

ICT and omni-channel logistics

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This chapter discusses the importance of ICT in omni-channel. The migration to an omni-channel customer strategy has a great impact on the ICT environment and the availability of the correct, high-quality data. In omni-channel logistics, the channels are seamlessly connected and integrated. Thus, in an omni-channel context, ICT must ensure easy access to all of the relevant customer services. The ICT should be a solid backbone on which an organization can build further in the future.

The aspects of ICT discussed in this chapter refer to the alignment of business and technology essential in omni-channel logistics.

10.1. What is ICT?

Information and Communication Technology (ICT) is concerned with the storage, retrieval, manipulation, transmission and receipt of digital data. Importantly, it is also concerned with the way these different uses can work with each other. ICT is different from IT (Information Technology) which is often used as a synonym, mainly because it focuses more on the unification of communication. Since the human race is progressing technologically on a day-to-day basis, we see that the definition of ICT is also evolving because the concepts, methods, and applications of ICT are changing rapidly.

The application and development of ICT has had some significant effects on various industries, and the field of logistics is no exception. As a result, the style of business operation, upstream and downstream partnerships and customer relationships are changing as well.

The use of computers, internet, and information communication systems can be seen in almost every activity in the logistics industry. Activities like transportation, warehousing, order processing, material management, and procurement are currently

highly dependent on ICT. It is suggested that passing information to all businesses in the supply chain via ICT will improve their performance. Hence, ICT has been promoted as a means to enhance logistics competitiveness. Interestingly, it is one of the few factors that have simultaneously proven the increasing performance and the decreasing costs of logistics.

10.2. ICT challenges in an omni-channel context

In omni-channel logistics, the channels are seamlessly connected and integrated. Thus, in an omni-channel context, ICT must ensure easy access to all of the relevant customer services. This in itself is a tremendous challenge. Largely speaking, there are two main challenges for ICT in an omni-channel business context:

Staying up-to-date

There is a constant struggle for ICT to keep up with customer demands of the day because of the diversity and pace of change in the requirements. User interfaces for customer touch points must be up-to-date, attractive and modern. ICT should support a specific, recognizable user experience, and quickly serve the needs of users at any time.

Reconciliation of contrary interests

The need for swift changes in ICT might come in conflict with governance principles. These governance principles establish crystal-clear requirements for all types of interaction between customers and partners as well as the information technology on which they are based. Consequently, reconciliation of these contrary interests may impede fast response on the part of the ICT when it must satisfy the technical requirements for the consistent provision and governance of the contents, product information, prices, and processes. Transaction security must be assured, the most highly diversified business and legacy applications must be integrated, and data security and protection must be guaranteed.

Transitioning to omni-channel

The ICT works well in omni-channel only when all the systems involved 'talk to each other'. Above all, ICT must not only be agile but also flexible. It should be a solid backbone on which the company can be built further in the future. Thereby having a robust ICT system is key to the survival of most organizations, especially those dealing with omni-channel logistics.

Of late, digital channels have become much more important. Considering this fact, it is essential for companies to know their customers well and record data in dynamic customer profiles, CRM, which can be viewed and edited by all channels. The enriched data is critical in enabling companies to work in an omni-channel approach. Organizations can advise customers and offer them one-to-one services that are ever more relevant and delivered at the precise moment they are needed.

So far, omni-channel and supporting information systems have been an extension of multi-channel and cross-channel logistics. ICT has to play an active role in bridging the gap by taking the form of empirical constructs aiming at guiding corporate strategy and system design to deal with the future landscape of omni-channel business context.

The ability to design, implement, operate, and maintain omni-channel information systems, is highly decisive for shaping the future of any company. Technology should be considered as a principal factor in the creation of customer experience and the maintenance of a consistent level of customer service across existing and future sales channels and touchpoints.

10.3. Making omni-channel happen

Before determining how to change things to make a business successful in an omni-channel setting, it is important to identify to which omni-channel scenarios a business belongs. Understanding the AS-IS scenarios and targeting the TO-BE scenarios in terms of ICT, primarily requires a concise discussion of the possible scenarios. Paul Grefen, through his book, *Beyond E-Business: Towards networked structures* (Grefen, 2015), has tried to accomplish this using three dimensions namely: Parties, Objects and Time Scopes of e-business. We find it extremely useful to consider the omni-channel logistics with reference to a fourth dimension called the *Aspects*. The four aspects discussed are Business, Organization, Architecture and Technology (abbreviated as BOAT). The following sections of this chapter deal with an analysis of omni-channel logistics using the BOAT framework.

The BOAT Framework

Considering the developments in the omni-channel network, business and technology aspects are strongly interrelated. In many other fields, business developments create new requirements of technology. In other words: technology follows business. In the field of

omni-channel, however, many business developments have taken place because the enabling technology created the opportunity. A well-known and very clear example is the development of the use of the web for retailing applications: the web was not developed because business demanded this, but mere existence of the web has pushed business into new directions (Grefen, 2015).

Consequently, the developments in omni-channel are driven by two concurrently operating forces that reinforce each other: a market-pull (also called requirements pull) force and a technology-push force (Grefen, 2015). Both forces are strong in the sense that they are driven by rapid developments. From the technology side, developments are easily observable, as indeed they are on the market (business) as well. These developments cause omni-channel to change at a pace that is sometimes hard to keep up.

In trying to understand the fast developments of omni-channel logistics, an organization must always be aware of these dual forces. Focusing on technology only may mean that an organization forgets to understand what the market wants. Focusing on the market side only may mean that an organization forgets to



Figure 38 – Technology Push and Requirements Pull (source: *Beyond E-Business*, Grefen 2015)

adequately use new technological possibilities (Grefen, 2015).

The omni-channel network is a mix of business-oriented elements and technology-oriented facilitator elements. Omni-channel scenarios should be analyzed or designed with a clear and structured separation of concerns by distinguishing aspects of those scenarios. The BOAT framework provides a set of four aspects for the omni-channel field: business, organization, architecture and technology.

Business Aspect (B)

The business aspect describes the business goals of an organization. It answers the question *why* a specific omni-channel scenario exists or should exist or what should be reached by business collaboration in a specific scenario. Topics of these questions can be for example, interaction with the customers, new conceptual ways of collaboration in a business

network, access to new markets or business directions (Grefen, 2015).

An organization that wants to make the transition to omni-channel has to establish clear goals that bridge the gap between the customer's expectations and its capabilities. There are two important business drivers in achieving the desired omni-channel business goals: *reach* and *richness* (Grefen, 2015).

Reach describes the parties that an organization can collaborate with in an omni-channel scenario.

Richness describes what can be achieved from the collaboration with the other parties in an omni-channel scenario.

Reach and richness are major parameters in the way an organization creates value for its customers (Grefen, 2015).

Designing omni-channel scenarios is often based on increasing reach, increasing richness, or increasing both. Reach is increased to address new customer groups. Richness is increased to make a business more attractive to existing or projected customer groups (Grefen, 2015). Increasing richness is preferred in an omni-channel context because the aim is to create more personalized, relevant and dynamic interactions with customers.

Each omni-channel scenario has its own combination of reach and richness characteristics. However, changes in reach and richness have to be carefully operationalized, i.e., designed concretely in operational terms like customer groups to address, channels to be used, time frames for realization, etc. (Grefen, 2015).

Organizational Aspect (O)

The organizational aspect describes how organizations are structured and connected to achieve the goals defined in the business aspect. The main ingredients of this aspect are the business network level, the organization structures within the organization, business processes within the organizations and across organizations in a business network, business functions and business services (Grefen, 2015).

Automated ICT systems to support these structures, processes and functions are not within the scope of this aspect.

The interaction between parties in a networked omni-channel context changes frequently. It changes as a consequence of changing business models, parties switching between channels and changing technology (Grefen, 2015). The fact that internal business functionality and externally oriented business functionality change at different paces implies that a clear disconnect between these two types of functionality has to be made. Without a clear disconnect, one cannot be changed without affecting the other.

The core business functionality that has an intra-organizational goal is commonly referred to as back-end functionality. The business functionality that is in contact with external parties and that has an inter-organizational goal is commonly referred to as front-end functionality (Grefen, 2015).

Decoupling front-end and back-end means that in a concrete situation, the back-end part, the front-end part, and how the two ends interoperate, needs to be clearly defined. The Cfx represent the customer front-end

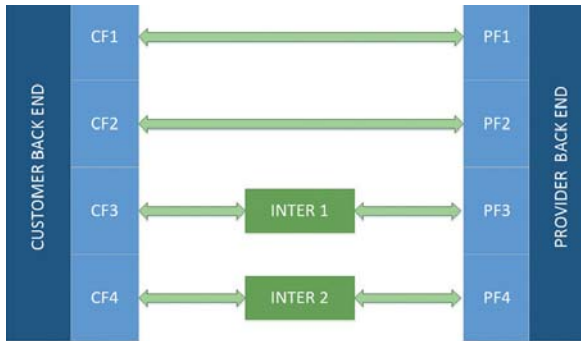


Figure 39 – Abstract e-business organization structure: Traditional Approach

modules and the PF_x represent the provider front-end modules. The Inter-_x represent the intermediary parties used to handle the transactions between consumers and provider modules. The number of front-end modules depends on the amount of business scenarios (Grefen, 2015).

The front-end functions implement the collaboration in an omni-channel scenario; hence they most determine the omni-channel character of an organization.

Which business functions are important in the front-end of an organization depends on the role that the organization plays in a scenario: provider with a sell-side perspective or consumer with a buy-side perspective.

The front-end and back-end functions of an organization can be identified using the Porter's value chain model. For the provider front-end perspective the focus is on Outbound Omni-channel Logistics, Marketing & Sales and Service.

For the consumer perspective, the focus is on Procurement and Inbound omni-channel Logistics. As with the provider perspective, the other functions are present in most organizations as well, but they are not part of the consumer front-end perspective.

Porter's value model was designed for traditional production organizations where physical production and transportation are of major importance. Therefore, the model cannot be applied directly to an omni-channel business context. However, the model can be extended and detailed for an omni-channel environment. The front-end functions from Porter's model are the basis for the structured identification of front-end functions for networked omni-channel business.

The Procurement Function is listed in both tables. In the back-end function, it is seen without the perspective of networked omni-channel. An organization that sells products in

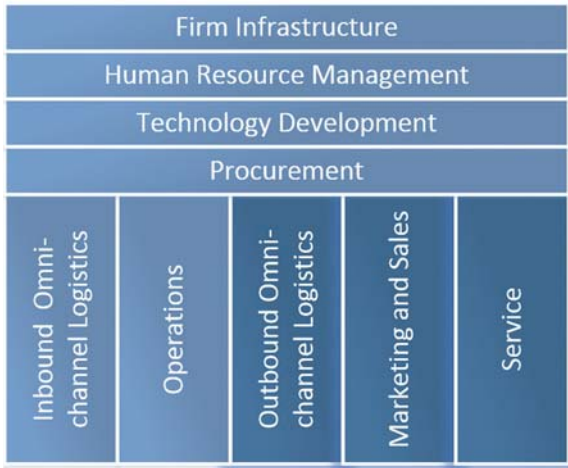


Figure 40 – Provider (sell-side) front-end business functions

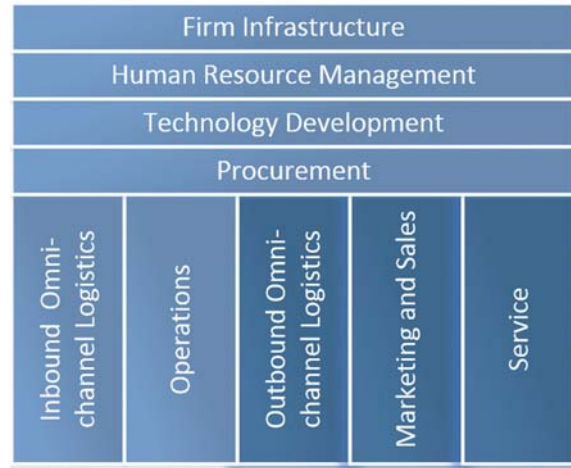


Figure 41 – Consumer (buy-side) front-end business functions

an omni-channel scenario at its output side may have to buy products in a traditional business scenario at its input side (Grefen, 2015). Integrating these two concepts lets us examine an abstract e-business organization structure with an omni-channel approach.

Architecture Aspect (A)

The architecture aspect covers the conceptual structure or blueprint, i.e., the architecture of automated information systems required to make the organizations defined in the organization aspect work. As such, the architecture aspect describes how automated systems support the involved organizations in

a conceptual, high-level fashion (Grefen, 2015). The architecture of an omni-channel system must have a number of characteristics. It should have the capability to support a great level of detail in the context of the end-user access – their location, motion, who they are, what their preferences are. An omni-channel architecture should shape the scalable software systems that form the basis for business platforms that enterprises can use to develop business ecosystems.

By using an architectural approach, the organization developing an omni-channel business strategy can deliver with the agility

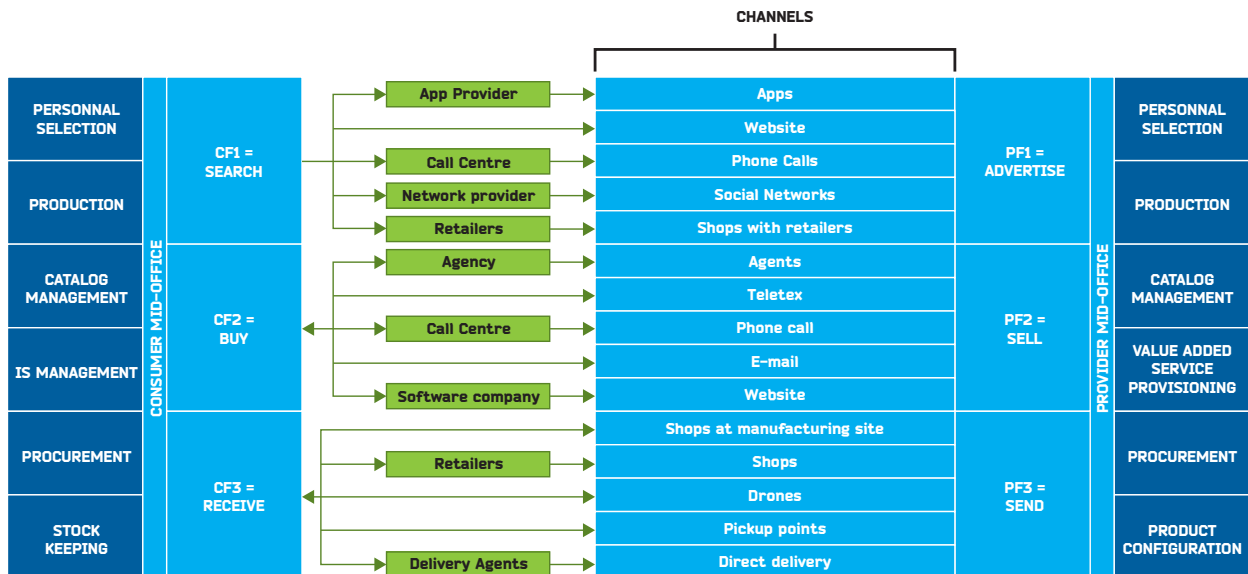


Figure 42 – Abstract e-business organization structure: Omni-channel Approach

that the market requires. An omni-channel architecture requires a network that is capable and secure through consumer, business partner and employee touch points. The architecture must support the flexibility to perform big data analytics and maintain a session context with customer data as they move from channel to channel. A successful omni-channel architecture integrates components from multiple technology and business partners into the organization information systems. Ultimately, the omni-channel architecture needs to enable each

organization to implement their unique strategy and to adapt to change.

An omni-channel platform that enables companies to promote and sell products via every channel and device can be a solution for an information system in an omni-channel business context. It employs a unique and powerful 'single source/single view' model and a special tool for product information management. The platform should allow the aggregation and enrichment of data from different sources in a single place, providing a

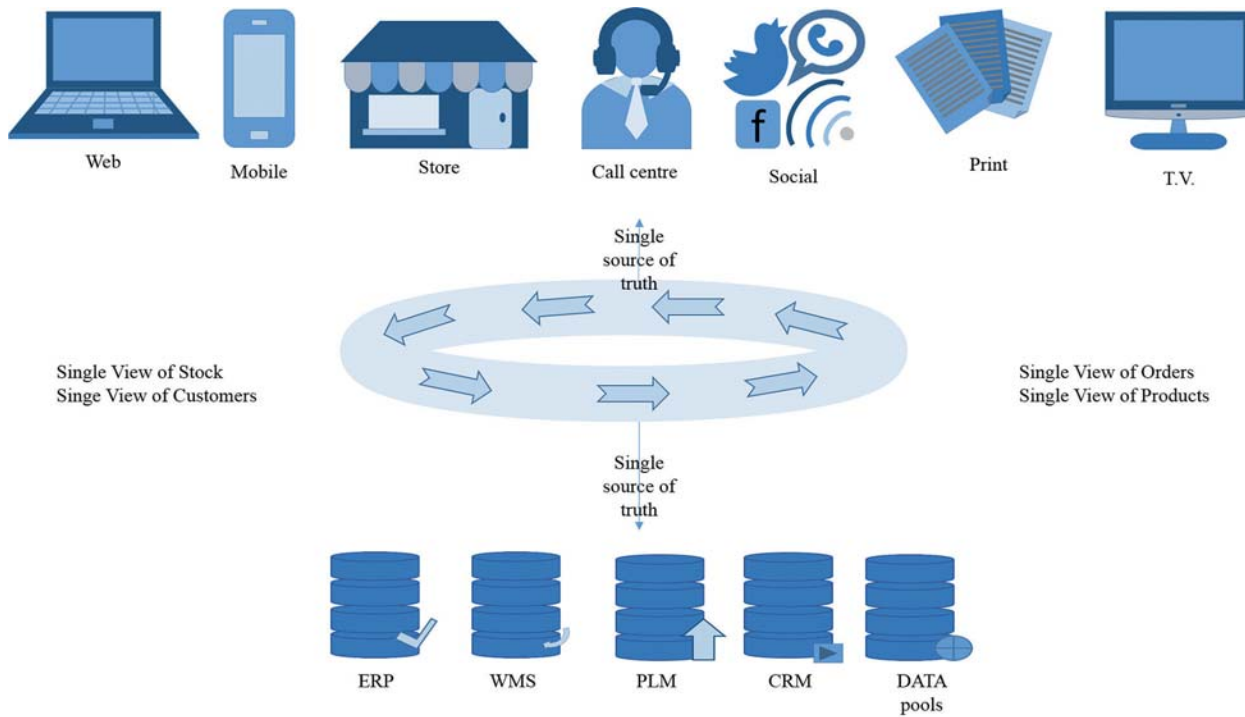


Figure 43 – Example of an omni-channel platform (source: adapted from H. Kourimsky and M. v. d. Berk 2014)

single data source for all channels and across all markets. This ensures a single view of product data for both customers and providers.

Service-oriented architecture

To support omni-channel business, the information systems should be focused on the distributed character of information and disjoint service platforms. This can be

accomplished by the use of a service-oriented architecture (SOA). SOA enables the separate modules to efficiently communicate with the others and the architecture to be flexible to new requirements. SOA ensures fast response time and support for both synchronous and asynchronous messages between modules (Grefen, 2015).

The modules underlying an omni-channel architecture should be designed with a distinct emphasis on technology and modeled as reusable services.

Technology Aspect (T)

The technology aspect describes the technological realization (embodiment) of the systems for which the architecture is specified in the 'A' aspect above. In other words, the 'T' aspect describes from which ingredients an omni-channel system can be built. The 'T' aspect covers the concrete ingredients of information and communication technology, including software, languages, communication protocols, and hardware where relevant.

Many decisions in omni-channel logistics are strongly influenced by the ICT developments. Some of these developments are related to cloud computing, social media, internet of things, mobile computing or big data.

Some of these developments are briefly described below.

Cloud computing

Nowadays, e-commerce and mobile solutions tend to be separate from front-end systems. Although many of these channel-centric systems have been integrated with systems of record to prevent the duplication of customer and product data, the actual workflows, the heart and soul of each system, are unique (Butte).

An omni-channel customer experience requires a cloud computing foundation to be successful. In the omni-channel world, each channel transforms into one access method funneling interactions between the customer and company. Behind the scenes, a large-scale application, embodying the features and functions comprising the desired customer experience, is responsible for delivering the right response at the right time through the right channel (Butte). Therefore, the cloud technology is becoming the key platform to enable transformation in the way that companies engage with their customers.





Using cloud solutions implies providing access to real time data and orders as they flow in. All sales channels, stores, webstores, call center operations or mobile apps feed into one centralized system.

The tight integration that cloud platforms exhibit enables companies to more seamlessly adopt the critical and multiple applications that drive omni-channel operations. Between the speed, efficiency and cost benefits these web-sourced applications deliver, cloud computing clearly gives companies a business advantage among competitors that still

struggle to deliver innovative business opportunities.

Internet of things

In the development of internet of things (IoT) an integration of the digital and physical world is created (Grefen, 2015). This can be accomplished in two ways. The first way is to embed computing and communication facilities into digital and physical objects and to connect these to the internet. The second way is to attach tags to physical objects, such that sensors that are connected to the internet can read these tags and generate information about the objects (Grefen, 2015).

Radio frequency identification (RFID) technology is a well-known and relatively simple class of tags and sensors. By equipping physical objects with RFID tags, their movements can be automatically fed to the internet when they pass by RFID readers (Grefen, 2015).

The use of networked, location-aware devices can also be seen as part of the internet of things when it applies to physically tracking these devices. This use applies to people with networked, GPS-enabled smartphones and to vehicles with networked, GPS-enabled devices like digital driving assistants (Grefen, 2015).



Applications in the internet of things can also serve as sources of big data. For instance, the automatic tracking of products and vehicles in large logistics companies can generate huge amounts of logistics data. Cloud computing can be used as an enabler of the internet of things by making data processing capabilities available in an integrated global fashion (Grefen, 2015). The IoT opens the door to unprecedented visibility in the supply chain. And visibility is what's needed to be agile enough to accommodate the volatile flows of today's consumers.

Big Data

It is essential to identify, standardize and centralize data in the company – from price, product specification, to customer information – so there is only 'one version of the truth' accessible to all. Also, it is important for an organization to make sure that it is effectively using the data provided by its customers and business partners.

The use of big data is becoming increasingly important for business intelligence in an omni-channel context. Internet and web technology are important for the transport of data from



the data sources where data originates to the big data repositories where the data is stored for processing.

Companies should use customer data analytics to obtain deeper insights on preferences that can impact all areas of product management,

allowing more informed decisions on pricing, marketing, inventory and supply chain management and other areas. This can provide the key to unlocking a more personal communication between organizations and its customers.