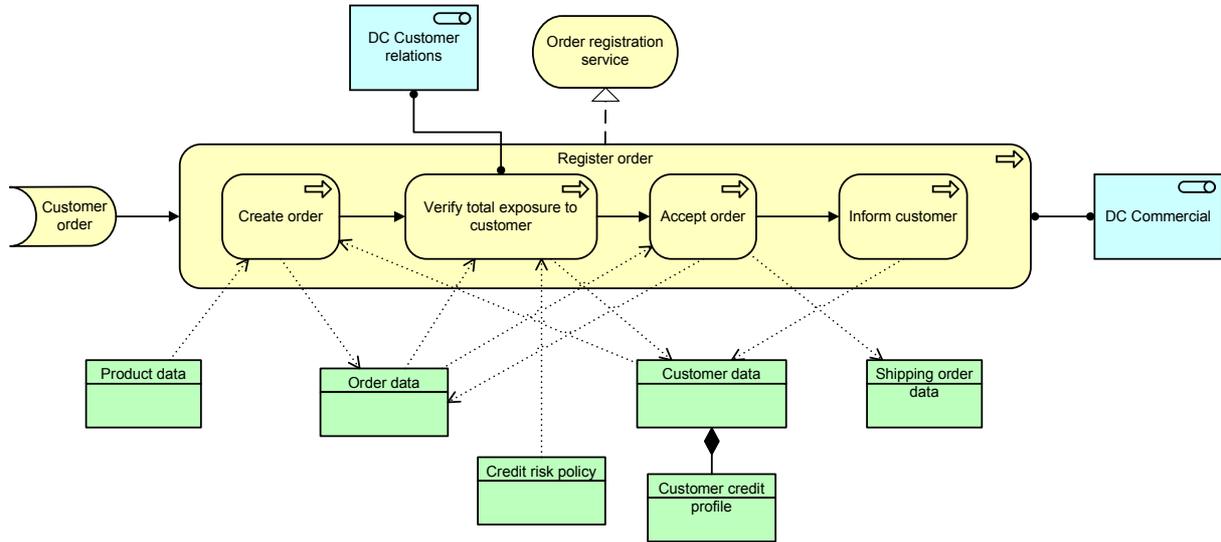


Figure 7 Register customer order process

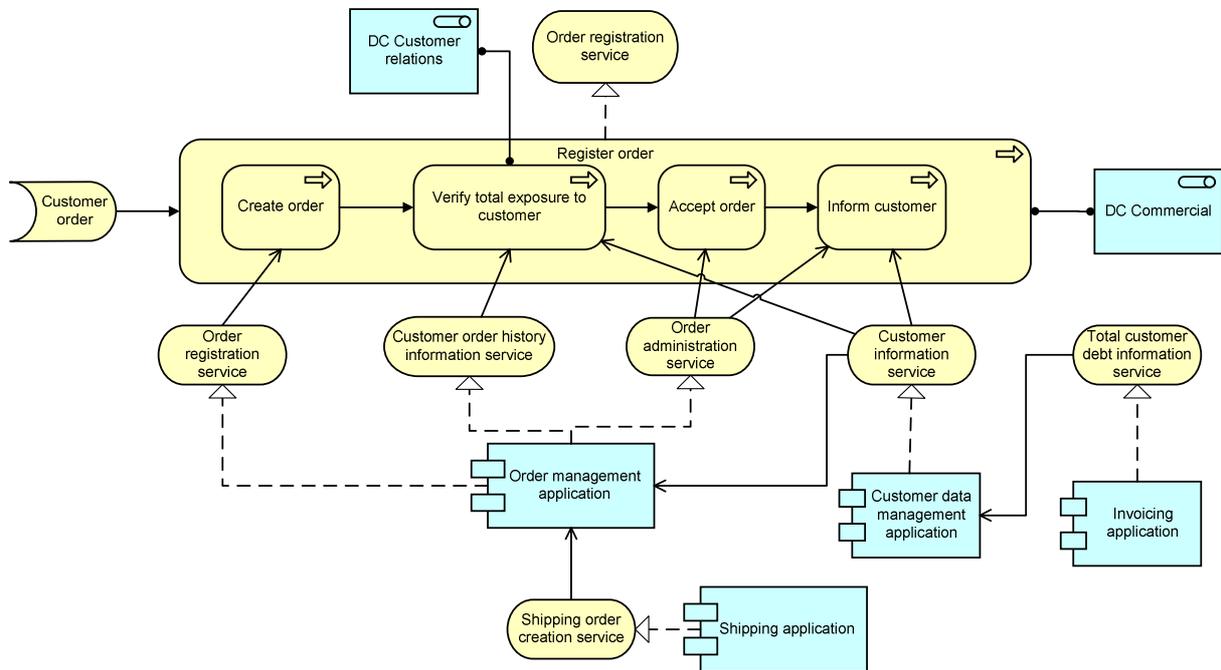


Figure 8 Applications usage by Register customer order process

DC gathers customer orders, and accepts them following the verification of customer credit exposure (i.e. after total exposure per customer vs. assigned credit limit and collection history has been analysed).

While having the autonomy, DC is still obliged to have the significant orders (i.e. those susceptible to expose the Company to the elevated collection risk) approved centrally by HQ.

As with customer management, each DC has its own systems for order management. Order management application interfaces with the Shipping application, to create the Shipping order as the customer order is placed.

When assessing the customer total debt, the Customer order history information service provides the data regarding the placed but still not invoiced orders, while the information on remaining debt for invoiced orders is acquired through Customer information service.

Verify total exposure to customer

Prior to accepting the customer order, the total exposure to the customer is verified by examining the customer profile and related documentation. DC has to adhere to the credit risk policy established by the Company. DC needs the approval of the HQ when significant order is placed by the customer, and in that case, the additional assessment is performed by the HQ.

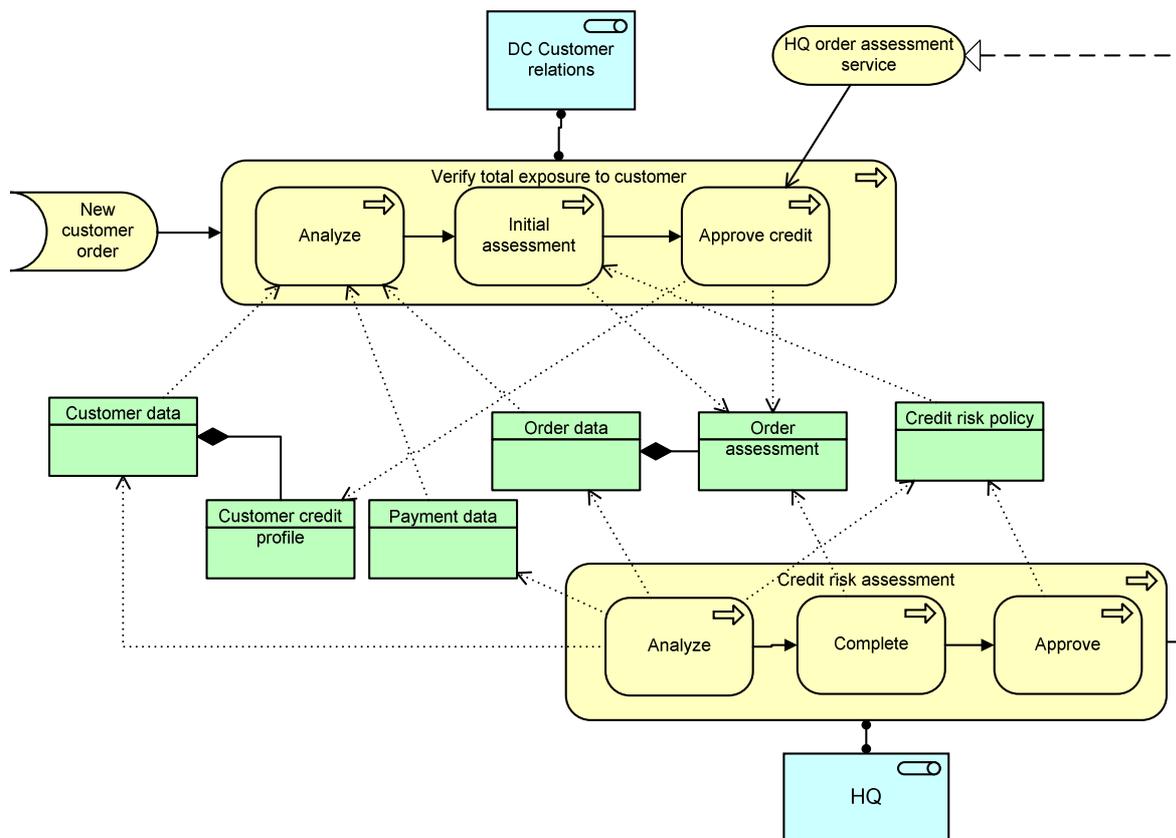


Figure 9 Verify total customer exposure process

Transmit orders

The exchange on placed orders is defined in such a way that distribution centres prepare and send bulk orders to the production centre (unit within sales department). This process repeats at the end of each working day. DC has no visibility over the information on production scheduling and on available products in the warehouses, and thus has to wait until it gets that information from Sales within PC, as well through established communication channel. This feedback on orders processing from PC is, amongst others purposes, used to update the customer regarding the delivery estimates for his order.

There exists the standardized structure through which the order data is exchanged. The communication with the PC is realized through the EDI file exchange, which defines the file format each DC has to comply with in exchanging the order data. Both bulk order from DC to PC and the information regarding status of orders processing from PC to DC are sent using this EDI file format.

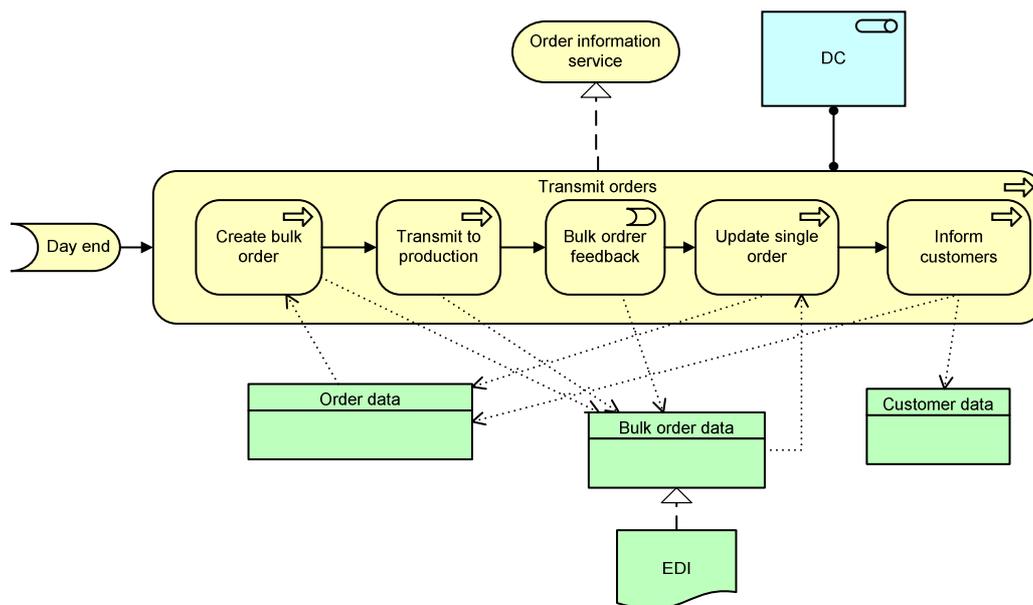


Figure 10 Transmit orders process

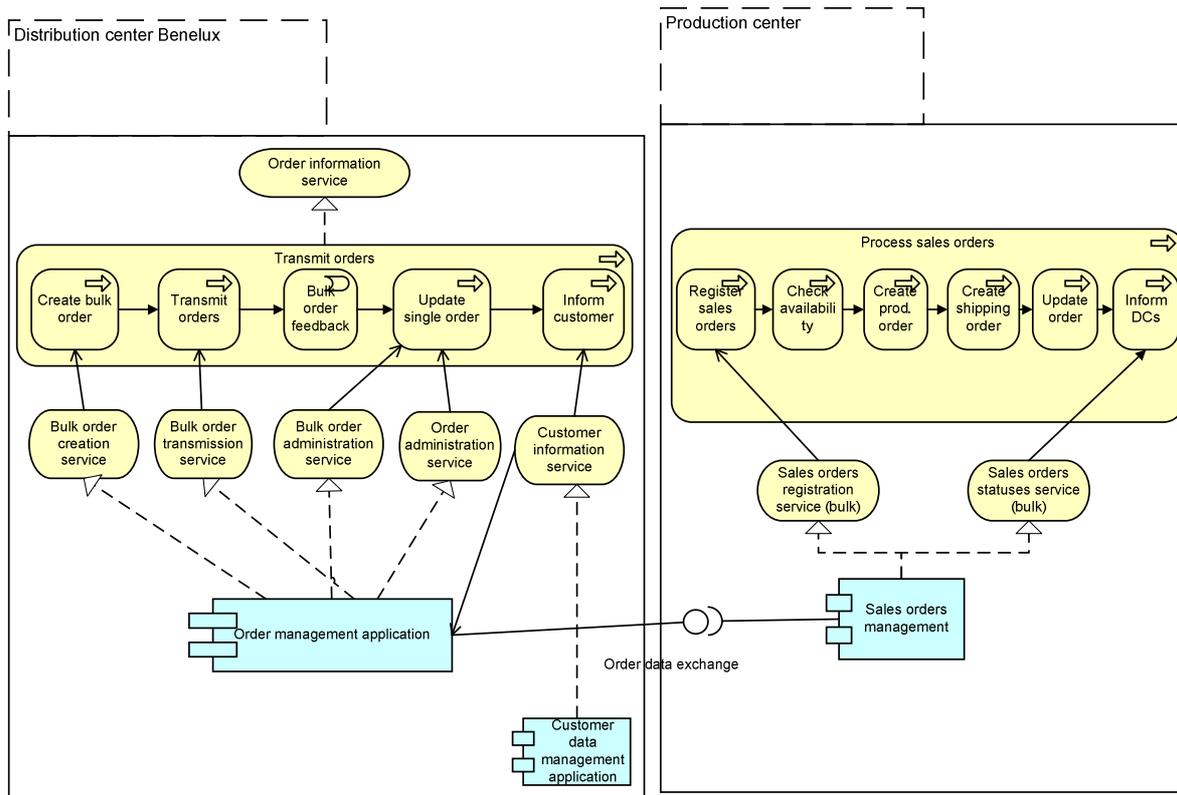


Figure 11 Interfacing between applications supporting bulk-order communication

The defined order data exchange structure consists in bulk order data including the “local” references to individual customer orders only. Any other detail on individual order is not included. Hence no customer information is shared, since anyway customer data are held regionally, and Production centre overall does not have the visibility over customer. As previously discussed, this lack of transparency causes various inefficiencies of sales processes of PC, especially of sales forecasting, which subsequently impacts suboptimality down the supply chain (i.e. in production, procurement planning, warehouse etc.)

In addition, the current way of communication between DCs and PC regarding the orders prevents more precise tracking of customer order processing, and as well does not allow the Company to offer “advanced” services to the customer, such as real-time order tracking, prioritized order placing, modifying the order quantities “on-the-fly” etc.

Process sales orders

At the PC, all incoming bulk orders from DCs are registered, and subsequently processed together with other unprocessed orders. If an order can be fulfilled directly from the finished goods stock, it is then prepared for shipment, i.e. shipping order is issued and order is updated accordingly. Otherwise, the ordered products have to be produced, and both the production and shipping order are issued and the

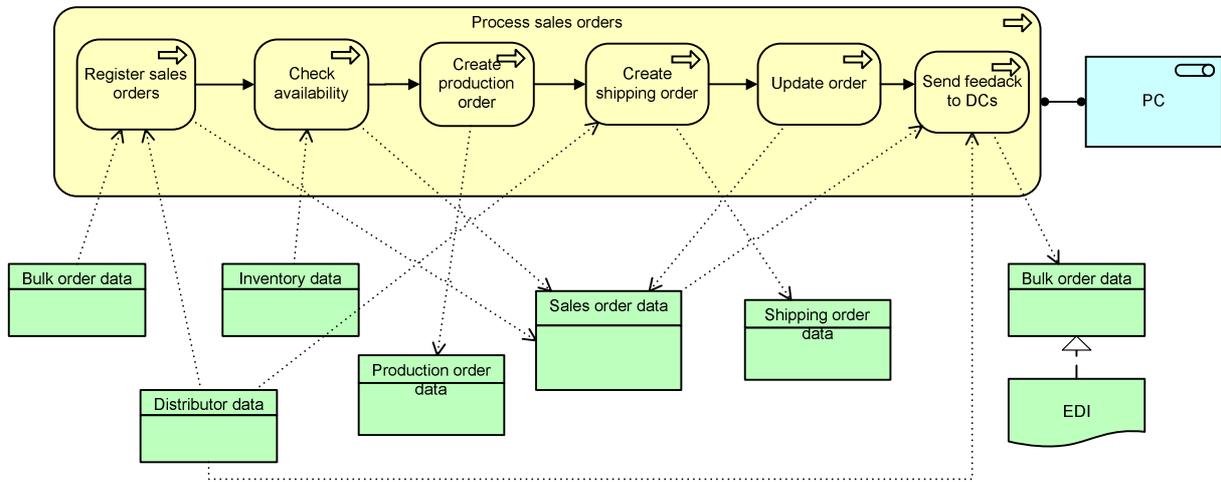


Figure 12 Process sales orders

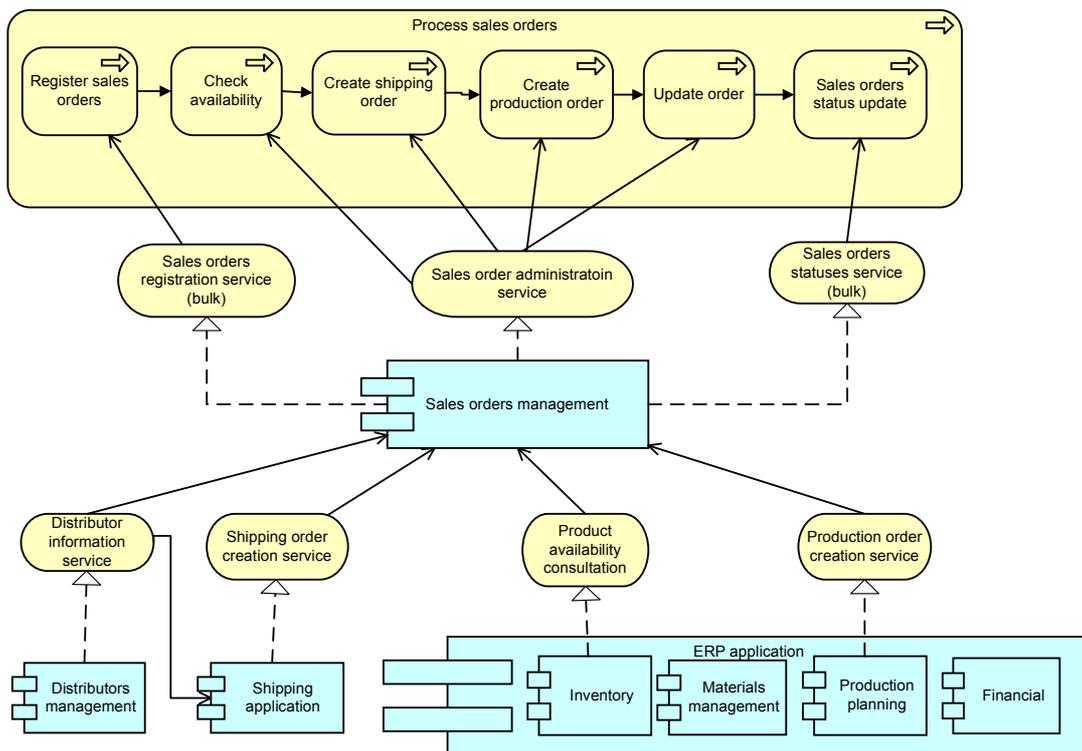


Figure 13 Applications usage by Process sales orders process

order is handled accordingly. PC informs each DC on the processing status of sales (bulk) orders through the established file exchange interface.

The current organization of order management processes across Company's business units has several issues that have to be addressed in this improvement initiative:

Each DC has its own system for order management, and PC has its own system for managing bulk orders. Consequently, order data is partially duplicated across PC and DC's systems. Consequently, the human work regarding order checking and registration is partially duplicated.

Relying on bulk-order exchange causes an additional work comparing to the shared use of the centralized order management system. The slightest modification in the file exchange format (i.e. enriched set of data, changing the name/type of the data element etc.) would require corrective maintenance on order management applications in DCs, as well as in the PC.

The unique identification of individual customer order has to be implemented across the Company before tighter integration of these applications, or before switching to the new centralized system for order management.

Application architecture

The operating model of ArchiMetal supports the autonomy of distribution centres, both in terms of defining their business processes and the choice of underlying IT support. Even though each DC uses different applications in support of its business, their set and global structure are however similar.

The application architecture presented in the following schema is elaborated based on the applications of DC Benelux and of the Company's Production centre. The recommendations for optimizing IT will however be done having the overall company benefits in mind.

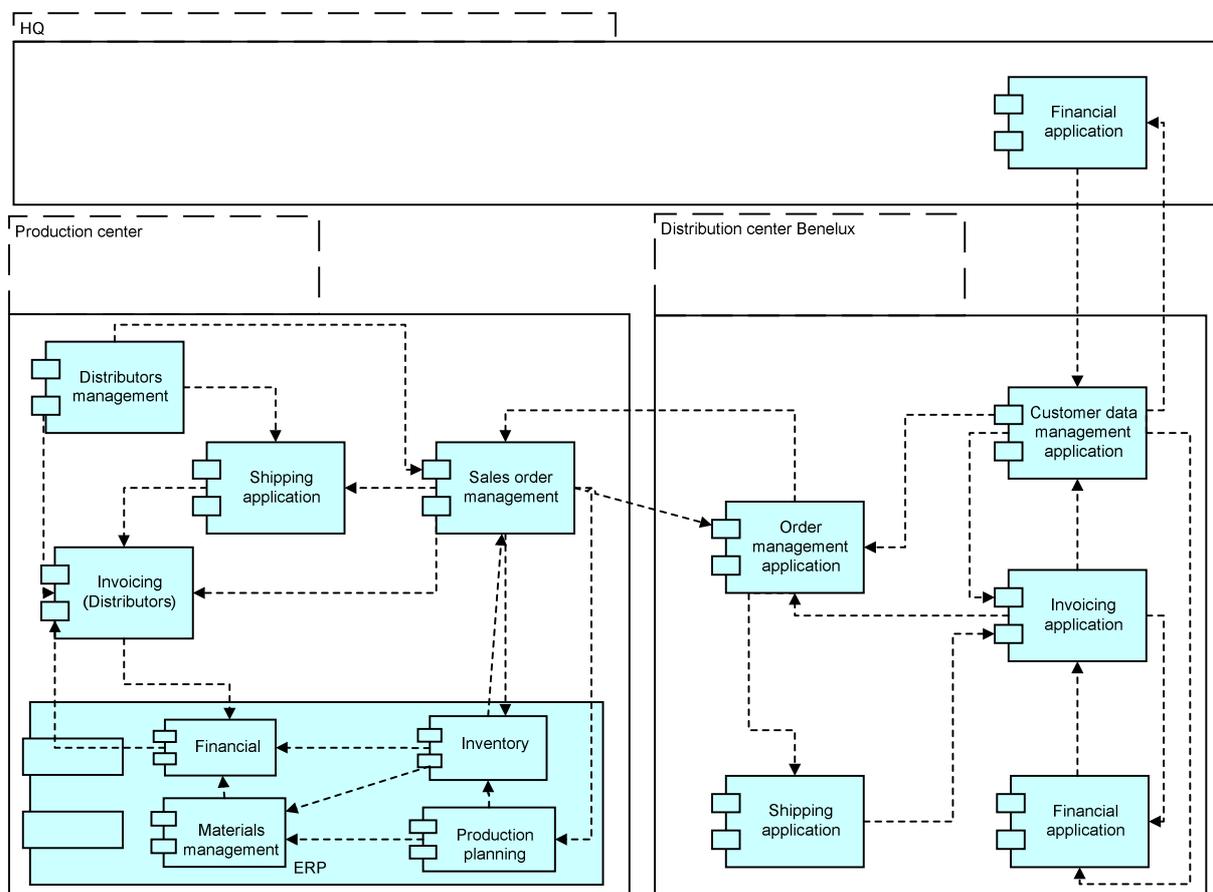


Figure 14 Application landscape

DC Benelux uses the Customer data management application for editing of customer data, contract creation and printing, as well as for the support of credit risk analysis. The relevant customer data is shared with Order management, Financial and Invoicing applications.

Customer data management application shares relevant customer data to Financial application in a HQ, and this with regards to necessary customer credit analyses, in the situation when these have to be checked, completed and approved by HQ.

Table 2 Application ownership

Business unit	Application	Owner (function)	Functionality relevant for the discussion
HQ	Financial application	Finance	Customer credit risk assessment
DC Benelux	Customer data management application	Customer relations	Managing customer data, contracts, some credit risk analysis support
DC Benelux	Order data management application	Commercial	Managing customer orders and bulk orders being sent to PC
DC Benelux	Invoicing application	Commercial	Invoice issuing per order, reporting
DC Benelux	Financial application	Finance	Payments per invoice
DC Benelux	Shipping application	Distribution	Shipping order issuing and managing
Production centre	Sales order management application	Sales	Management of bulk orders per DCs
Production centre	Distributors management	Sales	Managing DC information
Production centre	Distributors invoicing	Sales	Issuing and management invoices per DCs
Production centre	Shipping application	Logistics	Managing shipping orders to DC (per bulk order)
Production centre	ERP	Production	Fully integrated modules for Material Management, General Ledger, Inventory (of raw materials and finished goods), and Manufacturing

Order management application at DC Benelux provides the order administration functionality, and the import/export of order data for communication with PC system for sales orders management. However, the import/export structure does not include the detailed data of individual order and related customer, but only aggregates the quantities of products being ordered each day at DC.

Order management application interfaces with Shipping application, which provides the functionality of shipping order management, fleet and distribution planning. The interface exists between Shipping and Invoicing application.

Invoicing application provides the functionality of creating, editing and managing statuses of invoicing handling, and has some reporting functionalities which are relevant for customer credit analysis. It also exchanges the data regarding invoice creation and related payments with Financial application. The latter offers the receivables management functionality.

Production centre Sales has its system for managing Sales orders, which also implements the communication with DCs' order management applications. Sales order management system interfaces with the application for invoicing distributors upon shipment of the order. As the communication between DCs and PC relies on bulk order exchange and processing, the invoicing of distributors is done upon the completion and shipment of the bulk order content.

Sales order management application integrates with ERP solution, so as to enable verification of finished goods stocks for the availability of ordered products, and to initiate the production order, if products are not available. The sales order application is updated when the demanded products are available on stock upon completion of the production order, and this initiates the shipping order creation, through interfacing with Shipping application.

ERP solution contains the basic package of ERP implementation, and provides the integrated support for Production planning, Inventory management, Material management and related financial aspects, including General Ledger.

Change scenario: Operational business improvement

Following the discussed current situation within the Company, the recommendations on improving global efficiency are presented. The change scenario that is discussed in the following chapters considers two possible alternatives of business improvement. Both alternatives focus on building the foundation for advanced and enhanced customer services, through introducing (centralized) customer master file, it's sharing to the relevant processes and better coordination of processes across Company's units.

The change comprises increased IT integration, and eliminating of data redundancy and functional overlapping between existing applications. It is reflected by introducing the CRM system to store and centrally manage customer data and by its appropriate interfacing with applications requiring access to customer information. The rights for accessing and editing the customer master data are defined in accordance with the responsibilities of the units and processes manipulating the customer data.

The first discussed alternative is limited to the changes regarding the introduction of CRM system: definition of customer master data, introduction of CRM and its interfacing with other applications, and hence coordination of related business processes. The second alternative goes further in that it in addition it targets the rationalization of applications and coordination of processes related to the customer order management.

REMARK: The decision has been taken to leave out of consideration the related financial processes (e.g. invoicing, payment processing, following up on overdue payments, updating credit risk profiles based on payments history, receivables management etc.) and the implications that the CRM might have on them and related applications. Though it would be interesting to discuss them as well in the frame of this report, we decided to leave them out of scope as the main goal of this report is to illustrate the use of ArchiMate, and not to be extensive in discussing the defined situation within the fictitious Company.

Alternative 1: Customer data integration and standardization

The first migration alternative covers the introduction of CRM system and development and modifying the interfaces with other existing applications, so that customer data is shared to the business processes that need it. The slight redesign of analysed processes is suggested, but its impact is less important than in the second migration alternative.

Business architecture

The main structural change in the ArchiMetal's organization consists in introducing a new unit within the HQ – **Customer Relation and Services**, who would be responsible for developing the foundation for better customer relationship and customer services. The main element of this foundation consists in single view over customer being shared companywide.

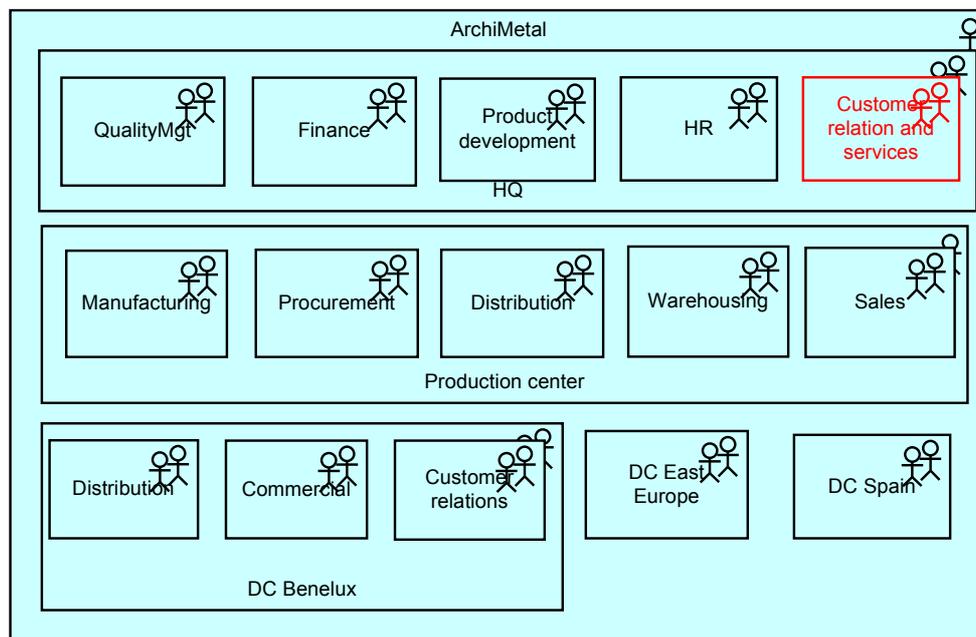


Figure 15 New ArchiMetal organisation

Therefore, the newly formed department would have under its responsibilities the following:

- Own and manage centralized customer database (CRM system)
- Define and manage the structure of customer master file
- Enable customer data sharing to relevant processes and systems (e.g. for production scheduling, as well as production/procurement planning etc.)

- Verify and approve new customer entries (to assure the uniqueness of customer entries and the correctness of data)
- Perform analytics relative to market segmentation, client profiling, sales forecasts etc. and make it available companywide
- Ensure the collection when problems arise in regional DCs
- Own/enable new service of tracking client orders (Order information service).

The primary reason for this centralization of responsibilities regarding customer data management lies in establishing and managing customer master file, to assure accuracy and completeness of data, and to share this data companywide. Ultimately, this change would allow the company to have better knowledge of its customers, which may lead to more effective market segmentation and marketing strategies, and better customer services.

The benefits of this major change can be observed across the processes and functions of all business units. As the responsibility of customer database management is being shifted away from DCs and centralized, DC employees can focus on their core capabilities, i.e. sales. The benefit for DCs consists in having the access to the global customer database, including customer credit risk profiles and different analytics that may be useful for sales and particularly for developing marketing strategies. While DCs would keep the same level of autonomy in their business, increased transparency over customer-related data enables HQ to monitor correct application of key procedures and policies by DCs, such as pricing and credit risk policy.

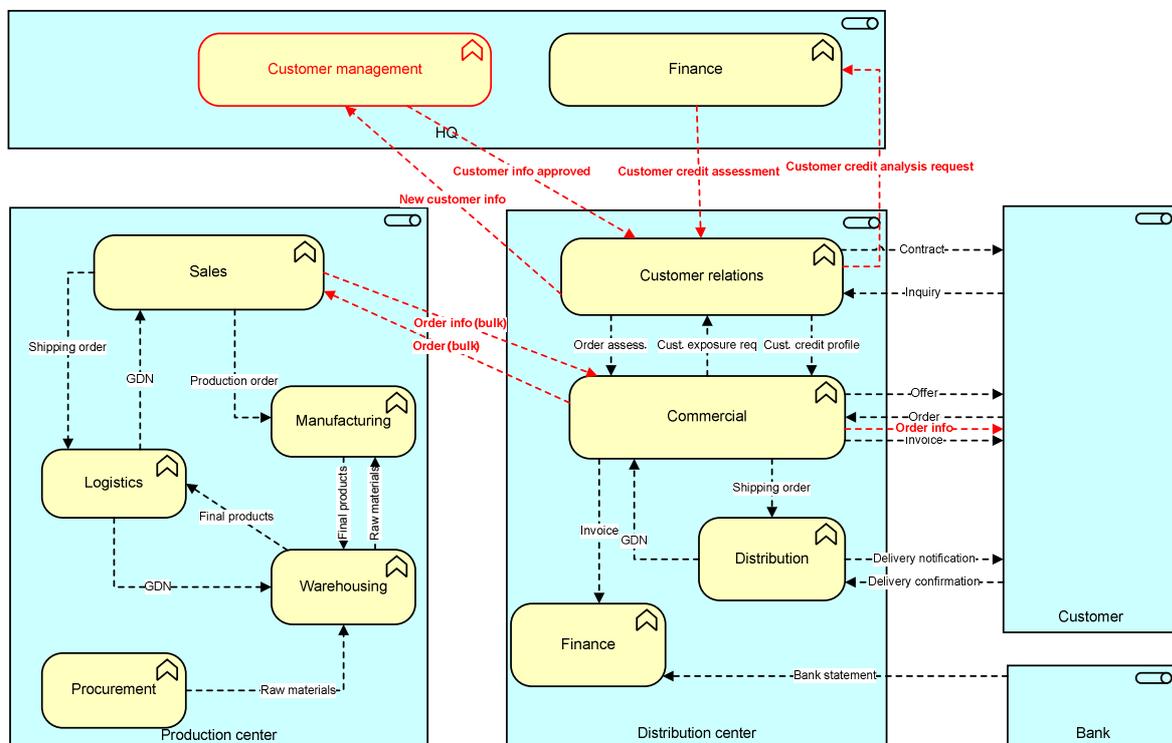


Figure 16 Relevant information flows between business units

However, this scenario does not go into reconsideration of the design of processes that handle customer order and their underlying IT support. The customer order data remain partially duplicated in different order management systems, the communication between PC and DC is still based on bulk orders, and therefore production and shipping order in the Production centre remain issued per bulk orders. Although better tracking of and individual order is achieved through slight modification of bulk order exchange data format, this is still overall sub-optimal solution.

Based on the changes proposed in this first alternative for migration, the sales forecasting can be optimised, but significant number of interfaces between applications has to be developed in order for all the data relevant for sales forecasting and different customer analytics to be available. This is due to the decision to reduce the extent of changes in this scenario and thus not completely optimize IT support for order management.

Application architecture

As already underlined, the new CRM system introduces the key change to the existing application portfolio. CRM should be owned by HQ department Customer relations and services. The functionalities provided by the CRM system should include managing customer master file (including customer credit profile) and defining access rights for read/write operations over the master file, performing customer analytics and should offer as well the reporting functionalities.

CRM application should replace the functionality of applications used in all DCs for customer data management. DCs should however have limited edit rights over customer data, since assuring the correctness and uniqueness of customer entries would be the responsibility of Customer relations and services within HQ.

New interfaces between CRM system and Order management, Invoicing and Shipping applications in each DC should be developed, to enable sharing of customer master file. These new interfaces can be developed based on the existing specifications for previous interfaces, under the condition that they correctly reflect the new customer data structure.

A new interface designed between the CRM and all regional order management applications (at PC and DCs) would be necessary for gathering all data necessary for customer analytics, which would be performed with CRM application.

Regional order management applications and Sales order management application in PC would remain the same in this first migration alternative. However, the way they communicate should be modified: instead of communication based on bulk orders, which only contained local (DC's) references to customer orders, the bulk order should incorporate more details on individual orders contained in the bulk file. These details should (at least) include: local order identification, and details on product quantities of each order. This would enable more precise gathering of information relative to tracking of the status (of production) of customer order.

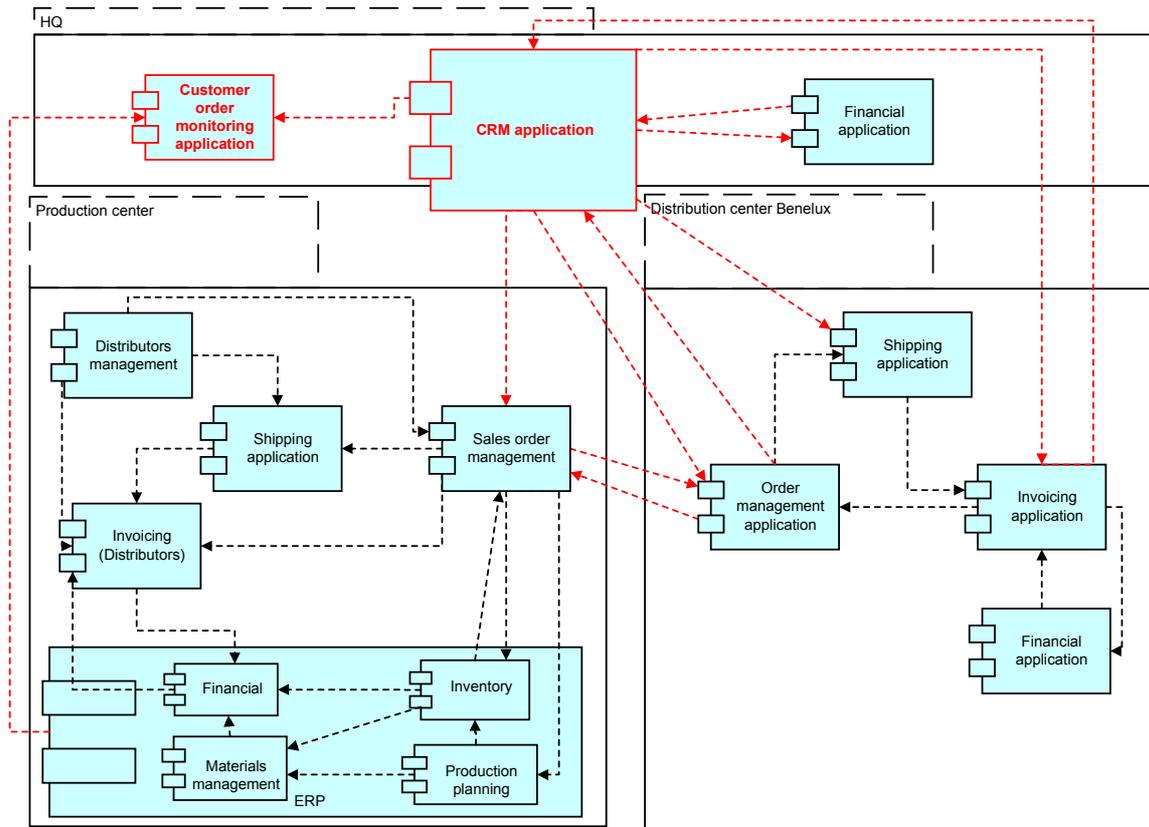


Figure 17 New application landscape

However, in the PC systems, the production order and shipping order will continue to be handled on the bulk order basis, meaning that the interfacing between Sales management application and ERP components, Shipping and Invoicing application remains the same.

Invoicing per customer order should remain the responsibility of regional DCs, because of the specificities of legal environments in which distribution centres are located. Therefore, the support for Invoicing (Invoicing application) would remain the same, with only modification consisting in the use of shared customer master file (CRM application), compared to the previous interfacing with regional customer databases owned by DCs.

The interfacing between CRM application and Invoicing applications in DCs is necessary in other direction as well: the reports on total debt per customer have to be made available by Invoicing applications to the central CRM system.

Table 3 Application ownership

Business unit	Application	Owner (function)	Functionality
HQ	Financial application	Finance	Customer credit risk assessment
HQ	CRM application	Customer relations and services	Managing customer master file, customer analytics, reporting
HQ	Customer order monitoring	Customer relations and services	Tracking of customer order status
DC Benelux	Order data management application	Commercial	Managing customer orders and bulk orders being sent to PC
DC Benelux	Invoicing application	Commercial	Invoice issuing per order, reporting
DC Benelux	Financial application	Finance	Payments per invoice
DC Benelux	Shipping application	Distribution	Shipping order issuing and managing
Production centre	Sales order management application	Sales	Management of bulk orders per DCs
Production centre	Distributors management	Sales	Managing DC information
Production centre	Distributors invoicing	Sales	Issuing and management of invoices per DCs
Production centre	Shipping application	Logistics	Managing shipping orders to DC (per bulk order)
Production centre	ERP	Production	Fully integrated modules for Material Management, General Ledger, Inventory (of raw materials and finished goods), and Manufacturing

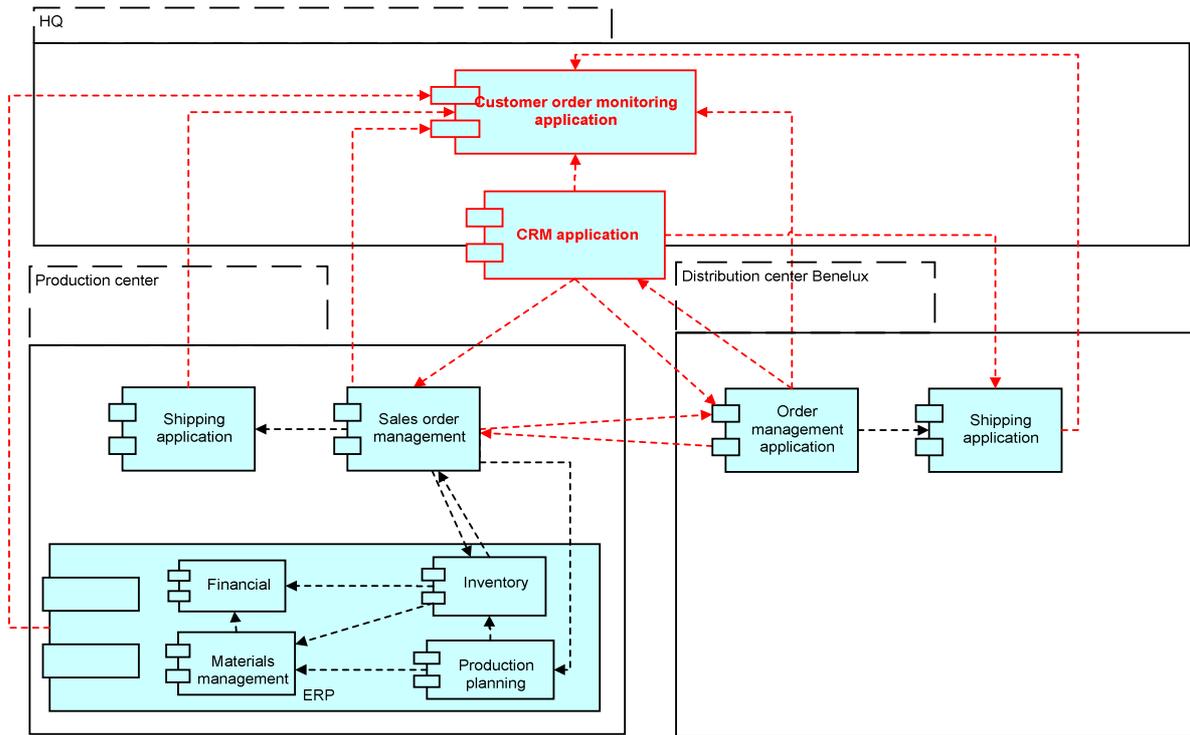


Figure 18 New application landscape - continued

Finally, new application component Customer order monitoring application should realize Customer information service, which enables tracking of the customer order. This application combines the data from CRM application, regional Order management and Shipping applications, with which it should have developed interfaces (see schema above, detailing the interfaces for realizing this service). Besides, Customer order monitoring application will have the functionality of managing the customer subscription to the order tracking service (including the type of events for which the notification should be sent, channels through which it should be sent etc.). A subset of the functionalities of this application would preferably be exposed over the Web, so that the customer can access it online.

CRM application

The following models provide more insight into the internal organization of the CRM application, and on how the relevant functionalities of the CRM are realized by its components.

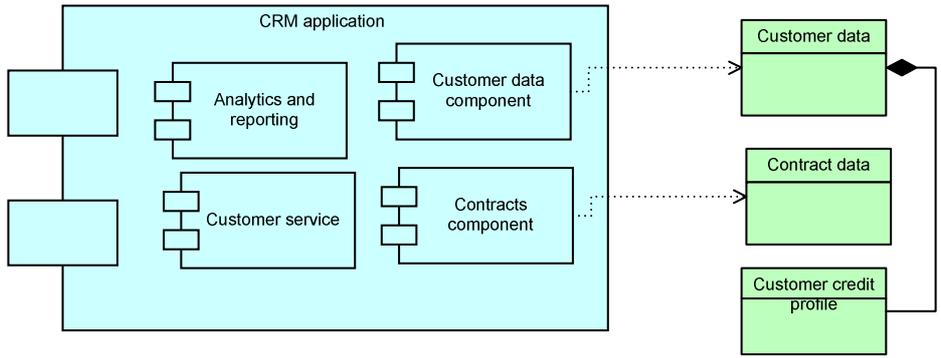


Figure 19 CRM application structure

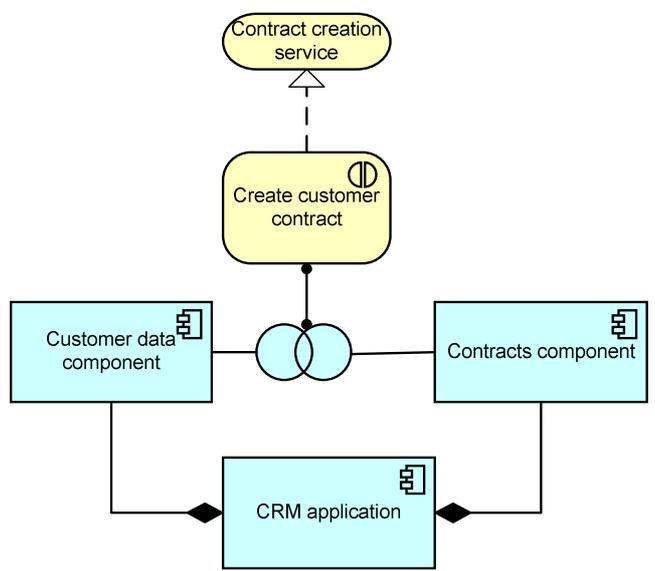


Figure 20 Realization of Contract creation service by CRM application

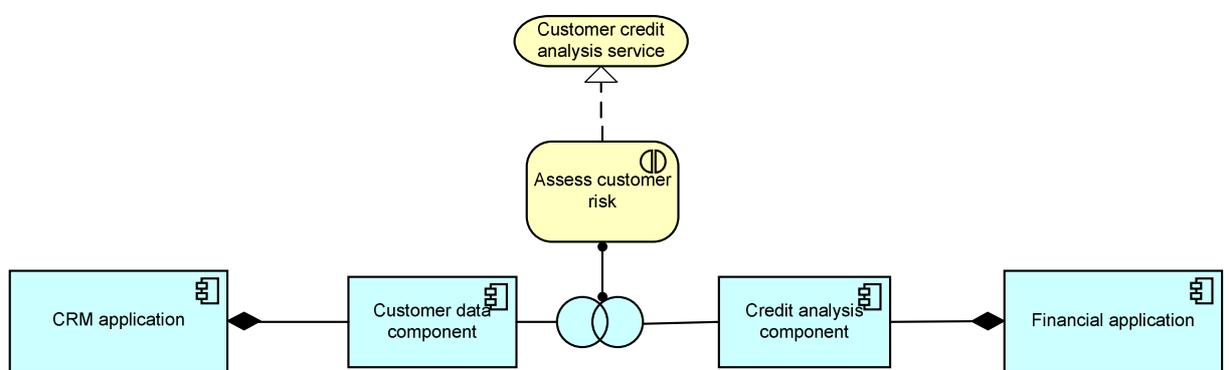


Figure 21 Realization of Customer credit analysis service by collaboration of CRM and Financial application

Relevant business processes and application usage

The interface to customer will only be slightly modified in the content of Order information service. It will offer sending the information to the customer on the change of status of his order, from the moment of placing the order until the final shipment. The customer will be able to choose the type of events for which he wants to receive the notification, as well as channels through which this notification should be sent.

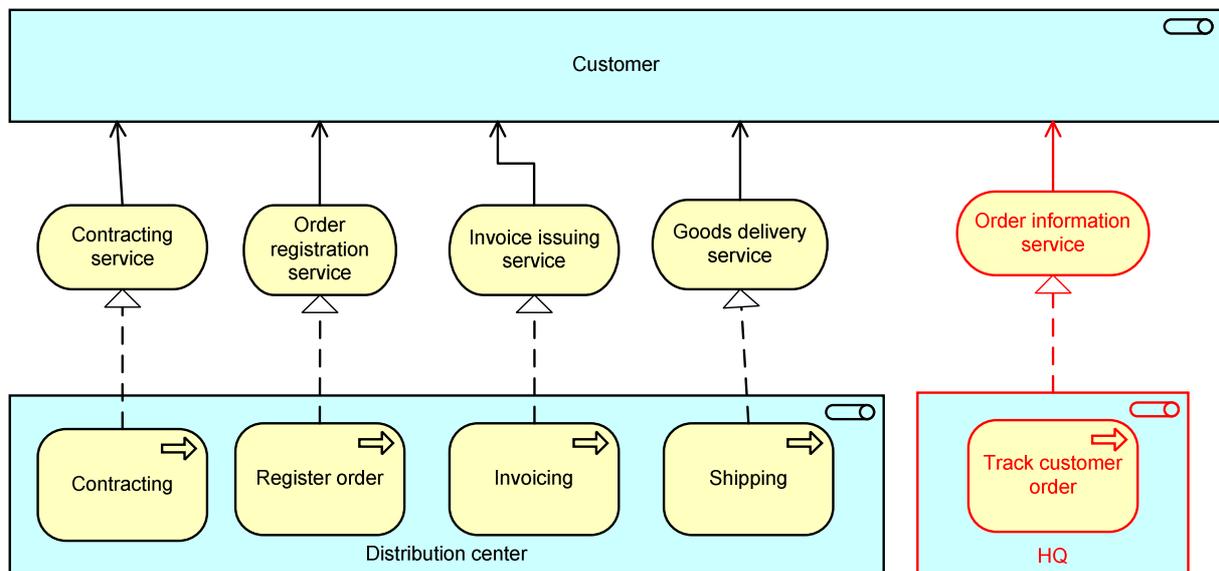


Figure 22 Customer services

As already indicated, DC will keep their autonomy relating to their core capabilities (sales). The discussed business processes will only be modified in those elements that foster coordination and integration of ArchiMetal's processes.

Contracting

Being the closest to the customer, and having the knowledge of regional language(s) and legal environment(s), distribution centres keep contracting under their responsibility.

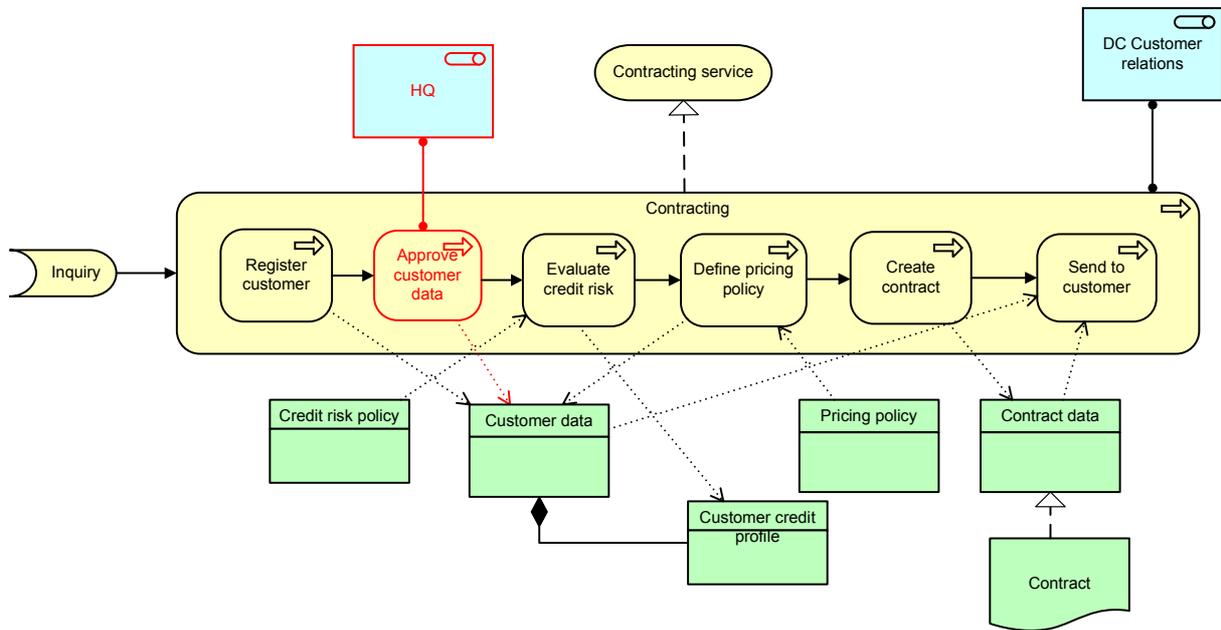


Figure 23 Contracting process

The Contracting process now incorporates the new step of formal verification of the data entered for new customer (Approve customer data, assigned to Customer Relation and Services in HQ). Subsequently, the entire process has to respect the new “requirements” for customer information, coming out of the standardized customer master file structure.

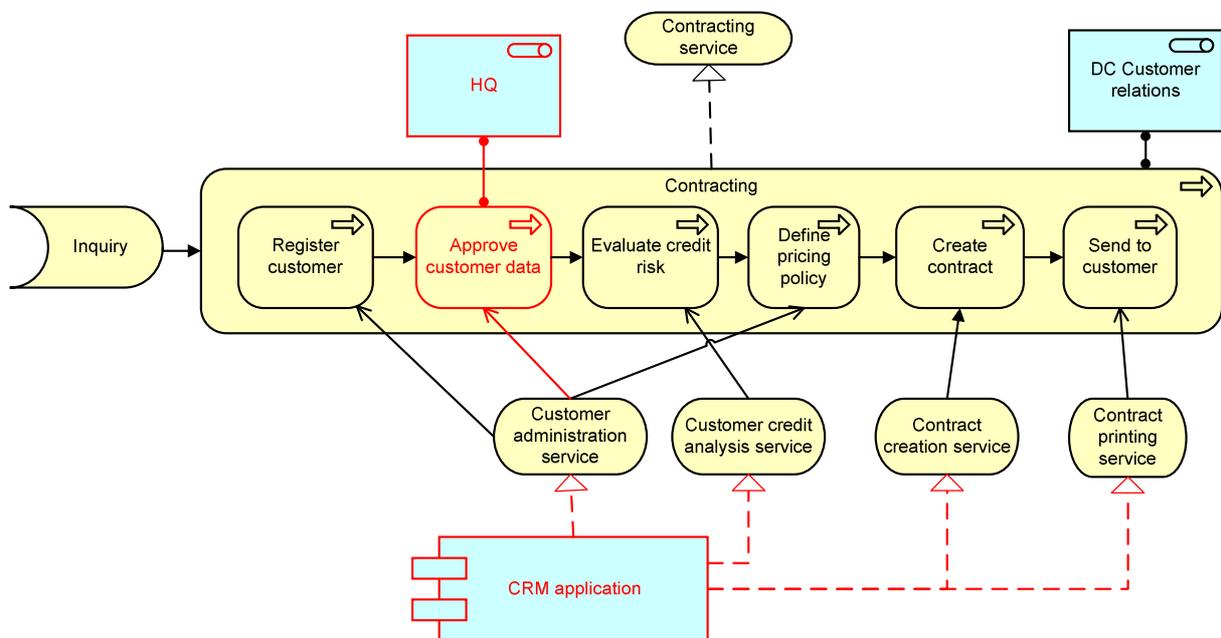


Figure 24 Applications usage by Contracting process

The Contracting process is now to be supported with CRM application, instead with different DC-specific applications and databases.

DCs will have the access to some of the functionalities of the CRM, in particular creating new customer entries and some limited rights of their editing.

The definition of application services supporting the Contracting process (shown in the figure) will have to be changed to reflect the requirements for standardized customer data set. These services will be realized by/on top of the CRM system.

Evaluate credit risk

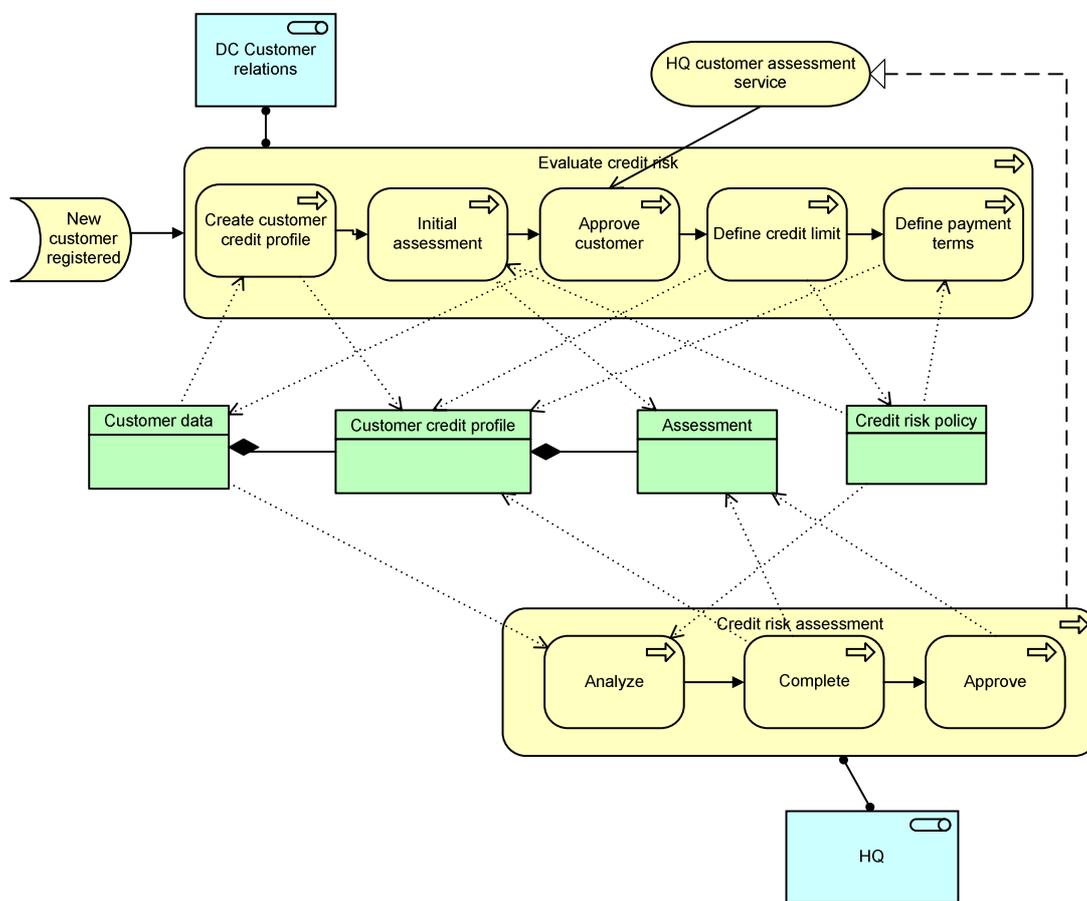


Figure 25 Evaluate credit risk process

The impact on this process is limited. It resumes to using CRM system for customer credit profile editing, and again, this obliges the process to respect the requirements relative to the set of customer data to be maintained.

The benefit storing the credit risk assessment within the global customer database consist in making the assessment visible company-wide, and especially to HQ, which then can effectively monitor the diligent application of the Company’s credit risk policy.

HQ interacts in the credit risk analysis when necessary (under conditions stated in credit risk policy, as in the state before change).

Register order

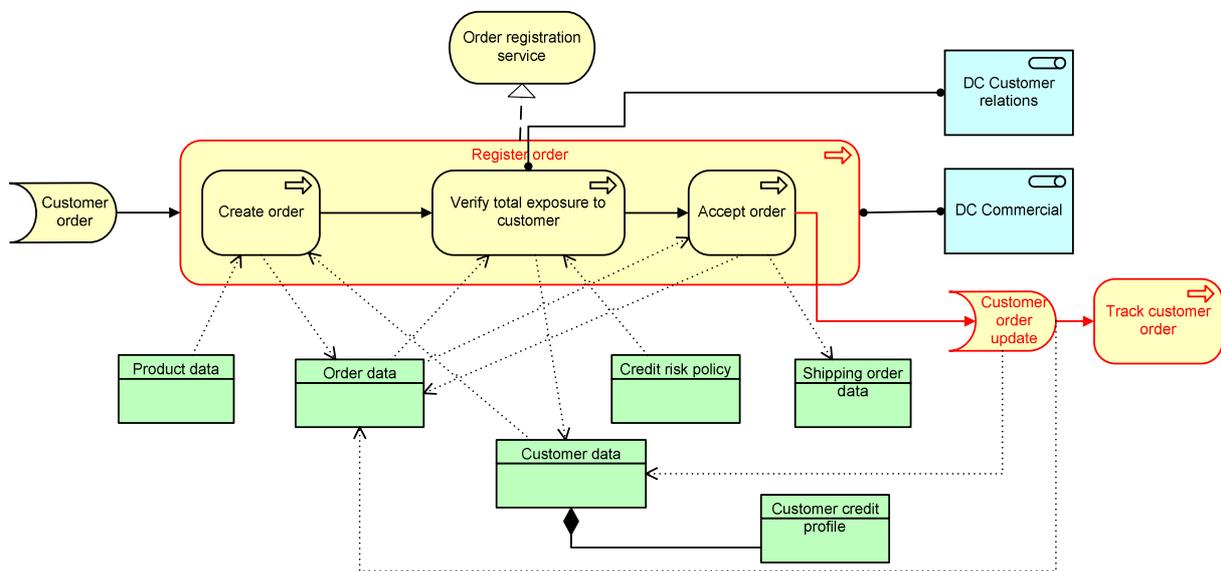


Figure 26 Register customer order process

This process is redesigned in a way to leave out the information service to the customer to the new Track customer order process. In other words, the former process will only execute order registration. The order status update in the DC’s order management application triggers the process of customer order tracking.

The application support of Register order process is modified in that the DC’s Order management application has to interface with the CRM application. The customer order update event is “generated” through the application service Update event handling service.

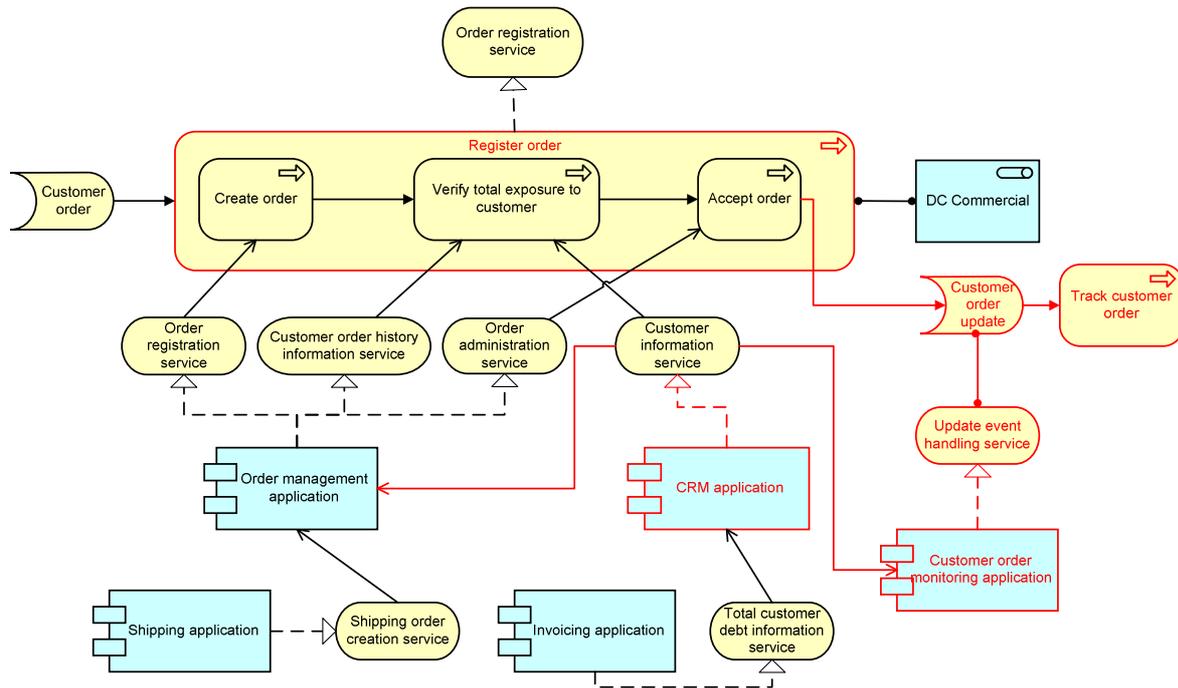


Figure 27 Applications usage by Register customer order process

Verify total exposure to customer

In this process, the CRM system is used for customer credit profile consultation, instead of local customer management applications.

The customer credit profile is updated with the information regarding paid and due customer orders from the corresponding local applications. In this way, all the critical information for credit risk assurance is available to company-wide, enabling for the significantly greater transparency.

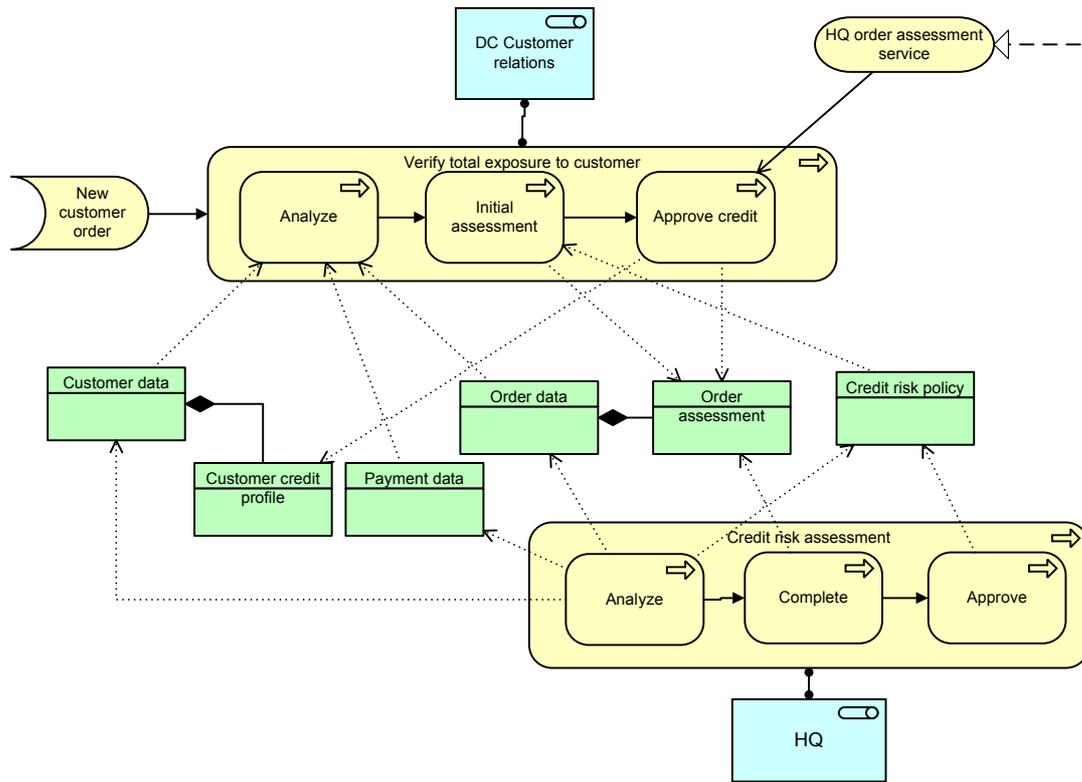


Figure 28 Verify total customer exposure process

Track customer order

The newly introduced business process Track customer order is assigned to the new Customer Relation and Services department in HQ. This process is realizing the Order information service, which allows the customer to be informed on the advances on his order processing.

The events to notify can be specified for any step of order handling, and incorporated into this system, under condition that the notification (respecting the specification) is sent to the tracking application. For example, shipping application in DC may generate the event of order update after the goods have been shipped, or Sales order management application within PC may generate the event just after the goods have been produced and are ready on the stock.

The suggestion would be that these events contain at least customer and individual order identifications, together with the identification of the type of event for which the notification should be sent.

The subscription for this type of service may be proposed at the moment of establishing the contract with the customer, or later on, during next order placing or even the customer may at any time subscribe to this service on a Company's web site. These and similar details of this service should be left on the choice of the Company's management.

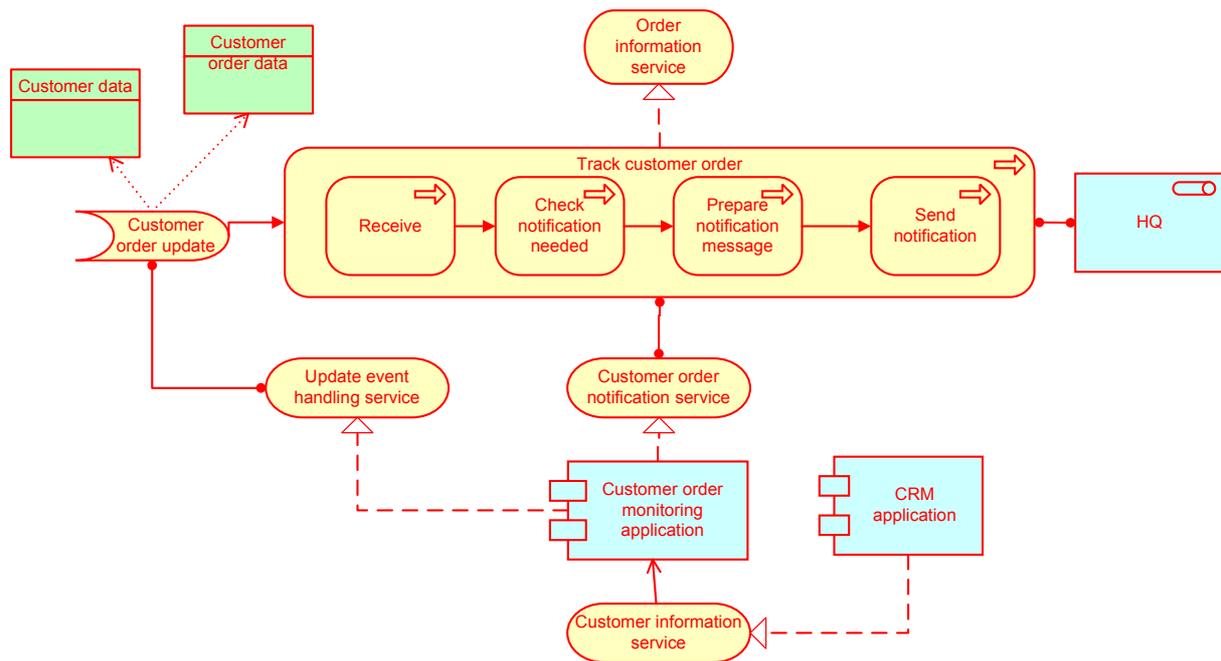


Figure 29 Track customer order process

Track customer order process is fully automated with the new Customer order notification (application) service. This application manages the customer subscription to the tracking service, which include the information on the type of events for which customer required the notification to be sent, as well as the channels (interfaces) through which the information should be sent to the customer. It also enables online (Web) editing of the customer’s subscription, and finally, this application generates the notification.

The proposition is that the HQ’s Customer Relation and Services department is responsible for Order information service and for Customer order monitoring application.

In the context of Alternative 1 change scenario, there is a limitation regarding the type of order update events that other applications may “report” to the Customer order monitoring application. This is due to the fact that not all application executing some processing step over customer order may be able to generate the event, due to the lack of information on customer ID and order ID. Thus, the notification will only be possible for the following events:

- Order accepted
- Order transmitted to the production centre
- Order treated in production centre and delivery to DC estimate communicated
- Ordered goods arrived in distribution centre
- Order has shipped

Transmit orders

Transmit orders process is not anymore realizing the Order information service, which is realized by the new business process, Track customer order process.

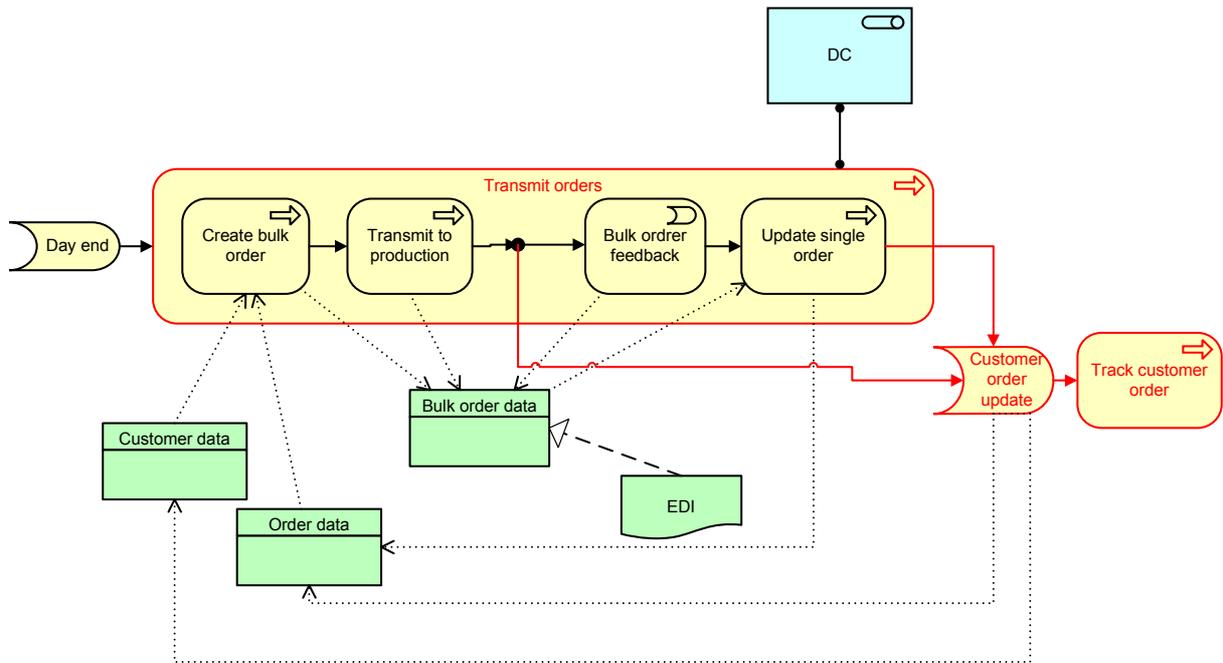


Figure 30 Transmit orders process

Another impact to this process consists in adapting to redesigned way of how order data are currently exchanged between the processes for order handling.

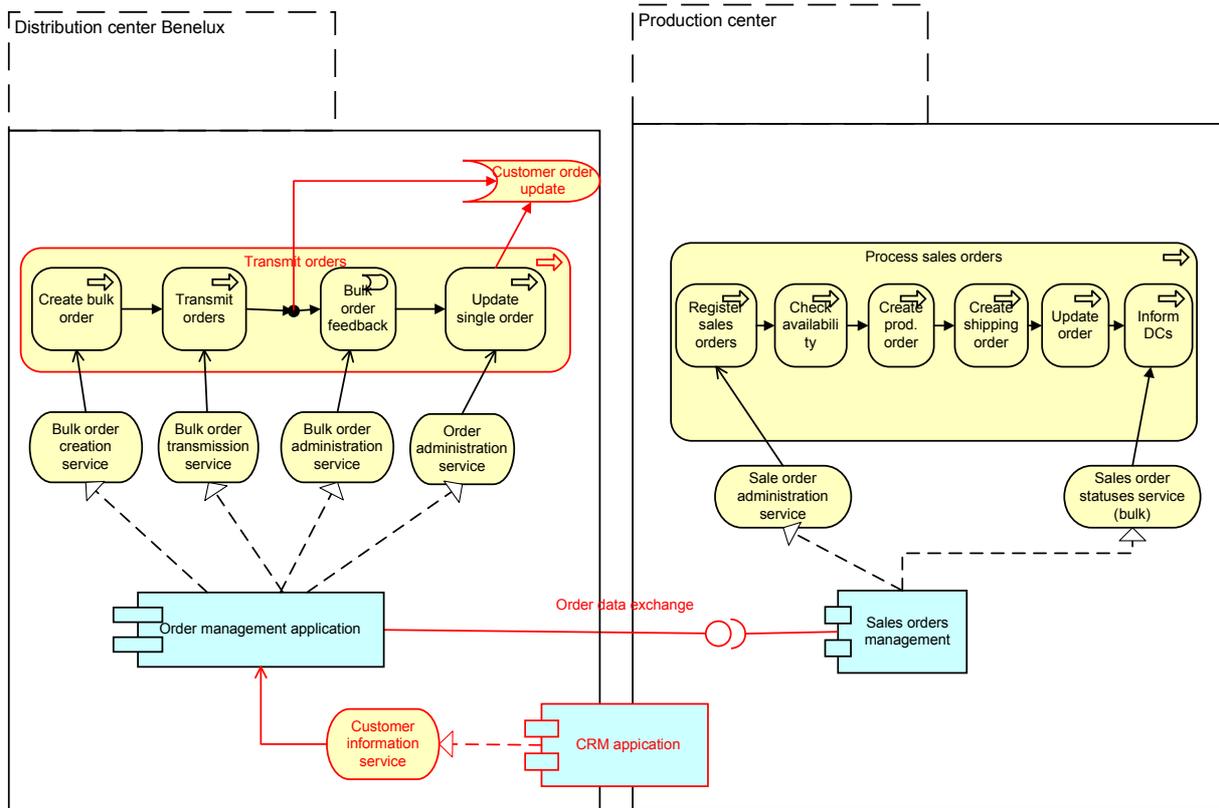


Figure 31 Interfacing between applications supporting bulk-order communication

Process sales orders

This process definition is not impacted by the change scenario in Alternative 1. Indeed, the format of data exchange has been changed, but the decision has been taken not to modify the interfaces between Sales order management application and Shipping, ERP and Invoicing applications. As a consequence, the production order is shipped based on a bulk order quantities, and the production order is linked with the bulk order. The same applies to the shipping order and the rule of invoicing Distributors.

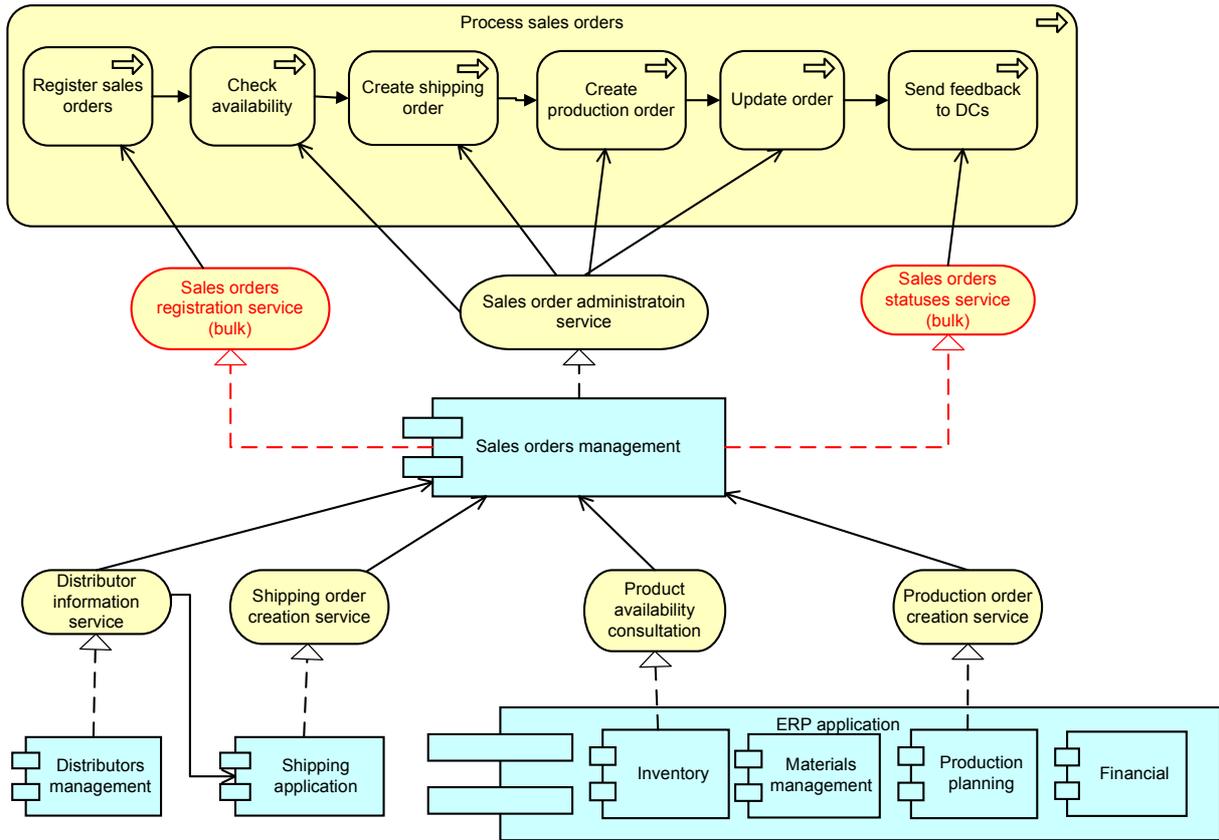


Figure 32 Applications usage by Process sales orders process

Alternative 2: Centralized customer and order management systems

The second migration alternative covers the introduction of CRM system to centralize customer data and customer order management. Consequently, the communication between PC and DCs with regards to the customer orders is considerably changed, and the corresponding processes on both DCs and PC side are significantly altered. Many application interfaces have to be (re)developed to reflect these changes.

Business architecture

The main structural change in the ArchiMetal's organization consists in introducing a new unit within the HQ – **Customer Relation and Services**, who would be responsible for developing the foundation for better customer relationship and customer services. The main element of this foundation consists in single view over customer being shared companywide.

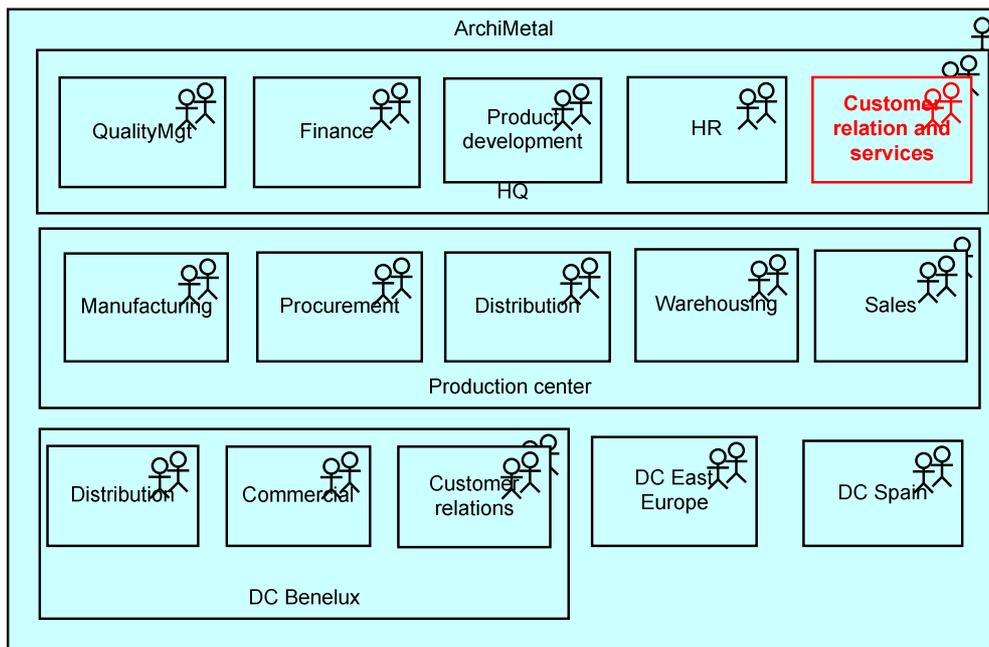


Figure 33 New ArchiMetal organisation

Therefore, the newly formed department would have under its responsibilities the following:

- Own and manage centralized customer database (CRM system)
- Define and manage the structure of customer master file
- Enable customer data sharing to relevant processes and systems (e.g. for production scheduling, as well as production/procurement planning etc.)

- Verify and approve new customer entries (to assure the uniqueness of customer entries and the correctness of data)
- Perform analytics relative to market segmentation, client profiling etc. and make it available companywide
- Ensure the collection when problems arise in regional DCs
- Own/enable new service of tracking client orders (Order information service).

The primary reason for this centralization of responsibilities regarding customer data management lies in establishing and managing customer master file, to assure accuracy and completeness of data, and to share this data companywide.

The benefits of this major change can be observed across the processes and functions of all business units. The responsibility of customer database management being shifted away from DCs and centralized, they can focus on their core capabilities, i.e. sales. The benefit for DCs consists in having the access to the global customer database, including customer credit risk profiles and different analytics that may be useful for sales and particularly for developing marketing strategies. While keeping the same level of autonomy in their core activities, the increased transparency over related data enables HQ to monitor correct application of key procedures and policies, such as pricing and credit risk policy.

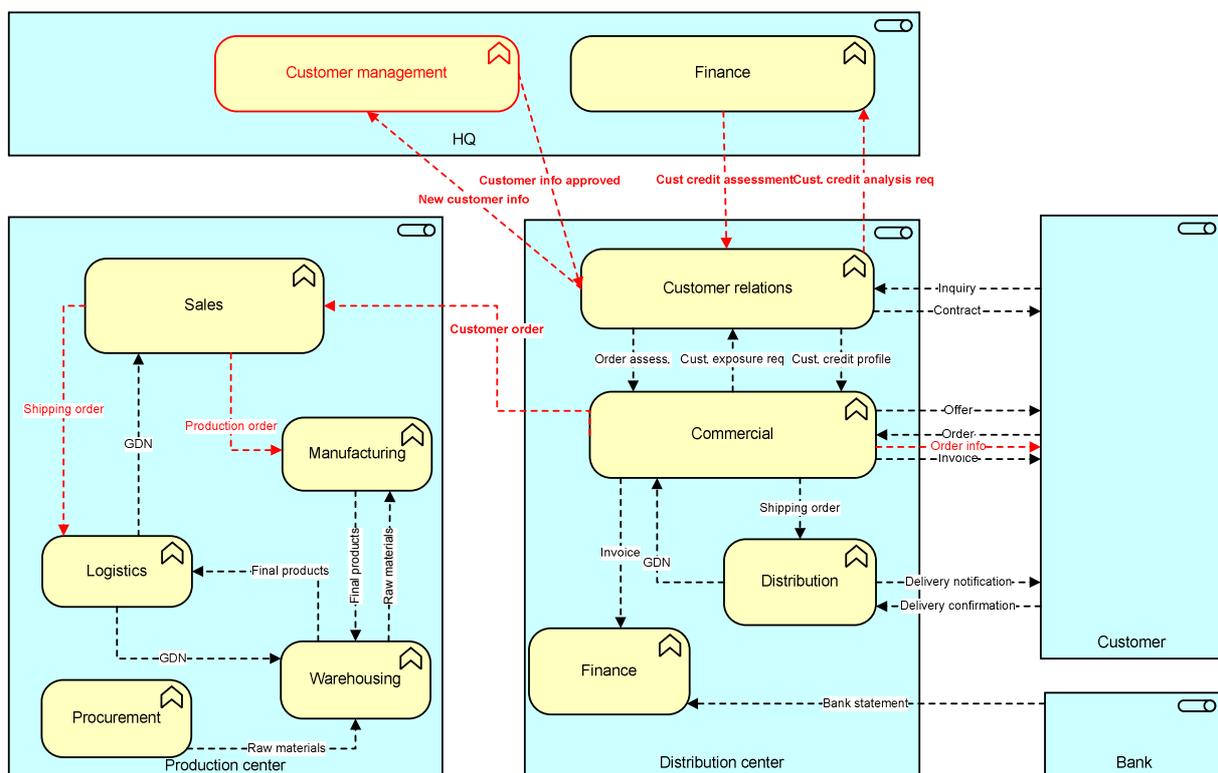


Figure 34 Relevant information flows between business functions

Compared to the first alternative, this scenario also understands the centralization of order data and the integration of IT support for order management, by implementing the order management component in CRM system. This would result in greater centralization and transparency of data relative to client behaviour, benefiting from the integrated solution. Furthermore, this scenario would understand realising greater degree of coordination between processes related to order handling and processing. This will especially be achieved with altering the existing communication model between production and distribution centres, in a way that single customer order can be manipulated by PC. In addition, the production (and shipping order at PC) would be issued per individual customer order.

Shared and integrated data on customer behaviour enables optimized sales forecasting, and in turn the optimization of product portfolio, production and procurement plans.

Ultimately, optimized and integrated sales processes should allow for better and faster flow of information across processes and business units, better decision making, increased transparency of data and easier development of advanced customer services.

Application architecture

As already underlined, a new CRM system introduces the key change to the existing application portfolio. CRM should be owned by HQ department Customer relations and services. The functionalities provided by the CRM system should include managing customer master file (including customer credit profile) and defining access rights for read/write operations over the master file, performing customer analytics and should offer as well the reporting functionalities.

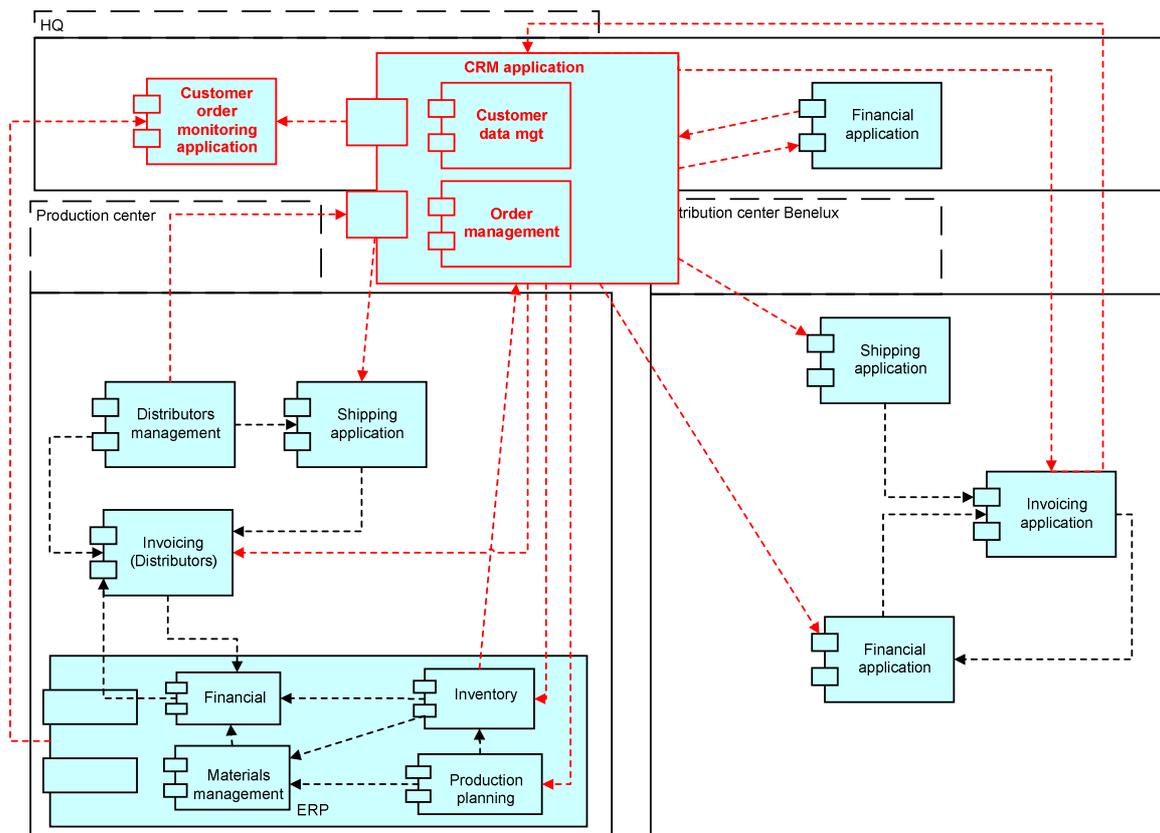


Figure 35 Application landscape

Therefore, CRM application should replace the functionality of applications used in all DCs for customer data management. DCs should however have limited edit rights over customer data, since assuring the correctness and uniqueness of customer entries would be the responsibility of Customer relations and services within HQ.

New interfaces between CRM system and Order management, Invoicing and Shipping applications in each DC should be developed, to enable sharing of customer master file. These new interfaces can be developed based on the existing specifications for previous interfaces, under the condition that they correctly reflect the new customer data structure.

Table 4 Application ownership

Business unit	Application	Owner (function)	Functionality
HQ	Financial application	Finance	Customer credit risk assessment
HQ	CRM application	Customer relations and services	Managing customer master file, customer analytics, reporting
HQ	Customer order monitoring	Customer relations and services	Tracking of customer order status
DC Benelux	Invoicing application	Commercial	Invoice issuing per order, reporting
DC Benelux	Financial application	Finance	Payments per invoice
DC Benelux	Shipping application	Distribution	Shipping order issuing and managing
Production centre	Distributors management	Sales	Managing DC information
Production centre	Distributors invoicing	Sales	Issuing and management of invoices per DCs
Production centre	Shipping application	Logistics	Managing shipping orders to DC (per customer order)
Production centre	ERP	Production	Fully integrated modules for Material Management, General Ledger, Inventory (of raw materials and finished goods), and Manufacturing

In this migration scenario, CRM should cover the functionality of customer order management, and thus regional order management applications and Sales order management application in PC will be replaced by a CRM component. For the purposes of order management, CRM will directly interface with ERP components, and this interface will replace the previous connections between Sales order management application at PC and ERP. The production and shipping order will, under this migration option, have to be modified, so that they are issued based on a single customer order (and thus reference it).

Invoicing per customer order should remain the responsibility of regional DCs, because of the specificities of legal environments in which distribution centres are located. Therefore, the support for Invoicing (Invoicing application) would remain the same, with only modification consisting in the use of

shared customer master file (CRM application), compared to the previous interfacing with regional customer databases owned by DCs. On the other hand, the reports on total customer debt would be made available by Invoicing applications to the central CRM system.

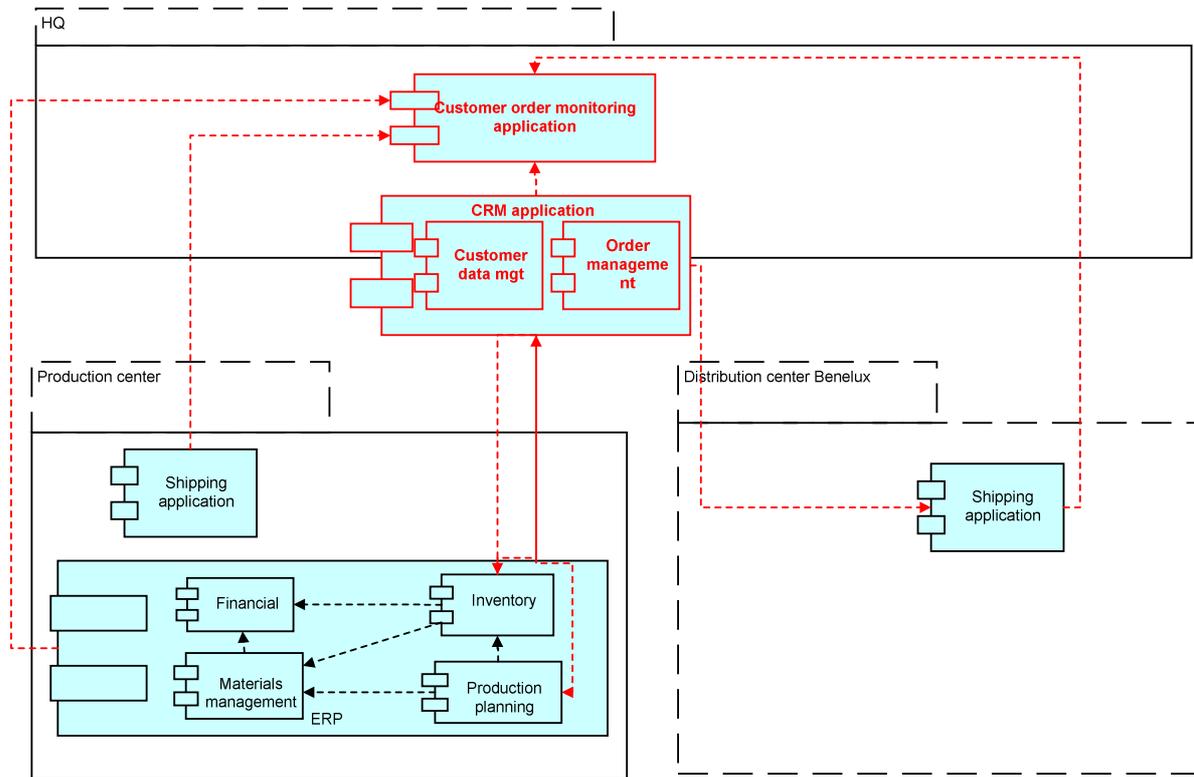


Figure 36 Application landscape - continued

Finally, new application component Customer order monitoring application should realize Customer information service, which enables tracking of the customer order. This application combines the data from CRM application, regional Order management and Shipping applications, with which it should have developed interfaces (see schema above, detailing the interfaces for realizing this service). Besides, Customer order monitoring application will have the functionality of managing the customer subscription to the order tracking service (including the type of events for which the notification should be sent, channels through which it should be sent etc.). A subset of the functionalities of this application would preferably be exposed over the Web, so that the customer can access it online.

CRM application

The following models provide more insight into the internal organization of the CRM application, and on how the relevant functionalities of the CRM are realized by its components.

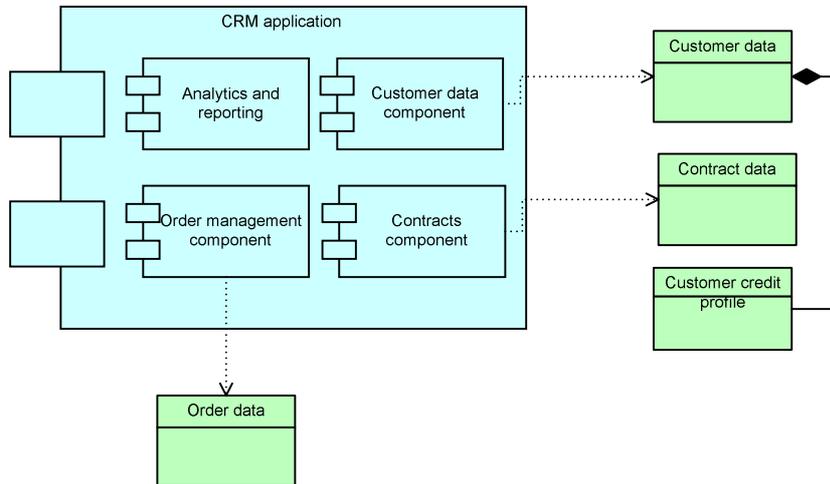


Figure 37 CRM application structure

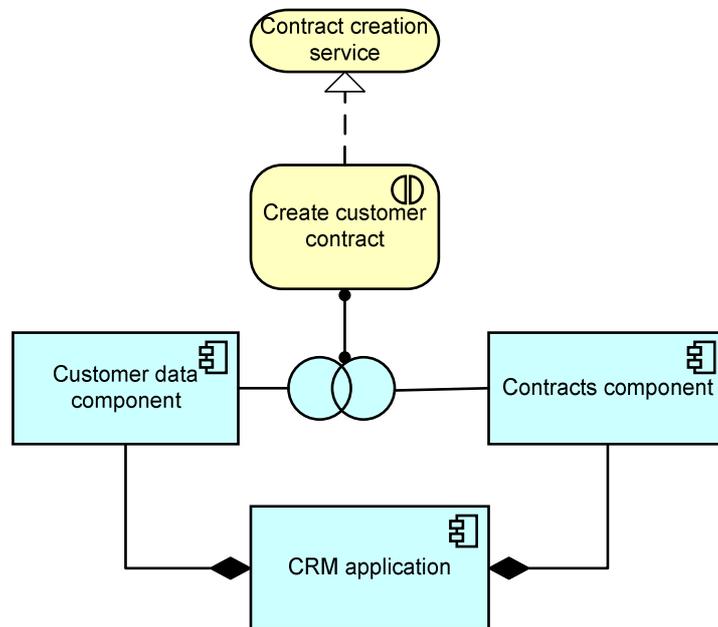


Figure 38 Realization of Contract creation service by CRM application

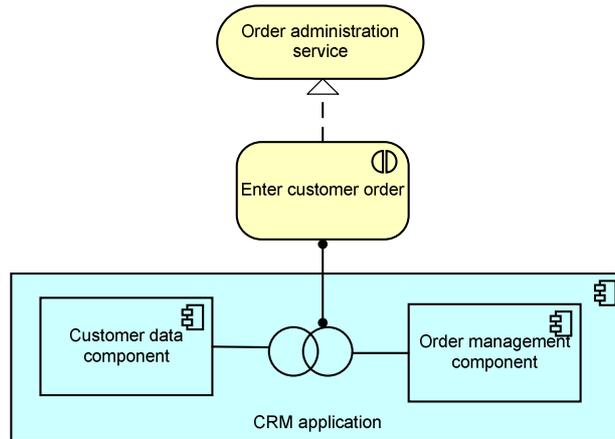


Figure 39 Realization of Order administration service by CRM application

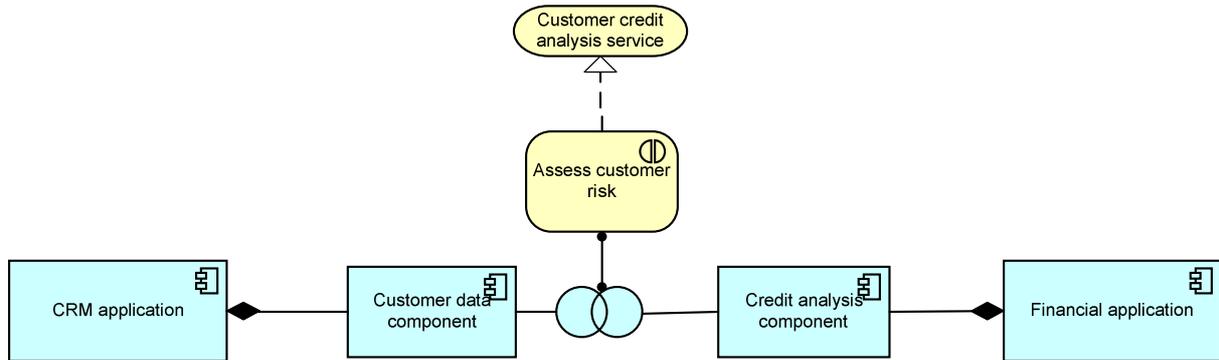


Figure 40 Realization of Customer credit analysis service

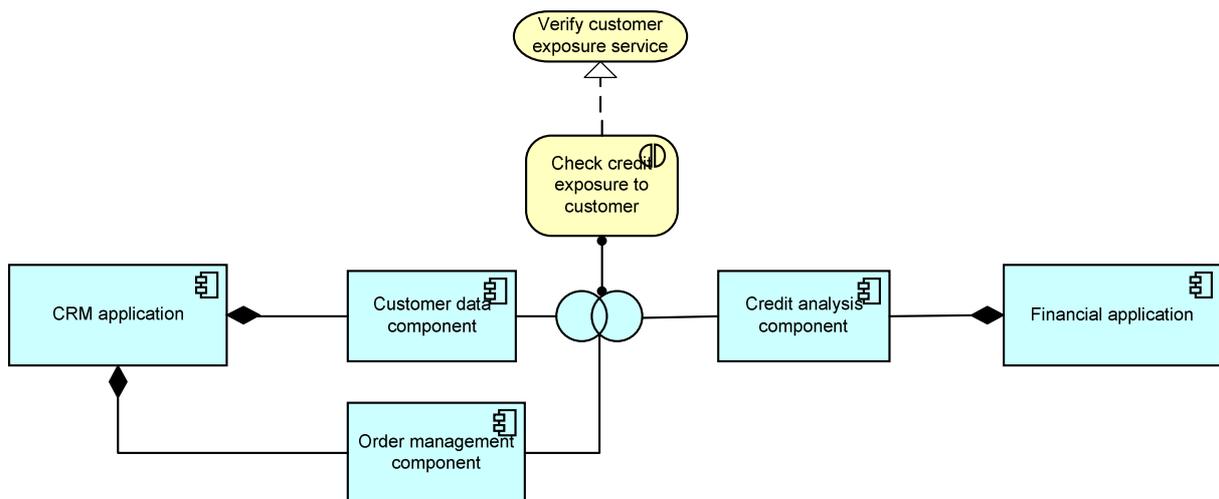


Figure 41 Realization of Verify customer exposure service

Business processes and application usage

The interface to customer will only be slightly modified in the content of Order information service. It will offer sending the information to the customer on the change of status of his order, from the moment of placing the order until the final shipment. The customer will be able to choose the type of events for which he wants to receive the notification, as well as channels through which this notification should be sent.

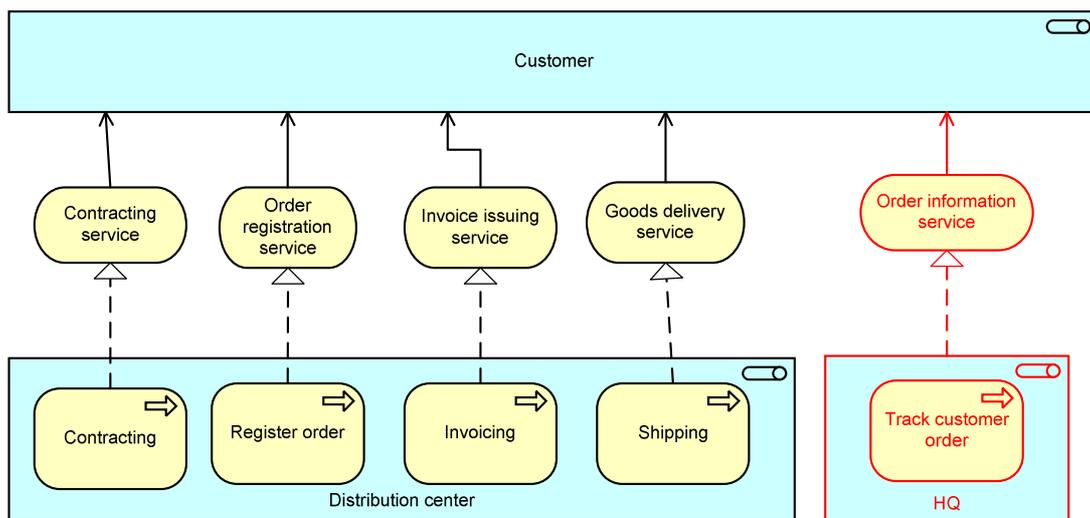


Figure 42 Customer services

As already indicated, DC will keep their autonomy relating to their core capabilities (sales). The discussed business processes will only be modified in those elements that foster coordination and integration of ArchiMetal's processes.

Contracting

Being the closest to the customer, and having the knowledge of regional language(s) and legal environment(s), distribution centres keep contracting under their responsibility.

The Contracting process now incorporates the new step of formal verification of the data entered for new customer (Approve customer data, assigned to Customer Relation and Services department of HQ). Subsequently, the entire process has to respect the new "requirements" for customer information, coming out of the standardized customer master file structure. The Contracting process is now to be supported with CRM application, instead with different DC-specific applications and databases.

DCs will have the access to some of the functionalities of the CRM, in particular creating new customer entries and some limited rights of their editing.

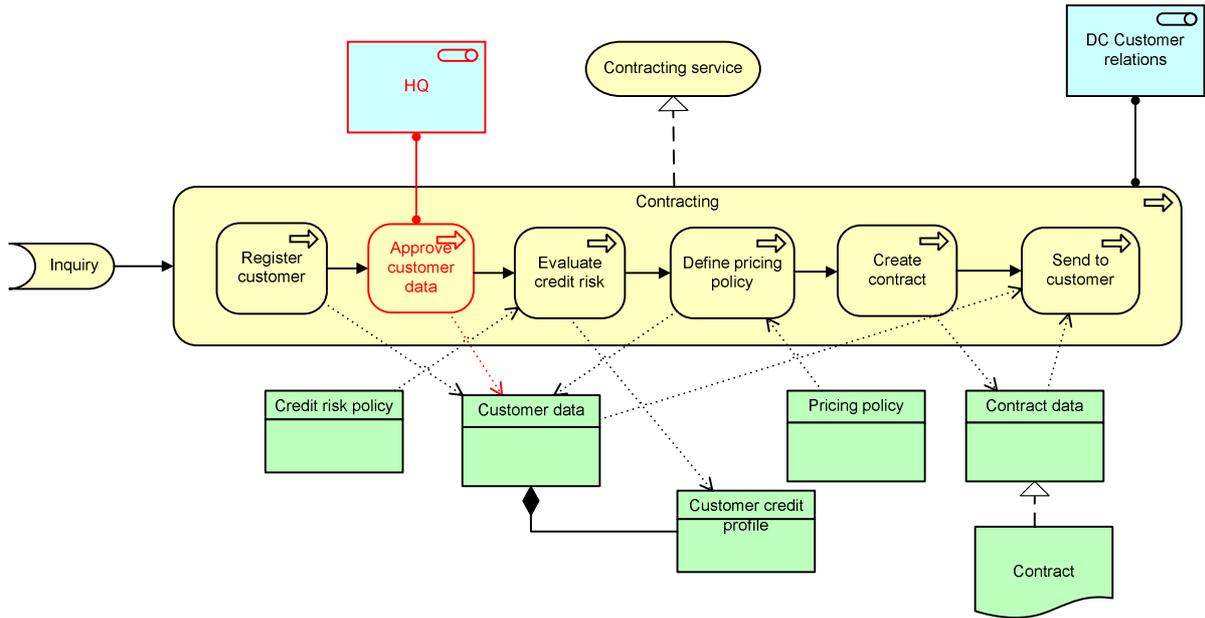


Figure 43 Contracting process

The definition of application services supporting the Contracting process (shown in the figure) will have to be changed to reflect the requirements for standardized customer data set. These services will be realized by/on top of the CRM system.

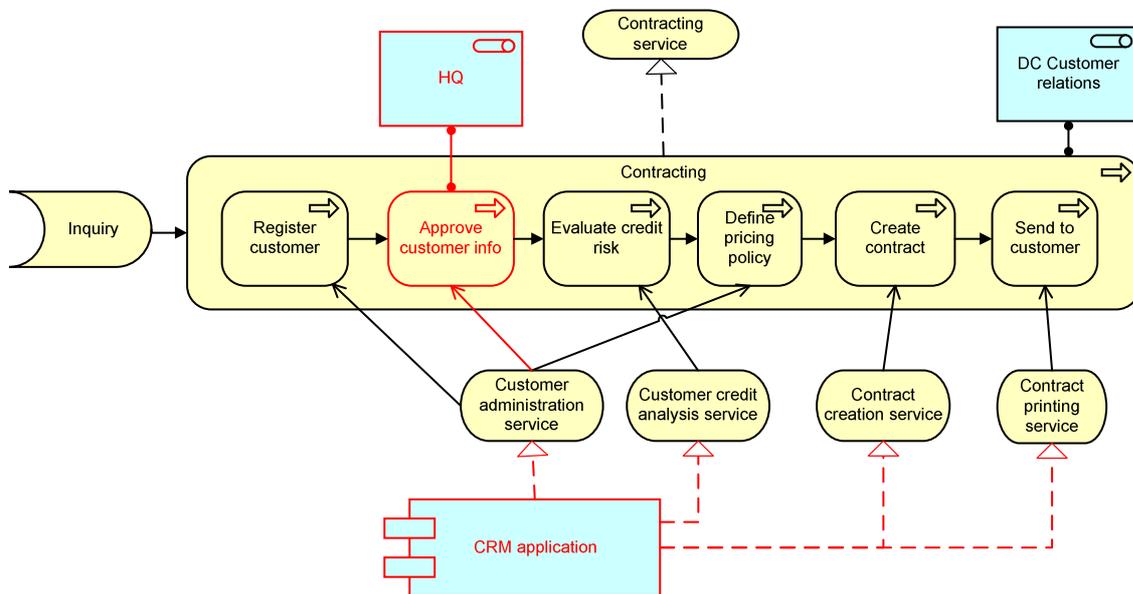


Figure 44 Applications usage by Contracting process

Evaluate credit risk

The impact on this process is limited. It resumes to using CRM system for customer credit profile editing, and again, this obliges the process to respect the requirements relative to the set of customer data to be maintained.

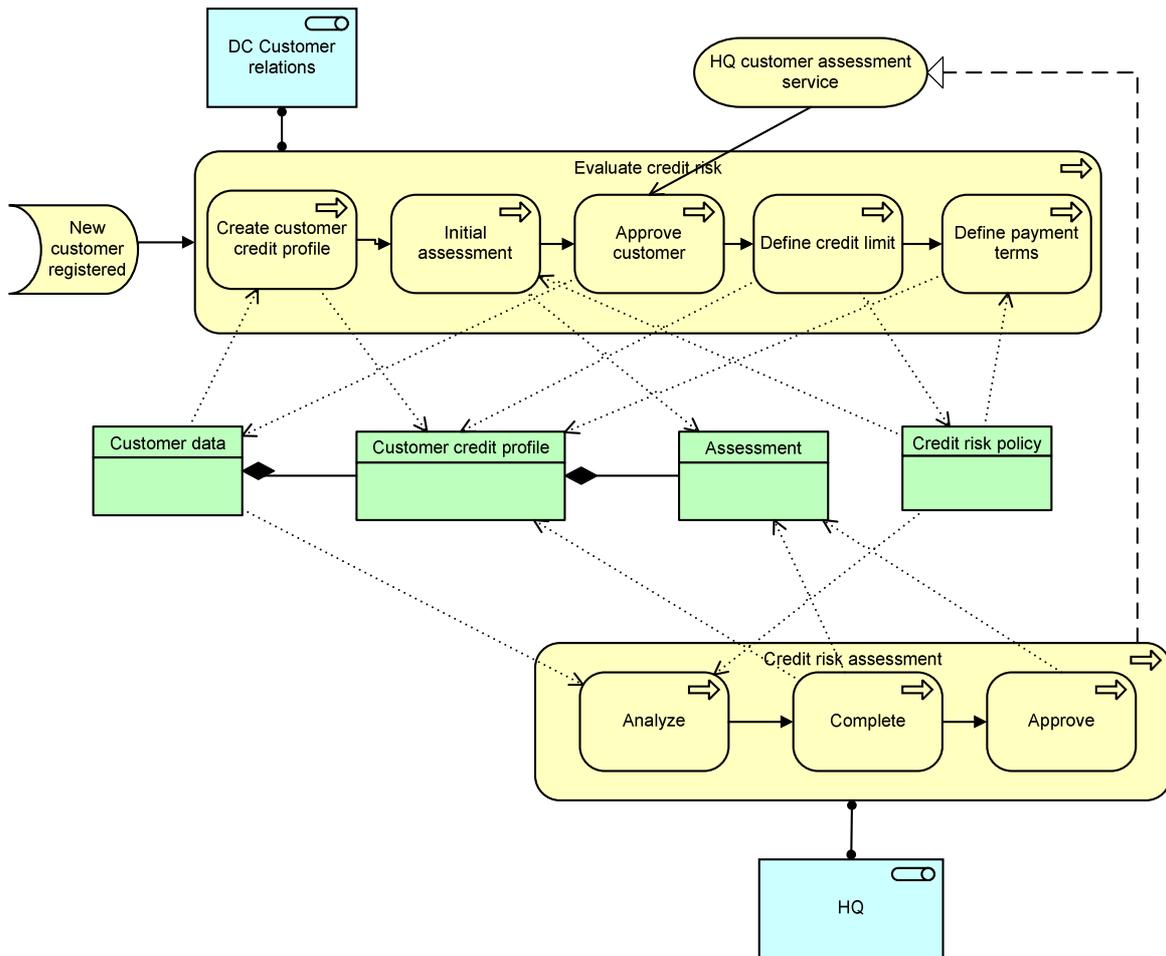


Figure 45 Evaluate credit risk process

Register order

This process is redesigned in a way to leave out the information service to the customer to the new Track customer order process. The order status update triggers the process of customer order tracking.

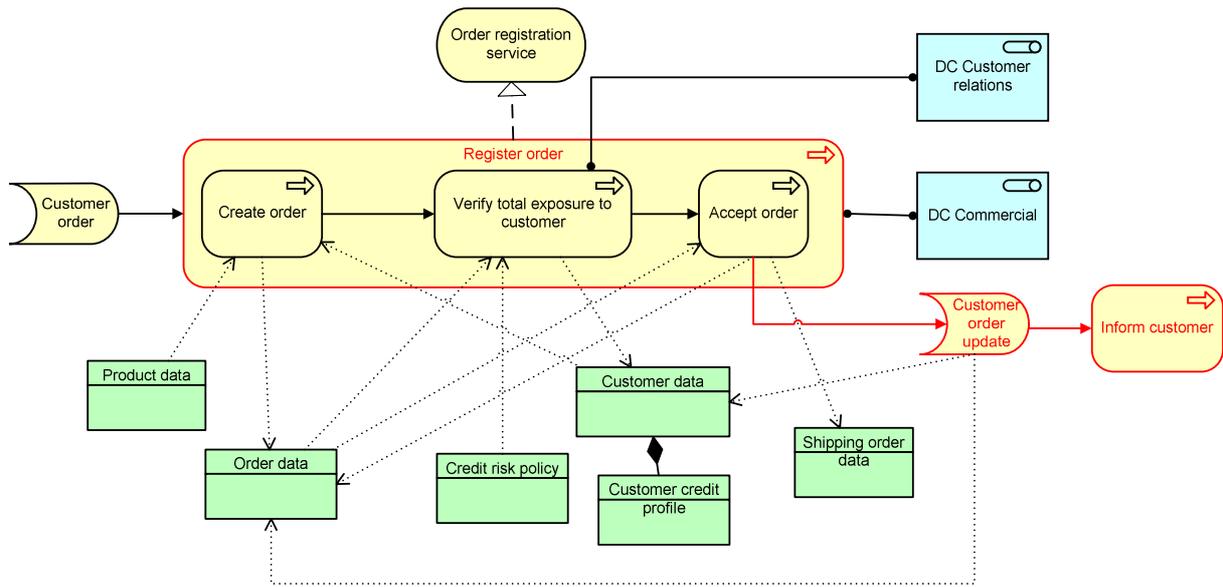


Figure 46 Register order process

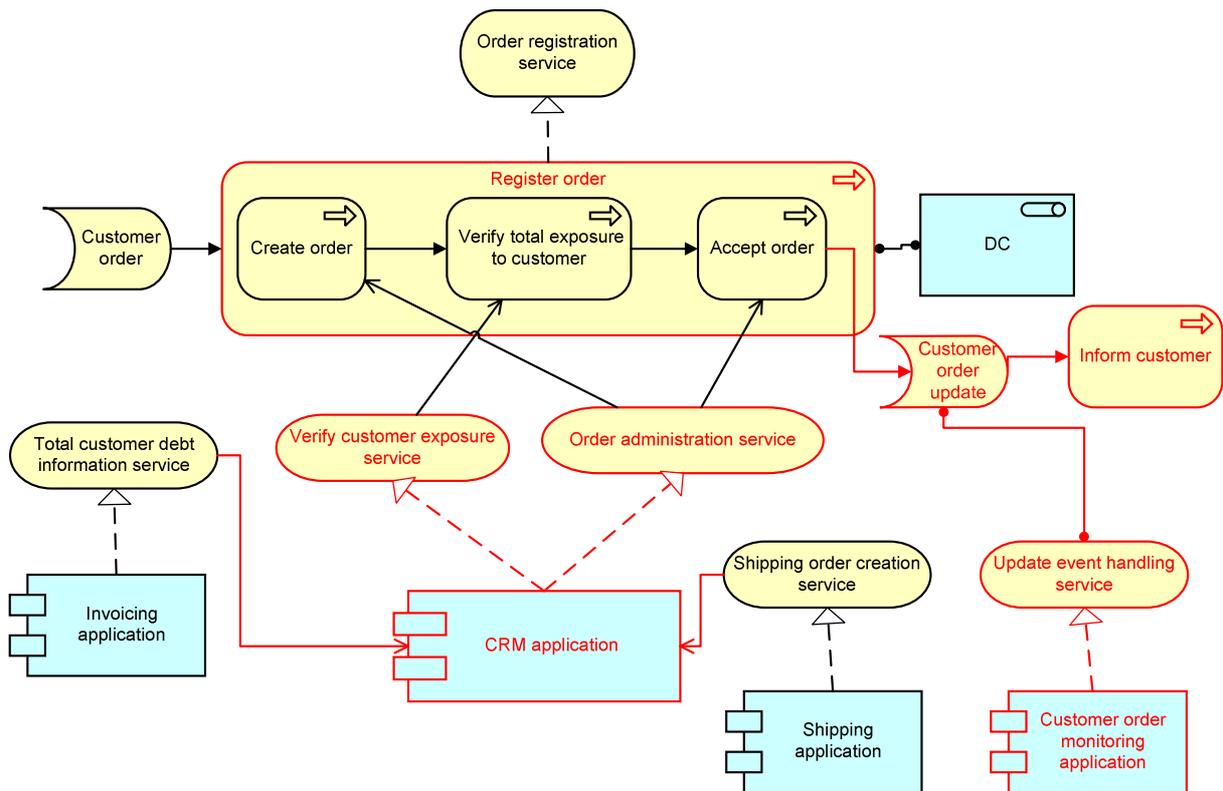


Figure 47 Applications usage by Register order process

As change scenario discussed in Alternative 2 targets integration of Order management functionalities within the introduced CRM system, this process is completely supported with the CRM functionalities. In particular, CRM will be configured to realize Verify customer exposure service, and a new service will be defined and implemented to enable editing of the customer order (Order administration service).

CRM system will enable the functionalities of order administration. The customer order update event is “generated” through the application service Update event handling service.

Track customer order

The newly introduced business process Track customer order is assigned to the new Customer Relation and Services department in HQ. This process is realizing the Order information service, which allows the customer to be informed on the advances on his order processing.

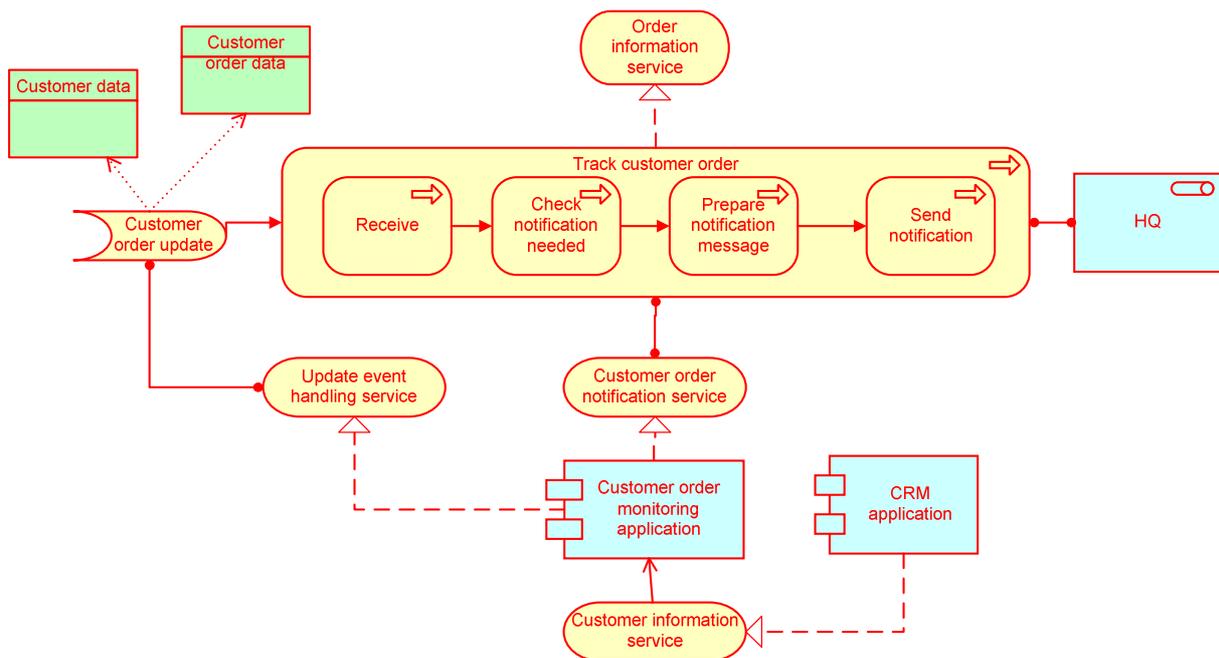


Figure 48 Applications usage by Track customer order

The events to notify can be specified for any step of order handling, and incorporated into this system, under condition that the notification (respecting the specification) is sent to the tracking application. For example, shipping application in DC may generate the event of order update after the goods have been shipped, or Sales order management application within PC may generate the event just after the goods have been produced and are ready on the stock.

The suggestion would be that these events contain at least customer and individual order identifications, together with the identification of the type of event for which the notification should be sent.

The subscription for this type of service may be proposed at the moment of establishing the contract with the customer, or later on, during next order placing or even the customer may at any time subscribe to this service on a Company's web site. These and similar details of this service should be left on the choice of the Company's management.

Track customer order process is fully automated with the new Customer order notification (application) service. This application manages the customer subscription to the tracking service, which include the information on the type of events for which customer required the notification to be sent, as well as the channels (interfaces) through which the information should be sent to the customer. It also enables online (Web) editing of the customer's subscription, and finally, this application generates the notification.

The proposition is that the Customer Relation and Services department is responsible for Order information service and for Customer order monitoring application.

In the context of Alternative 2 change scenario, any type of order update throughout the entire cycle of order processing may potentially be reported. This is due to the increased transparency of customer and order data across the processes related to customer order processing. So the customer may, if desired, receive the notification for the following events (under condition that all these applications interface with Customer order monitoring application):

- Order accepted
- Order received by production centre
- Production estimate communicated
- Order in production
- Delivery estimate communicated
- Order shipped from the production centre
- Order arrived at the distribution centre
- Order shipped to customer

Verify total exposure to customer

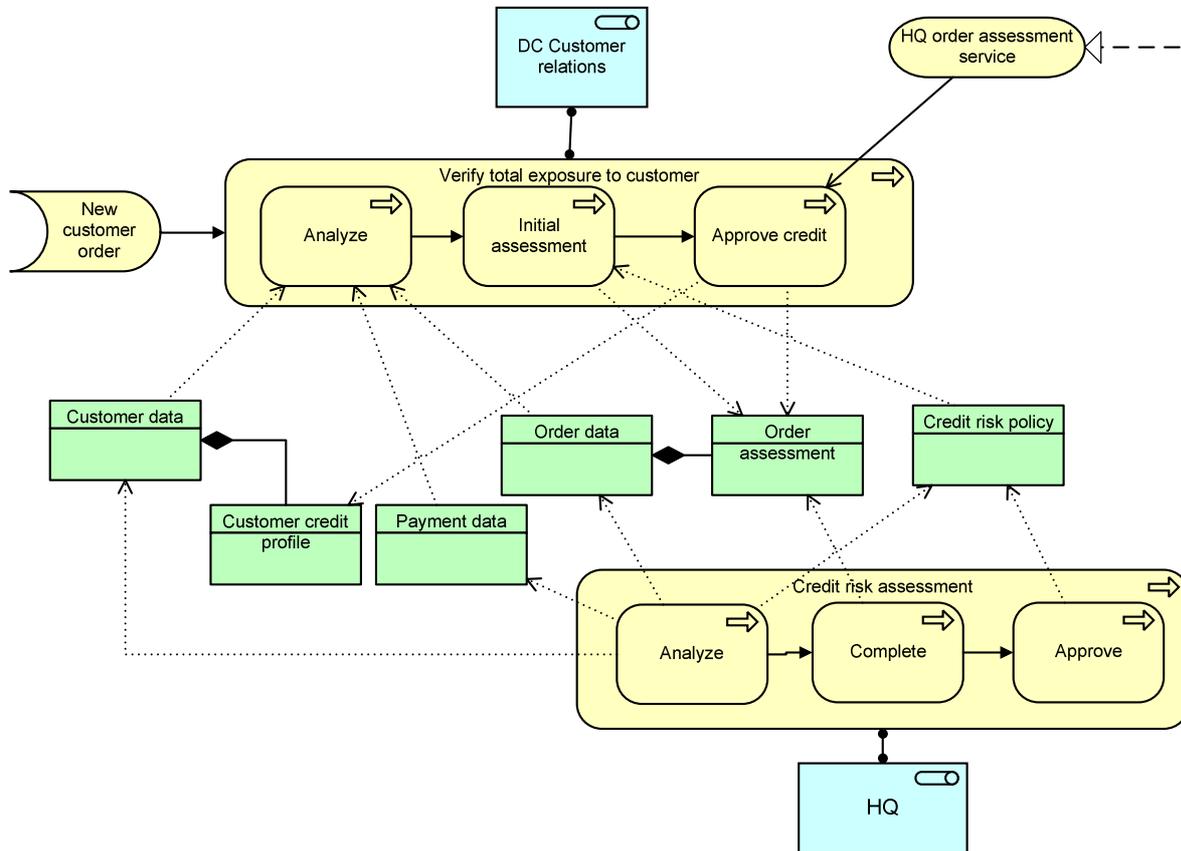


Figure 49 Verify total exposure to customer process

In this process, the CRM system is used for customer credit profile consultation, instead of local customer management applications. CRM system is used for both customer and order management, while information on orders payment are gathered through interfaces with corresponding invoicing/finance applications from DCs.

In this way, all the critical information for credit risk assurance is available to company-wide, enabling for the significantly greater transparency.

Process customer order

As the Alternative 2 understands the change in the communication between PC and DC on customer orders, and since the CRM system is to be used with Order management functionalities, the Sales order processing process is redesigned and renamed to Process customer order, to reflect the fact that now this process is executed on each individual customer order.

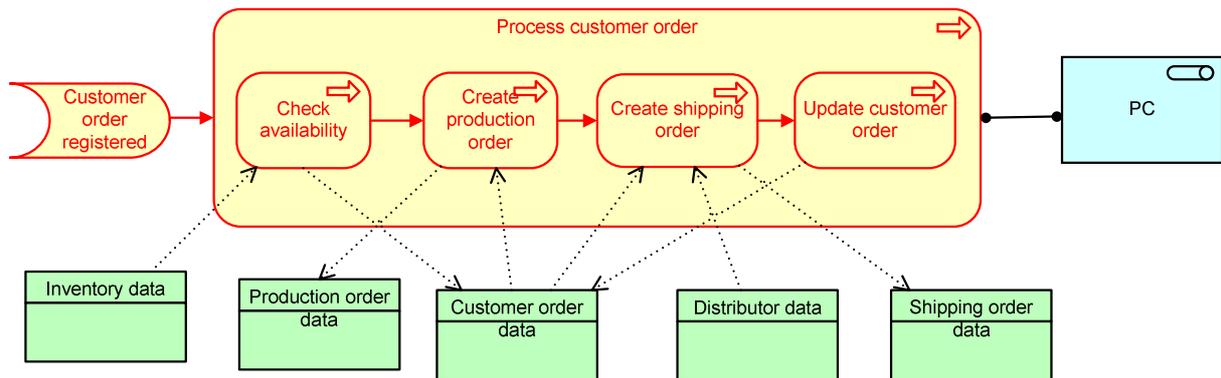


Figure 50 Process customer order process

Instead of receiving and handling bulk orders, the individual customer order is received and treated. The production and shipping orders also relate to the individual order. In this way, the transparency of customer- and order-related data is significantly increased. Not only that this allows for efficient tracking of order processing status across the processes of the Company's business units, but it also increases the manufacturing flexibility. This change indeed makes it possible to intervene to some extent to the production scheduling and on top of that propose various "advanced" services, such as prioritized order placing; "late" modifications of order quantities etc.

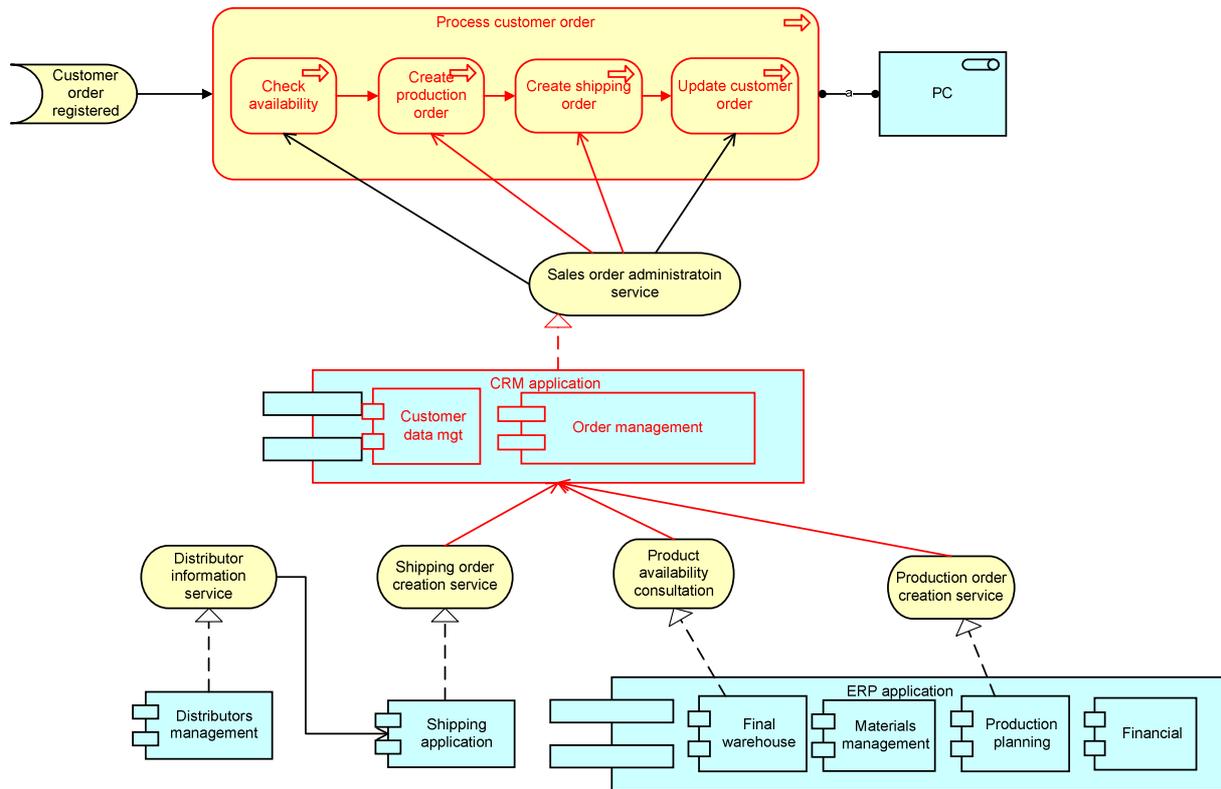


Figure 51 Applications usage by Process customer order process

Comparison of alternatives

So far, we have analysed the current situation in ArchiMetal in order to identify the opportunities for increased overall efficiency and enhanced customer service. ArchiMate models document the architecture of the enterprise, providing high-level view of the Company's business and IT architecture, suitable for the required analysis.

Furthermore, we have discussed the possible improvements, and a number of supporting models helps tracing the impact of these changes across all levels of the architecture. The elaborated ArchiMate models are just sketching the high-level design of changes, while the detailed design within the specific domains (e.g. detailed business process design) is necessary before these changes are to be implemented. In that context, the present high-level models are very useful for assuring the coherence, and as a support for steering the operationalization of enterprise transformations.

Relying on the analysis of the current situation in the ArchiMetal and the identified business challenges, two alternatives within the migration scenario have been discussed:

- The first alternative focuses only on the critical issue that is to be resolved, i.e. the non-existence of customer master file. This option corresponds to the situation where, due to different constraints, the scope and breadth of change should be limited and overall business improvement done in stepwise approach. In that context, this alternative of business improvement comprises the definition of the master file (standardization of customer data structure), its implementation in the CRM system, and the integration of the CRM with existing applications. In terms of business processes, some modifications are proposed, but these do not include any significant redesign of processes. The major modifications of processes for handling customer order and their underlying IT support have not been considered. Even though order data are not managed in the centralized system, this scenario makes it possible to optimize sales forecasting and provide required customer analytics. To enable relevant information to these processes, significant number of interfaces has to be developed between the existing applications.
- The second alternative includes customer master data centralization and standardization, and at the same time aims at centralization of customer order data, their tight integration with customer database. In terms of business processes, this scenario aims to eliminate the main bottleneck in customer order handling and thus proposes major redesign of related processes. The overall expected result consists in gaining the deep understanding of customer behaviour, which in turn would enable the Company to adapt its product portfolio, cross-sell and develop advanced customer services. In addition, optimized and integrated sales processes should allow for better and faster flow of information across processes and business units, better decision making, increased transparency of data and easier development of advanced customer services.

The implementation of changes proposed by the second alternative is expected to have considerably greater impact on the overall business efficiency, but requires greater effort in its implementation. In particular, eliminating the causes for inefficiency in customer order handling processes requires not only the centralisation of data and rationalisation of IT portfolio, but asks for a major redesign of the processes for order registration (at DC) and processing (at PC), and their coordination.

From the IT perspective, the second alternative proposes the introduction of pre-integrated solution for customer and order data management. This should allow easier applications maintenance, since it allows to eliminating duplication of customer and order management functionalities in different systems, and also it reduces the number of interfaces that has to be developed between the applications. While the first alternative would seem to be easier to implement (because of not considering the customer order management optimization), a significant number of interfaces having to be developed to gather data for required analytics, sales forecasts and customer services (e.g. order tracking service) would in the end generate considerable efforts and costs for systems maintenance. On the other side, the Alternative 2 would allow for the reduction of maintenance, as all the modifications of the CRM functionalities would be performed over one system and applied once before they reflect to other systems.

Conclusion

Enterprise architecture (EA) provides holistic view of the enterprise, and captures essentials of the business, IT and their evolution. As such, it is an essential instrument in managing the complexity of the enterprise, its processes and systems.

This case study demonstrates the added-value of EA instruments in the context of operational business improvement in a fictitious company from metallurgic domain. We have shown in particular how ArchiMate language for high-level architectural modelling, can be used to analyse, design and guide such change processes. ArchiMate models provide a big picture of business processes and their underlying IT, while intentionally leaving out the details of architecture and design of processes, applications, and technical infrastructure. ArchiMate focuses rather on the global structure and on the relationships between these domains, which helps to gain insight into the alignment between, e.g., business processes and their supporting applications.

The concepts of ArchiMate modelling language are sufficiently generic and expressive to model many aspects within specific domains, but ArchiMate doesn't intend to replace languages for specific and detail design for e.g. business processes (e.g. BPMN) or applications (e.g. UML). The goal of the ArchiMate is rather to integrate them through high-level architecture models.

ArchiMate 1.0 Technical Standard is The Open Group's standard for enterprise architecture modelling, and is published in 2009. It accompanies the Open Group's architecture framework TOGAF. The second version of the Technical Standard, which is recently published, includes the extensions for modelling motivation, implementation and migration aspects of the architecture.

References

- [1] The Open Group ArchiMate 1.0 Specification, technical standard, 2009.
- [2] The Open Group Architecture Framework TOGAF, Version 9, 2009.
- [3] M.M. Lankhorst et al, Enterprise Architecture at Work: Modelling, Communication, and Analysis, Springer, 2009.
- [4] J.W.Ross et al, Enterprise Architecture as Strategy: creating a foundation for business execution, Harvard Business School Press, 2006.
- [5] R. Kroese and G.-J. Kamer, EA at TATA Steel with ArchiMate – Experiences, best practices, and lessons learned. In The Open Group Conference, Cannes, France, April 2012. Presentation.
<http://www3.opengroup.org/cannes2012>
- [6] E. de Vos. Enterprise Architecture at Corus – A steel company. In The Open Group Conference, Amsterdam, The Netherlands, October 2010. <http://www.opengroup.org/amsterdam2010>
- [7] R. Ravenhorst. Developing a project architecture and evaluating the Enterprise Architecture initiative at Tata Steel. Master's thesis, Delft University of Technology, Delft, The Netherlands, February 2012.
- [8] M.V. de la Fuente, L.Ros, M.Cardós, Integrating Forward and Reverse Supply Chains : Application to a metal-mechanic company, International Journal of Production Economics, 111, p.782-792, 2008.
- [9] A.Potter, R.Mason, M.Naim, C.Lalwani, The evolution towards an integrated steel supply chain: A case study from the UK, International Journal of Production Economics, 89, p.207-216, 2004.