Internet-Based Customization in the Automobile Industry

By: Auto-Industry Customization Group

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IE 597B.001

Designing Product Families

Submitted: May 4, 2001

For: Dr. Timothy Simpson

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1. Abstract

Preliminary findings of the feasibility of Internet-based automobile customization and sales are discussed in this paper. The project includes the study of the degree to which customization is possible over the Internet today. The obstacles that have to be surmounted to implement an Internet-based sales strategy have been discussed. Results were derived by studying customer needs, which are translated into desirable features on an automobile, and evaluating those needs with respect to the existing customizable features in the automobile industry. A survey of dealers highlights the obstacles that the manufacturer has to contend with, when proposing to move on to the Internet as a medium for the selling of automobiles.

2. Introduction

The automobile industry has progressed from the days of the Model-T. The market is no longer the monopoly of any one corporation but an even playing field for the many competing brands. Today, the demanding consumers have compelled the industry to 'rethink' its strategy on the production and marketing of automobiles. Consumers are no longer satisfied with the models that are made for them and introduced into the market. They demand a greater variety and individuality. The concept of customization of automobiles attracted the consumer as it afforded the luxury of configuring a car to one's needs. The advent of the Internet age propelled the auto industry into the revolutionary concept of customizing cars online and delivering them to consumers in the shortest amount of time.

Consumers have been able to customize previously but this was restricted to the high-end market. Waiting periods for delivery were lengthy, resulting in unsatisfied customers. The manufacturers have to be agile enough to build cars and supply them at short notice. Thus, the concept of quick response time and quick delivery of products came into being. The idea of build to order, which reduces the inventory by more than half, is a target that most manufacturers would like to achieve; however, the rewards certainly are not easy to achieve.

An overhaul of the manufacturing processes would be a necessity to attain the status that computer companies like Dell or Gateway have attained on the field of Internet-based customization. Compounding the problems are non-manufacturing issues that include the pressure of local dealers, the lack of responsiveness of the supply chain to short time demands and the shortened product cycles. The ensuing topics give an insight into some of the common problems that the automobile industry faces, that prove to be hurdles in the way of Internet based commerce.

3. Methodology

The focus of the project was to study the viability of Internet based customization of automobiles. Though the topic suggests an enhancement of the sales strategy of the companies, the underlying technical and strategic principles that have to be changed to bring about such a change is very demanding. The focus of the project concentrated on a limited number of these factors, which have been considered to be the obstacles in the way of Internet-based customization. A brief overview of the pertinent issues and their plausible solutions is discussed later.

The presence of car dealerships is viewed as a threat to the manufacturers efforts to go online. The dealers form a potent force not only because of their sheer large numbers but also because of the very strong customer inhibition to buy a vehicle online without having a "feel" of the purchase. The dealers have thwarted the efforts of the manufacturers to go online and perhaps formed one of the most insurmountable obstacles to the process. The project encompasses a study of the dealer's role in the marketing of the cars and examines the changing trends in the purchase of cars by the consumer.

Local dealers in State College, PA were interviewed and an analysis was done on the responses to the issue. The possibility of the coexistence of dealerships and Internet-based customizing and buying of vehicles was explored.

It is believed that in most cases, the changes that a customer demands are purely cosmetic. Performance enhancing features of the automobile are in general less of a concern for customization and are usually realized by buying a high-performance car. This project examines the nature of customer demands and the nature of customization that they expect. Customer feedback is an extremely important tool for decision-making. It is the viability of a large market segment that needs to propel the manufacturer into adapting to an Internet-based sale strategy.

Most automobile manufacturers do offer a certain degree of customization on their products. However, the options are usually limited to packages that are demarcated by the manufacturer. The nature of customization is such that the demand for an automobile with a certain set of specifications is not made to order. Most automobile web sites match the customer to the dealer that has the closest product to the one that he/she customized on-line. The objective of this study was to examine the degree of customization that the manufacturer provided and the degree of exactness to which the automobile (supplied to the customer by the dealer) matched the customized vehicle. The extent of customer satisfaction with the product from such a purchase was also of interest.

4. Motivation

An automobile is a work of art. The sheer numbers that go into manufacturing such a product, in terms of the components, the lead times and other issues like inventory are overwhelming. A survey by General motors sheds light on a few of these numbers that go into making an automobile – the number of components/modules being 3000, the lead times (order to manufacture) being 8 days, shipping time amounting to 11 days and elapsed time (order to delivery) being 8 weeks or more. These sheer numbers would make one wonder if the manufacturer would be able to come up with a quick solution like “five day car” concept proposed by Toyota Motor Corporation.

The manufacturer is motivated to take up a project of such gargantuan proportions as a result of the customer feed back on the present state of affairs. As Harold Kutner, GM’s crusader in Internet-based customization and sales so succinctly sums up “Today, people sometimes buy a car just because its there on the lot. Six months later they may not be as happy because it wasn’t quite what they really wanted.” But manufacturing a made to order car is certainly not going to be easy for the automobile manufacturers. The ensuing sections discuss the prominent barriers that stand in the way of the automobile industry going on track of internet based sales and customization.

5. The Automobile and the Computer Industries - A Quick Comparison

The concept of Internet based customization in the automobile industry can perhaps be directly attributed to the success enjoyed by the personal computer market segment controlled by players like Dell, Gateway and IBM. However, the comparisons between the two industries wear thin as one looks into the intricacies that go into the manufacture of an automobile. As opposed to a computer that has about 30 modules, the manufacture of an automobile is a carefully coordinated exercise that involves the assembly of about 3000 parts.

The supply base of the automobile industry is spread far and wide as opposed to the computer industry and the procurement of the raw materials is in itself a task that cannot be managed without an infrastructure that supports an Internet based selling. The number of combinations, though dictated by the manufacturer currently, is still large as opposed to those that could be made from computers, and coordinating them could prove to be a Herculean task. The final delivery of the product is yet another aspect of the computer industry that cannot be easily incorporated into the automobile industry. A computer can be shipped in two days from the point of order. Saturn is the only automobile manufacturer in the U.S. that has shown consistency in achieving a modest time of two weeks from the point of order, and recall that Saturn produces very few vehicle models. It is obvious that major overhauling of the system would be required by the auto industry to make an impact on the Internet-based trading scene.

6. Manufacturers

Manufacturers are faced with many issues involving their supply chains, and the actual activities that occur within the walls of their plants.

6.1. Supply Chain Issues

The supply of components and modules to the automobile manufacturer is spread over a vast number of suppliers, not necessarily near the final assembly unit of the manufacturer. These suppliers are further sub divided into tier 1 and tier 2 suppliers, each collaborating with the next highest level in the hierarchy to produce components that are required by the manufacturer.

For the automobile industry to run even a remotely successful Internet-based customization and sales strategy, it is imperative that these elements be integrated into the information highway of the manufacturer. A look at the Dell model of manufacturing would reveal that the orders that are placed with dell trickle down to the lowest level of their suppliers in quick time. The automobile manufacturers would have to ensure that information flow is good enough to reach the lower tier supplier. This is essential, as the Internet-based system would usher a “pull” system as opposed to a “push” system that is being employed by the industry today. The problems are compounded by the fact the lower level of suppliers may not be technologically adept at receiving such information. That burden falls on the shoulders of the manufacturers to work in collaboration with the tier 2 and tier 3 suppliers to upgrade the facilities.

The spread of the supplier base is a detrimental factor that prohibits speedier production of automobiles. Location of a supplier base close to the final assembly unit could usher in a quicker supply of parts and thus a shorter lead-time.

6.2. Manufacturing Issues

Some of the relevant factors that need to be addressed by the manufacturers from a manufacturing point of view vary from the in plant-activities such as the stamping operations carried out to the painting of the final product. Automobiles are produced in large volumes of the same model during a typical production run. An Internet-based manufacturing system, at the worst, would imply the manufacture of individual automobiles instead of a batch of automobiles as they are produced now. Production runs in batches allow the manufacturer to achieve economies of scale as opposed to the individual manufacture of the automobiles that would result in wastage of resources and material.

Outsourcing modules has been suggested as one of the effective methods by which the manufacturer could possibly decrease lead times and order-to-delivery times. The strategy envisions the manufacturer to be merely a unit that assembles parts that the suppliers provide them with, much like the computer industry. Key issues like design could be kept in-house while the manufacturer works with the supplier to produce and supply modules for the vehicle. This may not seem to be a viable option for the manufacturer who no longer would have control over the product that he envisions. Outsourcing does allow the manufacturer to free up the capital investment and channel it to building the infrastructure to conduct business over the Internet, but objections from all quarters including unions have to be contended with!!!

Shrinking life cycles of automobiles prompt the manufacturers to have body shops that are flexible by nature. A body shop that can transcend the life cycle of one or a family of automobiles could be used to produce greater variety. The location of such a facility near the final assembly unit could provide automobile manufacturers with the much needed flexibility, provided the vehicles are built of the same platform.

Increasing the modularity of component parts (i.e. those parts integral to the automobiles) could increase product variety over the Internet. Modularity ushers a quicker assembly time and lower costs, both of which could produce beneficial results to both consumers and the manufacturer. Most importantly, a decrease in assembly time could make a strong case for internet-based customization of automobiles.

Common platforms could prove advantageous to the manufacturer in going global as well as increasing the production output as the technology and the methods by which the platform is being produced remains consistent. Volkswagen currently employs an effective platform strategy that allows it to produce variety for its customers. VW produces vehicles as seemingly diverse as the VW Beetle and the Audi TT Coupe on the same underpinning platform. Honda caters to the world market with its scalable Accord platform. However, the responsibility of developing a successful family of products rests with the manufacturer by means of which they could use the Internet as a leveraging platform to market his products.

Subsequent sections analyze the current trends in internet customization that exist in the market today and looks at one of the prime obstacles that stand in the way of internet based customization of vehicles, the dealers.

6.3. Current Trends

The idea of “more is better” has been around for quite some time in the automobile industry. Many manufacturers thrive on this principle as a key strategy and it is something they use to motivate and “push” their employees. Listed in Table 1 is a summary of what manufacturers are currently faced with under the existing “Push” system within the major divisions (i.e. design, marketing, manufacturing & supply, and dealer network).

Today, many (if not all) automobile manufacturers have websites that allow users to “build your own” car. In addition to being able to simply view a particular model, a user could choose various packages and get updated information on pricing as options are selected. One of the things that make this experience unique is the fact that a user can actually see things change on the screen in real-time as opposed to looking at a static ‘catalogue’ picture. The next section will discuss the collaborative customization process that currently exists among several websites and explain the importance of the third-party websites that co-exists with the manufacturers’ sites on the Internet.

7. A Closer Look at Online Customization

Several manufacturers' websites were examined in order to get the full scope of the process of how a user could actually customize a car online and perhaps proceed with buying one online. Two segments of the auto industry were studied: small cars and high-end SUVs. Many things were similar in the structure of the websites between these two segments, but other things clearly separated them as well.

Table 1. Current "Push" System [Austin, 1999]

Division	Process	Ideology / Current Situation
Design	Design strategy	Please everyone
	Vehicle combinations	More is better
Marketing	Pricing strategy	Budget-driven
	Vehicle purchase incentives	Higher
Manufacturing & Supply	Capacity planning	Multiple material / capacity constraints driven by program budget
	Schedule and build stability	Maximize production – make whatever you can build
Dealer Network	Dealer ordering	Orders based on allocations and capacity constraints
	Order to delivery times	Longer (60+ days)
	Inventory	High with low turnover
	Dealership model	Independent dealerships, negotiations with company

7.1. Auto Manufacturer's Sites

For the small car segment, the sites of Chevrolet, Honda, Nissan, and Toyota, were examined. As mentioned earlier, all of these sites contained customizable sections entitled "build your own" or "customize". The customization process typically consists of the following steps:

- Select a model

- Select an exterior color
- Select an interior color
- Select packages and options
- View a summary page
- Find the vehicle at a local dealer / or locate a dealer (if none are local)

Most pages were fairly easy to navigate through, although a few pages had a few minor turnoffs for the user. For example, on Chevrolet's page, the appearance of the car is never updated aside from selecting the model type. On the other hand, Honda's page updates the picture every time the user clicks on a feature that they want to select. On Nissan's and Toyota's pages, the car is only visually updated when the model is selected and the color is changed. When additional features are added on to a vehicle (such as a spoiler) they are never updated or added to the picture in the customization process. Several other metrics (i.e. # of pages, # of check boxes, etc.) that were captured from examining these sites are displayed in Table 2.

Table 2. Internet-based Customization of Small Cars

	nissandriven.com	honda2001.com	chevrolet.com	toyota.com
customizable	yes	yes	yes	yes
web page				
type of	After assembly one			
customization				
Production	Already produced, find dealer with match			
Method				
# of pages	5	6	9	7
# of drop-down	0	1	1	1
boxes				
# of check boxes	10	0	34	32
# of text boxes	1	0	0	1
# of defaults	0	0	7	0
# of click pictures/text	11	47	0	6
# of options/page	4.2	8	3.89	5.57
Register	no	no	no	no
Picture	Updating Picture to Match Selected Options			
Pricing	yes	yes	yes	yes

All of the web pages update the price each time features are added or when the next page of customization is selected. However, the customization of these “build your own” sites is limited by one major thing – the specification of certain desired options does not actually result in the production of the customized vehicle. The current system does not allow a user to buy directly from the manufacturer; it merely searches for a local dealer that has a vehicle that closely matches the specifications of the customized vehicle.

When the time comes for adding special packages or options on these vehicles, a large number of choices are available to the user. In fact, sometimes too many options are available as shown in the Appendix Table A1. For example, throughout Appendix Table A1 one could see several “N/A” listings in several rows; however, these options usually are available and could actually be purchased for that particular vehicle but they may not have been listed or included under the “build your own” section of the website.

The Chevrolet Cavalier, for example, has a complete list of accessories that are not included in the “build your own” process. Also, there may be other costs associated that are not as easily noticeable. Honda actually states that installation of all of its accessories is not included in the cost, so a user may have to pay more in this instance.

The small cars selected were chosen based cars that contained similar equipment and had similar base prices. Two of the models, the Honda Civic and the Toyota Corolla, had the lowest prices simply because the air conditioning is not included. In reality, this is a common option which most people want; therefore, it would instantly bump the price up by over $1000. The manufacturers already know that air conditioning is a fairly common “option”, so they automatically incorporate it in the model selection customization process as a default. The user still has the ability to not choose it if they do not want it though. These small things could be oversights to some users if they are not careful; therefore, a user must take their time to understand the website while they are enjoying all of the nice things on the screen.

For the high-end SUV segment, the sites examined included the following vehicles: Lincoln Navigator, Land Rover Range Rover, Lexus LX470, BMW X5, and Mercedes-Benz ML55. The customization process for these high-end SUVs is very similar to the aforementioned small car websites, and more details on this could be found in Appendix Table A2. However, Several of these sites had things that set them apart from the small car websites.

Table 3 describes on some of the metrics captured for the high-end SUV segment. The bottom portion of the table contains several metrics concerning the automobile dealers and clearly shows how each site differs. For example, at the end of the Lincoln Navigator's customization process, not only did it automatically locate the nearest dealer for the user, it also provided a map to the dealership and driving instructions as well. This feature was unique only to Lincoln's page, but that alone did not necessarily make the customization process better.

On the other hand, this was one of the only sites that disabled the "Back" button of the computer browser; therefore, the user had to start over again whenever a mistake was made or if they wanted to do another vehicle. Almost all sites contained some type of financial calculator to assist you in figuring out how much to spend when buying or leasing their vehicles. Appendix Table A3 describes many more of these "extra features" and "minor drawbacks" in greater detail.

All sites contained pictures that updated as the user selected options (by clicking the mouse on some button or picture), but two of these sites contained one additional feature that no other site provided (in the small car segment or high-end SUV segment). The Lexus website allowed the user to simply scroll their mouse over a certain exterior color and the vehicle would change instantly in real-time. This eliminated the 'sometimes annoying' page refreshing that occurs on most websites. At the same time, Land Rover offered users to select certain kits (optional wrap around brush bars that go around the outside of the vehicle) and when selected, the picture would change to show the SUV model with the kit that was selected (as seen in Figure 1). Again, this feature was unique to them alone and it gives the user a nice feeling and better appreciation of the website when compared to the other sites that never change when options are selected. Options available for SUVs were much smaller in number when compared to the small car segment. This data was collected and is available in the Appendix Table A4.

Figure 1. Instant Picture Updating with Selection of Options

Table 3. More Metrics for Internet-based Customization of High –End SUVs

					
FACTORS:	Lincoln Navigator	Land Rover Range Rover 4.6 HSE	Lexus LX 470	BMW X5 4.4i	Mercedes-Benz ML55 AMG
Customizable web page	YES	YES	YES	YES	YES
Uses Separate or Normal web page?	SEPARATE	SEPARATE	NORMAL	NORMAL	SEPARATE
Same page customization?	NO	YES	YES	YES	YES
Type of customization?	COLLABORATIVE	COLLABORATIVE	COLLABORATIVE	COLLABORATIVE	COLLABORATIVE
Production method	Factory Only	Factory Only	Factory Only	Factory Only	Factory Only
# of pages	8 (9 if including extra link page)	8	6	5	6
Do you have to register?	NO	NO	NO	NO	NO
Picture Updates on Same Page, Separate page, or none at all	Same page (refresh)	Same page (instant w/ mouse click)	Same page (instant w/ mouse scroll)	Same page (refresh)	Same page (refresh)
MSRP Price (or Price Range)	$44,730 - $48,480	$62,665 - $68,665	$62,400	$50,045	$66,545
Purchasing methods	Dealer Only	Dealer Only	Dealer Only	Dealer Only	Dealer Only
Nearest Dealer Located Automatically?	YES	NO	YES	NO	NO
Is Dealer Contact Info Displayed On-screen Automatically?	YES - web-site, email link, and local address/phone#/fax#	NO	YES - web-site, email link, and local address/phone#	NO	NO
Is it possible to select/find another dealer?	YES	YES - via hyperlink	YES	NO	YES - via hyperlink
Driving instructions to dealer option given?	YES	NO	NO	NO	NO
Is Dealer Location Map option available?	YES	NO	YES	NO	NO

In summary, at this point in time most people only use these customizable websites to make decisions on what type of vehicle they actually may purchase in the near future. Others simply are simply logging on just to look at cars and never really intend to buy anything from a particular website. Down the line, this may hurt the manufacturer as they try to move from dealer sales to Internet sales because people who are not considering buying cars online may potentially tie up their websites if enough bandwidth and storage space is not available on the computer servers. This may impose an additional cost to the manufacturer.

For the manufacturer, this is simply another way of doing collaborative customization, but it the user can not actually get the product that they may want to customize at this point in time. Why? True customization would allow a user to ask for something that they desire that is not listed on a website's page (i.e. a special paint job, or special trim). This could be done with an additional text box in added to the items already currently available on the website. If manufacturers would ever allow for this to happen remains to be seen.

There is one problem worth mentioning concerning the current Internet-based approach – the user cannot test drive the customized vehicle or close a transaction over the Internet. With the Internet serving as a key enabler for customization, the auto industry will soon develop a mechanism to get around this point because they want to sell their cars to the consumers as quickly as possible – this is the bottom line. Just as the computer industry has turned to the Internet to sell their products directly, auto manufacturers are taking the steps to follow the same path.

7.2. Introducing FordDirect.com

In April 2001, Ford launched a new website called FordDirect.com - a website in which Ford proposes to sell their cars “directly” to the customer. In fact, the new “dot com” company is a joint venture between Ford and its dealers and is open to voluntary participation of the dealers. From the customer point of view, the offerings available on this site are very similar to those of the websites previously described. It has an advantage of containing better information about Ford’s products in addition to providing the familiar online interface for the customization process. Transactions are still completed with the dealer and the operations of the company are limited to 11 states at the moment, due to regulatory policies.

Another anticipated advantage for the purpose of giving better satisfaction to the customer is that FordDirect.com will be able to get more accurate feedback on the models that are preferred by the customers. In turn, this will assist the manufacturing division with adapting the production to the consumer demand.

Finally, it is worth mentioning that other companies are planning to follow similar steps: GM has announced plans for the creation of a website named AutoCentric. It would result in relationships between GM and its dealers similar to those that Ford has with its participants of FordDirect.com. Meanwhile, GM has shown interest in creating a website which resembles that of the existing Third-party websites which including information about all car makes and brands. They believe that this will be the key to attracting many more customers.

7.3. Third-party Sites

The Third-party websites offer an alternative method for researching and locating vehicles via the Internet. Basically, these businesses get information from dealers (“qualified dealers”) and put them in contact with potential customers who look for vehicles on the Internet. The websites of Cars.com, CarsDirect.com, Autobytel.com and MSN Carpoint belong to this category and were examined. The results from the observations of the websites are presented in the Appendix Table A5.

These websites differ from the manufacturers' in several aspects. First of all they are more commerce-oriented, dedicated essentially to serve as intermediates between the dealers and the customers. Dealers benefit from their relationship with these websites in two aspects: 1) in many cases the dealers do not have a website to sell their vehicles; thus, they use these Third-party websites which are already well-known throughout the Internet community to help them become known, and 2) the dealers who subscribe to them may have better chances of selling their vehicles with the exposure of their vehicles over the Internet. Some of these websites are independent, whereas some others are partners of websites offering wider services (e.g. MSN Carpoint is the automobile branch of MSN.com). The Third-party sites have diversified their offerings and brought customization of vehicles and auto-services to their websites. This is another distinctive feature of these websites. The broad range of offerings from these sites also includes options for financing (i.e. online payment estimations, insurance, maintenance and repair packages) and advertising the sales of their used cars.

In addition, there are some navigation options that are different from those offered by the manufacturers' websites. These include:

- Possibility of selecting vehicles from many different manufacturers
- Search among the most selected vehicles
- Access to customer reviews about satisfaction from previous transactions
- Possibility of comparing cars from up to 4 different makes simultaneously

Additional features vary from one site to the other. For instance, CarsDirect.com allows reservation of the vehicle with a fixed price by the use of a credit card (there is a fee to process the request), but the final transaction is carried out between the dealer and the customer. Besides, they also warrant the lowest price for the cars sold through the site.

Another important feature from the customer perspective is the comparison between the retail price (manufacturer suggested retail price or MSRP) and the so-called "invoice price" which is the amount paid in principle by the dealer. This "invoice price" actually may vary due to special selling conditions between the manufacturer and the dealer. The information about the MSRP already gives an upper limit to the price the dealer is allowed to sell a vehicle for. In addition, the "invoice price" may also give a hint about the amount of flexibility in price a customer may expect or want to pay for a car from a dealer.

On the other hand, a number of characteristics make the utilization of these websites less user-friendly than those sites of the manufacturers. The latter have achieved a high level of performance in customizing online with the utilization of graphical interfaces. Nevertheless, most of the Third-party sites don't have such a main feature as "Building your own car", and it often takes a while to get to the first page in which several choices are available for choosing a particular feature of a car. Moreover, the picture of the automobile that illustrates the current selection is fixed and remains static until the end (i.e. no picture updates). Many of the color options appear only as a name on the screen – not providing the user with a preview image. Finally, the number of options for certain features is limited to a few choices. This decreases the extent of the customization that can be done for those automobiles. This forces the user to become a "serious buyer" and requires them to fill out information sheet or even register with their site.

There exists a serious contrast between the Third-party websites and the manufacturers' websites on the Internet. The former plays more of a role of intermediary and stress the offer of services, while the latter is more concerned about their brand image and about giving as much information about their products to the customer. Although the number of Third-party websites has decreased compared to what it was in 1999, some of them remain active and have a good reputation among auto-buyers. Many dealers know this and they are now beginning to use them extensively.

7.4. The Future of Internet-based Customization

While sites like FordDirect.com and the GM's upcoming AutoCentric are racing to get going and sell direct to customers, many other automobile manufacturers hope that in the next few years that a user can log into their website and order a vehicle to their exact specifications and receive it within a matter of days. Well, this may be very optimistic, but a more realistic future seems to be along the lines of what Austin proposes in Table 4.

Table 4. Moving to the "Pull" System [Austin, 1999]

Division	Process	Ideology / Current Situation
Design	Design strategy	Mainstream customer wants
	Vehicle combinations	Minimal
Marketing	Pricing strategy	Market-driven
	Vehicle purchase incentives	Lower
Manufacturing & Supply	Capacity planning	Market-driven (no constraints)
	Schedule and build stability	Schedule from customer-driven order bank, build to schedule
Dealer Network	Dealer ordering	Orders based on customer-demand
	Order to delivery times	Shorter (15 days or less)
	Inventory	Low with rapid turnover
	Dealership model	Company controlled dealerships

8. Customer and Future Customer Survey

To attempt to gauge the views of the public on mass customizing automobiles, a survey was prepared and distributed. Due to a lack of research funding, the market research had a statistically narrow scope. Surveys were distributed to a class of engineering students, and were distributed through email to other consenting individuals. All of these individuals with the exception of one are college students. A blank copy of the survey can be seen in the Appendix B. A summary of the results and their implications is shown below. Additionally, the survey was posted online at the URL below:

http://www.createsurvey.com/cgi-bin/pollfrm?s=1010&magic=1aKunn6G93AQVFK

This online survey was promoted through 'word-of-mouse' advertisement in Internet chat rooms, however there were no responses.

Of the entire survey distribution, there are forty-five respondents.

In terms of general demographics, the respondents were:

- 75% male
- 95% engineering majors (and one graduated engineer)
    - other 5% comprised a psychology major and a geology major
- Varied age as shown below in Figure 2

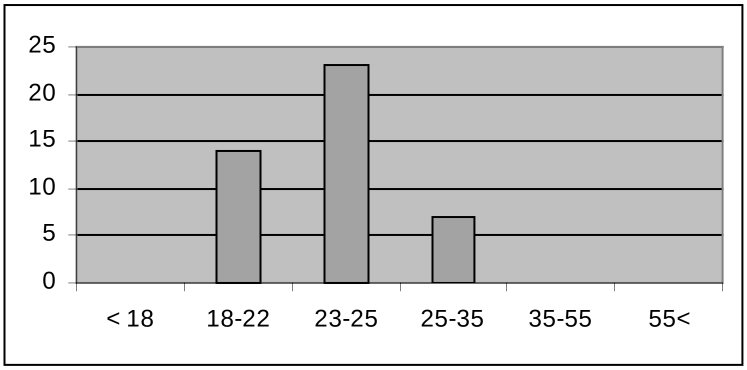

Figure 2. Age Histogram

Educational levels also varied little within the respondent group and all have completed at least some college. Figure 3 below shows this graphically.

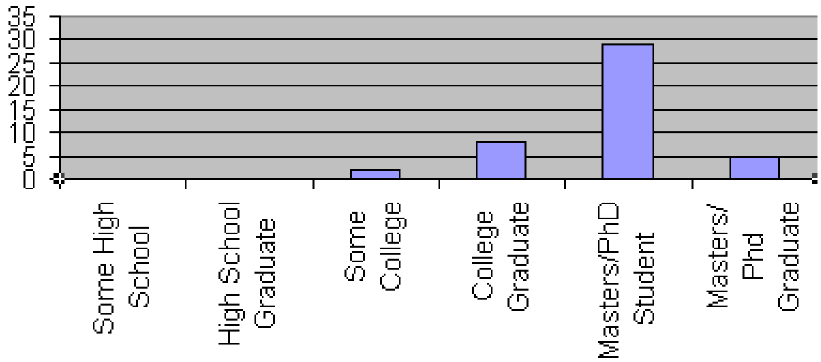

Figure 3. Educational Status in Fall '01

Notably, this compromises a distinct group. Coupling the large percentage of engineering respondents with the notion that engineers are more adaptable and accepting of new technology, the results of this survey are expected to be skewed towards a more liberal stance on technology issues.

In order to determine a basis for the experiences of the respondents, several questions were asked regarding vehicle ownership. Of the respondents, 40% are vehicle owners. Out of these 40%, only 11% had purchased the vehicles in a ‘new’ condition. Notably, the respondents are extremely limited in their hands-on car buying experience, especially of new vehicles. This will make the results of the survey slightly more valuable, as one would expect an unknown system to operate to their current expectations. The ‘it can’t be done’ mentality is less likely to be present.

Previous experiences aside, the desires of the respondents were clearly captured. Of current vehicle owners, 50% would be interested in purchasing their next vehicle new. In Figure 4 below, a histogram displays the price range the perspective owners believe they would fall into.

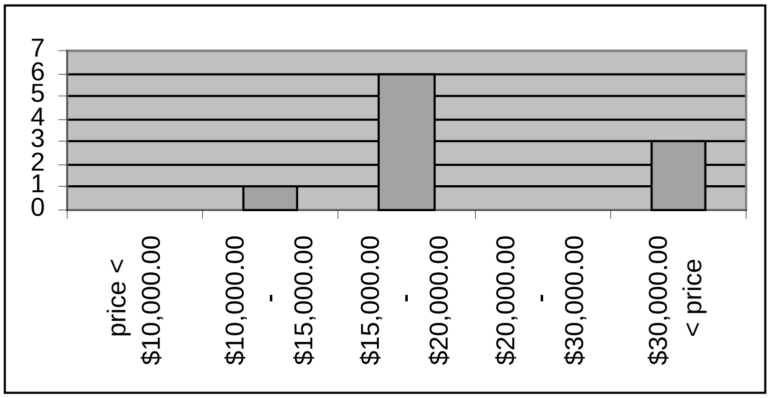

Figure 4. Histogram of Believed Price Range

Although not enough data points are available to compute worthwhile statistics, clearly there is a strong interest in the $15,000.00 - $20,000.00 price range and the greater than $30,000.00 price range. It will be expected that these price ranges will correspond to the expectations of included features.

Of all the respondents, 59% have used the Internet to research vehicles. Also, 47% have gone through a “build your own” process on an automobile manufacturer’s web page. This indicates that of the group studied, between 47% and 59% would be interested in participating in collaborative customization via a web site. Later in the survey, the questions were asked, “Would you be willing to purchase a new vehicle from a web site?” and “Would you be willing to custom configure a new vehicle online and purchase the vehicle from a web site?” The ‘yes’ responses were 70% and 65% respectively. Notably, the amount of respondents who are believed to be potential Internet collaborative customization customers has gone up. This leads to the conclusion that advertising and promotion of future web site customization strategies for automobiles would only need to be focused on a specific 10-15% of the population. The lower 47-59% of the population is already receptive, and the upper 30-35% of the population would be a harder sell. Clearly, this indicates a worthwhile market segment that is attainable.

Respondents were also asked on what features they wish to customize. Below is a table tabulating their responses.

Table 5. Customization wishes of respondents

	Yes, regardless of price	If the price is right	Not interested
Safety Features (Airbags, Restraints, OnStar, etc)	59%	18%	23%
Performance Features (Shocks, Engines, Turbocharger, etc)	34%	57%	9%
Interior Design (Type of seats, color schemes, etc.)	11%	66%	23%
Personalization (paint customization ….use your imagination)	23%	43%	34%

Other interesting results from the study included a survey on what features the respondents consider delighters, satisfiers, and dissatisfiers. Below is a list of the answers that were deemed by the study leaders to be unexpected from the respondents:

- 18% of people expect flexible fuel capacity to be standard on a new vehicle
- 18% expect OnStar to be standard
- 52% expect the freedom to choose a color as optional
- 34% expect the freedom to choose transmission as optional
- 70% expect to see dual climate control on their vehicle, yet only 30% are in proper price range for this feature.
- 77% expect tire pressure monitor to be a present system in the car, yet only 30% are in the proper price range.
- 93% expect v8 as an option, only 30% are in the proper price range.

The primary conclusion to draw from the above list is that there are enough differences, such as wanting a feature not in a given price range, that warrant customization in automobiles.

9. Dealers

Car dealerships are the biggest obstacle when it comes to direct customized sales over the Internet. Sales and Internet managers from six different dealers were interviewed to gain insight into how the dealers go about sales and customization, how dealers utilize the web, and to learn their opinions on the issue of direct Internet sales. Recall that dealers have been, not a part of the car sales game, but essentially the only part of the sales game since cars were first mass-produced.

9.1. How Dealers Sell and Customize Vehicles

The dealerships interviewed ranged from those carrying a single line like Saturn or a single make like Honda, to those carrying numerous makes and models like Rider Auto, which carries, among others, Chrysler, Mazda, and Cadillac. For this reason, the dealers, while similar in many aspects, were very different in other aspects. The dealers were in general agreement that it was rare to have a person who wanted to customize their car exactly, and nearly all sales came off of the dealer lot with standard options packages. Most everyone is willing to compromise if necessary and buy a standard package. Glenn Black of Stocker Chevrolet claims that 99% of the sales come right off of the lot. The standard packages, according to Jason Dix of Dix Honda, allow manufacturers to save money by sort of mass-producing a set of vehicles with the same options. It could further be stated that these packages allow some degree of customization while still maintaining economies of scale. Some car models, such as Saturn and Honda, offer very few options on a particular model. The customer is forced to choose from one of the options packages, and if one option such as leather interior or a more powerful engine is desired, then the customer is forced to buy a higher priced package or model rather than simply paying to add on that single option. Thus, while providing some type of customization, options packages also limit the degree of customization.

If some of the options and styling features could be delayed to the dealerships, much more automobile customization would be possible, but many practical reasons, including the non-modularity of such features, prevent this from happening to a great extent. Some options are available as dealer add-ons, but they are usually non-integral parts like floor mats, mudguards, and fog lights in the case of Honda. According to Steven Temple of Saturn, dealerships do not add too many dealer add-ons because anything done by the manufacturer is far superior. Another limitation with add-ons pointed out by Glenn Black of Stocker is that add-ons, which alter the standard features of a car, may violate the manufacturer’s warranty. Hence, for more delayed customization to take place, dealers and manufacturers would have to work together to create more dealer add-ons.

Several dealers indicated strongly that exterior color was the most common customized feature, and according to Jan Albert of Rider Auto, it is not uncommon for people to be unwilling to compromise to get a desired color. Other options that dealers pointed out as commonly customized features are the transmission (standard/auto), AC, anti-lock breaks/traction control, and air bags. John Leitzinger of Leitzinger imports adds that people tend to be much more specific about customization when it comes to an expensive car like a Mercedes than with a cheaper car like a Nissan; consequently, these expensive cars generally have more options available for customization.

Dealerships must try to predict which models will sell the best when ordering the automobiles from the manufacturer for their inventory. All dealers generally order cars based on (1) past performance (2) special offers by the manufacturers (rebates, incentives), and (3) making educated guesses as to what will be a "hot" new car. Not choosing the right cars will obviously cost the dealer sales, and choosing the wrong car may cause the dealer to get stuck with a car they cannot sell. When customers want a specific model that is not on the dealer's lot, the dealers will try to locate it at another dealer. All dealers interviewed said that they regularly participate in dealer trades, where they swap cars with another dealer to get a car the customer wants. Most dealerships have networks of other dealers that they are linked with for such trades. If a dealer cannot find a car from another dealer, then most dealerships can order the car directly from the manufacturer if the customer is willing to wait. Lead times required for the dealer to receive a customized order range from 2 to 3 months at Leitzinger Imports to as short as 3 weeks at Saturn (Figure 5). Saturn, with its very limited car line, has the faster order time. In addition, car features can even be altered up to four days just before the car is scheduled to be built. Exceptional cars like Chevy Corvettes and Honda S-2000's or popular new cars like the Chrysler PT Cruiser or the Nissan Xterra may take much longer (over a year wait for a PT Cruiser according to Rider Auto).

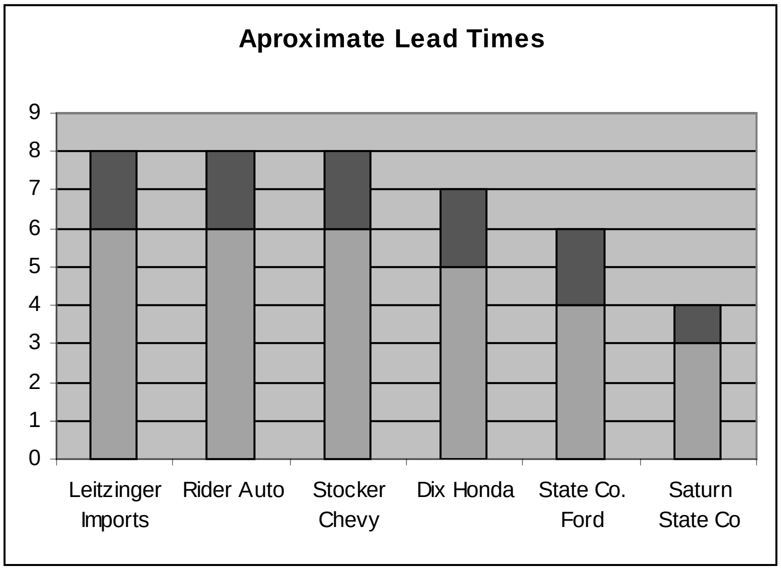

Figure 5. Time range in weeks from order to delivery

9.2. How Dealers Are Using the Internet

Auto Dealerships, like auto manufacturers and Internet auto sales companies, are developing their own websites. Figure 6 shows the results of a study of eight State College-area websites. All dealers that we visited had their own unique website or a site they shared with only a few other dealers. According to NADA (the National Automobile Dealers Association), 92% of new-car dealers have websites, and 40% have relationships with third party lead providers (McLean 2000). Ford and GM are developing direct selling websites along with their dealers. Dealers whom were interviewed said that they focus their websites more toward used car sales because new car information is extensively available at manufacturers' websites. Pictures of used cars along with descriptions are available at most sites, while only some sites offer this information for new car inventory.

All of the interviewed dealers, except Saturn, are contacted directly by the manufacturers or the manufacturers' websites with specific customer requests. Some of the dealers, including Rider and Stocker, utilize third-party lead providers like Autobytel.com. Most of the websites seemed to be relatively small operations, but Glenn Black of Stocker says that 18% of their total sales begin on the Internet. Notice that these sales begin on the Internet, and currently the dealers contact the customers who made the online inquiries and try to set up an appointment for them to come in to meet a salesperson. The most common use of auto websites is not for buying cars but to spec out a car and determine its price. Dealers' estimates of the number of people who did Internet research before buying ranged from 5 – 90%. According to Forrester Research, over 31% who buy cars do online research (McLean 2000). Because of pricing information now available to consumers via the internet, the difference between the price paid by the most- informed and least-informed consumers has been cut in half from 10 to 5% (McLean 2000).

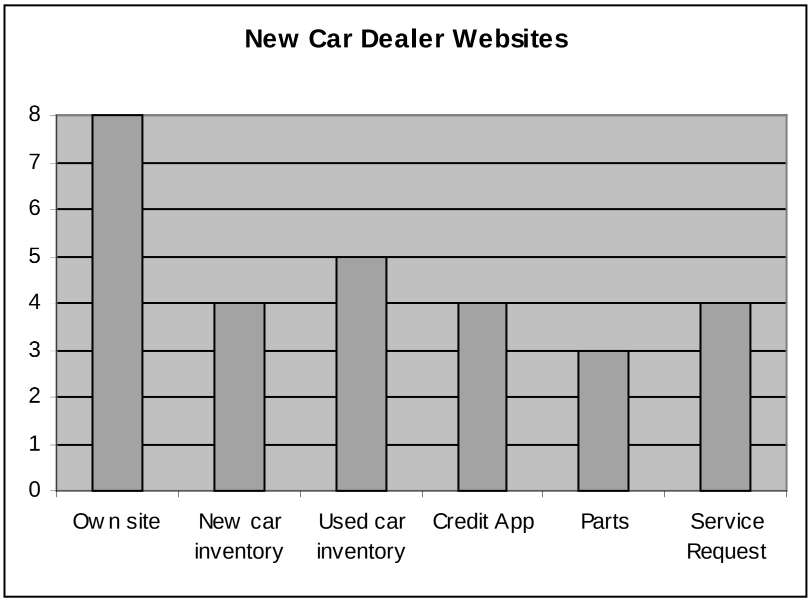

Figure 6. Study of 8 new car websites

9.3. Dealer Opinions on Internet Sales and Obstacles

All the dealers that were interviewed felt strongly that the dealer could never be taken out of the car buying equation and provided strong reasons to support their opinions. Dealers gave a variety of reasons for their opinions about direct selling, but the main reasons they gave were the need to see and feel a car before buying, the need to have a real person to deal with and to come back to, and the need for manufacturers to maintain the relationships with their dealers. The dealers felt that people would not be satisfied with simply seeing a car on the screen, that this doesn't allow you to fully experience the car before buying it. Steven Temple of Saturn emphatically said "How are you going to test drive one over the Internet, how are you going to feel the leather, how are you going to smell the new car?" A critical aspect of experiencing the car that would be missed over the Internet is the test drive. According to the dealers, nearly everyone test drives a car before buying and the test drive is part of the normal buying process. Glenn Black of Stocker said that about 75% of people test drive but a strong 25% do not. Also deemed very important by the dealers was the need to deal with real people and a real location rather than just a computer. A real person is necessary in order to effectively sell the car, and a dealer location is necessary for warranty work and to have the security of a place to go back to if something goes wrong. Glenn Black stated, “price and the vehicle are 45% of the deal, the other 55% is the relationship between the sales person and the customer, that’s what sells the car.” All dealers mentioned the necessity of having a dealership to perform warranty work, which some felt could not be done adequately outside of the dealership. Additionally, purchasing a new car is not like many other purchases because of the price and importance of the product; hence, dealing with a real person is necessary for many people to feel comfortable and secure with their purchase.

Finally, dealers felt that manufacturers would not want to circumvent dealers because of how this would affect the manufacturer/dealer relationship. Steven Temple felt direct selling would put the Saturn Company in competition with itself, and Jan Albert of Rider Auto exclaimed “the last thing you want to do is anger the people who are trying to sell the cars for you.” Other reasons dealers gave for the necessity of dealerships included financing, final inspection of vehicles, and state required issues such as state inspection and vehicle registration. According to Jason Dix of Dix Honda, the “little things” that dealers do may not seem like that much individually, but taken together they represent significant tasks that would have to be accounted for some how in direct selling.

9.4. Why It Is Hard to Circumvent the Dealers

The majority of the reasons given by the dealers as to why the dealerships were necessary focused mainly on what they saw as reasons why customers would need and prefer a dealership versus direct Internet purchasing. To some extent, the dealers are probably right about why many customers would prefer a dealership, but many factors beyond this are working to preserve the dealers and make circumventing dealers difficult or impossible. For one reason, selling automobiles is simply a complicated and involved business with deep roots. Dealers are involved not just in the sale of new cars, they also sell used cars (and accept trade-ins), they finance, they insure cars, they perform warranty repair, and they provide parts and service. These various operations of the dealers are also woven together, which makes doing just part of what the dealers do (like new car sales) more difficult (McLean 2000). An example is a company trying to sell new cars without offering warranty service or without offering financing; the lack of these services may cost the company enough customers that it cannot stay in business. The CEO of Autobytel.com, Mark Lorimer summarizes the auto industry by saying "The car business is so vast, so well defended, and so heavily regulated. If you don't know it, you'll lose a pile of money. Even if you do know it, you're likely to lose a pile of money." (McLean 2000).

In addition to the complexity of the auto retail business itself, there are other factors that seem to protect dealers on all fronts. When it comes to online sellers, they are unable to get franchises from the manufacturers, so they are forced to work through dealers. Thus, instead of hurting dealers, these online sellers, or more appropriately online matching services, actually provide dealerships with customers. Dealer consolidators (like AutoNation) have been limited by franchise laws. Dealers provide about 20% of state sales tax revenues (McLean 2000). For this reason, dealers have a lot of power in the political arena. Franchise laws get rid of any benefit of volume buying because regardless of how many cars a dealer purchases, all dealers must be charged the same price, and thus the dealer consolidators do not receive volume discounts. (Dealer consolidators have a host of other problems as well including the difficulty of advertising on a local scale over a wide area.) Laws also protect dealers from their own manufacturers—at least 42 states prevent manufacturers from competing with their dealers (McLean 2000). The Big 3 manufacturers, instead, are establishing direct sales websites in coordination with their dealers, which in turn, actually help the dealers.

10. Conclusions

In conclusion, auto companies have realized the importance of using the Internet as a viable avenue for selling their vehicles to consumers. Internet-based customization is on the rise, and manufacturers are looking at ways to sell directly to the customer. Manufacturers have websites that allow a large degree of customization but the actual selling of customized vehicles is currently limited by a several factors. State laws aimed at protecting dealers are one large obstacle. The customers and manufacturers who demand customized vehicles must find a way to change or get around the laws that prevent direct selling. Dealers also prevent direct customized selling of vehicles over the Internet because of the services they provide. In order for this to change, the many facets that dealers provide to customers beyond new car sales, including accepting trade-ins and performing warranty work, must somehow be accounted for. A number of obstacles also exist that prevent more rapid and more customized manufacturing of automobiles.

Most of the Third-party websites offer limited customization capabilities, compared to the automakers' websites. Meanwhile, they have some advantages over the manufacturers' sites such as a wider number of car models from different makes, and the variety of services offered (which could be viewed as additional customization options). Finally, it appears that the system used by these websites to connect dealers with customers has served as a reference model for the automakers to start implementing the direct sale of cars via the Internet.

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APPENDIX

Appendix A. Vehicle Website Analysis

Table A1. Options Available for Small Cars

			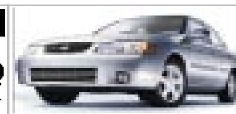	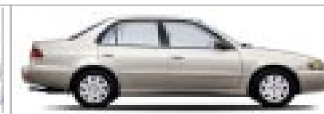
	www.chevrolet.com	www.honda2001.com	www.nissandriven.com	www.toyota.com
	Cavalier 4 Dr Sedan	Civic DX	Sentra GXE	Corolla S
Base Price	$13,360	$12,960	$13,499	$12,793
4-Speed Auto	$780	$800	$800	$815
Cargo Net	Equip Group $413	N/A	N/A	$45
Floor Mats		$49 front/$59 rear/$89 both	$79	$76
Visor Mirrors		Standard	Luxury Pack $649	Standard
Color-Keyed Body-Side Moldings		N/A	N/A	Standard
Front Mudguards/Splashguards		$89	$79	$70
Mechanical Trunk Release			Convenience Pack $150	
Intermittent Windshield Wipers		Standard	Standard	Standard
AM/FM Cassette Stereo		$219	N/A	$210
AM/FM Stereo w/CD		$349		$310
Touring Tires	Standard	N/A		N/A
15" Wheels	Standard	see other wheel types		see other wheel types
Premium Front Speakers	$165	N/A		N/A
Keyless Remote Entry	$410	$169		N/A
Power Locks		Standard	Standard	
Security System		$338	$299 W/Immobilizer	$439
Ashtray and Lighter	$15	$69	Standard	N/A
Natural Gas Engine w/Auto Trans	$5,935	N/A	N/A	N/A
60/40 Fold Down Seat	N/A	Standard		N/A
Rear Auxilliary Power Outlet	N/A	N/A		N/A
Valet Key	N/A	N/A		N/A
Side Impact Airbags	N/A	$250	$699	$250
Vehicle Immobilizer	N/A	Standard	$299 W/Security Sys	N/A
Sunglasses Holder	N/A	N/A		Standard
Map Lights	N/A	N/A		Standard
In-Dash 6 cd Changer	N/A	$628	$399	$589
6-Disc Autochanger	N/A	$528	N/A	$550
Rear Spoiler	N/A	$499	$339	$499
In-Cabin Microfilter	N/A	N/A	$39	N/A
Air Conditioning	Standard	$1,099	Standard	Value Pack 1($1095) & 2($1235)
Cruise Control	Standard	Standard	Standard	Convenience Pack $430
Tilt Wheel	Standard	Standard	Standard	
Moonroof	N/A	N/A	N/A	$735
Heavy Duty Rear Window Defogger	N/A	N/A	N/A	$205
ABS	Standard	Standard	Standard	$550
Wheel Locks	N/A	$49	N/A	$52
Alloy Wheels	N/A	$876	N/A	$499
Moonroof Wind Deflector	N/A	N/A	N/A	$59
Gold Package	N/A	N/A	N/A	$179
Nose Mask	N/A	$139 full/$69 half	N/A	N/A
Fog Lights	N/A	$289	N/A	N/A
Leather Steering Wheel	N/A	$59	N/A	N/A
Wood/Metal/Carbon Fiber Trim	N/A	$129	N/A	N/A
Wood/Metal/Carbon Fiber Console	N/A	$99	N/A	$75
Trunk Tray	N/A	$99	N/A	N/A
Trunk Apron	N/A	$39	N/A	N/A

TABLE A2. Page Details on Customization Process of High-End SUVs

					
FACTORS:	Lincoln Navigator	Land Rover Range Rover 4.6 HSE	Lexus LX 470	BMW X5 4.4i	Mercedes-Benz ML55 AMG
Customizable web page	YES	YES	YES	YES	YES
Uses Separate or Normal web page?	SEPARATE	SEPARATE	NORMAL	NORMAL	SEPARATE
Same page customization?	NO	YES	YES	YES	YES
Type of customization?	COLLABORATIVE	COLLABORATIVE	COLLABORATIVE	COLLABORATIVE	COLLABORATIVE
Production method	Factory Only	Factory Only	Factory Only	Factory Only	Factory Only
# of pages	8 (9 if including extra link page)	8	6	5	6
Do you have to register?	NO	NO	NO	NO	NO
Picture Updates on Same Page, Separate page, or none at all	Same page (refresh)	Same page (instant w/ mouse click)	Same page (instant w/ mouse scroll)	Same page (refresh)	Same page (refresh)
MSRP Price (or Price Range)	$44,730 - $48,480	$62,665 - $68,665	$62,400	$50,045	$66,545
Purchasing methods	Dealer Only	Dealer Only	Dealer Only	Dealer Only	Dealer Only
Nearest Dealer Located Automatically?	YES	NO	YES	NO	NO
Is Dealer Contact Info Displayed On-screen Automatically?	YES - web-site, email link, and local address/phone#/fax#	NO	YES - web-site, email link, and local address/phone#	NO	NO
Is it possible to select/find another dealer?	YES	YES - via hyperlink	YES	NO	YES - via hyperlink
Driving instructions to dealer option given?	YES	NO	NO	NO	NO
Is Dealer Location Map option available?	YES	NO	YES	NO	NO

Table A3. Extra Website Features and Minor Drawbacks for High-End SUVs

					
EXTRA FEATURES:	Lincoln Navigator	Land Rover Range Rover 4.6 HSE	Lexus LX 470	BMW X5 4.4i	Mercedes-Benz ML55 AMG
	Pages 5-8 are also available from a menu on the left side of the screen	When user starts, they can click on the actual SUV model picture	Left sidebar shows what user selected from previous steps	Continue' is available on each page	Payment Calculator is available via hyperlink from last page
	Next' is at the bottom of each screen to advance to next page	Next step' is at the bottom of each screen to advance to next page or 'Step #' menu is at the top	Lease/Purchase Calculator is available	Calculator automatically comes up under Explore Financing Section	
	Also 'Financing Help' is available from left menu on each page	Spec sheet can scroll automatically if you hold mouse over the up/down arrows			
		User can View and print spec sheet from any page			
		User can calculate payments or view special offers while on-line			
MINOR DRAWBACKS:	800 x 600 resolution is necessary for full screen viewing	800 x 600 resolution is necessary for full screen viewing	On initial page, there is a label under the vehicle, but it does not work properly when clicked (misleading)	800 x 600 resolution is necessary for full screen viewing	800 x 600 resolution is necessary for full screen viewing
	IE Explorer BACK button is disabled	Find a retailer' is a separate hyperlink on last 2 pages only			
		If the user clicks 'Next page' too fast, you get a message indicating that the page can't load, click back			

Table A4. Options Available for High-End SUVs

AVAILABLE OPTIONS/ PACKAGES	Lincoln Navigator	Land Rover Range Rover 4.6 HSE	Lexus LX 470	BMW X5 4.4i	Mercedes-Benz ML55 AMG
	STANDARD PACKAGES	**PACKAGES & OPTIONS:**	**PACKAGES:**	**OPTIONS:**	**ACCESSORY OPTIONS: (16 of 31)**
	Rear Entertainment System $ 1280.00	Woo//Leather Steering Wheel (MSRP $400)	Mark Levinson Audio ($1,280)	Premium anti-theft sound system ($1,200)	Motorola TIMEPORT phone and installlation kit (($1295)
	Includes 6.8" Retractable Overhead Color LCD, VHS VCR, Wireless Headphones (2)	Color Keyed Carpet and Seat Piping with Lightstone Interior (MSRP $750)	**Navigation System / Mark Levinson Audio package ($4,280)	Heated steering wheel ($150)	Rear-Seat Video Entertainment System ($2250)
				AM/FM/CD player in-dash ($200)	6-Disc CD Changer $765)
	SOME ADDITIONAL PACKAGES		**Navigation System includes Compass, Inside Electrochromic Rear View Mirror, 6-Disc Center Console-Mounted Dvd/CD Auto Changer with Mark Levinson Audio	BMW On-board Navigation System ($1,990)	Walnut & Leather Steering Wheel ($989)
	17x7.5" Chrome Aluminum Wheels $ 595.00			Multi Information Display ($300)	Sheepskin Frons Seat Covers ($550)
	Climate Controlled Front Seats, Driver and Passenger $ 595.00		**ACCESSORY OPTIONS:**	Xenon headlights ($500)	Illuminated Door Sills ($468)
	Alpine Audio System/Cassette $ 580.00		Cargo Mat ($76)	Lumbar support ($400)	Side Cargo Net ($22.75)
	Premium 6-Disc CD Changer $ 595.00		Rear Wind Deflector ($306)	Sport front seats ($0)	ML55 Trailer Hitch Kit ($372)
			Towing Receiving Hitch ($399)	Park Distance Control ($350)	Basic Carrier - Roof Mounted ($268)
	Options		Roof Rack ($603)	Automatic dimming inside and outside rear-view	Ski Carrier - Roof Mounted ($58)
	Moonroof, Power $1,495.00		Cargo Net ($39)	Power glass moonroof ($1,050)	Snowboard Rack - Roof Mounted ($125)
	Navigation System $1,995.00		Space Tire Lock ($51)	Privacy Glass ($275)	Sunroof Wind Deflector ($50)
	Reverse Sensing System $255.00		Wheel Locks ($60)	Retractable cargo floor ($380)	Car Cover ($196)
	Skid Plate Package $115.00			Rear door sun blinds ($180)	6-Spoke Two Piece Style A Wheels ($3,020)

Table A5. Analysis of Third-party Websites

	Third-party websites analysis				
	Carsdirect.com	**Autobytel.com**	**Cars.com**	**Carpoint.com**	**FordDirect.com**
Services offered					
Research of vehicles	Y	Y	Y	Y	Y
# of make options	37	37	62	45	-
Research by car categories	Y	Y	Y	Y	Y
Most popular vehicles	N	Y	N	Y	N
Insurance	N	Y	Y	Y	N
Financing options	Y	Y	Y	Y	Y
Service / Maintenance	N	Y	N	Y	N
Online Reviews	Y	Y	Y	Y	N
Classifieds	N	Y	Y	Y	N
Payment by internet	Y[1]	N	N	N	N
Price comparison (invoice/retail)	Y	not if configuring to actually buy	Y	Y	N
Price warranty	Y	N	N	N	N
Product comparison	Y	Y	Y	Y	N
Live chat customer service	Y	N	N	N	N
Ph customer service	Y	Y	N	Y	Y
Registration	Optional	Optional	N	Optional	Optional
Is customization available?	Y	Y	Y	Y	Y
# of clicks before start customizing	3	5	4	4	2
# of pages with custom options	2 + 1 for services	1	1	5	4
Options per web-page	15-5	30 (checkboxes)	12	5	2 to 8
Visual display & freq of update	N	N	N	N	Y (color)
Pricing & freq of updates	Y - immediate	until end if configuring to buy	Y	Y	Y - immediate
Purchasing process	thru dealer	thru dealer	thru dealer	thru dealer	thru dealer
Estimated delivery time	N/A	N/A	N/A	N/A	N/A
Save car configuration	Y	Y	N	N	Y

1. The customer can make a deposit to cover file expenses, which gives him a warranty on the price he will pay

Appendix B. Customer Survey

1. Do you currently own a vehicle? (Yes/No)

2. If you answered No to Question 1, please skip this question and proceed to Question 8. In what condition was your vehicle when purchased? (New/Used)

3. If you needed to purchase a vehicle in the near future, in what condition would it be?
(New/Used)

4. If you answered New to Question 3, what would be its price range?
price < $10,000.00
$10,000.00 - $15,000.00
$15,000.00 - $20,000.00
$20,000.00 - $30,000.00
$30,000.00 < price

5. How did you purchase your vehicle?
Retail Dealer
Online Dealer
Other (private sale, etc.)

6. Did you get all the features you wanted? (Yes/ No)

7. If you answered No to Question 6, why not?
Dealer did not carry a vehicle with those features in stock
Features too expensive
Other (used vehicle, etc.)

8. Have you used the Internet to configure a customized vehicle? (commonly referred to as build-your-own)? (Yes/ No)

9. Have you used the Internet for researching vehicles? (Yes/ No)

10. How old are you?
Younger than 18
18-22
23-25
26-35
36-55
Older than 55

11. What is your sex? (Male/Female)

12. What will be your educational level in Fall 2001
Some High School
High School Graduate
Some College

College Graduate
Masters/PhD Student
Masters/PhD Graduate

14. What is (was) your major in college?

15. Do you expect the following features to be standard in a new vehicle? Please check as many boxes as apply.
Choice of Number of Doors
Flexible Fuel Capability
Airbag
3 Year Warranty
Adjustable Seats
OnStar
V6
Color Choice
Leather
Transmission Choice (manual vs. automatic)
Dual Automatic Climate Control
Air Conditioning
Radio w/ cassette
Radio w/ CD
Tire Inflation Monitor
Sunroof
V8

16. Do you expect the following features to be optional in a new vehicle? Please check as many boxes as apply.
Choice of Number of Doors
Flexible Fuel Capability
Airbag
3 Year Warranty
Adjustable Seats
OnStar
V6
Color Choice
Leather
Transmission Choice (manual vs. automatic)
Dual Automatic Climate Control
Air Conditioning
Radio w/ cassette
Radio w/ CD
Tire Inflation Monitor
Sunroof
V8

17. Which features would you be interested in customizing? Note: Customization will incur a fixed cost (per category) plus an amount proportional to the value of the necessary components and labor. What features would you customize at any cost?
Safety Features (Airbags, Restraints, OnStar, etc)
Performance Features (Shocks, Engines, Turbocharger, etc)
Interior Design (Type of Seats, Color Schemes, etc)

Personalization (Paint Customization ...use your imagination)
Meters (Tire Inflation Gauge, Oil Temp, Fuel Economy, etc)

18. Which features would you be interested in customizing? Note: Customization will incur a fixed cost (per category) plus an amount proportional to the value of the necessary components and labor. What features would you customize 'at the right price'?
Safety Features (Airbags, Restraints, OnStar, etc)
Performance Features (Shocks, Engines, Turbocharger, etc)
Interior Design (Type of Seats, Color Schemes, etc.)
Personalization (Paint Customization ...use your imagination)
Meters (Tire Inflation Gauge, Oil Temp, Fuel Economy, etc)

19. How long would you be willing to wait for delivery of your customized vehicle?
Not willing to wait
Up to 1 week
1-2 weeks
2-4 weeks
Longer than 4 weeks

20. Would you be willing to purchase a new vehicle from a web site? (☐ Yes/☐ No)

21. Would you be willing to custom configure a new vehicle and purchase the vehicle from a web site? (☐ Yes/☐ No)