



## The Model T Ford – the machine that changed the world?

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## The Model T Ford

Henry Ford did not invent the motor car – in fact he was a comparative latecomer to the scene. Although he had started producing cars back in 1903 he had little success until the Model T. The first production Model T was built on September 27<sup>th</sup>, 1908 in Detroit and production continued until 1927.

The key contribution which he made was to change the approach to manufacture and marketing of cars. Prior to his activities cars had been a specialised luxury product available only to the wealthy; his vision of producing ‘a car for Everyman’ and at a price which Everyman could afford resulted in a revolution in the marketplace. Importantly the ways in which the vision was realised extend beyond cars to thinking about a whole range of consumer products and even services; again Ford did not invent ‘mass production’ but his efforts around the Model T ushered in the era in which this mode of thinking predominated.

It’s possible to think of innovation taking place along several different dimensions – the ‘four Ps’ of ‘product’, ‘process’, ‘position’ and ‘paradigm’. (See chapter 1 of ‘Managing innovation’ for more detail on this). In the case of the Model T Henry Ford and his team moved the frontiers of all four at the same time – and in doing so created a completely new system for thinking about manufacturing.

Product innovation – involved rethinking the design of the car. Earlier car manufacturing had been like bespoke tailoring, hand building a car to suit the wishes of a particular client, offering extensive variety and choice around a basic engine and chassis. Ford’s contribution here was to work to a target cost – aiming to bring the Model T within the purchasing power of a large market by designing and standardising – essentially applying what we would now call ‘value engineering’ approaches – not only the whole car but the constituent elements within it.

Position innovation – involved rethinking the target market for the product. Instead of working with the small wealthy niche which his contemporaries had been doing, Ford saw the potential of reaching a much bigger market of people who wanted personal transportation but could not yet afford it. This vision took a lot of effort to realise but effectively Ford did for personal car ownership what the low cost airlines would do a century later for personal air travel. Henry Ford said of the vehicle:

*I will build a car for the great multitude. It will be large enough for the family, but small enough for the individual to run and care for. It will be constructed of the best materials, by the best men to be hired, after the simplest designs that modern engineering can devise. But it will be low in price that no man making a good salary will be unable to own one - and enjoy with his family the blessing of hours of pleasure in God's great open spaces.*

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Paradigm innovation – although his early efforts at car making were typical of those used by his contemporaries the vision Ford evolved was much broader – nothing short of a revolution in thinking about the car as product and the manufacturing process which would deliver it. It required a change at the level of the whole system of product, process and market. His underlying business model was essentially one of low cost, high volume producing for a mass market – something which we take for granted today but which at the time was a little applied concept and one fraught with technical difficulties in actually making it work.

Process innovation – the key to realising the new paradigm lay in process innovation – how the car would actually be built. In order to deliver on his target cost and make the product widely available at a low cost Ford and his team of engineers needed to rethink the entire suite of production operations. The model which he (and his gifted team of engineers) developed and systematised was based on a number of innovations which reduced the need for skilled labour, mechanised much of the assembly process, integrated preparation and manufacturing operations for both components and finished product and systematised the entire process. Importantly this was not about inventing a totally new way of working. The basic elements of the Ford system were largely already in existence; the key was in *synthesising* them into a new system. (Even the idea of flow production lines for motor cars was first used in the Olds Motor Works in 1902, while Leland's Cadillac design of 1906 won an award for the innovation of using interchangeable, standardised parts).

The challenge of high volume, low cost production of the Model T led Ford engineers to extend the application of these ideas to new extremes - involving heavy investment in highly specialised machine tools and handling systems, and extending the division and separation of labour to provide workers whose main tasks were feeding the machines. The dramatic impact of this pattern on productivity can be seen in the case of the first assembly line, installed in 1913 for flywheel assembly, where the assembly time fell from 20 man minutes to 5. By 1914 three lines were being used in the chassis department to reduce assembly time from around 12 hours to less than 2.

This approach extended beyond the actual assembly operations to embrace raw material supply (such as steelmaking) and transport and distribution. At its height a factory operating on this principle was able to turn out high volumes (8000 cars/day) with short lead times - for example, as a consequence of the smooth flow which could be achieved it took only 81 hours to produce a finished car from raw iron ore - and this included 48 hours for the raw materials to be transported from the mine to the factory! In the heyday of the integrated plants such as at River Rouge, productivity, quality, inventory and other measures of manufacturing performance were at levels which would still be the envy even of the best organised Japanese plants today.

The table below highlights some of the key features of this blueprint for manufacturing, typified in the car plants of Henry Ford but applied to many other industries throughout the 1930s and beyond.

Table 1: Characteristics of the Ford/Taylor system for manufacturing, circa 1920

\* Standardisation of products and components, of manufacturing process equipment, of tasks in the manufacturing process, and of control over the process

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\* time and work study, to identify the optimum conditions for carrying out a particular operation and job analysis, to break up the task into small, highly controllable and reproducible steps.

\* Specialisation of functions and tasks within all areas of operation. Once job analysis and work-study information was available, it became possible to decide which activities were central to a particular task and train an operator to perform those smoothly and efficiently. Those activities which detracted from this smooth performance were separated out and became, in turn, the task of another worker. So, for example, in a machine shop the activities of obtaining materials and tools, or maintenance of machines, or of progressing the part to the next stage in manufacture, or quality control and inspection were all outside the core task of actually operating the machine to cut metal. Thus there was considerable narrowing and routinisation of individual tasks and an extension of the division of labour. One other consequence was that training for such narrow tasks became simple and reproducible and thus new workers could quickly be brought on stream and slotted into new areas as and when needed.

\* Uniform output rates and systemisation of the entire manufacturing process. The best example of this is probably the assembly line for motor cars, where the speed of the line determined all activity.

\* Payment and incentive schemes based on results - on output, on productivity, etc.

\* Elimination of worker discretion and passing of control to specialists

\* Concentration of control of work into the hands of management within a bureaucratic hierarchy with extensive reliance on rules and procedures - doing things by the book.

### Reaching the limits ...

There is little doubt that this was a 'better' way of making cars – at least in terms of the overall production figures (although the question of whether the conditions under which manufacturing took place is perhaps more open to question). But innovation is always about a moving target – and having set the pace with his revolutionary approach Ford began to lose out to competitors who saw new innovation opportunities within this framework. General Motors opened up a new competitive frontier by offering a much wider range of choice against which Ford's standard Model T became less attractive. Others adapted the model for different market regions – the growth in indigenous European manufacturing focused on, for example, the different needs of tiny Italian streets or frozen conditions in Sweden ate into Ford's dominant position. And a rethink of the role of people in the production system, from being simply human cogs in a giant and well-oiled machine to playing a role in continuous improvement of quality and productivity led to the gradual rise to dominance of Japanese producers like Toyota and Honda.

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For more information on the Model T and the underlying innovation messages, see:

[1-3]

1. Womack, J., D. Jones, and D. Roos, *The machine that changed the world*. 1991, New York: Rawson Associates.
2. Brown, S., et al., *Strategic operations management (2nd edition)*. 2nd ed. 2004, Oxford: Butterworth Heinemann.
3. Bessant, J., *High involvement innovation*. 2003, Chichester: John Wiley and Sons.

There are some good films about the Model, ranging from a detailed view of the car and its factory through to those looking at the broader impact. For example, see:

A view of the assembly line <https://www.youtube.com/watch?v=cTZ3rJHHSik>

A history of the car and its impact <https://www.youtube.com/watch?v=D5mZqERUIHY>

5 reasons why the car was revolutionary <https://www.youtube.com/watch?v=Zu07cS5BmRI>

Henry Ford and the American Dream – wider social impact of his innovations  
<https://www.youtube.com/watch?v=dCyXjoy6wRI>

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## Reflection questions

1. How far do you think the Model T changed the thinking around cars as a product and the manufacturing process which created and delivered them?
2. Much if the 'revolution' in the Ford approach to car manufacture was about standardisation – of product, process, working practices, etc. How far might this be a strength – and what might be the weaknesses in this approach which another innovator might exploit?
3. Do some research around the car industry in the 1920s. How did other innovators challenge the strong position which Ford and his team had established?
4. 'The machine that changed the world' is the title of a book published in the 1980s about the car industry. How far do you think this title might apply to Ford and his Model T – and why?