A Pilot Usability Assessment of a Novel AI Platform for Car Price Estimates

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ABSTRACT
The Usable Artificial Intelligence (UAI) paradigm holds the promise of bridging the gap between Human-Computer Interaction (HCI) and Artificial Intelligence (AI) developments. This study contributes to the matter by assessing the usability of a new Romanian AI-based car price estimation platform. A survey tailored to the application was conceptualized using existing literature on technology acceptance/adoption theory and UAI. The survey was completed by 20 potential users after interacting with the platform. Several aspects were assessed: the perceived usefulness, ease of use, enjoyability, accuracy of the estimations, and the intention to use the application in the future. Taking all into consideration, the current work brings forth the following: (1) a new AI-based platform for car price estimation, (2) an assessment of its usability based on a set of survey questions publicly made available in the Romanian language, and (3) a preliminary exploration of the relationship between the measured variables.

Author Keywords
Usability Assessment; Artificial Intelligence; Car Price Prediction;

ACM Classification Keywords
H.5.2: Information interfaces and presentation (e.g., HCI): User Interfaces

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INTRODUCTION

Assessing the usability of Artificial Intelligence (AI) applications plays a crucial role in understanding and enhancing the acceptance and adoption of such technologies. As AI systems continue to permeate various domains, evaluating their effectiveness in meeting users' needs and ease of use becomes increasingly important. However, there is a notable gap between traditional Human-Computer Interaction (HCI) methods primarily designed for non-intelligent systems and the development of AI technologies [1].

To bridge this gap, the emerging paradigm of Usable Artificial Intelligence (UAI) [2] offers a promising approach. The UAI paradigm aims to integrate HCI methods with AI development. Research conducted under the UAI paradigm seeks to enhance the usability of AI technologies. However, the UAI paradigm is still in its infancy and requires further exploration and investigation. Given these considerations, there is a need for studies that employ various methods and instruments to assess the usability of AI applications. This study contributes to the field by assessing the usability of an AI platform designed for car price estimation. The current pilot assessment targets only part of the functionalities envisioned in the final platform designed for automated claims management. The presented functionalities target both regular users inquiring for quotes about their cars and claim inspectors quantifying whether the repair cost exceeds the price of the vehicle.

LITERATURE REVIEW

Technology acceptance and adoption models

Technology acceptance and adoption models are essential in understanding the factors determining the intention to use specific software or hardware products. For example, the Technology Acceptance Model (TAM) examines how a technology's perceived usefulness and ease of use influence the intention to use it [3]. TAM has undergone several iterations, incorporating various variables that impact the perception of usefulness and ease of use [4]. While TAM is a well-established model widely used in technology acceptance research, it may not fully capture the full extent of the factors influencing technology acceptance and adoption [5]. In this sense, other models were developed.

The Value Adoption Model (VAM) illustrates how the intention to use a technological artifact is influenced by its perceived usefulness, enjoyment, technicality, and cost [6]. The Information System Success (IS) model highlights the significance of information quality, system quality, and service quality in shaping the intention to use, user satisfaction with the technology, and the net benefits from using the technology in question [7]. The Unified Theory of Acceptance and Use of Technology (UTAUT) examines how performance expectancy, effort expectancy, social influence, and facilitating conditions collectively influence the intention to use technology [8]. This model also emphasizes the importance of personal characteristics such as age, gender, and experience. In its second version, UTAUT introduced additional variables like hedonic motivation, price value, and habit to comprehensively understand technology acceptance [4].

Useful and usable AI

HCI methods were primarily developed for traditional non-intelligent systems, prompting the need for adaptation to AI-specific contexts [1]. This has given rise to the Usable Artificial Intelligence research perspective, which aims to integrate HCI usability methods with AI systems. Recent developments in the UAI paradigm suggest a series of principles: usefulness, suitability, integrability, and interoperability [2]. Another recent perspective illustrates that, in an industrial context, UAI principles can be encapsulated by three main principles: effectiveness (i.e., generating plausible outputs), efficiency (i.e., achieving computational efficiency), and ease of use (i.e., being easy to operate) [9].

Under the UAI paradigm, various methods can be employed to evaluate AI systems. For example, Wang [10] employed mixed methods to evaluate an AI-based systematic review software. Another study used qualitative methods to evaluate an AI-based application designed to provide diet recommendations [11]. Yet another study employed a quantitative method to evaluate the feasibility and usability of an AI-based application developed for pain detection [12].

METHOD

The platform

The AI platform under examination in the current case study is represented by a webpage where the user can insert details about a car to obtain a price estimation. After accessing the webpage, the user must fill in the following information: the car maker, model, year, type of fuel, cylindric capacity, horsepower, type of traction, type of transmission, and mileage.

The user has the option to insert the car's registration certificate (ro. "talon") - a document containing information about the characteristics of the vehicle - to automatically fill in part of the required information (see Figure 1). The document is then processed via Optical Character Recognition (OCR) technology using Azure Cognitive Services to extract relevant information, namely the car maker, model, year, type of fuel, cylindric capacity, and horsepower. Information that was not available for extraction must be manually inserted by the user.

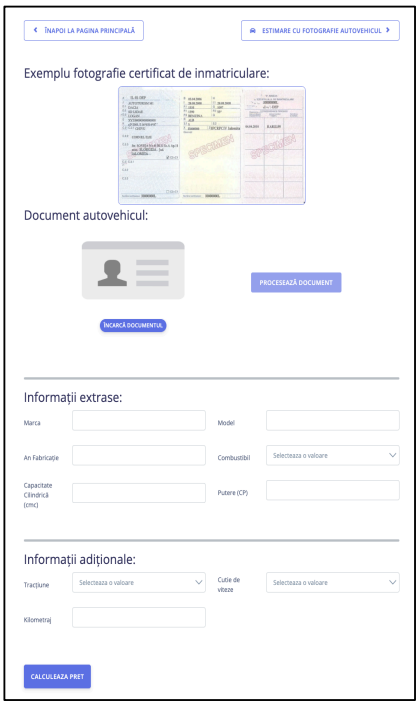

Figure 1. Interface for inputting required information to estimate the price of the car.

Alternatively, the user can select to fill in part of the required information by uploading an image of the car (see Figure 2). The image of the car is processed by two deep-learning models: one for car detection and one for car classification. The car detection architecture is a pretrained YOLOv7 [13] that predicts the bounding boxes of all the cars in the image. Based on the bounding box coordinates, we select the dominant car in the image and forward the crop to the classification model. The classification model is based on the

Swin Transformer architecture [14] and is trained on 200,000 car images from autovit to predict the make, model, and generation from visual data. The second model makes the classification in sequential order: it first obtains the make prediction, which conditions the car model prediction, which in turn conditions the generation prediction. On the test set, we obtained an accuracy of 98.4% for the make, 96.5% for the model, and 89.5% for the specific generation. Following the automated prediction, the user must manually insert information unavailable for extraction.

After the user inserts all the required information and presses the button on the bottom left of the screen, the webpage displays the price estimation in euros, an error interval displayed in +/- Euros, as well as examples of similar cars in the database (see Figure 3). The price estimation is based on an AI model presented in a different paper [15], while the examples of similar cars are identified using a K-nearest neighbor method. Regarding data privacy, no personally identifiable information is stored in the database.

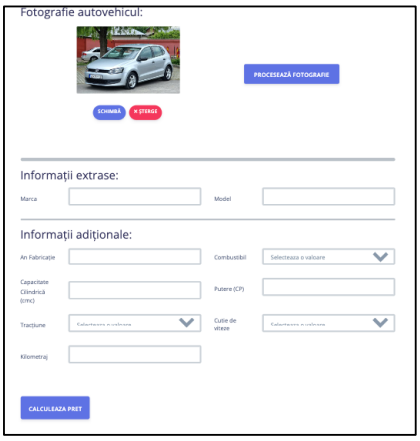

Figure 2. Interface for filling in the required information to estimate the price of the car using a picture of the car to extract relevant information.

The survey

A survey was developed to assess the usability of the presented AI application. The survey included 30 open-ended and close-ended questions inspired by the review of the technology adoption models and the UAI paradigm, of which 11 questions were explored in the current analysis. The survey questions were devised to capture both the interaction of the user with the AI models and the designed interface.

The *(a) first section* of the survey focused on the device used to access the application, the use of the features designed to assist in filling in the information, the number of made estimations, and the intention to use the application in the future (i.e., agreement with the statement: "I want to use the application in the future").

The *(b) second section* was represented by open-ended and close-ended questions. The latter asked the respondents to express their agreement on a 5 points Likert scale with four sentences, namely: "I find the app useful.", "I find the app easy to use.", "I enjoyed using the application.", "The price estimations are pretty accurate." The first three sentences sought to evaluate the user's interaction with the interface, whereas the last sentence focused on the predictions of the AI model.

The *(c) third section* of the survey collected demographic information (i.e., age, sex) and self-assessment information relating to the experience of the respondent with cars (i.e., high, moderate, low, very low expertise).

The survey was distributed toward a convenience sample. The data collection procedure resulted in a sample of 20 respondents, with a mean age of approximately 30 years. 75% of the respondents were male; 30% stated they are highly experienced in cars, 45% declared moderate expertise, while the rest declared low expertise.

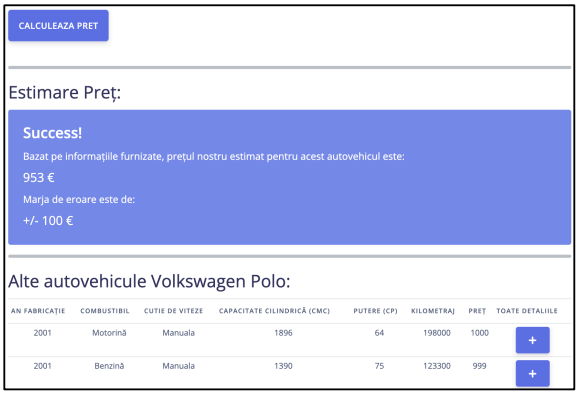

Figure 3. Price estimation, margin of error, and similar cars.

RESULTS

The mean and standard deviation scores on the four main usability dimensions are as follows: usefulness (μ=4.15, σ=1.23), ease of use (μ=4.4, σ=1.14), enjoyability (μ=4.3, σ=1.13), and perceived price estimation accuracy (μ=3.7 σ=1.23). We also explored the relationship between the four variables and the intention to use the application in the future. Figure 4 illustrates significant positive correlations between all the investigated variables.

The respondents considered different versions of using the application. For instance, 45% of the respondents used it on a laptop/computer, 25% on a smartphone/tablet, and the remaining 30% on both. Regarding the type of function used to assist in filling in the required information, 15% used the picture-based functionality, 10% used the car document, 30% used both, and the rest introduced the required information manually. Furthermore, 70% of the respondents used the application to make between 2 and 5 price

estimations, 25% made only one price estimation, while the remaining 5% made more than 10 estimations.

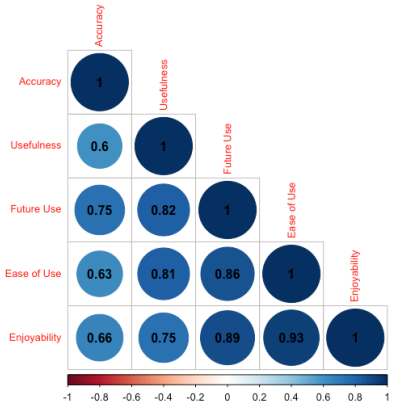

Figure 4. Spearman correlations between usability dimensions (only correlations with p < .05 are displayed).

The positive relationship in Figure 4 between the intention to use the application in the future (i.e., future use) and its current usability (i.e., usefulness, ease of use, enjoyability, accuracy) provides an initial validation of our measurements.

CONCLUSION

The current work introduced a new AI-based platform for car price estimation, a set of survey questions designed to assess its usability, as well as a preliminary analysis of the survey responses obtained from 20 potential users. Our next aims are a) to apply the survey on a larger sample size and b) to analyze the answers to the remaining questions included in the survey which sought to identify specific improvement opportunities of the application and aspects related to the post-hoc explanations included in the interface, namely the margin of error and the list of similar cars displayed after the price estimation.

Moreover, we encourage future usability studies of AI-based applications involving Romanian users to be conducted starting from the survey questions devised in the current work (available at https://forms.gle/gAp4BAzijD4W1sZn6). In return, this would enable further exploration of the role of AI prediction accuracy and explainability on the perceived usability, ease of use, and enjoyability.

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