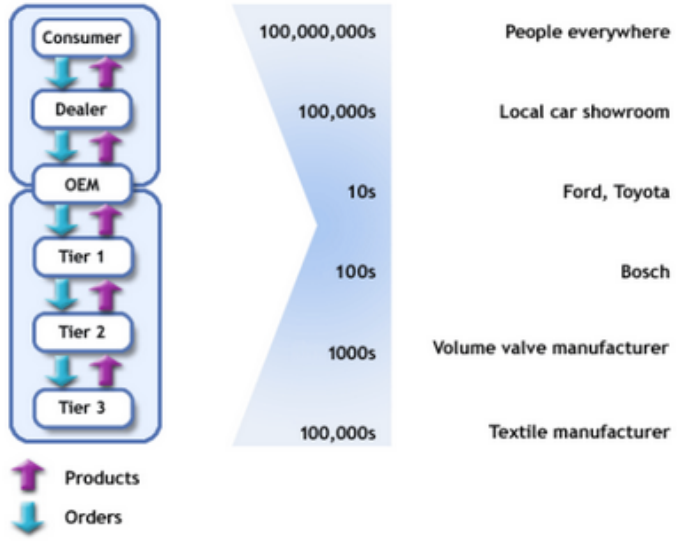
The Automotive Supply Chain

The automotive **supply chain** represents a typical manufacturing value network.

Within this network, many different companies outsource work to each other, as they contribute towards the creation of an end product.

The global scale and complexity of the automotive network is demonstrated by the vast numbers of players at each level of the chain (see graphic).



How the Chain Works

In this industry, orders flow from consumers, through dealers, and back through companies of decreasing size and scope - and products flow the other way.

- there are 100s of millions of consumers
- these are served by 100s of thousands of dealers
- significant OEMs are counted in tens
- there are hundreds of tier 1 suppliers, who act as the main suppliers to the OEMs
- thousands of tier 2 companies supply tier 1 with components for their products
- there are hundreds of thousands of tier 3 manufacturers across the world who service tier 2 customers

Automakers constantly tweak and optimize their supply chains (mainly through the use of Information Technology) to reduce costs, but the networks are so complex that extensive changes are almost impossible to achieve.

However, global supply chains have been refined to such an extent that new entrants cannot possibly compete in this capital-intensive industry. In fact, Tesla is the only automaker to 'go public' since Ford in the mid 1950s.

Research and Development (R&D)

The term **research and development (R&D)** refers to the discipline responsible for applying science and technology to:

- create new **products**
- improve the **processes used to make them**

Automakers and their **suppliers** try and understand local market tastes, using focus groups and other research methods.

Then, they work together on **vehicle design** to create:

- good-looking, safe, reliable cars and trucks
- which are good to drive
- which comply with a host of different regional **regulations**
- which can accommodate a variety of additional options and extras to broaden their appeal
- which match the practical and cultural nuances of their target markets

And in most cases, they also need to be as cheap as possible to make.

Sounds easy, right?!

R&D Topics in Automotive

A lot of R&D is focused on lowering emissions and increasing fuel efficiency, so that future vehicles comply with regulations like the **CAFE standards** and the **European equivalent**.

Manufacturers are looking at things like:

- more efficient **powertrains**
- cutting costs through global vehicle **platforms**

Economies of Scale

Economies of scale refers to the cost advantages associated with increasing the rate of production.

But why do products cost less to manufacture when you make more of them?

The reason is that the **fixed costs** of production are spread over a greater number of units.

Example

Let's imagine a company's annual lease on their factory premises is $200,000 per year.

If they make **100,000 units**, the cost is 200,000 / 100,000 = $2 per unit.

If they crank up production to **200,000 units**, then the lease component of the **cost of goods sold** falls to $1 per unit.

Costs obviously come from a variety of sources, and these savings, added up, can be passed onto the end customer through lower prices.

In the automotive industry, **overcapacity** is hurting company profits - although companies are producing at lower volumes (and therefore higher cost to themselves), they still need to keep prices as low as possible in order to compete.

Comments [Add a Comment]

Edit This Page | New Page

Pages in this Section

- Procurement
- Research and Development (R&D)
- Vehicle Design
- Portfolio Planning and Management
- Production
  - Systems Integration
  - The Automotive Production Line
  - Lean Manufacturing
    - Kanban
    - Just-in-Time (JIT)
    - Assemble-to-Order
      - Economies of Scale
  - Six Sigma
  - Logistics
- Sales and Marketing

Overcapacity

Overcapacity refers to a situation in which a production system or even a whole industry simply cannot sell as much as it was designed to produce.

This has been a feature of the business landscape in Automotive in recent years, with consumers only just beginning spend at anything like pre-recession levels.

Of course, weak demand is a problem for automakers and their suppliers, who invest millions and million in production facilities all over the world.

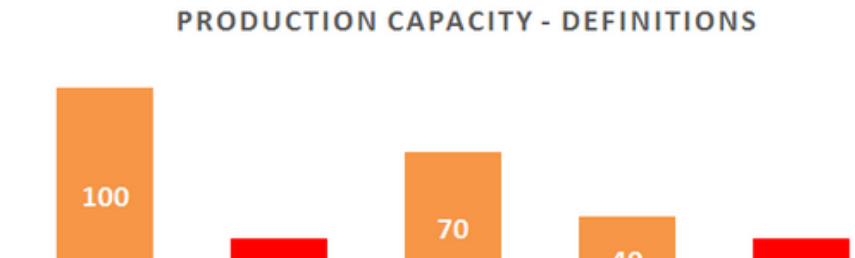
They need to sell in high volumes to get a **return on these investments**, and to create the **economies of scale** which allows them to make a profit from competitive prices.

Continuing overcapacity means companies are forced to respond by:

- lowering prices
- offering financial incentives to shift unsold vehicles
- running factories at reduced speed - this hurts **factory efficiency metrics**
- moving factory facilities to low cost countries
- reducing the number of employees
- closing down factories

Overcapacity Definitions Explained

To fully understand the nature of the problem, let's look at some basic terms. For the purposes of this exercise, let's imagine the below chart applies to an imaginary industry, and is counted in million of units:



Edit This Page | New Page

Pages in this Section

In-Vehicle Electronics
Big Data
The 'Digitization' of the Supply Chain
Low Oil Prices
Product Recalls
Overcapacity
Urbanization
Dealership Consolidation

Recently Changed

Products & Services
Outsourcing
Overview
Driverless Vehicles

3D Printing

3D printing (also known as 'additive manufacturing') has existed in some form for around 30 years, but has only recently been adopted for commercial manufacturing.

The technological strides which enabled this - namely the availability of faster, lower cost printers - have propelled the sector from the R&D lab into the $2 billion global market it is today.

How Does 3D Printing Work?

Traditional manufacturing is subtractive, meaning that components and parts are created by cutting them out of (or 'subtracting' them from) much larger bits of material.

3D printing does exactly the opposite it creates objects from the 'bottom up' - by adding successive layers of material until a fully formed object exists.

The technology is becoming more and more advanced, allowing these printers to use the output of **CAD systems** to create very complex moving parts and components.

Although the process isn't yet fit for volume production, it still offers several benefits:

- new and redesigned prototype parts can be printed quickly and cost-effectively for testing, speeding up the product development process
- the process creates less material waste
- it reduces on-site **inventory**, since parts and components can be created 'on-demand'

3D Printing in Automotive

As we mentioned, the relatively slow speed of current 3D printers means they can't really be used for high volume production - in Automotive, parts and components would need to be made - often in a matter of minutes - as part of a fast-moving **production line**.

So, printed components tend to be one-off, customized parts used for testing and prototyping, or for use in high-end, one-off vehicles, rather than the mass produced cars most people buy.

Usually, engineers will simulate the performance of designs - like wing mirrors or air ducts - using **computer-aided engineering** software, and then choose a small number to 3D print and try out in real life.

Source: Local Motors

Local Motors' Reload Redacted Swim

Case Study - Local Motors

But by far the most complete use of the technology in this industry is the example of Phoenix company **Local Motors**, whose new low speed **electric car** is set to hit the road in 2016.

Edit This Page | New Page

Pages in this Section

Internet of Things (IoT)
Predictive Maintenance
3D Printing
Cloud Computing
Mobility
Mass Customization
Concurrent Engineering
Mergers and Acquisitions (M&A)
Outsourcing

Cloud Computing

Cloud computing means access to computing power via the Internet.

Cloud services are regarded as a useful tool for companies looking to minimize costs and knit together all the different aspects of their IT infrastructure.

Across most manufacturing sectors, **outsourcing** is common and many companies across the **supply chain** contribute to the final product.

For example, the US semiconductor manufacturer Intel uses over 2000 suppliers, so just imagine how difficult it is for them to co-ordinate product manufacture, storage, distribution, sales, and support services across the world!

In an Automotive context, business partners include:

- OEMs
- other members of the **product value chain**
- **dealers**
- any **joint venture** associates
- external **logistics** companies providing storage and distribution services

In order to achieve cost savings, and the speed and flexibility required to design vehicles and get them to market as quickly as possible, all partners must be able to freely share information amongst themselves.

The cloud helps companies to achieve this by offering an IT environment that puts every company connected to the OEM 'in one room.'

This allows seamless collaboration amongst business partners, and gives companies the ability to extract and analyze their supply chain **big data** and get to the bottom of how each and every aspect of their business is performing.

How Does It Work?

Cloud computing is delivered to customers as a 'rented' service - completely hosted and maintained using a provider's infrastructure, and usually on a pay-per-use basis.

Services take three major forms:

- **Software as a Service (SaaS)**

Dealers

Dealerships are private businesses which act as middlemen between **automotive manufacturer** and **customer**.

They vary in size as scope and could be:

- **small companies** - usually operating on a single site
- **dealer groups** - handling multiple brands and covering more than one country
- **dealers owned by the OEM themselves** - in some states in the US, however, it is illegal for OEMs to bypass **dealership monopolies** and sell directly to consumers

In simple terms, a dealer borrows money from a bank, or from the manufacturer's financing arm, to pay for the cars he orders - a process known as 'floor planning.'

Rather than simply buying the vehicles using cash, the dealer is paying a monthly interest on the initial loan for each car sitting in the yard.

Even in small dealerships, the cars sitting in the lot can represent millions of dollars of **capital investment**, so it's easy to see how many dealers went out of business following the 2008 credit crunch.

These financial pressures have created a trend towards **dealer consolidation**, which will ultimately lead to a smaller number of very large, very influential companies in this sub-industry.

Setting Up the Dealership

Dealers enter into a franchise agreement and work closely with the automaker, receiving cash bonuses in return for hitting sales targets, as well as making a marginal profit on the sale of the vehicles themselves.

Remember, auto industry sales and marketing is all about 'lifestyle' - consumers tend to buy vehicles based on the image the brand projects about them to the outside world. This concept makes **social media** a valuable marketing tool for dealers looking to engage with potential customers.

Dealerships are instructed by the brand-owning **VBE** on how to decorate the showroom and present the vehicle **inventory**, so that the customer experience is consistent with the automaker's brand values.

Sales reps also undergo training so they get a good grasp of the features and options available for each vehicle type.

Driverless Vehicles

Think of **driverless vehicles** (or 'autonomous vehicles') as the ultimate implementation of **the connected car**.

How They Work

Human beings are generally bad drivers - every year, over 1 million people die in road accidents throughout the world. In the US alone, this figure reached nearly 33,000 in 2013 - on average, that's 90 each and every day.

These cars (also known as 'autonomous vehicles') use the **Internet of Things (IoT)** to interact with sensors in the road infrastructure around them, and will one day offer us previously unimaginable levels of road safety that could make a huge impact on these astonishing statistics.

Using inputs from GPS, radar, and other sensing equipment, software embedded in these vehicles will be, in theory, able to:

- interpret signs and other elements of road infrastructure, including the exact position and behavior of other vehicles
- navigate without any human involvement

We say 'in theory,' because experts predict market trials to begin in 10 years, and for the concept to become a commercial reality within the next 20 - 30 years.

Advances in Driverless Technology

Google's autonomous car is probably the best-known project at the moment, although both Apple and Uber are investing in similar projects, hiring skilled staff from the automotive industry to design and develop their own version of this next gen vehicle.

Even though there are no 'fully autonomous' vehicles cruising around our streets at the moment, there are still elements of 'assisted driving' found in current production cars, and these are the kind of technology steps which will lead **OEMs** and the companies above towards their ultimate goal:

- **anti-lock braking systems** - software in the car calculates the braking load and takes over to avoid skids
- **traction and stability control**
- **assisted parking** - this takes the concept of vehicle autonomy and applies it to a limited situation (a huge advance in driverless technology)

And this is just the very beginning of what autonomous cars will be able to do!