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BIKE RENTAL SYSTEM

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Abstract - : The bike rental system has emerged as a viable and sustainable solution to urban transportation challenges, such as traffic congestion, air pollution, and limited parking space. This review paper aims to examine the various aspects of the bike rental system, including its design, implementation, and user experience.

The study utilizes both quantitative and qualitative research methods to gather data from bike rental system users and providers. The findings indicate that the bike rental system has significant benefits, including increased accessibility, affordability, and convenience, and that it is a feasible alternative to other modes of transportation. However, the system faces several challenges, such as vandalism, theft, and maintenance issues, which need to be addressed to ensure its long-term sustainability.

Keywords: Bike rental system, software, hardware, web based.

1.INTRODUCTION

In recent years, there has been a growing interest in sustainable transportation alternatives due to increasing concerns about environmental sustainability, congestion, and public health. Bicycles have emerged as a popular choice for short-distance travel, offering numerous benefits such as reduced carbon emissions, improved air quality, and personal fitness. Bike rental systems enable individuals to conveniently access bicycles for short-term use, promoting a greener and healthier mode of transportation.

The effectiveness of bike rental systems heavily relies on efficient management and seamless user experiences. Traditional manual rental processes often faced challenges such as limited availability information, complicated booking procedures, and cumbersome payment methods. These drawbacks hindered the widespread adoption of bike rentals. However, the advent of web-based software has transformed the way bike rental services are offered, addressing these limitations and introducing a range of innovative features.

This review paper aims to delve into the key features and benefits of web-based bike rental software, highlighting its potential to enhance accessibility and convenience for users while improving operational efficiency for rental providers. It will also address the challenges associated with bike rental systems, such as fleet maintenance, user safety, and demand-supply management, and explore potential solutions. Additionally, case studies and success stories from cities or organizations that have implemented the software will be presented to showcase real-world applications and positive outcomes.

Looking ahead, the paper will discuss future directions and innovations in bike rental systems, including integration with emerging technologies such as the Internet of Things (IoT) and artificial intelligence (AI), as well as the potential for collaboration with public transportation systems. The conclusion will summarize the transformative role of web-based bike rental software in promoting sustainable urban mobility and offer insights into the future opportunities and challenges in this field.

Bike rental systems can be found in various locations such as cities, tourist destinations, and recreational areas. These systems offer a convenient and affordable mode of transportation for customers who want to explore the area at their own pace.

Bike rental systems typically have a fleet of well-maintained bikes that are regularly inspected and serviced to ensure their safety and reliability. The bikes can be rented for different purposes such as commuting, leisure riding, sightseeing, and sports.

Bike rental systems offer several benefits to customers. They provide a cost-effective transportation option that is often cheaper than taxis or public transportation. They also promote physical activity and outdoor recreation, which is beneficial for both physical and mental health. Furthermore, bike rental systems are environmentally friendly as they reduce traffic congestion and carbon emissions.

The rental process is simple and straightforward. Customers can walk up to a rental counter or access an online platform to view available bikes, rental rates, and pickup/drop-off locations. Once they select a bike, they can provide their personal information, payment details, and sign a rental agreement. Some systems may also require customers to provide a deposit or show identification.

2. LITERATURE REVIEW

The bike is reappeared in the last years with a phenomenal development on almost all continents after a long disappearance. Nowadays, the shared bike, represent an alternative solution to motorized mobility [19]. Since the launching of the first system in the 1960s in the Netherlands, four generations of bike sharing can be considered [4], [17], [10]. The first generation is known as Witte Fietsen "white bikes" This service is characterized by bikes randomly placed in a certain areas for free usage [17]. Unfortunately, this experience had failed, because bikes were simply harmed either thrown into channels or adapted for private use [4]. A second generation appeared in the early 1990 years, in Farsø, Grenå, and Nakskov to face the problems encountered during the first generation by integrating a financial fee to encourage users to bring the borrowed bike into a station to recover their deposit [2]. The third generation start in the beginning of 1996, the bike sharing system became more popular. This generation is characterized by a variety of technological enhancements, including the electronic locking barriers, telecommunication systems, smart cards or magnetic stripe cards, mobile phone access and embedded computers [3]. In May 2009, BIXI is the first shared fourthgeneration bike system appeared in Canada with its solarpowered mobile stations [15]. Other innovations emerged with the fourth generation including mobile stations, solar energy stations, electrical assistance bikes and the setting up of self-regulation policy using smartphones applications [9]. In 2014, approximately 855 bike sharing programs was counted in almost every region of the world with about 946,000 bikes [12]. However, in the African continent, only two shared bike programs have been set up. The first is located in Marrakech in 2016 with 350 bikes and a dozen stations. The second was set up in Egypt in 2017 with 100 bicycles and 5 stations. In Tunisia, preparations are in progress in Sfax, Kairouan, and Tunis1. This system has multiple environmental, economic and social benefits. Bike share is a sustainable practice with minor negative impacts and even without any negative impacts compared to other transportation methods. The increased use of bikes can solve problems of congestion, fuel expenses, and greenhouse gas emissions [13]. A 312 000 km/day course by the users of Vélib' represents a reduction of about 57 720 kg of CO2 per day compared with the same usage by car [17]. Shared bike systems contribute to reduce air and noise pollution, as well as preserve urban spaces. Moreover, requested space for bike facilities is smaller than the infrastructures required for cars [6]. Furthermore, using bikes helps to reduce stress and make users more healthy18]. Some literature reviews, highlight a lot of variety of researches done on shared bike systems [12] [20], some of them was done with deep analysis to check if it is possible to implant similar system. Others study done by focusing on the environmental, socio-economic, geographic and psychological factors that influence the probability to use the bike. However, few studies have explored the characteristic of bike sharing users and the factors that encourage and discourage them to use it [21]. In our study, we will particularly focus on this innovative system.

The number of bike sharing programs on university campuses and city centers today is growing. Unfortunately, the literature on impacts of bike sharing systems is thin, but is gaining more attention as cities like Paris, Minneapolis and New York devote their resources to such programs. Below, existing literature dealing with bike sharing programs will be reviewed.

Bike sharing is described by *Shaheen et al. (2010)* as being a solution to what is called the "last mile problem." This is where a commuter is trying to decide between driving or taking transit/carpooling, and decides on driving because there is no connection between the drop-off point and the destination (Ibid). By putting in shared bicycles around high-value destinations like urban cores, college campuses or corporate campuses, these systems can provide the last vital link in a non-automobile commute.

Bike sharing started in the late 1960's in the Netherlands and the UK as free, communal bikes that could be picked up, ridden to any destination, and then dropped for the next user *(Shaheen et aI., 2010).* Due to theft and vandalism, these programs changed fIrst into coin operated and then electronic stall systems so that the fleet could be better tracked and maintained (*Ibid).* These programs spread to North America in the early 1990's, starting with Portland, Oregon's Yellow Bike Program. This program eventually ran into the same problems of theft and vandalism as the early programs in Europe *(Ibid.).*

The most prominent case study today for urban bike sharing systems is Paris, France. The Ve1ib program in Paris started with 13,000 subscribers, growing to 100,000 only three months later, and gaining international accolades for its environmental responsibility in the process (NYCDCP 2009). Velib is an example of a "Smart System", complete with docking stations and digital rental technology, which one study put the international total at 78 cities with a combined fleet of almost 70,000 bicycles in 2008 (*Midgley 2009).* A separate report put the number at 90 (MetroBike 2009). These systems are not cheap; Velib in Paris had start-up costs of $114 million, with annual operating costs of $45.8 million for a fleet of24,000 bicycles (NYCDCP 2009). Across North America, there are roughly 65 college campuses with bike sharing programs, with another 10 planned by the end of20l0 *(Shaheen et aI., 2010).* In the U.S. only Smart Bike in Washington DC has automated kiosks like in Europe (NYCDCP 2009). However, Minneapolis is slated to begin a bike sharing program "Nice Ride" in June of20l0, and Philadelphia

and New York City are both in the planning stages for bike sharing programs of their own *(Ibid.)*. Other programs have a variety of funding levels and organizational structure; indeed, some have no apparent funding source and operate based on donated labor, space, tools, and bikes Despite the time, effort and funding devoted to these programs, there have to date been few systematic studies evaluating the effectiveness of them in cities, and no pre- and post-test evaluations done on college campus bike sharing programs. As *Pucher et al (2010)* points out, "The impacts of these programs are hard to assess, as they are often accompanied by the expansion of the bicycle network in anticipation of the increased bicycling." There are suggestive findings, such as a more than doubling ofthe bicycle mode share in Barcelona and Paris after the implementation of their programs *(Ibid.)* These statistics are confounded however by concurrent improvements in bicycle infrastructure.

Determining the mode shift impacts of these urban bike sharing programs can be challenging. A 2007 study of the bike sharing programs in Paris, Lyon and Barcelona showed that when asked how trips would have been made if not by a shared bicycle, the majority of respondents indicated public transit (see Table 1) *(JZTI & Bonnette Consulting 2010)*. However, it is noted that the survey results do not make it clear if the trip on a shared bike replaces only part of a transit trip (i.e. a circulator bus trip to a subway line) or the entire transit trip. Depending on interpretation, these results may overstate or understate the shift from transit.

In the case of bike sharing programs on campus, the evidence base is even shallower. Probably because of the low cost, grassroots nature of campus bicycle sharing programs initiated by students, there is very limited data on the potential impact they might have. Two studies have been conducted by students to determine campus interest in potential bike sharing programs, though none could be found which evaluate the actual impacts of existing programs *(Brougham et al. 2009; ECOHusky 2004)*.

3. PROJECT DETAILS

3.1 Existing System & Proposed System

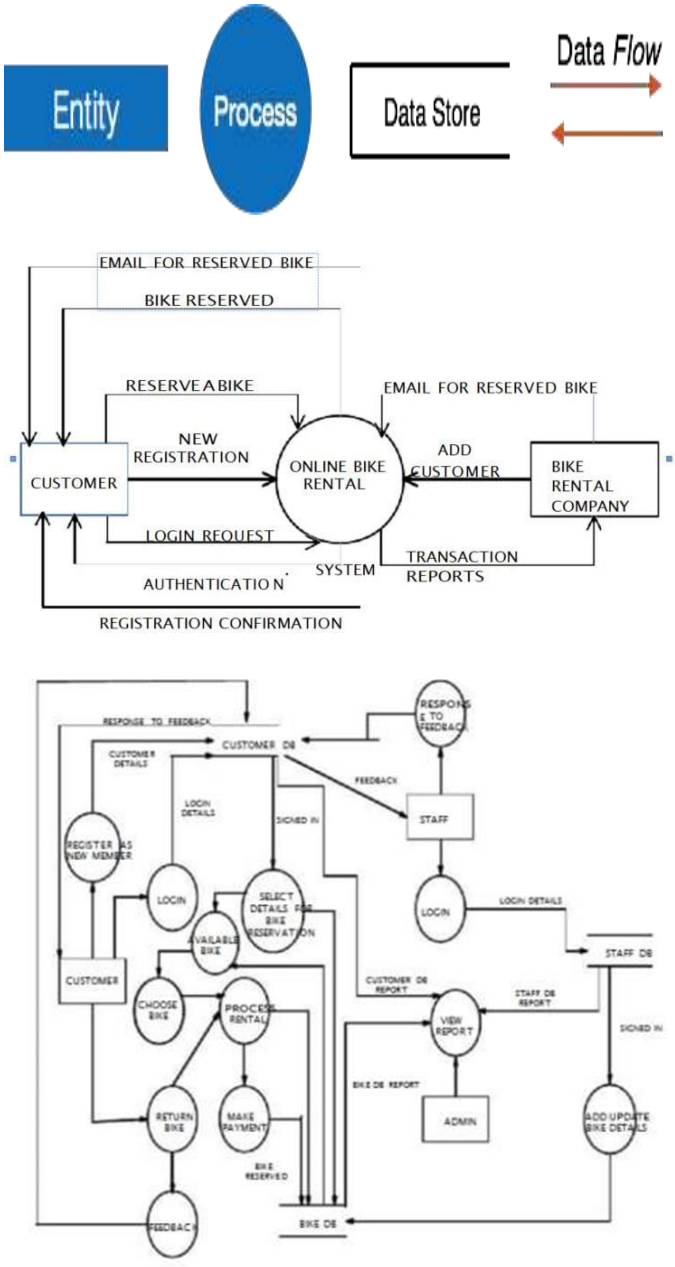
3.1.1 Existing System

Bike Rental System service will help users to book a bike for some fee specified. Till now there was no clear web based UI to help the users to rent the vehicle. They had to manually rent the vehicle through their offices. It was a difficult task to manage rental vehicles. Keeping track of all the rental bikes was a problem.

3.1.2 Proposed System

This Bike Rental System project will enable the user to rent a vehicle. The user shall login to the system and check for availability of bikes. The user specifies a type of bike and the journey date and time. The Bike Rental System shall check for the availability of the bike and rent the bike to the customer. The user can make payment online. The tool is designed using PHP. All the data regarding the rental bikes are stored in MySQL database. The user has to enter his name, address, phone details and check for the bikes available for rent. The UI is very simple and the connectivity to back end is robust. The main advantage is that the user shall be able to choose a bike depending on his budget.

3.2) Context Diagram



3.3) Tools and Technology used

A graphical user interface (GUI) is an interface for the user to communicate with a computer application using graphical symbols rather than typing the instructions in. The GUI of the proposed BIKE Rental system will be

developed using HTML5, CSS and PHP (PHP Hypertext Processor).

Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. HTML elements are the building blocks of HTML pages. With HTML constructs, images and other objects, such as interactive forms, may be embedded into the rendered page. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. HTML elements are delineated by tags,written using angle brackets. The BIKE Rental system uses HTML as the building blocks for creating UI elements.

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language. CSS is used to format the pages to make it appealing to the user. CSS is designed primarily to enable the separation of presentation and content, including aspects such as the layout, colours and fonts. The BIKE Rental system application uses Bootstrap 4.1 a boilerplate designed with CSS to reduce development times on the GUI design.

PHP (PHP Hypertext Processor) is a server-side scripting language used to dynamically create webpages. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management systems, and web frameworks. PHP code is usually processed by a PHP interpreter implemented as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP code may also be executed with a command-line interface (CLI) and can be used to implement standalone graphical applications. The BIKE Rental system uses PHP for interacting with the database using MySQL and to display dynamic content on the webpage based on the users queries.

4. METHODOLOGY

4.1 Use Case Diagram

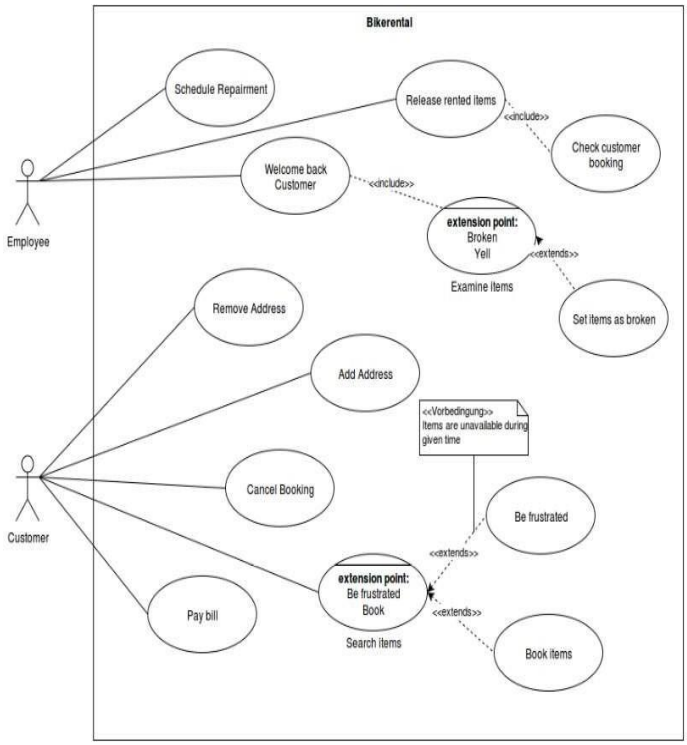
To model a system, the most important aspect is to capture the dynamic behaviour. Dynamic behaviour means the behaviour of the system when it is running/operating.

Only static behaviour is not sufficient to model a system rather dynamic behaviour is more important than static behaviour. In UML, there are five diagrams available to model the dynamic nature and use case diagram is one of them.

Now as we have to discuss that the use case diagram is dynamic in nature, there should be some internal or external factors for making the interaction.

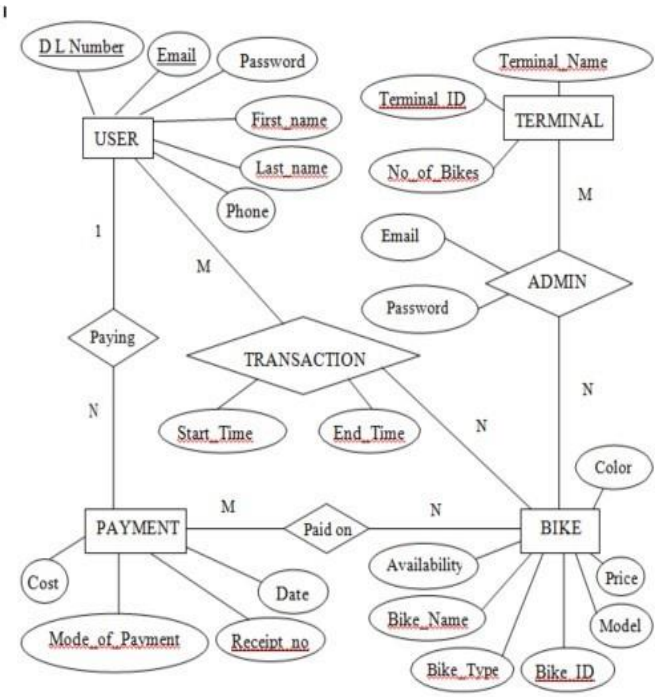
These internal and external agents are known as actors. Use case diagrams consist of actors, use cases and their relationships. The diagram is used to model the system/subsystem of an application. A single use case diagram captures a particular functionality of a system.

Hence to model the entire system, a number of use case diagrams are used.



4.2 ER Diagram

The ER Model is represented by means of an ER diagram. Any object, for example, entities, attributes of an entity, relationship sets, and attributes of relationship sets, can be represented with the help of an ER diagram.



5. SYSTEM REQUIREMENT

5.1 Software Requirement

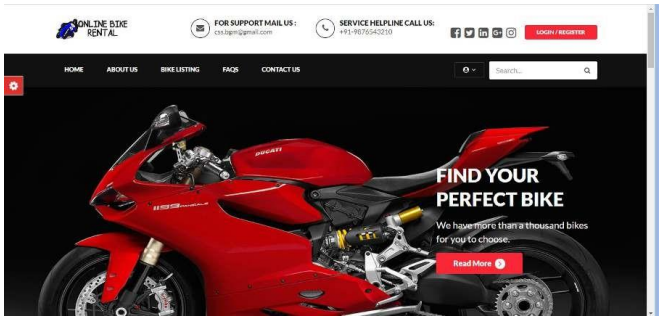
Operating System :Windows 7/8/10 or Linuxdistribution
Browser : Chrome or Firefox or any browser
Front-end : HTML/CSS/PHP
Backend : PHP

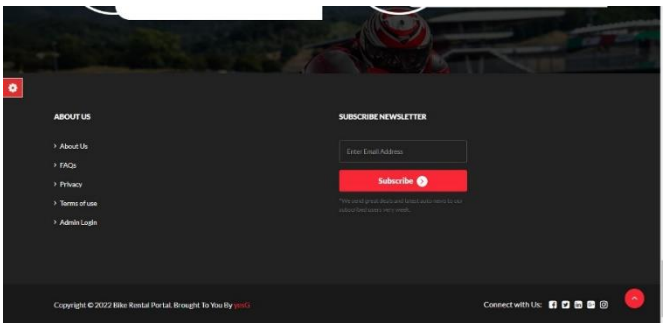
5.2 Hardware Requirement

Processor	:	Pentium Duel Core or above
RAM	:	4GB
Hard Disk	:	100 GB hard disk or above
Monitor	:	15 inch Color Monitor
Keyboard	:	102/104 Keys
Mouse	:	Optical Mouse

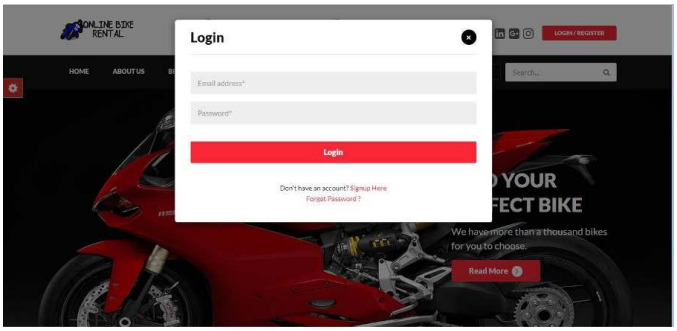
6. RESULT

6.1 Home Page

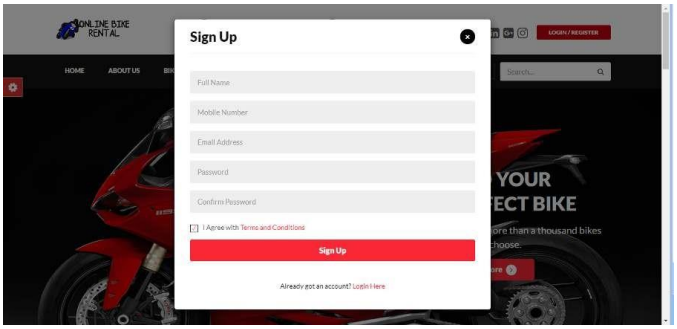




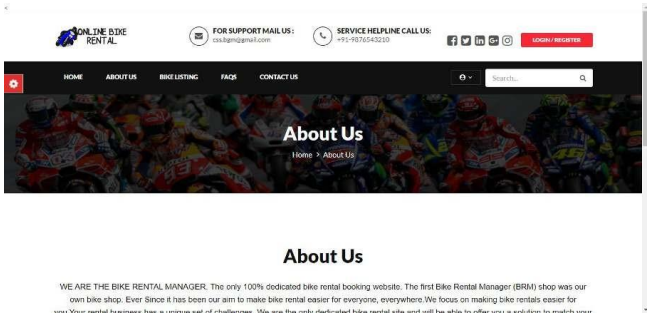
6.2 Login Page



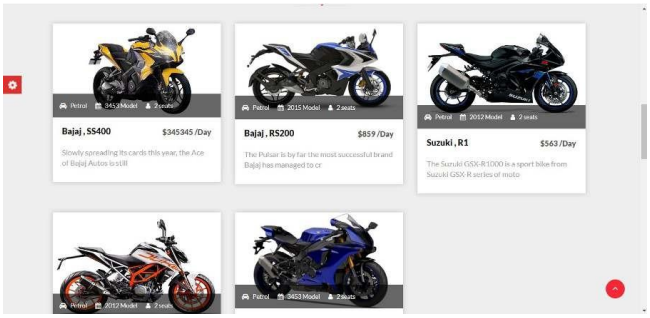
6.3 Registration Form



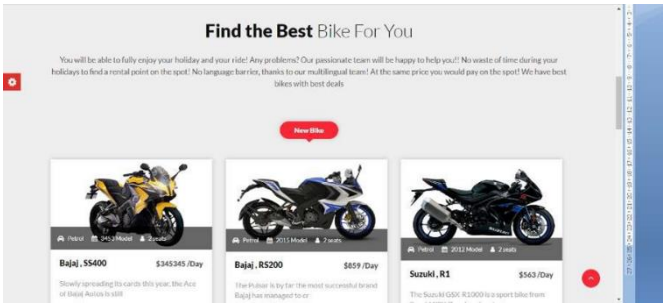
6.4 About



6.5 Listing



6.6 Footer



7. CONCLUSIONS

Bike Rental System is a web application and it is restricted to only limited type of users. In this application, Admin have been given access rights and are restricted up to certain functionalities, so that the data is maintained securely and redundant data is prevented. As the Data is stored electronically, it is necessary to have a Computer and Network connection to access the Application. It is a

software which helps the user to rent BIKE base on their need. This software reduces the amount of manual data entry and gives greater efficiency. The User Interface of it is very friendly and can be easily used by anyone. It also decreases the amount of time taken to write details and other modules. At the end, this software can perform all the tasks accurately and can do the work for which it is made.

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