

# PATTERNS OF CAR HISTORY - A TEACHING AID THAT DEVELOPED INTO A RESEARCH PROJECT

**Chris DOWLEN**

London South Bank University, London, UK

## **ABSTRACT**

In the 1980s a set of colour slides was developed to teach students the design history of the car. This developed from a student teaching aid to being a research project, investigating design paradigms for cars using statistical processes to analyse changes and developments. The paper includes the research questions, methods and some results, concluding by asking how the research might be used to develop a teaching aid for students.

*Keywords: Product development, design history, research from teaching*

## 1 NARRATIVE BACKGROUND

This paper describes how a teaching aid to tell students the story of the car became a PhD project. Old cars attract enthusiasts keen to share their interests. There are get-togethers of like-minded people, exhibitions and events such as Retromobile in Paris, the Goodwood Revival, the London to Brighton Veteran Car Run. This isn't a small industry: it was estimated as £1.8bn pa in 2002 in the UK [1].

The project started in the 1980s as a student design history case study. This was developed as colour slides telling around a hundred years of car design history.

This approach left something to be desired. Themes were identified, giving topics to discuss technology and form and how these related.

A conference paper and a book chapter were written in the mid-1990s on using car history for teaching purposes, indicating the specific lessons for students of Design and Mechanical Engineering [2].

One was to investigate what was termed design paradigms for cars. This term has several meanings and needs to be defined carefully; this was done for an ICED conference in 1999 [3]. It was also taken up in a paper on hedge trimmer development [4].

Design paradigms and their development became fascinating, as did answers to philosophical questions of change, development and progress.

A quantitative approach took place to investigate car history, charting layout and form developments using categorical principal component analysis [5] to investigate correlations of changing parameters.

## 2 THE BIGGER PICTURE – PRODUCT DEVELOPMENT AND PARADIGMS

Is change increasing, decreasing or constant? Some people suggest that change takes place exponentially, particularly with respect to computing; “Moore’s Law” was coined to describe these [6], although this was modified by Moore from practical considerations [7].

Reality is far more complex. The perception in car history is something different. Similarly to Thomas Kuhn’s scientific revolutions [8], it was suggested that in car history, jumps were separated by periods of stasis – Golden Ages. These could be described as paradigms. Not a big picture encompassing the whole of science, but a smaller one limited to car design. Or was there insufficient evidence for this?

Products are designed using rational human processes where ideas and thoughts are transformed into products through manufacturing. This has been likened to an evolutionary process [9], but the reality is different. Thought patterns build on what is before: deliberate actions with imagination based on access to ideas, learning and culture of others [10]. But this does not necessarily result in better products: it merely indicates that culture and products impacts on designed products. Thus progress is not inevitable: in fact the idea of it has only been around for about two hundred years [11]. Constant carried out a significant review of technological change in 1980, using the turbojet engine as his

example, but cars are not aircraft and whilst they are technical, the shifts have so far not been as huge as that particular one he describes [12].

### 3 CAR HISTORY: HOW TO START TO ANSWER THE QUESTIONS

The project approached the presentation of car history to students as, initially, a way that indicated how they might build upon the collected history of the car to understand the difficulties and processes inherent in the design and development of such a complex everyday product. It included innovative, novel car designs and boring, middle-on-the-road, commonplace and prosaic ones.

A more coherent analysis was required: one that investigated change parameters and determined what had taken place.

#### 3.1 Possible approaches: narrative, shape grammar, repertory grid, statistics

Most history is simply investigated through narrative. In car history, this approach is taken by such as Sparke [13], Scott-Moncrieff [14], Whyte [15] and Georgano, Sedgwick and Ason Holm [16]. There is no attempt to measure change although describing it is their *raison d'être*.

Another approach is shape grammar. This describes form (not the overall product) using verbal descriptors. It has been used in architecture since the 1980s, and developed to investigate brand characteristics through car history by people such as McCormack and Cagan [17].

Whilst this approach clarifies meanings of form, it is not amenable to comparative study.

Statistics was more hopeful. Things could be measured along with their changes over the period of car history from the 1870s. Quantitative processes means comparisons can be made across periods and timescales, spreads measured at dates and rates of change measured to discover when step changes, if any, occurred. Design paradigms would be located as periods of stasis or of clusters of vehicles described in a constant linear fashion over time.

#### 3.2 What to measure?

Parameters for car layout and for car form were measured – more than might be expected – and use data reduction techniques to reduce the data to a small number of parameters. Layout parameters are shown in Figure 1 and form ones in Figure 2.

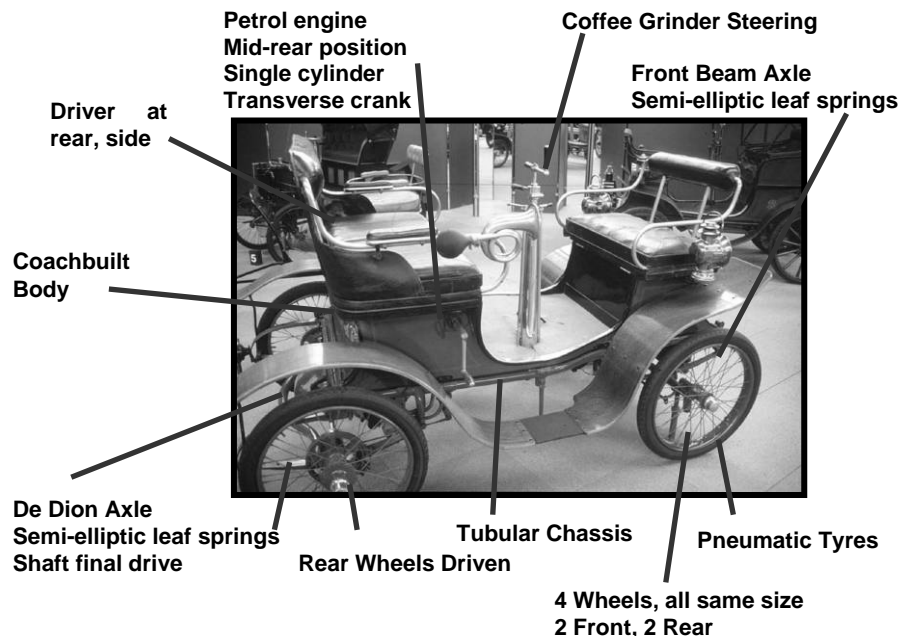


Figure 1. Layout parameters illustrated on a 1900 de Dion Bouton vis à vis

The data reduction techniques used were similar to factor analysis, which uses correlations to determine relevant factors [17], but the type of data meant that a non-linear approach based on probabilities had to be taken using the categorical principal components analysis procedure within SPSS [5]. Nineteen layout parameters were analysed and 27 form ones. The output of each of the analyses (layout and form) was reduced to two factors.



well enough to be able to identify the precise date at the moment. From about 1935 the position moves, in particular with the introduction of independent front suspension and structural monocoque body shells.

During the post-war period things are much less constrained, although there is a general shift and there are some significant lines similarly showing for the best sellers analysed so far.

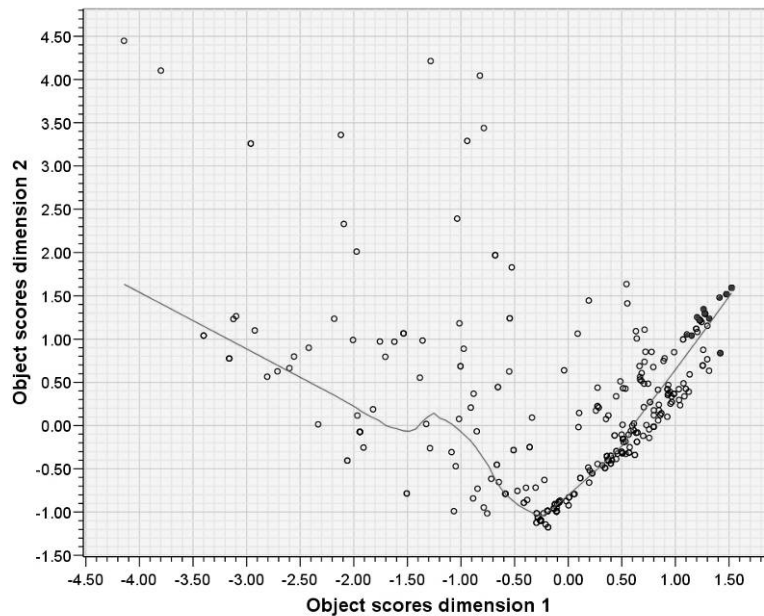


Figure 3. First two layout components from the CATPCA analysis plotted against each other

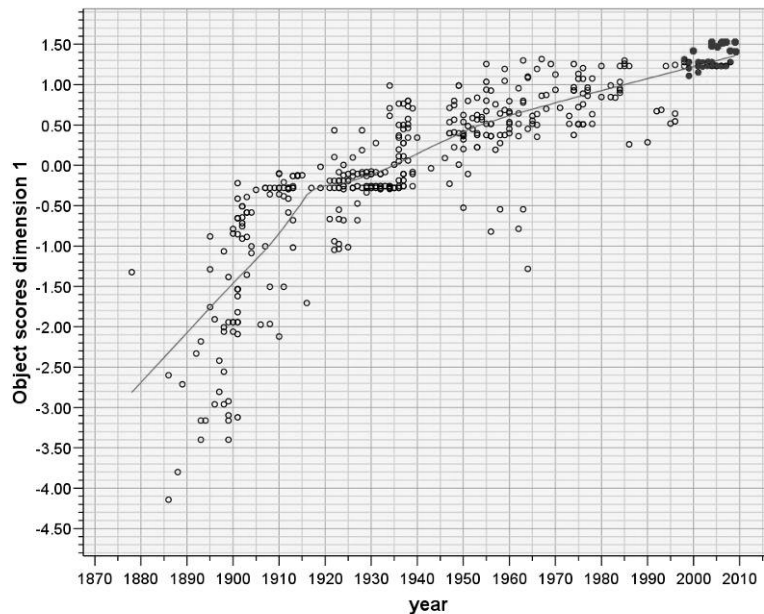


Figure 4. First Layout component plotted against year of manufacture.

For form analysis, a plot equivalent to Figure 3 is shown in Figure 5.

The form analysis results are significantly less clustered than the layout ones. However, they still show a definite development. The early cars are in the left lower quadrant and are short, with a set of separate ill-arranged and connected components. From about 1905 the move is to the upper left quadrant, where bonnets start to become longer and the car is lower overall. This is the vintage era. The form moves to the upper right quadrant in the late 1930s, where engines start to move forward and the form becomes significantly more integrated and (perhaps) streamlined. Integration continues and bonnets become shorter and shorter, and the cars move to the bottom right quadrant, with the best

sellers analysed so far (solid) clustered in the bottom right, but rather looser than with the layout analysis.

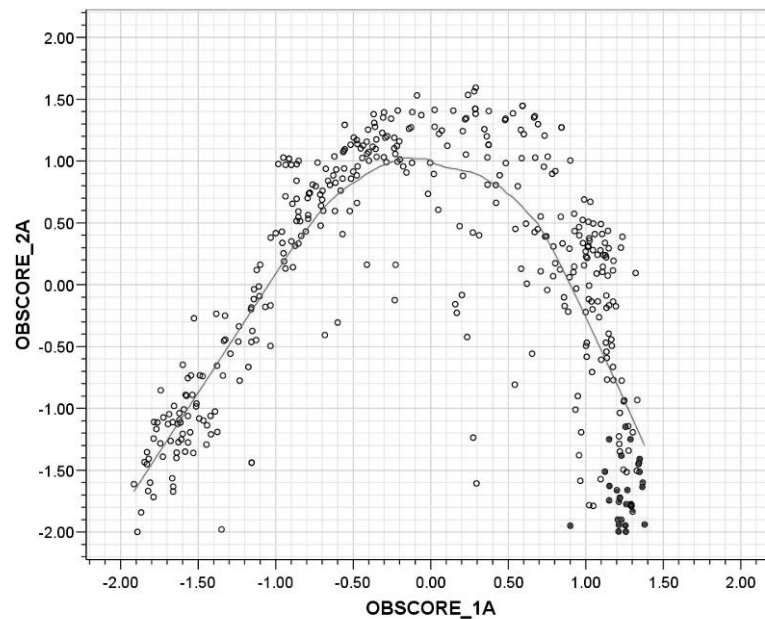


Figure 5. First two form components from the CATPCA analysis plotted against each other.

## 5 HOW DO THE RESULTS ANSWER THE RESEARCH QUESTIONS?

The project is as yet incomplete. The results certainly demonstrate that change occurs and that it is not constant. But sometimes it is more apparent than at others. Using the concept of a design paradigm is now backed up and is a more confident assertion. What appears to take place is indeed a set of design paradigms for car layout, connected with significant paradigm shifts. With car form there is change, but the clearly defined paradigmatic behaviour is less clear. Although forms cluster together they don't exhibit the same sets of lines that are clearly the case for layouts.

The hypothesis of the initial paradigm from 1905 to 1934 was always present and has been confirmed. The surprise was perhaps the shift that took place in the late 1930s, from 1934 to 1939. Here independent front suspensions start to be used and integral body-chassis structures become more common. British manufacturers were not so involved in the changes, so it may be simply that the wrong viewpoint (ie from the UK) had previously been taken: most US automotive historians would probably have pointed to events in 1933 as being significant in car history.

Paradigms present in post-war years need more work to confirm their existence: analysis of a larger set of best sellers probably help to confirm this, although these data are only available from 1965.

As the project progresses it is likely that more significant paradigmatic behaviour will be seen: it is already clear that step changes occur, particularly in the layout parameters.

What such an analysis does not show is whether later cars are any better or worse than earlier ones: this is a value judgment, although quantified can be used to back up the decisions.

This project can also show how unanswered questions about teaching material can lead to an effective and useful research project and it may encourage others to pursue such processes.

For a more visual conclusion, if car design had to be split up into, say, four equal periods, what single car might characterise each period? From 1878, the date of the first car in the original survey (Amedée Bollée's La Mancelle) to the present, this gives periods to 1911, 1944 and 1977. See Figure 6 for some visual suggestions, with no attempt at an analysis of typicality.



Figure 6. Representative cars for different periods:  
1892 Peugeot, 1925 Morris Cowley, 1969 Riley 4/72 and 1986 Renault Twingo

## REFERENCES

- [1] *20 Years: The Driving Forces*, in *Classic and Sports Car*. 2002. p. 33.
- [2] Dowlen, C. *Using Car History for Teaching Engineering and Design*. in *ICED'97*. 1997. Tampere, Finland: Tampere University of Technology.
- [3] Dowlen, C. *Development of Design Paradigms*. in *International Conference on Engineering Design*. 1999. Munich, Germany: Technical University, Munich.
- [4] Dowlen, C. and M. Atherton. *New Wine in Old Wineskins: A case study on the evolution of hedge trimmer design*. in *Design Reuse*. 1998. Brunel University: MEP.
- [5] Leiden University, D.T.S.S.G.D., Faculty of Social and Behavioural Sciences, *CATPCA*: Leiden.
- [6] Moore, G.E., *Cramming more components onto integrated circuits*. *Electronics Magazine*, 1965.
- [7] Dubash, M., *Moore's Law is dead, says Gordon Moore*. *Techworld*, 2005.
- [8] Kuhn, T., *The Structure of Scientific Revolutions*. 1962, Chicago: University of Chicago Press.
- [9] Yagou, A. *Rewriting Design History from an Evolutionary Perspective: Background and Implications*. in *design > system > evolution: 6th European Academy of Design Conference*. . 2005. Bremen, Germany.
- [10] The Royal Society for the encouragement of Arts, M.C., *The RSA Adelphi Charter on creativity, innovation and intellectual property*. 2005: London.
- [11] Bury, J.P., *The idea of progress*. 1955, New York: Dover Publications Inc.
- [12] Constant, Edward W., *The Turbojet revolution*. 1980, Baltimore, Maryland: John Hopkins University Press.
- [13] Sparke, P., *A century of car design*. 2002, London: Mitchell Beazley.
- [14] Scott-Moncrieff, D., *Veteran and Edwardian Motor Cars*. 1963, London: Batsford.
- [15] Whyte, A., *The Century of the Car: 1885-1985*. 1984, London: Octopus Books.
- [16] Georgano, N., M. Sedgewick, and B. Ason Holm, *Cars 1930 - 2000: The birth of the Modern Car*. 2001, New York: Todtri.
- [17] McCormack, J.P. and J. Cagan, *Speaking the Buick language: capturing, understanding and exploring brand identity with shape grammars*. *Design Studies*, 2004. **25**(1): p. 1 - 29.
- [18] Child, D., *The essentials of factor analysis*. 1990: Cassell.