E-Agri Web Application for Agricultural Development in Sri Lanka

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Abstract:*Sri Lanka has been an agricultural country since the age of kings. As one of the main economic streams in the country,, it brings a massive amount of foreign exchange to strengthen the economy. Rice and organic food consumption have drastically increased due to the population and high demand for fresh and healthy foods. Both fruits and vegetables are cultivated all across the country. Including the highlands of the central province and the in-land areas. The main reason to build an E-commerce platform like this is to address the problem of unnecessary involvement of the middlemen who buy produce from farmers and sell it to customers. They are the ones who control the market price and cause unnecessary price hikes, gaining the highest profit from the business. Because every farmer doesn't have the storage and transport facilities to deliver the product to markets. Farmers can't get the price they deserve and the customers have to pay extra. The solution suggested in this research paper will stifle this problem by keeping a steady market price while farmers can make a better profit from their products. Therefore, they can widespread their sales all over the world. Through this e-commerce platform, farmers can suppress the middlemen's involvement by directly interacting with customers. Nevertheless, with this web application, users will be aware of the agricultural products in the nearest locations. This web application can reduce the wastage of food in transport. Anyone can buy the products they need with great comfort.*

Keywords : *e-commerce, agricultural goods, web application.*

1. Introduction

Currently, most of the farmers in rural areas are going through difficulties in introducing the products to the consumers. For example, when a client requests sure agricultural merchandise from a third party, the 0.33 celebration will then have to contact the cultivators to get the anticipated products, subsequently having a third party consumes greater time than the purchaser contacting the cultivator directly.

This agricultural e-commerce software with the usage of the internet is developed as an answer to the above-mentioned problem. Once the photo is uploaded, the utility has the functionality of figuring out the contents of the picture to understand which product category it belongs to. Shipping the agricultural merchandise will then be in the methods after it is agreed both to pay by using Pay Online or Cash on delivery.

2. Related Work

Impact on Market & Retailers

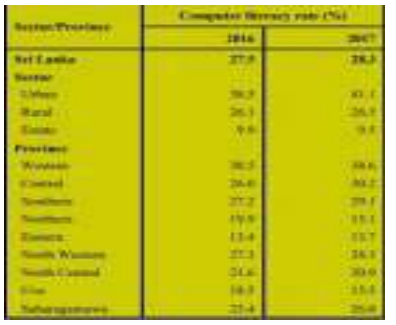
This research focuses on a variety of e-commerce websites. To be precise, this research uses the C2C e-commerce approach for agriculture, to be achieved via existing methodologies in e-commerce. Also, this web application aims at both non-computer literates and computer literates in the field of agriculture. The demands of e-commerce for buying and selling via the Internet are expanding every day with the sophisticated needs of educational, business, and even sociological landscapes.

The existing e-commerce web applications in the world do not provide the functionalities for any non-computer literate users. Almost all e-commerce sites have complicated interfaces and therefore novice users come across a greater probability of being resistant to using such systems.

It is in this light, that the demand has risen for a simple, user-friendly, c2c e-commerce web application to be developed which would have the ability to make it possible to be used by non-computer literates to sell and order via the internet, which will be a great incentive as an outcome morally as well as monitory for the cultivators. Also, consumers can buy fresh products much faster without third-party involvement

- *Computer Literacy and Language Literacy of the people in Sri Lanka*

For e-commerce, computer literacy data can provide immeasurably an understanding of the demand and supply of skills in the global, knowledge-based economy.



According to the Sri Lanka Department of Census and Statistics —Computer Literacy Statistics – 2017 (First Six Months), the results for computer literacy in different age groups, sectors and provinces, language literacy areas as well as occupational groups are given in the tables as shown above.

A person between the ages of 5 and 69 is considered computer literate if he/she can use a computer on his/her own. For example, if a 5-year-old child can play a computer game, he/she can be considered computer literate.

The average rate for computer literacy in the first half of 2017 for Sri Lanka was reported to be 28.3%. The above survey results show an increase of 0.8 percentage points from the first half of 2016 to the first half of 2017. The urban sector shows the highest computer literacy rate of 41.1% among the residential sectors, while the rate for the rural and estate sectors shows computer literacy at 26.5% and 9.5% respectively.

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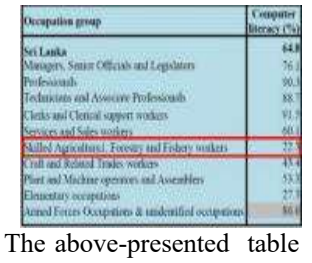
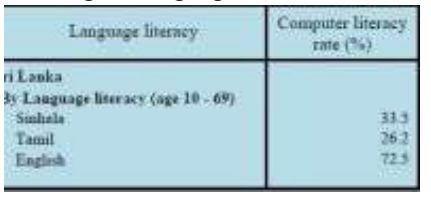
of 2017 for Sri Lanka is 28.3%. The above survey results demonstrate an increase of 0.8 percentage points from the first half of 2016 to the first half of 2017



The above-presented table reveals that computer literacy is higher among those who are also literate in the English language.



According to the survey it has displayed that English literates have a percentage of 72.5 computer literacy than Sinhala and Tamil literates who has computer literacy at 33.5% and 26.5% respectively. The table presented above has discovered that Skilled Agricultural workers as well have the least knowledge in the field of computer literacy, in Sri Lanka.

Image Processing Methodologies in the Industry

In mobile, web and software development images serve for many reasons, including Object recognition, Pattern recognition, identifying duplicates (exact or partial), Image search by fragments, Camera image processing, and Improving mobile apps UX, Augmented reality. Generally, image processing consists of several stages: importing image, analysis, manipulation and image output. There are two methods of image processing: digital and analogue. This article is all about digital image processing and its methodologies. Which means altering digital images with graphical software tools.

As it has just been established, various factors can adversely affect RTR image quality. With the use of image enhancement techniques, the difference in sensitivity between film and RTR can be decreased. Several image processing methods, in addition to enhancement methods, can be applied to improve the usefulness of Data. Methodologies include convolution edge detection, mathematics, filters, trend removal, and image analysis.

D. *Technology adoption and why does it matter?*

Various technologies can be used to implement most of the software and hardware development projects. Some projects are way better implemented with specific technology combinations (Azati, 2017). Technology selection is therefore very critical and plays a key role in software development research.

Especially, concerned about the following factors when making decisions about technologies for the development of the software like fruitfulness, Fault tolerance, Flexibility and reusability, Time and cost efficiency, User-friendliness, Attractiveness of the interfaces, Future maintenance, and Overall performance

3. Materials & Methods

This research deploys a combination of quantitative and qualitative methodologies for gathering and analyzing data. Quantitative methods, the positivist paradigm, emphasize numbers and frequencies rather than meanings and experiences. These methods provide information which is easy to analyze statistically and tend to be more reliable for making visions. In this project, quantitative analysis was done to evaluate metrics such as the time elapsed for new users to join how much data is needed to input to the system to retrieve an output and the time duration taken by the system to recognize an uploaded image. The data collected via the pilot testing done in this regard will be analyzed in the post-research review.

Qualitative methods, the phenomenological paradigm, are ways of collecting data which are concerned with describing meaning, rather than

withdrawing statistical inferences. It provides more in-depth and rich descriptions. Observations and discussions with potential users are the methods that were used in the project to find the issues when registering into the system, the complexity of using the web application, the difficulty in understanding the user interfaces, the language with which the interfaces are displayed in, how the products are being filtered according to the search details which are provided to the system by the user, the ability of the device to successfully access the website and acquiring the output of a certain task. The technology
that will be used in the system will be as Framework: Laravel version 5.5 LTS, Architecture: Model-View-Controller (MVC) architecture, Language: PHP, CSS, JavaScript, HTML, JavaScript, Python, AJAX, Database: MySQL, Software: JetBrains PHP Storm, XAMPP, OpenCV 3.0.1, Method of data analysis: Machine Learning, Method used for Machine Learning: Oriented FAST and rotated BRIEF, Machine Learning framework: Numpy, Payment Gateway: PayHere: PayPal, Working Internet Connection.

Use of Chosen Technologies

Laravel Framework

Laravel is an open-source PHP framework, which is robust and easy to understand. It follows a model-view-controller design pattern. Laravel reuses the existing components of different frameworks which helps in creating a web application. The web application thus designed is more structured and pragmatic.

Model-View-Controller Architecture

The MVC paradigm is a way of breaking an application, or even just a piece of an application's interface, into three parts: the model, the view, and the controller. Model-View-Controller is a really good way to develop clean, scalable, powerful and fast applications in the least amount of time and with the least effort.

MVC architecture with PHP

It's a software architecture built on the idea that the logic of an application should be separated from its presentation. A system developed on the MVC architecture should allow a front-end developer and a back-end developer to work on the same system without interfering with each other.

Model.

Model is the name given to the component that will communicate with the database to manipulate the data. It acts as a bridge between the View component and the Controller component in the overall architecture. It doesn't matter to the Model component what happens to
the data when it is passed to the View or Controller components.

View

The View requests data from the Model component to determine the final output. View interacts with the user, and then transfers the user's reaction to the Controller component to respond accordingly. An example of this is a link generated by the View component when a user clicks and can get triggered in the Controller.

Controller.

The Controller's job is to handle data that the user inputs or submits through the forms, and then the Model updates this accordingly in the database. The Controller is nothing without the user's interactions, which happen through the View component.

PHP

Hypertext Preprocessor is a server-side scripting language designed for web development but also used as a general-purpose programming language.

There are three main areas where PHP scripts are used;

Server-side scripting: The user needs to run the web server, with a connected PHP installation and can access the PHP program output with a web browser, viewing the PHP page through the server. Writing desktop applications: Some advanced PHP features could be used in client-side applications to write such programs. The user also can write cross-platform applications this way.

Python

Python is a high-level, interpreted, interactive and object-oriented scripting language.

Python is interpreted at execution as it does not require the program to be compiled before execution. Python is interactive and allows the interpreter directly to write any program.

Python is Object-Oriented and encapsulates code within objects.

AJAX

AJAX stands for Asynchronous JavaScript and XML. AJAX is a new technique for creating better, faster, and more interactive web applications with the help of XML, HTML, CSS, and JavaScript.Ajax uses XHTML for content, CSS for presentation, along with Document Object Model and JavaScript for dynamic content display.

Conventional web applications transmit information to and from the server using synchronous requests. With AJAX, when you hit submit, JavaScript will make a request to the server, interpret the results, and update the current screen. In the purest sense, the user would never know that anything was even transmitted to the server.

MySQL

MySQL is an open-source relational database management system (RDBMS). MySQL uses Structured Query Language (SQL). SQL is the most popular language for adding, accessing and managing content in a database. It is most noted for its quick processing, proven reliability, ease and flexibility of use. MySQL is a mandatory part of almost every open-source PHP application.

JetBrains PhpStorm is a commercial, cross-platform IDE for PHP built on JetBrains' IntelliJ IDEA platform. PhpStorm provides an editor for PHP, HTML and JavaScript with on-the-fly code analysis, error prevention and automated refactorings for PHP and JavaScript code. It includes a full-fledged SQL editor with editable query results.

JetBrains PHP Storm

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OpenCV.

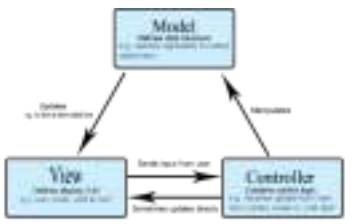
OpenCV is a cross-platform library using which we can develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection.

Computer Vision Vs Image Processing

Image processing deals with image-to-image transformation. Both input and output of image processing are images. Computer vision is the construction of specific, meaningful descriptions of physical objects from their image. The output of computer vision is a description or an interpretation of structures in 3D.

Machine Learning with python

Python has libraries that enable developers to optimize various algorithms and use them. It implements popular machine learning methodologies such as recommendation, classification, and clustering. Therefore, it is necessary to have a brief introduction to machine learning before we move further. To achieve the successful conclusion of development with a fully functioning outcome, a proper design is a must, as the design sets the foundation for the project and would determine if the project will achieve its final goals. Not having the design in place would mean that the scholar would have to face many unexpected and unsolved challenges during the execution of the research. This is both cumbersome and time-consuming. and will result in the scholar not being able to complete the project in time. Hence all design aspects of the project should be thought of in detail before the implementation can begin. The following illustrates a diagram of the overall architecture of the system application. To build the e-commerce website, the architectural structure uses an MVC architecture consisting of N layers, such as the model, view, controller and user. The figure also illustrates which layers will normally be categorized by the 3-tier architecture consisting of the layers which are known as the presentation layer, business layer and data layer. The purpose of the MVC pattern is to separate the model from the view so that changes to the view can be implemented, or even additional views created, without having to refactor the model.



The following image illustrates the complete working process of the system. Every single user will initially have to register with the system to proceed with any further actions. Once the user logs into the system, the user will be directed to their specific user profile. The user may insert/retrieve/update/delete data accordingly as per the provided privileges. The main modules in this web application are; Image recognizing, Insert/retrieve/update/delete, Shopping cart, Payments handling, Dashboard handling, and Stock Handling

To develop an efficient and effective e-commerce web application, certain tasks must be performed to manage all the processes of this application.

- Ability to provide secure authentication.
- Ability to enter data by users.
- Ability to store and maintain a database.
- Ability to manage website content.
  - Fast and accurate search function filtering by customer's location.
  - Prioritize the content displayed on the item page based on user preferences.
- Ability to offer sale promotions and discounts
- Use of report generation mechanisms.
- "Help" facility is always available for users.

- Email marketing integration.
- Inclusion of an in-app wish list for users to bookmark items they wish to purchase in the future.

4. Discussion

websites based on e-commerce act a crucial role in the modern technology field. It is possible to overcome geographical boundaries as the products will be accessed by anyone from being at any place. Hence, the limitation to a single geographical area is solved by giving access to the products to customers island-wide, the customer base for all suppliers can be gone on an upward trend. Consumers can locate the ideal product as per their needs efficiently without any hassle. The consumers will be provided with a range of product variations based on their search criteria. The products can be filtered according to where the producer is located and the results from the nearest location will be displayed. The excess delivery expenses will therefore be reduced for the supplier and the customer may receive the requested products in no time. Abundant information is provided through this website for the product consumers. Awareness of products unique to specific locations can be raised through this website. This is a website made with simple interfaces and stepwise proceedings for non-literate users to either buy or sell their products with the least knowledge. Because image processing is used to identify the product images uploaded, the system, therefore, acquires lesser details to be inserted by the user to post their product to sell. The website provides the admin with statistical data on a pie chart regarding the purchases done through the site per year and per month as well as the system provides statistical data for every user with each of their monthly purchases and sales did pe r the current month.

This is a web application specially built focusing on non-English literates and non-computer literates which enables all users to do any process stepwise regardless of their rate of literacy.

- Easy to use checkout.
- Various payment handling methods such as; Delivery and Pay Here.
- Websites should be mobile-friendly.

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Minesha Kulasekara is a Lecturer at Infotec International Institute of Technology who's holding an HND in Computer Science, HEQ in BCS Computer Science and an Oracle Certified Database Administrator. I am a passionate researcher who's keen to learn new technology trends and apply them to develop Innovative Systems. This research was one of her major developments to ease out the day-to-day life of small Agribusinesses and the people in the society.