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Here Comes the Omnichain

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Abstract

The value chain encompasses all the activities involved in delivering a product or service to customers. In the pharmaceutical industry, for example, that includes everything from raw materials suppliers to drugstores that sell the end products and all the steps in between: manufacturing active ingredients, pills and solutions, packaging products and managing the logistics of delivering them to pharmacies.

In traditional value chains, players usually have a well-defined role that does not change much. The manufacturer makes the product and the distributor transports it to the retailer, who sells it to the end user. However, with big data, value chains become more flexible and dynamic. Participants can take on new roles and connect directly with others within the ecosystem, breaking away from the linear value chain structure. For example, manufacturers can also be retailers. Players in these ecosystems inhabit a common ground in which they can compete and cooperate at the same time, depending on their role at any point in time. Through direct selling, manufacturers can compete with retailers, although they usually collaborate in the value chain. This new environment in which relationships evolve and change rapidly depending on the circumstances, is dynamic. This is the **omnichain** (Cordón, Caballero, Ferreiro 2015).

This paper aims to provide an in-depth picture of the omnichain: its definition, drivers and key dilemmas. Using several examples, it shows how value chains are evolving and bringing the omnichain closer to people's daily lives. It also suggests how value chains could evolve in the future.

The landscape is changing

The current industry landscape is characterized by blurring boundaries. Until recently, boundaries were relatively well defined and it was clear to which industry a company belonged. Today those limits are no longer so easy to draw. Apple, for example, started out making computers but then moved on to also produce smartphones, watches and digital media players. The company has also entered industries such as financial services and network operations, and rumors suggest that it might even be considering entering the car industry, which is not even remotely close to the computer industry. Or is it? In this new landscape, companies have access to new spaces that were unavailable to them 10 years ago, and they can adopt positions that were out of their reach before because it would have meant completely changing their operating model.

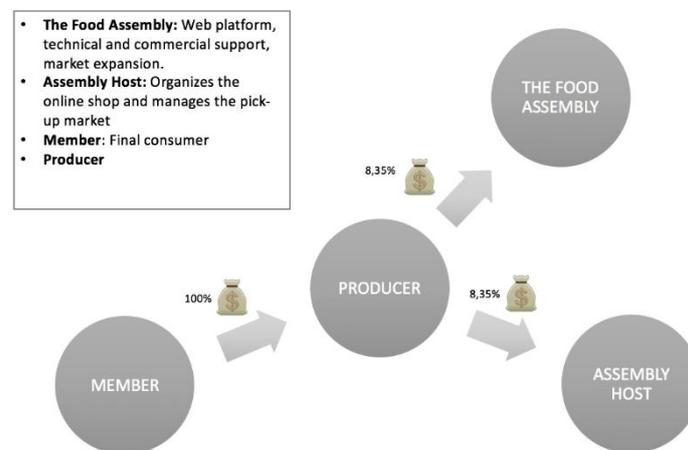
Consequently, it is becoming easier for companies to change their role in the value chain and redefine it dynamically.

The Food Assembly (<https://thefoodassembly.com>) offers individuals a new way of shopping for groceries. The organization provides the structure and overall organization as well as the online platform to link producers directly with individual buyers. Local "hosts" coordinate the pick-up market at regular intervals (weekly or fortnightly for example). Each Assembly has its own space on the portal, where producers can indicate what products they can offer and individual members (consumers) can place their orders. The members buy and pay their selection directly online and collect their purchases from the local pick-up market organized by the host, who also arranges for local producers to come and present their produce.

There are no intermediaries. The members pay the producers directly online and the producers pay a small percentage of their total earnings to the host for the organization and coordination of the Assembly, and to The Food Assembly

organization, which provides the infrastructure and maintains and develops the web portal. The producers prepare the bags based on the online purchases and then deliver them to the pick-up point on the agreed date and time (see **Figure 1**). The advantage for producers is that they have a lot less wastage than if they sold on local public markets because they only bring to the pick-up point what has already been sold. They also obtain a fairer price for their produce compared to selling to supermarkets for example. The advantage for consumers is that they know where their food is coming from, they get to discover new local products, they have the chance to meet the producers and like-minded consumers in their community and they can enjoy a much more relaxed and pleasurable shopping experience, using their PC, phone or tablet to place their orders in advance but enjoying a social gathering when they collect their shopping.

Figure 1: The Food Assembly ecosystem



This example shows how players are changing roles in the value chain:

- **Producers become retailers:** In addition to being suppliers, producers also act as retailers, preparing the orders for the final customers. This new way of doing things has profound implications on the producers' ecosystem and the way he or she interacts with other players. In traditional value chains, producers usually have only four or five customers – major food chains who make bulk purchases at lower prices. In this new ecosystem producers may have hundreds of customers, the final consumers, and they can obtain a fairer price for their produce because they eliminate the intermediaries.
- **Producers handle logistics:** The producers transport their products in person to the pick-up point (the Assembly) and hand them over directly to the end customers (the Members), thereby bypassing logistics companies and other distribution intermediaries.

Many examples in today's landscape show other interesting trends:

- **Retailers become producers:** Companies such as Walmart are offering their own-brand products, making them even more important players in the consumer goods industry.
- **Logistics providers become manufacturers:** Logistics companies are evolving from being just delivery companies toward offering added value services in their warehouses. One example is DHL, which now offers various additional services, including assembly, packaging, customization, postponement and kitting.

In *The Food Assembly* example, the producer plays several roles and is in contact with all the players of the value chain, which marks a major break from the traditional linear value chain. The host is also in contact with all the producers that sell in the community as well as with the members, and the members can interact directly with the host and the producers. Additionally, the host can also be a producer and a consumer, and producers can become hosts and also be consumers within the network. In short, *The Food Assembly* is an ecosystem in which producers, hosts and members are all connected to one another and can play several roles. The relationship among these players is dynamic. Just as members can change their orders every week, producers can opt not to take part in *The Food Assembly* on any given week.

The business model of this ecosystem is also different to what we usually see. Whereas retailers traditionally earn their money by buying products from producers and selling them on to end consumers at a higher price, in the case of *The Food Assembly*, the host who coordinates the online sales and the pick-ups is paid by the producer in the form of a percentage of sales as compensation for their work.

Before the digital revolution, this new way of shopping for groceries proposed by *The Food Assembly* would have been impossible for a number of reasons:

- Producers would not have been able to establish direct contact with consumers to the extent that the Internet now allows this.
- Producers deliver to the pick-up market (the equivalent of a typical market or retailer) the exact amount of produce that has already been sold through the Internet portal. There is no transfer of money at the pick-up market. Traditionally, producers would take their stock to a market and sell it there.
- Consumers would not normally have been able to buy directly from so many producers in one place; it would have been too time-consuming to visit or contact all of them individually, and the number of producers selling their produce directly at physical markets is limited.

The Food Assembly modifies the traditional value chain in yet another way. Since the producers also prepare and deliver the goods to the end-consumer, the customization phase of the value chain, known as postponement, which is traditionally one of the final steps in the value chain, moves right to the beginning.

How big data is changing the value chain

Value chains, by definition, handle huge amounts of information from end to end. In the example above, it handles detailed information that goes from the member to the producer. Traditionally, because technology was not sufficiently developed to cope with this volume of data, the information was often aggregated and lost. In such situations, information can be perceived as excessive or burdensome. Big multinationals, like fast-moving consumer goods companies for example, were unable to handle all the data about their individual customers that retailers could generate, such as their favorite products or the total number of orders they made per year, so they tended to group it to make it easier to manipulate (see **Figures 2 and 3**). As a consequence, they lost the detail.

Figure 2: Aggregated data from consumers

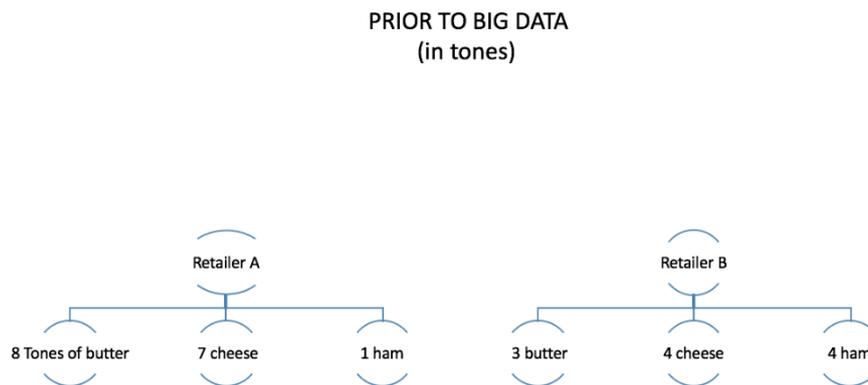
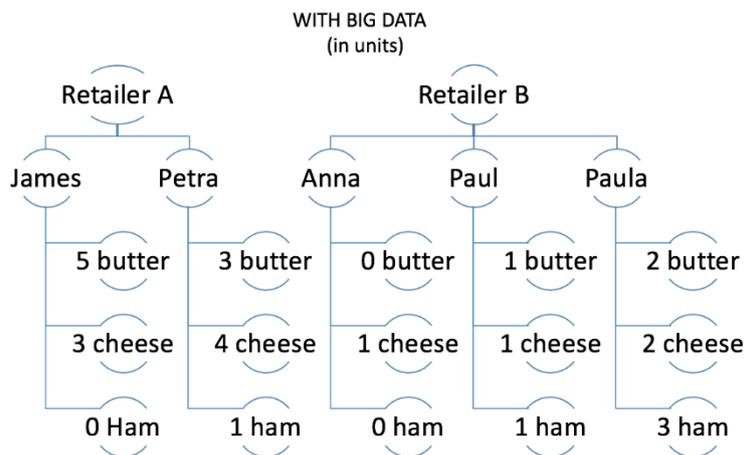


Figure 3: Detailed data from consumers



The big data era brings new capabilities that brush aside previous problems related to handling the huge amount of information produced at all stages of the value chain, allowing it to fly fast and accurately from one end to the other and in all directions within the ecosystem.

First the omnichannel: Now the omnichain

Over the years, the shopping experience has evolved. The last 30 to 40 years have witnessed important changes in the food value chain. Examples like *The Food Assembly* show that today’s consumers question everything and want more. They are not willing to pay intermediaries if a new business model can eliminate them. They prefer to buy local, using what is called the “short circuit” or KMO, which prioritizes proximity farming and seasonal foods over large manufacturers that ship their mass-produced goods over long distances.

Consumers are now better informed and engaged. They are more empowered and demanding (Havas Worldwide, 2009). According to Havas, one of the largest global communications groups, only 12% of them are digitally dissociated and stick to traditional face-to-face shopping. The rest have integrated the digital into different levels of their shopping experience, from the basics of only doing online research to making more than 50 e-purchases per year (Havas Worldwide, 2013).

All these customers combine multiple channels in their shopping experience: we call this the omnichannel. Before the omnichannel, shoppers used one channel and remained in it throughout their whole shopping process. Today all the channels are combined and available to customers, who have at their disposal a new universe of options to make their personal shopping experience pleasurable. They can select their preferred channels and customize their experience at will.

A good example of an omnichannel is the car purchasing journey. Microsoft commissioned a study on how people went about buying cars. First they fantasize about the possibility of buying a car (stage 1), then make the decision to do so (stage 2). Next, they evaluate the options (stage 3), then shop for their chosen car (stage 4), and finally experience their new car, which includes seeking external validation (stage 5) (Ipsos Media CT and Ipsos OTX – commissioned by Microsoft, 2012). It is clear that digital plays an important role in the first three stages. The car industry needs to adapt to these more pro-active consumers – who find out all they can about a vehicle before going anywhere near a dealership – and cater for the kind of experiences that car buyers are seeking along their entire journey.

The omnichannel came about as a result of adapting the distribution channel to the consumer experience. Unlike the “traditional” online shopping experience whereby the final step was to have the purchases delivered to a given address, usually the person’s home, today, new options offer a variety of delivery options, such as *Click and collect* (buy online and collect in store), or having purchases delivered to pick-up points. Along the same lines, companies born as “online marketplaces” are now opening physical shops to add a more “human touch” to the customer experience.

In-store shoppers wishing to combine physical and digital channels now have new options at their disposal. A Google research report entitled “Digital Impact on In-Store Shopping: Research Debunks Common Myths” explains how “Consumers still visit stores for more than just transactions, but they now expect more out of any place they shop. They want informed, customized experiences.” (Think with Google. 2014)

Many in-store shoppers use their smartphones as information points in physical stores. The online in-store experience that companies like Sephora are already offering includes providing information that has been designed specifically for shoppers while they are in the shop. Sephora, for example, has an app that shoppers can use with their smartphone to obtain more details about the items they are interested in. Other companies have taken this experience to a whole new level. Walgreens, for example, integrated its app with discount vouchers, its customer card and wearable devices, and it offers geographically and personally adapted messaging to inform customers about specific deals as soon as they enter a store. The combination of options is seemingly endless when it comes to ensuring a successful shopping experience.

Building on the omnichannel, the recent market-of-one concept, which refers to personalized marketing based on a one-to-one relationship between the customer and the company, introduces new opportunities for companies to benefit from using a tailored approach toward their customers. This marketing goes into so much detail in its interaction with its customers that it offers real-time information specifically developed for them. In 2012 the travel agency Orbitz.com conducted an experiment that consisted in displaying different hotel rates to Mac and PC visitors. By tracking their behavior, Orbitz found that Mac users spent, on average, \$20 to \$30 more a night on hotels than their PC counterparts (Mattioli, 2012).

The Omnichain

Just as marketing and sales are progressing toward the market of one within the omnichannel, value chains are adapting to the new situation and being transformed by the big data revolution

as they evolve toward a new scenario in which **they reconfigure themselves in real time**, making it possible to design, produce, plan and deliver products and services almost individually.

Traditional value chains were designed around physical constraints that assumed limited access to information about products and their location. They needed to be planned in a consolidated way because of insufficient computer power and restricted access to granular data. Consequently, goods were produced in bulk based on estimated sales rather than actual demand. The **new value chains, or omnichains, are modular** and can be reconfigured in real time. They can cope with designing, producing, planning and delivering products and services for very small or even individual orders. Companies can create their own omnichains by selecting and sorting their preferred modules in the best way to achieve their desired revenue, risk profile or time-to-market. All this has been made possible by digitalization and big data. One example of a company that works with modular value chains is Li & Fung. Founded in 1906, it designs customized supply chain solutions for retailers and brands.

Historically, companies were restricted in terms of the number of clusters into which they could **segment** their value chain, typically to three to five, because the technology to handle more was not available and it was thus too complicated to manage and maintain them. Today, more **granular value chains** are needed to meet ever-changing market demands and business needs. Big data and vastly improved technological capabilities are making it possible to meet these expectations.

In *The Food Assembly* example, we saw that **customization** has been moved to the beginning of the value chain since the producers prepare the packages, not the retailers. The value chain is granular and modular, and can adapt products in the early stages of the chain.

Another example of **granularity** on a large scale is smartphones. Apple consumers differ from Samsung consumers, who in turn differ from those who buy other smartphones. An Apple aficionado might wait a month, if necessary, to acquire a particular device, whereas someone thinking of buying an LG device might change their mind on the spot and buy a different model or even brand if the one he or she is looking for is not available at the time of purchase. Therefore, phone retailers need to handle these customers differently.

Traditionally, companies designed and optimized different value chains to fulfill their consumers' demands, forecasting sales and stocking large numbers of items in warehouses irrespective of lifecycle expectations, risks (currency, obsolescence, competition, etc.). Today, companies are moving toward a more granular segmentation with well-differentiated operating models by segment, which means that if we take it to the extreme, they could design different value chains for individual products if needed. This segmentation is managed more dynamically. Digital capabilities should enable real-time operating model configuration, including trading partners, assets, processes, organization and governance across trading partners. Omnichains allow a dynamic alignment of business rules in which, for example, contract terms are based on market response.

The **omnichain** is a **digitally connected ecosystem** in which companies can **dynamically reconfigure** the value chain for each business segment. This means that the same company in a given ecosystem can assume different roles, working as a supplier in situation A and as a client in situation B. So if a supermarket chain like Carrefour decided that it wanted to expand its offering and become more sustainable, for example, it may decide to add a new service and purchase some of its fresh produce through an organization such as *The Food Assembly* then sell that merchandise through its stores. In this case, players of the value chain would change roles. Carrefour would become a member of *The Food Assembly* and thus assume the role of a final consumer, when this is, in fact, the beginning of Carrefour's value chain. *The Food Assembly* would thus become a supplier and move inside a value chain in which it would play a different role from the one it plays in its normal ecosystem.

This concept of dynamism and flexibility encompasses the entire omnichain, expanding from suppliers to customer experience. **Final consumers can also assume new positions** in the value chain very fast. A good example is bloggers, who are initially normal consumers but, through their knowledge in a specific field, become opinion leaders. Companies today ask those opinion leaders for advice before, say, releasing a new product. Thus, these consumers adopt a different role in the ecosystem, shifting their position in the chain from the end to the beginning. Triathlete DC Rainmaker is one example. As he explains in his blog (<http://www.dcrainmaker.com/>), he runs, bikes and swims just like his readers. The only difference is that he blogs about what he learns. He started in 2007 by helping readers understand how to integrate technology in their sports and recommending gadgets and gear. He became so successful that now he often works with manufacturers to improve and adapt new products to the needs of final customers as much as possible before they go to market.

As this example shows, the omnichain is **multidirectional**. While in traditional value chains information used to flow in one linear direction, from the client to the distributor to the manufacturer, today's value chains behave more like neurons, developing new connections throughout the ecosystem. All players are information senders and receivers that generate multiple flows and multidirectional exchanges of information. The blogger communicates with the manufacturer and with the readers, who are mainly the final consumers; the consumers communicate among themselves and with the blogger who distributes the information; the manufacturer communicates with the blogger, suppliers, final consumers if needed, and so on. Thus, in this new multidimensional universe, information travels in all directions.

Stages of the omnichain

With the omnichain, every stage of the value chain is affected. A report by A.T. Kearney reveals that from 2015 to 2017 supply chain managers, especially from larger companies, will make relevant investments in supply chain integration both across all areas of the company and with partners; paperless freight documents; big data analytics for supply chain improvement and the use of e-platforms to select carriers and for transactions (European A.T. Kearney/WHU Logistics Study 2015):

- **Making.** Methods such as Industry 4.0, digital manufacturing or 3D printing have made it possible for a factory to receive instructions digitally and then automatically adapt the production line. As a consequence, the company can make a brand new item in a short time frame, shortcutting previous steps and sending the order directly to manufacturing rather than involving all the supply chain levels as before.
- **Buying.** Transparency increases. Information about suppliers, prices, contracts and conditions is updated in real time and through multiple channels. The proliferation of e-platforms and the standardization of interfaces for suppliers, customers and service providers facilitates processes. Information can be compared much faster and more options are available, at the time that value propositions get commoditized.
- **Moving.** The flow of products can be tracked and routes can be defined in real time based on market needs. New developments – such as smart packaging that informs and acts on the condition of the goods it contains, GSM tagging and tracing goods or packaging as well as the use of robots and autonomous vehicles – transform the distribution of goods, which are always connected.
- **Planning.** The huge amount of information provided by the value chain makes it easier for different players to make faster and more automated decisions. Thus, the boundaries of planning and execution are blurred as both are integrated into a single process. This is key, as it implies that some steps that previously required human intervention can now be automated. In addition, it helps anticipate the whole system's future behavior.

- **Service.** The relationship with the consumer becomes more complex as products evolve from what they used to be – just devices – to an experience. B2B companies such as Michelin shifted their main focus from selling products (tires) to selling services (the kilometers traveled with those tires).
- **Design.** Product design and development is no longer restricted to in-company experts. Consumers now have the opportunity to play an active role by suggesting modifications to an existing product. Such changes can now be implemented quickly. Similarly, the number of connections that the value chain creates and the way information can now be shared makes it possible for multiple companies to collaborate on the same design.
- **Product.** Products are now enhanced with additional digital components and other customized services. Consumers can interact a lot more, which changes the consuming experience from linear and one-directional to non-linear and interactive.

Mediq: An omnichain in the pharmaceutical industry

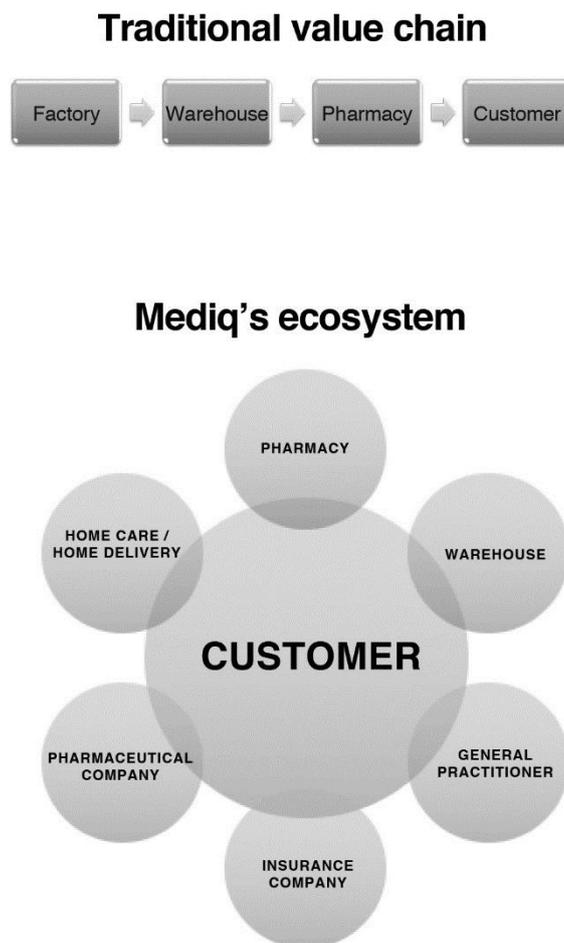
Dutch healthcare company Mediq used to be just a drug retailer and distributor. Its main focus was on “moving boxes” from place to place, and its profits initially came from the fees it earned on the medicines it sold. In 2012 the Dutch government deregulated pharmaceutical fees, resulting in an immediate 90% drop in the company’s profits. To survive, Mediq had to reinvent itself. Under the leadership of a new CEO, the top management team transformed the company’s main mission to looking after patients. Today the company provides medical devices and pharmaceuticals to its customers, at home as well as through doctors and pharmacies.

External circumstances pushed Mediq to develop a way to benefit from the big data it collected from users. It built a system that can analyze patients’ needs and track if they are taking their prescribed medicines. If not, Mediq warns the pharmacy – or the patient directly. The same goes if a patient is buying more medicines than necessary. Similarly, if Mediq’s system detects that a patient has been prescribed a particular drug that should be taken in conjunction with, say, a stomach protector and that the latter has not been prescribed, the company will discuss this with the doctor.

How is Mediq capitalizing on all this big data information? Patient tracking is preventing numerous hospitalizations resulting from the misuse of drugs. Mediq commissioned an external company to estimate, with the use of big data, the total savings that this reduction in hospitalizations represented for insurance companies and then proposed to insurers to share the savings resulting from its efforts. This arrangement currently accounts for around half of Mediq’s total income.

Mediq is completely changing the value chain. Instead of just being one step in the chain, it has become part of an ecosystem in which the well-being of patients is at its center and in which Mediq plays several roles. By reaching its patients directly as well as through the pharmacy or the doctor, Mediq changes positions dynamically in the value chain (see **Figure 4**).

Figure 4: A traditional value chain vs. Mediq's ecosystem



The pharma industry is also innovating in the way it handles value chain postponement, which consists in pushing product customization to the end of the value chain. Printer manufacturers for example, created generic products that were adapted in the final stages of the value chain, for example by adding a plug or converter to adapt the printer to a specific country. Similarly to what we saw with the example of *The Food Assembly* where producers customize the final product during the production step, some pharma companies have reversed their postponement strategy. Instead of customizing at the end of the value chain, i.e. at the pharmacy, they do so at the warehouse and then distribute the customized final product to the pharmacies, which sell it on to the final customers.

The possibilities that this new model creates are huge. By knowing patients and their patterns better, it is easier to forecast their health and medical requirements, which also reduces or even eliminates the need to keep huge stocks of medicines. Mediq is now working with hospitals to help them to reduce the risk of patients becoming ill and to cure them faster when they do get ill by implementing Mediq's model.

Key drivers of the evolution toward the omnichain

The evolution toward the omnichain is led by a number of drivers that are present in today's value chains.

Reducing uncertainty by using big data

One of the reasons why it is important to manage a value chain effectively is to be able to handle uncertainty at all stages of the process: supply, distribution, etc. The impact of big data in the value chain has implied that today companies know a lot more about their demand thanks to a considerable increase in the information at their disposal. Logically this should reduce uncertainty. But at the same time, customers have become more volatile because they also have access to more information and can therefore react faster to the market. This reinjects uncertainty into the process. A traditional pharmacy does not know what it is going to sell from one day to the next so all it can do is make an estimation. Its uncertainty is 100%. Later in this article we show how Mediq knows for certain 80% of its demand, meaning its uncertainty is just 20%.

Increasing flexibility using big data

Value chains are constantly aiming to be more flexible in an effort to handle increasing uncertainty. Big data helps make this possible by allowing players in the value chain to react faster because they can know what is happening along the value chain in real time. Say a retailer from a small village is awaiting his supplies but that there is a problem in the production line that requires stopping and re-planning. Thirty years ago, this would have caused considerable delays and the retailer would have had to wait ages to find out what was going on and the reason for the lag. Nowadays, the retailer would probably not even notice that something had gone wrong. As soon as a production line breaks down, the supply chain tower is notified, potential solutions are analyzed and the optimum one is selected, all in real time. Everything goes back to normal in no time, which avoids blockages in the value chain. Traditional value chains are often slow and rigid and it is difficult for them to react with the flexibility and agility of omnichains.

Economies of scale

It is not new that the more units of a product a company produces, the cheaper its cost per unit is. What is new is that big data is reducing the minimum scale. Years ago customers had to order at least 1,000 business cards at a time because the expensive part was creating the template. With digital printing, the initial investment is low so it is financially feasible to print a much smaller number of cards if necessary. The market of one whereby products are personalized to individuals is also reshaping economies of scale.

Twenty years ago Amazon only sold books. Today it sells just about everything, from wine to body cream, from tires to space in the cloud. Economies of scale or, to be more accurate, economies of scope (efficiencies brought by variety, not volume) made this expansion possible. In addition to books, it thought, why not offer a variety of products to allow customers to take advantage of ordering multiple items to be shipped at the same time? Amazon has changed the way consumers buy. Online selling points are no longer defined by the type of products they sell and no longer reproduce the physical reality. Amazon now sells everything, including fresh produce in the US.

Open dilemmas derived from the development of the omnichain

The advent of the omnichain – and all the changes taking place in the ecosystem as a result – is having an impact on at least two dilemmas that have co-existed for years in value chains, and these need to be considered and evaluated.

Uncertainty versus risk minimization

This is one of the main dilemmas that constantly comes up. Companies complain that their forecasting is never good enough. One strategy for handling uncertainty is to play with the stock. If the forecast is not well done or is not accurate enough (i.e. it has a high error margin), the company's stock needs to cover what the forecast is unable to predict. The omnichain can minimize the risk of running out of stock or react quickly if it does happen. An Omnichain approach uses agility to compensate for the lack of accuracy in the forecast, limiting the need to keep stock as a buffer. One of Mediq's dilemmas was figuring out what quantities of each product that the manufacturer, the distributors and the pharmacies should stock. Previously, it needed to stock six months' worth of supplies. Now Mediq only needs to keep one day's worth of stock because it knows exactly 80% of its total demand and has thus dramatically minimized its risk. The uncertainty has practically disappeared.

Flexibility versus economies of scale

The evolution of the value chain has given us the possibility of working with much more flexible value chains that enable a more granular management. Traditionally, a company could not handle more than five or six value chains at a time. The omnichain allows pretty much unlimited granularity. Pharmacies are beginning to offer tailored pills. There was a time when pharmacies made up prescription medicines from scratch, but cost and complexity all but extinguished that practice. Today it is a reality again, to some extent. The difference is that individualized medicines are prepared in distribution centers – which have the necessary machines, resources and chemical products to create them – rather than at the drugstore.

Big data and the digital revolution: Its impact on the value chain

According to Wikipedia, big data is a broad term for data sets so large or complex that traditional data processing applications are inadequate. Challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization and information privacy. The value chain is being profoundly transformed by the digital revolution, and big data is one of its most important elements – but it is not the only one. Many other digital trends are strongly contributing to that transformation. The three most prominent ones are:

- **Cloud infrastructures:** Beyond increasing storage capacity and reducing infrastructure costs, cloud computing allows real-time information exchange.
- **Internet of Things:** Applied to the value chain, the Internet of Things (IoT) captures data from products and assets and is able to implement instructions that modify the behavior of the different elements.
- **Cognitive Computing:** This allows autonomous decision-making processes that enable faster reaction to events.

One of the key developments that has been fundamental to this digital revolution is the huge increase in data storage capacity. Material Requirements Planning (MRP) was developed in the 1960s to help companies plan their manufacturing activities. Companies used a computer program to list the materials they needed to manufacture their goods.

MRP II (manufacturing resource planning), the next step, added the possibility of checking the company's resources, including labor, machine capacity and materials. The goal was to provide consistent data to all players in the manufacturing process as the product moved through the production line.

More recently, ERP (enterprise resource planning) allowed companies to have an integrated view of their core business processes. This was usually a suite of integrated software applications that allowed companies to collect, store, manage and interpret data from many of their business activities.

These three models were created to cover the needs of companies at the time. Gradually, software companies developed complex programs that facilitated what had turned into a difficult planning exercise involving huge amounts of information. Computer capacity was limited, however, which restricted the possibilities. Companies tended to aggregate information from their retailers instead of preserving its granularity because their systems could not handle the detail.

There were also other problems that required workarounds. For example, processes had to be sequenced because it was not possible to optimize the entire problem at once; sub-optimizations had to be made for the different echelons of the chain; and decisions had to be planned synchronously in agreed time buckets, typically weekly or monthly.

Data capture and computing time did not allow for re-planning exceptions during execution. We saw in the example used to describe flexibility that a village retailer awaiting supplies today may barely notice a slight delay in the delivery of his order due to a problem in the production line, whereas three decades ago he might have waited for days for information about why his goods had not arrived. When a disruption affected the chain, computers were not capable of integrating a fresh information update and re-computing, so the value chain and its decision-making process had to be fragmented, creating two different worlds: planning and execution.

These problems are no longer an issue, and companies like Mediq are reinterpreting the models. Instead of aggregating information about demand obtained from pharmacies, which would mean losing valuable information about individuals (see **Figure 2**, “prior to big data”), the big data revolution is making it possible for them to use the detail to provide a personalized service. Mediq keeps its customers’ details and customizes its final products at its warehouse, delivering its final products in a similar way to *The Food Assembly*. Instead of delivering medicines in bulk to pharmacies, it delivers bags that have been custom-prepared at the warehouse based on the prescriptions of each individual customer. The pharmacy only completes the sale of the final package.

Mediq’s omnichain example prompts us to explore new possibilities and new models to drive and structure companies, because the previous ones no longer fulfill today’s complex needs.

In the coming years, new models will be able to handle all the information that we are storing now. Some of that information comes from the ever-expanding IoT and its impact on the value chain. Today’s digital revolution is allowing value chains to operate in dramatically different ways:

- Instead of having to plan decisions synchronously within an agreed time frame, value chains can be adapted in real time to meet changing customer needs.
- Today’s value chains allow end-to-end optimization, which means that they look and extend beyond the boundaries of the organization to the whole ecosystem.
- Value chains are now characterized by their granularity in a way that they can plan and operate at the most detailed level, i.e. individual products, consumers or events.
- They are being automated, displacing the role of humans to the most sophisticated and complex activities.

Companies once accepted that there were aspects they did not and could not know and that information had to be aggregated because computers could not cope with the large amount of data. But big data transformation is changing all that.

We have seen how big data is going to eliminate most of the uncertainty and dramatically change the concepts of economies of scale and flexibility. Many companies find it difficult to forecast what, when and how their consumers are going to buy. Big data is changing the way companies are doing their forecasting. Rather than using a sample of past demand to forecast future sales, some companies are predicting the behavior of individuals based on their actions. A telling example is Amazon's *anticipatory shipping* whereby the company sends items closer to final customers before they actually make a purchase, in the hope that, based on the company's data analysis, the customer will soon complete the process. This is what happened with a user in Sweden who was amazed to receive a bicycle that she purchased from the US the day after placing her order. She was expecting it to arrive two or three weeks later but Amazon had tracked her visits to its website, analyzed her behavior and forecasted on that basis that she would soon make the purchase. This demonstrates that the company is serious about its claims that it is continuously working to improve the consumer experience.

Is the future evolutive or disruptive?

We saw that uncertainty, flexibility and economies of scale are some of the main drivers that lead to the omnichain. We also saw how companies need to adapt to this new environment, diversifying their products and exploring new industry sectors with new competitors and new "frenemies" (companies that play simultaneously the role of friend and enemy). This is our present reality. But to what extent will the omnichain affect companies, markets and consumers in the future? We have imagined two different futures that may reflect what value chains will look like and how they will behave in five years' time.

Scenario 1: Evolutive – "2001: A Space Odyssey"

Looking back, the development of systems and applications to help companies manage their value chains started in the 1960s with MRP. Gradually, companies grew more complex and so did the systems.

The new millennium marked a transition period for IT. Big corporations were spending huge amounts of money to migrate their information to SAP and other big platforms. These massive IT budgets led them to question the true competitive advantage of customization – programs and applications that were tailor-made or adapted to their needs – over standardization.

Oracle, the giant software company created in the late 1970s, had kept its leading position as business applications provider throughout this time. With the new millennium, Oracle changed its strategy to transform from being a best-of-breed, dominant niche player to becoming a strategic partner for global organizations, delivering more value and enabling them to develop a global infrastructure strategy. A period of acquisitions started, culminating with the rollout of Oracle "Red Stack," a new vision in business IT that offered an integrated package including servers, storage, operating systems, applications, etc. (Cordon, Liu, Margery and Seifert, 2012).

This evolution was pushed by market needs. Software companies like Oracle worked on the basis of what organizations were lacking to improve the way they functioned.

Building on the ones we have today, new theoretical models will appear to help us manage the big data landscape. Their starting point will probably be today's huge amount of information

and the granularity of the value chains. The theoretical framework will be followed by new IT developments. It will be a slow and progressive evolution characterized by the emergence of new models that will build on what we have.

This future is similar to what the movie *2001: A Space Odyssey* portrays: a slow, tidy and centralized world that is the result of a predictable step-by-step evolution.

Scenario 2: Disruptive – “Blade Runner”

In direct contrast to the evolutive future is what we have called the *Blade Runner* future whereby companies realize that the models they are currently using to manage businesses are no longer valid because they do not allow them to leverage the opportunities offered by big data. New competitors emerge with business models architected around value generated from big data. These new models offer fresh solutions to old problems. This future would imply a fast change in the way companies function. Flexe could very well illustrate this new scenario.

Flexe is a marketplace for warehouse space. It offers on-demand warehousing, connecting organizations in need of additional space to organizations with extra space. Rather than following the path of what already existed in the warehousing industry before them and simply improving the current systems, Flexe opted for creating a new concept and a new business model from scratch based on big data.

If after a period of time the industry sector realizes that Flexe works better than the traditional models, the new disruptive scenario will be imposed and warehousing as it has been understood up until now will disappear.

The *Blade Runner* future would be characterized by fast changes that, instead of requiring new models, could develop independent routines that help companies make their decisions in real time. Just as airlines change their offering in real time, what if traditional companies like LEGO or Nike were to do the same thing and adapt in real time the products they are manufacturing based on demand?

As in the movie *Blade Runner*, this future proposes an integrated chaos that works rapidly and efficiently.

Conclusions

Value chains have evolved into complex networks where all players are connected to one-another, competing and collaborating at the same time. Consumers are radically changing the way they shop. They no longer use one single channel to interact with products and services. Companies need to adapt their product marketing to this new consumer experience, develop new strategies to communicate and engage with their consumers, and offer a consistent message across all the channels that consumers use to obtain information about their products. This is the omnichannel.

The blurring of industry boundaries makes it easier for companies to enter new industry sectors. The natural consequence of this evolution is the generation of new flexible, modular and re-configurable value chains that we have named omnichains. The omnichain turns the existing linear supply chain into a multidimensional chain that travels in all directions, creating new connections. In addition, it allows consumers to step in and share their feedback at any time at any level of production, not only with the retailer once the final product is delivered. This affects not only value chains but also whole ecosystems.

Just as it is happening in the marketing field, big data and the digital revolution are rapidly transforming value chains. The access to much more data in real time has revolutionized the way purchasing, sales, transport and logistics operate. To survive in this new scenario, companies need to adapt to the omnichain – a flexible value chain that can manage different types of demands by being able to identify every single piece or component and its location and handle it in a differentiated way. In the past, companies designed and optimized their supply chains to fulfill the demands of customers and consumers. Different supply chains were created to meet the needs of different customer segments with varying needs. Today, this distinction has disappeared. Now a single multi supply chain can cater for all customer segments.

In a world in which each part of the value chain offers so many alternatives and goes beyond the company to connect chains that up until now were independent, the linear value chain turns into a complex system in which any player can change and assume new positions very fast. These interconnected chains are alive and develop new connections and shortcuts at an amazing speed, generating multiple flows and multidirectional exchanges of information. This universe is no longer linear– it is evolving toward the more integrated omnichain.

Now it is up to companies to anticipate and adapt to the changes that the omnichain is bringing with it. To help them in their exercise, we imagined two different futures that could become real within a few years: The evolutive future, which we called *2001: A Space Odyssey*, and the disruptive future, which we called *Blade Runner*.

We believe that the *Blade Runner* future is more likely because big data and the IoT are already eliminating some of the constraints that companies have faced for the last forty years. This new situation can open the doors for many others to create new and more cost-effective business models.

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