**LITERATURE REVIEW**

* 1. **Overall Survey**

According to the survey, with about 130 million vehicles on its roads and about 2.7 million cars being added each year, India's parking woes are only going to get worse, especially as there is no organized industry or policy framework in the country.

Time (also fuel) expenditure to find free parking spaces in modern cities is the most critical; no proven and affordable technologies exist to assist drivers up to now. The multi-level vehicle stacking system is one of the best methods to control the traffic that prevails. In most cities of India the traffic occurs due to less space for parking.

Due to lack of adequate parking space in shopping areas, malls, theatres etc. congestion occurs. Cars are parked along road sides and vehicle in search of parking areas creates heavy traffic. Thus this leads to traffic congestion and insufficient parking space. Various measures have been taken to in the attempt to overcome the traffic mainly in Europe, America and Japan advanced technologies and research was developed.

Although the problem can be addressed via many methods, but the focus is on the automatic multi-level parking system [10]. Building this multi-level stacking system creates a lot of space for parking more number of cars in minimum space. The smart parking system is beneficial to car park operators, drivers and also helps in environment conservation. For car park operators it helps to predict the future parking patterns. The amount of air pollutants released by vehicles is also decreased and thus helps in environment conservation. The parking space can also be efficiently utilized and this increases parking capacity. Smart payment system reduces requirement for additional staffs for payment related purposes and traffic control. This smart parking system can be exploited to predict the future parking space using e-parking. E-parking provides an alternative for patrons to enquire the availability and /or reserve a parking space at their desired parking facility to ensure the availability of vacant car space when they arrive at the parking facility. The system can be made more efficient with the information provided as the drivers are able to avoid car park that are fully occupied and locate the vacant parking spaces using the fuzzy logic controller.

Despite the undeniable importance of usability and utility, one should not forget that people use Internet booking service [6] for variety of reasons or in essence overlooked the vital intent. Online booking systems challenge the effectiveness of traditional way of booking process. Therefore the effectiveness of the task is crucial to support the user to complete the tasks.

User Experience (UX) [6] is basically a constant “good-bad” feeling towards any products or service to finish a task. Standard heuristics evaluation has been performed in UX to measure if the perceived usability of the online booking based on the perceived utility matched to the user’s satisfaction. This indicates that several design features do not entirely conform to the usability standard and design principles. The finding shows that the users experience some difficulties in completing the task; however, they proceed in order to get competitive prices. They also attribute the difficulties to their incautious and negligent without realizing the design features have lead them to experience human error in the online booking system.

With the rapid development of Internet, people's daily life has basically been inseparable from the network, and network development to today, has been to everywhere in the era of computing time, all sectors have been increasing their use of network services, to create new opportunities for themselves.

After the Internet, without purpose, whether individuals or businesses, both consumers and manufacturers, are made on the network of hope, this new hope is to get through the network of the best things the cheapest, most practical to find the fastest information. Currently the general public via the Internet for many business activities such as textbook, Lam Tin, shopping, games, etc., which also includes booking (e.g. air tickets, train tickets, tickets to arts activities, etc.)

The advent of Internet has brought down geographical distances but proportionally increased the digital geographical distances with masses of data and information that demands more than a mind to comprehend. Every digital megabyte is a mile of physical distance. Getting the wrong information is like taking a wrong turn. It wastes time, energy, productivity and money. This growth has led to the demanding needs of effectively using Digital Geography.

Intelligent agents[7] can play a role in ensuring this doesn’t happen. They are pieces of software focused on organizing and getting the best out of our digital geography. They will become extensions of our will, aiding in the fulfillment of our needs and wants. They will venture into the digital wilderness and bring back to us the list of options we demand.

A product’s ability to satisfy what people have to do with ease is a matter of product usability and utility – quality aspects at the heart of practical and academic Human–Computer Interaction (HCI). ISO CD 9241-210 tentatively defines User Experience (UX) as “all aspects of the user’s experience when interacting with the product, service, environment or facility. It includes all aspects of usability and desirability of a product, system or service from the user’s perspective”. On the other hands, researcher described UX definition in two parts: one that defines UX itself and a second that states how UX is “made”. Evaluation of websites has adopted two approaches: first, observation of users’ errors when navigating websites; and secondly, expert style heuristic evaluation in which the quality of the interface is judged against a set of criteria-the heuristics. In recent years, there has been great excitement about using the Internet as the most effective platform to automate task and reduce merchandising costs. Asian companies, including Malaysian companies, are responding to this new reality. While companies have embarked on transferring merchandising skills to the website, issues of the website user interface design effectiveness have rarely been addressed or evaluated.

User interface for business websites affects many features of peoples’ lives as it is part of the system/product with which people come into contact physically, perceptually and conceptually. The lack of vision for the user is they have lost the opportunity to voice what is wrong with current user interface by mistake; not knowing what is good or bad design. To assure that users are in essence design educated and guarantee that user interface design conforms to ergonomic design universal, evaluation of the effectiveness of user interface is needed. Whether the evaluation is done in a formal setting or a self-evaluation (self-talk); both could perhaps be beneficial for the end users. This paper presents a common heuristics evaluation in a formal lab setting to identify users’ satisfactions in using online booking system.

The world economy is going digital and a handful of business pioneers already provide exemplars of the tactics and operation of 21st century business competitors. In recent years the Internet (World Wide Web) due to its exponential growth enabled substantial progress in new information society functions such as online commerce. Electronic commerce entails business-to business, business-to-customer and customer-to-customer transactions. It encompasses a wide range of issues including security, trust, reputation, law, payment mechanisms, advertising, ontologies, electronic product catalogs, intermediaries, multimedia shopping experiences, and back office management. Agent technologies can be applied to any of these areas. Software agents help automate a variety of activities, mostly time consuming ones, and thus lower the transaction costs. Software agents differ from “traditional” software in that they are personalized, social, continuously running and semi-autonomous. In this way, e-commerce is becoming more user-friendly, semi-intelligent and human-like. These qualities are conducive for optimizing the whole buying experience and revolutionizing commerce, as we know it today.

* 1. **Basic System Design**

The smart parking system has been demonstrated using a miniaturized working replica of a real time system. It constitutes a disc shaped structure with toy cars in place of real counterparts for parking. Figure.1 shows the basic structure where the disc has been divided into ten slots .Each slot can accommodate a car. Similarly our design has three floors of parking space with parking capacity of twenty four different cars according to its size. The floors are classified on the basis of cost and urgency for parking. Quick entry and exit of vehicle is possible.



**Figure 2.1: Disc Shaped Parking System**

In practice, product development teams may extend systematic evaluation to real usage because at this point in time the web interface is on the market and is not very difficult to fix. Thus, heuristics evaluation methods have been extended for web interfaces. HCI-oriented sought the most reliable UX evaluation data comes from people who have actually purchased and used a product on the market.

In the context of HCI and UX, suggested that interactive products are perceived by their users/owners with regard to their capability to fulfil what users want to do (i.e. online booking) and what users’ need (i.e. promotion price according to their affordance). Studies show that individual’s motivational orientation influence product evaluation and choice. Thus, people may perceive products promotional is primarily important than perceived value of interactive products. In addition, products appeal (e.g. websites that lead to mistakes) and choice is strongly context-dependent. To date, research have shown that results of objective and subjective evaluation correlated poorly due to the character of users in the study; subjects were less vocal, exceedingly polite and disinclined to express negative comments in front of observers. Although Malaysia has implemented web interfaces in various field, the effectiveness, efficiency and satisfactory of these web interfaces have rarely been evaluated or published. On the whole, these user interface designs have rarely been studied, and few comparisons have been made.

Research has shown that one of the reasons for this lack of studies in the area on user interface in Asia is due to the Asian culture whereby “it is considered culturally unacceptable to criticize the designer directly, as this may cause the designers to lose face”. Malaysians try to refrain from giving negative comments/feedback of user interface design in order not to humiliate the designer. A study in human computer interaction related field in the region also found that user broke down and cried during a software evaluation session. Consequently, it seems crucial to monitor product experience throughout the whole product lifecycle and to use these findings at least as a guide for future products. Recent work by Malaysian researchers draws on the new paradigm of producing desirable websites as opposed to concentration on website usability and performance. Even if the basic needs of the safety (e.g. error avoidance principle on user interfaces) are fail to be observed in Malaysia, concentration on engagement and fun will inevitable fail to be produced. Studies of website design evaluation based on cross-cultural issues is important step towards adopting Grounded Theories in social science to further investigate Malaysian website user interface design develop an evaluation tool for usability; however, the usefulness of such tool has never been refined and testing by industry.

Appropriate publicity should be provided to persuade people to support HCI at every stage of design, development and deployment through public demonstrations, media, word-of-mouth and other mechanism.

* 1. **Intelligent Agents**

Intelligent agents are software entities that can execute functionalities in an autonomous, pro-active, social and adaptive fashion. These functionalities include searching, comparing, learning, negotiating and collaborating and endorsing. Subsequently, based on these functionalities, seven types of agents have been identified: collaborative agents, interface agents, mobile agents, information/Internet agents, reactive agents, hybrid agents and smart agents. Provisionally in electronic commerce, interface agents and information or Internet agents will be heavily used. Theory and development on the use of intelligent agents has focused on two areas - making agents 'smarter' (that is, enlarging their functionalities) and creating a framework (an electronic marketplace) in which intelligent agents can operate. Hence in the near future, these developments make the digital geography a reality.

* 1. **Electronic Commerce[4]**

Electronic commerce is sharing business information, maintaining business relationships, and conducting business transactions by means of communication networks. Ecommerce includes the relationship between companies (business to- business), between customers (customer to customer), as well as between companies and customers (business-to customer). Business-to-business segment currently dominates the E-commerce while consumer oriented segment is significantly lagging behind and current estimates place it at less than 10 percent of the total volume, even though they are all experiencing an exponential growth.

* 1. **Statistics and Research**

IBM's first-ever Parking Index, a ranking of the emotional and economic toll of parking in 20 international cities, released in 2011, put New Delhi and Bangalore as the worst. In India, we have very few multi-level parking lots. Generally, it's open parking lots that are provided by the local authorities. India also has one of the lowest public parking rates in the world [12].

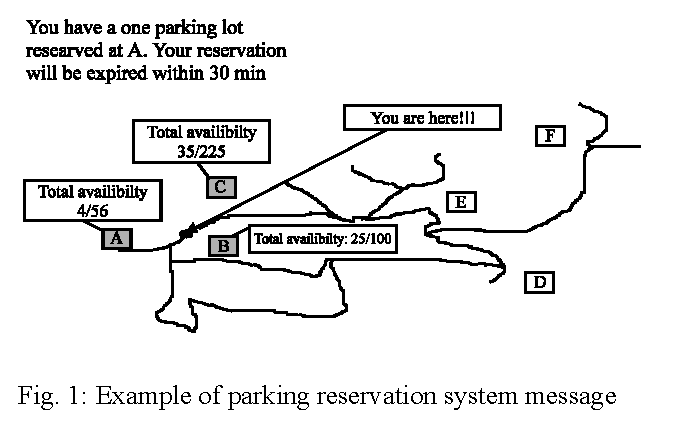
An advance booking online facility for parking space has been implemented in Chennai, India named uPark[15]. Ramachandran, who is the company's chief executive, said an internal survey done by his company across eight Indian cities revealed that 93% of the respondents wanted to know parking availability in advance and did not mind paying for it. Car Owners are desperately looking for Parking Information and are often frustrated circling around the roads with no information on parking. Car owners often park haphazardly in the roads and grow tired of paying penalties and being towed.

The project team came across a research paper related to E-Parking System [10] while doing the survey. The study helped to find a proper solution to the mentioned traffic problems.

The smart parking system is considered beneficial for the car park operators, car park patrons as well as in environment conversation. For the car park operators, the information gathered via the implementation of the Smart parking system can be exploited to predict future parking patterns. Pricing strategies can also be manipulated according to the information obtained to increase the company’s profit. In terms of environment conservation, the level of pollution can be reduced by decreasing vehicle emission (air pollutant) in the air. This can be attributed to the fact that vehicle travel is reduced. As fuel consumption is directly related to vehicle miles travelled, it will be reduced as well.

* 1. **E-Parking System**

It provides an alternative for patrons to enquire the availability and/or reserve a parking space at their desired parking facility to ensure the availability of vacant car park space when they arrive at the parking facility. System can be accessed via internet on WAP enabled Android smart phone.



**Figure 2.2: Example of parking system reservation message[10]**

The above figure, Figure 4, is an example of parking system reservation message which shows the number of available spaces out of the total spaces at different car parks. The message related to booked space is displayed to the user on their phones along with the current position and the nearest car park location.

But there are some limitations of implementing this system in India. The most important of them being, less number of multi-storey car park systems in India. So, smart parking systems can’t be implemented. Manual operation by an operator is required.

* 1. **Smart Payment System[10]**

The smart payment system is implemented in the effort to overcome the limitation of the conventional payment methods by revamping the method via parking meter and introduce new technologies. This is because the conventional methods cause delay and inconvenience. The smart payment system consists of contact method, contactless method and mobile devices. While the contact method involves the use of smart cards, debit cards and credit cards, the contactless method involves contactless cards, mobile devices as well as Automated Vehicle Identification tag whereby RFID technologies are utilized.