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A CORRELATIONAL STUDY ON TOOLS OF INTEGRATED MARKETING COMMUNICATION ON THE PURCHASE OF FAST-MOVING CONSUMER GOODS

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ABSTRACT

This study is undertaken to understand the impact of Integrated Marketing Communication on the purchase of fast-moving consumer goods based on correlation and percentage analysis. Descriptive research method was used and samples were selected based in simple random sampling. Inter-relationships among the variables such as publicity and public relations, sales promotion, advertisement and internet marketing were studied to given suggestions on effective combination of Integrated Marketing Communication. All the above variables result in the purchase of fast-moving consumer goods independently. Results were not the same when it is integrated.

Keywords: Integrated Marketing Communication, fast-moving consumer goods, IMC, FMCG

INTRODUCTION

Marketing communications are vitally important in order to increase the purchase of fast-moving consumer goods. All fast-moving consumer goods (FMCG) companies spend millions of dollars on marketing communications. However, it is still up in the air as to which communication tool or integrated communication strategy will provide the most value. This research paper investigates the relationship between Integrated Marketing Communication tools (internet marketing, Sales Promotion, Advertising, Public relations and Publicity) and purchase decision on fast-moving consumer goods

REVIEW OF LITERATURE

Ruswanti et al. (2019), predicted the influence of Integrated Marketing Communication (IMC) techniques (sales promotion, advertising, direct marketing, and personal selling) on customers' intent to buy organic goods in a local Indonesian supermarket was projected. The primary data was gathered through the distribution of questionnaires to customers. A total of 128 consumers were included in the sample size. Before hypothesis testing, the data was subjected to a reliability and validity study. Only direct marketing had a substantial beneficial effect on the intention to buy organic products, according to the findings. Integrated Marketing Communication informs consumers about organic product purchasing policies.

Abdul Haseeb et al. (2017), discovered how Integrated Marketing Communication, such as internet marketing, public relations, advertising, sales promotion, and direct marketing, influences consumer purchasing decisions of internet services. The primary goal of this research study was to investigate the impact of Integrated Marketing Communication on consumer purchasing decisions for Mobilink's internet service and make recommendations to marketing professionals. 435 To acquire primary data from respondents, questionnaires were employed. The findings revealed that online marketing, public relations, advertising, sales promotion, and direct marketing all have a favourable influence on customer purchasing decisions. It is recommended that marketing managers focus more on digital promotion and public relations when designing an Integrated Marketing Communication programme in the future, which will build a better image about the company and its internet services, influencing customer purchasing decisions.

Agodi Joy and Aniuga (2016) investigated the impact of Integrated Marketing Communication on the creation of customer-based brand value for enterprises and their customer. In today's technology-driven marketing environment, traditional promoting media such as TV, radio, magazines, and newspapers look to be losing their hold on consumers. Because of the shift in the type of media brought about by the dynamic marketing situation, advertisers have been forced to reassess how they must connect with consumers and increase the brand value for the company and its customers, applying the concept of Integrated Marketing Communication has shown to be a viable option. Marketing communications are the tactics used by businesses to educate, persuade, and remind customers of the presence of a brand. Integrated Marketing Communication tries to mix and match communication options – that is, how to use communication options in an orderly or coordinated manner to create customer-based brand value. According to the customer-based brand value model, marketing communication can increase market value by making customers familiar with the brand; connecting the brand's purposes of equality and point-of-contrast relationship in shoppers' memories; evoking good brand decisions or emotions; and encouraging a more grounded customer brand association and brand resonance. The primary focus of this study is on the impact of Integrated Marketing Communication on customer-based brand value.

FACTORS INFLUENCING HYBRID WORKING AMONG IT EMPLOYEES

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Abstract
Hybrid work enables a combination of working from home and working in an office and Employees spend adequate time with family and coworkers. The study is quantitative in nature. A descriptive research design was used in this study, non-probability sampling technique (purposive sampling) was used to select the respondents (n=60) from IT companies who were working from home. The objective of the study was to find (1) the push factors of hybrid working, (2) the pull factors of hybrid working. The self-prepared questionnaire consisted of four parts socio-demographic profile, factors of online working, factors of offline working, and factors of hybrid working respectively. The questionnaire was circulated through google forms to the respondents and the responses were collected online. The study found that two-thirds of the respondents (66.7%) have clear work-from-home (WFH) policies. The study respondents preferred to work in hybrid mode (55%) and more than half of the respondents (55%) are not looking for going to the office. Nearly half of the respondents have a good work-life balance when working from home. The respondents mostly want to get to work on Tuesday, Wednesday, and Thursday. Interestingly, respondents with work experience of 11-15 years and in the age group of 41-50 years prefer to work from the office. The socio-demographic variables such as gender, type of family, and marital status have no significant results on working from home, office or in hybrid mode. The study came out with a few suggestions such as the organization charting out WHF policies, and providing necessary materials to the employees to easily adapt to hybrid work mode.

Keywords: hybrid working, work from home, purposive sampling, COVID-19, work-life-balance

Introduction

The office, a home office, or even remotely while travelling are all possible spots for the workplace. Hybrid work enables a combination of working from home and working in an office and Employees spend adequate time with family and coworkers. In the era of the Internet of Things (IoT), Artificial Intelligence (AI), and Deep and Machine Learning the role of IT is indispensable as IT contributions to other fields are commendable. Full-time employees of the IT sector are considered as the respondents in this article. Work from the office, Work from home and Hybrid model of working are the three modes that are common in the IT sector. Work from the office, Work from home and the Hybrid model of working all have their inherent merits as well as demerits. In this study, the authors attempt to see the push and pull factors of hybrid working among Information technology (IT) employees.

Literature Review

Neirotti, Paolucci and Raguseo (2013) studied the relationship between a company's adoption of telework and its technological, organizational, and environmental factors and claimed that adopting technology-based remote work was novel for them at the time.

Aczel et al., (2021) found that almost half of the respondents claimed that the lockdown affected their ability to work efficiently, and the majority believe that remote work will continue to be preferred in the future.

Baker (2021) said that the organization would also experience financial gains after working out the cost-benefit analysis of the hybrid workplace.

Bloom (2021) concluded that allowing workers to choose their own workdays would lead to issues like employee anxiety and that offices would be just partially occupied on certain days.

Kanimozhi & Athulyae (2022) study found that employees are satisfied with their decision to pursue a hybrid work style in the future.

Tran (2022) reiterated that hybrid work has a beneficial effect on job satisfaction, collaboration, and communication.

Materials & Methods

This study is quantitative in nature. A descriptive research design (D' Cruz & Jones, 2004) was used in this study. Purposive sampling (Alston & Bowels, 2003), a non-probability sampling technique was used to select the respondents (n=60) from IT companies who were working from home. The self-prepared questionnaire consisted of four parts (1) socio-demographic profile, (2) factors of online working, (3) factors of offline working, and (4) factors of hybrid working respectively were used to collect the data. The questionnaire was prepared based on the Likert scale with 5 rating points (5 = strongly agree and 1 = strongly disagree). As the respondents were working from home, the e-mail ids were collected and the questionnaire was mailed to the respondents using the Google form. The response rate for the questionnaire was 74%. The research ethics were strictly adhered to in this study. Non-parametric statistics (Mann-Whitney U test and Kruskal- Wallis H test) using IBM-SPSS were used for statistical analysis as a non-probability sampling technique.

Objectives of the Study

1. To study the socio-demographic profile of respondents.
2. To learn the push factors of the hybrid work model.
3. To know the pull factors of the hybrid work model.

Analysis

Table 1 Socio-demographic Profile of the Respondents

Variables	N	Per cent	Variables	N	Per cent
Gender			Family Type		
Male	27	45.0	Joint Family	19	31.7
Female	33	55.0	Nuclear Family	41	68.3
Total	60	100.0	Total	60	100.0
Age			Marital Status		
21-30 Years	36	60.0	Married	22	36.7
31-40 Years	20	33.3	Unmarried	38	63.3
41-50 Years	4	6.7	Total	60	100.0
Total	60	100.0			
Educational Qualification			Total Family Members		
UG	28	46.7	0-3 Members	11	18.3
PG	25	41.7	4-6 Members	41	68.3
Ph.D.	7	11.7	7-10 Members	8	13.3
Total	60	100.0	Total	60	100.0
Designation			Number of Children		
Developer	19	31.7	None	40	66.7
Software Engineer	13	21.7	One	9	15.0

Tester	9	15.0	Two	9	15.0
HR	13	21.7	More than two	2	3.3
BPO	1	1.7	Total	60	100.0
Medical Coder	3	5.0	Annual Income		
Data collection analyst	2	3.3	Up to Rs. 2,50,000	11	18.3
Total	60	100.0	Rs. 2,50,001 to Rs. 5,00,000	26	43.3
			Rs. 5,00,001 to Rs. 10,00,000	18	30.0
			More than Rs. 10,00,000	5	8.3
			Total	60	100.0

Table 2 Reason for not returning to physical work location

S. No	Reason	Frequency	Per cent
1	I work in a hybrid work culture	25	41.67
2	I am already back to my pre-COVID work arrangement	16	26.67
3	I was a 100% virtual work employee pre-COVID	14	23.33
4	I am comfortable with the work-from-home culture	3	5
5	WFH has not started yet in my company	2	3.33
Total		60	100

Table 2 explains the reasons for the respondents not returning to physical work. Slightly more than two-fifths (42%) said they are in hybrid work culture.

Results from the Study

1. More than half of the respondents (55%) have not been trained on the hybrid work model and only 43% got orientation on the hybrid work model.
2. More than half of the respondents (55%) say their productivity is a result of hybrid working mode.
3. Slightly more than two-fifths (41.7%) work in hybrid mode and 30% of the respondents work from the office.
4. Nearly two-thirds (65%) of the respondents have 0-5 years and 28.3% have 6-10 years of working experience
5. Work From Home (WFH) did not differ significantly with the gender of the respondents, $U = 393.5$, $z = -.377$, ns
6. Work From Office (WFO) did not differ significantly with the gender of the respondents, $U = 364$, $z = -.831$, ns
7. Hybrid mode of working did not differ significantly with the gender of the respondents, $U = 331$, $z = -1.341$, ns
8. WFH did not differ significantly with family type, $U = 269.5$, $z = -1.911$, ns
9. WFO did not differ significantly with family type, $U = 387$, $z = -.04$, ns
10. Hybrid mode of working differs significantly with family type, $U = 230$, $z = -2.546$, $p < 0.05$
11. WFH is not significant with respect to the age category, $H(2) = 1.611$, $p > 0.05$
12. WFO is significant with respect to the age category, $H(2) = 7.119$, $p < 0.05$

13. Hybrid mode of working is not significant with respect to the age category, H (2) = 2.444, $p > 0.05$
14. WFH is not significant with respect to the educational qualification, H (2) = 1.611, $p > 0.05$
15. WFO is significant with respect to the educational qualification, H (2) = 7.119, $p < 0.05$
16. Hybrid mode of working is not significant with respect to the educational qualification, H (2) = 2.444, $p > 0.05$
17. WFO is significant with respect to the work experience, H (2) = 7.119, $p < 0.05$
18. Hybrid mode of working is not significant with respect to the work experience, H (2) = 2.444, $p > 0.05$
19. WFH is not significant with respect to the income category, H (2) = 1.611, $p > 0.05$
20. WFO is significant with respect to the income category, H (2) = 7.119, $p < 0.05$
21. Hybrid mode of working is not significant with respect to the income category, H (2) = 2.444, $p > 0.05$

Conclusion

The pandemic led to the emergence of the hybrid work model, which is now a permanent phenomenon. Hence, organizations should consider how to give their staff members a healthy work-life balance. Most workers are unaware of the policies and have not received any training on the hybrid work model. A higher level of production could be attained with more exposure and proper training. Employees are still excited to come to the office and collaborate. The possibility for employees to spend time with both their family and coworkers is the greater benefit.

The commute time to the work location, disturbance in the home or office, lack of flexible work hours, relocation, a lack of training and employee engagement activities, workload, and work-life balance are the pull factors of the hybrid work model. Increased productivity, adaptable home schedules, family time, and collaboration with coworkers when necessary are the push factors behind the hybrid work model.

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REASONS & REMEDIES OF A MOUNTING NON-PERFORMANCE ASSETS OF PUBLIC SECTOR BANKS IN INDIA

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ABSTRACT

Raising non-performing assets in banking sector is a great threat to banks' survival and growth. NPA affects banks profitability negatively and the worst leads to closure of bank/merger/acquisition. This research paper explores the causes for increasing NPA in public sector banks through conceptual research method using literature review method. Public sector banks have more NPA than private sector banks, public sector banks have diluted control over disbursal of loans, less effectiveness of present credit rating methods and political influence is more on public sector banks are the main findings of the study. The researcher suggested that RBI must reengineer the parameters of CIBIL and Basel III ratings to appraise the loans in an effective to prevent disbursal of loans in the wrong hands. Banking operations must be free from political and other pressures. Banks must adopt an automated reporting system of clients financial status monthly. This will help to reduce NPA of public sector banks.

Key Words: NPA, Loan, Public sector banks

Introduction

Financial Soundness of the most of the bank is a big question mark today, as NPA - Non performing assets of banks became unmanageable crisis which in turn affected the profitability of banks. Most of the Public sector banks are victims of NPA. This paper explores the reasons behind sky rocketing NPA in Public sector banks.

Objectives of the study:

To understand the reasons of mounting NPA in public sector banks.

To suggest the suitable solution to the bank, implement to control NPA.

Research Methodology:

The researcher followed conceptual research method tore view the existing literature extensively. Only secondary data was used to arrive findings and discussions. Existing literature were reviewed systematically on the chronological basis.

Review of literature:

This chapter provides an overview of various area related to the research as well as theoretical background for management of Non-Performing Assets of Public Sector Banks in India.

Jayraj Javheri et al. (2022) studied the selected commercial and public sector banks in India's non-performing assets". The study examines the trends in NPA levels over a ten-year period (2011-2020) in order to assess the status of private and public sector banks with regard to NPAs. The study analyses the

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INFLUENCE OF CONSUMER PREFERENCE ON CONSUMER SATISFACTION AND BRAND LOYALTY

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ABSTRACT

Customer satisfaction and brand loyalty is determined by the price and quality of the products the customer wants. The price and quality of a product is the foundation for building consumer satisfaction and brand loyalty. Hence, research sought to examine the influence of consumer preference on consumer satisfaction and brand loyalty. Convenience sampling technique was used for primary data collection. Sample size was 125 Aavin product users in Cuddalore district. Data analysis was done through path analysis. The analysis found that there is impact of price and quality on customer satisfaction. The research also identified that there is impact of customer satisfaction on brand loyalty. Finally, the analysis discovered that there is impact of price and quality on brand loyalty. Hence, It is concluded that the Aavin management should implement price strategy and product quality to influence the buying intentions of consumers.

Keywords: Consumer Preference, Price, Quality, Consumer Satisfaction, and Brand Loyalty.

INTRODUCTION

As a result of globalization more and more competitive companies want to improve their performance. By improving their performance, Aavin can compete with other competitors' products (Arokiya milk products, Amul milk products, etc.) (Stucke, 2013; Chattopadhyay & Bhawsar, 2017). Only a company that understands and acts on consumer demand can improve their performance (Lemon & Verhoef, 2016; Iqbal, et al. 2016; Peighambari, et al. 2016). Thus Aavin should design an effective marketing strategy that understands consumer needs.

Customer satisfaction and brand loyalty is determined by the price and quality of the products the customer wants. According to Bei and Chiao (2001) the price and quality of a product is the foundation for building consumer satisfaction and brand loyalty. Khan and Ahmed (2012) stated that the price and quality of a product is an important determinant of consumer satisfaction. Furthermore, Ehsani and Ehsani (2015) stated that based on the price of the product can increase both profit and customer satisfaction. Another factor affecting customer satisfaction is the quality of the product, as proposed by Ma and Ding (2010).

The quality distribution of the product can satisfy the customer demand. Likewise, Sugiarti, et al. (2013) stated that satisfied customers with better product quality and price than what competitors offer. Also, product quality and price will make customers loyal. Based on the many expert opinions above,

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வண்ணாரப்பேட்டை, சென்னை-21.

ஆய்வுச்சுருக்கம்

மனிதன் பல நூற்றாண்டுகளாக வேளாண்மை செய்து வருகின்றான் வேளாண்மை மூலம் மனிதனுக்கும் பிற உயிரினங்களுக்கும் உயிர் வாழ அடிப்படை தேவையாக இருக்கும் உணவு உற்பத்திச் செய்யப்படுகிறது. மனிதன் நாகரிக வளர்ச்சி அடைந்ததற்கு முதன்மை காரணமே வேளாண்மையாகும். அது, பூமியின் தட்பவெப்ப நிலை, தொழில் நுட்பங்கள் போன்ற காரணங்களால் பல மாற்றங்களுக்கு உள்ளாகியுள்ளது. அவ்வேளாண்மை மனித வாழ்வோடு ஒன்றிணைந்துள்ளது. இன்றைய காலக்கட்டத்தில் அறிவியல் அறிவின் உதவியுடன் பல தொழில்நுட்பங்கள் தோன்றியிருந்தாலும், உணவை உருவாக்க முடியாது. அத்தகைய உயர்வுடைய வேளாண்மை பற்றி தமிழ் இலக்கியங்கள் பதிவுசெய்துள்ளன. அதில் தற்காலத்தில் மண்சார்ந்த புதினமாக வெளிவந்துள்ள முனைவர் ப.முருகன் எழுதிய விதைத்தவனும் விதைகளும் புதினத்தில் இடம்பெற்றுள்ள வேளாண்மைச் செய்திகளை இக்கட்டுரை விளக்குகின்றது. புதினத்தில் இயற்கை விவசாயத்தில் நிலத்தைப் பண்படுத்துகிற முறைமை, விதைகளைத் தேர்வு செய்தல், நீர் நிலைகளைப் பாதுகாத்தல், நெல், பருத்தி, கரும்பு முதல் குதிரைவாலி, கம்பு உள்ளிட்ட சிறுதானிய பயிர்களைப் பயிரிடுதல் போன்ற பல வேளாண்மை சிந்தனைகளைப் பெருவாரியாக பதிவு செய்துள்ளன. அவற்றை ஆராய்ந்து வெளிப்படுத்துகிறது இக்கட்டுரை.

முன்னுரை

இலக்கியம் என்பது குறிக்கோளுடன் அழகியலையோ அல்லது அறிவியலையோ இயம்புவதாகும். அவ்விலக்கியம் மனித வாழ்வியலை கொண்டது. வாழ்வில் பின்பற்ற வேண்டிய நற்செயல்களையும் பின்பற்றக் கூடாத தீயச்செயல்களையும் எடுத்துரைக்கிறது. அது, படிப்பவர்களுக்கு இன்பத்தையும் அறிவையும் புகட்டி நல்வழியில் செலுத்துகிறது. அவ்வகையில் பழந்தமிழர்களின் வாழ்வை உணர்த்தும் சங்க இலக்கியம் முதல் இன்றைய தமிழர்களின் நிலையை எடுத்துரைக்கும் இலக்கியம் வரை தமிழ்மொழியில் இலக்கியங்கள் பரந்து விரிந்து காணப்படுகின்றன. அவை அனைத்தும் பாரம்பரியம் மிக்கவை. இலக்கியங்கள் மக்களின் வாழ்வியல் முறைகளை இயம்புவதோடு, ஒரு குறிப்பிட்ட காலத்திற்குரிய நாகரிகம், கலை, வரலாறு, பண்பாடு, அறிவியல், ஆகியவற்றைப் படம்பிடித்துக் காட்டும் கண்ணாடியாய் விளங்குகின்றன. அவ்வகையில் முனைவர் ப.முருகன் எழுதிய விதைத்தவனும் விதைகளும் புதினத்தில் இடம்பெற்றுள்ள வேளாண்மை சார்ந்த இன்றியமையாதப் பல செய்திகளை வெளிக்கொணர்வதே இக்கட்டுரையின் பணியாகும்.

நீர் மேலாண்மை

உலக உயிர்கள் உயிர்த்திருப்பதற்கு ஆதாரம் நீர். அது நமக்குப் பல வகைகளில் பயனளிக்கிறது. தாவரங்கள் மற்றும் விவசாயப்பொருள்கள் வளர்வதற்கு, தாகம் தணிப்பதற்கு, தங்கும் வீடுகள் அமைப்பதற்கு என்று நீர் மனிதனோடு இரண்டற கலந்துள்ளது. மாதம் மும்மாரி பொழிந்தது அந்த காலம். ஆனால் இன்று மழை நீரை வீணாக்காமல் சேமித்து வைத்தால் மட்டுமே பின்வரும் காலங்களில் பயன்படுத்த முடியும். மழை பெய்யும் பொழுது, அவற்றை வாங்கிக் கொண்டு உயிர் வாழ்கின்ற புன்செய் நிலங்களும், ஆண்டு முழுவதும் நீரை உறிஞ்சி வாழும் நன்செய் நிலங்களும் நிறைந்தது இந்த பூமி, நெல், கரும்பு, வாழை போன்ற பயிர்கள் நன்செய் நிலத்தில் வளரக்கூடியவை. எனவே அவற்றிற்கு வற்றாத நீர் தேவை. "பரந்துபட்டு வேளாண்மை செய்ய வேண்டுமாயின் நீரை சேமிக்க வேண்டும். அதற்காக பல்வேறு அமைப்புகளை உருவாக்கினர். தாங்கல், கேணி, பல்வலம், படு, பட்டம், மடு, உவளகம், பண்ணை, வாவி, வட்டம், தடம், கயம், பயம், தடாகம், குளம், குட்டம், இடங்கு, சூழி, அலந்தை, குண்டம், பங்கம், இலஞ்சி, கோட்டம், பொய்கை, ஏல்வை, ஓடை, ஏரி, கண்மாய், ஊறு என்று 30க்கும் மேற்பட்ட அமைப்புகள் இருந்துள்ளன"[1] "அப்புறம் சொல்ல மறந்துட்டபேட முக்கியமா குளத்தில தாமரை, அல்லி இதுக, மீனுங்க இதெல்லாம் காயப்படாமல் படியில இற"[2] மேலும், "எல்லாத்தையும் நம்மவூர் ஏரியில கொண்டு குளிப்பாட்டிக் கொண்டு வாங்கடான்னு அண்ணாமலை ஒரு அதட்டல் பெரியவன் அருணாச்சலம்

தம்பிகள கூட்டிண்டு தம்புள்ள ஆளுக்காரனுங்க எல்லோரையும் கூட்டிண்டு பெரிய ஏரி நல்லதண்ணி மழை பெஞ்சு தேங்கிக் கிடக்கு இதுக எல்லாத்தையும் நிலை தண்ணியில நிக்கவச்சி குளிப்பாட்டி வாங்கடான்னு"[3] இப்புதினத்தில் கூறுவதிலிருந்து நீர் மேலாண்மையின் முக்கிய அங்கமான ஏரி, குளம் பற்றி அறிய முடிகிறது. புதினத்தின் முக்கிய கதாபாத்திரமான சிவன்பிள்ளை சோர்ந்து போவதை குறிப்பிட வந்த எழுத்தாளர் இயற்கையின் வறட்சியையும் குறிப்பிட்டு பேசுகிறார். அதில் இனைற்றின் வறட்சி வேளாண் சமூகத்துக்கு தரும் மனச்சோர்வைப் பார்க்க முடிகிறது. "இச்சூழலில் இயற்கையும் சதி செய்ய தான் சார்ந்த உறவுகளும் சதி செய்ய ஏற்கனவே உள்ள வயல்வெளி இணறும் சதி செய்ய அற்றகுளத்து அறு நீர்ப்பறவையாக துவண்டுபோனான். இச்சூழலில் தான் தன் தம்பி புலவர் சபாபதி உதவியால் தன் வயலில் சனிமூலையில் ஒரு இணறு தோண்ட கங்கையானவள் கைகொடுத்தாள். நீரின்றி அமையாது உலகு என்பதைப் போல நீர் ஆதாரம் கிடைத்தவுடன் தன் மனைவி யமுனாவே கங்காவாக தமக்கு கிடைத்திருப்பதாக மகிழ்ந்தான் சிவன்பிள்ளை"[4]

வேளாண் சமூக மக்கள் வேளாண்மை செய்வதில் மிகுந்த ஆர்வம் கொண்டிருந்ததால் அதற்கு தேவையான [illegible]

பன்னோக்குப் பார்வையில் தமிழ் இலக்கியங்கள்

(தேசியக் கருத்தரங்க ஆய்வுக்கோவை)

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ஏப்ரல் 28, 2023

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அறிமுகம்

சங்க காலத்தில் பெண்கள் கல்வி அறிவு பெற்றது மட்டுமல்லாமல் புலவர்களாயும் இருந்திருக்கின்றனர் என்பதை சங்க இலக்கியத்தினை காணும் போது அறியமுடிகிறது. தற்காலத்தைக் காட்டிலும் ஆளுமையும் அஞ்சா நெஞ்சம் கொண்டவர்களாய் பெண்கள் இருந்துள்ளனர். சங்க இலக்கியத்தில் நற்றிணை, குறுந்தொகை, அகநானூறு, புறநானூறு, பதிற்றுப்பத்து ஆகிய எட்டுத்தொகை நூல்களிலும் பத்துப்பாட்டில் பொருநாற்றுப் படையிலும் பெண்பாற்புலவர்கள் இலக்கியத்தைப் படைத்துள்ளனர். பெண்பாற் புலவர்களுள் சங்க இலக்கியத்தில் ஔவையார் பெரும் ஆளுமை பொருந்தியவரும் அதிக பாடல்களைப் பாடியவரும் ஆவார். சங்க கால ஆண்பாற் புலவர்களின் எண்ணிக்கை 473, பெண்பாற்புலவர்கள் 40 புலவர்கள் ஆவர். ஆக சங்க காலத்து புலவர்களில் பத்து சதவீதம் பெண்பாற்புலவர்கள். பொதுவாக கவிஞர் என்றாலே ஆளுமை பொருந்தியவர்கள் என்றே சொல்லலாம். அவற்றிற்கு மேலாக தமிழே உயிர்மூச்சாக வாழ்ந்த தமிழ் மக்களும் பெரும் ஆளுமை பொருந்தியவர்களாக காணப்பட்டனர். ஓர் அரசனை குறித்து பாடுவதற்கு கூட ஆளுமை வேண்டும் அத்தகைய ஆளுமை சங்ககால பெண்பாற் புலவர்களுக்கு இருந்திருக்கிறது. பெண்பாற் புலவர்கள் அரசனை புகழ்ந்து பாடியும் வேந்தனையே விமர்சித்தும் இருந்திருக்கின்றனர் என்பதற்கு வெண்ணிக் குயத்தியார் சான்றாகும். ஒரு சங்க இலக்கியப்பாடலைப் பாடிய வெண்ணிக் குயத்தியார் ஆளுமையைக் எடுத்துக்காட்டி தற்கால பெண்ணியத்தைக் காட்டுதும் சங்க கால பெண்களின் நிலை உயர்ந்திருந்தது என்பதை எடுத்துக்காட்டி விளக்குவதே இவ்வாய்வு கட்டுரையின் நோக்கமாகும்.

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தேசியக் கருத்தரங்கம்

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திரு/திருமதி/முனைவர் து. அருண்பாண்டியன், உதவிப் பேராசிரியர், தமிழ்த்துறை

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Laser based study of the variation of refractive index of liquid solutions with the concentration

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Abstract: Refractive index knowledge is an important parameter, when physical properties of liquids are investigated. A simple, reliable method of measuring refractive index of the liquid is by measurement of the angle of minimum deviation produced by a laser beam that passes through a liquid contained in a hollow prism made of transparent glass. This technique was used to study the variation of refractive index of liquid solutions with the concentration using He-Ne laser of 632.8 nm. The refractive indices of aniline, carbon tetra chloride carbon di sulphide and ethylene glycol solutions, for the range of density varying from pure form to saturated conditions and the variations with concentration is presented here. The value of refractive index boosts with the increase in concentration. The graphs interpret the purity of the liquids used in the study.

Keywords: laser, hollow prism, minimum deviation, refractive index, concentration

INTRODUCTION

Refractive index measurements of a substance play a pivotal role in the describing an important part of its interaction with an electromagnetic radiation. Refractive index is the basic optical property of materials. Its precise measurement is often needed in various branches of physics and chemistry [1]. Also the refractive index of a liquid carries important information about its physical properties, including concentration and density, thus making it possible to determine and monitor the composition of the solution. This is important in fundamental research, chemical analysis and medical diagnostics, as well as in the manufacturing and processing of many materials. Thus refractive index measurements have been used as purity check, and can be correlated to a wide range of concentrations which can be used to characterize many different samples in food-beverage, chemical, pharmaceutical industries and applications. Additionally, for some applications, combining refractive index with a density measurement creates a simple yet powerful quality control technique [2,3].

Several techniques and discussion were reported for the measurement of concentration dependence of refractive index of liquids [4,5]. The authors have reported the simple method for the measurement of refractive index of a liquid is the measurement of minimum deviation produced by a light beam that pass through the liquid contained in a equilateral hollow prism made of glass [6,7]. Also it opens up the possibility of analysing small variations in the refractive index of a solution with concentration. In the present work, an experimental technique using He-Ne laser to determine the refractive index of transparent liquid samples, namely, aniline, carbon tetra chloride carbon di sulphide and ethylene glycol solutions has been discussed, using the principle of refraction governed by Snell's law. The study of variation of refractive index with concentration is done and the graphical analysis leading to the quality check of the liquid samples is carried out.

EXPERIMENTAL

The materials selected for study were significant laboratory liquid samples of aniline, carbon tetra chloride carbon di sulphide and ethylene glycol. Standard solution preparation methods were adopted to maintain the homogeneity of the samples. The standard solutions of aniline, carbon tetra chloride carbon di sulphide and ethylene glycol with concentration gradient of step size unity ranging from 100%-90% were prepared. Benzene was used as solvent, for diluting the samples, since all the four samples are organic in nature. The minimum deviation method provides desirable features of high accuracy and effortlessness of calculation as compared to various techniques reported in literature [8,9]. Making use of Snell's law, the angle of minimum deviation is measured to compute the refractive index of liquid solutions.

The angle of deviation is minimum (δ_m) if i_1 and i_2 are equal as shown in Figure 1.

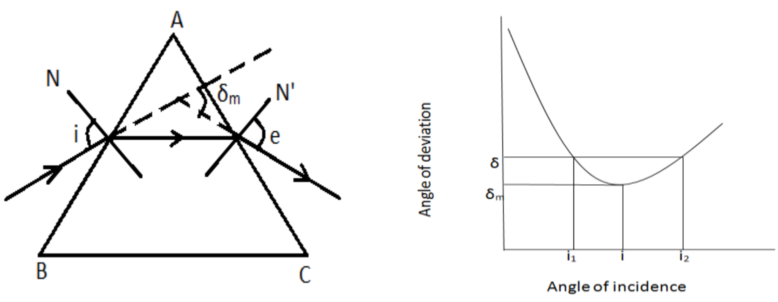

Figure1: Refraction through a prism at the position of minimum deviation

Also in this position, the refracted ray is parallel to the base of the prism. At this position, for a prism with refracting angle (A), refractive index is given by

$$n = \frac{\sin\frac{(A+\delta m)}{2}}{\sin\frac{A}{2}} \quad \ldots(1)$$

Equation (1) is used to compute the refractive index of the solution filled in the hollow prism. To perform the experiment, an equilateral hollow prism and 2 mW He-Ne laser at 632.8 nm was used as the light source. The set up consisted of a laser, a table with a graduated scale parallel to it , a hollow prism, a white screen as shown in the Figure 2.

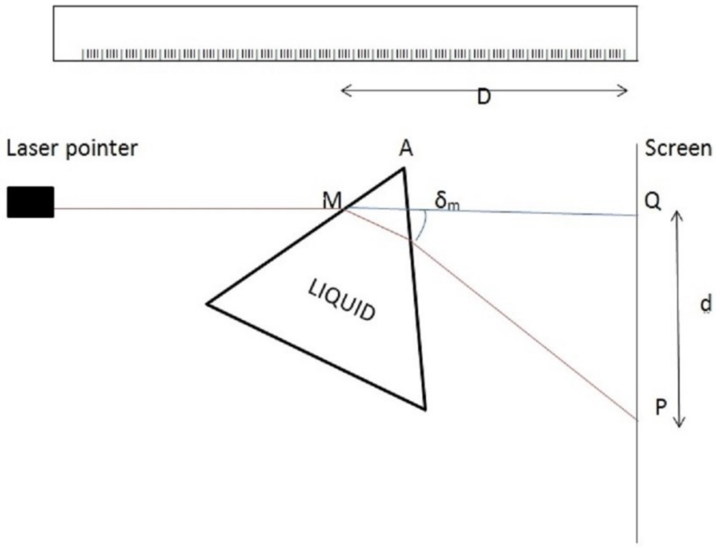

Figure 2: Experimental set up to measure the angle of minimum deviation

To start with, the laser pointer was set in such a way that the lase beam fell perpendicularly on a screen kept nearby. A piece of paper was attached to the screen and the spot on the screen is marked. The laser pointer was fixed and the original spot made by the laser beam was checked and ensured once again. The empty hollow prism was placed in the path of the laser beam and the laser spot was marked on the screen (point Q in Figure 2). When the prism was filled with liquid sample, the laser beam got refracted within the prism (Figure 3 and Figure 4).

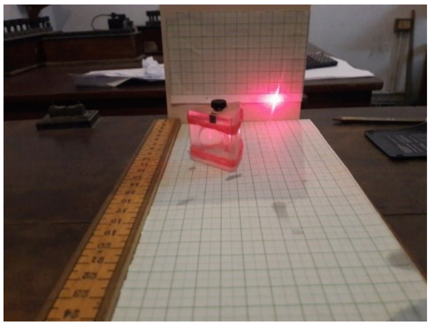

Figure 3 and Figure 4 : Photographs of the experimental set up in the laboratory

The position of minimum deviation was determined by changing the angle of incidence by rotating the prism in that direction where the deviated laser beam spot move towards the undeviated laser spot. The emerging laser beam hits the screen (point P in Figure 2) some distance away from the original spot of the undeviated beam. Thus, the angle of minimum deviation can be measured easily using the formula:

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$\delta_m = \tan^{-1}(d/D)$ … (2)

The refractive indices of all the liquid samples taken were calculated using equation (1). Earlier, the refractive index of doubly distilled water was estimated as 1.333 using this experimental set up and the procedure. This was carried out in order to validate the experimental set up and the procedure adopted.

RESULTS AND DISCUSSION

Using equation (1), the refractive indices of aniline, carbon tetra chloride carbon di sulphide and ethylene glycol solutions of varying concentration were calculated. The variation of refractive index with concentration is plotted for all the four liquid samples.

All the data points on the graphs represent six independent measurements done at a particular concentration of the liquid samples. From the Figures 5-8, it is clear that the variation of refractive index with concentration is a linear relationship [10].

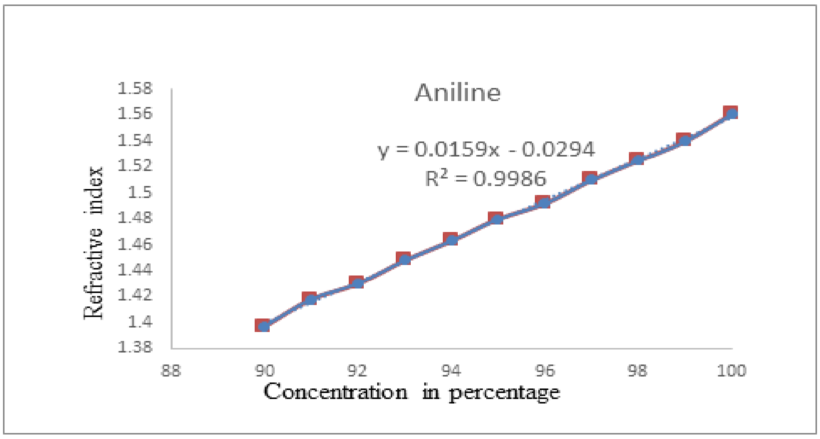

Figure 5: Calibration plot for variation of refractive index with concentration of Aniline

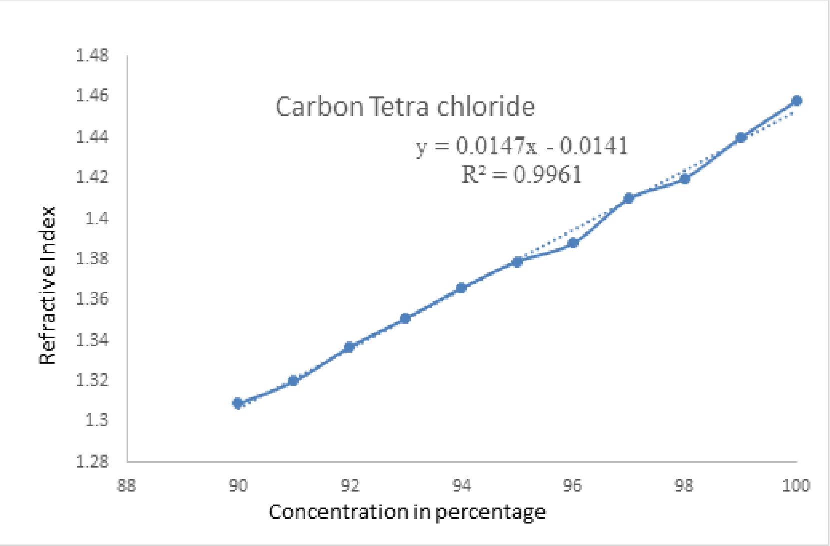

Figure 6: Calibration plot for variation of refractive index with concentration of Carbon tetra chloride

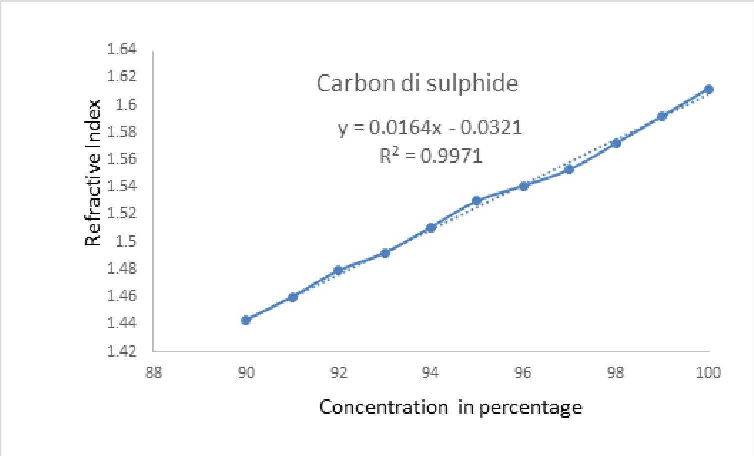

Figure7: Calibration plot for variation of refractive index with concentration of Carbon di sulphide

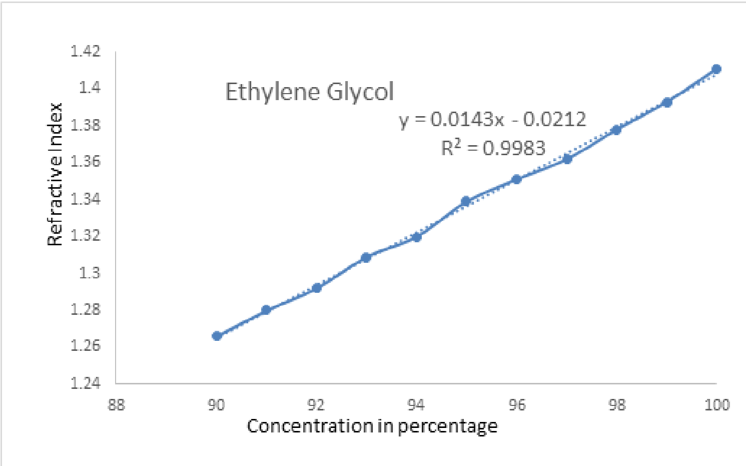

Figure 8: Calibration plot for variation of refractive index with concentration of Ethylene Glycol

For more accuracy, calibration curves were drawn for different concentrations of aniline, carbon tetra chloride carbon di sulphide and ethylene glycol solutions, by plotting refractive index vs concentration using ORIGIN software. Six measurements were carried out separately to determine the refractive index of each liquid sample and at last, the mean relative standard deviation (RSD) of the refractive index is calculated.

The slopes of these calibration curves were obtained by fitting the data in the linear regression functions. The R^2 value in the calibration graphs interpret the highest purity of the samples. The linearity of calibration graphs also reinforces the quality of the liquid samples. Figure 9 shows the plot of refractive index of all the liquid samples in one calibration graph.

Using these calibration curves, we have checked the quality and the purity of the significant laboratory chemicals aniline, carbon tetra chloride, carbon di sulphide and ethylene glycol. Also, as an extension of the work, the concentration of these in industrial chemicals can be determined using the calibration curves.

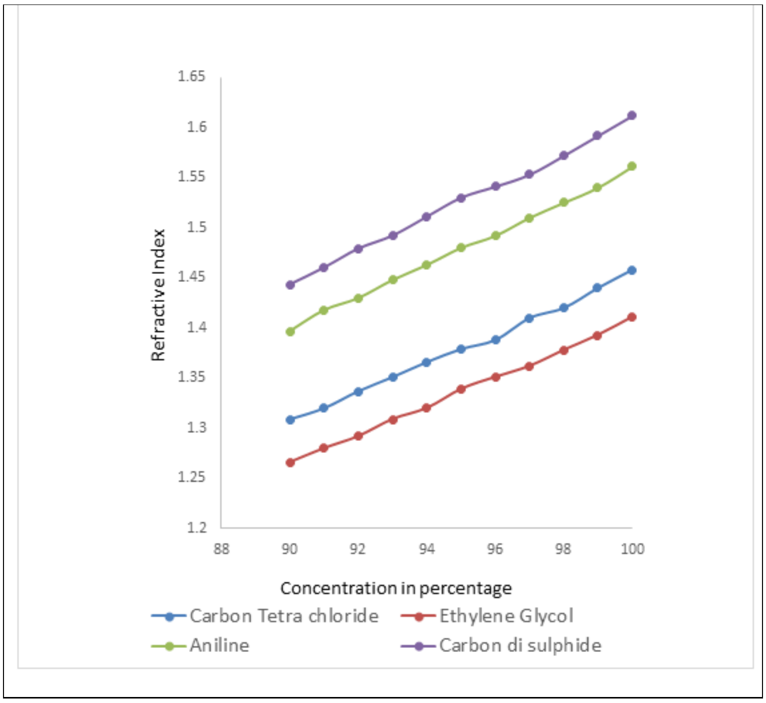

Figure 9: Overlay Calibration plot of all liquid samples

CONCLUSION

In the present work, the study of the variation of refractive index of liquid solutions of aniline, carbon di sulphide, carbon tetra chloride and ethylene glycol with the concentration using He-Ne laser of 632.8 nm was carried out. The refractive indices increase with the increase in concentration of the samples. The interpretations of the calibration curves, reflect the good quality of the samples. In summary, we have demonstrated that this method is quite capable to use as a quality control technique.

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नवदेहली-16

CONTENTS

शोध प्रभा
Shodha Prabha (UGC CARE Journal)

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A COMPARATIVE STUDY ON THE ANALYSIS OF THE SELECTED LARGE CAP MUTUAL FUNDS IN INDIA

S.Bala Murali MBA., UGC – NET., *Assistant Professor,Department of BBA,Dwaraka Doss Goverdhan Doss Vaishnav College,Chennai.*

Kishan Sharma M. *Graduate of BBA, Department of BBA, Dwaraka Doss Goverdhan Doss Vaishnav College,Chennai*

Abstract

Mutual funds are very popular investment vehicles in India. Many middle class people invest in in systematic investment plan under Mutual Funds. In India, 44 AMFI (Association of Mutual Funds in India)-registered fund institutions offer more than 2,500 mutual fund plans collectively. The vast selection of funds can make it difficult for investors to select the optimal scheme. It is necessary to study the fund performance based on various criteria such as expense ratio, NAV, Sharpe Ratio, Treynor Ratio, NAV, Beta, Credit Rating, Risk Vs returns etc; The main objective of this paper is to analyse the performance of selective large cap mutual funds in India. The results were based on secondary data analysis and it is concluded that UTI Mastershare Fund, Kotak Blue-chip Fund and ICICI Prudential Fund have maintained healthy statistical and financial metrics.

Keywords : Mutual funds, Sharpe Ratio, Treynor Ratio, NAV, Beta, Credit Rating, Fund analysis

INTRODUCTION TO THE STUDY:

The mutual fund industry has thrived in the past two decades and has seen many days of successful existence. This is becaus of its minimum risk and maximum returns policy and government initiatives to promote investment in our country. Thi phenomenal growth has attracted many national and international players into the Indian mutual fund industry.

Due to the co-existence of many mutual funds, it becomes difficult for retail investors to analyze every fund or get int the technical data. This paper tries to render the complete information required to fundamentally understand the mutual fund by explaining the structure, types, expenses involved etc.

This paper is to analyze the financial performance of select equity mutual funds with the help of statistical tools like Bet Standard Deviation, Sharpe Ratio, Treynor's Ratio, Jenslon's Alpha etc. This paper considers the data of past 3 years and trie to analyze and determine the best performing mutual funds among the selected funds, and to discover the best portfolio mi for the financial markets. This paper also finds the minute details and notable characteristic of certain parameters and tries give suggestions for its findings.

The researchers have identified research gap in large cap mutual funds, as many research papers have shown that, lar cap gives capital safety but slow growth. The researchers wanted to examine the agreeability of the above, from the practic point of view.

REVIEW OF LITERATURE:

Mayank Malviya & Prateek Khanna. (2020) analyzed the performance of large cap, mid cap and small cap mutual fur and found that large cap funds and small cap funds give higher returns in longer term, but small cap funds do not hav guarantee for future existence. Whereas mid cap funds give higher returns in medium to longer term.

Kalpesh P Prajapati and Mahesh K Patel (2012) used a performance index, risk-return analysis, Treynor's meas Sharpe measure, Jensen's measure, and Fama's measure to examine the performance of Indian mutual funds. The relev data examined was daily closing NAVs from January 1, 2007 to December 31, 2011, and it was concluded that the majo of mutual funds performed well during the study period.

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CONTENTS

Articles

USAGE OF WIRELESS TECHNOLOGY IN WAREHOUSES FOR TRACING GOODS AT LOGISTICS COMPANIES IN KERALA

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ABSTRACT

Wireless systems are becoming more common as wireless technology evolves. Many authors argue that wireless systems can provide advantages and value to organizations, such as increased efficiency and effectiveness. Literature also shows that wireless systems especially wireless suits companies within the logistics industry. However, some authors also highlight disadvantages regarding these solutions, for example insufficient security. The purpose of this report is to analyze the efficiencies and need for wireless technology for organizations regarding usage of wireless systems in a warehouse setting, and the factors that have an influence over this modern system. This purpose is fulfilled with the aid of a quantitative and qualitative study at logistics companies in Kerala, where a number of respondents were interviewed. The empirical study shows that the wireless system at logistics companies provides value to their organizations at both the operational and management level.

Keyword: Warehouse, Wireless technology, efficiency, materials tracing, automation.

INTRODUCTION

The purpose of an effective supply chain is to have complete coordination of the flow of material and information from suppliers to the end users. The supply chain should be able to seamlessly connect supply, planning manufacturing and distribution operations and provide visibility across the supply network, thereby enabling rapid decision making and optimal execution. Supply chain management is the process of improving the flow of material, information and money through the entire supply chain from the supplier to the final customer.

The traditional supply chain which was supply driven has been replaced by a demand driven chain. The increasing competition as a result of globalization, decreasing consumer loyalty and shrinking time to introduce and market the product is forcing companies to become more and more efficient in managing their operation. Currently barcodes are used in supply management system for tracking the flow of material through supply chain. However barcodes have certain limitation such as line - of - sight read capability only, limited information, inability to identify individual produces and inability to be read inside containers. Radio frequency identification (wireless) tags have the capability to address these concerns. Moreover wireless tags can facilitate automatic audit the inventory and prevent pilferage from warehouses and retail outlets, thereby providing accurate inventory.

The purpose of this report is to analyze the efficiencies and need for wireless technology for organizations regarding usage of wireless systems in a warehouse setting, and the factors that have an influence over this modern system.

INDIAN LOGISTICS INDUSTRY AND WIRLESS TECHNOLOGY

Rapid growth in industries such as automobiles, pharmaceuticals, fast-moving consumer goods (FMCG) and retail has significantly increased the demand for movement of consumer and capital goods across the country, from entry ports to manufacturing or distribution locations or from manufacturers and distributors to consumers and exit ports.

The Indian logistics industry was valued at an estimated US$ 385 billion in 2014-15. It has grown at a CAGR of over 16 per cent over the last five years. The industry comprises the following main segments:

- Freight and passenger transportation via road, rail, air and water
- Warehousing and cold-storage

Wireless Communication: The term "wireless" has become a generic and all-encompassing word used to describe communications in which electromagnetic waves or RF (rather than some form of wire) carry a signal over part or the entire communication path. Common examples of wireless equipment in use today include:

- Professional LMR (Land Mobile Radio) and SMR (Specialized Mobile Radio) typically used by business, industrial and Public Safety entities
- Consumer Two Way Radio including FRS (Family Radio Service), GMRS (General Mobile Radio Service)
- Amateur ("Ham") and Citizens Band ("CB") radios
- Consumer and professional Marine VHF radios
- Cellular telephones and pagers: provide connectivity for portable and mobile applications, both personal and business.
- Global Positioning System (GPS): allows drivers of cars and trucks, captains of boats and ships, and pilots of aircraft to ascertain their location anywhere on earth.
- Cordless computer peripherals: the cordless mouse is a common example; keyboards and printers can also be linked to a computer via wireless.
- Cordless telephone sets: these are limited-range devices, not to be confused with cell phones.
- Satellite television: allows viewers in almost any location to select from hundreds of channels.
- Wireless networking (i.e. the various flavors of unlicensed 2.4 GHz Wi-Fi devices) is used to meet a variety of needs.

PROBLEM IDENTIFIED

Logistics companies needed a strategic look at the development of an information management structure that exploits the availability of real – time, accurate information and amend and develop business applications that drive business improvements. That is the reason the company is adopting wireless technology in its warehouse. The employees are required to be trained, educated, and exposed to this new technology.

OBJECTIVES

- To study the usefulness of wireless technology in tracing materials in warehouses at logistics companies.
- To understand the present method of materials tracing adopted in logistics companies' warehouses, Kerala.
- To analyze the functions of both manual and automated systems and to study their individual pros and cons.
- To provide a complete solution to organizations using wireless technology in tracing and handling cargo

REVIEW OF LITERATURE

Shenk (1996) tells us that Soviet policy governing information transmission had left Estonia's communication infrastructure in disarray. Yet, as Dyer-Witheford (1999) shares, only a decade after Soviet occupation finally ended in the Baltic region, the latest communication technologies have allowed Estonia to leapfrog into a new and modern economic paradigm. Kruse (1999) points out that one of these challenges has been how to maximize an antiquated telecommunication infrastructure using scarce resources spread across disparate industries each in desperate need of modernization. Star and Bowker (2002) describes the salient points of infrastructure: that is, that infrastructure is embedded within other structures and technologies; it is transparent in use, not needing to be reinvented at each use and only becoming evident when it breaks down; that infrastructure can be specific or general in scope; it is a natural component of usage to its initiates but must be learned by outsiders; it links with the past in practices of convention and is modified for future expansion, building upon the strengths and weaknesses of the installed base such that infrastructural changes are limited or enhanced by systems already in place. Greenstein, and Rothwell (Star &Bowker, 2002) illustrating how, as technology is adopted by more and more people, the value of that technology for those who already employ it increases even as its value increases for the late adopters.

RESEARCH METHODOLOGY AND SAMPLE SIZE

The research design undertaken for the study is descriptive one. A study, which wants to portray the characteristics of a group or individuals or situation, is known as Descriptive study. Considering the time and financial resources as well as the applications of relevant statistical tools it is thought fit to have an adequate sample size of 125 warehouse executives working across 47 logistics companies in Kerala.

IMPACT OF WIRELESS TECHNOLOGY IN INCREASING INTERNAL EFFICIENCY OF WAREHOUSE FUNCTIONS

Chart 1: WIRELESS TECHNOLOGIES TO LOWER INVENTORY

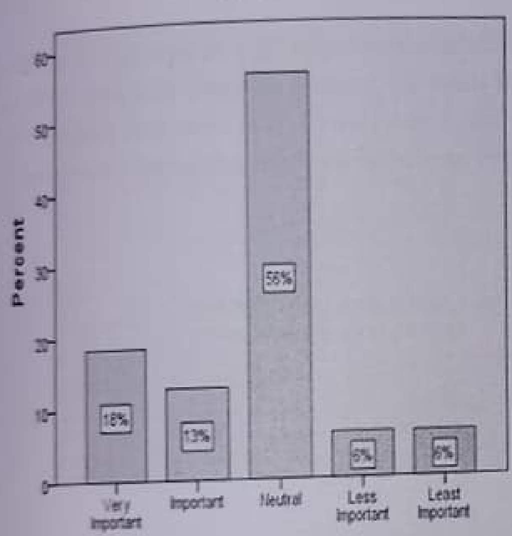


Chart 2: WIRELESS TECHNOLOGY REDUCE OPERATION COST

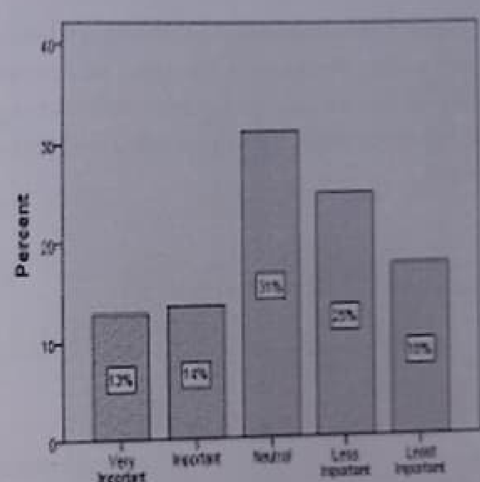


Chart 3: WIRELESS TECHNOLOGY REDUCE ORDER CYCLE

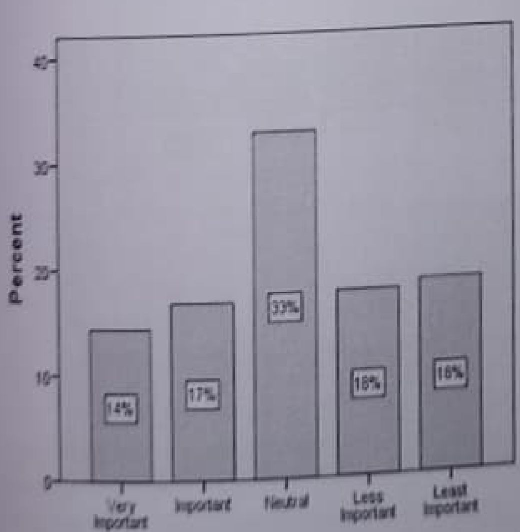
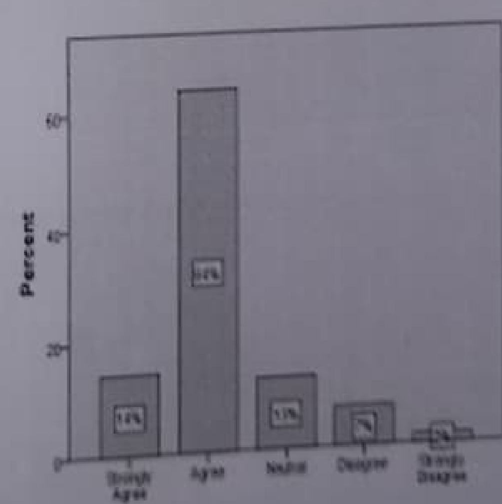


Chart 4: PREVENTION OF PILFERAGE AND COUNTERFEITING STOCK



From above chart 1 it is inferred that 18% respondents expressed wireless technology is very important to lower inventory, 13% said it is important, 56% of the respondents are neutral towards this, 6% of them said it is less important, 6% said it is least important. Chart 2 depicts 13% respondents said wireless Technologies reduces operational cost in supply chain by tracking goods in supply chain, 14% of them said it is important, 31% of the respondents are neutral towards this, 25% said it is less important, 18% said it is least important. Chart 3 represents 14% of warehouse executives strongly agrees wireless Technologies is needed to reduce order cycle, 17% of them said it is important, 33% of the respondents are neutral towards this, 18% said it is less important, 18% said it is least important and from chart 4 it is interpreted that 14% of the respondents strongly agree that adoption of new technology is needed to prevent pilferage and counterfeiting, 64% agree this statement, 13% of them are neutral towards this, 7% of them disagree this, and 2% of them strongly disagree this opinion.

Chart 5 represents 18% of the respondents strongly agree that adoption of new technology is needed to increase asset efficiency, 22% agree this statement, 34% of them are neutral towards this and 15% of them disagree this and the rest 10% of them strongly disagree this. From chart 6 it is clear that majority of the respondents strongly agree that adoption of new technology is needed to increase corporate control over mechanisms.

Chart 5: WIRELESS HELPFUL IN INCREASING ASSET EFFICIENCY

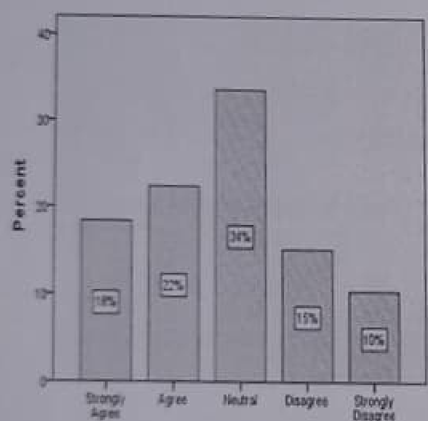


Chart 6: WIRELESS INCREASE CORPORATE CONTROL OVER MECHANISMS

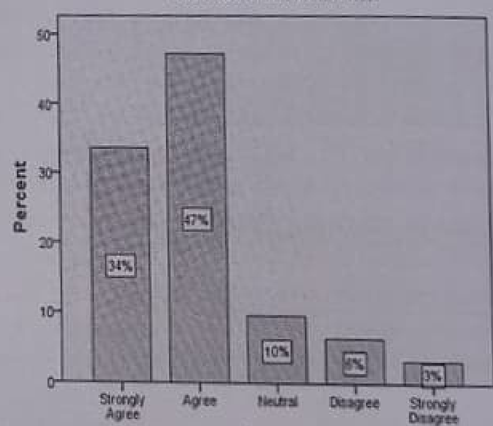
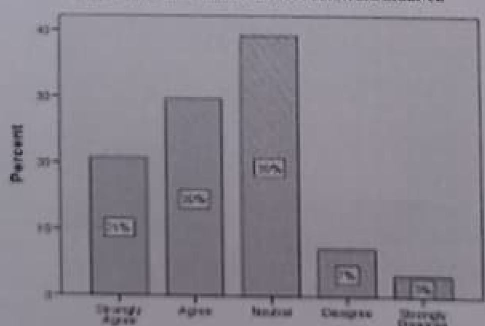


Chart 7: WIRELESS ENHANCE CUSTOMER EXPERIENCE



IMPACT OF WIRELESS TECHNOLOGY ON WAREHOUSE COMPETITIVENESS

Chart 8: WIRELESS TECHNOLOGIES FOR COMPETITIVE ADVANTAGE

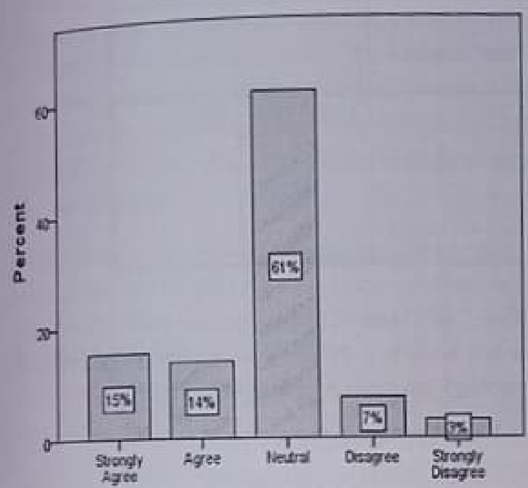


Chart 9: WIRELESS TECHNOLOGY TO INCREASE VISIBILITY

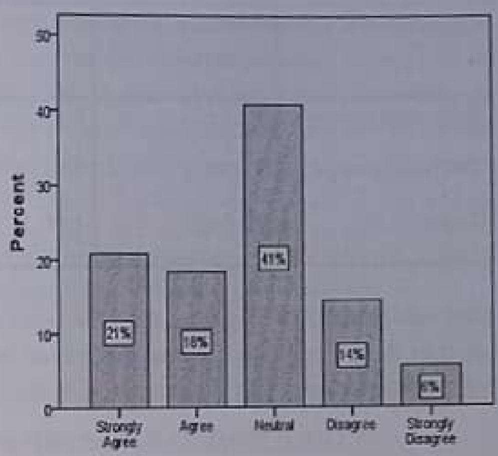
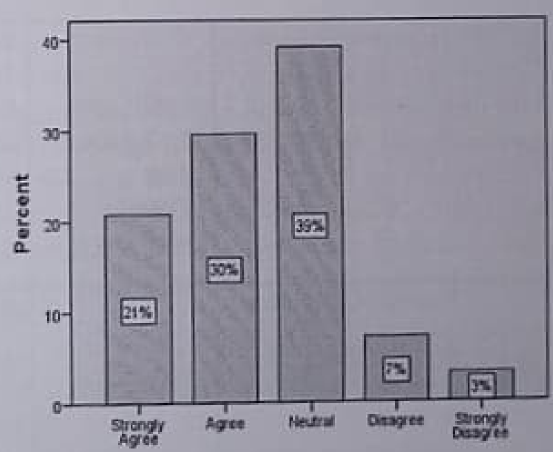


Chart 10: WIRELESS ENHANCE CUSTOMER EXPERIENCE



From above chart 8,9 and 10 it is clear that wireless technology in warehouse management is in second phase of adoption where many respondents has expressed that wireless technology started providing benefits to warehouse but not to the full extend and the reason behind neutral response is also identified in this research i.e., organizational readiness to accept, lack of vendor participation and technology maturity. The full effectiveness can be achieved by proper implementation and control process.

LEVEL OF SATISFACTION WITH THE IMPACT OF WIRELESS TECHNOLOGY ON WAREHOUSE MANAGEMENT OF LOGISTICS COMPANIES

Table 1: ADOPTION OF WIRELESS TECHNOLOGY REDUCES COST

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.163	4	4.291	150.180	.000
Within Groups	3.429	120	.029		
Total	20.592	124			

The calculated value of F 150 is greater than the tabulated value 2.46. Hence, we reject the null hypothesis and conclude that there is no significance difference between the adoption of wireless technology reduces cost and level of satisfaction with the impact of wireless technology on warehouse management.

TABLE 2: RELATIONSHIP BETWEEN THE WIRELESS TECHNOLOGIES TO LOWER INVENTORY AND WIRELESS TECHNOLOGIES FOR COMPETITIVE ADVANTAGE

		WIRELESS TECHNOLOGIES TO LOWER INVENTORY	WIRELESS TECHNOLOGIES FOR COMPETITIVE ADVANTAGE
WIRELESS TECHNOLOGIES TO LOWER INVENTORY	Pearson Correlation	1	.950**
	Sig. (2-tailed)		.000
	N	125	125
WIRELESS TECHNOLOGIES FOR COMPETITIVE ADVANTAGE	Pearson Correlation	.950**	1
	Sig. (2-tailed)	.000	
	N	125	125

Since r 0.950 is positive, there is positive relationship between the wireless technologies to lower inventory and wireless technologies for competitive advantage.

CONCLUSION

The warehouse often forms the heart of an organization's operations. It's the place through which all materials, products and merchandise flow enroute to their final destinations. And among the many industries that rely on warehousing, retailers are leading the growing trend to embrace wireless technologies to transform their warehouse operations and gain ground on the competition. Advances in wireless technology are providing opportunities for companies to think more broadly about how they sell to their customers by extending their sales channels. Mobile technology enables companies to offer customers new methods of access that help streamline processes such as billing, access to product and services information and purchasing.

While Wi-Fi has enabled organizations to significantly increase warehouse efficiencies, it has also made them critically reliant on a technology that can sometimes be complex to troubleshoot.

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DOIs:10.2015/IJIRMF/202302037 --:-- Research Paper / Article / Review

A STUDY ON THE INFLUENCE OF DIGITAL MARKETING ON CONSUMER PURCHASE BEHAVIOUR ON CONSUMER GOODS WITH SPECIAL REFERENCE TO CHENNAI CITY

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Abstract: *Marketing is a business process that entails communicating value to customers, a company, or an organisation. Digital marketing refers to the use of digital tools and processes to deliver value to customers. Digital marketing utilize tools like social media, search engines, and content marketing, which includes the development of videos, blogging posts, email marketing, and online advertising. Traditional marketing relies on tools and platforms like television, magazines, newspapers, billboards, direct mail, and other printed formats. The purpose of this study is to examine the significance and influence of digital marketing on consumer purchasing patterns. Based on 100 respondents to the administered questionnaires, the study's findings suggest that digital marketing is an essential tool in consumer decision making which improves the organizational productivity and also in capturing wider area of the market. Therefore digital marketing can be considered to have a favourable influence on consumer purchasing patterns, allowing traditional markets to disappear from the world of competition.*

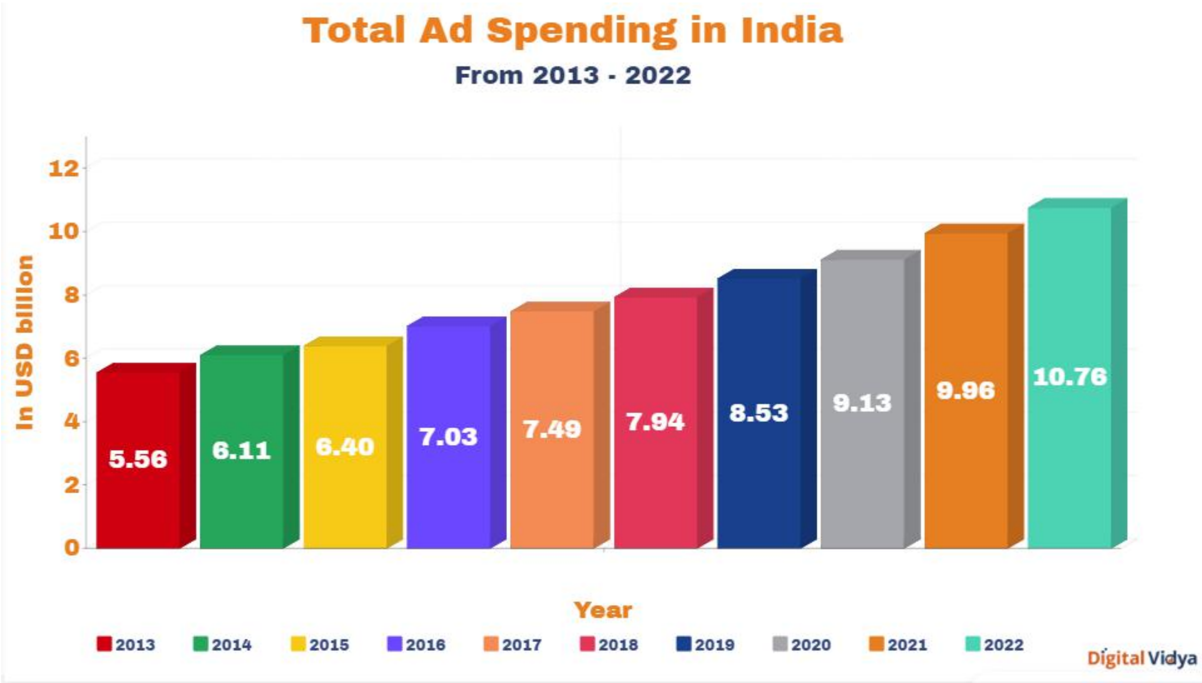
Keywords*: Advertising, Digital marketing, Traditional marketing, Social media marketing, Consumer decision-making.*

1. INTRODUCTION:

Digital marketing is also referred to as online marketing or internet marketing. Digital marketing is crucial for reaching a large audience, but it is also significant for customers because it gives them numerous opportunities to interact with company representatives and individuals who are already using the products they intend to buy. Digital marketing techniques are replacing traditional marketing strategies as time passes on due to advancements in technology and internet usage. A platform for digital marketing enables customers to access a wide range of goods from around the globe as well as within their specific geographic limitations. Therefore, it is believed that there are no geographic limits in the age of digital marketing. Over time, the phrase "digital marketing" has gained a lot of popularity.Digital marketing enables marketers to merchandise their goods and services on online marketplaces in accordance with consumer demand. Customers view digital marketing as a beneficial tool since it enables them to quickly find answers to their questions, receive more precise and accurate information, and solve their problems. The idea of digital marketing has influenced customer purchasing behaviour in addition to benefiting the businesses that have implemented it. In general, the costs of the businesses that are implementing the idea of digital marketing have decreased, which has led to a higher market share being attained.

DIGITAL MARKETING PRESENT SCENARIO IN INDIA

Indian marketing has advanced quickly to keep up with both technological advancements and consumers' continuously changing needs. Digital media has emerged as a formidable rival and is anticipated to overtake television as the primary marketing channel in the coming years, despite the fact that television still dominates marketing strategies. Given the nation's propensity for technology, marketers were prudent to adopt digital techniques quickly, as evidenced by the rising proportion of digital marketing budgets each year. The substantial media expenditures made by the FMCG, e-Commerce, and financial service verticals are also predicted to support the digital media market's expected compound annual growth rate of above 30%. The core of the nation's marketing environment is a sizable digital advertising sector. However, marketing is a more comprehensive process that also includes manufacturing, price, and promotion in addition to advertising.



Source. https://www.digitalvidya.com/blog/growth-of-digital-marketing-industry-in-india/

SIGNIFICANCE OF DIGITAL MARKETING:

Over time, digital marketing has emerged as the most popular. For gathering extensive information and communicating directly with the customers, digital marketing is crucial. Digital marketing promotes goods and services online via any digital platform, including mobile devices. Customers who are satisfied with the results of digital marketing are those whose questions and suggestions about any goods or services are answered. Traditional marketing is less convenient in the digital market than other forms of communication.

Global Reach: Traditional marketing is geographically constrained, and launching an international marketing campaign may be challenging, costly, and time-consuming. However, considering digital marketing takes place online, it has a tremendously wide audience that you may contact. Businesses now have access to a wide range of potential growth prospects thanks to the internet. Any firm has a lot to gain from having visibility and a worldwide reach.

Local Visibility: While having a global audience is undoubtedly a benefit of digital marketing, it also enhances local visibility, which is crucial if your company depends on local customers. Local SEO and locally focused advertising can be helpful for businesses looking to increase footfall.

Less expensive: When compared to online marketing, the expense of marketing a product through a retail outlet is considerable. Users did not contribute to store maintenance in any way. The item is shown in the store as customers place orders based on what they want.

Personalization: For executing the quicker and simpler customer interaction on the digital market, customer needs are efficiently met. Because they make informed purchases, customers are more satisfied with the products thanks to digital marketing.

Effective Targeting: Digital marketing helps you to extract data to determine which audiences would perform best for you and optimise your campaign around them, even if you don't have a clear understanding of your target audience.

Increased Engagement: Digital marketing is by its very nature very engaging. Users can interact with your website by clicking on paid advertisements, sharing blog posts, liking photos, or saving videos. The fact that all of these acts can be measured is the best part.

Analytics and Optimization: Web analytics, which track the effectiveness of digital marketing efforts in real-time, is another significant benefit of digital marketing. This aids in future campaign optimization and expedient error correction. By analysing your digital marketing strategies, you can also identify every traffic source and have complete control over your sales funnels.

INFLUENCE OF DIGITAL MARKETING ON CONSUMER PURCHASE BEHAVIOUR:

Customers are turning into researchers by utilizing the Internet in more practical ways. Users are more knowledgeable, driven, and overloaded with digital content. Every business uses digital channels to sell its goods.

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Customers may check and compare products very easily when making an online purchase. The relationship between a firm and internet influencers has a significant impact on the decision to purchase a specific product. The most accurate method used as a customer's most trusted source of counsel is digital word-of-mouth. Word-of-mouth is spread in the modern digital environment with the aid of consumer reviews, influencer endorsements, etc. Before making a purchase, shoppers ensure that they would research what other brand customers have to say about the product or service in question. Customers are not hesitant to try new things. Recently, consumers have been particularly wary about changing the labels they have been using all along. But things have changed over time. Nowadays, business idea has expanded greatly. They are more receptive than ever to goods and companies with higher standards. Only digital marketing made all of this possible and made it simpler for these new brands to connect with consumers. Customer involvement or engagement is difficult since there are so many options available, and switching is quick. In the end, buyers aren't in the mood to haggle or bargain in any form these days. We anticipate any inquiries or issues being addressed right away. On digital platforms, which have the power to make or damage a company's reputation in a matter of seconds, we openly share their opinions and points of view. Most users quickly trust unfavourable news and criticism, but very few genuinely post positive ratings. However, a lot of rivals take advantage of this by posting critical remarks from fictitious accounts on the websites of their respective businesses. This can be accomplished by using an effective online reputation management (ORM) strategy, where interactions with customers have the potential to transform a poor reputation into a positive one.

2. OBJECTIVES:

The main objective is given as follows:

- To study the awareness of digital marketing in India
- To study the demographic profile of consumers
- To study digital marketing influence on consumers purchase behaviour

3. HYPOTHESIS OF THE STUDY:

H_0: No significant relationship between income and product preference to buy through Digital Platform.

H_1: Significant relationship between income and product preference to buy through Digital Platform.

H_0: No significant difference between Mean Rank of platforms influencing digital marketing towards consumer purchase decision.

H_1: Significant difference between Mean Rank of platforms influencing digital marketing towards Consumer purchase decision.

4. LITERATURE REVIEW:

Service providers and customers can now communicate with one another online rather than in person thanks to the internet. Globally, online shopping has taken over as the preferred way for individuals to buy goods and services. People now prefer to shop online since it is more convenient and secure than going to crowded stores. The market provides for practically all of a person's daily needs and serves people from various social and economic backgrounds. Here are some instances of consumer purchase behaviour surveys and research projects carried out by various people from various nations

CONSUMER PURCHASE DECISION:

Abdul Brosekhan and Muthu Velyautham (2010) conducted a combined research on consumers' buying patterns for home appliances. It makes an effort to examine customer purchasing patterns for particular householdappliances.
Krishna Kumar (2011) conducted research on the purchasing patterns of the growing population with disposable income and their growing interest in electronic devices.
Parikh (2011) discovered that consumer behaviour and behavioural intentions can be used to forecast whether or not consumers will accept innovations like online purchasing. The research conclusively demonstrates that traditional factors like perceived utility (PU) and attitude toward usage (A) remain important determinants of behavioural intentions to use (BI) online purchasing. The study also showed that behavioural intentions to engage in online shopping were significantly influenced by security/privacy concerns.
Singhal and Shekhawat (2012), research on consumer behaviour is influenced by how consumers behave when making purchases. The customers are thought to be the most important component, acting as the buyer, payer, and procurer in this mechanism. The research of purchaser's behaviour is concerned with how people choose to spend their available resources—time, money, and effort—on consumable or usable things.

DIGITAL MARKETING:

Sharma (2002) Internet marketing benefits businesses since it gives them more opportunities to serve customers. It would alter the marketing process and have an impact on the markets, cost models, geographic locations, timing, and level of competition.

Foux's (2006) analysis of social media revealed that they are a more reliable and trustworthy source of information about an organization's products and services than corporate-sponsored communications.

Lages et al. (2008) established the five most essential criteria required for positive word-of-mouth value and customer loyalty. Relationship orientation, relationship commitment, trust, collaboration, and relationship satisfaction are the five criteria.

5. RESEARCH METHODOLOGY:

Modern management researchers are placing a lot of emphasis on digital marketing. Relationships between "Digital Marketing and Consumer Purchase Behaviour" were examined in this study. The use of digital marketing technologies enables customers to keep the business information organised. The businesses keep updating information regarding their products or services. Customers are able to browse the business website, research the products, and make an online purchase. Customers receive detailed information about the goods or services. Consumers make comparisons with similar products. Digital marketing made it possible for customers to make purchases around-the-clock. In digital marketing, prices are open and transparent. The primary information needed to study the influence of digital marketing on various metrics was gathered by questionnaire. 100 respondents provided the primary data that was collected. The respondents are chosen from the Chennai District, Tamil Nadu. Primary data was gathered in organised form via google form or by directly approaching respondents in a survey. 100 participants in the study have made digital purchases of goods or services. Through the use of statistical tools like the chi-square test, the data were analysed and the hypothesis was tested.

Table 1 Research Methodology Table

Research Design	Descriptive
Sampling Technique	Random Sampling
Sample Size	100 respondents
Data Collection	Primary Data:- Questionnaire Secondary Data:- Journals, Books, Internet
Testing of Hypothesis	Chi-square test, Friedman test

Study Area:

The study was carried out in Chennai City, the IT hub of Tamil Nadu. The State of Tamil Nadu has both National and Multinational ventures that can fully represent the study. The national undertakings share similar characteristics with other multinational companies in Chennai. Similarly, the private BPO (Business Process Outsource), Call centers, Data Analysis Centers of Chennai city possesses operating characteristic with multinational competitors employing workforce from all over the country.

Study Population:

The population of the study consisted of Software Professionals, employed in any national or multinational organization, situated in Chennai City. These sectors were the targeted population. Quantitative method is applied in this study to statistically test the causal relationship among the identified variables through hypothesis testing. The research seeks to identify the key determinants of moonlighting and also the individual factors on Job satisfaction, Organizational growth and Employees intentions. The data were gathered using structured questionnaires disseminated online during the months of May 2022 to August 2022 (through Google-Forms survey method) to employees at **17 Software facilities** in Chennai City. A total of **159** duly filled in survey forms were finally included in the study. The collected data were analyzed and computed using SPSS version 21.

Validity and reliability of data:

Job Satisfaction and Organizational growth were measured using the standardized scales. The Organizational growth Mowday et al. (1979) is analyzed using the Organizational Growth Questionnaire formulated on likert scale. Employees intentions are adapted from its four items for the present study, possible representation of emotions that employees might go through or feel with the organization for which they are employed with. The reliability test as reported by the findings is 0.75. Job Satisfaction scale is adapted originally formulated by Rothe and Brayfield (1951) and the same is adapted for this study. Job Satisfaction Questionnaire contains seven items whose scoring labels from ‘strongly agree’ to ‘strongly disagree’ on the likert scale. The findings reported 0.87 reliability of the scale. Sachdeva and Seema (2020) referred for then Moonlighting scaling, has been adapted. This was achieved after interviewing fifteen volunteer of Information Technology sector who showed inters to moonlight/moonlighting. The finds of the reliability and validity test placed before the final data collection& analysis for the study. The scale comprises of 18 items on likert scale. The reliability value for Moonlighting was 0.890 on the scale.

6. ANALYSIS AND INTERPRETATION:

The purpose of this research is to examine how "customer purchase behaviour" for consumer goods is influenced by digital marketing. The results are analysed with data collected from survey respondents. This chapter discusses the respondents' demographics, the many aspects of consumer purchase behaviour, Digital Marketing, and their interactions. Based on their responses, the table below is interpreted.

Table 2 Response from Online Buyers

	Category	No. of Respondents	Percentage
Gender	Male	61	61
	Female	39	39
Age	less than 25 years	23	23
	25 - 35 years	41	41
	35 - 45 years	28	28
	Above 45 years	8	8
Profession	Pvt. Employee	29	29
	Govt. employee	12	12
	Business	26	26
	Student	16	16
	Others	17	17
Monthly Income/ Family Income	Below 15000	18	18
	15001-30000	35	35
	30001-50000	30	30
	Above 50000	17	17
Frequency of online purchase	less than 3 purchases	21	21
	3 - 6 purchases	42	42
	7- 9 purchases	31	31
	10 or more purchases	6	6
Reasons for online shopping	Doorstep Delivery	8	8
	Wide Variety of Products	28	28
	Various Methods of Payments	22	22
	Lower prices	26	26
	Others	16	16
Influence of digital marketing in	Yes	93	93

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consumer purchase decision	No	7	7
Digital platforms that influence consumer to purchase	Social Media	41	41
	SEO & SEM	13	13
	Mobile Advertising	25	25
	Websites	12	12
	Emails	9	9
Product preferred to buy through digital channel	Convenience Goods	23	23
	Shopping Goods	43	43
	Specialty Goods	34	34
Satisfaction in purchase through digital channel	Strongly Agree	23	23
	Agree	37	37
	Neutral	28	28
	Disagree	7	7
	Strongly Disagree	5	5
From which digital channel you purchased products	Social Media	39	39
	Websites	31	31
	Email	7	7
	Advertising	19	19
	Others	4	4
Availability of information about the product online	Excellent	21	21
	Good	43	43
	Average	27	27
	Poor	9	9

In the current market, digital marketing has promising potential. Customers are satisfied after spending money on goods which are digitally marketed. People use the secure online payment method. 61% of online shoppers are men, which is a high proportion. 100% of respondents were aware of online buying. The range of respondents' monthly income (35%), is from Rs. 15,001 to Rs. 30,000. A sizable portion of respondents, 28%, believe that there is a broad selection of things available for purchase online. The remaining respondents agree that there is a wide range of affordable products and payment options. According to 43% of respondents, it is easy to find product information online. In a given month, 42% of the respondents make 3–6 goods purchases.

Relationship between monthly income and product preference to buy through Digital Channel using Chi Square Test:

1. Table 3 Relationship between income and product preferred to buy through digital platform

	Convenience goods	Shopping Goods	Specialty Goods	***Row Totals***
Below 15000	5 (4.14) [0.18]	9 (7.74) [0.21]	4 (6.12) [0.73]	18
15001-30000	7 (8.05) [0.14]	14 (15.05) [0.07]	14 (11.90) [0.37]	35
30001-50000	9 (6.90) [0.64]	15 (12.90) [0.34]	6 (10.20) [1.73]	30
Above 50000	2 (3.91) [0.93]	5 (7.31) [0.73]	10 (5.78) [3.08]	17
Column Totals	23	43	34	**100 (Grand Total)**

The data are interpreted from above table 3.
Based on the calculation, the chi-square statistic determined is 9.1534. The p-value given is 0.165134. The result is significant at $p < 0.05$ with minimum significance level. The null hypothesis is accepted and there is no relationship between monthly income and product preference to purchase through the digital channel.

Difference between Mean Rank of platforms influencing digital marketing towards consumer purchase decision.
Table 4 Friedman test for significant difference between Mean Rank of platforms influencing digital marketing towards consumer purchase decision.

Factors	Mean Rank	Sum of Rank (R)	R^2	Chi-Square value	Table value
Social Media	3.51	210.6	44352.36	26.2944	9.48
Websites	2.91	174.6	30485.16		
Mobile Advertising	3.43	205.8	42353.64		
E-mails	2.20	132	17424		
SEO & SEM	2.95	177	31329		
Total			165944.16		

2. Friedman's test is
3. $\chi 2 = \dfrac{12\sum R^2}{N(K)(K+1)} - 3N(K+1)$
4. $= \dfrac{12(165944.16)}{60(5)(6)} - 3(60)(6)$
5. = 26.2944
6. Hence calculated value of $\chi 2$ = 25.854
7. Table value of $\chi 2$ $= \chi^2_{k-1, 5\%}$
8. $= \chi^2_{4, 5\%}$
9. = 9.48

The data are interpreted from above table 4.
It is calculated value of Chi-square is greater than table value of Chi-square, the null hypothesis is rejected at 5% level of significance. It is concluded that there is a significant difference between Mean Rank of platforms influencing digital marketing towards consumer purchase decision. Mean level of Social Media Platforms is more when compared with other factors influencing digital marketing.

7. CONCLUSION:

The marketer must understand the distinctions between the various marketing theories in order to select the most effective implementation tools. Digital marketing has evolved as one of the most influential business models, contributing significantly to a company's success. Social media, on the other hand, is the new way to communicate with everyone; it is a component of digital marketing and helps to transform the way new customers are found and items are promoted in the current competitive market.

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A Study on the Effectiveness of Human Resource Management System (HRMS) in an organization from the perspective of the HR Department/Employees

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ABSTRACT:

The paper is a study of the effectiveness of the Human Resource Management System (HRMS) in an organization and how the employees benefit from this system. One of the major development opportunities that the digital age presents to businesses is the introduction of HRMS. HRMS is an advancement in the HRM discipline. The internet will be used to facilitate HRMS's operational procedures. HRMScan perform human tasks utilizing software via a variety of apps and the internet. HRM will become more effective and pertinent as a result of digitization. HRM will fall well short of what the organization needs without digital transformation. The data used for the research are secondary. This paper will aidin the study of the benefits and functions of the HRMS in an organization.

INTRODUCTION:

An HRMS, or human resource management system, is a collection of software programs that support and automate HR procedures across the whole employee lifecycle, including payroll, timekeeping, taxes, employee development, performance reviews, compliance, and more.An HRMS enables businesses to manage a variety of people-related tasks in one location, improving productivity and empowering business executives to comprehend their workforce and make better decisions about it. Ultimately, an HRMS can result in happier, more productive employees who work harder for the company.

An HRMS is installed on an application server that offers all authorized staff members local and/or remote access. An HRMS relies on HR management software as a component of a stand-alone or enterprise resource planning (ERP) system, which is integrated with HR-specific business processes and features that enable HR staff members to carry out routine tasks like employee records management, payroll, attendance management, and performance evaluations. Each element may be included in the core HRMS or added as additional software modules or components.An HRMS is typically connected and integrated with other supporting systems including time tracking, attendance, finance/accounts, and management.

AIM OF THE STUDY:

The study aims to measure the employees' satisfaction in using the HRMS and to analyze the efficiency and effectiveness of the HRMS in the organization.

REVIEW OF LITERATURE:

HR department forms the backbone of an organization as it is responsible for selecting the right talent required for the organization. It also takes the responsibility of managing the employee lifecycle of all its employees right from hire to retirement.

In the 1970s, as companies looked to automate the management of their people, payroll became the first HRMS function to be computerized but still many of the works required manual work. Only in the 2000s, with the widespread adoption of direct deposit and employee self-service, the payroll process became wholly electronic.

The rise of the internet in the 1990s brought the benefits of automation to even more HR processes. The online job posting, payroll system, etc., were managed online, enhancing the functions. By the 2010s, many technological developments have helped to maintain employee records and managed each function throughout the employee lifecycle.

HRMS falls under Digital Human Resource Management (DHRM). The growth of the IT department has prompted integration between the HR and IT divisions, resulting in an HRMS that can be accessed online. This improves the ability to compete in the market and makes it simpler to find the right talent.

PEOPLESTRONG- HRMS TOOL

PeopleStrong is an HRMS tool that is used by the organization to manage all its functions and processes. It provides various benefits such as Talent Acquisition, Talent Planning, Human Capital Management, Payroll, and Workforce Management, Onboarding, Leaves and Attendance, Learning and Developing, Training, Performance Appraisal, etc. the company adopted this software as it is easy to handle and has a user-friendly interface.PeopleStrong is also accessible on an Android/iOS device. The software can be taken into the pockets of the employees. The interface is also friendly, the employees can handle the software on their own and do not require a third party's involvement. The software provides all its features on a single screen. An intuitive interface is built for the employees for better usage. It also comes with a virtual assistant 'Jinie' to help the employees. It is voice-enabled and can answer multiple employee queries from leave balance to payroll process to course suggestions and so on. It has a built-in collaboration which provides a new way of working. It creates workgroups, indicates if any document is pending authorization, etc.

Therefore, PeopleStrong comes with lots of benefits and functions for the HR department. The AI-powered application is capable of handling all its functions and at the same time satisfies the employees of other departments and the organization as a whole.

1. STATEMENT OF PROBLEM:

If HRMS is effective in performing the HR functions? If employees are satisfied with using the HRMS tool in their day-to-day activities?

2. FINDINGS:

Effectiveness of HRMS

The well-known functions of the HR department are performance appraisal, talent acquisition, maintenance of employee lifecycle, payroll, onboarding, training and development, workforce planning, succession planning, etc. These functions are now done quickly and effectively with the help of HRMS. The software is built in such a way that people with minimum technological knowledge can easily work with it. It provides a step-by-step process and indicates a process's completion level. It is also suitable for employees who work from home and the company can keep track of their performances online.

In the case of performance appraisal, the employees get to self-evaluate themselves against their targets or goals set by them or the company. This helps them to realize their competence and be recognized by their superiors. The HRMS measures the performance of employees accurately and ensures they get the required reward based on their performance. HRMS is also helpful in talent acquisition as it identifies the candidates suitable for the job and provides an analysis based on which the managers can make a decision. It also helps to shortlist only those candidates who are eligible for the role. The onboarding process can be done with the help of this tool and it eliminates the need for an employee to be physically present during the onboarding process. The payroll process has been simplified and has reduced the manual workload. The software also provides the latest online training sessions, certificate courses required to boost employee profiles, and many more. It also helps in workforce planning and reduces the time taken to sit and manually make future organization predictions. The software is built in such a way that it can aid in the succession planning of the organization. It provides ranks or scores to all the employees based on their performance and position and identifies the next best employee to take up the job. One of the most important functions of HR is to maintain the employee lifecycle. It has to keep track of each employee and oversee their performances, their promotions, appraisals, grievances, attendance, leaves, employee engagement, etc., which can all be done with the help of HRMS. Along with the functions of HR, the software also provides security in maintaining employee information and providing role-based access.

Satisfaction of Employees in using the HRMS

The employees' satisfaction depends on the type of work they do, the relationship they build in the organization, growth, and the performance of any functions. The HRMS tool assists to complete any function with ease and with less time. It has reduced the manual workload by a lot. It is also user-friendly. The HRMS also provides other benefits such as high security by protecting employee details and personal files of the employees. It also provides role-based access to all professionals. It also engages in employee engagement activities such as notifying birthdays, completing 5 years or 10 years, sharing new achievements of employees, interacting with employees of other departments, performing HR audits, receiving feedback from superiors on the performances of the employees, training given to the employees to use the software, etc.

3. SUGGESTIONS

- Onboarding is the process of integrating a new employee into an organization and familiarizing them with the company's process, function, team, etc. It requires a personal touch. Though the online mode may seem convenient, the new employees need to be welcomed the traditional way.
- Employee satisfaction is very important for an organization. Weekly feedback from employees must be collected to know about their work satisfaction with ratings or a short descriptive answer so that the organization can come up with strategies to improve their satisfaction level.
- Online feedback is preferred these days. However, in an organization where everything is done online, the purpose of giving feedback is lost. This is because there is a lack of personal interaction. The employer can only measure the performance of an employee when they work in the office otherwise, the only means of evaluation is dependent on the software which might lack some features. The software can thus be enhanced with the feature of live performance tracking of the employees so that the feedbacks given are satisfying.
- Training is a crucial part of an employee. Though the HRMS is user-friendly training on how the software works, its functions, etc., must be provided to the new employees.

CONCLUSION

Everyone was obliged to stay inside when the pandemic struck. All of the groups had to suspend their operations. HR software proved useful later when the concept of work-from-home was rendered temporary for some firms and permanent for others. There were no other means to monitor an employee's work outside Zoom meetings. This situation was changed through HR software. The firm discovered a technique to keep track of its employees' performance digitally after several functions were made digital. With the HRMS tool, the firm can now efficiently monitor an employee's performance, provide training, conduct performance appraisals, store information, do audits, and so on while also satisfying the employees. Thus, the introduction of HRMS into a company has proven to be beneficial, and while some areas still require further development, the HRMS software benefits both employees and the organization and is ideal for both work-from-home and office circumstances.

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HUMAN TRAFFICKING: PARLLELING BETWEEN OBSERVATION AND EXPERIENCE

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Abstract

Literature is a reflection of society, is a fact that has been widely acknowledged. Literature reflects the society's good values and its ills. In its corrective function, literature mirrors the ills of the society with the view of making the society realize its mistake and make amends. This paper discusses about one such major social problem which is reflected in literature through its various forms. This paper looks at one of the most prevailing contemporary issue, modern day slavery or trafficking through the eyes of literature. The main objective of this paper is to explore how the issue of human trafficking (modern slavery) is represented in two different genres of literature. There are many forms of literature such as prose, poetry, novels, memoirs etc. The most realistic forms of literature are the novels. The stories in the novels deal which particularly with the problem of social, economic and political life of a country are bound to reflect contemporary problems and issue. This paper will discuss the representation of human trafficking through the novel *Anybody's daughter* by Pamela Samuels young in contrast with the Memoir by Somaly Mam *The road of lost innocence* it is a true story of a Cambodian heroine who fled sexual slavery and now devotes her life to rescuing others. This paper compare and contrast how human trafficking is expressed in these two forms of literature.

Key words: Trafficking, Society, Social problems.

Representation is general form of recording, educating and communicating to people about the existing issue, problem and giving them a detailed picture of the particular thing. Literature and media have always played a major role in representation. Human trafficking is a threat to the contemporary society, but it's so sad that only few people know about this existing threat. The society or people get a better understanding of a particular issue or theme only through the representation in literature and media. Literature is a broad term that refers to almost any widely available written work that centres on a common theme. Literary works are broken down further into several other types of literature depending on the degree to which they mimic reality, as well as their structural and thematic characteristics

Novel is one particular form of literature which mediates the issue to the society. This genre of literature reflects or represent about women trafficking through author's observation. Realistic fiction depicts stories that occur in real life. These characters exist in a setting that readers can realistically envision in the world. Good realistic fiction features a conflict that could exist in the real world. The first half of the paper will deal with one of such realistic fiction *Anybody's daughter* by Pamela Samuels Young which deal with the issue of human trafficking. This particular novel deals with trafficking of an young girl who is barely 13 years old, through her face book unknown friend. The whole novel speaks about how the chain of trafficking takes place with in America, The internal trauma of trafficked girls, and how deep it has been rooted in our society. It also focuses about how the pull factor is major responsible for women trafficking.

Another recent form is memoir. A memoir is a collection of memories that an individual writes about an events, both public and private that took place in his life. The claims made in the work are understood to be factual. Memoir has been historically defined as a subcategory of biography or autobiography since the late 20th century. A biography or autobiography tells "a story of a life" but memoir often tells "a story from a life". This paper compares memoir by Somaly Mam *The road of lost innocence*, true story of a Cambodian heroine who fled sexual slavery and now devotes her life to rescuing others.

This paper compare and contrast about the representation of human trafficking in American novel *Anybody's Daughter* by Pamela Samuels Young with a memoir by Somaly Mam *The Road of Lost Innocence*. Novel is one particular form of literature which mediates the issue to the society. This genre of literature reflects or represent about women trafficking through author's observation. Human trafficking is a global problem that exist throughout, including developed, developing and under developed country. This first half of the paper conducts a close analysis of representation of women trafficking in developed country (America) through the novel *Anybody's Daughter* by Pamela Samuels Young.

This story is based on real life horrors faced by thousands of girls, award-winning author Pamela takes readers deep inside the disturbing world of child sex trafficking in a fast-paced thriller that educates as much as it entertains. Thirteen-year-old Brianna Walker is ecstatic. She's about to sneak off to meet her first real boyfriend—a boyfriend she met on Face book. But Brianna is in for a horrifying surprise because her boyfriend doesn't exist. Instead, Brianna unwittingly becomes the captive of a ring of drug dealers- turned-human traffickers who prey on lonely girls from dysfunctional homes. But they've made a big mistake in targeting Brianna because she doesn't meet either of those criteria.

Brianna's Uncle Dre, a man with his own criminal past, is determined to find the niece who is more like a daughter to him. Rather than sit back and rely on police to bring Brianna home, Dre scours the dark corners of Los Angeles looking for her. He is stunned to learn that the trafficking of children isn't just happening in other countries. It's occurring at epidemic levels right in own backyard.

Representation in novel can be analysed through the narrative technique and style used by the author to picture the issues of society. This novel *Anybody's Daughter* has been written in the form of thriller. Even though it is in the form of thriller novel it has some characteristics of drama as well because its starts with prologue and ends with epilogue. On the whole the novel has been divided into 85 chapters. Each chapter starts with note of timing and count of days. The whole story revolves around the particular issue of trafficking but one could also see that the author has added some thrilling elements for the reader's entertainment. So this novel educates as well as it entertains. It takes the reader into the book and makes us to travel with the character named Dre.

Representation is general form of recording, educating and communicating to people about the existing issue or a problem in the society. Representation varies according to the form in which it's used. The other half of the paper attempts to show how women trafficking are represented through memoir, *the lost innocence* by Somaly Mam.

The road of lost innocence is a memoir which speaks about entire life of Somaly Mam right from her known age to till date of her succeeding foundation. In Cambodia, girls as young as five are sold into prostitution every day. Somaly Mam was one such girl. Abandoned as a baby, Somaly was looked after by her grandmother until she disappeared. She was then taken into the care of a man she called 'grandfather', but was treated no better than an unpaid servant. Raped at twelve and forced to marry at fifteen, Somaly was then sold to a brothel. After years of abuse she managed to escape, and went on to co-found AFESIP to combat the sexual trafficking of young girls and women.

This paper focuses on representation of women trafficking through the memoir *the road of lost innocence*. This book mainly focuses on trafficking in Cambodia during late 19th century to early 20th century. This book has been divided into fourteen chapters with separate title for each. Apart from the women trafficking we also learn many things from the book such as lives of Cambodian people, their culture and tradition, how the war has turned their life and major thing is the how the early days of trafficking was taking place. Since the book has been written in 2007, it does not mention any direct reference to trafficking instead it address the issue in name of sexual slavery. 'By far the lowest statistic for the number of prostitutes and sex slaves in Cambodia is between 40,000 and 50,000. It can be expected that 1 in 40 girls born in Cambodia will be sold into sexual slavery.'(*the road of lost innocence*) she dedicates this book to the thousands of little girls who are sold into prostitution every year. The book starts off with young age of Somaly. The narration of the book is through first person narrative as it is in most memoirs.

To understand the representation of trafficking or sexual slavery in this book one should know about the background details of the place and community of Somaly. The book starts off with her biography, makes reader travel into her life and ends with her current success. She belongs to Phnong. They are an old tribe of mountain people, quite unlike the Khmer who dominated the lowlands of Cambodia. Throughout Southeast Asia, people are very sensitive about skin colour. "The paler you are the closer to moon colour the more highly you are prized". A plump woman with white skin is the supreme object of beauty and desire. Since Somaly inherited the typical Phnong dark skin from her mother she was seen as unattractive. One could see how much important people give to colour of skin during those days, it's even today but not as strong as those days. Throughout the book she has explained in detail about every struggle of her due to her dark skin.

The main reason behind this book is to picture or represent to what extant victims are suffering and how important it is to help them. These women and girls are marked by their experience for life, and it will be very hard for them to find even a little happiness. This book mainly conveys that it isn't true as some people think about the girls in sexual slavery, the girls are not volunteered for this business but they are literally abducted and kidnapped. On the contrary these girls are so glad to find new work and volunteer for it. Most of the girls are so honest and will do anything they can to leave the suffering they endure in the sexual slavery. Through the representation in this book the author voices for thousands of other women. 'They have no voice, so let this one life stand for their story.' The whole chapter discusses about how well the book represents about sexual slavery through life of Somaly. It also attempts to view how one of the major pull factor of trafficking which is poverty and post war background make people more vulnerable to such crimes. The major discussion also covers the traumatic experience of the victim and how NGOs suffer in rescuing young girls from the harsh world of trafficking.

This research particularly concentrates on representation of women trafficking in two different genres novel and memoir. Each genre represents the issue through different focal lens. The research also covers the issue of trafficking from early period to contemporary era. The whole process of trafficking can be seen through different perspective in each chapter. The major reason for trafficking is the factor which is responsible for the victim to fall into the hands of traffickers. There are two major factors, one is push factor and other is pull factor. One major question raised over this issue is that, which factor contributes more to the women trafficking.

The major finding of this thesis is that, both the factor equally contributes to the trafficking of women. According to the particular eras political and social background the factors responsible for trafficking differs. The novel *Anybody's daughter* by Pamela Samuels young represents about women trafficking in recent years. Thirteen year old Brianna has been trafficked in to dark world through pull factor. This novel mainly represents about the major pull factor, such as internet and Facebook. Brianna has been trafficked by her so called boyfriend whom she met through Facebook. Due to development of technologies, the safety of an individual has been reduced so much. The advanced communication developments not only facilitate individuals, but also increase the crime in the society. There are many pull factors which plays a major role in women trafficking, Facebook is one of them which plays a major role among all. Pull factor is nothing but things which pulls the victim to fall into the hands of traffickers. Advanced technology remains as the major pull factor towards human trafficking in recent years. The whole chapter represents how the pull factor is major responsible for women trafficking and the effects the victim face in hands of traffickers.

The second genre is memoir, *the road of lost innocence* by Somaly Mam. Through this book one could see the representation of human trafficking in early periods of Cambodia. In Cambodia, girls as young as five are sold into prostitution every day. Somaly Mam was one such girl abandoned as a baby. The major factor responsible here is social background i.e. post- war period. This is one of the major push factors which push the victim to the dark world of trafficking. Since she is an orphan a person named as grandfather sell her into sex trafficking to clear his debts. Through this one could see that large number of displaced and war affected women and children are more vulnerable to traffickers. Because of the post war period there is no proper education and thereby it high teen the vulnerability of victim to various forms of exploitation. The major plus of this book is it covers both conflict and post-conflict period of victim, highlighting with the push factor.

Through these works of literature and film this thesis presents the politics of representation in women trafficking. Even though trafficking of women is a social issue, it is a complex issue which needs more research and multidisciplinary perspective. This research serves as a comparative study between sociology and literature. Briefly it may be pointed out that review of related literature gives an insight into the problem. So in that way this thesis has analysed the major social problem with literature perspective.

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AGRICULTURE CHANGING INTO AGRIBUSINESS: AN ECOFEMINIST READING OF RUTH OZEKI'S *ALL OVER CREATION*

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Abstract

A writer and filmmaker, Ruth Ozeki transcends the boundaries of literary and visual arts, both in her novels and documentaries respectively. She assembles her works with socio-political issues like racism, sexism and speciesism through her transgressive genre-bending form of narration. Ruth Ozeki's *All Over Creation* explores the hazard of genetically modified food through an activist group, Seeds of Resistance. The novel demonstrates various perspectives surrounding effects of genetically modified food on human beings and nature with the journey of Seeds of Resistance and the opposition they face from the corporations selling genetically modified food. The rights of indigenous farmers getting deprived because of Intellectual Property Rights is one of the major concerns in the field of Ecofeminism, MNCs infringing on consumer rights because of lack of labelling of genetically engineered food are some of the issues portrayed in the novel. This research paper attempts to trace the shift of agriculture into agribusiness, domination of MNCs over farmers and the influence of biotechnology and genetic engineering on human life and nature with the framework of ecological thinkers through Ruth Ozeki's *All Over Creation*. The paper also explores the trend of valuing monoculture farming over biodiversity where the process of homogenization of life becomes more valuable which in turn makes diversity of life a threat to capitalist society.

Keywords: Ecofeminism, dualism, agribusiness, homogenization

The term ecofeminism, coined by Francoise D'Eaubonne in 1974 owes its existence to various social movements such as the feminist, peace and social activism. Ecofeminism confronts the anthropocentric (human/nature) and androcentric (man/woman) dualisms prevalent in the society which creates hierarchical attitudes and discourses. Janis Birkeland claims that challenging the necessity of power relationships is the main aspect of ecofeminism. It is about changing the dynamics from "power over" to responsibility and reciprocity which can be described as "power to." Ecofeminists observe that human oppression and exploitation of nature are inter-connected and one cannot end one without ending the other. Ariel Salleh observes the similarity in the attitude of men towards nature and women by stating that there is "parallel in men's thinking between their 'right' to exploit nature, on the one hand, and the use they make of women, on the other" (qtd in Birkeland: 18). Vandana Shiva and Maria Mies in their book, *Ecofeminism* explore ecofeminism as a movement which enables confrontation of the modern world which according to them depends on a model which they describe as "the capitalist patriarchal world system" (Mies and Shiva, "Introduction" 2). This model of capitalist patriarchy encourages the exploitation of the 'other' and their resources in the pretense of aiming for global good and capital accumulation. The idea behind the model of capitalist patriarchy is that the domination of the south by the north, women by men, nature by human beings is justified if the outcome is global economic gain. According to Mies and Shiva, ecofeminism aims to project this world order which values homogeneity, uniformity and condemns diversity of life which in turn leads to exploitation and injustice in the society.

Ozeki, in her novel *All Over Creation* discusses the concerns surrounding the harmfulness of genetically modified food. In this novel, the activist group called the Seeds of Resistance raise awareness against the use of genetically modified food and genetically modified seeds through demonstrations and protests before both the public and farmers. The group mainly focuses on the genetically modified potatoes which are said to be created by infusing the DNA of potato with that of a bacterial toxin, namely Bacillus Thuringiensis (Bt). The corporations selling genetically modified seeds like Cynaco NuLife in the novel claim that this bacterium is found in nature and is harmless to human beings. They argue that their seeds will enable the farmers to decrease the usage of pesticides and protect their crops from being damaged by the insects. The Seeds of Resistance questions this theory of the safety of genetically modified food created by these corporations and voices the concerns of several environmental activists, "despite studies suggesting possible hazards to both human health and ecological safety, the NuLife has never been poison-tested by the EPA. But poison testing is being carried out at our dinner tables every day." (Ozeki, *All Over Creation* 184)

The primary debate revolving around genetically modified food is its safety. However, the longtime effect of genetically modified food cannot be known. As Lliane Loots points out, "the issue of health risks of consuming GMO-rich food is based on the fact that this technology is new and remains largely untested. Short- and long-term effects of consuming genetically altered food are not known" (Loots 86). The Seeds of Resistance state how the bacterial toxin which not just kills harmful insects but also beneficial insects and butterflies are being fed to human beings in high concentrations in the name of genetically modified food without thinking about the longtime consequences for both human beings and nature, "what about other beneficial insects? Like monarch butterflies that die eating Bt corn pollen?" (Ozeki, *All Over Creation* 271). Though several scientific researches' have linked genetically modified food to the issues like hormone imbalance in human beings and the possible cause for breast cancer in women, the lack of evidence against genetically modified (GM) food help the corporations to continue their capitalist tendencies by selling GM or the genetically engineered (GE) food.

Another vital issue that Ozeki brings forth in the field of agriculture through her novel is the issue of Intellectual Property Rights (IPR). The corporations attempt to take control over the farmers and their farming through the field of biotechnology. The Seeds of Resistance create awareness against the issues of IPR in the novel. They describe how the seeds are genetically modified to be sterile and kill their embryos. This technology is commonly called "The Terminator" and prevents the farmers from saving their seeds. The farmers are forced to buy the seeds from the corporations every year. Vandana Shiva describes how these Trade-Related Intellectual Property Rights deprive the farmers, the rights of their seeds. The seeds might have been the result of their hard work and innovation, but their lack of documentation enables the multinational corporations (MNCs) to sue the farmers on the basis of IPR. This law leaves the farmers vulnerable, and they have no protection or rights over the MNCs or the laws. Shiva points out that IPRs only protect the MNCs and the transnational corporations (TNCs) by taking control of the agriculture from the farmers and giving them "monopoly control" over "all agriculture and all production" (Shiva, "GATT" 241). This turns agriculture into agri-business, and farmers from the position of producers become consumers themselves who are dependent and under the control of the corporations, "TNCs … will thus take farmers' seeds, process them, and sell them back as patented varieties" (Shiva, "GATT" 241).

Capitalist patriarchy values anything which gives heavy outcome and high product. This output can only be produced through monoculture farming. As a result, diversity is considered to be an inconvenience. While diversity is an intrinsic part of nature, the capitalist agriculturists and the corporations aim for uniformity. In *All Over Creation*, Geek describes how there were once several different kinds of potatoes which do not exist anymore because of the capitalists' aim of uniformity, "we only have maybe a dozen kinds left in commercial production here, because engineers have decided that potatoes all have to be the same size. Diversity is inconvenient to mechanized farming. This is what happens when agriculture becomes agribusiness" (Ozeki, *All Over Creation* 125). The capitalist agriculturists have successfully created the image of uniformed vegetables and fruits being perfect. Thus, diversity becomes imperfection in this capitalist society. Biodiversity has no value because it is treated as a problem which has to be solved with genetic engineering and create perfectly uniformed species which caters the capitalist tendencies of the corporations and the monoculture agriculturists, “nature’s diversity is seen as not intrinsically valuable in itself, its value is conferred only through economic exploitation for commercial gain … destruction of diversity and the creation of monocultures becomes an imperative for capitalist patriarchy” (Shiva, “Women’s” 164).

Conclusion

Ruth Ozeki’s *All Over Creation* and ecological thinkers’ views on genetically modified food makes it apparent that genetically modified food does not just raise the concerns regarding human life and nature but also threatens the rights of farmers because of problems concerning intellectual property rights. The model of capitalist patriarchy challenges the existence of biodiversity in society and promotes homogenized, monoculture farming for the commercial and materialistic benefits of the capitalists which turns agriculture into agribusiness.

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ORIGINAL PAPER

Spray solution aging dominated optoelectronic, electrochemical and third order NLO properties of CdO:Mo thin films

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Abstract: In this work, thin films of molybdenum-doped CdO were prepared by spray technique from solutions with varied aging times. The structure of (1 1 1) preferentially grown films is cubic. Variation of crystallite size from 47 to 67 nm takes place with solution aging. Improvement in morphology is observed with aging. Increased transparency and E_g narrowing was realized with aging. The CdO:Mo film from 3-days aged solution exhibits a maximum transparency of 87%. With aging, resistivity decreases and a minimum value of 0.28×10^{-3} Ω-cm was realized with three days aging. Reverse saturable absorption (RSA) effect was realized from the Z-scan studies. Third order NLO susceptibility increases with solution aging. With a negative nonlinear refractive index and a high nonlinear absorption, it was confirmed that the aged films may be used as an optical limiter for laser radiation with self-defocusing.

Keywords: Aging; Optoelectronic; Z-scan; XPS; Optical limiter; Electrochemical

1. Introduction

Nowadays, ordered ultrathin film technology has received much attention in optoelectronic functional devices, gas sensitive films and modified electrodes [1]. Metal oxides are extensively used as gas sensors, flat-panel displays, phototransistors, transparent electrodes and smart windows thanks to their exceptional properties determined primarily by size and self-organized structures [2]. CdO is an II-VI group semiconductor with good opto-electrical qualities dominated by its structural point defects (cadmium interstitials (Cd_i) and oxygen vacancies (V_o)). This property makes it useful in optoelectronic devices, thin film resistors, etc. [3]. Activated reactive evaporation [4], CBD [5], PLD [6], dc magnetron sputtering [7] and spray pyrolysis [8] have been utilized earlier to deposit CdO thin films. Among these techniques, spray pyrolysis is influenced by deposition temperature, spray-nozzle distance, solvent volume, spray rate, doping concentration, spray solution aging effect, etc. which dominates CdO film properties. Solution aging profoundly influencing the opto-electrical properties of sprayed films was reported earlier [9, 10]. Hence, the solutions used to deposit Mo-doped CdO are aged with different periods.

Molybdenum is used as dopant because it improves the stability and band structure of various metal oxides [11, 12]. Over the years, molybdenum-based hydrogen evolution reaction (HER) catalysts have drawn great attention due to its d-based electronic structure similar to that of platinum [13]. Also, in the CdO lattice four excess electrons are available when Mo^{6+} ions substituted Cd^{2+} and enhanced electrical properties is realized. Mo

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Nano | Online Ready

Chitosan, a Cationic Polymer-Loaded CuS:Ni Nanoparticles Well Suited for Pseudocapacitors, Optical Switching and Sprintronic Devices

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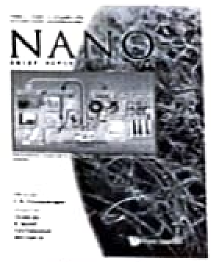

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Abstract

This paper reports the photoconductive and antimicrobial properties of SnS_2–CdO and SnS_2-NiO nanocomposites green synthesized using *Psidium guajava* leaf extract. X-ray diffraction studies reveal that the SnS_2–CdO nanocomposite exhibits hexagonal SnS_2 and cubic CdO diffraction peaks; whereas the SnS_2–NiO nanocomposite exhibits hexagonal SnS_2 and cubic NiO diffraction peaks. SEM image of the bio-synthesized SnS_2–CdO nanocomposite confirmed nanoneedles with grains being well distributed. Regular shaped grains with decreased sizes were observed for the SnS_2–NiO nanocomposite. Nanosized grains were observed from the TEM images. The existence of elements Sn, S, Cd, O in SnS_2–CdO nanocomposite; Sn, S, Ni, O in SnS_2–NiO nanocomposite was confirmed from the EDX and XPS spectra. Increased
nanocomposite was confirmed from the EDX and XPS spectra. Increased
photosensitivity value was realized for the SnS_2–CdO nanocomposite. Both the composites showed good fungal inhibition property against *Aspergillus terreus* fungi not only by the physical, chemical and biological processes but also owing to phyto-constituents in the leaf extract.

Keywords: Leaf extract · green synthesis · nanocomposites · antifungal

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Experimental and theoretical investigation of novel organic L-Glutaminium Benzenesulfonate single crystal – DFT and experimental approach

P. Arularasan [a], S. Sindhusha [b], K. Rajesh [c], B. Gunasekaran [d], V. Thayanithi [e]

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Highlights

- Organic NLO single crystal of L- Glutaminium Benzenesulfonate (LGBS) was grown at room temperature.
- Intermolecular interaction of crystallization is visualized by Hirshfeld surface analysis.
- Theoretical investigations were carried out to support the experimental results.
- Grown material shows good Second Harmonic generation efficiency.

Abstract

An organic nonlinear optical crystal of L-Glutaminium Benzenesulfonate (LGBS) crystal was grown by slow evaporation method. Crystallization parameters and structural analysis of LGBS crystal were notified by Single crystal XRD technique and the theoretical structural parameters were also identified and compared using DFT. The grown LGBS crystal crystallizes in monoclinic crystal system with the non-centrosymmetric space group $P2_1$. The presence of chemical bonding and functional groups were examined using FTIR and FT Raman spectra and their theoretical assignments were calculated. The lower cutoff wavelength was determined for grown LGBS crystal by UV–visible spectroscopy and it confirms that grown LGBS crystal has wide transmittance in the visible region. The emission region for the grown LGBS crystal was analysed by fluorescence spectrum. The global reactive descriptors and the intermolecular charge transfer interactions were also interpreted. The liberation of organic molecule and melting temperature of LGBS crystal were elucidated by thermo gravimetric analysis (TG) and DSC. The Kurtz and Perry powder technique confirms

Preparation of $CoFe_2O_4/SiO_2$ nanocomposite as potential electrode materials for supercapacitors

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Abstract

In the present work, the magnetic $CoFe_2O_4/SiO_2$ nanocomposites were prepared by the simple sol-gel method for supercapacitor applications. Various characterization techniques, including powder X-ray diffraction (PXRD), Fourier transform infrared (FT-IR) and Raman spectroscopy, transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), vibrating sample magnetometer (VSM), cyclic voltammetry, and galvanostatic charge-discharge (GCD) analysis, were used to investigate the $CoFe_2O_4$/S iO_2 composites. The same materials were used to perform the electrochemical activity for electrode applications, thus confirming their comparable efficiency and reversibility. The prepared electrode exhibited a maximum specific capacitance of 316.14 Fg^{-1}, a maximum energy density of 295.6 Wh kg^{-1}

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Fabrication of binary to quaternary PVDF based flexible composite films and ultrathin sandwich structured quaternary PVDF/CB/g-C_3N_4/ $BaFe_{11.5}Al_{0.5}O_{19}$ composite films for efficient EMI shielding performance

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ABSTRACT

This work reports the facile fabrication of binary, ternary, and quaternary polymer composite films using combinations of Polyvinylidene fluoride (PVDF), Carbon Black (CB), Graphitic carbon nitride (g-C_3N_4), and Aluminum doped Barium hexaferrite ($BaFe_{11.5}Al_{0.5}O_{19}$) nanoplatelets for application as EMI shielding materials at X-band frequency. The excellent total EMI-SE of 47.39 dB in X-band for ultra-small thickness of 0.193 mm was observed for the quaternary PVDF/CB/g-C_3N_4/$BaFe_{11.5}Al_{0.5}O_{19}$ composite film. The quaternary composite film was further hot pressed into sandwich-structured two-layer and three-layer composite films. The sandwich and/or multi-layered structure of the PVDF/CB/g-C_3N_4/$BaFe_{11.5}Al_{0.5}O_{19}$ composite film improved the EMI shielding performance through multiple reflection loss. With the addition of intact conduction of fillers and multiple-reflection-absorption effect, the multi-layered composite structure attained the best shielding efficiency (SE) of 64.54 dB.

1. Introduction

The rapid advancement of commercial electronic equipment has resulted in an increase in electromagnetic radiation, which results in electromagnetic pollution [1,2]. Electromagnetic radiation is released by various electrical gadgets, including cell phones, tablet computers, wireless local area networks, radar, etc., which causes electronic appliance problems and has also prompted human health concerns [3-5]. As a result, a new type of material known as electromagnetic interference (EMI) shielding materials have been developed [6–8]. These are classified into two types of shielding materials: (i) reflection-dominating, and (ii) absorption-dominating [9]. To better address the problem of electromagnetic pollution, the development of inexpensive, flexible, lightweight composite materials with a combination of microwave-reflection or microwave-absorption-dominant materials is required [10]. Magnetic ferrite nanostructures and carbon-based conductive fillers in polymer composites have emerged as prospective and outstanding EMI shielding materials [11].

Electroactive polymers, particularly poly(vinylidene fluoride) (PVDF) and its many copolymers have received great attention in recent decades due to their strong dielectric, piezoelectric, and ferroelectric properties [12,13]. PVDF-based composites are widely known for being lightweight, highly flexible, mechanically robust, and environmentally benign. For its orthorhombic unit cells with 'TTT' conformation, the β-phase of semicrystalline PVDF exhibits strong ferroelectric and dielectric characteristics among the five distinct phases (α, β, γ, δ and ε) [13, 14]. Hence, fabrication of β-phase enhanced PVDF composites is very sought for EMI shielding applications. To improve the β-phase stability of the PVDF matrix, various nanofillers such as metals, metal oxides, metal sulfides, ferrites, and carbon derivatives are being incorporated.

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MULTIFUNCTIONAL COPPER NANOPARTICLES AND ITS APPLICATIONS

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MULTIFUNCTIONAL COPPER NANOPARTICLES AND ITS APPLICATIONS

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ABSTRACT

Copper nanoparticles have been synthesised and characterised in great detail in this review study (CuNPs). Nanoparticles, their role in today's society, the methods of synthesis, and the characterization techniques used to study them are all widely discussed in the media. Physical, chemical, and biological methods of synthesising Nanoparticles have each been described in detail, and the results of each method have been published. The XRD, IR, TEM, DLS, UV-Visible, and HRTEM characterizations of the CuNPs are obviously distinct based on the synthesis processes. TG-DTA, WAXD, and EDAX were only a few of the diagnostic investigations examined in order to evaluate the physiochemical properties. (FCC) copper nanoclusters are confirmed by XRD and electron diffraction. Exhaustive coverage of their applications in chemical, physical, and biological disciplines has been provided.

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PHYSICOCHEMICAL AND BIOMEDICAL PROPERTIES OF ZINC OXIDE MICROPARTICLES AND THEIR COMBINATIONS AGAINST PATHOGENIC MICROORGANISMS

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ABSTRACT:

Nanoparticles of zinc oxide (ZnO) have been explored as antibiotic agents to boost antimicrobial action against pathogenic bacteria and viruses, whether or not they are resistant to antibiotics. A variety of biological and toxicological reactions in microbes can be influenced by their specific physicochemical properties. Metal ions, particles, and reactive oxygen species all contribute to their antibacterial properties. An in-depth look into ZnO nanoparticles/MPs, which have been shown to have antimicrobial properties, is presented in this study. We also cover current findings on ZnO NPs/MP antibacterial activity and their combination with other materials against pathogens. ZnO NPs/MPs and their combinations with other materials are also discussed in this article. An in-depth look at ZnO NPs/MPs as potential antibiotics will help researchers better grasp their potential applications in industrial and clinical settings.

Keywords: Biomedical application of zinc oxide microparticles; antibacterial activity; nano antibiotics; physical and chemical properties.

INTRODUCTION

Next-generation nanoantibiotics against pathogenic microbes have been researched using zinc oxide (ZnO) nanoparticles (NPs) [1,2]. The shape, particle size, crystallinity, and porosity of these nanoparticles [3] are all distinctive, as are their physical properties. Zinc

Assessment of Green Synthesized Cerium Oxide Nanoparticlesfrom Peel Extract

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ABSTRACT

A subset of nanobiotechnology is the development of nanotechnology-based instruments forthe study of biological processes. Microbial infection is a public health problem. This problem will be carried out with the help of many medicinal plants. In this present investigation the Cerium oxide Nanoparticles were synthesized from the medicinal plant; *Punica granatum* L peel extract using green synthesis methods, The Prepared Cerium oxide nanoparticles were characterized using Raman spectroscopy analysis. The cubic crystal structure of cerium oxide nanoparticles shows a very strong active base state in the Raman spectrum at 452cm^{-1}. The antifungal activity of *Candida albicans* and *Aspergillus niger* was conducted using the prepared Nanoparticles. As per the results obtained, the prepared nanoparticles have high anti-fungal activity which was found to be 14mm and 13mm.

Keywords: Cerium oxide nanoparticles, Antifungal activity, Raman Spectroscopy, CeO_2 Nps.

INTRODUCTION

Pomegranate (*Punica granatum* L) Peel is one of the most ancient and also endemic to the Mediterranean and has widely been employed in the folk medications of many nations. In India, arils are utilized or made into juice as such. Instead, the arils are utilized to make differentadded value goods such as concentrates, canned drinks, wine, jam, and jelly. The latest fresh juice preparation has a little amount of cellulose, ascorbic acid, and polyphenolic flavonoids. In addition, it belongs to the fruit cluster which has the most beneficial pharmacological effects, largely because of the extremely high concentration of several bioactive substances [1,2]. In yogurt samples, the addition of

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STUDIES ON THE DISINFECTANT ACTIVITY OF TITANIUM OXIDE NANOPARTICLES

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Abstract

In recent years, nanotechnology has experienced explosive growth. Because of their potential for attaining targeted processes and selectivity, nano-structured materials are garnering a lot of interest, particularly in the fields of biology and medicine. Nanotechnology has become one of the most practical technologies, because of unique physical and chemical features of nanoparticles. With their dazzling and intriguing optical, dielectric, and photo-catalytic features resulting from size quantization, nanomaterials like titanium dioxide nanoparticles (TiO_2-NPs) have become a new generation of sophisticated materials. Applying Nanoparticle-based formulations to their media prevents the growth of resistant bacteria. The ability of some nanoparticles to inhibit the growth of bacteria makes them promising candidates for use as antimicrobial agents. Disk diffusion technique is used to analyze the antibiotic resistance pattern of E. coli and can be performed with both liquid and agar nutritional media. The bactericidal efficacy of 0.01, 0.5, 1, and 1.5% nano-TiO_2 was determined using the optical density (OD) and the Kirby-Bauer disc diffusion test. Antibiotic resistance was observed for this strain across the board. Optical density decrease was detected with nano-TiO_2 concentration increase (0.225, 0.218, 0.158, 0.075, 0.031respectively). This was also seen in

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Antibacterial and Humidity Sensor Studies of Cerium Oxide Nanoparticles

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Abstract

Sucrose was used as a green capping agent in the co-precipitation process to produce CeO2 NPs, which were then coated with cerium oxide nanoparticles. An XRD, TEM, FT-IR, EDX, UV-Visible, and photoluminescence analysis was performed on the yellowish white powder to determine its chemical composition, as well as its morphological properties. It was found that the antibacterial activity of the produced nanoparticles was seen in two strains of Gram-negative bacteria and one strain of Gram-positive bacteria, which is a promising result that suggests a rise in the nanoparticle concentration zone of inhibition. Relative humidity was used to measure sensor resistance, which decreased linearly with increasing humidity levels. The results show that the cerium oxide nanoparticles generated can be used as a humidity sensor and antibacterial agent in many applications.

Keywords: Antibacterial activity, Cerium oxide nanoparticles, green capping agent, Humidity measurement

1. INTRODUCTION

Cerium oxide, also known as ceria (CeO_2), is a lanthanide rare earth metal oxide that has the structure of fluorite with a face-centered cubic (FCC) crystal arrangement [1]. In nanoceria, there is a cycle between the Ce^{3+} and Ce^{4+} valence states, and the existence of oxygen vacancies in the material

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Multi-level analysis of Health Management Information System (HMIS) adoption by healthcare professionals in the ESIC main hospital and dispensaries in the Tirunelveli sub-region in Tamil Nadu, India

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ABSTRACT

This study aims to analyse the unique contribution of individual factors on HMIS adoption among healthcare professionals in ESIC healthcare settings, as well as possible interrelations between these factors.. A simple random sampling method was used to select 171 healthcare professionals in the ESIC main hospital and dispensaries in the Tirunelveli sub-region. One-way ANOVA and Post-Hoc test were applied to identify the individual determinants of HMIS adoption in ESIC clinical settings. This study will assess the contribution of individual factors, as well as their interactions, to the implementation of HMIS in ESIC clinical settings. The analysis provides a set of key results making it possible to understand the challenges and opportunities for HMIS adoption by healthcare professionals.

Keywords: Health Management Information System, One-way ANOVA, Post-Hoc test, Adoption and Clinical settings.

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INTRODUCTION

Information and Communication Technologies (ICTs) include a set of effective tools to collect, store, process, and exchange health-related information. ICT could also improve safety, quality, and cost-efficiency of services in the healthcare environment.

IT in health sector could be used for better diagnosis, better training and sharing of knowledge and improving communication (Kalpa, 2012). The scope of public health informatics is immense and it requires the application of knowledge from numerous disciplines, particularly information science, computer science, management, organizational theory, psychology, communications, political science, and law. Policy, standards or guidelines had to be formulated to maintain quality in health information system. Constant flow of funds from the government could result in availability and improvement of current infrastructure, purchasing and installation of latest technology, recruitment of competent staff or train existing health staff. Public private partnership should be encouraged to expand the utilization of health information technology.

Among the applications of ICTs to the healthcare sector, the Health Management Information System (HMIS) is viewed as the backbone supporting the integration of various tools like emergency information, test ordering, electronic prescription, decision support systems, digital imagery, and telemedicine that could improve the uptake of services into clinical decisions. Using such a technology in daily clinical practices could enable a safer and more efficient healthcare system. Patients, professionals, organisations, and the public in general are thus expected to benefit from HMIS implementation.

Although information and communication technology are now part of the everyday life of most human beings, the use of HMIS software to provide health information and care in the ESIC healthcare environment is particularly challenging in Tirunelveli, sub-region in Tamil Nadu, India and calls for specific strategies. The aim of this paper is to analyse the factors that could facilitate healthcare provider utilization of HMIS in their work.

LITERATURE REVIEW

Digitization saves a lot of time in record keeping and report generation. The initial capital costs of digitization could be fully recovered within two years of implementation. Such a scenario could be achieved only if the available system is fully operational (Krishnan, Nongkynrih, Yadav, Singh, & Gupta, 2010). Further, digitization can also improve the service delivery, planning, monitoring and supervision activities. Therefore, in the near future, digitization aims to contribute in the convergence of different services related to health services.

IT stress is said to be an important factor and its evaluation techniques are based on the widely used Technology Acceptance Model (TAM). IT stress could be broadly classified into two types: There is Direct IT stress and Indirect IT stress (Raitoharju, 2005). Direct IT stress is a hindrance and caused by the following factors: person’s fear of breaking something, feeling of ignorance, fear of technology, fear about health, and fear about anything new and unfamiliar or sense of threat to intellectual self-assessment. Indirect stress is about time consumption and pressure. Here, the user is an expert in information technology and spends a lot of time in IT related works. Since he spends a lot of time in front of computers, he is unable to complete other tasks properly. This creates unwanted pressure and such pressure gives wayto indirect IT stress. Further, computer anxiety reduces the effectiveness of computerization. Perceived usefulness and Perceived ease of use play an important role in IT acceptance studies. Perceived usefulness encouraged IT usage and thereby results in technology acceptance. However, Perceived ease of use does not have any significant effect on Perceived usefulness.

The quality of data plays an all important role in setting up global standards. Firstly, the standards should be locally assigned and then there should be sound network facilities to support the local adaptation of standards. The health system of an entire country could be addressed through standardization. Such standardization should take place at the data production and collection levels (Jacucci, Shaw, & Braa, 2006). The set of essential data and its hierarchy constitutes the standard. Once the standard was implemented, the data quality in the entire system should be guaranteed to ensure its sustainability. The available data should be used at the level of collection and only then “local” sustainability of a local system could be a reality. Global standard-based health Information system in developing countries relies heavily on the 'sustainability' factor. Local use, local capacity building and local appropriation of the standard should also be taken into account while planning a sustainable information system. In a sustainable information environment, the responsibilities should reach the bottom of the hierarchy and only then standards could be proactively reinvented.

Adoption of electronic health records (EHRs) is progressing slowly. A stratified random sample of medical group practices is used in the study. Group practices are defined as three or more physicians practicing together with a common billing and medical record system. The main aim of the study is to assess the information technology usage of the medical practitioners. A five-point likert scale has been used to rate the benefits of electronic health records. It is found that electronic health records improved the access to medical record information. Further, they improve the workflow in medical practice and also brought about improved patient care (Gans, Kralewski, Hammons, & Dowd, 2005). The transition from computer-based administrative information systems to fully implemented EHRs has always been more complicated, more difficult, and more expensive. However, EHRs has numerous advantages and it promises to improve practice efficiency, quality, and service.

The telemedicine referrals were used as a second opinion advice tool. Technology helped a lot in assisting the patients and updating medical knowledge. The staff members were told about the available technology. Further, training and equipment were also provided. But the main problem was that staff was unable to put the technology into real practice (Shiferaw & Zolfo, 2012). Telemedicine referrals brought about a lot of awareness at the community level and also at the level of officials. Ambiguity always existed regarding the functioning and ownership of the projects. Such unclearness had a negative impact on the adoption, resource allocation and proper monitoring and evaluation of the health projects.

Security and patients' medical data formed an integral part of the electronic health records management system. Flexibility, modularity and scalability were found to be the important performance factors in electronic health records management systems (Končar & Lončarić, 2003). Unauthorized access of the patients' medical data from both outside and inside local hospital network should be prevented. Further, demand of legal patients' ownership of their own medical data should also be taken into consideration in a secured health information management system.

Paediatricians' decisions were not influenced by peer pressure. Attitudes of physicians played a prime role in adoption of technology (Chismar & Patton, 2002). Besides Technology

Acceptance Model (TAM), there was another model called the Extended Technology Acceptance Model (TAM2). In TAM2, two additional theoretical constructs were added. They were cognitive instrumental processes and social influence processes. These days, the paediatricians widely used the internet and hence, the Internet and Internet-based health applications (IHA) was also taken into account. It was found out that perceived usefulness had a significant effect on intention to use and perceived ease of use. The perceived usefulness was found to have a significant and strong influence on physicians' usage intention. However, the perceived ease of use was not found to be significant. As perceived ease of use factor weakened, the competency of the user got increased. All these results partially supported the TAM2 model. Further, the paediatricians were willing to use the internet only when it was found to be beneficial in their daily tasks.

The sustainability of Health Information System depended on the technical features and physical infrastructures. Any lack of technical approach would lead to instability of the information system. Socio-technical aspects played an important role in information system. Integration of such aspects into the organizational structures would lead to stability (Kimaro & Nhampossab, 2007). They would also enable easy execution of routine activities. Health services mainly included curative and preventive activities. These activities were hampered by scarce resources. The main aim of HIS was to overcome the scarcity and bring about better care. Further, extra attention should be given to users' needs, evaluation and feedback generation and future improvements. Information generation and sharing of knowledge within the sustainability strategy framework would also add to the stability of health systems.

Integration refers to the degree of interoperability and interconnectivity among technical components, and relies on standardization at a certain level. A certain degree of flexibility and a minimum level of symmetry may be necessary conditions for integration of systems to succeed (Sahay, Monteiro, & Aanestad, 2007). Technical and political symmetry are found to be the key components of an integration solution and furthermore, integration totally depends on adaptability and flexibility.

METHODOLOGY

Quantitative adoption study was applied by use of questionnaires on healthcare professionals in ESIC main hospital and dispensaries at Tirunelveli sub-region. The selected districts in Tirunelveli sub-region in Tamil Nadu include Tirunelveli, Tuticorin and Kanyakumari districts. The models that have been used to understand adoption behaviors with respect to HMIS among ESIC healthcare professionals are Technology Acceptance Model (TAM) and Revised Technology Acceptance Model. In order to carry out a multi-level analysis of HMIS adoption among healthcare professionals at the ESIC main hospital and dispensaries in Tirunelveli sub-region, 171 healthcare professionals were chosen through random sampling. The participants for the study were doctors, staff nurses, nursing assistants, lab technicians, pharmacists, administration officers and IT officers. Survey questionnaire was distributed to the ESIC healthcare professionals to collect their responses regarding the adoption of Health Management Information System (HMIS). Appropriate statistical tools were used to test the hypothesis and the statistical tools used in this study were One-way ANOVA and Post Hoc test.

DATA AND ANALYSIS

$H_0$5: There is no significant difference among administration officers, technicians, pharmacists, nursing assistants, staff nurses and doctors in adopting health management information system working in ESIC hospital and dispensaries.

TABLE 4.17

TABLE OF MEANS FOR THE CONSTRUCTS AND RESPONDENTS' OCCUPATION

		Designation					
		Doctor	Staff Nurse	Nurse Assistant	Technician	Pharmacist	Administration officer
System Quality	Mean	23.79	23.33	22.75	19.67	22.10	14.45
	SD	(4.21)	(3.94)	(5.12)	(4.01)	(4.54)	(3.98)
Computer Self-Efficacy	Mean	22.76	24.29	23.61	17.72	23.53	13.09
	SD	(5.27)	(4.73)	(6.33)	(4.76)	(6.61)	(3.67)
Facilitating Conditions	Mean	33.17	34.05	34.64	27.39	32.70	18.64
	SD	(5.59)	(5.76)	(5.47)	(8.98)	(7.43)	(5.16)
Perceived Usefulness	Mean	33.14	32.45	30.36	25.61	31.27	21.45
	SD	(6.37)	(5.89)	(7.20)	(6.93)	(6.21)	(6.20)
Perceived Ease of Use	Mean	13.57	14.24	14.32	12.17	13.33	8.91
	SD	(3.35)	(2.76)	(3.12)	(3.79)	(3.35)	(1.30)
Perceived Behavioral Control	Mean	36.71	38.38	36.82	31.78	35.00	20.82
	SD	(7.49)	(5.75)	(6.35)	(7.67)	(8.66)	(5.83)
Attitude	Mean	27.62	29.57	27.39	23.61	27.53	18.00
	SD	(6.59)	(6.80)	(7.69)	(7.54)	(7.73)	(3.85)
Subjective Norm	Mean	15.00	15.45	14.68	12.28	14.83	9.91
	SD	(3.27)	(3.47)	(3.35)	(4.47)	(3.22)	(1.38)
Behavioral Intention	Mean	14.33	14.50	13.82	12.28	14.50	8.45
	SD	(3.82)	(3.56)	(3.93)	(5.07)	(4.21)	(2.91)

TABLE 4.18

RESULTS OF ONE-WAY ANOVA FOR RESPONDENTS' OCCUPATION (HEALTHCARE PROFESSIONALS) AND HMIS ADOPTION FACTORS

Adoption factors	Source of variation	df (2, 168)		'F' value	'p' value
		Sum of squares	Mean square		
System Quality	Between	943.655	188.731	10.048	0.000**
	Within	3099.082	18.782		
Computer Self-Efficacy	Between	1577.822	315.564	10.577	0.000**
	Within	4922.856	29.835		
Facilitating Conditions	Between	2790.710	558.142	13.763	0.000**
	Within	6691.290	40.553		
Perceived Usefulness	Between	1798.392	359.678	8.724	0.000**
	Within	6802.848	41.229		
Perceived Ease of Use	Between	303.702	60.740	6.186	0.000**
	Within	1620.088	9.819		
Perceived Behavioral Control	Between	3080.459	616.092	12.302	0.000**
	Within	8263.331	50.081		
Attitude	Between	1404.381	280.876	5.706	0.000**
	Within	8122.613	49.228		
Subjective Norm	Between	372.322	74.464	6.497	0.000**
	Within	1891.199	11.462		
Behavioral Intention	Between	402.303	80.461	5.162	0.000**
	Within	2571.779	15.587		

Note : 1. ** denotes significant at 1% level

(At 5% level of significance for (2,168) df the table value of 'F' is 3.04)

Since P value is less than 0.01, the null hypothesis is rejected at 1% level with regard to dimensions of system quality, computer self-efficacy, facilitating conditions, perceived usefulness, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention. There is significant difference among administration officers, technicians, pharmacists, nursing assistants, staff nurses and doctors working in ESIC hospital and dispensaries in Tirunelveli sub-region in their system quality, computer self-efficacy, facilitating conditions, perceived usefulness, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention.

TABLE 4.19

RESULTS OF POST-HOC TEST FOR RESPONDENTS' OCCUPATION (HEALTHCARE PROFESSIONALS) AND HMIS ADOPTION FACTORS

Adoption factors	Designation		Mean Difference	Sig.
System Quality	Doctor	Staff Nurse	.452	.997
		Nurse Assistant	1.036	.924
		Technician	**4.119***	.012
		Pharmacist	1.686	.582
		Administration officer	**9.331***	.000
	Staff Nurse	Doctor	-.452	.997
		Nurse Assistant	.583	.994
		Technician	**3.667***	.036
		Pharmacist	1.233	.841
		Administration officer	**8.879***	.000
	Nurse Assistant	Doctor	-1.036	.924
		Staff Nurse	-.583	.994
		Technician	3.083	.179
		Pharmacist	.650	.993
		Administration officer	**8.295***	.000
	Technician	Doctor	**-4.119***	.012
		Staff Nurse	**-3.667***	.036
		Nurse Assistant	-3.083	.179
		Pharmacist	-2.433	.416
		Administration officer	**5.212***	.024
	Pharmacist	Doctor	-1.686	.582
		Staff Nurse	-1.233	.841
		Nurse Assistant	-.650	.993
		Technician	2.433	.416
		Administration officer	**7.645***	.000
	Administration officer	Doctor	**-9.331***	.000
		Staff Nurse	**-8.879***	.000
		Nurse Assistant	**-8.295***	.000
		Technician	**-5.212***	.024
		Pharmacist	**-7.645***	.000

Cont.,

Adoption factors	Designation		Mean Difference	Sig.
Computer Self-Efficacy	Doctor	Staff Nurse	-1.524	.796
		Nurse Assistant	-.845	.988
		Technician	**5.040***	.016
		Pharmacist	-.771	.992
		Administration officer	**9.671***	.000
	Staff Nurse	Doctor	1.524	.796
		Nurse Assistant	.679	.996
		Technician	**6.563***	.000
		Pharmacist	.752	.992
		Administration officer	**11.195***	.000
	Nurse Assistant	Doctor	.845	.988
		Staff Nurse	-.679	.996
		Technician	**5.885***	.006
		Pharmacist	.074	1.000
		Administration officer	**10.516***	.000
	Technician	Doctor	**-5.040***	.016
		Staff Nurse	**-6.563***	.000
		Nurse Assistant	**-5.885***	.006
		Pharmacist	**-5.811***	.006
		Administration officer	4.631	.236
	Pharmacist	Doctor	.771	.992
		Staff Nurse	-.752	.992
		Nurse Assistant	-.074	1.000
		Technician	**5.811***	.006
		Administration officer	**10.442***	.000
	Administration officer	Doctor	**-9.671***	.000
		Staff Nurse	**-11.195***	.000
		Nurse Assistant	**-10.516***	.000
		Technician	-4.631	.236
		Pharmacist	**-10.442***	.000

Cont.,

Adoption factors	Designation		Mean Difference	Sig.
Facilitating Conditions	Doctor	Staff Nurse	-.881	.988
		Nurse Assistant	-1.476	.933
		Technician	**5.778***	.019
		Pharmacist	.467	1.000
		Administration officer	**14.530***	.000
	Staff Nurse	Doctor	.881	.988
		Nurse Assistant	-.595	.999
		Technician	**6.659***	.004
		Pharmacist	1.348	.950
		Administration officer	**15.411***	.000
	Nurse Assistant	Doctor	1.476	.933
		Staff Nurse	.595	.999
		Technician	**7.254***	.003
		Pharmacist	1.943	.855
		Administration officer	**16.006***	.000
	Technician	Doctor	**-5.778***	.019
		Staff Nurse	**-6.659***	.004
		Nurse Assistant	**-7.254***	.003
		Pharmacist	-5.311	.063
		Administration officer	**8.753***	.006
	Pharmacist	Doctor	-.467	1.000
		Staff Nurse	-1.348	.950
		Nurse Assistant	-1.943	.855
		Technician	5.311	.063
		Administration officer	**14.064***	.000
	Administration officer	Doctor	**-14.530***	.000
		Staff Nurse	**-15.411***	.000
		Nurse Assistant	**-16.006***	.000
		Technician	**-8.753***	.006
		Pharmacist	**-14.064***	.000

Cont.,

Adoption factors	**Designation**		**Mean Difference**	**Sig.**
Perceived Usefulness	Doctor	Staff Nurse	.690	.996
		Nurse Assistant	2.786	.483
		Technician	**7.532***	.001
		Pharmacist	1.876	.825
		Administration officer	**11.688***	.000
	Staff Nurse	Doctor	-.690	.996
		Nurse Assistant	2.095	.764
		Technician	**6.841***	.003
		Pharmacist	1.186	.972
		Administration officer	**10.998***	.000
	Nurse Assistant	Doctor	-2.786	.483
		Staff Nurse	-2.095	.764
		Technician	4.746	.147
		Pharmacist	-.910	.994
		Administration officer	**8.903***	.002
	Technician	Doctor	**-7.532***	.001
		Staff Nurse	**-6.841***	.003
		Nurse Assistant	-4.746	.147
		Pharmacist	**-5.656***	.041
		Administration officer	4.157	.539
	Pharmacist	Doctor	-1.876	.825
		Staff Nurse	-1.186	.972
		Nurse Assistant	.910	.994
		Technician	**5.656***	.041
		Administration officer	**9.812***	.000
	Administration officer	Doctor	**-11.688***	.000
		Staff Nurse	**-10.998***	.000
		Nurse Assistant	**-8.903***	.002
		Technician	-4.157	.539
		Pharmacist	**-9.812***	.000

Cont.,

Adoption factors	**Designation**		**Mean Difference**	**Sig.**
Perceived Ease of Use	Doctor	Staff Nurse	-.667	.925
		Nurse Assistant	-.750	.923
		Technician	1.405	.605
		Pharmacist	.238	1.000
		Administration officer	**4.662***	.000
	Staff Nurse	Doctor	.667	.925
		Nurse Assistant	-.083	1.000
		Technician	2.071	.182
		Pharmacist	.905	.833
		Administration officer	**5.329***	.000
	Nurse Assistant	Doctor	.750	.923
		Staff Nurse	.083	1.000
		Technician	2.155	.210
		Pharmacist	.988	.836
		Administration officer	**5.412***	.000
	Technician	Doctor	-1.405	.605
		Staff Nurse	-2.071	.182
		Nurse Assistant	-2.155	.210
		Pharmacist	-1.167	.812
		Administration officer	3.258	.077
	Pharmacist	Doctor	-.238	1.000
		Staff Nurse	-.905	.833
		Nurse Assistant	-.988	.836
		Technician	1.167	.812
		Administration officer	**4.424***	.001
	Administration officer	Doctor	**-4.662***	.000
		Staff Nurse	**-5.329***	.000
		Nurse Assistant	**-5.412***	.000
		Technician	-3.258	.077
		Pharmacist	**-4.424***	.001

Cont.,

Adoption factors	**Designation**		**Mean Difference**	**Sig.**
Perceived Behavioral Control	Doctor	Staff Nurse	-1.667	.889
		Nurse Assistant	-.107	1.000
		Technician	4.937	.137
		Pharmacist	1.714	.913
		Administration officer	**15.896***	.000
	Staff Nurse	Doctor	1.667	.889
		Nurse Assistant	1.560	.945
		Technician	**6.603***	.014
		Pharmacist	3.381	.348
		Administration officer	**17.563***	.000
	Nurse Assistant	Doctor	.107	1.000
		Staff Nurse	-1.560	.945
		Technician	5.044	.177
		Pharmacist	1.821	.924
		Administration officer	**16.003***	.000
	Technician	Doctor	-4.937	.137
		Staff Nurse	**-6.603***	.014
		Nurse Assistant	-5.044	.177
		Pharmacist	-3.222	.647
		Administration officer	**10.960***	.001
	Pharmacist	Doctor	-1.714	.913
		Staff Nurse	-3.381	.348
		Nurse Assistant	-1.821	.924
		Technician	3.222	.647
		Administration officer	**14.182***	.000
	Administration officer	Doctor	**-15.896***	.000
		Staff Nurse	**-17.563***	.000
		Nurse Assistant	**-16.003***	.000
		Technician	**-10.960***	.001
		Pharmacist	**-14.182***	.000

Cont.,

Adoption factors	Designation		Mean Difference	Sig.
Attitude	Doctor	Staff Nurse	-1.952	.798
		Nurse Assistant	.226	1.000
		Technician	4.008	.331
		Pharmacist	.086	1.000
		Administration officer	**9.619***	.001
	Staff Nurse	Doctor	1.952	.798
		Nurse Assistant	2.179	.799
		Technician	**5.960***	.035
		Pharmacist	2.038	.829
		Administration officer	**11.571***	.000
	Nurse Assistant	Doctor	-.226	1.000
		Staff Nurse	-2.179	.799
		Technician	3.782	.479
		Pharmacist	-.140	1.000
		Administration officer	**9.393***	.003
	Technician	Doctor	-4.008	.331
		Staff Nurse	**-5.960***	.035
		Nurse Assistant	-3.782	.479
		Pharmacist	-3.922	.421
		Administration officer	5.611	.298
	Pharmacist	Doctor	-.086	1.000
		Staff Nurse	-2.038	.829
		Nurse Assistant	.140	1.000
		Technician	3.922	.421
		Administration officer	**9.533***	.002
	Administration officer	Doctor	**-9.619***	.001
		Staff Nurse	**-11.571***	.000
		Nurse Assistant	**-9.393***	.003
		Technician	-5.611	.298
		Pharmacist	**-9.533***	.002

Cont.,

Adoption factors	Designation		Mean Difference	Sig.
Subjective Norm	Doctor	Staff Nurse	-.452	.990
		Nurse Assistant	.321	.999
		Technician	2.722	.054
		Pharmacist	.167	1.000
		Administration officer	**5.091***	.000
	Staff Nurse	Doctor	.452	.990
		Nurse Assistant	.774	.936
		Technician	**3.175***	.014
		Pharmacist	.619	.973
		Administration officer	**5.543***	.000
	Nurse Assistant	Doctor	-.321	.999
		Staff Nurse	-.774	.936
		Technician	2.401	.181
		Pharmacist	-.155	1.000
		Administration officer	**4.769***	.002
	Technician	Doctor	-2.722	.054
		Staff Nurse	**-3.175***	.014
		Nurse Assistant	-2.401	.181
		Pharmacist	-2.556	.121
		Administration officer	2.369	.451
	Pharmacist	Doctor	-.167	1.000
		Staff Nurse	-.619	.973
		Nurse Assistant	.155	1.000
		Technician	2.556	.121
		Administration officer	**4.924***	.001
	Administration officer	Doctor	**-5.091***	.000
		Staff Nurse	**-5.543***	.000
		Nurse Assistant	**-4.769***	.002
		Technician	-2.369	.451
		Pharmacist	**-4.924***	.001

Cont.,

Adoption factors	Designation		Mean Difference	Sig.
Behavioral Intention	Doctor	Staff Nurse	-.167	1.000
		Nurse Assistant	.512	.995
		Technician	2.056	.438
		Pharmacist	-.167	1.000
		Administration officer	**5.879***	.000
	Staff Nurse	Doctor	.167	1.000
		Nurse Assistant	.679	.981
		Technician	2.222	.348
		Pharmacist	0.000	1.000
		Administration officer	**6.045***	.000
	Nurse Assistant	Doctor	-.512	.995
		Staff Nurse	-.679	.981
		Technician	1.544	.788
		Pharmacist	-.679	.987
		Administration officer	**5.367***	.003
	Technician	Doctor	-2.056	.438
		Staff Nurse	-2.222	.348
		Nurse Assistant	-1.544	.788
		Pharmacist	-2.222	.413
		Administration officer	3.823	.121
	Pharmacist	Doctor	.167	1.000
		Staff Nurse	0.000	1.000
		Nurse Assistant	.679	.987
		Technician	2.222	.413
		Administration officer	**6.045***	.000
	Administration officer	Doctor	**-5.879***	.000
		Staff Nurse	**-6.045***	.000
		Nurse Assistant	**-5.367***	.003
		Technician	-3.823	.121
		Pharmacist	**-6.045***	.000
*. The mean difference is significant at the 0.05 level.				

The Tukey post hoc test indicated that in system quality, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention, the mean difference of administration officer differs significantly from all the other groups ($p<0.05$). In computer self-efficacy, facilitating conditions and perceived usefulness, the mean difference of technician and administration officer differ significantly from all the other groups($p<0.05$).

Results

In system quality, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention, the mean difference of administration officer differs significantly. In computer self-efficacy, facilitating conditions and perceived usefulness, the mean difference of technician and administration officer differ significantly.

Discussion

The researcher has found the mediating effect of technological knowledge on two types of healthcare professionals in the ESIC environment. Technicians and Administration officers in the ESIC main hospital and dispensaries are quite comfortable in using the HMIS software. The identified organisational and individual determinants that are key elements to the success of the ambitious interoperable HMIS project were found to greatly influence the working style of the technicians and administration officers in the ESIC healthcare environment. The researcher investigated the possible features of a use-friendly HMIS that healthcare professionals found beneficial during the care process in the ESIC healthcare arena and the positive relationship between perceived benefit and perceived experience of HMIS software encouraged the technicians and administration officers in the ESIC main hospital and dispensaries in the Tirunelveli sub-region to do well in the technology based healthcare domain. Moreover, a wide range of healthcare settings in the ESIC environment ensured greater generalisability of the above found results.

Limitations of the research

This study has addressed the perspectives and opinions of stakeholders in the ESIC hospital and dispensaries in Tirunelveli sub-region only. However, in future studies, there is a need to elicit the perspectives of stakeholders at government hospitals in the state. Comparative studies could also be carried out between ESIC and state government, private hospitals to determine their differing perspectives regarding HMIS adoption, benefits and barriers. Longitudinal studies of adoption of health information system would provide a holistic understanding of the changes in the adoption process over a period of time.

CONCLUSION

This study provides unique knowledge on the most important factors to consider in the design of strategies for improving HMIS adoption by healthcare professionals in any software-based working environment. The user-friendly HMIS features identified in this study have been empirically shown to have a positive effect on the perceived benefits of the evolving HMIS medical software. The findings can be used by software vendors to guide their multifaceted-software design and by medical organizations when choosing a HMIS that not only enhances patient experience but also provides a competitive advantage to the healthcare professionals. This study will recommend a novel approach to assess adoption behaviour among healthcare professionals that is likely to be transferrable to other settings in the near future.

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ADOPTION OF HEALTH MANAGEMENT INFORMATION SYSTEM (HMIS) IN ESIC MAIN HOSPITAL AND DISPENSARIES IN TIRUNELVELI SUB-REGION: HMIS USAGE BY URBAN HEALTHCARE PROFESSIONALS VS RURAL HEALTHCARE PROFESSIONALS

***Dr.C.Sriram**
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Abstract

E-health solutions have already been embraced in the developing countries and it has brought about superb advancements in the healthcare industry. The researcher surveyed the adoption of Health Management Information System (HMIS) in a large-scale population based study, involving a representative sample of 171 healthcare professionals in the ESIC main hospital and dispensaries in the Tirunelveli sub-region. The issues examined include the HMIS infrastructure in place for the urban and rural ESIC healthcare professionals, the knowledge of the healthcare professionals in terms of the benefits gained through the use of HMIS software in the ESIC environment and the challenges posing barriers to the adoption of HMIS among the healthcare professionals in the ESIC main hospital and dispensaries. Consequently, suggestions on how to tackle the various adoption challenges have been addressed in this paper.

Keywords: *Health Management Information System, developing countries, healthcare professionals and adoption.*

INTRODUCTION

Health Management Information systems are usually designed to meet specificpurposes. The functions of a health management information system areto monitor, inform and evaluate a health system and to makeclinical and management decisions. HMIS allows physicians or hospital administrators to makeinformed decisions since it allows daily workflow of medical services in all the departments within the hospital to beevaluated and monitored. Patient records are also updated andtherefore made immediately available to the doctors and healthcare professionals.A technology assessment was therefore carried out withinthe urban andrural doctors and healthcare professionals in the Employees'State Insurance Corporation (ESIC) main hospital and dispensaries in Tirunelveli sub-region to investigatethe HMIS adoption process. Consequently, suggestions on how to tackle the various adoption challenges have also been addressed in this paper.

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REVIEW OF LITERATURE

Certain theoretical models could be applied to the ICT adoption studies. Themodels that were found to be very useful in healthcare sector were Diffusion ofInnovation(Rogers, 1995), Theory of Planned Behavior (Ajzen, 1985; 1991), Theory ofReasoned Action (Fishbein &Ajzen, 1975), Theory of Interpersonal Behavior(Triandis, 1980) and The Technology Acceptance Model (Davis, 1989). In theDiffusion of innovation model, three main sources are taken into account. They areperceptions of innovation characteristics, characteristics of the adopter and contextu-alfactors. Theory of Planned Behavior and Theory of Reasoned Action explains thebehavior of healthcare profes-sionals. In the Theory of Interpersonal Behavior, threefactors are taken into account. They are cultural, social, and moral factors. Further, thistheory is also sensitive to cultural variations. Such variations affect behavior pattern-swithin specific groups of the society (Gagnon M. P., 2006).From the theoretical models,three broad categories of factors were identified. These categories were perceivedattributes, perceived normative factors and perceived barriers and facilitators.Perceived attributes are based on users' perception towards the technology; socialnorm, role beliefs and professional norm come under normative factors; perceived control includesproper training, tech-nology access and in-house technology expertise.Thus ICT adoption studies should be made on a continuum basis and further, properdue importance should be given to theoretical frameworks.

The quality of data played an allimportant role in setting up global standards. Firstly, the standards should be locally assigned and then there should be sound network facilities to support the local adaptation of standards. The health system of an entire country could be addressed through standardization. Such standardization should take place at the data production and collection levels (Jacucci, Shaw, &Braa, 2006). The set of essential data and its hierarchy constitutes the standard. Once the standard was implemented, the data quality in the entire system should be guaranteed to ensure its sustainability. The available data should be used at the level of collection and only then "local" sustainability of a local system could be a reality. Global standard-based health Information system in developing countries relied heavily on the 'sustainability' factor. Local use, local capacity building and local appropriation of the standard should also be taken into account while planning a sustainable information system. In a sustainable information environment, the responsibilities should reach the bottom of the hierarchy and only then standards could be proactively reinvented.

The sustainability of Health Information System depended on the technical features and physical infrastruc-tures. Any lack of technical approach would lead to instability of the information system. Socio-technical aspects played an all important role in information system. Integration of such aspects into the organizational structures would lead to stability (Kimaro&Nhampossab, 2007).They would also enable easy execution of routine activi-ties. Health services mainly include curative and preventive activities. These activities are hampered by scarce resources. The main aim of HIS is to overcome the scarcity and bring about better care. Further, extra attention should be given to users' needs, evaluation and feedback generation and future improvements. Information gen-eration and sharing of knowledge within the sustainability strategy framework would also add to the stability of health systems.

A deeper consideration of the institutional context and its influence on technology adoption and usage could represent the missing link between public sector reforms and the attainment of expected performance. Fountain (2001), for example, refers to "technology enactment" as the process by which organizational forms, both affecting and being affected by existing institutional arrangements, influences the adoption of IT. The "enacted technology" can send feedback that directly creates changes into the organization and indirectly into policy institutions. Thus, the effects of information technology in relation to public sector reforms can be better understood by situating IT-enabled organizational change in the actual institutional context of a public organization.

Training of managers in data analysis and use played a crucial role in the health information system (Loevinsohn, 1993). Data intended for use should be presented in simple ways. Pie charts appeared to be a very good choice for data representation. However, the programme managers should avoid the usage of complex tables and graphs. The health managers should feel the 'institutional pressure' and only then, there would be routine analysis of data. The generated data should be accurate and so the managers were expected to pay more attention to the available information. Reliable data was found to be the hall mark of health information system. Decision making was never an easy task and hence the generated reliable data should be applied in the decision making process.

Training on basic computer skills was useful to health care employees even if they did not intend to use the computer for health care activities. The introduction and use of the technology contributed to the transformation of relationships among some employees (Kouroubali, 2003).Further, interested employees influenced other health care providers into using the technology. Healthcare personnel in leading positions, such as directors were expected to attend management and leadership trainings. Such trainings and workshops would enable them to manage the organization better. Leadership played a very important role in effective health care. The education and training of leaders requires a broad vision and a pragmatic approach. Moreover, proper due importance should be given to practitioners' concerns, compatibility and complexity of the work. Individuals within a system were asked to disseminate knowledge, skills, and best practice. Such an endeavor would bring about technological awareness and competency in the whole organization.

METHODOLOGY

Quantitative adoption study was applied by use of questionnaires on healthcare professionals in ESIC main hospital and dispensaries at Tirunelveli sub-region.The selected districts inTirunelveli sub-region in Tamil Nadu include Tirunelveli, Tuticorin and Kanyakumari districts. In order to carry out a technology assessment of the ESIC main hospital and dispensaries in Tirunelveli sub-region, 171 healthcare professionals were chosen through random sampling. Survey questionnaire was distributed to the ESIC healthcare professionals to collect their responses regarding the adoption of Health Management Information System (HMIS). Appropriate statistical tool was used to test the hypothesis and the statistical tool used in this study was T-test.

DATA AND ANALYSIS

$H_0$2: There is no significant difference between urban and rural ESIC healthcare professionals in adopting health management information system.

TABLE 4.12 Results of 't' test for URBAN AND RURAL healthcare professionals and adoption of hmis

Adoption factors	Location of hospital	N	Mean	S.D	't' value	'p' value
System Quality	Urban	132	21.36	4.98	5.273	0.000**
	Rural	39	24.95	3.28		
Computer Self-Efficacy	Urban	132	21.03	6.20	6.469	0.000**
	Rural	39	26.41	3.95		
Facilitating Conditions	Urban	132	30.64	7.62	6.027	0.000**
	Rural	39	36.62	4.61		
Perceived Usefulness	Urban	132	29.45	7.29	5.369	0.000**
	Rural	39	34.69	4.64		

Perceived Ease of Use	Urban	132	13.08	3.44	2.254	0.041*
	Rural	39	14.33	2.91		
Perceived Behavioral Control	Urban	132	33.93	8.39	5.379	0.000**
	Rural	39	35.81	7.58		
Attitude	Urban	132	25.39	7.31	6.768	0.000**
	Rural	39	32.46	5.17		
Subjective Norm	Urban	132	13.81	3.67	4.881	0.000**
	Rural	39	16.46	2.74		
Behavioral Intention	Urban	132	13.23	4.34	3.499	0.004**
	Rural	39	15.41	3.10		

Note : 1. ** significant at 1% level

2. * significant at 5% level

(At 5% level of significance the table value of 't' is 1.98)

Since P value is less than 0.01, the null hypothesis is rejected at 1% level with regard to dimensions of system quality, computer self-efficacy, facilitating conditions perceived usefulness, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioralintention.There is significant difference between urban and ruralhealthcare professionals working in ESIC hospital and dispensaries in Tirunelveli sub-region in their system quality, computer self-efficacy, facilitatingconditions, perceived usefulness, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention.

RESULTS

Based on the mean score, it is found that the rural health care professionals (M=24.95) are better than the urban healthcare professionals (M=21.36) in their system quality. They are also found to be better in their computer self-efficacy (M=26.41). The rural healthcare professionals are also very much confident about the facilitating conditions provided in the hospital (M=36.62). With regard to the health management information system, the rural healthcare professionals are quite positive about the perceived usefulness of the software used in the ESIC hospital (M=34.69). When compared to the urban healthcare professionals (M=33.93), they are found to have better perceived behavioral control (M=35.81) over the adoption process. The rural healthcare professionals also had a positive attitude towards the health management information system adoption process (M=32.46). Moreover, the rural healthcare professionals are better in their subjective norm (M=16.46) and are also found to be better in their behavioral intention (M=15.41).

Since p value is less than 0.05, the null hypothesis is rejected at 5% level, with regard to perceived ease of use. There is significant difference between urban and rural healthcare professionals in adopting health management information system working in ESIC hospital and dispensaries in Tirunelveli sub-region in their perceived ease of use. According to the mean score, it is also found that the ruralhealthcare professionals (M=14.33) are better than the urban healthcare professionals (M=13.08) in their perceived ease of use.

DISCUSSION

Based on the above findings, it can be concluded that the adoption of HMIS software in the ESIC environment isstill scanty.The majority of older doctors and healthcare professionals in the urban ESIC main hospital do not know how toefficiently use the HMIS software. Some basic form of training is neededif HMIS adoption is to take place, otherwisethey may reject any e-health initiatives implemented. There isa need to educate them in order to benefit from the available HMIS technology.However, most of the younger doctors and healthcare professionals in the rural ESIC dispensariesseem aware of how to go about with HMIS software.There is no need for them to beeducated on the HMIS software environment; being youngsters, they are well equipped withtechnological information and also, they can visualize the benefits ofHMIS adoption in the ESIC environment. Such a positive attitude among the younger doctors and healthcare professionals can make them push for the effective implementation of HMIS in the rural ESIC dispensaries.

The t-statistics related to the effect of the product term of behavioral intention and location of hospital (urban/ rural) on HMIS adoption and usage was 3.499, showing a significance level of 95%. Therefore, the influence of behavioral intention on hospitals' staff HMIS adoption will be moderated by location of hospital, such that the effect will be stronger for rural area hospital healthcare professionals. The ESIC doctors working in rural health clinics and dispensaries explained the reasons for successful HMIS adoption among rural doctors and healthcare professionals through the given questionnaire. Some of the younger ESIC doctors explained that with proper networking facilities, the ESIC rural healthcare dispensaries can expertly manage the implementation of HMIS. Rural Health information technology (HIT) networks provide shared HIT technical staff, volume purchasing for HIT software and training, health information exchanges, and data analytic services. The HIT technical supportstaff observe ESIC dispensaries on a regular or periodic basis to determine possible needs and they also provide separate training for the ESIC rural-based doctors andhealthcare professionals. Usually, the HIT workforce is limited in rural areas, and thereis a lack of adequate HIT workforce development in rural communities. However,through the HIT support staff programme, the ESIC hospital management is doing itsbest to help healthcare professionals cross the technology barrier and embrace change.

CONCLUSION

The researcher found a statistically significant higher HMIS adoption among the younger doctors and healthcare professionals stationed in the rural ESIC dispensaries in the Tirunelveli sub-region. This is not surprising considering that this group consists of many youngsters with good computer knowledge.Prior studieshave found that location of hospital is an important predictor for HMIS adoption. Moreover, ESIC healthprofessionals may also use HMIS software for instance, to update themselves professionally orto find information for their patients.

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Role of educational level as moderator in health management information system (HMIS) adoption among healthcare professionals in the ESIC main hospital and dispensaries in the Tirunelveli sub-region

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***Abstract*---**Adoption of innovations by firms and workers is an important part of the process of technological change. Health Management Information System (HMIS) is an emerging technology that employs the internet and the typical health services infrastructure of hospitals. The adoption of a technology by users is vital if the organization wants to benefit from the technology advancements and synergies. Education is an important factor in predicting HMIS adoption by healthcare professionals in the Employees State Insurance Corporation (ESIC) main hospital and dispensaries. This study utilized two education levels (Under Graduation and Post Graduation in medical sciences) to moderate the research model that was proposed by the Technology Acceptance Model (TAM). Relying on data from the workplace and employee survey, this study assesses the causal effects of education on technology use and adoption by using instrumental variables for healthcare environment derived from the Technology Acceptance Model (TAM) and Extended Technology Acceptance Model (TAM2). The models concluded to five major predictors of HMIS adoption among ESIC healthcare professionals: Training, Social influence or Subjective norm , self-efficacy (SE), Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The statistical results show that education influences the use of computer-controlled and computer-assisted devices or other technological devices in the ESIC healthcare environment in the Tirunelveli sub-region. The results are consistent with the view that formal education increases the use of technologies that require or

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enable workers to carry out higher order tasks more efficiently, but not those that routinize workplace tasks.

***Keywords*---**technology acceptance model, extended technology acceptance model, health management information system, employees state insurance corporation, health services infrastructure.

Introduction

Innovations in health care account for some of the most dramatic improvements in population health outcomes in the developed world as well as the developing world. Currently, technology development has become one of the strategic elements in organizations. Provider organizations are the adopters of many innovations, and understanding the factors that inhibit or facilitate their diffusion to and possible disengagement from these organizations is important in addressing cost, quality, and access issues. In this paper, the researcher discusses the most important educational level factor affecting the acceptance of the Health Management Information System (HMIS) adoption among the healthcare professionals in the ESIC main hospital and dispensaries in the Tirunelveli sub-region. Given the importance of these issues, the purpose of this research paper is to (1) create a comprehensive study examining the adoption of and disengagement from HMIS in ESIC healthcare environment; (2) organize these results into a statistically derived classification scheme; (3) assess the studies' strengths and weaknesses; and (4) reflect on the implications and scope for future research. Moreover, health care provider organizations are significant investors in medical innovations; so understanding the factors that inhibit or facilitate adoption and disengagement in any organization is important to enhance the appropriate system-level diffusion of innovations.

Review of Literature

The quality of data played an all important role in setting up global standards. Firstly, the standards should be locally assigned and then there should be sound network facilities to support the local adaptation of standards. The health system of an entire country could be addressed through standardization. Such standardization should take place at the data production and collection levels (Jacucci, Shaw, & Braa, 2006). The set of essential data and its hierarchy constitutes the standard. Once the standard was implemented, the data quality in the entire system should be guaranteed to ensure its sustainability. The available data should be used at the level of collection and only then "local" sustainability of a local system could be a reality. Global standard-based health Information system in developing countries relied heavily on the 'sustainability' factor. Local use, local capacity building and local appropriation of the standard should also be taken into account while planning a sustainable information system. In a sustainable information environment, the responsibilities should reach the bottom of the hierarchy and only then standards could be proactively reinvented.

There was a remarkable increase in Op registration, Clinical Op and Pharmacy. The data generated by HMIS could be used for decision making (Natarajan.S, Panchanathan.V, & Bansal, 2013). Further, recommendations aimed at health care development could also be made to the government. The main objective of the project is to use ICT in improving the ability to collect, store and analyze accurate health data across the state. The AMC (Application Maintenance Cost) reports were generated periodically. These reports were found to be very useful in estimating the cost and longevity of each set up. With the help of these reports, the monetary allocation for each district was proficiently made.

Every action had to be planned, organized, coordinated and controlled in an information management system. Management information system enabled more comprehensive use of information and thereby helped in the decision making process. Information management processes greatly helped in knowledge creation, sharing and use. They also helped to meet the future challenges of effectiveness, increasing needs and demands of patients and decreasing availability of staff resources (Kivinen & Lammintakanen, 2013). There were four sub-categories in the “usage of management information system”. They were system quality, information quality, use and user satisfaction and development. Most of the generated information was used for the human resource management. Automatically generated patient satisfaction and feedback information assisted in evaluating the quality of daily work.

Information technology advances and their adoption into healthcare industry are likely to improve healthcare provision quality, reduce healthcare cost, and advance the medical science. Technology alone could not meet the ulterior goals of high quality care; Instead a balanced approach of investment in technology, processes, people, and knowledge base must be considered to improve health care services. Information security failures could lead to financial losses to various stakeholders including patients, providers, and payers. Due to the multitude of roles, interdependent information systems, and dynamic nature of role assignment, it is very difficult to establish and revise access control policies in hospital environments (Appari & Johnson, 2010). Understanding the operational effectiveness of data disclosure technology from the field was indeed considered as an important task. Such an endeavor would help hospital administration in refining disclosure policies, as well choosing appropriate data disclosure technology solutions.

The use of a unique national Medical Record Number (MRN) is a critical issue for any Health Information System (HIS). It provides accurate and efficient access to the patient medical information whenever and wherever it is needed. The system had been designed with compliance of the main elements of e-security: confidentiality, integrity, and availability. The system was isolated physically from the internet and it did not allow the use of removable storage such as USB memory and CDs within the Health Net. Medical Audit was found to be vital for the measurement of the quality of care given to the practice population (Elhadi, et al., 2007). Medical audit required standard setting, data collection, comparison with standards, review of data and standards. There has always been a need for a unified referral information system in which patient care records can be shared among hospitals over the internet.

Methodology

Data were collected in the ESIC hospital and dispensaries in Tirunelveli sub-region (Tirunelveli, Tuticorin and Kanyakumari districts). Survey questionnaire was distributed to 171 healthcare professionals to collect their responses regarding the adoption of Health Management Information System (HMIS). Appropriate statistical tool was used to test the hypothesis and the statistical tool used in this study was T-test. Throughout this research, all independent variables for this quantitative article were classified according to the connection between measure and construct intended by the researcher. The findings of this study will be reliably based on intended meaning of constructs and practical cause-effect relationship in the ESIC healthcare environment.

Data and Analysis

A null hypothesis is formulated and the T-test is carried out to statistically analyze the survey data.

H01: There is no significant difference among ESIC healthcare professionals on the basis of their education in adopting health management information system.

Table 1
Results of 't' test for respondents' (healthcare professionals') education and HMIS adoption in ESIC

Adoption factors	Educational qualification	N	Mean	S.D	't' value	'p' value
System Quality	Bachelor degree	137	22.88	4.23	3.972	0.003**
	Master degree	34	19.32	6.18		
Computer Self-Efficacy	Bachelor degree	137	23.27	5.56	4.540	0.000**
	Master degree	34	18.18	6.93		
Facilitating Conditions	Bachelor degree	137	33.43	6.01	5.434	0.000**
	Master degree	34	26.24	9.78		
Perceived Usefulness	Bachelor degree	137	31.66	6.36	3.924	0.002**
	Master degree	34	26.53	8.49		
Perceived Ease of Use	Bachelor degree	137	13.84	3.05	3.819	0.002**
	Master degree	34	11.47	3.93		
Perceived Behavioral Control	Bachelor degree	137	36.74	6.83	4.960	0.000**
	Master degree	34	29.47	10.3		
Attitude	Bachelor degree	137	27.94	7.09	3.380	0.001**
	Master degree	34	23.24	7.94		
Subjective	Bachelor	137	14.90	3.43	3.591	0.000**

Norm	degree					
	Master degree	34	12.47	3.89		
Behavioral Intention	Bachelor degree	137	14.23	3.89	3.231	0.001**
	Master degree	34	11.71	4.76		

Note : 1. ** denotes significant at 1% level
(At 5% level of significance the table value of 't' is 1.98)

Since P value is less than 0.01, the null hypothesis is rejected at 1% level with regard to dimensions of system quality, computer self-efficacy, facilitating conditions perceived usefulness, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention. There is significant difference between bachelor degree completed healthcare professionals and master degree completed healthcare professionals working in ESIC hospital and dispensaries in Tirunelveli subregion in their system quality, computer self-efficacy, facilitating conditions, perceived usefulness, perceived ease of use, perceived behavioral control, attitude, subjective norm and behavioral intention.

Based on the mean score, it is found that the bachelor's degree completed (M=22.88) health care professionals are better than the master's degree completed (M=19.32) healthcare professionals in their system quality. Also, the bachelor's degree holders had better computer self-efficacy beliefs (M=23.27) than the master's degree holders (M=18.18). The bachelor's degree healthcare professionals agreed that better facilitating conditions was provided to them in the ESIC hospital environment (M=33.43). They also perceived the health management information system was very much useful in the daily routine at the ESIC hospital and dispensaries (M=31.66). The bachelor's degree holders in the ESIC hospital indeed acknowledged the user friendliness of the health management information system software (M=13.84). Further, the bachelor's degree healthcare professionals showed greater perceived behavioral control over the health management information system adoption process (M=36.74) and also reported greater intentions to engage in the system usage (M=14.23). According to the mean score, it is found that the bachelor's degree completed (M=27.94) health care professionals are better than the master's degree completed (M=23.24) healthcare professionals in their attitude. In addition, the bachelor's degree holders in the ESIC hospital are greatly influenced by social groups or subjective norms during the adoption process (M=14.90).

Discussion

This study found that young healthcare professionals who are bachelor degree holders efficiently used the health management information system, with all of them citing ease of use of the software as their primary motivation. Also, senior healthcare professionals who are master degree holders had a difficult time in adopting the health management information system that is easy to use for the younger professionals. The statistical results showed that perceived usefulness and perceived ease of use are the most important factors in technology adoption. Further, in an integrated model of adoption and use of technology, the most important factor is the simplicity of perceived usage and also social impacts have a greater role to play. The ESIC healthcare organization should address expectations regarding ESIC healthcare professionals' technology adoption behavior. The organization should ensure that the senior medical staff and healthcare professionals reveal their problems regarding HMIS adoption to the Information Technology (IT) team. By this way, proper training can be given, especially to the senior ESIC healthcare professionals so that they become familiar with the perceived usage of the HMIS in the ESIC healthcare environment. Young ESIC healthcare professionals already learn about computers and gadgets in their college days so they are well versed with the advancing tech. Since, technology has become an important part of everyday life, they stay updated on the latest apps and technologies and hence HMIS adoption easily takes place among the young ESIC healthcare professionals in the ESIC main hospital and dispensaries in the Tirunelveli sub-region. The ESIC hospital management should regularly revise or expand technology related policies to keep the healthcare professionals up to date with industry best practices. Moreover, the ESIC healthcare professionals should understand the need to adhere to the technology adoption process and only then appropriate use of technology would take place in the ESIC healthcare environment.

Conclusion

The results show that TAM model based factors influence the technology adoption process and perceived usefulness and perceived ease of use are the factors that should be considered while implementing the health management information system in any hospital environment. This experience at the ESIC main hospital and dispensaries in the Tirunelveli sub-region shows that educational qualification of the ESIC healthcare professionals greatly influences the HMIS adoption process. Hence, maintaining a good HMIS is essential for an effective health system in a developing country like India.

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राष्ट्रहिताय संस्कृतम्

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This is to certify that the article entitled

THE INSIGHTS OF BLOCKCHAIN-DEMYSTIFIED

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A SURVEY ON THE RESEARCH CHALLENGES OF BIG DATA ANALYTICS

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Abstract: In the recent years, the rapid growth of science and technologies gave a way to adoption of SMAC. SMAC is Social, Mobile, Analytics and Cloud where four technologies are currently driving the entire universe. Also, permeate physical spaces and lives of human and produce huge amount of heterogeneous data known as Big Data for analysis. Human sourced information from social network, processed mediated data from business systems and machine generated data from Internet of Things, Web, healthcare sectors are the primary sources of big data. The heterogeneous data is transformed into a precious knowledge by using artificial intelligence (AI) and machine learning (ML). Further the generated knowledge will play a vital role in decision making, system performance boosting and optimum utilization of resources. Big data mining attracted researchers that make use of Hadoop. MapReduce is the programming paradigm used for processing big data. It is done in distributed environment with parallel processing. This paper focuses on challenges encountered in handling big data which are utilized by the various researchers and show case the issues faced by them.

Keywords: Big Data Analytics, DBSCAN, Partition Around Medoids, Markov Random Fields, Support Vector Machine

I. INTRODUCTION

The importance of data in day-to-day escalation plays a crucial role in many fields. Organizations know what they are looking for to compete with their competitors. The goal is to collect the data what is needed and go after the data to meet the objectives. The data are collected for the analysis and predictions from various sources. These collected data was huge in volume. This has coined the term “Big Data”. These data are processed in such a way that traditional data mining techniques are unable to analyze. Data is scrutinized to diagnose behaviors, patterns and market trending information to make decisions. The bulk of data generated comes from three key resources – social data, machine data and transactional data. The figure 1 represents the exponential growth of big data by the year 2025.

Characteristics of big data: Big data are treasure trove for research and computational tools are developed to extract knowledge from such data. The four main features of big data are volume, velocity, variety and veracity. Volume refers to the size of data that are used to archive. The size of data is important in determining the value out of data and also based on the volume a particular data is considered big data or not. The velocity refers to the speed at which data is generated and processed. The data flows from sources like social media, application logs, business processes, smart IoT devices is enormous and continuous. In an enterprise, with the development of sensors, smart devices, and social collaboration technologies data in an organization has become complex.

Analysis of Chest Accelerometer Data using Machine Learning Techniques

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Abstract: In the recent years, Internet of Things (IoT) is one of the technology related catchphrase that hear and see about it everywhere. The development of IoT brings immense value into human lives. It is the embedded platform where devices are connected through the internet. These devices collect and exchange data with each other. The IoT technology is applied on various applications such as wearable, smart home applications, health care, smart cities and so on. IoT has shown more potential application growth in the field of medical by connecting medical devices, sensors and healthcare professionals to provide quality medical services in the remote location. Wearable technologies combined with proper data analysis provide a low cost option to monitor chest during the various physical activity of human. The accelerometer based activity has become the most apposite means for objective evaluation of mobility trends within patient study groups. Recognition of activity pattern is the problem of predicting the current action. The data collected through the device is raw data. In this work, the dataset used is from Kaggle repository. The raw data is pre-processed, the training and testing data is split based on the user_id. Then the dataset is converted into frequency domain and features are extracted. Human activity recognition (HAR) is predicted using K-Nearest Neighbor, Decision Tree and Random Forest methods. The performance of these algorithms is measured as accuracy.

Keywords: Data pre-processing, classification, k-nearest neighbor algorithm, random forest algorithm, decision tree algorithm, human activity recognition.

I. Introduction

In the recent years, health care industry has shown swift development and has been a major contributor to revenue and employment. The growth of the technology has changed the diagnosis of the disease and various healths monitoring using smart devices known as Healthcare IoT (HIoT). The science and technology has changed hospital centric to patient centric. Various clinical analyses such as blood pressure, pO2, glucose level can be measured at home without the support of health care professionals. These data are communicated to the health centre from remote areas with the help of telecommunication services [1].

Innovation of wearable embedded system has resulted in utilization of body wearable sensor network for remote health and activity monitoring. Devices with motion sensors are used to monitor the daily activity. Placing the devices at the prompt place and position in the body will help the healthcare professionals to predict the health conditions of patients [2].

Classification is a challenging problem with database as input in the form of training records and each record has multiple attributes.

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RESEARCH CHALLENGES IN BIG IOT DATA ANALYTICS

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ABSTRACT: The incredible growth in the number of devices with sensors and actuators connected through the internet reflects the tremendous growth of big data with IoT. The IoT-driven human and machine collaboration enhances operational efficiencies and productivity. Analytics of data from IoT has improved decision-making and the quality of life. The evolution of the smart world has become inevitable. Internet of Things connects the physical world to the internet that shares critical information to the surface quickly than a system depending on human intervention. The data collected by the things in IoT is enormous and big data provides faster and efficient storage and processing of the data. Big data analytics applies analysis tools to the huge volumes of data generated by IoT devices to help in efficient decision making. The convergence of IoT, big data analytics and cloud has created several research opportunities to explore. In this paper, the concept of IoT, the applications of IoT, characteristics of big data, the relationship between IoT and big data analytics is discussed. The IoT layer architecture,IoT and big data architecture, the tools used for analytics of big data and the challenges in analysis of big IoT data is elaborated.

Keywords: IoT, Big Data, Big Data Analytics, Challenges in Big Data Analytics

1. INTRODUCTION

The tremendous amount of data that is exponentially increasing due to the recent advancement in technology has become inevitable. The data explosion is caused by the following: increase in the number of data generating smart devices with sensors and actuators which are connected globally through the cloud, increase in the number of users of the internet, increase in virtual reality and augmented reality, 5G cellular network, increase in e-commerce transactions etc[1]. The global internet protocol traffic has grown at a compound annual growth rate of 26% from 2017 to 2022[2]. The number of devices connected to the internet will be three times the global population by 2022. Smartphones will be 44% of total IP traffic. Digital world will reach a brontobyte in the coming decade.

We live in a Big data era and information is the new gold. The data explosion has created challenges in the collection of data, storage of data, retrieval, processing and representation due to volume, variety and velocity of data. Discovering value or useful patterns from Big data poses many challenges requiring enormous computing resources, technological infrastructure and skilled data analysts. Internet of Things(IoT) is one of the technological revolutions in this era posing a serious challenge in the ability to exploit huge amounts of data. IoT and Big Data are two independent technologies where IoT would generate large amounts of data and Big data would enhance storage efficiency and processing of the data.

The objective of this paper is to highlight the association between IoT and Big Data Analytics and explore the research perspective in this area. The relationship between IoT and Big Data in terms of transforming the huge data into more understandable and meaningful patterns is discussed. The platforms available for Big Data Analytics of IoT data are elaborated.

2. OVERVIEW OF IOT, BIG DATA AND BIG DATA ANALYTICS

Internet of Things(IoT) refers to the network of physical objects that are embedded with sensors, softwares and technology for communicating and exchanging data with other objects on the internet[3]. A thing in the Internet of Things can be any object that can be assigned an Internet

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A SURVEY ON VARIOUS IMAGE ENHANCEMENT TECHNIQUE USING CCTV SURVEILLANCE

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Abstract: Digital Image Processing (DIP) is a type of software that allows you to alter digital images using a computer system. It is also used to enhance the image and extract useful information from the image. Image enhancement, analog and digital signal processing, image signals, voice signals, and other procedures are all possible with Digital Image Processing. CCTV one of the most significant and difficult aspects of video research is image enhancement. Video enhancement aims to improve the video's visual appearance or provide a better transform representation for future automated video processing, such as analysis, detection, segmentation, recognition, surveillance, traffic, and criminal justice systems. The goal of this study is to analyze low-resolution images to high-resolution images to detect the clear image. The purpose of this work is to present an analysis of recent publications concerning with Image processing using various algorithm. This survey finds out some of the best suitable algorithms for Image processing analyses suggested by the various researchers in their research work.

Keywords: Closed Circuit Television (CCTV), High Resolution Images (HR), Low Resolution Images (LR).

1. INTRODUCTION

Digital images are dependent upon a wide assessment of twists during acquisition, processing, compression, storage, transmission, and reproduction, all of which can degrade visual quality. The only "proper" approach to assessing visual picture quality for applications in which images are eventually to be viewed by humans is through subjective evaluation. Subjective analysis, on the other hand, is often inconvenient, time-consuming, and expensive in practice. Image processing is a technique for improving raw images acquired from cameras/sensors aboard satellites, space probes, and aircraft, as well as pictures captured in everyday life. Various Image Processing techniques have been developed over the previous four to five decades. The majority of the techniques were created to improve photos captured by unmanned spacecraft, space probes, and military reconnaissance flights. Image processing systems are becoming more common as powerful personal computers, big memory devices, and graphics software become more readily available. Computer vision techniques that improve the appearance of a picture are known as image enhancement. Image enhancement is a set of techniques for modifying the pixels in images so that the viewer can adjust the results more quickly. Image processing is a method of converting an image signal into a physical image. Digital or analog image signals both are possible. The real output can be a physical image or image characteristics.

Pre-Processing: The initial step in preparing the video for the next stage is pre-processing. Pre-processing improves image quality by removing image defects and noise created during scanning and reading. Color normalization, statistical methods, and convolution methods are among the pre-processing procedures. The pre-processing output would be ready for the following stage, which would involve performing complex video sequence processing tasks on the video data. Conversion to Grayscale: For image processing purposes, the frame collected from a video is converted to grayscale. The image is made up of pixels, each of which is identified by three distinct color schemes: Red, Green, and Blue. It is used to convert color image to a grayscale image. Background

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EFFECTIVE APPROACHES FOR ANALYZING MEDICAL IMAGES USING CLASSIFICATION ALGORITHMS

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Abstract:
Diabetes is the most prevalent chronic condition, characterized by low insulin production, which raises blood sugar levels in a wide range of people. Diabetes can cause a number of problems to develop throughout the body if it is not addressed. Diabetes causes diabetic retinopathy (DR), an asymptomatic eye condition that affects the retinal blood vessels.In the literature, numerous automatic diagnostic systems have been created using traditional handcrafted features.Deep Learning (DL) does autonomous feature extraction; it can give more accurate and promising findings, especially in medical imaging.In the processing of medical image data, convolutional neural networks (CNNs) are the most often used deep learning technique.This research work analyzed the various classification algorithms which are applied in the chosen dataset of retinal images to compare the algorithms and find the best method and accuracy of medical imaging. Finally, this research work finds out some of the best suitable algorithms for medical imaging analyses suggested by the various researchers in their research work.
Keywords: Classification algorithms, Medical imaging, Convolutional neural networks, Deep learning, Diabetic retinopathy

I. INTRODUCTION

Digital image processing isto process the digital images with the use of a digital computerthrough an algorithm. Digital image processing has significant benefits over analogue image processing as a subfield or area of digital signal processing.In several domains, including forensics, automobile detection, face and iris recognition, signature recognition, and military applications, digital image processing has become cost-effective. The fundamental criteria for each of these applications may be different from those for the others.The process of creating visual representations of a body's internal structure for clinical study and medical intervention, as well as visual representations of particular organs' or tissues' functions, is known as medical imaging. Additionally, to detect the condition early on, digital techniques like magnetic resonance imaging (MRI) and computed tomography (CT) are used.A diabetes condition that damages the retina of the eye is called diabetic retinopathy (DR). The blood vessels in the light-sensitive tissue in the back of the human retina are damaged, resulting in the causes it. When diabetes is not well controlled, it is the most common cause of blindness in persons who are working age.Computing models with many processing layers also can learn data representations at various levels of abstraction according to deep learning (DL). Modern object detection, speech recognition, pattern recognition, and other fields were all significantly enhanced by these techniques.

In figure 1 shows that the image acquisition is the first step for processing digital image like repositioning, orientation, size which is already in digital format. Image Enhancement is mainly applied to brighten the image and adjust the contrast of that digital image.

PREDICTION OF DIABETIC RETINOPATHY IN RETINAL FUNDUS IMAGES USING RESNET ARCHITECTURE

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Abstract: Diabetic retinopathy (DR) in patients affects retina function owing to chronic elevated excessive blood glucose rates. The DR is a severe medical disorder. Patients with diabetes are easily prone to this medical complication which when not detected and treated at earlier stages, leads to vision loss. Globally, diabetes mellitus is the fifth leading cause of vision loss. So, active research is being conducted in this area to find novel ways in identifying the stages of DR. Specific image recognition methods and computer simulation algorithms were initially used to classify DR, but their usefulness was inadequate in real-time clinical practice. In comparison to traditional machine learning models, the emergence of deep learning models such as convolution neural networks fared better at recognising DR and non-referable DR. Over time, other CNN design modifications have been created, but more research and testing are still needed to determine the best architecture for diagnosing diabetic retinopathy. The purpose of this study is to apply and comprehend how the pre-trained ResNet deep layered neural network performs to distinguish between various kinds of referable DR and non-referable DR.

Keywords: Diabetic retinopathy; CNN; Neural network; ResNet; Deep learning; Classification

I. INTRODUCTION

Elevated blood glucose levels result in a chronic diabetes as a result of hyperglycemia. The onset of DR development occurs when hyperglycemia persists for an extended period of time. Globally, the number of persons at risk for diabetes is rising quite quickly. By 2025 and 2030, respectively, 69, 9 million and 80 million Indians are expected to get diabetes. And the number of people with diabetes-related retinal diseases is expected to reach 382 million worldwide, with a potential increase to 592 million by 2025 [1]. The most important indicator for determining the prevalence of diabetic retinopathy in individuals was a diabetes mellitus period. After 10 years, 20% of Type I patients and 25% of Type II patients, 20% of Type I patients and 60% of Type II patients, and 95% of people with Type I or Type II develop this illness over a 30-year period. Patients with type I diabetes have a total lack of insulin, while those with type II diabetes have a failure in progressive insulin secretion [2]. In a 4:3 ratio, women are more influenced than men. Other risk factors linked to the development of DR include pregnancy, obesity, hypertension, hyperlipidemia, smoking, and anaemia [3].

According to clinical trials, when DR is caught early enough, blood lipids, blood sugar, and blood pressure can all be brought under ideal control to reduce the disease's progression. However, a third of the population's lack of awareness is contributing to the rapid increase in the number of diabetics. Another reason is that, according to analysis by specialists for populations of 60 million diabetics at risk for retinal illness, there are around 12,000 ophthalmologists and 3,500 retina consultants, respectively [1]. Because of this, WHO considers DR a severe retinal illness and calls for attention from experts and authorities [1, 20]. Computer scientists and engineers can significantly contribute to the identification of DR by

Image Pre-Processing Techniques used to Improve Face Recognition Rate

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Abstract:

Image quality is important in increasing the rate of face recognition. A high-quality image has a higher recognition rate than a noisy image. It becomes more difficult to extract features from such noisy images, potentially reducing the rate of face recognition. To overcome issues caused by low-resolution images, pre-processing is performed before extracting images from the features. In this paper, study the impact of pre-processing prior to the feature extraction process on the face recognition rate. It also provides a qualitative description of the various pre-processing techniques and feature extraction schemes used in the analysis. It is used to analyze with results of bar graphs. The combined feature extraction method (Spatial and Frequency) outperforms individual feature extraction schemes. Furthermore, even without image pre-processing, this combined method will produce good recognition results.

Keywords:

Face Recognition, Image Pre-processing, Image Quality, Spatial Feature, Frequency Feature.

Introduction:

Face recognition in recent times, important in a separate biometric recognition method for accurate authentication [1]. Other than the most well-known application of mug shot identification, the problem of face recognition can be defined as “identifying an individual from images of the face” [2]. PCA is widely used in face recognition because it is the foundation of the standard eigenface technique. Each image is traditionally converted to a vector first by row (or column) concatenation. After that, PCA is used to reduce dimensionality. Despite providing effective approximation, the method has a high computational load and poor discriminatory power. To overcome these limitations, it is suggested that PCA on the curvelet domain be used [3]. Much research has been performed in this area in order to better control the human ability for face recognition. The problem of which features humans use for face recognition has been debated, and the findings of related studies have been implemented into the algorithm design of some face recognition systems [4].

Face recognition, handprint recognition, human-made object recognition, industrial robotics, and mobile robotics have all been used in PCA [5]. Many industries around the world are now attempting to implement face recognition-based authentication systems in order to protect their assets. Many governments around the world are also interested in installing face recognition-based video surveillance systems in public places such as airports, railway stations, and bus stations, among others. However, they remain ineffective due to a low recognition rate in recognizing a person in real-time due to a variety of factors [6]. Visual privacy has been a source of concern since the invention of photography, but the issues are becoming more pressing as digital imagery becomes more widely available. Simultaneously, image processing, computer vision, and cryptography techniques are for the first time capable of providing technological solutions to some visual privacy issues [7]. One of the most important factors influencing face recognition rate is image quality.

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FEATURE EXTRACTION AND PREPROCESSING OF DIABETIC RETINAL FUNDUS IMAGES FOR EARLY DETECTION OF DIABETIC RETINOPATHY

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Abstract: According to a review of clinical reports, more than 10% of diabetic individuals have a significant chance of developing eye problems. Eighty to eighty-five percent of people with diabetes who have had the disease for longer than ten years will develop diabetic retinopathy (DR), an eye condition. In clinics, diabetic retinopathy disease is frequently seen and assessed using retinal fundus imaging. Machine learning algorithms have a very difficult time processing the raw retinal fundus images. This study uses image enhancing, resizing, histogram equalisation, and green channel extraction to perform pre-processing on raw retinal fundus images. Moreover, fourteen features are extracted for quantitative analysis from pre-processed photos. The experiments are carried out using the Kaggle dataset for diabetic retinopathy, and the outcomes are assessed by taking into account the mean value and standard deviation for the characteristics that were retrieved.

Keywords: Diabetic retinopathy; Image processing, Retinal fundus images; Median Filter; Feature selection; Feature extraction

I. INTRODUCTION

The number of diabetic people who have diabetic retinopathy has dramatically increased in recent years (DR). One of the most common chronic disorders, DR is the primary factor in middle-aged vision loss in the developed world [1]. Small alterations in the retinal capillaries signal the emergence of DR. Microaneurysms, which are localised interruptions of the retinal capillary, are the first differentiable deviations. Intraregional bleeding is produced by the deformed microaneurysms. This causes the first stage of DR, also known as moderate non-proliferative diabetic retinopathy [2], to develop. Fundus imaging is more suited for noninvasive types of screening since the eye fundus is sensitive to some vascular disorders. The quality and precision of the fundus image extraction technique together with effective image processing methodologies [3] for recognising the abnormalities [4, 5] strongly influence the screening approach's outcome.

Exudates are merely greasy deposits that leak from the damaged ends of blood vessels. The DR is known as moderate nonproliferative diabetic retinopathy once it begins to manifest. Diabetic maculopathy is the term for when these exudates begin to appear around the area of the central vision. The microinfarcts in the retina eventually block the blood vessels as the retinopathy worsens over time. Soft exudates are the medical name for these little infarcts.

A LEAKYRELU SEQUENTIAL DEEP LEARNING SOLUTION FOR ANOMALY ACCESS BEHAVIOR DETECTION

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Abstract-
Malicious software, known as malware, can accomplish destructive activities on computer systems, leading to financial damage and data disclosure. Malware classification is therefore useful and necessary to avoid malware attacks. Application Programming Interface (API) call categorizations are easy to observe and a virtuous choice for malware classification characteristics. However, one of the major problems is that classification algorithms produce appropriate features to attain high classification accuracy. Different malware samples contain API call sequences of varying lengths, and these can reach millions in length, resulting in computational cost and time complexity. This work describes a malware recognition technique built on behavioral features of API calls, as extracting and interpreting API calls can help determine program behavior and functionality. This paper proposes a feature selection process that selects normal and abnormal APIs and apply Deep Learning (DL) methods to classify unusual user access behaviour in applications. The purpose of this work is to provide an efficient and comprehensive DL techniques, for malware detection using activation functions Relu and LeakyRelu. The comparative analysis of DL based methods outplaces the traditional ML based methods. So, in order to assess the proposed model's training accuracy, accuracy, loss validation, confusion metrics, recall, f1 score, sensitivity, specificity, and support value are cast-off metrics. Through the experiments, LeakyRelu optimization is best suited functions and increases accuracy by 99.96%.

Index Terms-Malware classification, Application Programming Interface call sequence, Deep Learning, activation functions Relu and LeakyRelu

I. INTRODUCTION

With the swift expansion of the Internet, the day-to-day life of hundreds of heaps of users is meticulously connected to the Internet. For example, online shopping, ordering food, banking transactions, etc. Pandalabs reports that there will be over 60 billion Internet-connected strategies by 2020 [1]. The Internet makes the lives appropriate, but it is still threatened by viruses, worms, Trojan horses, and more. Malicious software or malware can accomplish malicious activities on servers, computer systems, and mobile devices to increase unusual access, corrupt systems, and steal information. Malware not only spitefully leaks users' personal data, but also poses safety threats to businesses and can cause unwanted losses namely data outflow and commercial harm. Consequently, inordinate effort is essential to identify malware occurrences. In general, two main methods to malware classification are compiler-based approaches [2] and executable based approaches [3]. Compiler-based access behaviour classification approaches examine the assembly of executables without displaying any actual commands. For example, opcode sequences are one of the signatures of malware commonly cast-off for static investigation of malware [4]. Yet, the data limited in the opcode sequence is very limited and the cost of finding and execution is very high. With this approach, a huge number of alternates are created moment by moment, making it difficult to determine the type of malware based on fixed features alone. An executable access behaviour classification method implements and identifies unusual user without the necessity to inverse engineer the user's behaviour. Anomaly detection states to the problematic of discovery occurrences or outlines in information that diverge from usual behavior. Reliant on the framework and domain, these nonconformities can be classified as variances, outliers, or normal [5]. The word anomaly detection is used in this work are used in many areas. Fraud detection in financial communications, failure discovery in industrial organizations,

PERFORMANCE OPTIMIZATION OF THE API ACCESS BEHAVIOR CLASSIFIER MODEL FOR ANOMALY DETECTION

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Abstract- Distributed micro-services-based programs are usually accessed through Application Program Interfaces (APIs). These APIs are accessed through applications or they may be opened immediately through programs. Often times, attackers attempting to take advantage of the business intelligence provided through APIs disrupt API access. Several programs have 200s of APIs which can be referred to as in precise directive and relying on different factors inclusive of browser revives, consultation uplifts, community errors, or programmatic get entry to those behaviors are not static and might range for the equal user. API calls in lengthy walking classes shape get entry to graphs that want to be analysed so one can find out assault styles and irregularities. Investigation built on analysing user behaviour for validation is the drive for this work. The main goal is to build an AI-based model that can detect odd API call access behavior and stop it from breaking the APIs. The proposed system identifies malicious and valid users using a behavior-based approach. The Extra Tree Classifier is the model that fits the classification problem the best, according to a comparative examination of Machine Learning (ML) models using several accuracy metrics. This approach also affects the periodic updating of the random search's hyperparameters, which results in fewer search iterations and increased security model correctness. So, in order to assess the proposed model's training accuracy, accuracy, recall, f1 score, sensitivity, specificity, and support value are cast-off metrics. Extra Tree Classifier (ETC) optimization increases accuracy by 99.98%.

Index Terms- Anomaly detection, unusual users, Application Programming Interface, Machine Learning algorithms, Extra Tree Classifier

I. Introduction

Anomaly discovery is a machine learning process that detects data points, actions, and observations that turn from the normal behaviour of a data set. Detecting irregularities [1] in unusual users is a key problem that APIs need to address. Artificial Intelligence (AI) are ubiquitous for monitoring resources. Data from these can be analysed using progressive statistical and ML algorithms to provide intuition into upcoming failures and finest preservation and operational approaches. An API is a software edge that permits two applications to interrelate with each other deprived of user interference. An API is an assembly of software functions and events. An API is software code that can be retrieved or implemented. It is the code that supports two diverse software programs which interconnect with each other and exchange data. Batch delivery [2] or traffic growth, footprint expansion, feature development, exploring novel business models, business models for acquiring content, and internal delivery or innovation of content assist from such perceptions are some of the examples of an API. To create a current forecasting program, it is important to be able to perceive these anomalies so that we can take action to avoid downtime [3]. Still, detecting these over anomalies prior to a failure occurrence is difficult. This is because outages are generally relatively rare events, so there is often little tagged information to build predictive models based on the forecast anomalous position of the preceding data input. The irregularity discovery algorithms maintained by this service deliver an unsupervised technique to train models from data containing mostly "normal" operational information with a small number of real failure actions. In recent years, behavioral analytics has been the motivation of powerful efforts in API's [4]. The goal is to implement new, precise, and effective approaches based on data. Recorded data representing former activity of potential customers. Behavioral analysis is also useful in fraud detection and several other applications [5]. Now, behavioral analytics is improving the ML settings, organizing production tools more efficiently, detecting insider threats like targeted attacks,

Sentiment Analysis of Customer Reviews Based Texts Using Classification Algorithms

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***Abstract*— Nowadays, a large number of text-based sentiments posted by customers about their reviews on products. They provide their sentiments via their reviews. Sentiment analysis is also known as an opinion mining. Businesses frequently do sentiment analysis on textual data to track the perception of their brands and products in customer reviews and to better understand their market. In this research work, it is implemented that the Naive Bayes, Random Forest, Decision Tree and Support Vector Machines classifiers and the results are compared and examined. This work has a performance-based analysis of different classifiers by assessing the accuracy of classification depending on the size of the product data sets of mobile products. The dataset which has been collected from the shopping websites of Amazon, Flipkart, Snapdeal and which is used to find the classification accuracy by its methods used for the analysis. Finally, it compares the performance of four classification methods like Naive Bayes, Random Forest, Decision Tree and Support Vector Machines to identify the best method.**

Keywords-naïve bayes algorithm; support vector machine; random forest algorithm; decision tree algorithm; natural language processing.

I. INTRODUCTION

A machine learning technology called sentiment analysis examines texts for polarity, ranging from positive to negative. By being trained with examples of text's emotions, machine learning technology may automatically pick up on sentiment without human input. In this research work the machine learning algorithms which are used to classify the text data by using some algorithms. They are Naive Bayes, Random Forest, Decision Tree, Support Vector Machines, and Logistic Regression classifiers. Based on the Bayes theorem in sentiment analysis, one of the supervised techniques is Naive Bayes algorithm is to detect the classification problems, it primarily uses a huge training set for text categorization. One of the most simple and effective classification algorithms now in use is the Naive Bayes Classifier. It facilitates the creation of efficient machine learning models that are capable of making precise predictions.

Random Forest is one of the Popular machine learning algorithms and it is a part of the supervised learning methodology. It can be used for ML problems involving both regression and classification. It is based on the concept of ensemble learning, which is a technique for combining several classifiers to handle challenging problems and improve model performance. Classification and regression issues can be resolved using the supervised learning technique known as a decision tree, however this approach is frequently preferred. It is a tree-structured classifier, where each leaf node represents the classification outcome and inside nodes represent the features of a dataset. Both classification and regression are performed using supervised machine learning techniques known as Support Vector Machines (SVM). Although we also refer to regression concerns, categorization is the most appropriate term. The SVM method aims to find a hyperplane in an N-dimensional space that clearly classifies the data points. One of the most often used Machine Learning algorithms, within the category of Supervised Learning, is logistic regression. Using a predetermined set of independent factors, it is used to predict the categorical dependent variable.

II. REVIEW OF LITERATURE

A research work done by Sanjay Dey et al. in [1]. The purpose of this study is to compare SVM and Naive Bayes classifier as machine learning techniques based on statistical measurement. The support vector machine can polarize Amazon product reviews more accurately, according to experimental findings. A research paper carried out by Mubarok et al. in [2]. In which that the data pre-processing, which includes the three stages of this study's execution were part-of-speech (POS) tagging, feature selection using Chi

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A SURVEY ON THE RESEARCH CHALLENGES OF BIG DATA ANALYTICS

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Abstract: In the recent years, the rapid growth of science and technologies gave a way to adoption of SMAC. SMAC is Social, Mobile, Analytics and Cloud where four technologies are currently driving the entire universe. Also, permeate physical spaces and lives of human and produce huge amount of heterogeneous data known as Big Data for analysis. Human sourced information from social network, processed mediated data from business systems and machine generated data from Internet of Things, Web, healthcare sectors are the primary sources of big data. The heterogeneous data is transformed into a precious knowledge by using artificial intelligence (AI) and machine learning (ML). Further the generated knowledge will play a vital role in decision making, system performance boosting and optimum utilization of resources. Big data mining attracted researchers that make use of Hadoop. MapReduce is the programming paradigm used for processing big data. It is done in distributed environment with parallel processing. This paper focuses on challenges encountered in handling big data which are utilized by the various researchers and show case the issues faced by them.
Keywords: Big Data Analytics, DBSCAN, Partition Around Medoids, Markov Random Fields, Support Vector Machine

I. INTRODUCTION

The importance of data in day-to-day escalation plays a crucial role in many fields. Organizations know what they are looking for to compete with their competitors. The goal is to collect the data what is needed and go after the data to meet the objectives. The data are collected for the analysis and predictions from various sources. These collected data was huge in volume. This has coined the term “Big Data”. These data are processed in such a way that traditional data mining techniques are unable to analyze. Data is scrutinized to diagnose behaviors, patterns and market trending information to make decisions. The bulk of data generated comes from three key resources – social data, machine data and transactional data. The figure 1 represents the exponential growth of big data by the year 2025.

Characteristics of big data: Big data are treasure trove for research and computational tools are developed to extract knowledge from such data. The four main features of big data are volume, velocity, variety and veracity. Volume refers to the size of data that are used to archive. The size of data is important in determining the value out of data and also based on the volume a particular data is considered big data or not. The velocity refers to the speed at which data is generated and processed. The data flows from sources like social media, application logs, business processes, smart IoT devices is enormous and continuous. In an enterprise, with the development of sensors, smart devices, and social collaboration technologies data in an organization has become complex.

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IMPACT OF CUSTOMER REVIEWS ON PURCHASE BASED DATA USING SENTIMENT ANALYSIS WITH MACHINE LEARNING ALGORITHM

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Abstract: This research work focuses on online products purchased by the customers from various online shopping websites. The customers post their queries after the purchase of products in online mode. The classification algorithms play a very vital role in analyzing different kind of data. Here, some of the classification algorithms are used for the analysis of text-based customer review data. People purchase products like costumes, accessories, mobile phones, laptop, electronic goods etc., Most of the people purchase the products through online based on the customer's reviews and movie reviews which have been collected from the various social media pages like Twitter, Facebook etc. in the form of text, audio, video, images and emojis. Machine Learning Algorithm is used to analyze the customers review about the product based on their emotional comments. The term emotion-based marketing refers to a wide range of emotional client reactions, including positive, negative, neutral, negative, uptight disgust, frustration," and others. Understanding the psychology of client reactions can help you improve product and brand recall. This work finds the performance of the classification algorithms based on its classification accuracy. A best method is to be suggested after this survey-oriented analysis.

Keywords: Machine Learning Algorithms, Text based Sentiment Analysis, Accuracy, Classification Algorithm and Natural Language Processing.

1. INTRODUCTION

Sentiment Analysis plays an important role nowadays, and it is one of the Natural Language Processing (NLP) approach. It is also called as opinion mining. Sentiment analysis is a machine learning technology that looks for polarity in texts, ranging from positive to negative. Machine learning tools helps to learn how to detect sentiment without human input by training them with samples of emotions in text. In various applications like social media websites, sentiments can be detected from the reviews given by the customer. The sentimental based reviews given by the customers in different forms like text, audio, video, emoji etc. are classified by using classification algorithms in machine learning techniques and Lexicon based approach. The approaches of sentiment analysis are mainly used to identify the emotions that are expressed by the customer in any kind of social media websites in figure 1. These emotions are identified and processed by using the sentiment analysis approach. Machine Learning approaches are utilized to extract and classify the text from the complex dataset.

Supervised learning is a good approach for classification and regression problem in data. Unsupervised sentiment classification algorithms can eliminate domain reliance and reduce the demand for annotated training data. The majority of unsupervised sentiment categorization systems can be generally classified into lexicon-based methods. The lexicon-based method is one of the approaches or techniques used in semantic analysis. From the semantic orientation of lexicons, this technique estimates the sentiment orientations of the entire document or set of sentences.

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RESEARCH CHALLENGES IN BIG IOT DATA ANALYTICS

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ABSTRACT: The incredible growth in the number of devices with sensors and actuators connected through the internet reflects the tremendous growth of big data with IoT. The IoT-driven human and machine collaboration enhances operational efficiencies and productivity. Analytics of data from IoT has improved decision-making and the quality of life. The evolution of the smart world has become inevitable. Internet of Things connects the physical world to the internet that shares critical information to the surface quickly than a system depending on human intervention. The data collected by the things in IoT is enormous and big data provides faster and efficient storage and processing of the data. Big data analytics applies analysis tools to the huge volumes of data generated by IoT devices to help in efficient decision making. The convergence of IoT, big data analytics and cloud has created several research opportunities to explore. In this paper, the concept of IoT, the applications of IoT, characteristics of big data, the relationship between IoT and big data analytics is discussed. The IoT layer architecture,IoT and big data architecture, the tools used for analytics of big data and the challenges in analysis of big IoT data is elaborated.

Keywords: IoT, Big Data, Big Data Analytics, Challenges in Big Data Analytics

1. INTRODUCTION

The tremendous amount of data that is exponentially increasing due to the recent advancement in technology has become inevitable. The data explosion is caused by the following: increase in the number of data generating smart devices with sensors and actuators which are connected globally through the cloud, increase in the number of users of the internet, increase in virtual reality and augmented reality, 5G cellular network, increase in e-commerce transactions etc[1]. The global internet protocol traffic has grown at a compound annual growth rate of 26% from 2017 to 2022[2]. The number of devices connected to the internet will be three times the global population by 2022. Smartphones will be 44% of total IP traffic. Digital world will reach a brontobyte in the coming decade.

We live in a Big data era and information is the new gold. The data explosion has created challenges in the collection of data, storage of data, retrieval, processing and representation due to volume, variety and velocity of data. Discovering value or useful patterns from Big data poses many challenges requiring enormous computing resources, technological infrastructure and skilled data analysts. Internet of Things(IoT) is one of the technological revolutions in this era posing a serious challenge in the ability to exploit huge amounts of data. IoT and Big Data are two independent technologies where IoT would generate large amounts of data and Big data would enhance storage efficiency and processing of the data.

The objective of this paper is to highlight the association between IoT and Big Data Analytics and explore the research perspective in this area. The relationship between IoT and Big Data in terms of transforming the huge data into more understandable and meaningful patterns is discussed. The platforms available for Big Data Analytics of IoT data are elaborated.

2. OVERVIEW OF IOT, BIG DATA AND BIG DATA ANALYTICS

Internet of Things(IoT) refers to the network of physical objects that are embedded with sensors, softwares and technology for communicating and exchanging data with other objects on the internet[3]. A thing in the Internet of Things can be any object that can be assigned an Internet

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PREPROCESSING THE PARKINSON DISEASE DATASET BY STATISTICAL TECHNIQUES

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Abstract: Parkinson Disease (PD) is a progressive neuron system disorder that affects movements, prompting shake, trouble with strolling, balancing and coordination. Parkinson symptoms usually begin gradually and get worse in the human bodies. Early finding of PD is more complicated and crucial in preventing the disease development. Data Mining (DM) techniques assists organizations and researchers to effectively utilize the cleaned data after the preprocessing. Medical field associations that exploit DM to bring down the medical services costs while further developing medical services quality by utilizing fast and better clinical investigation. Preprocessing procedures are investigated for their ability to improve learning efficiency, increase insightful accuracy, and reduce the multifaceted nature of learned results. In this research work, some of the statistical techniques are used to preprocess numerical data in order to fulfill the missing information. The statistical methods Mean and Median are used to find the dataset's fragmented and contradictory information. After the preprocessing the entire data set, the data set is very easy for experimental analysis and the results may be accurate to further processing.

Keywords: Statistical Techniques, Preprocessing, Mean, Median, Parkinson Disease

1. Introduction

Data mining in the supportive region assembles data from the previous encounters and analyzes them to perceive examples and answers for the ongoing conditions. Parkinson's Disease (PD) is a neurodegenerative problem that influences predominately dopamine-creating ("dopaminergic") neurons in a particular region of the cerebrum called substantia nigra. Side effects for the most part foster gradually over years. The movement of side effects is in many cases a piece unique in relation to one individual to one more because of the variety of the illness. Individuals with PD might encounter Tremor, mostly very still and portrayed as pill moving tremor in hands. Different Individuals with PD need this drug since they have low levels or are missing dopamine in the cerebrum, chiefly because of impedance of neurons in the substantia nigra. It is vital to comprehend that individuals with PD initially begin encountering side effects later over the infection in light of the fact that a lot of the substantia nigra neurons have proactively been lost or disabled. Lewy bodies (gathering of strange alpha-synuclein) are found in substantia nigra neurons of PD patients.

As of now, all treatments utilized for PD further develop side effects without easing back or ending the sickness movement. In [1], According to the researchers, it is an effective way for extracting important information from a vast data set derived from clinical science, medical procedures, and clinical trials. Data mining-based strategies can be utilized for the difference in perceptive models that enables characterization and expectation. In the fields of information mining, the center issue is to choose the significant elements and overlook superfluous highlights from the clinical dataset. Accordingly, a large portion of the scientists have utilized proficient preprocessing methods like element determination, discretization, and head part investigation on the clinical dataset to lessen the

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TEXT BASED SURVEY OF ONLINE CUSTOMER REVIEWS USING THE TECHNIQUES OF SENTIMENT ANALYSIS

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Abstract: One of the NLP classification methods named as sentiment analysis has a number of difficulties that are not present in traditional text classification systems. These difficulties, like expressing a good opinion without using overly positive phrases, arise due of the nature of the issue. The field of research known as sentiment analysis is responsible for extracting and analysing user sentiment toward various entities, including things like products, companies, services, events, people, themes, and their attributes. In computer science, modelling a system that categorises the polarity of a given review is important. Sentiment analysis models try to categorise reviews into identified polarities, such as negative or positive, and some even add neutral classes. Since its inception, sentiment analysis systems have classified reviews using traditional binary classification. The machine learning algorithms have been shown to be effective for the analysis of text based sentiments. This survey oriented research work is carried out to analyse the text based sentiments produced by the customers in various platforms. Also, not only to analyse in general approach of sentiment analysis, this work has discussed the sentiments of lexicon based and Aspect based approaches. The product reviews are identified in order to find the customer sentiments about the purchase of products in online.

Keywords: Sentiment Analysis, Natural Language Processing, Lexicon-based Approach, Aspect-based Approach, Customer Reviews.

I. Introduction

Research in computer science and artificial intelligence (AI) that focuses on human interactions is called "natural language processing" (NLP). It comprises a variety of techniques for assisting computers in reading, comprehending, and producing language that humans can understand. Programming languages for computers differ from natural languages. Unlike programming languages, they are not meant to be transformed into a limited set of mathematical operations. The ability of computers to understand human language is now at the heart of many apps that people use on a daily basis, including grammar checkers, voice assistants, chatbots, spam filters, and social media monitoring tools. A huge issue space is represented by sentiment analysis. This information could be used to reflect the authors' general emotions, such as "I am glad," or to draw out opinions about things like services or products. Understanding research on sentiment analysis, language models, aspect-based sentiment analysis, and lexicon–based approach sentiment analysis techniques has been the focus of the literature review.

A machine is instructed on what to do by a computer programme created for a computational a ctivity. However, there aren't any translators or compilers for natural languages like Hindi, English, German, or French, among others. Language processing often entails converting sentences from natu ral language into numerical data that a computer can use to analyse and interpret the natural language input and create natural language text that people can interpret semantically. Traditional NLP techni ques use a linguisticsbased mechanism where a solution is constructed from fundamental semantic a nd syntactic elements, such as a language's part of speech. NLP is becoming a part of our daily lives. When users begin typing a search term into a search engine's field, for instance, the system will attempt to guess the next words.

Additionally, almost all contemporary gadgets, including computers, tablets, and smart phones, come with software that tries to decipher speech commands in order to carry out specific activities.

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A SURVEY ON THE ANALYSIS OF SOCIAL MEDIA DATA BY DICTIONARY AND CORPUS BASED APPROACH IN SENTIMENT ANALYSIS

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Abstract: Social media data plays a very vital role in analyzing different kind of data available in various data base repositories. A number of methods utilized for the analysis which include classification, clustering, sentiment analysis and etc. Above all, sentiment analysis produces virtuous results based on the social media data to ensure the upper most utilization of the same. Sentiment analysis (SA) is a natural language process approach aimed at mining huge corpus of data to identify the emotions from certain topic to gain its opinions. In order to apply algorithms in sentiment analysis, the corpus is broken down into smaller unit called tokenizing, then segregated into groups and label the adjectives such as positive, negative and neutral. This study is carried out to evaluate the social media data like twitter, face book and etc. In particular, only the text data are taken into account for the analysis. Among the lexicon based and machine learning based approaches, this work uses, only the lexicon based approach. In particular, within the lexicon based approaches, the dictionary and corpus based methods are considered. A survey has been done in this work for the comparative study to establish leading edge of SA (Sentimental Analysis) from recent literature, comprehends. Finally, it clinches a method that is best suited for analysis of text data. Number researches were contemplated in this comparative survey and put in evidence around the datasets, topics, data creators, downstream applications, algorithms used and its evaluation.

Keywords**:** Social media data, Dictionary based methods, Corpus based approach, Sentimental Analysis.

1. Introduction

Social media produces a large amount of data for every login of user's. This data is been used by business, political and governments. This data is used to assimilate the views, opinion and thinking of users. For the analysis of this content, organization uses Sentiment analysis. Sentiment analysis is a computational science which is aimed at identifying the producer's opinion from the large corpus of data. These data may be from a text document, social media document, and medical data document and so on. The data can be a text, image, audio, and video.

The SA is aimed at categorizing the corpus as positive, negative and neutral, and this categorization is used to understand customer, gauge brand reputation and etc… There are methods to perform the opinion mining from the data corpus. In this paper we take social media data and use dictionary based and corpus classification methods and review the previous work on them. SA has various classification techniques as shown in the Figure.1.

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PREDICTION OF HOUSE SALES PRICES USING HYPERPARAMETER TUNING METHOD OF MACHINE LEARNING (ML) ALGORITHMS

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Abstract: The trends in house pricing not only arouse curiosity of buyers and sellers it represents the current economic situation. The relationship among house prices and the current economy is one of the main factor in predicting the house price. The value of individual property is very essential during real estate transactions whereas the transactions are highly opaque over certain period and became complex for the novice to understand the best price of any available plot or house. However, there are several websites for real estate functionality in predicting the house prices based on the various features depends upon users or customers. Therefore, the predictive model assist the sellers in providing awareness by building the raw materials to construct and want to sell for high prices as well as support the buyers in identifying the best price to the houses. Thus, the paper propose a study in identifying the hidden awareness factors for determining the house prices using hyperparameter tuned Machine Learning (ML) model. Moreover, this hyperparameter tuning is generated for producing the robust model as Exploratory Data Analysis (EDA) over various parameters. The fine tunes model is evaluated and compared with predictive house price of untuned ML model. This proposed hyperparameter tuned ML model has been analyzed and the final outcome determines that the customers can find a better sales price for their buying house and also help the sellers to understand the factors which fetched more money for the houses.
Keywords: Hyperparameter, Tuned Model, House Sales Pricing, Prediction Algorithms, Machine Learning Methods.

1. Introduction

Shelter is one of the essential basic needs in human life that has been acquired through build house whereas the demand over houses get increased promptly in day by day which shows the living standards of the people are improved. Nevertheless, there are certain people build their house for an investment and as their property but most of the people in worldwide are preferred to buy the house for their sheltering or for their living. Housing market has creates a positive effects on country's currency that make a significant role in national economy scale. In general, the house owners has purchase household materials to their home based on their satisfaction and in the case of contractors or house builders need to buy raw materials for constructing the house in satisfying the demand of their customers. This representation of economic wave's effect is generated through new house supply [1]. Similarly, the country's level of house supply with high can be recognized through people who have made huge investment for building house as well as construction industries with good conditions to build their units. The essential of house has been indicated through human rights as well as several international organizations [2]. The fluctuation of house price is a major issues to the builders, house owners and real estate brokers due to expensive pricing in which the material cost gets increased in various countries over housing sector [3]. The national economy and residential life quality is entirely depend upon possibility of increase in house price. Finally, this problem has affected the investors who initiate their house as an investment. The house demand increase may occur in day to day life which normally create an increase of house price in each year. However, the issues may raises with several variables namely location, Sq.feet, Number of rooms and property demand that may impact the pricing of house. Hence, the stakeholders like developers, real estate brokers, house

Analysis of Chest Accelerometer Data using Machine Learning Techniques

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Abstract: In the recent years, Internet of Things (IoT) is one of the technology related catchphrase that hear and see about it everywhere. The development of IoT brings immense value into human lives. It is the embedded platform where devices are connected through the internet. These devices collect and exchange data with each other. The IoT technology is applied on various applications such as wearable, smart home applications, health care, smart cities and so on. IoT has shown more potential application growth in the field of medical by connecting medical devices, sensors and healthcare professionals to provide quality medical services in the remote location. Wearable technologies combined with proper data analysis provide a low cost option to monitor chest during the various physical activity of human. The accelerometer based activity has become the most apposite means for objective evaluation of mobility trends within patient study groups. Recognition of activity pattern is the problem of predicting the current action. The data collected through the device is raw data. In this work, the dataset used is from Kaggle repository. The raw data is pre-processed, the training and testing data is split based on the user_id. Then the dataset is converted into frequency domain and features are extracted. Human activity recognition (HAR) is predicted using K-Nearest Neighbor, Decision Tree and Random Forest methods. The performance of these algorithms is measured as accuracy.

Keywords: Data pre-processing, classification, k-nearest neighbor algorithm, random forest algorithm, decision tree algorithm, human activity recognition.

I. Introduction

In the recent years, health care industry has shown swift development and has been a major contributor to revenue and employment. The growth of the technology has changed the diagnosis of the disease and various healths monitoring using smart devices known as Healthcare IoT (HIoT). The science and technology has changed hospital centric to patient centric. Various clinical analyses such as blood pressure, pO2, glucose level can be measured at home without the support of health care professionals. These data are communicated to the health centre from remote areas with the help of telecommunication services [1].

Innovation of wearable embedded system has resulted in utilization of body wearable sensor network for remote health and activity monitoring. Devices with motion sensors are used to monitor the daily activity. Placing the devices at the prompt place and position in the body will help the healthcare professionals to predict the health conditions of patients [2].

Classification is a challenging problem with database as input in the form of training records and each record has multiple attributes.

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Reviewer Perspective on the Essentials of Scientific Experiments Based Research Articles

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ABSTRACT
Scientific research papers must be published to visualize the results obtained by the experiments conducted as part of their research work. Every scientific article must have some experimental results. These results are a small step of the research work carried out by the researchers. All the experiments-based research articles must follow some of the minimum structure when writing them. Most of the articles have utilized the standard format which is recognized by peer-reviewed journals. Some of the articles are not using the proper structure. This research work must discuss the basic requirements for the preparation of scientific research papers. Also, summarise some of the rules about how to prepare papers that are easily accepted by the indexed journals. The drawbacks and advantages are also discussed in this work to write experimental papers effectively and efficiently. A commonly acceptable format for writing the articles is specified and suggested based on their merits and demerits in this work.

KEYWORDS
Research articles, research articles structure, scientific articles, format of scientific paper

INTRODUCTION

Scientific research articles must be published to visualize the results which are the individual research work-based experiments. Most of the research articles written by scientific researchers are depending on their experiments. The experiments are conducted to complete the research work via their findings. The innovative information produced in the research articles is useful to other researchers who are doing their research work in the same field. Not only to showcase the experimental results, but also to know the format of writing the article, the area in which it is taken for the research, the type of article written for the requirements of the research work and the format used in it to write an efficient method. Different kinds of research articles are produced by the research community, majorly which are review articles, survey articles and original research articles. Almost all scientific articles have followed the standard format to write them. But some of the articles are not good enough in structure. These articles require writing to follow the basic structure of peer-reviewed journals.

The scientific articles were explained by producing the experimental results via tables, figures and other types of visualization techniques. Nowadays, we can easily find the basic structure of how to write an article which is available on various websites. Also, every journal must have its format. Most journals follow a specific method for the preparation of scientific articles, which is given on their journal website itself. So that the researcher can find a suitable method to write and submit their articles to journals that are easily

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AN ANALYSIS OF MOVIE REVIEWS IN SOCIAL MEDIA DATA USING DATA MINING TECHNIQUES

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Abstract: The entertainment for the real-world peoples is very huge and analyzing such kind of entertainments are not easy. One of the areas of this topic is movies. Different types of movie reviews are produced by various reviewers. Some of the movies create a high impact in the society as well as it changes some viewers mind to do better thinks and also behave in an improper way. The movie reviews are based on their understanding and usefulness of the information and the main theme adopted in the movies. The personal feelings are produced in the form of movie reviews. To analyze all such useful and un useful information is a tedious task. This research work utilizes the datamining techniques like Naïve Bayes, Support Vector Machine, Random Forest and Logistic Regression to find the pros and cons of the movie reviews. To visualize the feelings of the reviewers. This work identifies the best movie released and accepted based on the reviewer comments. Finally, the best algorithm is suggested by means of its accuracy and performance.
Keywords: Naïve Bayes Algorithm, Decision Tree Methods, Support Vector Machine Method, Random Forest Algorithm

1. Introduction

Internet facilitates interpersonal connections. People use the internet to voice their opinions through social media, blogs, movie reviews, product reviews, etc. Every day, users generate enormous amounts of data. The best kind of entertainment known to man is undoubtedly movies, and it is usual for individuals to watch movies and share their impressions on social media. By examining movie review data, we may discover a film's strong and weak points and determine whether it lived up to audience expectations [1]. A person always reads the review and rating of a film before deciding to watch it. Finding the movie's review is made easier with the aid of sentiment analysis (SA). SA is the process of extracting important information from a large body of data. It categorizes people's opinions as either positive or negative automatically.

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PREDICTION BASED ANALYSIS OF ONLINE PRODUCT REVIEWS USING DEEP LEARNING MODELS

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Abstract: The goal of product reviews is to identify any positive or negative undertones in a given text document. It is widely utilized in a variety of commercial fields to enhance goods or services by learning what customers think about them. Deep learning produces cutting-edge findings in a variety of difficult disciplines. Due to deep learning's success, several researches have presented deep-learning-based sentiment classification models, which outperformed traditional machine learning models. The challenge of modeling and predicting the helpfulness of online reviews look at the variables that affect review helpfulness and attempts to forecast it with accuracy. In this research, It is compared several deep learning-based sentiment classification model topologies to draw useful predictions for the analysis of sentiment based customer reviews. Also, it is provided that a benchmark comparison of many deep learning models such as the Recurrent Neural Network, Attention Mechanism, and the Bi-Directional Long Short Term Memory and evaluated using several word embedding techniques such as FastText and Word2Vec. Each model was evaluated using one of two different setups. The performance of algorithms are compared and suggested for the better use real time applications.

Keywords: Deep Learning Methods, Sentiment Analysis, Online Review Data, Bidirectional RNN Model, Bi-Directional Long Short Term Memory.

1. Introduction

This research work is carried with the advancements that have been made in the fields of computers and the internet, online marketing has also evolved as an area that is at the forefront of technological innovation [1]. When purchasing anything online, the ratings and reviews left by previous customers have a significant amount of weight. It has an impact on the reputation of businesses as well, particularly those who utilize the internet market to promote their products [2]. Because user evaluations are, for the most part, unstructured, the process of extracting user feedback is a time-consuming and laborious one [3]. As a result, techniques from sentiment analysis are utilized. Analysis of people's attitudes and opinions regarding things such as goods, events, themes, and so on is referred to as sentiment analysis.

The extraction of aspects and feelings is an important endeavor [4]. Display and camera quality are two elements of Samsung that are evaluated in the statement "The Samsung J7's display is good, but its camera quality is awful." This sentence serves as an example of an

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STUDENTS PERSONALITY BASED PREDICTION OF EMOTIONAL INTELLIGENCE USING DATA MINING TECHNIQUES

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Abstract: In the current world, the behavior of students changes from time to time, based on their emotional decisions regarding the kind of activities they are involved with. Many emotions are produced by the students when they act in a particular incident-based activity. This research work, analysis such kind of emotion-based students' personalities through their activities using some of the data mining techniques, Naive Bayes and Random Forest are utilized to predict the usefulness of the students' activities, created utilizing their decisions. The data set is collected from the students for this analysis employing a questionnaire. The performance of both algorithms is evaluated based on the results of students' decision-making responses collected from the survey. The best algorithm for the analysis of emotional intelligence-based students' information is suggested based on the accuracy of the algorithms.

Keywords: Data Mining Algorithms, Emotional Intelligence, Naïve Bayes Algorithm, Random Forest Algorithm, Performance Accuracy.

1. INTRODUCTION

Today, it is the world of the digital era, where everyone's daily activities are preoccupied with digital gadgets and social media.[1] It has become very difficult for every individual to survive without the indulgence of social media in our day-to-day activities. Moreover, the current changes that have occurred due to the covid situation have also pushed everyone to be a social media addict. Students, who happen to be the future in deciding the progress of a nation, have been severely addicted to this digital threat. As a result of this, the student's mentality and behavior have changed and there is a severe wavering in their mood swings and emotions from time to time. This change in their emotions affects the efficiency of any individual in all their daily activities like making decisions, handling relationships, facing an interview, and their academic performance.[2] This study is carried out by collecting data from students through a google form. The questions were taken from a popular known technique to assess the emotions of the students, called the Maire Bridge Type Indicator (MBTI) [3] survey. The data are then analyzed, pre-processed, and evaluated based on the accuracy of the data mining algorithms.

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FREQUENT ITEMSET GENERATION ON CUSTOMER DATASET USING ASSOCIATION RULE MINING

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Abstract: Data mining is an important tool in extracting interesting patterns from large datasets to represent knowledge. Association rule mining is one of the important concepts in Data Mining. Frequent itemset Generation is one the step in Association Rule Mining. In order to discover the relationships among the data items in large size of database, the most of the research activities focus on it. This research work is mainly implemented by focusing on the analysis of frequent itemset generation in customer dataset to find out customers buying behavior. The traditional algorithms Apriori and existing algorithm Cluster Based Bit Vector Association Rule Mining (CBVAR) and a proposed algorithms namely Improved Cluster Based Bit Vector Association Rule Mining (ICBVAR) are taken to find the efficiency of the algorithms in terms of its execution time and occupied space. A comparative analysis of the all the algorithms is carried out and the best algorithm is based on its performance that is suggested. From the experimental results, the proposed algorithm ICBVAR is faster and gives high recognition results.

Key words: Association Rule Mining, Apriori Algorithm, Cluster Based Bit Vector Association Rule Mining, ICBVAR, Frequent Itemset Generation.

I. INTRODUCTION

Data mining is an important tool in extracting interesting knowledge from large databases. It proposes many solutions for the extraction of significantly and potentially useful patterns from a large collection of data. Thus, mining process depends on the user requirements, who may be a business analyst or a marketing manager. The need for information differs from user to user. Data mining, also called knowledge discovery, it is the process of discovering interesting and useful patterns in large volumes of data, which have not previously been discovered, and relationships among them [1]. The different data mining techniques are suggested based on their requirements. One among them is association rule mining. Association rule mining is one of the most widely used data mining technique. Association rule

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PREDICTING EMOTIONS IN SOCIAL MEDIA DATA USING MACHINE LEARNING TECHNIQUES

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Abstract: In the current world social media plays a vital role to deliver different kinds of emotions in the form of text, emojis, etc. It is very essential that the emotions are very well identified to detect the feelings of the persons who posted it. In this series many kinds of feelings are available in various forms of database repositories. Analyzing all such kind of emotions is very tedious task. This research work applies the Transfer Learning techniques which are used to identify and analyze the emotions produced by different persons in the social media like Twitter, Face book, WhatsApp etc. This approach uses various techniques like Transfer Learning, Convolutional Neural Network (CNN), Deep Learning, Support Vector Machine (SVM) etc. Based on the data this work detects the six different types of emotions namely Happiness, Sadness, Fear, Disgust, Anger, Surprise and Neutral. From this Experimental approach the performance of the chosen algorithm is tested and reported. Finally, Transfer Learning Technique is suggested as the best method for the identification of emotions. Thus, enables psychiatric analysis of patients and interrogation sessions with the accused easy and effective.

Keywords: Transfer Learning, Emotions Detections, Social media data, Support Vector Machine, Gabor filters, Principal Component Analysis, Convolutional Neural Network

1. INTRODUCTION

Prediction of human emotions is very important, as this nonverbal communication tries to convey some information to the other person. This information conveyed is more accurate and precise than the verbal communication. By predicting emotions we can support the department of cybercrime, psychiatry and product marketing. When interrogating an accused, the images of the accused can be captured and the emotions can be determined, thereby making the investigation process easy. In the case of psychiatric counselling the patient may not be in a position to express their emotions in words, where the images taken are analyzed and the emotions are predicted thereby making the treatment procedure easy and efficient. In marketing of a product the images of the customer watching the clipping is captured and their emotions are predicted which acts as a review about the product. Thereby supporting the marketing of the product as customer review plays a vital role in marketing. Facial expression is the result of movement of one or more muscles underneath the skin. The six basic facial emotions are

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PREDICTING STUDENTS' ACADEMIC SUCCESS USING HYPER PARAMETERIZED MACHINE LEARNING TECHNIQUES

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Abstract: The definitive goal of any educational institute is to provide students with the best possible educational knowledge and practice. Categorizing students who need additional backing and taking proper steps to improve student performance plays a key role in attaining this goal. A student's academic performance is a significant aspect for educational success at all stages. Academic background is very important for students who want to continue their studies and secure their future. Several studies have uncovered factors related with personal responses such as: For example, in relation to family's communication, understanding and anticipating student perspectives on campus to improve student performance. A regressor that can forecast student success in the academic's status from the student dataset collected from online repositories. The main goal of this research work focus on the academic performance of the students through their behavior using five different Machine Learning techniques such as Random Forest Regressor (RFR), Extra Trees Regressor (ETR), Gradient Boosting Regressor (GBR), Bagging and ElasticNet. The comparative analysis of these models shows that RFR model best fit model through the predictors lazy regressor and standard scalar methods. A proposed model is developed by hyperparameter tuning the best fit model using random search. The performance metrics such as Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), R Squared, Adjusted R Squared shows that proposed method is better than the existing models.
Keywords: Hyperparameter tuning, Machine Learning, Random Forest, student performance, lazy regressor, random search

INTRODUCTION

The classroom plays an important role for students to learn wisdom and become educated. With the continuous development of social skills and the firming up of education restructuring, the need for data and intelligent investigation to improve the eminence of teaching in the classroom is increasing. The training of face-to-face classes is a pillar of educational research. Education data mining (EDM) is an emerging field concerned with creating and evolving improved approaches of mining knowledge from education-generated data. Over the past decade, numerous researchers have focused on student behavior analysis. Student behavior is examined through entropy measures to help determine behavioral traits of industry and tidiness. This examination aims to establish a correlation between the regularity of campus life and academic performance [1].

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PERFORMANCE ANALYSIS OF CLASSIFICATION METHODS FOR SENTIMENT ANALYSIS USING CUSTOMER REVIEWS BASED TEXT DATA

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Abstract: Social media archives have enormous amounts of a wide range of unstructured data kinds. Among them are text data, audio, video, and visual media. It also includes sentiments, medical information, debate topics, and client testimonials. The data also includes client evaluations of goods and services. There are countless amounts of online reviews. Because of this, it may be challenging for a potential merchant to analyze them. It also makes it difficult for the product's creator to keep track of and manage user reviews. Sentiment analysis is a technique that helps with the challenging process by looking at the emotions expressed in so many online evaluations. Above all, sentiment analysis yields beneficial outcomes based on facts, enabling you to decide for your organization from the most important feelings present in social media. Sentiment analysis (SA) is a method of natural language processing that seeks to identify emotions related to a given topic and extract views about that topic from a vast corpus of data. The objective of this work is to examine the sentiment analysis technique like bag-of-word, Word distribution – inverse document frequency, Vader sentiment Analysis and evaluate the performance of classification algorithms for the analysis of twitter poco customer review sentiments. The classification techniques Tree Logistic Model Tree (LMT), Lazy Bayesian Rules (LBR), Hoeffding tree classifier, and Naive Bayes classifier are employed in this work to examine consumer sentiments. This work determines which algorithms are most appropriate for the analysis of text data.
Keywords*:* Twitter Sentiment Analysis, Bag-of-Words method, VADER sentiment Analysis, inverse document frequency method.

1. INTRODUCTION

The two most essential logical substances in human existence are emotions as well as opinion. These opinions can be utilized to gather useful information that impacts decision making. The volume of data on the internet has expanded intensely since the origin of the Internet. Though this large amount of information is beneficial and the majority of which is in the form of online recourse, people have a difficulty in identifying the most relevant information or expertise. Various databases hold a huge amount of information that can be analyzed for product and customer reviews. This can be accomplished by reviewing client comments. A customer's attitude could be a decision or evaluation, an emotional experience, or the destined sentimental interaction. Customers are more likely to share their real feelings

Ecological Factors Associated with Malaria Fever using Binary Logistic Regression Analysis

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Abstract
Malaria is the world's most important vector-borne disease. Malaria's sensitivity to climate is illustrated in desert and highland fringe areas where rainfall and temperature, respectively are critical parameters for disease transmission. In these regions higher temperatures and/or rainfall associated with increase transmission of malaria. 72 hospital admission of malaria cases during January 2012 to December 2017. Also, ecological factors temperature, rainfall and humidity in Tirunelveli district were taken into account of my study. The data were analysed with binary logistic regression analysis by using R software. The aim of this study is to estimate the associations between ecological variables and malaria diseases.

Keywords: *Malaria, ecological factors, Binary Logistic Regression.*

1. Introduction

Climate change has the potential to alter the distribution of vectors by altering the weather conditions that influence their breeding places (water, vegetation or host). Temperature can also influence rates of reproduction and maturation of the infectious agent in the vector organism and the survivability of the organism. Some of the many factors that combine with temperature, relative humidity and precipitation patterns that influence vector-borne disease transmission include land use and irrigation systems, sewage and waste management systems, housing type location, availability of screens and air conditioning and human population density. Climate change may introduce vector-borne disease into new areas or decrease the distribution of vectors in others because of factors like droughts.

Climate change will be associated with changes in temperature, precipitation and possibly soil moisture, all factors that may affect disease prevalence. Global study of the impacts of climate change must include possible effects on the global pattern of malaria, dengue and other mosquito-borne diseases.

The IPCC concluded that changes in environmental temperature and precipitation could expand the geographical range of malaria in the temperate and arid parts of Asia. Some vector-borne diseases (e.g. malaria and dengue fever) also show significant seasonal patterns whereby transmission is highest in the months of heavy rainfall and humidity. Low temperatures a small increase in temperature can greatly increase the risk of malaria transmission. The aim of this study was determine whether there is an association between ecological factors and number of malaria diseases is explored.

2. Review of Related Works

Devi and Jauhari (2006) explored empirical relationship of primary climate factors with the malaria incidence using Pearson's correlation analysis and to capture the essential events responsible for such variability in Doon Valley in district Dehradun. Concluded the climatic variables that predict the presence of absence malaria are likely to be best suited for forecasting the distribution of this disease at the edges of its range. Linwei et al.,(2008) examined the effect of weather factors on the transmission of malaria on Mengla country by using the auto-regressive integrated moving average. The effect of minimum temperature on malaria incidence appeared stronger in the cool months than in the hot months. The fog day frequency in October was positively associated with malaria in May. The study was prediction of future patterns of malaria for similar tropical rain forest area worldwide.

Dan et al.,(2010) evaluated the spatiotemporal distribution of malaria on Hainan. The cross correlation analysis was conducted to the detected effect of climate factors on malaria transmission with the lag time of six months. The good fitted and predictive validity of the multivariate time series model can be used to fit and predict malaria epidemics on Hainan. Huang et.at.,(2011) explored the relationship between meteorological factors and malaria incidence in Motuo country. The relationship between malaria incidence and rainfall was complex and it was not directly and linearly. The lags of temperature and relative humidity were similar and smaller than that of rainfall. Since the lags of meteorological variables affecting malaria transmission were short, it was difficult to do accurate long-term malaria incidence prediction using meteorological variables.

Salomon et.al.,(2012) reviewed vector-borne diseases closely associated with natural environments, such as malaria or Leishmaniasis, have been frequently cited as an argument on health risks related to the changes and instability of the climate. Ali Arab et al.,(2014) studied hierarchical Bayesian statistical modeling framework that can be used to analyse the effect of multiple climate factors on the distribution of malaria while taking into account spatiotemporal dependencies. Finally, the modeling accounts for spatial and temporal dependence typical in studies of infectious diseases such as malaria.

Shengjie et al.,(2016) investigated plasmodium falciparum malaria importation from Africa to China is rising with increasing Chinese overseas investment and international travel. The spatial heterogeneity uncovered, principal drivers explored, and risk factors for mortality found in the rising rates of P. falciparum malaria importation to China can serve to refine malaria elimination strategies and the management of cases, and high risk groups and regions should be targeted. Darkoh and Larbi (2017) determined the prevalence rate and some contributory factors of malaria in the Amenfi West District of Ghana. It is therefore suggested that, much emphasis on the use of ITNs should be focused on younger children since they are more vulnerable to malaria infection.

3. Materials and Methods

Monthly cases of malaria data were obtained from **www.cbhidghs.nic.in** and monthly observations of ecological factors data such as maximum temperature (^{o}C), minimum temperature (^{o}C), rainfall (mm), wind speed (mph), cloud (%) and humidity (%) were obtained from **www.worldweathearonline.com**.

The general form of the logistic regression model is

$$y_i = E(y_i) + \varepsilon_i \tag{1}$$

where the observations y_i are independent Bernoulli random variables with expected values

$$E(y_i) = \frac{\exp(x_i' \beta)}{1 + \exp(x_i' \beta)} \tag{2}$$

The method of maximum likelihood to estimate the parameters in the linear predictor $x_i' \beta$. Then the log-likelihood can be written as

$$\ln L(y, \beta) = \sum_{i=1}^{n} y_i \, x_i' \beta - \sum_{i=1}^{n} \ln[1 + \exp(x_i' \beta)] \tag{3}$$

Logistic regression models we have repeated observations or trials at each level of the x variables. This happens frequently in designed experiments. Let y_i represent the number of first observed for the i^{th} observation and n_i be the number of trails at each observation. Then the log-likelihood becomes

$$\ln L(y, \beta) = \sum_{i=1}^{n} y_i \, \pi_i + \sum_{i=1}^{n} n_i \ln(1 - \pi_i) - \sum_{i=1}^{n} y_i \ln(1 - \pi_i) \tag{4}$$

The Newton-Raphson method is used to compute the maximum likelihood estimates $\hat{\beta}$. Let $\hat{\beta}$ be the final estimate of the model parameters. If the model assumptions are correct, then we can show asymptotically,

$$E(\hat{\beta}) = \beta \text{ and } V(\hat{\beta}) = \left(X' V^{-1} X\right)^{-1} \tag{5}$$

The estimated value of the linear predictor is $\eta_i = x_i' \hat{\beta}$ and the fitted value of the logistic regression model is written by,

$$\hat{y}_i = \frac{1}{1 + \exp(- x_i' \hat{\beta})} \tag{6}$$

The solution to the set of maximum likelihood estimator can be used to construct Odds Ratio (OR), 95% confidence intervals (CI) on individual model parameters using R Software.

4. Result and Discussions

The descriptive statistics for January 2012 to December 2017 of the study, with the respect to monthly malaria cases and corresponding ecological factors data are shown in Table 1. Average concentrations of the malaria cases and rainfall are shown in Figure 1.

Table 1: Descriptive analyses of the variables in the study

Variables	Mean	Std. Dev	Minimum	Maximum
Malaria	213.81	195.99	13	604
Maximum Temperature	34.51	2.36	30	41
Minimum Temperature	25.03	2.21	20	31
Rainfall	61.98	70.71	0	366
Wind Speed	9.53	2.67	6	15
Cloud	24	10.97	3	70
Humidity	62.97	5.88	51	74

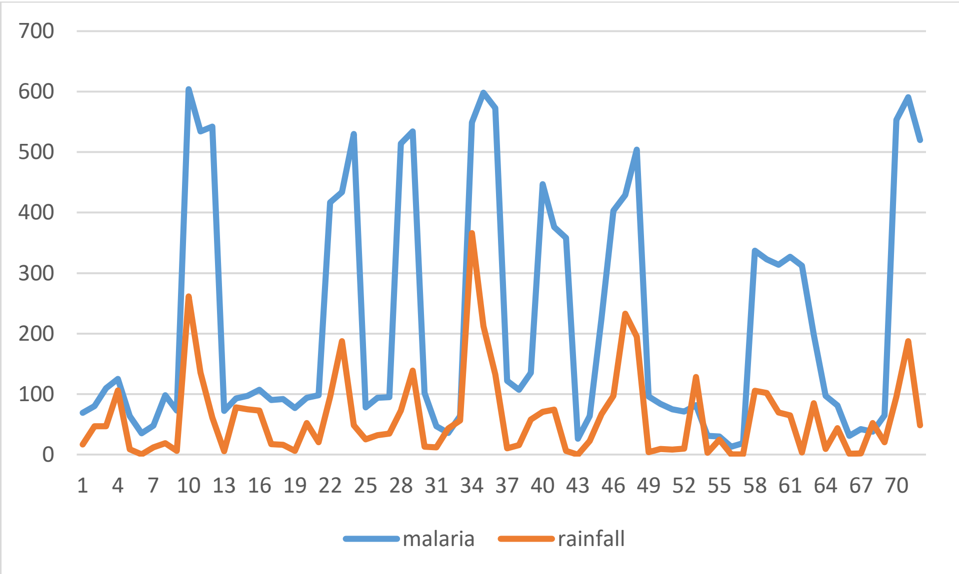

Figure 1: Average concentrations of Malaria Cases and Rainfall, 2012 – 2017.

4.1. Association of Ecological Factors with Malaria Cases

Table 2 shows the characteristics of ecological factors with malaria cases and ORs for risk factors and percentage change in 95% CI associated with each ecological factors measure is reported together with the p value by using binary logistic regression model.

Table 2: Association with malaria cases and ecological factors

Variables	OR	LCL	UCL	P-Value
Maximum Temperature	0.000698	0.000609	0.000707	1.00
Minimum Temperature	0.000940	0.000892	0.000966	1.00
Rainfall	4.406000	4.398000	4.410000	1.00
Wind Speed	0.000433	0.000398	0.000451	1.00
Cloud	0.000441	0.000427	0.000453	1.00
Humidity	4.833000	4.821000	4.840100	1.00

In the binary logistic regression, among the malaria cases, the highest association between rainfall and hospital admissions OR value is 4.406000 and 95% confidence interval value is [4.398000 to 4.410000] not statistically significant (p=1.00). The effect of malaria cases and maximum temperature OR value 0.000698 and 95% confidence interval value is [0.000609 to 0.000707]. The effect of malaria cases and minimum temperature OR value 0.000940 and 95% confidence interval value is [0.000892 to 0.000966]. The effect on hospital admissions for malaria cases and humidity was strongly linear, with the largest effect of OR value is 4.833000 and 95% confidence interval value is [4.821000 to 4.840100]. Malaria hospital admissions were not significantly associated with wind speed with OR value is 0.000433 and 95% confidence interval value is [0.000398 to 0.000451]. The effect of malaria cases and cloud OR value is 0.000441 and 95% confidence interval value is [0.000427 to 0.000453].

5. Conclusions

In this study, the relationship of ecological factors and malaria cases are high. In the binary logistic regression, we observed that the largest association between rainfall and malaria cases OR value is 4.398000 with not statistically significant and malaria cases the largest association between malaria and humidity OR value is 4.833000 was not statistically significant. This study revealed that a high proportion of respondents in rainfall and humidity.

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TEACHING THE "WORLD" THROUGH THE "WORD": FOSTERING CRITICAL CONSCIOUSNESS THROUGH SOCIO-POLITICAL DISCOURSES IN TERTIARY ESL CLASSROOM

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Abstract

One of the most important goals of teaching is to promote the critical thinking capability of the students and thus, create good citizens for a just society. Living in the age of information where data and pieces of information are readily available, it becomes highly crucial for students to research this information and check on its authenticity of information before accepting it as the truth. Classroom teaching must awaken the values of justice and equality in students' minds. English Language Teaching is a broad area of study that has evolved over a period of time. Language trainers and teachers have discovered and practiced different techniques to teach English. Teaching English through Critical pedagogy and CDA can be a fruitful approach as it aims to develop both the critical and language competency of the student hand in hand. This research attempts to find the effectiveness of using socio-political discourses as content in fostering Critical Thinking in tertiary ESL learners and helping students to develop critical consciousness. Finally, the study suggests an alternative way to foster critical skills across domains which would be fruitful for students from all walks of life.

Key words: Critical thinking, discourse analysis, banking model, critical consciousness.

Creating knowledge and enhancing student critical thinking capability is a central aim of the modern education system. We have come a long way since the time when we were hunter-gatherers and had to work hard just to stay alive. The proliferation of information, fierce competition, persecution, and natural disasters pose challenges to today's global village. We have slid into a time where information is at our fingertips and as a result, change is swift, profound, and ongoing. The complexity of life and living has greatly increased. In the creation of this complex world, we have used our rational powers. Ironically, to disentangle the complexity, we have to depend again on our rational faculties. For the development of these rational faculties among students, the onus is placed on educators and education systems. We need to prepare our students to think for themselves and society at large. The educational institution should assume a fundamental and constructive role in nurturing thinking skills and dispositions in their pupils to equip them to rise and respond to the challenges posed by the ever-changing society.

In the 21st Century, teachers' effectiveness and students' achievements are constantly evaluated through high hand tests. Accordingly, numerous educators are not keen on drawing students seriously in learning; they are occupied with planning understudies only for tests. Frequently, educators search for techniques to assist students with acquiring a decent score but not to improve their critical thinking capabilities, norms, and values, or to bring about overall positive behavioral change. Classroom teaching should awaken the values of social justice and equality in the minds of the learners. Rote learning and memorization are no longer appropriate for those who are hungry for new, meaningful knowledge and critical thinking (Marin & Halpern, 2011). Teachers today are busy in the classroom, they prepare the student for high-stakes testing and, in the process, work to save the school from closing. As a result, teaching is most often test-oriented rather than knowledge-centered.

The linear approach to education has a negative psychological and cognitive effect on students' attitudes about education in general and reading in particular. Since students are expected to be passive recipients of information from the book, their own reflection on what they read and how they may optimize what they read, is never given prominence and their metacognitive abilities are never catered to. As a result, how well students perform and achieve is dependent on both how much knowledge and content the teacher can convey to them and how much of that information they can retain and duplicate.

Aim of the Study

To develop critical thinking in our students, our pedagogy has to change and our examination system too has to be revamped. Open-ended questions and those aimed at problem-solving, not just information-seeking, should be vigorously promoted. An educational system that churns out students who cannot think on their own is the bane of our times. Our society is multifaceted and complex and in need of leaders who can engage in purposeful, self-regulatory judgment when dealing with social, political, and ethical challenges (Abrami, et al. 2008). This study has the potential to impact our greater society by contributing to the development of critical thinkers who can think for themselves in a manner that enhances a democratic society and ensures a competent workforce

Conceptualizing Critical Thinking

Etymologically critical thinking according to the Greek word “Kriticos” (meaning discerning judgment) and “criterion” (means judgment). The word infers the improvement in "discerning judgment based on standards." Critical thinking is a mode of thinking that allows people to analyze and examine ideas of a topic, and then synthesize this into a process of decision-making (Paul & Elder, 2008). In educational settings, teachers should be critical thinking agents who guide students to become better critical thinkers through teaching strategies (Halpern, 1999). Critical thinking elicits problem-solving, creativity, and decision-making (Pithers & Soden, 2000).

Critical thinking is an intellectually disciplined process of actively and skilfully conceptualizing, applying, synthesizing, and evaluating information as a guide to believing each other. Educators have long been aware of the importance of critical thinking skills as an outcome of student learning. More recently, the Partnership for 21st Century Skills has identified critical thinking as one of several learning and innovation skills necessary to prepare students for post-secondary education and the workforce.

Delphi (1990), with experts of all disciplines (humanities and sciences) within US and Canada in American philosophical association was formed for deciding the core critical thinking skill. The APA Delphi Report defined Critical thinking as “the process of purposeful, self-regulatory judgment. This process reasoned consideration to evidence, context, conceptualizations, methods, and criteria.”

Critical Discourse Analysis and Critical Thinking

The term "Critical Discourse Analysis" is one that has only recently been used in the field of (critical) reading pedagogy, despite the fact that it has been frequently applied to research language acquisition and teaching. According to Fairclough and Wodak (1997), CDA views "the context of language usage" as being essential and approaches "language as a social practice". Discourse, or the use of language in speech and writing, is regarded by CDA as a type of "social practice," which denotes that in a particular context, language or the discourse created by language is carrying out some functions, and this use of discourse is largely manipulative.

As a method for language and discourse analysis, CDA has branched out into numerous schools of thought, leading to the emergence of numerous methodological methods. The fundamental tenet of CDA is that its limits should remain open. On the one hand, it explores the fields of linguistics, sociolinguistics, and cognition; on the other, it forays into those of anthropology, ethnography, critical linguistics, and critical theory. As a result, this method of language and discourse study encompasses all approaches to critical reading as a project of empowerment and emancipation.

Integrating Critical Thinking into the English Language Classroom

It is extremely important to incorporate critical thinking into English language instruction for a number of reasons. First and foremost, it will support language learners' capacity for self-expression, independent thought, and learning assessment. Second, critical thinking activities will broaden students' knowledge and experience (Pica, 2000; Zainuddin, et al. 2003). These exercises will also help students learn language more effectively and will raise their competence levels, oral communication abilities, and other language skills too. Additionally, these exercises that promote higher-order thinking will also help students get ready for educational and professional opportunities (Chamot, 1995; Chapple & Curtis, 2000; Davidson, 1994, 1995, 1998; Tarvin & Al- Arishi, 1991).

Unfortunately, there is little discussion among theorists and educators about the importance of thinking abilities in language development in academic settings. It is explained by Miraman & Tishman (1988) and Suhor (1984) that cognitive abilities are frequently viewed as separate processes. According to Pica (2000), the integration of language and cognitive skills has been a minor concern in English language education practices. In order for language learners to be proficient, they must possess the capacity for critical thought when utilizing the target language. Brown (2004), asserts that the goals of a well-designed academic language program should incorporate both linguistic and critical thinking skills. In order to prepare kids for life, Lipman (2003) insists that teachers must promote critical thinking. Educators have a duty to promote critical thinking in order to better prepare students for the real world.

The responsibility of second language teachers is to help their learners acquire critical thinking skills while learning the language. As Mahyuddin, et al. (2004) note, there is much space for improvement in how thinking skills are included in our curricula. They also note the value of such critical thinking abilities in preparing children for life. Along with giving students critical thinking exercises, teachers should offer comments on their work and instructions on how to complete the activities.

In order to properly interpret information, students need to be taught how to effectively ask questions, formulate solutions, gather and evaluate pertinent information, and use abstract concepts. The development of well-reasoned findings and solutions, as well as their evaluation against pertinent standards and criteria, should be taught to students. Students should be taught how to think critically within alternative systems of thought, identify and evaluate the assumptions, implications, and consequences as necessary, and communicate effectively with others in order to find solutions to complex problems without being unduly influenced by other people's ideas on the subject (Qualifications and Curriculum Authority 2001-2002).

Socio-Political Discourses as content in tertiary ESL classrooms

Humans, according to Aristotle, are "political animals" (politikon zoon) who reside in a polis (from the Greek word polis, which means "state"). Politics is always associated with activities that have an impact on governmental or social decisions. Politics has one of its goals as the use of power to alter the behavior of others. To implement specific political, economic, and social principles, there is a power struggle. The role that language plays in this process is vital. Socio-political discourse is the use of language in speech and writing that addresses current socio-political issues prevalent in society. It hardly needs to be argued further that political discourse analysis is important for the emerging cross-disciplinary field of discourse studies. This research at the same time formulates a plea that advocates a broader use of Socio-political discourse analysis in the ESL context.

Many social theorists and linguists who work in the fields of DA and CDA provide opportunities for ELT practitioners to bridge the gap between English language teaching and social event analysis in a dynamic interdisciplinary approach. The majority of earlier research on ELT for ESL students focuses on teaching aids like methods or authentic content. This study aims to offer an alternative perspective on how socio-political discourse is used in ESL classroom activities. Although analyzing socio-political discourse as part of the ELT process holds up a lot of promise, it requires a thorough and appropriate methodology in order to achieve the learning process objectives.

Conceptual framework of the study

The theory and practice of critical thinking share a deep affinity with the critical paradigm of theory and practice, namely critical pedagogy, critical literacy, and also critical discourse analysis. Therefore, the current study is dependent on these theoretical frameworks for the implementation of its pedagogical methods in ESL classrooms since it borrows concepts from them in order to foster the critical thinking skills of ESL learners.

Methodology

In this research, a sample group of 50 members was chosen for examination. The research was conducted in DG Vaishnav College, Chennai where students from different parts of the national study. Pre-test and Post-test were administered and recorded in the form of written worksheets. Following this, a questionnaire was formulated as a means to examine the feedback and perception of the sample population on the research. The entire intervention was conducted for four weeks including pre-test and post-test. To give a thick description of the intervention, the effort is made to describe the intervention step by step as it happened. What follows, therefore, is the description of the following phases of the intervention:

Pre-intervention

The pre-test was the study's initial phase. It examined the students' comprehension of the text's theme, aim, and impact on them as readers, or how the text places the readers. It also looked at how social actors and social structures were portrayed, as well as how language was used to further the author's goals. Two sessions of the pre-test were conducted. The students were asked to write on their own during the first session because there would be no right or incorrect answers; the pre-test was just meant to gauge the student's critical reading proficiency. Two news articles that discussed the same socio-political issues but with a different points of view were distributed to the students. Students' scripts were examined and assessed for preliminary findings after the pre-test. In order to adapt the assignments and concentrate on those areas where the students had demonstrated merely inherent reading, the evaluation was conducted to better understand the students' critical reading behavior.

Intervention phase

The intervention phase started with an ice-breaking session where students' perception of the pre-test was gathered informally. This helped the researcher to modify the other intervention sessions according to the needs of the students. Students were then introduced to theories of Critical Pedagogy and Critical Discourse analysis. Several characteristic features of these theories and practical examples were given in this session. Students were then asked to list a few crucial socio-political issues that are prevailing in society. A list of different social issues was prepared and students were informed that materials for the current study will be gathered based on these societal issues.

In the next session, students were shown a parliamentary speech by Mr. Raghul Gandhi. This furious speech outlined the serious threat that India is encountering currently in terms of economy, defense, and Health. His speech highlighted the rising intolerance in the nation and seriously attacked the hegemonic attitude of the Union government that poses a serious threat to the democracy and peace of the nation. Students were asked to critically analyze this speech in terms of text, discursive practice, and social practice. They were asked to find the bias and acknowledge the statements of the speaker with relevant facts and data if any.

In the following week, students were given a newspaper article on "Climate Change" and were asked to read it. In the subsequent session, students were divided into groups and debated on this topic. The researcher acted as a facilitator by just guiding the flow of information in the debate. Next week, students were asked to take up an issue on their own and present for 3 minutes. Other students were asked to listen carefully and identify the bias in the presentation.

Post-intervention

Finally, in the fourth week, the same two news articles that were administered during the pre-test were given. Students were asked to analyze both these articles and find the differences, similarities, ideology, author's bias, etc. Students' responses were recorded and evaluated by the rubrics of the California Critical Thinking Test. Both the results of the Pre-test and Post-test were analyzed.

Major findings of the study

The information was gathered through the written replies provided in the Pre-Intervention and Post-Intervention Assessments. The Pre-Intervention Assessment determined the thinking abilities and attitudes that the student needs to learn. The goal of the Post-Intervention Assessment was to evaluate the changes that occurred from the pre-intervention to the post-intervention. The data was analyzed using specific rubrics developed for each task.

The pre-test examined the students' comprehension of the text's theme, aim, and impact on them as readers, or how the text places the readers. It also looked at how social actors and social structures were portrayed, as well as how language was used to further the author's goals. The study of the students' answers revealed that their critical reading horizon was still in its nascent stage reading. The performance of the sample population during the pre-test shows that the students lack critical thinking skills. Students did well on the problems that required more textual and factual processing, but they lacked elaboration and substantiation. Many of the student's answers were not quite relevant to what was being asked. Mostly their answers reverberated with the chunks from the text. As a result, to expand their horizon of critical thinking, it was decided that the students would be given a detailed dialogic engagement in such areas.

The post-test was administered later after the intervention stage. The same two news articles that were administered during the pre-test were given. Students were asked to analyze both these articles and find the differences, similarities, ideology, author’s bias, etc. Students’ responses were recorded and evaluated by the rubrics of the California Critical Thinking Test.

The performance of the sample population during the post-test shows that the students performed the post-test more effectively and confidently than during the pre-test. Many of the students’ answers were quite relevant and factual. The language and reasoning skills of the majority of students were improved. The majority of the student's essays were structured logically compared to their pre-test answers. Several students' interpretation was objective. They tried to compare and contrast both articles and also mentioned their views as well. This was missing in their pre-test. The comparative study of pre-test and post-test reveals that there is a significant improvement in the Critical thinking scores of the sample population when using Socio-political discourses as materials in tertiary ESL classrooms.

In addition to the pre-test and post-test. A questionnaire consisting of 25 questions was administered to record students' perception of using methods like Critical pedagogy and Critical Discourse analysis as well as the socio-political discourse as content. The findings of the questionnaire are as follows,

The majority of the students find critical thinking to be the most necessary skill in the 21st century. They believe that it's only through critical thinking they can attain several heights in their fields irrespective of the domine. It is found that the development of critical thinking skills, promotes the development of other language skills simultaneously. Many students strongly agreed that learning critical thinking skills motivate them to learn the target language (English) effectively.

Students prefer the use of more authentic materials than conventional materials. Authentic material provides learners with real-life situations and provides information about the culture's perspective on an issue or event. It is proved that students learn the language better when we as teachers use authentic materials as a teaching aid. The majority of the students preferred the use of these authentic materials as the greatest advantage of Critical pedagogy in addition to its learner's autonomy, Conscious raising methodology, etc. This is one of the major reasons behind using Socio-political discourses as content rather than any other conventional materials for the research.

From the results, it is found that most of the students (80% strongly agreed and agreed) believe that learning through socio-political discourses has helped them improve their overall Critical Thinking skills. In addition, it also helps them to be aware of the societal issues as well (78% agreed and strongly agreed). A majority of the students (82% Agreed and strongly agreed) believe that learning Critical thinking through socio-political discourses helps them to transfer their learned CT skills to their social life.

The results clearly show that the majority of the students (64% Agreed and strongly agreed) that CDA has helped them to find that language is a more interesting phenomenon. CDA has opened the scope for students to look at the small nuances of the language and critically appreciate them. Both Critical pedagogy and CDA procure awareness that language is social and dialogic in process for the majority of the students (80% Agreed and strongly agreed). It helped them to identify their personal bias and urges them to act objectively.

Both CP and CDA provide meaningful situations to ascertain that language is learned and explored in the best possible ways. The majority of the students (78% Agreed and strongly agreed) believe that both CP and CDA encourage them to understand structures of power, oppression and critique the societal status quo. It also promotes socialization among the facilitator and learners which is the central tenant of a learner-centric classroom.

Finally, the research proves that both fostering Critical consciousness through CP and CDA have the ability to create awareness and motivate students for a social transformation (94% Agreed and strongly agreed).

Conclusion

A head that cannot sift and process information critically and a mind that cannot and does not ask questions and a heart that accepts everything meekly and uncritically reflect the poor quality of education that is being offered today. The extension of the world into the word and the reverse is the focus of critical pedagogy. A language classroom that deals with words and words that deal with worlds can base its instruction on the local worlds of learners so that it can enable learners to use language in tangible, identifiable situations and also empower them to make changes in their lives. Therefore, incorporating critical pedagogic strategies would be of utmost importance and have a significant impact on both language education and social empowerment in an ESL classroom.

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In Silico Molecular Interaction Analysis and Pharmacokinetic Profiling of Flavonoids from *Catharanthus roseus* (Flower) Against TXNIP Protein

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Abstract

Catharanthus roseus is a flowering plant whose flowers have been used in traditional medicine to treat diabetes mellitus. Some of the flavonoids present in these flowers, namely, quercetin, petunidin, malvidin, kaempferol, and hirsutidin were utilized for studying molecular interaction analysis. Diabetes mellitus which is a metabolic disorder caused by the depletion in the secretion of insulin, which regulates the blood glucose levels by facilitating the metabolism of glucose. Reduction in insulin secretion is often caused by the loss of beta cells of the pancreas. Thioredoxin-interacting protein (TXNIP) is an alpha arrestin which inhibits the production of thioredoxin. It can regulate the beta cells and its inhibition can be advantageous. Reduction in insulin secretion is often caused by the loss of beta cells of the pancreas. Studies have shown that elevated levels of TXNIP can induce apoptosis in beta cells while deficiency of TXNIP leads to protection against Type I & II diabetes due to beta cell survival. To study molecular interactions, flavonoids from the flower of *C. roseus* and control drug glibenclamide were subjected to docking against 3D structure of TXNIP protein using Autodock 4.2 and their molecular interactions were visualized using a Biovia discovery studio visualizer. Docking interactions and ADMET studies of the bioactive compounds signified the application of *C. roseus* as a natural therapeutic agent to combat diabetes.

Keywords: Diabetes mellitus, TXNIP, *Catharanthus roseus*, Flavonoids, Molecular docking

Introduction

Diabetes Mellitus is a term used to denote a group of metabolic disorders marked by a rise in blood glucose levels occurring due to defects in the secretion of insulin or defect in its action [1]. Diabetes Mellitus can be differentiated into 3 different categories based on its pathophysiology [2]. Type1 Diabetes Mellitus is caused by an auto-immune reaction [3]. Gestational diabetes mellitus is another sub type seen in the period of pregnancy in the mother.

Type2 Diabetes Mellitus is caused by deterioration in insulin secretion from the beta cells and insulin sensitivity [4]. There are various documented evidences presents that confirm the role of pancreatic beta cell death in the development of diabetes [5]. Thioredoxin-interacting protein (TXNIP) which stands for Thioredoxin interacting protein is a metabolism regulating protein that is found in important sites like adipose tissues, skeletal muscles and liver. TXNIP are proteins belonging to alpha arrestin family [6]. TXNIP interacts with Thioredoxin (TXN1 & TXN2) which leads to negative modulation of their activity. TXNIP plays an important role in glucose regulation and lipid metabolism by regulating beta cell function, peripheral glucose uptake, adipogenesis etc. TXNIP upon overexpression leads to pancreatic beta cell apoptosis and reduction in insulin sensitivity [5]. TXNIP protein binds with TXN1 which affects the ability of TXN1 to reduce oxidized protein and results in oxidative stress and heightened chances of apoptosis. TXNIP migrates to the mitochondria where it binds with TXN2 by competing with Apoptosis signal regulating kinase 1 (ASK-1) which leads to the release of ASK-1. ASK-1 usually binds with TXN2 which leads to the inhibition of its action [4]. Due to the TXNIP action the released ASK-1 gets phosphorylated and activated, leading to the initiation of apoptosis signaling cascade in pancreatic beta cells. Beta cell impairment and reduction in the production of insulin are the major causes of diabetes [6].

Catharanthus roseus is a traditional medicinal plant that has been used to treat diabetes in various parts of India. Different parts of the plants such as a leaf, flower, stems are administered to the patients to treat Diabetes mellitus [7]. Flower of *C. roseus,* according to Ayurvedic studies is considered to treat diabetes. Various experiments done in the laboratory show hypoglycemic activity of *C. roseus* extracts obtained from different plant parts such as root, leaf, flower and stem [8]. Flowers of *C. roseus* contain several flavonoids like quercetin, petunidin, malvidin, kaempferol and hirsutidin and their activities were reported in **Table 1**. Flavonoids is a group of natural substances with variable polyphenolic structures is a good anti-oxidant, anti-diabetic activity and anti-ageing activity [9]. Quercetin controls the body glucose homeostasis by interacting with many molecular targets in places such as small intestine, pancreas, skeletal muscle, adipose tissue, liver etc., [10]. Other phenolic compounds such as petunidin and malvidin are dietary polyphenols that help in preventing and managing Type2 Diabetes Mellitus by protecting pancreatic beta cells, initiating their proliferation, reducing beta cell apoptosis, and limiting oxidative stress [11]. Studies have suggested that phytocompounds like kaempferol might be concerned with the alleviation of diabetes [12]. The current investigation was done to study the inhibitory effect of the flavonoids from the flowers of *C. roseus* against TXNIP protein using bioinformatics tools and evaluating the docking score by AutoDock Tools.

Table 1 Flavonoid from *C. roseus* and reported bioactivity review.

Bioactive compound from *C. roseus*	Reported activities	References
Kaempferol	Antidiabetic, Antimicrobial, Antioxidant	[13-15]
Quercetin	Antidiabetic, Antioxidant, Anti-inflammatory, Anti Mutagenic	[10, 16-18]
Malvidin	Antioxidant,	[19]
Petunidin	Antioxidant	[20]
Hirsutidin	Hypoglycemic	[21]

Material and methods

Retrieval of TXNIP protein and active site prediction

TXNIP proteins crystal structure was retrieved from the Research Collaboratory for Structural Bioinformatics Protein Data Bank (PDB; www.rcsb.org/pdb). To the retrieved protein structure Hydrogen bonds and Kollman charges were added using ADT. The active site of TXNIP protein was determined using Computed Atlas of Surface Topography of Proteins (castP) 3.0 [22].

Ligand preparation

The structures of quercetin, malvidin, hirsutidin, petunidin, kaempferol, and the control drug glibenclamide were retrieved from PubChem (https://pubchem.ncbi.nlm.nih.gov) in the form of canonical SMILES. Using the software ChemSketch the 3-dimensional (3D) structures were generated and optimized. The compound structures were then saved in MDL mol file (.mol). The MDL mol files were then converted to PDB format using Open Babel molecular converter [23].

Molecular property assessment of the compounds

Physiochemical and Pharmacological properties of the compounds were assessed using Molinsipiration Server (https://molinspiration.com) [24]. Properties such as molecular size, rotatable bond, logP, hydrogen bond donor and acceptor characteristics were estimated. Membrane permeability, bioavailability, distribution, metabolism, adsorption (Lipinski's rule of 5) of the selected ligands were evaluated [25].

Ligands ADMET prediction studies

PkCSM (unimelb.edu.au) is a web server used to predict pharmacokinetic properties of compounds [26]. It anticipates different parameters based on certain characteristics. These parameters include absorption, distribution, metabolism and excretion that help us to determine the pharmacokinetics of a drug. Absorption of a drug can be predicted by predicting its characteristics such as CaCO2 & skin permeability, intestinal absorption, P-glycoprotein substrate or inhibitor. Characteristics such as volume distribution (VD) and permeability of central nervous system (CNS) and blood brain barrier (BBB) were utilized to predict the distribution of the drug. For the determination of the Metabolism Cytochrome P450 model was used. Excretion of the drug was determined by Total clearance and Renal substrate.

Molecular docking

Docking analysis of flavonoids, quercetin, malvidin, petunidin, kaempferol, hirsutidin from *C.* roseus and the control glibenclamide against TXNIP protein was done using AutoDock Tool to make out the affinity [27]. To the 3D TXNIP macromolecular structure, hydrogen atoms (polar) and kollman charges were added. In the ligand preparation, centre node and rotatable bonds were selected and saved in PDBQT format. Many intermediate steps such as making pdbqt files of protein and ligand, grid preparation (grid size 72×72×72 Å) and grid map using the grid box were performed. Generation of active site was done using the data gathered from castP 3.0. Genetic algorithm was used as a search parameter and Lamarckian GA was the output selected. The parameters of genetic algorithm were set to 10 runs with 150 population size; the number of evaluations were set to 25,000,000; generation numbers to 27,000 with default mutation rate and crossover rate of (0.02) and (0.8) respectively. The protein-ligand interaction between quercetin, malvidin, hirsutidin, petunidin, kaempferol and the control glibenclamide against TXNIP protein was visualized using Biovia Discovery Studio Visualizer software [28].

Results and discussion

Diabetes mellitus refers to a widespread heterogenous group of metabolic disorders that can result in chronic illness and death. Despite the fact that the origin and development of diabetes mellitus can be due to various other mechanisms, TXNIP (Thioredoxin interacting protein) plays a major role in the pathogenesis of diabetes mellitus [6]. TXNIP proteins are from alpha arrestin family inhibiting TXN and leading to oxidative stress. Pancreatic beta cells are vulnerable to oxidative stress as it leads to apoptosis in them. So, TXNIP protein can be considered to be a target for bioactive compounds in order to control diabetes mellitus.

Protein structure preparation

Crystal structure of TXNIP from *Homo sapiens* was downloaded from PDB database and its structure id was 4LL1. Water molecules were removed and hydrogen atoms merger to the receptor molecule was carried out. RasMol application was used to visualize the 3D structure of TXNIP protein. The structure is depicted in **Figure 1**. Active sites of TXNIP protein were determined using castP 3.0. The amino acid sequences of the active sites were documented as GLY24, LEU47, TYR69, LEU70, ARG71, TYR72, GLU73, PHE103, GLU104, LEU105, PRO106, GLN107, PRO109, LEU222, ALA223, ASN224, GLY225, GLN226, THR227, LEU270, ARG271.

Figure 1 TXNIP protein structure visualization using RASMOL. yellow colour indicates betasheets and white colour indicates turns.

Ligand preparation

Bioactive compounds from the flowers of *C. roseus* are rich in flavonoids and alkaloids and are known for their hypoglycemic activity. Molecular Docking analysis was used to find the best fit of the bioactive compounds with TXNIP protein.

The compounds of quercetin, malvidin, petunidin, hirsutidin, kaempferol and the control glibenclamide were drawn using ACD ChemSketch, optimized and saved in MDL-mol format. Conversion to PDB format using OpenBabel molecular converter tool was carried out later. The pubchem id and SMILES format of all the compounds are shown in **Table 2**.

Table 2 Pubchem id and SMILES format of flavonoids from *C. roseus* and glibenclamide.

Compounds	Pubchem id	SMILES
Kaempferol	5280863	C1=CC(=CC=C1C2=C(C(=O)C3=C(C=C(C=C3O2)O)O)O)O
Quercetin	5280343	C1=CC(=C(C=C1C2=C(C(=O)C3=C(C=C(C=C3O2)O)O)O)O)O
Malvidin	159287	COC1=CC(=CC(=C1O)OC)C2=[O+]C3=CC(=CC(=C3C=C2O)O)O
Petunidin	73386	COC1=CC(=CC(=C1O)O)C2=[O+]C3=CC(=CC(=C3C=C2O)O)O.[Cl-]
Hirsutidin	441694	COC1=CC(=C2C=C(C(=[O+]C2=C1)C3=CC(=C(C(=C3)OC)O)OC)O)O
Glibenclamide	3488	COC1=C(C=C(C=C1)Cl)C(=O)NCCC2=CC=C(C=C2)S(=O)(=O)NC(=O)NC3CCCCC3

Molecular property assessment of the compounds

Bioactivity score prediction of quercetin, malvidin, petunidin, hirsutidin, kaempferol and the control glibenclamide is recorded and tabulated based on their drug likeliness in **Tables 3** and **4**. Lipinski's rule of 5 was followed while assessing the molecular properties. All the compounds chosen for the study adhere to Lipinski's rule [25]. Greater absorption and favorable oral bioavailability was predicted as topological polar surface area (TPSA) was < 140 Å for all of the compounds. From the bioactivity score prediction, the compound glibenclamide demonstrated good activity (> 0.20) towards G-protein coupled receptor (GPCR) ligand. Quercetin and kaempferol had a good bioactivity score against kinase receptors, whereas quercetin and kaempferol good bioactivity (> 0.20). Glibenclamide depicted a good bioactivity against protease inhibitor, whereas quercetin was found to be a strong enzyme inhibitor when compared to kaempferol and glibenclamide.

Table 3 Properties of flavonoids from *C. roseus* and glibenclamide predicted using molinspiration.

Compounds	M.wt	Hydrogen bond donor	Hydrogen bond acceptor	miLogP	Rotatable bonds	nViolations	TPSA (Å)	Volume	N atoms
Kaempferol	286.24	4	6	2.17	1	0	111.12	232.07	21
Quercetin	302.24	5	7	1.68	1	0	131.35	240.08	22
Malvidin	331.30	4	7	−0.42	3	0	110.55	277.88	24
Petunidin	317.27	5	7	−0.73	2	0	121.54	260.36	23
Hirsutidin	345.33	3	7	0.11	4	0	99.56	295.41	25
Glibenclamide	494.01	3	8	4.77	8	0	113.60	424.74	33

Table 4 Drug likeliness properties of flavonoids from *C. roseus* and glibenclamide predicted using molinspiration.

Compounds	GPCR ligand	Ion channel modulator	Kinase inhibitor	Nuclear receptor ligand	Protease inhibitor	Enzyme inhibitor
Kaempferol	−0.10	−0.21	0.21*	0.32*	−0.27	0.26*
Quercetin	−0.06	−0.19	0.28*	0.36*	−0.25	0.28*
Malvidin	−0.15	−0.17	0.02	0.01	−0.25	−0.03
Petunidin	−0.15	−0.17	0.03	0.01	−0.29	−0.01
Hirsutidin	−0.18	−0.19	−0.02	−0.03	−0.24	−0.05
Glibenclamide	0.20*	−0.05	−0.27	−0.33	0.24*	0.05

*Compounds with value greater than > 0.2 has good bioactivity against respective target

Molinspiration studies predicting the molecular properties such as hydrophobicity, membrane permeability, bioavailability are linked to molecular descriptors like log P, log S, the number of hydrogen donors or acceptors and molecular weight. These are associated with the designing of new drugs [29]. Molinspiration results were very favorable in the current study for quercetin, malvidin, petunidin, hirsutidin and kaempferol. TPSA of a molecule is a useful descriptor in molinspiration analysis as it helps to characterize the drug absorption and bioavailability. The values of TPSA and OH-NH interaction display the ability of the ligands to smoothly and efficiently bind to the target protein. Meanwhile, TPSA value of > 140 Å for a drug molecule depicts low absorption with lipophilicity and is crucial to estimate the oral bioavailability of the drug. Based on the previous statement it can be affirmed that flavonoids show good bioavailability when compared with glibenclamide which shows TPSA value greater than 140 Å.

Ligand ADMET characteristics analysis

ADME of the selected ligands was determined using pkCSM. The finding from the study are documented in **Table 5**. The TPSA value of all the ligands were < 100 which signify that the ligands show good membrane permeability. The AlogP value of the selected ligands turned out to be < 5 which is in correspondence with an ideal ligand AlogP value representing greater lipophilicity.

Table 5 ADMET prediction of ligands using PkCSM server.

Parameters	Kaempferol	Quercetin	Malvidin	Petunidin	Hirsutidin	Glibenclamide
TPSA	117.213	122.108	136.109	141.57	142.793	198.674
AlogP	2.2824	1.988	3.2205	−0.0785	3.5235	3.6417
Absorption						
Water solubility	−3.04	−2.925	−3.07	−2.938	−3.583	−4.582
CaCo2 permeability	0.032	−0.229	−0.381	−0.192	0.041	0.709
Intestinal absorption	74.29	77.207	88.785	68.964	84.27	71.775
Skin permeability	−2.735	−2.735	−2.735	−2.735	−2.735	−2.773
P-glycoprotein substrate	Yes	Yes	Yes	Yes	Yes	Yes
P-glycoprotein inhibitor1	No	No	No	No	No	Yes
P-glycoprotein inhibitor2	No	No	No	No	Yes	Yes
Distribution						
VDss(human)	1.274	1.559	0.763	0.94	−0.215	−0.218
Fraction unbound	0.178	0.206	0.137	0.206	0.054	0
BBB permeability	−0.939	−1.098	−1.335	−1.076	−1.292	−1.01
CNS permeability	−2.228	−3.065	−3.374	−3.88	−3.018	−2.674
Metabolism						
CYP2D6 substrate	No	No	No	No	No	No
CYP3A4 substrate	No	No	No	No	Yes	Yes

Parameters	Kaempferol	Quercetin	Malvidin	Petunidin	Hirsutidin	Glibenclamide
CYP1A2 inhibitor	Yes	Yes	Yes	No	Yes	No
CYP2C19 inhibitor	No	No	No	No	Yes	No
CYP2C9 inhibitor	No	No	No	No	Yes	Yes
CYP2D6 inhibitor	No	No	No	No	No	No
CYP3A4 inhibitor	No	No	No	No	No	Yes
Excretion						
Total clearance	0.477	0.407	0.678	0.641	0.746	−0.155
Renal substrate	No	No	No	No	No	No
Toxicity						
AMES toxicity	No	No	No	No	No	No
Maximum tolerated Dose	0.531	0.499	0.554	0.528	0.657	−0.026
Herg-1 inhibition	No	No	No	No	No	No
Herg-2 inhibitor	No	No	No	No	No	No
Oral rat acute toxicity (LD50)	2.449	2.471	2.346	2.453	2.32	1.701
Oral Rat chronic toxicity	2.505	2.612	2.412	2.611	1.68	1.81
Hepatotoxicity	No	No	No	No	No	Yes
Skin sensitization	No	No	No	No	No	No
T. pyriformis toxicity	0.312	0.288	0.327	0.293	0.341	0.333
Minnow toxicity	2.885	3.721	1.224	3.002	1.626	0.173

Absorption nature of the selected ligands was studied using parameters such as CaCo2 permeability, skin permeability, and absorption by intestine [30]. Compound with Papp value > 8×10 − 6 cm/s and predicted value > 0.90 signifies high CaCo2 permeability. None of the selected ligands showed predicted value of > 0.90 except the control glibenclamide indicating low CaCO2 permeability [31]. Intestinal absorption is a parameter which signifies the absorption of a molecule in the intestine. Molecule with < 30 % absorption is considered to be poorly absorbed [32]. The results indicated that all the selected ligands showed greater intestinal absorption (i.e) > 30 %. Malvidin showed the highest intestinal absorption rate with 88.758 %. P-glycoprotein belonging to ATP binding cassette protein family acts in stopping the xenobiotics and toxins from entering our system [33]. P-glycoprotein substrate model was used to analyse whether the compound is a substrate of pgp or not [34]. From the current study, it can be determined that all the selected ligands act as P-glycoprotein substrate. Log Kp is used to signify the skin permeability of a compound. > −2.5 Log Kp value signifies low skin permeability. Results from the current study illustrate that all the selected ligands have Log Kp value < −2.5 indicating favorable skin permeability. P-glycoprotein inhibitors help in inhibiting P-glycoprotein and help in raising drug bioavailability. P-glycoprotein inhibitors are of 2 types class 1 and 2, and this model helps in determining whether the selected compounds are P-glycoprotein 1 and 2 inhibitors [35]. Current studies suggest that all the selected ligands except the control glibenclamide are not Class 1 P-glycoprotein inhibitor. Meanwhile, only hirsutidin and the control glibenclamide act as inhibitors for class 2.

VD is one of the characteristics that can be used to calculate the rate of distribution of a drug [35]. If the VD value of a drug is > 0.45, then it is considered to have a high distribution rate. Current study suggests that from the selected compounds kaempferol, petunidin, malvidin show greater VD meanwhile hirsutidin and the control glibenclamide displayed low VD. The BBB protects the brain from exogenous molecules by stopping them from reaching CNS [34]. BBB permeability can be used to study the distribution of a drug in the brain. Compounds with LogBB value > 0.3 will easily cross the blood brain barrier while permeability of those with a LogBB value of < −1 is considered poor. All selected ligands from the current study display poor BBB permeability.

Cytochrome P450 is an enzyme that is found in the liver. It plays a major role in detoxifying xenobiotics in our body [36]. It is also involved in the activation and inactivation of drug molecules in our body. It is necessary to examine the Cytochrome P450 inhibiting capability of the selected ligands. In this study different models of isoforms (CYP1A2,CYP2C19,CYP2C9,CYP2D6, CYP3A4) were used to predict the Cytochrome P450 inhibitory capabilities of a compound [37]. Current studies suggest that from the selected ligands kaempferol, quercetin and malvidin show inhibitory effect on (CYP1A2) while hirsutidin shows inhibitory effect on (CYP1A2, CYP2C19, CYP2C9), petunidin shows no inhibitory effect while the control glibenclamide exhibits an inhibitory effect on (CYP2C9,CYP3A4). CYP2D6 & CYP3A4 are 2 isoforms of Cytochrome P450 substrate which are used to assess the metabolism of the compound [37]. The current study suggests that of the selected ligands only hirsutidin and the control glibenclamide were capable of acting as CY3A4 substrate.

The selected ligands showed no toxicity in the current study. Toxicity studies, like AMES study, skin sensitivity, cardiotoxicity, Herg 1 and 2 inhibition revealed negative results except for glibenclamide which displayed hepatotoxicity [34,38]. Determination of the pharmacokinetic property of a possible drug is extremely vital. PkCSM is a web serving platform which uses machine-learning to predict the pharmacokinetics properties of small molecules. PkCSM studies were done to determine the ADMET properties of the selected ligands, parameters such as CaCO2 permeability, intestinal absorption, BBB permeability, CNS permeability, Cytochrome P450 model study and various toxicity studies such as AMES toxicity, cardiotoxicity and hepatotoxicity [32]. For the current study, were deduct that all the ligands exhibit poor CaCO2 permeability and P-glycoprotein inhibitors except hirsutidin and the control glibenclamide. Meanwhile skin permeability and intestinal absorption was good for all of the ligands. Distribution of the selected ligands was found to be favorable. All of the selected ligands exhibited greater VD except hirsutidin and glibenclamide. BBB permeability was very poor for all the selected ligands. To assess the metabolism of the selected ligands a study was done using Cytochrome P450 model. Cytochrome P450 model had 2 isoforms CYP2D6 and CYP3A4. The current study showed that of the selected ligands only hirsutidin and glibenclamide were capable of acting as substrate (CYP3A4 substrate) indicating the lower metabolism in the liver. From the toxicity studies of our selected ligands only glibenclamide was found to be hepatotoxic. Present studies showed that all the flavonoids display good intestinal absorption, good bioavailability when compared with glibenclamide, they are incapable of crossing the BBB and unable to penetrate the CNS. For a successful drug development, it is important that the lead molecule should exhibit maximal potency against the drug target, be safe as well as have appropriate pharmacokinetic properties.

Molecular docking analysis

ADT used in this study, is an automated docking tool consisting of software that helps in modelling flexible small molecules like drug molecule binding to receptor protein [27]. Ten conformations of protein-ligand complex can be generated in ADT 2.0 or higher version. It displays conformations from lowest binding energy to highest binding energy. Prediction of relative binding affinity of TXNIP with quercetin, malvidin, petunidin, kaempferol, hirsutidin and the control glibenclamide was done using a computational docking algorithm which helped in observing the structure-inhibitory action relationship. The best fit was determined according to the number of hydrogen bonds with the enthalpic gain due to water molecules [39]. In the present analysis, the docking of quercetin, malvidin, petunidin, kaempferol, hirsutidin, and the control glibenclamide against TXNIP developed favorable receptor-ligand complex. There are 2 important steps associated with docking analysis where the prognosis of the identical orientation of the conformers in the best active site pocket known as pose and scoring was utilized to get the strength of target-ligand binding interactions [40].

Lamarckian Genetic Algorithm was used in the current study to see the binding conformational landscape of quercetin, malvidin, petunidin, kaempferol, hirsutidin and the control glibenclamide against TXNIP. Docking scores on TXNIP is a clear indication of a direct relationship between energy of the binding affinity and stability. Considering the previous statement, apart from the binding energy, torsional energy, and intramolecular energy were higher for petunidin followed by kaempferol and quercetin. The quercetin forms 5 hydrogen bonds with ARG271, TYR69, THR227, ARG71 and 2 hydrophobic interactions with PRO106, THR227 and kaempferol forms 5 hydrogen bonds with ARG71, ARG271, TYR69 and GLN107 which is similar to the position of glibenclamide which forms 5 hydrogen bonds with ARG271, THR227 and GLN107 and hydrophobic interactions with PRO106, LEU270, LEU222. Glibenclamide utilizes binding energy of −6.91 kcal/mol whereas quercetin and kaempferol utilizes little higher energy value of −6.59 and −6.56 kcal/mol. From the docking results, Quercetin and kaempferol found to inhibit TXNIP in the same position as glibenclamide. Hence among the screen flavonoids, Quercetin and kaempferol found to inhibit TXNIP. Quercetin and kaempferol when compared with glibenclamide have good bioavailability value, pharmacokinetics parameter, drug likeliness property and inhibitor activity against kinase receptors, enzymes and nuclear receptor ligand that was confirmed by molinspiration results. Elevated levels of TXNIP levels were found to induce β-cell death and causes diabetes [6]. and hence the compounds Quercetin and kaempferol from *C. roseus* prevents type -I and type-II diabetes by inhibiting the activity of TXNIP.

The compounds quercetin, malvidin, petunidin, hirsutidin, kaempferol and the control glibenclamide were subjected to molecular docking against TXNIP. The best conformer was selected based on the binding energies. The bond interaction between quercetin, malvidin, petunidin, hirsutidin, kaempferol and the control glibenclamide against TXNIP in stick model using Biovia Discovery studio visualization tool is presented in **Figures 2(a)** - **2(f)**. The bioactive compound Petunidin binding with amino acids of TXNIP displayed lowest estimated binding free energy of −7.29 kcal/mol and forms 1 hydrogen bond interaction with GLU104. Malvidin interacted with TXNIP with the binding energy of −6.63 kcal/mol and hydrogen bond with THR227, GLN107, LEU70 and ARG71 GLU104 and hydrophobic interaction with PRO106 and LEU70. Kaempferol exhibited a binding energy of −6.59 kcal/mol, 5 hydrogen bond interactions with ARG71, ARG271, TYR69 and GLN107 and hydrophobic interaction with LEU270 and PRO106. Quercetin displayed a binding energy of −6.56 kcal/mol with 5 hydrogen bond interactions, namely ARG271, ARG271, TYR69, THR227 and ARG71, whereas PRO106 and THR227 formed hydrophobic interactions. Hirsutidin showed a binding energy of −6.42 kcal/mol and 3 hydrogen bond interactions with GLU104, ARG71, and ARG271 while the control Glibenclamide displayed binding energy of −6.91 kcal/mol and 6 hydrogen bond interactions with ARG271, THR227 and GLN107. **Table 6** displays the Ligand efficiency and docking scores between bioactive compounds and TXNIP. The 2D diagram depicting Hydrogen and hydrophobic interactions are shown in **Figures 3(a)** - **3(f)** and residues forming interactions are tabulated in **Table 7**.

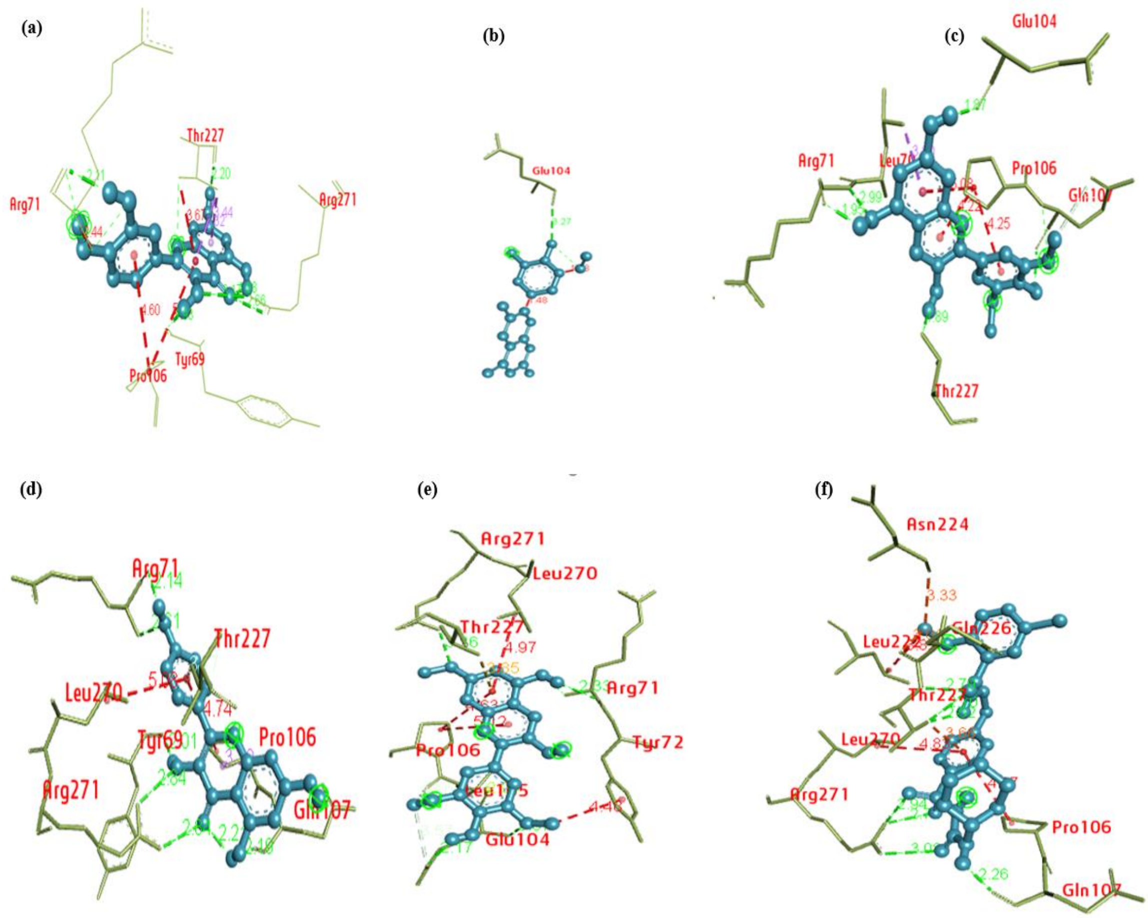

Figure 2 TXNIP (depicted in light green stick model) with compounds (shown in scaled ball and stick model) (a) quercetin; b) Petunidin; c) Malvidin; d) kaempferol; e) hirsutidin; f) glibenclamide interaction visualized by Biovia Discovery Visualizer. green colour dotted lines indicates hydrogen bond.

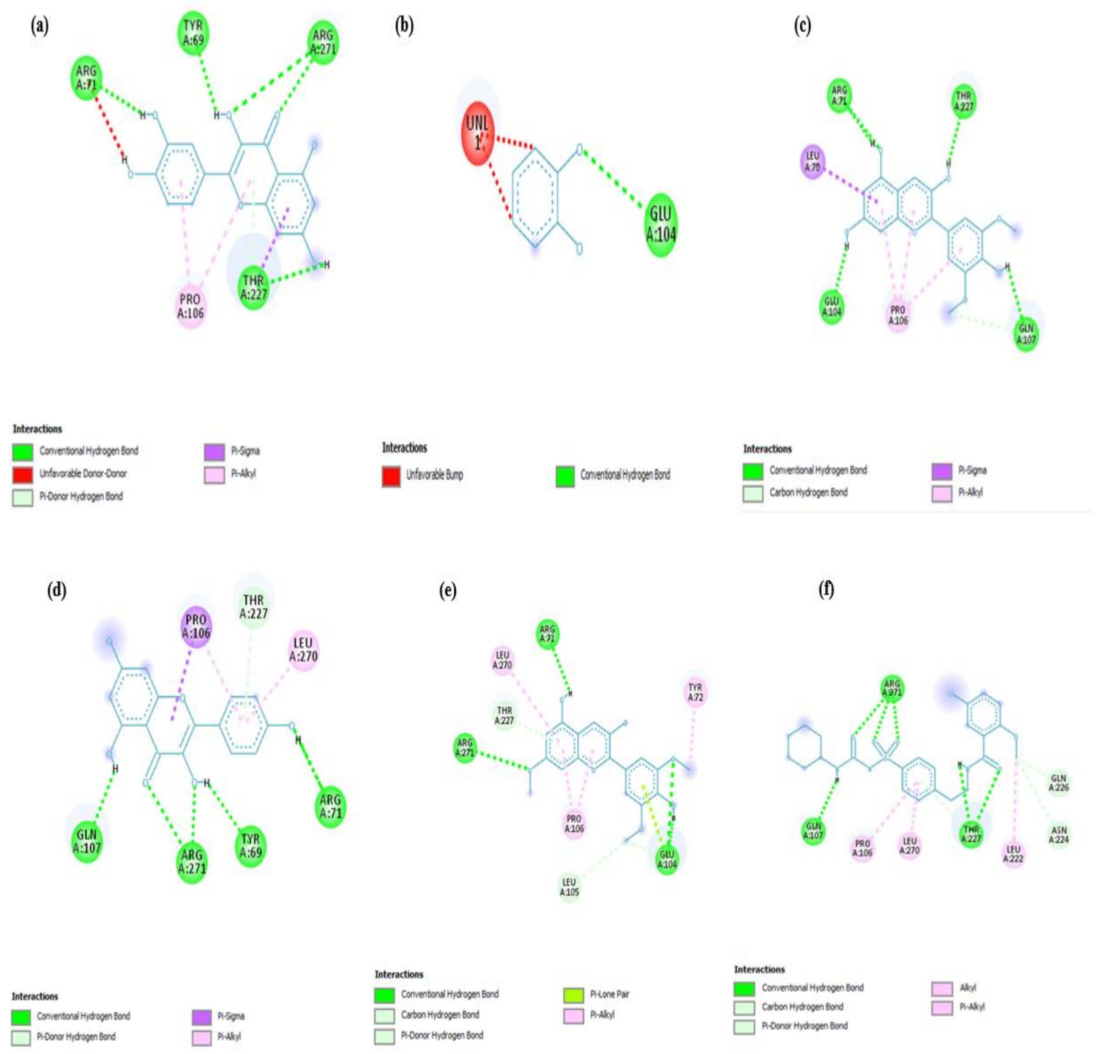

Figure 3 Two dimensional interaction of TXNIP with (a) quercetin; (b) Petunidin; (c) malvidin; (d) kaempferol; (e) hirsutidin; (f) glibenclamide visualized using Biovia Discovery studio visualizer showing hydrogen and hydrophobic interactions.

Table 6 Binding energies and ligand efficiency of flavonoids from *C. roseus* and glibenclamide and TXNIP predicted using autodock 4.2

TXNIP docking with compounds	Number of hydrogen bonds	Binding energy	Ligand Efficiency	Intermolecular energy	VdW + Hbond + Desolv energy	Electrostaic energy	Torsional energy	Total internal unbound
Quercetin	5	−6.56	−0.3	−8.35	−7.98	−0.38	1.79	−1.81
Petunidin	1	−7.26	−0.3	−7.86	−7.74	−0.12	0.6	−0.2
Malvidin	4	−6.63	−0.28	−8.27	−8.4	−0.32	2.09	−0.7
Kaempferol	5	−6.59	−0.31	−8.08	−7.72	−0.36	1.49	−0.99
Hirsutidin	3	−6.42	−0.26	−8.51	−8.19	−0.32	2.09	−0.75
Glibenclamide	6	−6.91	−0.27	−11.24	−10.84	−0.4	2.39	−1.36

Note: Unit for all energy values is Kcal/mol.

Table 7 Hydrogen bond interactions, hydrophobic and other interactions between TXNIP and flavonoids from *C. roseus* visualized using biovia discovery studio visualizer.

TXNIP with ligand interactions	Hydrogen bond interactions		Hydrophobic interactions	Other interactions
	Amino acid (Atom···Ligand atom)	**Distance (Å)**		
TXNIP + Quercetin	ARG271(NH1···O) ARG271(NH2···O) TYR69(O···H) THR227(O···H) ARG71(O···H)	3.17 2.66 1.93 2.20 2.11	**Alkyl/pi-alkyl** PRO106 **Pi-Sigma** THR227	NIL
TXNIP + Petunidin	GLU104 (O···O)	3.27	NIL	NIL
TXNIP + Malvidin	THR227(OG1···H) GLN107(O···H) LEU70(N···H) ARG71(O···H)	1.89 2.13 2.99 1.95	**Alkyl/pi-alkyl** PRO106 **Pi-Sigma** Leu70	NIL
TXNIP + Kaempferol	ARG71(O···H) ARG271(NH2···O) ARG271(NH1···O) TYR69(O···H) GLN107(O···H)	2.14 2.84 2.84 2.01 2.19	**Alkyl/pi-alkyl** LEU270 PRO106 **Pi-Sigma** PRO106	**Pi-Donor H-Bond** THR227
TXNIP + Hirsutidin	GLU104 (OE2···H) ARG71(O···H) ARG271(NH1···O)	2.17 2.33 3.36	**Alkyl/pi-alkyl** LEU270 PRO106 TYR72	**Pi-Lone Pair** GLU104 **Carbon hydrogen bond** LEU105 **Pi-Donor H-Bond** THR227
TXNIP + Glibenclamide	ARG271(NH2···O) ARG271(NH1···O) ARG271(NH1···O) THR227(OG1···H) GLN107(O···H)	3.08 2.94 2.72 2.52 2.26	**Alkyl/pi-alkyl** PRO106 LEU270 LEU222	**Pi-Donor H-Bond** GLN226 ASN224

Conclusions

Diabetes mellitus is the third biggest cause of early deaths worldwide and beta cell apoptosis is a very important characteristic of this disease. TXNIP protein can influence beta cell apoptosis. As a result, selecting an inhibitor against TXNIP target protein is a necessity, keeping in mind the approaching diabetes epidemic. This can be achieved by *in silico* molecular mechanism prediction. The current study, in docking proposes that bioactive compounds quercetin and kaempferol from the flowers of *C. roseus*, and act as a favorable candidate against TXNIP by downregulating its activity that in turn by promotes β-cell survival that combat type-2 diabetes. Quercetin and kaempferol may serve as a potential lead compound for as a promising anti-diabetic agent for further *in vivo* and *in vitro* studies.

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