MyCar

Project „Flexible Assembly Processes for the Car of the Third Millennium (MyCar)"

Methodology Description (High Level)

Buyer Behaviour Modeling Tool

CASP

Methodology Description

a method of evaluating the <u>probability</u> that a customer, under a certain <u>delivery time</u> and <u>price</u> and given a set of factors, <u>submits an order</u> for a product

Basic math

- ## Law of total Probabilities
  - the probability of an incident A_1 is the sum of the probability of every incident B_n, multiplied with the probability of the incident A given the B_n
  - $P(A_1) = [P(A_1|B_1)*P(B_1)] + [P(A_1|B_2)*P(B_2)] +.....+[P(A_1|B_n)*P(B_n)]$

- ## Bayes' theorem
  - $P(A|B) = [P(B|A)*P(A)] / P(B)$

(Everitt 2006, Schay 2007).

Basic model

- Two factors identified to be having an impact on the probability of sale is the <u>vehicle's driving quality</u> and the <u>Price competition</u>.

ProbabilityOfSale

High	33.0
Medium	34.0
Low	33.0

GoodDrive

Excellent	33.3
Moderate	33.3
Adequate	33.3

CompetitivePrice

Competitive	33.3
Average	33.3
Expensive	33.3

GoodDrive	CompetitivePrice	High	Medium	Low
Excellent	Competitive			
Excellent	Average			
Excellent	Expensive			
Moderate	Competitive			
Moderate	Average			
Moderate	Expensive			
Adequate	Competitive			
Adequate	Average			
Adequate	Expensive			

Bayesian model-2 factors

Conditional probabilities table
2 factors

3

LMS

Data entry reduction – Reverse model

- The model suggests using the *Bayes theorem*. For calculating the Probability of sale based on a set of factors

- For the case of the *GoodDrive* node, the likelihood that a state of the *ProbabilityofSale* node will occur will be calculated
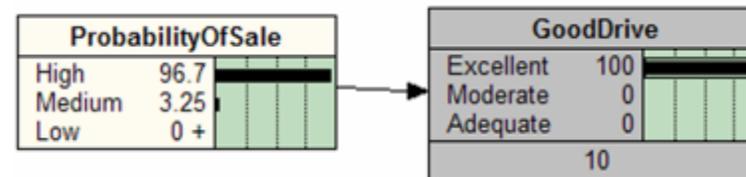
(Makris, Chryssolouris, 2010).

Factors modeled

- 19 factors have been modeled

- Each factor has potential states.

- E.g. GoodDrive can be:
  - Excellent
  - Moderate
  - Adequate

(Makris, Chryssolouris, 2010).

Factor	Potential states		
FleetMember	*Closed Fleet scheme*	*Limited choice*	*No Fleet/open choice*
PossessBrandLoyaltyVoucher	*Employee Scheme*	*Other discount*	*No discount*
HasOtherBrandedVehicle	*No other brand*	*1 other brand*	*All Other Brands*
SatisfactionLevelFromPast	*Very high satisfaction*	*Medium satisfaction*	*Ambivalent*
OtherBrandsFromPast	*No other brand*	*1 other brand*	*All Other Brands*
UniqueSegment	*Unique*	*Low choice*	*Highly populated segment*
LookingAlternativeBrands	*Not looking*	*May look/not known*	*Definitely looking*
ManyOptionPacks	*Many*	*Few*	*None*
ManyIndividualOptions	*Many*	*Few*	*None*
PersonalizationFeatures	*Many*	*Few*	*None*
EarlyInLifecycle	*Just launched*	*Up to 12 months*	*Over 12 months*
NeedTheVehicleEarly	*No requirements*	*Insignificant requirements*	*Specific requirements*
ComplyToTimeRequirements	*Comply*	*Partially*	*Not Complying*
LinkToFleetScheme	*No choice*	*Low choice*	*High choice*
CompetitivePrice	*Competitive*	*Average*	*Expensive*
GoodDrive	*Excellent*	*Moderate*	*Adequate*
GoodStyle	*Excellent*	*Moderate*	*Adequate*
Reliable	*Excellent*	*Moderate*	*Adequate*
Image	*Excellent*	*Moderate*	*Adequate*

Bayesian network model

- All the 19 factors have been modeled in a Bayesian network.
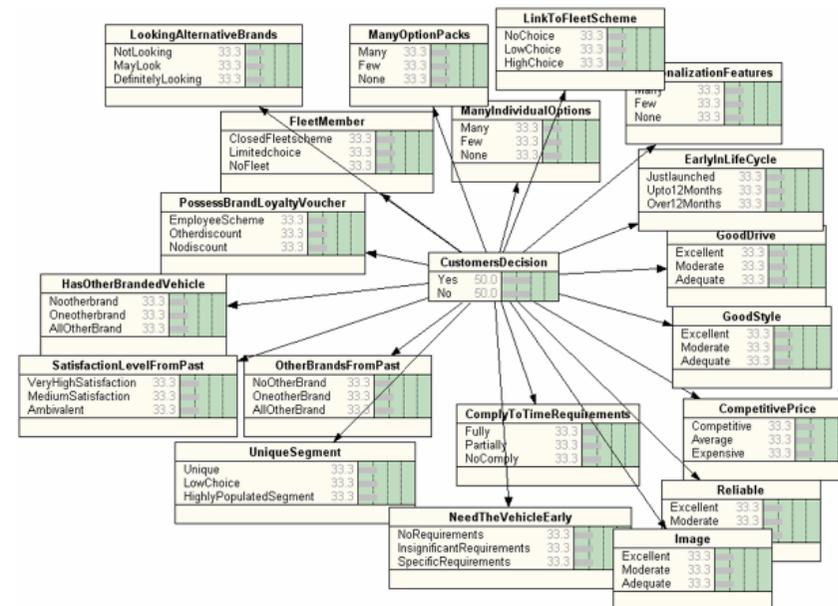
(Makris, Chryssolouris, 2010).

Software tool snapshot

Dealer data entry form   **Web application architecture**
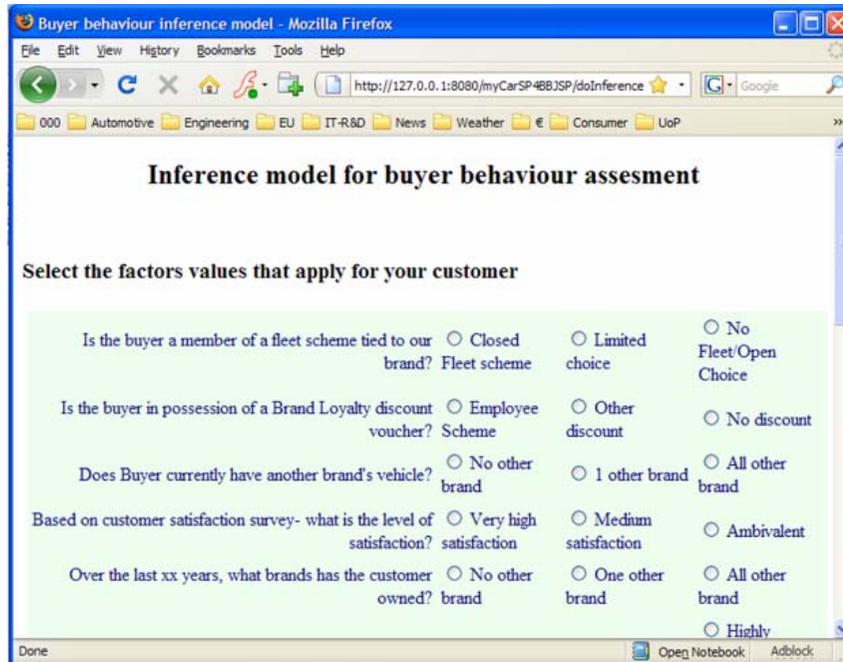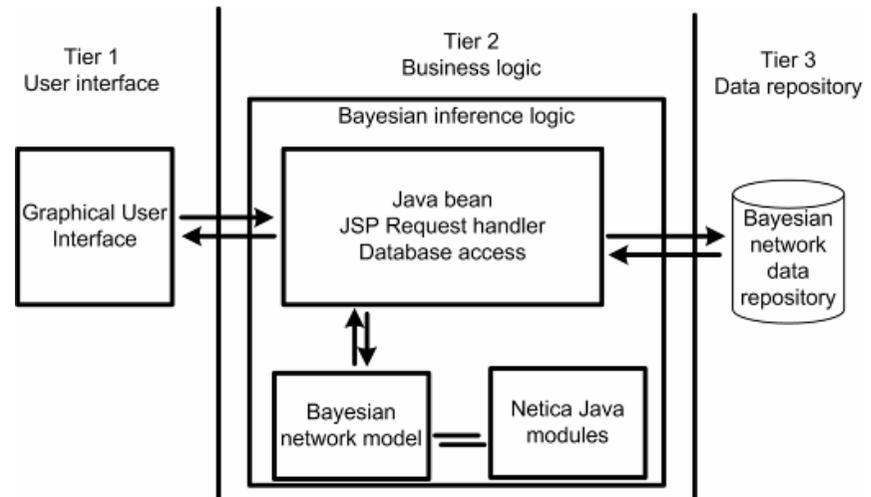
Outcome of the tool

Outcome

According to this evaluation, the customer will most likely place his order, 56,7%, however, there is another 43,3% that he will not be placing his order.

The result of the evaluation is a relative measure and can be used for comparing alternative assessments that are performed for a customer.

Bayesian inference outcome

References

- Everitt, B., S., 2006., The Cambridge dictionary of statistics, 3rd edition, Cambridge University Press.

- Schay, G., 2007. Introduction to probability with statistical applications, Birkhauser Boston.

- S. Makris, G. Chryssolouris, Customer's behavior modeling for manufacturing planning, International Journal of Computer Integrated Manufacturing, Volume 23, Issue 7 July 2010 , pages 619 – 629.