Extended Abstract

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An empirical study of factors affecting hours-per-vehicle in automotive industry

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Abstract:

The main goal of this research was to pinpoint and understand factors that improve performance in automotive industry in North America. Obviously, the most important factor to improve automakers' productivity is the manufacturing processes itself. However, in general, hours per vehicle (HPV) is a widely recognized and practiced measure that companies use to increase their performance level and raise productivity. Unfortunately, there is a limited understanding of the set of factors that affect HPV across the automotive industry at conceptual and technical levels. Using data from Harbour's survey of 10 automakers in North America, we have developed the best fitting linear regression model for HPV that include 12 independent variables and some transformations that are controllable by the automakers. The Generalized Linear Model (GLM) was used to analyze the data and derive the HPV regression equations. Stepwise regression procedure was terminated after the inclusion of 9 significant variables (and their transformations) in the model. Automaker brands that supplied the data used in this study are: DCX, Ford, GM, Honda, Cami, Nummi, Auto Alliance, Mitsubishi, Nissan, and Toyota. Independent variables used in the statistical analysis were: vehicle segment, car assembly and capacity utilization, number of models, vehicle variety, platform strategy, production volume, flexible manufacturing, outsourcing, new product launch, annual available working days, salaried employees' percentage, and year. Regression equations that were formulated in this research may be used effectively to help automakers to set guidelines to improve their productivity with respect to internal and external constraints, strength, and opportunities. This paper reviews the history of automotive technology development and human factors research, largely by decade, since the inception of the automobile. The human factors aspects were classified into primary driving task aspects (controls, displays, and visibility), driver workspace (seating and packaging, vibration, comfort, and climate), driver's condition (fatigue and impairment), crash injury, advanced driver-assistance systems, external communication access, and driving behavior. For each era, the paper describes the SAE and ISO standards developed, the major organizations and conferences established, the major news stories affecting vehicle safety, and the general social context. The paper ends with a discussion of what can be learned from this historical review and the major issues to be addressed. A major contribution of this paper is more than 180 references that represent the foundation of automotive human factors, which should be considered core knowledge and should be familiar to those in the profession. This paper investigates why material throughput remains high in the UK automotive industry when there are opportunities for material efficiency improvements. Informed by socio-technical studies of auto mobility, the paper emphasizes the importance of recognizing how decisions regarding material use are always shaped by more than simply cost considerations. Drawing on industry interviews, six interconnected socio-technical factors are identified that guide the vehicle design and manufacturing process. These are: (1) customer preferences; (2) market positioning; (3) techno-economic feasibility; (4) supply chain feasibility; (5) regulation and (6) organizational attributes. These factors can provide insights into the current operating context of the UK automotive industry and help explain why the average material intensity of vehicles and vehicle throughput are increasing. Overall, the paper shows that the efficiency of material use in the UK automotive industry is the outcome of complex and advanced design and manufacturing processes. Understanding these processes and the factors that guide them can potentially increase the likelihood of the automotive industry adopting material efficiency initiatives.

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