13th World Conference on Applied Science, Engineering and Technology (WCASET – 18)

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Editorial:

We cordially invite you to attend the ***13th World Conference on Applied Science, Engineering and Technology (WCASET - 18)*** which will be held at ***Mandarin Hotel Bangkok, Thailand*** on ***October 19th - 20th, 2018***. The main objective of ***WCASET*** is to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in relevant fields of Science, Engineering and Technology. This conference will provide opportunities for the delegates to exchange new ideas and experience face to face, to establish business or research relationship and to find global partners for future collaboration.

These proceedings collect the up-to-date, comprehensive and worldwide state-of-art knowledge on cutting edge development of academia as well as industries. All accepted papers were subjected to strict peer-reviewing by a panel of expert referees. The papers have been selected for these proceedings because of their quality and the relevance to the conference. We hope these proceedings will not only provide the readers a broad overview of the latest research results but also will provide the readers a valuable summary and reference in these fields.

The conference is supported by many universities, research institutes and colleges. Many professors played an important role in the successful holding of the conference, so we would like to take this opportunity to express our sincere gratitude and highest respects to them. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing extra help in the review process, and to the authors for contributing their research result to the conference.

Since August 2018, the Organizing Committees have received more than 71 manuscript papers, and the papers cover all the aspects in Electronics, Computer Science, Information Technology, Science Engineering and Technology. Finally, after review, about 21 papers were included to the proceedings of ***WCASET - 2018***.

We would like to extend our appreciation to all participants in the conference for their great contribution to the success of ***WCASET 2018***. We would like to thank the keynote and individual speakers and all participating authors for their hard work and time. We also sincerely appreciate the work by the technical program committee and all reviewers, whose contributions made this conference possible. We would like to extend our thanks to all the referees for their constructive comments on all papers; especially, we would like to thank to organizing committee for their hard work.

Editor-In-Chief
Dr. Nalini Chidambaram
Professor
Bharath University

Acknowledgement

IFERP is hosting the ***13th World Conference on Applied Science, Engineering and Technology*** this year in month of October. The main objective of WCASET is to grant the amazing opportunity to learn about groundbreaking developments in modern industry, talk through difficult workplace scenarios with peers who experience the same pain points, and experience enormous growth and development as a professional. There will be no shortage of continuous networking opportunities and informational sessions. The sessions serve as an excellent opportunity to soak up information from widely respected experts. Connecting with fellow professionals and sharing the success stories of your firm is an excellent way to build relations and become known as a thought leader.

I express my hearty gratitude to all my Colleagues, staffs, Professors, reviewers and members of organizing committee for their hearty and dedicated support to make this conference successful. I am also thankful to all our delegates for their pain staking effort to travel such a long distance to attend this conference.

Er. R. B. Satpathy
Director
Institute for Engineering Research and Publication (IFERP)

Message from Keynote

I am pleased to know that "**13th World Conference on Applied Science, Engineering and Technology (WCASET)"** in association with **IFERP** has got overwhelming response from quite a good number of researchers worldwide.

I foresee the common goal of promoting technology for protection, conservation, restoration and sustainability can be greatly achieved by this type of conferences.

I am glad to be associated with **13th WCASET** and look forward to be associated in future also.

I congratulate all the members of the organizing committee, for their excellent efforts in making the conference an impressive achievement.

I wish the deliberations of this International conference a grand success.

Dr.C.V.Gopinath
Principal
BITS Visakhapatnam, India

Message from Session Chair

I congratulate all the authors , members of the program committee , the external referees, Reviewers, organizers, members of editorial board with their opinion and expertise, ensured a very high quality program. I wish that the proceedings will serve as a useful reference for research. I hope this **13th World Conference on Applied Science, Engineering & Technology** on 19th-20th October, 2018 in Bangkok organized by **IFERP** in association with WRF, would be a remarkable bench mark event across the globe. Wishing you all the best.

Dr.Chitra kiran.N
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DNA Based Access Control Method in Cloud Environment

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Abstract:-- **Cloud Computing is a thriving technology due to its scalability, flexibility and cost-effective and pay-per-use model. Because of the advantages of the cloud technology most of the organizations are moving the data to the cloud. But many of the new problems are introduced by moving data to the cloud in addition to the existing problems. One of the major problems faced in the cloud environment is access control and security of data. Many of the access control mechanisms are followed in the cloud. In this paper, we are proposing an efficient access control method based on Deoxyribonucleic Acid (DNA) cryptography. By taking the advantages of unique features of DNA sequences, the secure and efficient access control mechanism is developed.**

Index Terms: Access Control, Cloud Computing, DNA, Security.

I. INTRODUCTION

Cloud computing is the renowned technology for storing and processing large volumes of data. Most of the organizations are moving their data in the cloud to make them available whenever and from wherever it is required. Cloud service providers (CSP) provide many services and facilities to the clients in different forms like infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a Service, Data as a service (DaaS)[1]. The advantages of moving data to the cloud are many like scalability, accessibility, availability, increased user mobility, green technology etc[2]. Besides the advantages of cloud, it also faces many challenges like loss of control of data, vendor lock in and security of data[2]. One of the major challenges faced by cloud computing is the security of the data stored in the cloud. The major concern of security and privacy issues in the cloud exists because of the user has no control over the data which is stored in the cloud. In the CSA (Computer Security Alliance) report of top threat in 2013[3], data security is listed as one of the top threats in the cloud. It has three important dimensions namely confidentiality, integrity and availability. Access control is an important method of giving access rights only to the authorized users for achieving data confidentiality.

In the cloud environment, the key components are data owner (DO), Cloud service provider (CSP) and data user (DU). The CSP stores the data in its location or in the data owner's location based on whether public or private cloud is used. It provides services requested by the data user. The data user would be able to access the data from anywhere based on the access policy assigned to the user.

II. RELATED WORKS

A. Access Control Methods

In a cloud computing environment, the security of data is at risk due to the mischievous users and hackers. So, the access control model allows only valid and genuine users to access data from the cloud server.

Many access control schemes have been developed to solve the problems faced by the cloud. Attribute based encryption (ABE) is one of the commonly used access scheme over the conventional cryptographic techniques. It was first introduced by shamir [4] in which sender of a message can specify an identity such that only the intended receiver can decrypt the data. In ABE, the attributes are viewed as an identity to access the data. There are two types of ABE such as Key Policy based ABE (KP-ABE) and Cipher Policy based ABE (CP-ABE). In KP-ABE[5], the ciphertext is associated with the set of attributes, and private key is associated with an access structure. Decryption is possible if and only if the access tree satisfies the attributes in the ciphertext. In CP-ABE[6], ciphertext is assigned to an access policy, and private key is based on the user's attributes. If user's attributes satisfy the access policy, then only a user will be able to decrypt the ciphertext.

In Role Based Access Control Model (RBAC)[7], the access is granted based on the role of the user. The access rights are based on the role and roles are not transferrable. In Gateway Based Access Conrol (GBAC) [8], each user's data is converted into Security Assertion Markup Language (SAML) format and then it is sent to the user. The entire access control is in the hands of the gateway of the CSP which does the translation. This access method

takes more time for searching the data in the server and accessing the data. In Purpose Based Access Control Model (PBAC)[9], the purpose tree is maintained for access control. The access of data will be granted if the reason of access matched with the intended purpose of the data.

B. DNA cryptography

DNA or Deoxyribonucleic Acid is a long molecule, which contains genetic information. All of our body cells contain the same DNA. It can be used to store and transmit data. Strands of DNA are long polymers of millions of linked nucleotides. These nucleotides consist of one of four nitrogen bases, a five carbon sugar and a phosphate group. The nucleotides that make up these polymers are named after the nitrogen base that it consists of: Adenine (A), Cytosine (C), Guanine (G) and Thymine (T)[10]. We can utilize these four letters to encode information. For encoding the information, we can make use of any 24 combinations from four letters.

DNA Cryptography can be defined as a technique of hiding data in terms of DNA sequence. In the cryptographic technique, each letter of the alphabet is converted into a different combination of the four bases which make up the human deoxyribonucleic acid (DNA).
The DNA concept for securing and hiding data is used by many researchers today. Gehani et al. [11] first introduced the DNA concept in the field of cryptography. Phangal et al.[12] used DNA sequencing and substitution method to improve the traditional symmetric key encryption. Abbasy and Shanmugan [13] proposed DNA sequences to hide data for improving confidentiality in cloud. In [14] Hitaswi et.al., proposed encryption and decryption algorithm based on DNA bases. Neha et al.[15] proposed a data hiding through DNA complementary rule. Wang et al. [16] proposed a novel technique of DNA computing with RSA algorithm for secure transmission of data. They have combined DNA computing with asymmetric encryption. In [17], Zhang and Gao proposed a technique for data hiding using DNA codon. Gupta and Singh [18] proposed an encryption scheme based on DNA and Ribonucleic Acid (RNA) sequences.

III. PROPOSED SYSTEM

Our proposed system consists of three entities CSP, Data Owner and Data User. The CSP provides cloud services and infrastructure for storing data for both DO and DU.
In the first phase, CSP generates the public and private key pair for all data users and owners. In the user registration phase, the private key of the user is communicated over the secure channel. Once the user registration is over, the user can login into the system. Whenever the user requests the file from the CSP, it provides the public key of the owner to the user to get the DNA key. Using the public key of the owner it requests the DNA key from the data owner. After checking the authenticity of the user from the CSP, owner creates a DNA key for the user using user's attributes. In the data access phase, the user shows the certificate to the CSP and request the file from the CSP. The CSP provides the encrypted file to the user where the file is decrypted by the user using the DNA key and secret key for decryption which is provided by the owner.

A. DNA Based Key Generation

The attributes of the user are considered as a full string and each letter of the string is assigned some decimal value. This decimal sequence is generated by the data owner using their own sequence using Table 1. These decimal values are converted into binary string in the next step. This binary string is used as key for the encryption of data which is stored in the cloud. Here we are using 256 bits DNA key for simplicity. In the next step, the binary string is divided into four parts of 64 bits each. Each 64 bit part is assigned a four letter sequence using any one out of 24 combinations of letters A, T, C and G randomly using the Table 2. Then the complementary rules are applied in the sequence which is obtained from the previous step. Here, we are using the complimentary rules as A->C, T->G, G->A,C->T. The complimentary rules are used to complicate the intruder to guess the DNA sequences. The complimented sequence is rotated twice to the left to form the DNA based key

Table 1. Decimal Encoding Table

Character	Decimal Value	Character	Decimal Value
A	1	a	37
B	2	b	38
C	3	--	--
D	4	$	98
---	---	#	97
--	--	@	96
--	---	--	---
---	---	[	104
0	27	]	102
1	28	&	101

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Table 2. DNA Base Assignment Table

Sr. No	DNA Base	Sr. No	DNA Base
1	ACGT	13	GATC
2	ACTG	14	GACT
3	ATCG	15	GTAC
4	ATGC	16	GTCA
5	AGTC	17	GCTA
6	AGCT	18	GCAT
7	CAGT	19	TCGA
8	CATG	20	TCAG
9	CGAT	21	TACG
10	CGTA	22	TAGC
11	CTGA	23	TGAC
12	CTAG	24	TGCA

IV. IMPLEMENTATION

To experiment the proposed scheme, a cloud simulation platform has been set up using cloud sim 3.0. CloudSim[19] toolkit was developed by a group of researchers at the University of Melbourne. CloudSim toolkit has four layers, namely cloud services, cloud resources, user interface structures and virtual machine services. There are several entities in the CloudSim toolkit, namely Cloud Information Service (CIS), host, data center, Virtual Machine (VM), cloudlet, broker and VM Manager (VMM). CloudSim toolkit is installed on laptop with 3.40 GHz Intel corei3 processor, 4 GB RAM and 500 TB storage capacity with Windows 10 Operating System. Java version 8 with Netbeans 8.1 as IDE is used for execution purpose.

V. PERFORMANCE OF THE PROPOSED SYSTEM

Our proposed scheme is secure against the collision attack, man-in-the-middle attack and password guessing attack.

It does not reveal any sensitive information about the user to the CSP. The DNA sequence is generated using the user's personal information like aadhar card no, email id and date of birth etc. The attributes of two users cannot be same. Even any malicious user, who wants to access data illegitimately from the cloud, would not be getting all the attribute information of an authorized user. The decimal encoding table is provided by the owner only to the authorized user.

DNA based secret key will not be provided to the user unless and otherwise it is authenticated from the CSP. No middle man can request the key from the data owner. So, our proposed system is secure against the man-in-the-middle attack.

Our proposed system is also secure against the password guessing attack. DNA key is generated based on the user's attributes. DNA key is generated based on the data owner's decimal encoding and ATCG combinations. The final key is generated by using complimentary rules and rotation. We use the complementary rules and rotation for confusing the attacker.

The key generation time is less when compared to other access control schemes. In the cloud environment the number of users varies from time to time. From the Fig.1, it clearly shows that even if there are ups and downs in the key generation time, it is less compared to other access control methods.

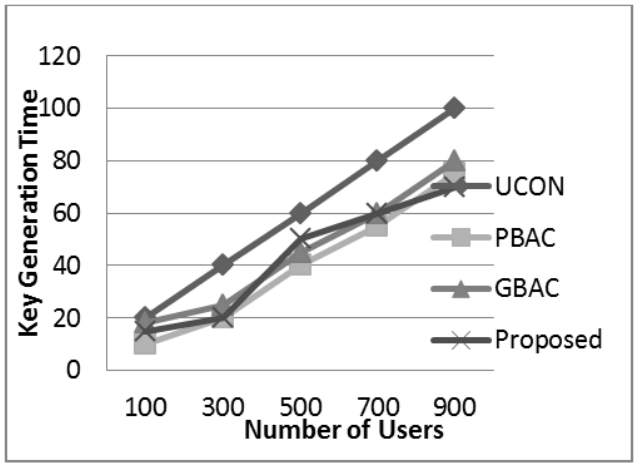

Figure 1. Number of Users Vs Key Generation Time

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Project Characteristics Indicating Safety Performance

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Abstract:-- **Safety performance has been long discussed and assessed in order to ensure less harm identified and reduce accidents in construction projects. Practically, accident rate is one common used key performance indicator to indicate the on-site safety performance in construction projects worldwide. Theoretically, there were various indicators that developed for the assessment of the safety performance of construction projects. These indicators were derived from previous literatures and lack of potential linkage to the project performance of construction projects. Thus, it is worth to explore the project characteristics that identified in construction projects with outstanding safety performance. This study introduced the project characteristics that identified in the construction projects with outstanding safety performance. The project characteristics were firstly identified by the sate-of-the-practice review and verified by panels of experts through structured interview and questionnaire survey. In general, findings of literature and structured interview were consistent. A series of interviews were supplemented the literatures' findings. There were totally 27 project characteristics that indicating outstanding safety performance of a construction project. Eighteen experts were participated in the questionnaire surveys to verify the importance levels of the proposed project characteristics. All experts agreed with project characteristics that indicating the safety performance of the construction projects. The most agreed project characteristics were good housekeeping, more support and commitment from senior management, clear understanding of construction work activities, and good planning of project execution. These are indicative to future development of project management practice and sustainable safety strategies in construction industry locally and globally.**

KEYWORDS: Safety performance; Construction industry; Safety commitment; Safety audit

BACKGROUND

Construction involves high risk work activities and contributed to 20% of overall industrial accidents during the period between 1996 and 2005 in Japan, South Korea and Hong Kong (Poon, Tang, & Wong, 2008; Yiu & Chan, 2016). Particularly, in Hong Kong, 62% of industrial fatalities in the year of 2015 were constituted from construction sector, and a total of 3,723 accidents were reported from construction sites (Labour Department, 2017). The high accident and fatality rates of construction industry are mainly attributed to its hazardous workplace environment and fast changing work practices (Fan, Lo, Ching, & Kan, 2014; Tam & Fung IV, 1998). There are a few well-recognized key performance indicators that represent the safety performance in construction industry. Accident rate is considered as a common key performance indicator. Other safety performance indicators and indexes currently available were mostly derived from previous literatures without specification of assumed fitting criteria. The less reliability of the indicators, the fewer construction companies adopted. With the consideration of the limited evidence of safety performance due to the impact of on-site project practices (Bottani, Monica, & Vignali, 2009; Robson et al., 2007), this study aims to identify the project characteristics that indicating outstanding safety performance on construction sites.

PROJECT CHARACTERISTICS

Journal papers on the topic of construction safety were obtained through systematic searching in Scopus database. Scopus database was commonly reviewed for the research studies in construction management due to its better coverage and accuracy of sources of information (Ameyaw, Hu, Shan, Chan, & Le, 2016; Hon, Chan, & Yam, 2011). Articles containing the most-searched terms 'safety performance' and 'construction' in the 'title/abstract/keyword' were considered for review in this research. By reviewing the content of these articles, there were 20 project characteristics identified from the articles. Table 1 shows 20 project characteristics that potentially found in construction project with outstanding safety performance. These project characteristics will then be verified through interviews and questionnaire survey.

Table 1. Key characteristics to distinguish safety performance in Hong Kong Construction Industry

Key characteristics to distinguish safety performance in Hong Kong Construction Industry		References
1	More support and commitment from senior management	(Goh & Chua, 2013; Ismail, Doostdar, & Harun, 2012)
2	Better logistic arrangement of site materials	(Moorkamp, Kramer, Van Gulijk, & Ale, 2014; Tam, Fung IV, & Chan, 2001)
3	Clear understanding of construction work activities	(Moorkamp et al., 2014)
4	Lower accident rates	(Bottani et al., 2009)
5	Good planning of project execution	(Bottani et al., 2009)
6	Clear site activities / working sequences	(Tam et al., 2001)
7	Strong financial performance	(Bottani et al., 2009)
8	Well-functioned communication system	(Bottani et al., 2009)
9	Higher education level of workers	(Tam et al., 2001)
10	Strict operational procedures	(Bottani et al., 2009)
11	Higher teamwork spirits	(Tam et al., 2001)
12	Clear safety organization with defined responsibilities and accountabilities	(Ismail et al., 2012; Tam et al., 2001);;
13	Incentives offered for employees' participation	(Bottani et al., 2009; Ismail et al., 2012)
14	Rigorous enforcement of safety regulations	(Ismail et al., 2012; Tam et al., 2001)
15	Availability of site safety manual	(Tam et al., 2001)
16	Innovative technology	(Tam et al., 2001)
17	Project manager with higher safety awareness	(Tam et al., 2001)
18	Top management of the firm with higher safety awareness	(Goh & Chua, 2013)
19	Active participation in OSH activities by employees	(Bottani et al., 2009)
20	Better safety culture	(Goh & Chua, 2013)

RESEARCH METHODOLOGY

Based on the literature findings, this study adapted structured interview and questionnaire survey to verify the proposed project characteristics. In the interview, stakeholders of construction sector were invited to participate in the structured interview, namely contractor, client and consultant. Eleven respondents were asked to suggest the key characteristics to distinguish a construction project with 'outstanding' safety performance and a construction project with 'ordinary' safety performance project. A series of interviews were conducted in between 1 May to 30 June 2015. All respondents were registered safety officer and registered safety auditors by profession. They all engaged in sizeable companies with more than 500 employees in a single working day and equipped with at least 8 year working experiences in Hong Kong construction projects. Their viewpoints were expected to supplement the literature findings. Coding the findings from the previous literature and a series of interviews, all project characteristics were categorized by their nature. A list of project characteristics was then verified through the questionnaire survey.

For the questionnaire survey, the respondents were asked to indicate their endorsement of the identified project characteristics based on their previous 12 months working experience in the Hong Kong construction sector. There were two sections in the survey, asking about the background information of respondents in the first section and rating the agreement level of project characteristics in the second section of the questionnaire survey. A five-point Likert rating scale was adopted in the second section of the survey, namely '5' as strongly agree; '4' as agree '3' as neutral; '2' as disagree; and '1' as strongly disagree. I To ensure the representativeness of the collected data, the selection criteria for the experts were strict and covered a wide range of scope in terms of their knowledge, availability and willingness (Ameyaw et al., 2016; Chan, Yung, Lam, Tam, & Cheung, 2001). The target respondents of the questionnaire survey were well-experienced experts with professional recognition in construction sector. There were totally eighteen experts, on behalf of key stakeholders, namely client, contractor and consultant groups. All respondents indicated more than 8 years of working experiences as managerial roles or above in construction projects. They have engaged in diverse nature of construction projects which included building works, civil engineering works and repair and maintenance works. A three-round questionnaire survey was conducted in between September 2015 and April 2016. Experts were showed the mean score of each project characteristic after each round of the questionnaire survey. They could adjust the rating of each project characteristics after each round of the survey. The score of each project characteristic was finalised in the third round due to the mutual agreement of

the scores from all participated experts. The final scores of the project characteristics were expected to be the most appropriate and accurate rating (Hallowell & Gambatese, 2009; Yeung, Chan, Chan, & Li, 2007).

Using the software Statistical Product and Service Solutions (SPSS) 24.0, statistical analysis was conducted to analyze the data collected from the questionnaire survey, namely Chi-square test, Kruskal-Wallis test and Kendall's coefficient of concordance. Chi-square was conducted to test consistency of respondents' responses. Kruskal-Wallis test was conducted to check the inter-group responses to see if there are significant differences among respondents from different groups (S. Siegel & Castellan, 1981). Kendall's coefficient of concordance (W) is employed to assess the group agreement of the experts' rankings (S. C. Siegel & Castellan).

RESULTS AND DISCUSSIONS

The findings of interviews were consistent to literatures' findings. There were seven more project characteristics being identified by experts in the structured interviews. The project characteristics indicating safety performance, that supplemented the literatures, included (1) caring of people, (2) adequate rest time for employees, (3) good housekeeping, (4) good site physical conditions, (5) effective control and review of site activities, (6) better protection to transportation and storage of site materials, and (7) good sense of belonging.

The questionnaire survey incorporating all 27 project characteristics including the above-mentioned seven project characteristics. Table 2 shows the results of Kruskal-Wallis test and mean ranks among groups of respondents. All project characteristics, C01-C27, indicated the significant values of Kruskal-Wallis test were larger than 0.05. Thus, there was no evidence established to show the differences among sub-groups for the perceptions of project characteristics showing safety performance. With the consideration of mean rank, the overall rankings indicating by the contractor group were relatively lower than those indicating by client and consultant groups. Client group found C12 effective control and review of site activities and C17 clear safety organization with defined responsibilities and accountabilities as the two most agreed project characteristics that indicating outstanding safety performance. C12 was significant important as one of key project success factors, it indicate that there is a potential linkage of successful project management and outstanding safety management (Sawacha, Naoum, & Fong, 1999). C17 is one of the essential elements of safety management system (Labour Department, 2002). It highlighted that the implementation of safety management system was beneficial to the project performance of construction projects (Yiu, Sze & Chan, 2017). Consultant group found C13 well-functioned communication system and C18 incentives offered for employees' participation as the two agreed project characteristics that indicating outstanding safety performance. C13 was one of the key project success factor for project management, thus it implies the importance of effective communication of site matters for assuring project efficiency and safety performance (Sawacha et al., 1999). C18 was highly depends on the contractual incentives initiated by client and incentives spent by contractors. In general, client and contractor with more commitment on OSH would spend more resources on safety (Yiu, Sze & Chan, 2017).

Table 2. Kruskal-Wallis Test between the Client, Consultant and Contractor Group on Characteristics of construction project with 'outstanding' safety performance

No.	Characteristics of construction project with 'outstanding' safety performance	Mean rank			Significance Level*
		Client	Consultant	Contractor	
C01	Caring of people	11.750	8.500	8.286	.385
C02	Adequate rest time for employees	11.417	8.500	8.571	.518
C03	Good housekeeping	9.500	11.000	8.429	.445
C04	Good site physical conditions	8.167	11.300	9.357	.526
C05	More support and commitment from senior management	8.500	11.200	9.143	.592
C06	Better logistic arrangement of site materials	11.000	9.300	8.357	.630
C07	Clear understanding of construction work activities	9.667	10.200	8.857	.868
C08	Lower accident rates	8.500	11.800	8.714	.481
C09	Good planning of project execution	9.167	9.100	10.071	.908

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C10	Clear site activities / working sequences	9.583	9.600	9.357	.994
C11	Strong financial performance	11.750	9.200	7.786	.340
C12	Effective control and review of site activities	12.167	8.800	7.714	.216
C13	Well-functioned communication system	9.667	13.400	6.571	.054
C14	Higher education level of workers	9.833	10.000	8.857	.912
C15	Strict operational procedures	9.917	11.600	7.643	.391
C16	Higher teamwork spirits	10.500	10.700	7.786	.474
C17	Clear safety organization with defined responsibilities and accountabilities	13.167	8.100	7.357	.074
C18	Incentives offered for employees' participation	10.250	12.100	7.000	.200
C19	Rigorous enforcement of safety regulations	11.250	10.000	7.643	.429
2C0	Availability of site safety manual	9.333	9.900	9.357	.979
C21	Innovative technology	11.667	9.800	7.429	.324
C22	Project manager with higher safety awareness	10.417	10.600	7.929	.532
C23	Top management of the firm with higher safety awareness	10.417	10.600	7.929	.532
C24	Active participation in OSH activities by employees	9.083	10.500	9.143	.852
C25	Better protection to transportation and storage of site materials	8.917	8.800	10.500	.798
C26	Good sense of belonging	10.833	9.300	8.500	.681
C27	Better safety culture	10.500	9.600	8.571	.743
	*less than 0.05 which indicates significant statistical differences				

Table 3 also indicates the ranking of experts' agreement of project characteristics that showing the outstanding safety performance. Seeing that there are more than 7 project characteristics in this questionnaire survey, chi-square was also used to test the consistency of respondents' responses. The experts' rankings were consistent for each group and all experts in the questionnaire survey. The most agreed project characteristics were C03 good housekeeping, C05 more support and commitment from senior management, C07 clear understanding of construction work activities, and C09 good planning of project execution. These project characteristics were considered as observed in construction projects with outstanding safety performance. C03 was physical conditions that observed in construction project. Housekeeping was found important in accident prevention (Labour Department, 2017). C5 indicated that senior commitment and support were important because it facilitate the resources allocation and thus project management. C5 was also considered as critical success factors for implementation of safety management system. C7 was mostly likely related to the competency profiles of the project teams. No matters the role of project team members, understanding of construction sequences could be beneficial to the overall project management. Certainly, project manager was expected to have strong academic background in construction management while safety practitioner was expected to have relevant working experiences in construction sequences. Client ranked C09 as less important project characteristics when comparing with consultant and contractor groups. This significant difference might be caused by the different roles ambiguity. The on-site project management was mostly replied on the contractor and consultant, so contractor and consultant expressed a higher importance on good project planning and execution.

Table 3. Ranking of Perceived Benefits of Implementing SMS among Client, Consultant and Contractor Groups

No.	Results on Characteristics of construction project with 'outstanding' safety performance	All respondents		Client group		Consultant group		Contractor group	
		Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
C03	Good housekeeping	4.83	1	4.83	1	5	1	4.71	1
C05	More support and commitment from	4.61	2	4.50	5	4.8	2	4.57	3

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	senior management								
C09	Good planning of project execution	4.61	2	4.50	5	4.6	5	4.71	1
C07	Clear understanding of construction work activities	4.61	2	4.67	3	4.6	5	4.57	3
C04	Good site physical conditions	4.56	5	4.33	13	4.8	2	4.57	3
C10	Clear site activities / working sequences	4.56	5	4.50	5	4.6	5	4.57	3
C22	Project manager with higher safety awareness	4.44	7	4.50	5	4.6	5	4.29	7
C23	Top management of the firm with higher safety awareness	4.44	7	4.50	5	4.6	5	4.29	7
C27	Better safety culture	4.39	9	4.50	5	4.4	10	4.29	7
C17	Clear safety organization with defined responsibilities and accountabilities	4.33	10	4.83	1	4.2	13	4.00	11
C12	Effective control and review of site activities	4.33	10	4.67	3	4.2	13	4.14	10
C13	Well-functioned communication system	4.28	12	4.33	13	4.8	2	3.86	17

Table 3. Ranking of Perceived Benefits of Implementing SMS among Client, Consultant and Contractor Groups (continued)

No.	Results on Characteristics of construction project with 'outstanding' safety performance	All respondents		Client group		Consultant group		Contractor group	
		Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
C16	Higher teamwork spirits	4.22	13	4.33	13	4.4	10	4.00	11
C06	Better logistic arrangement of site materials	4.22	13	4.50	5	4.2	13	4.00	11
C01	Caring of people	4.06	15	4.50	5	3.6	22	4.00	11
C24	Active participation in OSH activities by employees	4.06	15	4.00	20	4.2	13	4.00	11
C18	Incentives offered for employees' participation	3.94	17	4.00	20	4.4	10	3.57	20
C19	Rigorous enforcement of safety regulations	3.89	18	4.17	16	4	18	3.57	20
C26	Good sense of belonging	3.89	18	4.17	16	3.8	19	3.71	18
C11	Strong financial performance	3.83	20	4.17	16	3.8	19	3.57	20
C15	Strict operational procedures	3.83	20	3.83	23	4.2	13	3.57	20
C02	Adequate rest time for employees	3.78	22	4.17	16	3.4	26	3.71	18
C25	Better protection to transportation and storage of site materials	3.72	23	3.50	24	3.6	22	4.00	11
C08	Lower accident rates	3.61	24	3.50	24	3.8	19	3.57	20
C21	Innovative technology	3.56	25	4.00	20	3.6	22	3.14	27
C14	Higher education level of workers	3.44	26	3.50	24	3.6	22	3.29	25
C20	Availability of site safety manual	3.28	27	3.17	27	3.4	26	3.29	25
	Number of samples *(N)*	18		6		5		7	
	Kendall's coefficient of concordance (*W*)	0.295		0.256		0.389		0.412	

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Chi-Square	138.143	40.008	50.593	75.044
Degrees of freedom (*df*)	26	26	26	26
Level of significance (*p*)	<0.001	0.039	0.003	<0.001

5. CONCLUSIONS

Construction safety is considered to important practically in project management. This study was established a potential linkage between the project characteristics and safety performance of construction projects from the viewpoints of well-experienced construction practitioners. There were 11 experts and 18 experts participated in the structured interview and questionnaire survey respectively. In addition to the 20 project characteristics found in the previous literatures, there were seven more project characteristics being supplemented by the experts during interviews. The identified project characteristics were then verified by the experts through the questionnaire survey in three rounds. The most agreed project characteristics were C03 good housekeeping, C05 more support and commitment from senior management, C07 clear understanding of construction work activities, and C09 good planning of project execution. These project characteristics were considered as observed in construction projects with outstanding safety performance. The results indicated that the close relationship between the project management and safety performance of construction projects. The implementation of site safety management practices could also facilitate the performance of project efficiency in a long run.

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Reverse Engineering in Manufacturing Industry to Capture Global Markets

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Abstract:-- **To capture global markets, organizations need to produce products that can be easily configured to offer distinctive capabilities compared to the competition. In globalization, the automotive, telecom, banking and oil sectors which are under control of major developed nations have benefited most. The developing countries gained less when compared to the loss in farm and agricultural sectors. But some countries like China, Taiwan, South Korea, Malaysia, and Singapore took the advantage of globalization in such a way that they are now having world class manufacturing hubs for leading MNCs. The emergence of appropriate technologies like CAD, CAM, Reverse Engineering and Rapid Prototyping make significant improvements in productivity and product quality. The role of government policies in application of these technologies in manufacturing industry, limitations, applicable areas for developing countries are presented in this paper. The related IPR, patent issues are discussed.**

KEYWORDS: Global markets, IPR, patents, Reverse Engineering

1. INTRODUCTION

The success of any organization is based upon the ability to respond quickly to changing customer demands and to utilize advanced technologies. In such an environment, the advantage goes to the firm that can offer greater varieties of new products with higher performance and greater overall appeal. In order to capture the global markets, organizations need to produce products that can be easily configured to offer distinctive capabilities compared to the competition. Furthermore, organizations need to develop new methods and utilize advanced technologies to react rapidly to required changes in products to shorten the product development cycle, which will enable them to gain more economic competitiveness.

The emergence of complementary advanced technology strategies such as Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and Computer Integrated Manufacturing (CIM) makes possible significant improvements in productivity and product quality. Automation of the product design, development, manufacturing, evaluation, and distribution processes may well be the key to success for industrial firms seeking to attain and maintain product leadership in an increasingly competitive and global marketplace.

The main thrust is on product quality, faster design and development and finally cheaper product. To sustain the local and global competition, one has to improve technologies. To continue in the competitive market, industries have to update their knowledge, acquire new skills to offer world class products. Reverse Engineering (RE) and Rapid Prototyping (RP) are the promising appropriate technologies every industry aspiring to implement and to enhance more productivity.

2. GLOBAL MARKETS

The global market refers to the merging of historically distinct and separate national markets into one huge global marketplace. It has been argued for some time that the tastes and preferences of consumers in different nations are beginning to converge on some global norm, thereby helping to create a global market. A company does not have to be the size of the multinational giants to facilitate, and benefit from the global markets.

In the case of many products, these differences frequently require that marketing strategies, product features, and operating practices be customized to best match conditions in a country. Thus different car models depending on a whole range of factors such as local fuel costs, income levels, traffic congestion, and cultural values.

The most global markets currently are not markets for consumer products, where national differences in tastes and preferences are still often important enough to act as a brake on globalization, but markets for industrial goods and materials that serve a universal need the world over. These include the markets for commodities such as aluminium, oil, and wheat, the markets for industrial products such as microprocessors. In many global markets, the same firms frequently confront each other as competitors in nation after nation.

3. THE GLOBALIZATION OF PRODUCTION

The globalization of production refers to the tendency among firms to source goods and services from locations around the globe to take advantage of national differences in the cost and quality of factors of production. By doing so, companies hope to lower their overall cost structure or improve the quality or functionality of their product offering, thereby allowing them to compete more effectively. The result of having a 'global web' of suppliers is a better final product, which enhances the chances of 'Boeing' winning a greater share of total orders for aircraft than its global rival, 'Airbus'. Boeing also out sources some production to foreign countries to increase the chance that it will win significant orders from airliners based in that country. The global dispersal of productive activities is not limited to giants such as Boeing. Many much smaller firms are also getting into the act.

The road toward a future characterized by the increased globalization of markets and production. Modern firms are important actors in this drama, fostering by their very actions increased globalization. These firms, however, are merely responding in an efficient manner to changing conditions in their operating environment, as well they should.

4. THE ROLE OF TECHNOLOGY

4.1 Microprocessors and Telecommunications

The single most important innovation has been development of the microprocessor, which enabled the explosive growth of high-power, low-cost computing, vastly increasing the amount of information that can be processed by individuals and firms. The microprocessor also underlies many recent advances in telecommunications technology. These technologies rely on the microprocessor to encode, transmit, and decode the vast amount of information that flows along these electronic highways. The cost of microprocessors continues to fall, while their power increases. As this happens, the costs of global communications are plummeting, which lowers the costs of coordinating and controlling a global organization.

4.2 The Internet and World Wide Web

The phenomenal recent growth of the Internet and the associated World Wide Web (WWW) is the latest expression of this development. The Internet and WWW promise to develop into the information backbone of tomorrow's global economy. Included in this expanding volume of Web-based electronic commerce or e-commerce as it is commonly called, is a growing percentage of cross-border trade.

The new product development teams composed of individuals based in different countries. When developing new products, these individuals use videoconferencing to "meet" on a weekly basis. They also communicate with each other daily via telephone, electronic mail, and fax. Communication technologies have enabled Hewlett-Packard (HP) to increase the integration of its globally dispersed operations and to reduce the time needed for developing new products.

4.3 Implications for the Global Markets

In addition to the globalization of production, technological innovations have also facilitated the globalization of markets. As noted above, low-cost transportation has made it more economical to ship products around the world, thereby helping to create global markets. Low-cost global communications networks such as the World Wide Web are helping to create electronic global marketplaces. In addition, low-cost jet travel has resulted in the mass movement of people between countries. This has reduced the cultural distance between countries and is bringing about some convergence of consumer tastes and preferences. At the same time, global communications networks and global media are creating a worldwide culture. While modern communications and transportation technologies are ushering in the 'global village' very significant national differences remain in culture, consumer preferences, and business practices.

5. APPROPRIATE TECHNOLOGIES IN MANUFACTURING

5.1 Computer Aided Design (CAD)

Computer Aided Design (CAD) incorporates computer technology to design and draft engineering products, subassemblies and components. CAD drawing transfers information related to a design through design processes and stages. It is the translation from art to technical aspects in order to achieve the intended product. CAD has been used for two dimensional drawings, although due to technological improvements, three dimensional solids can now be easily generated using a wide range of CAD software. CAD systems incorporate the interaction of graphical user interface and boundary representation through geometric modeling.

Designs that are generated using CAD software can be easily modified in the form of parametric design for developing variants of existing designs. This allows for reduced time and cost of development. Automatic generation of standard components for designing parts is now available as part of application databases for faster design and integrated analysis. The capabilities of CAD software are not limited to solid modeling. It is also used for free-form surface modeling and simulation of designs before achieving physical product. Output files can now be easily extracted for automatic process planning and rapid prototyping

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5.2 Computer Aided Manufacturing (CAM)

Computer Aided Manufacturing is defined as the use of computer systems to plan, manage, and control the operations of a manufacturing plant through either direct or indirect computer interface with plant's production resources.

CAM is concerned with automating the planning and control of various production processes with computers. The salient steps in CAM are 1.Plan production 2.Prepare product routings, 3.Generate NC programs 4.Fix the settings of machinery 5.Prepare production schedules, and 6.Control the operation

5.3 Reverse Engineering

The process of duplicating an existing part, component, or product, without the aid of drawings, documentation, or computer model is known as reverse engineering. Reverse engineering process involves sensing the geometry of existing part, creating a geometric model of the part from the sensed data and passing this model to an appropriate CAD/CAM system for analysis and manufacturing. Reverse engineering plays a major role in generating digitized data from a complex component with intricate shape.

Reverse engineering (RE) used to be a nefarious term. It formerly meant making a copy of a product, or the outright stealing of ideas from competitors. In current usage, however, RE has taken on a more positive character and now simply refers to the process of creating a descriptive data set from a physical object. RE methods and technologies can still be used for negative purposes like those mentioned, but today there are numerous important legitimate applications for RE, as well.

Reverse engineering is very common in such diverse fields as software engineering, entertainment, automotive, consumer products, microchips, chemicals, electronics, and mechanical designs. For example, when a new machine comes to market, competing manufacturers may buy one machine and disassemble it to learn how it was built and how it works. A chemical company may use reverse engineering to defeat a patent on a competitor's manufacturing process. In civil engineering, bridge and building designs are copied from past successes so there will be less chance of catastrophic failure. In software engineering, good source code is often a variation of other good source code.

Computer Aided Design and Manufacturing involves the design and manufacture of machined parts. The problem of reverse engineering is to take an existing mechanical part and to inspect or produce a design, and perhaps a manufacturing process, for the part. The main purpose of this work is to explore the difficulties involved in the reverse engineering problem.

Reverse Engineering has a variety of potential applications. It may be illegal for an organization to obtain the original model or drawings for a part, but legal to reverse Engineer it. Original plans may have been lost or have been completed before CAD was in vogue. Some design is still done using clay models, which then must be digitized. A Manufacturer may go out of business, making replacement parts difficult to obtain. An Organization may wish to analyze a competitor's product.

5.3.1 Limitations of Reverse Engineering

1. Through digitization process, the geometric data of the existing part is obtained. A few advanced scanners are also having the capability of capturing the color of the object. But the material properties can not be obtained by this process. The material properties can be obtained by other methods like destructive or non-destructive testing. If a single original part is available, non-destructive testing is the only option even though expensive.

2. With reverse engineering, some legal and Intellectual Property Rights (IPR) issues may crop up, because of the misconception of comparing this process with "Copying". This process is not "Copying" since reverse engineering is not meant for mass production of Products.

3. If reverse engineering is misused to produce popular branded quality products, ethical problems may augment, leading to patents cases, eventually landing in courts.

4. Reverse engineering should not be carried out in National Security related products like Nuclear, Missiles, and Tanks etc. It is also restricted in case of Space research and development.

5.4 Rapid Prototyping

Rapid prototyping (RP) is a technique for direct conversion of 3D CAD data into a physical prototype using a number of technologies, mostly based on slicing a three-dimensional object into multiple two-dimensional layers and building them up one layer at a time. Industries have been using RP techniques increasingly to reduce their product development cycle. Having realized the potential of RP for prototyping applications, a large number of processes have been developed allowing the use of various materials ranging from plastics to metals for the development of prototypes. RP can be used for a variety of applications. RP components are further categorized into model prototype, functional prototypes, tooling, and

manufactureable parts. Model prototypes are non-functional parts, although they are fabricated with high accuracy and dimension.
RP model can be used for concept validation, design verification and form, and fit analysis of assembly parts. Functional prototypes are developed to be analyzed under the same conditions as in actual use. Material selection and use is an important part of this process since the properties of the prototype material should be very similar to the properties of the material that will be used for the actual component. These are physical properties such as stress and strain and thermal properties such as expansion. RP models can be used as patterns for molds in investment and sand casting processes. This process is known as the indirect approach to rapid tooling. They can also be used as direct approach in case of the design of the pattern in spray metal operation. Finally, the production parts are directly manufactured using rapid prototyping equipment. This process is known as rapid manufacturing. These parts have the required durability and functional.

5.4.1 Benefits of Rapid Prototyping

- Reduced lead times and costs. Prototypes with the characteristics of finished products allow detailed evaluation and analysis to help avoid costly design iterations. Additionally, physical prototypes can be used as masters and patterns for a wide range of manufacturing processes.
- Improved product quality. RP enables more design iterations in a given time thus facilitating better quality in design.
- 3D visualization of product designs. Hands-on prototypes ensure that customers have a clear understanding of new and innovative concepts.

6. GOVERNMENT POLICIES, CHALLENGES AND SUGGESTIONS

The Governments must follow the China model in encouraging the manufacturing industry to apply appropriate technologies particularly reverse engineering. China invests less on R&D and more on mass manufacturing by adopting RE and RP technologies. The basic China model is to encourage SMEs and active participation of cottage industries. The China Government policies allow reverse engineering and protect the industries from IPR issues. Due to this policy China has become the manufacturing hub of all the major MNCs and become a threat to USA, Japan, UK and Australian economies. Taking a cue from China, Indian Government announced its Defense Production and Procurement Policy [6] to give a boost to the indigenous industry, both in the public and private domains. This will allow people and companies to carryout reverse engineering. But this is confined to Rs.50,000-crore defense industry and it must be extended to all segments. The recent declaration of National manufacturing policy [7] for a sound infrastructure development through the creation of large integrated industrial townships dubbed as National Investment and Manufacturing Zones (NIMZs) in line with SEZs also may not help if there is no paradigm shift in manufacturing policies as discussed above.

6.1 Challenges

The main challenges will be in the form of IPR and Patent issues from developed countries. The government has to create strong protective laws for the industry just like China. Once economically sustained, the industries should be encouraged for R&D and innovate to compete global markets.

6.2 Suggested Areas for Developing Countries in utilizing RE and RP Technologies

- The products which are being imported and consumes large foreign exchange
- Ex. Automobiles, Farm Equipment
- The products which can be manufactured with raw materials available at cheaper price.
- Ex. Textile, Garments and Toys,
- The products which are having high import duty
- Ex. Digital Cameras, Videos, DVDs, Computer peripherals.
- The Products/Services which can be carried out with affordable man power
- Ex. Software Development, Call Centers, BPOs.

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Rainfall-Runoff Modelling Calibration on the Watershed with Minimum Stream Gage Network Data

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Abstract:-- **The hydrological model has an important role to present the accurate and reliable information for water resources management. In this research, combination of HEC-GeoHMS and HEC-HMS that adopt the SCS-CN model have been chosen to analyse the hydrological characteristic at Upper Ciliwung Watershed. Ciliwung Watershed is one of 13 watersheds that has big influence to flood management in Jakarta. Flooding is the natural hazard that occurs every year at Jakarta. One of important part of flood early warning system at Jakarta is Katulampa Weir that located at Upper Ciliwung watershed. The area of it watershed is about 150 km2 that only has one stream gauge station at Katulampa. Accurate representation of rainfall runoff modelling at this location is important in order to predict the discharge and water infrastructure design. The objective of this paper is to obtain the parameter combination of Upper Ciliwung Watershed which can produce the discharge close to the discharge observation using HEC-HMS. The comparison between HEC-HMS and observation gage at Upper Ciliwung Watershed was calculated by Nash-Sutcliffe Efficiency (NSE) method. Nash value of discharge simulation at Upper Ciliwung Watershed compare with the discharge observation at Katumpa Weir reach up until 0,9.**

KEYWORDS: HEC-GeoHMS,, separated by commas.

I. INTRODUCTION

Hydrological model plays an important role on the discharge forecasting to present the accurate and reliable information for water resources management [1] Hydrological modeling also could simulate the same measured rainfall with varying catchment condition to generate more data. The representation of watershed processes that influenced by complex spatio-temporal hydrological processes can be accommodated by the hydrological modeling [2]. The representation of watershed characteristic on the hydrological model is really important because the hydrological response is affected not only by rainfall but also the complex parameter of watershed [3]. Model calibration is a necessary requirement to obtain the flood prediction from the hydrological model. The availability of rainfall station and discharge gage data are the essential requirement to calibrate the hydrological model. Upper Ciliwung watershed is one of the most important section of Ciliwung watershed. The dendritic shape of Upper Ciliwung watershed may cause the flash flood at Katulampa Weir. Katulampa weir is one of several Jakarta early warning system location during rainy season. In order to predict the surface runoff, many hydrological model was applied at Upper Ciliwung Watershed. In 2016, Murniningsih,et.al.[4] identified the influence of spatial landuse variability at it watershed using WIN TR-20. The other study, assessment of climate and landuse change the impact of flooding at Upper Ciliwung watershed using HEC-HMS give the Nash value 0.6 to 0.8 [5]. Flooding is one of natural hazard that occur every year at Jakarta, the accurate predicting of flood is important to water management. Area of Upper Ciliwung Watershed is about 150 km2 only cover by three (3) rainfall station and one (1) automatic water level recording. In order to provide a better analyze of rainfall-runoff prediction at the outlet, development of approach system is necessary for hydrological models. HEC-GEO HMS (one interface of GIS) is a model that develop used the interface of GIS. This model used to help the user with limited GIS experience, an extension tool in ArcGIS called Hydrologic Engineering Center-GeoHydrologic Modeling System (HEC-GeoHMS) to provide geospatial hydrology modelling. The Objective of this research are to analyze the performance of HEC-GEO HMS in order to represent the watershed properties and to calibrate the performance of HEC-HMS at Upper Ciliwung Watershed using Nash-Sutcliffe Efficiency (NSE) method.

II. RESEARCH METHODOLOGY

A.Case Study Identification

Ciliwung is one out of 13 rivers, which flowing through Jakarta before debouching into the Java Sea, and the most

influential river to Jakarta. The area of Ciliwung Watershed about 400 km2 with the longest river that flows across Bogor, Depok, South Jakarta and East Jakarta about 120 km. Ciliwung watershed is one of critical watershed in Indonesia [6]. Upper Ciliwung watershed, from upstream until Katulampa weir, has a dendritic shape that characterizes the fast increasing flow or we called flash flood. Nevertheless, the downstream part of Ciliwung has elongated and narrowing shape. With this shape characteristic, the Upper Ciliwung Watershed has an important role, as contributor of runoff from the watershed, which is quite large. The boundary of Upper Ciliwung watershed is delineated from Gede Pangrango until Katulampa Weir at Bogor City. The watershed area is around 150 km2 and 25 km long. The Ciliwung Watershed and the discretization of Upper Ciliwung Watershed present at the figure 1.

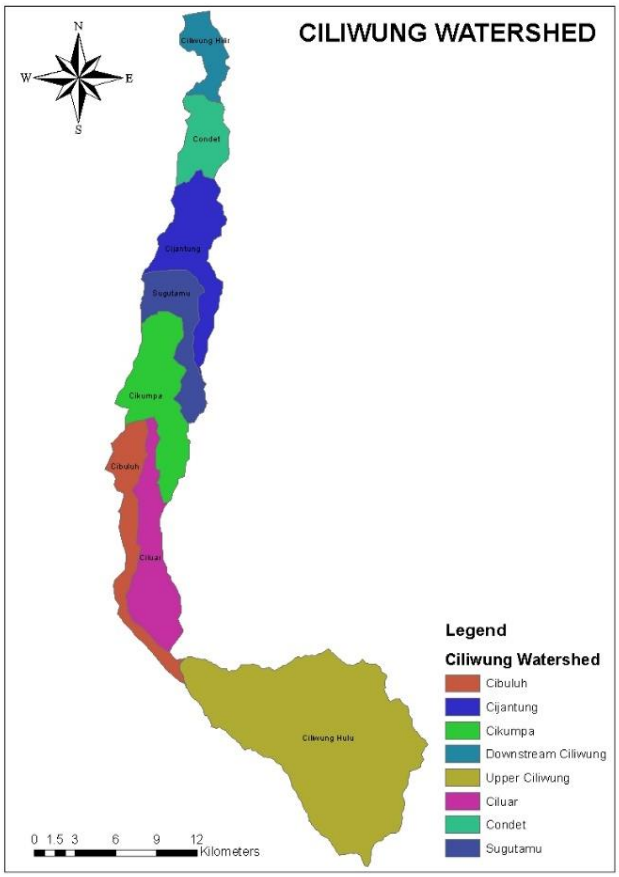

Figure 1. Ciliwung Watershed and Upper Ciliwung Discretization

B. Available Data Set

Daily rainfall data was collected from 3 (three) rainfall station, Gunung Mas, Cilember and Gadog for the past events (15 Feb 2017, 7 March 2017, 13 April 2017 and 5 Feb 2018). Automatic Water Level Recorder (AWLR) as an observation data was obtained from Katulampa Weir station. All collected data supported by Ciliwung Cisadane River Basin Agency. Analysis of land cover at Upper Ciliwung Watershed was used landsat 8 digitation on 2017 over the catchment. CN grid map that represent the land cover at its catchment present at figure 2.

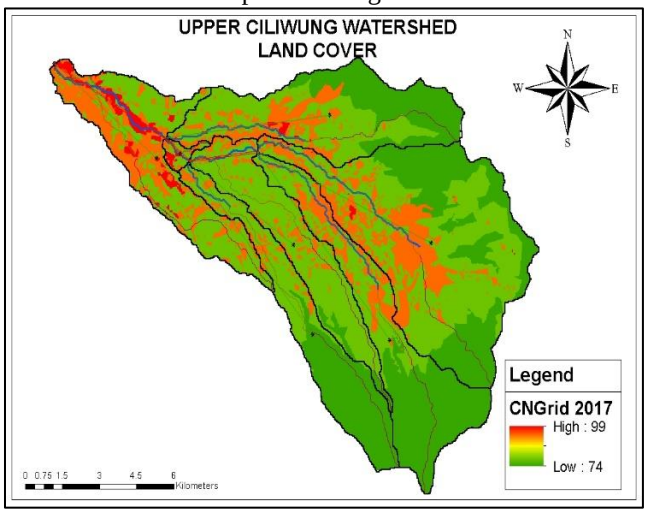

Figure 2. CN Grid at Upper Ciliwung Watershed

C.HEC-GEOHMS

"HEC-GeoHMS has been developed as a geospatial hydrology toolkit for engineers and hydrologists with limited GIS experience."[7]. This tool helps to analyze the digital terrain data, transforming to the drainage paths and watershed boundaries that represents the drainage network. The watershed delineation, and the spatial characteristic of its watershed ware proved by Geographical Information Systems (GIS). The spatial information of watershed characteristic and stream network in GIS is done by the interfaces of Arc-Hydro or HEC-Geo HMS. Schematic of Upper Ciliwung Watershed based on HEC-GeoHMS interface can be seen at the figure 3.

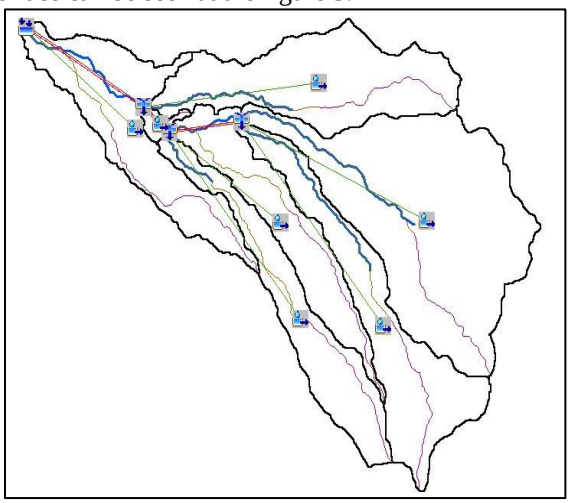

Figure 3. Schematic of Upper Ciliwung Watershed Using HEC-GeoHMS

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D. Hydrological model HMS

The U.S. Army Corps of Engineers is the organization which develop the Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS). This study used HEC-HMS version 4.0by interconnecting with HEC-GeoHMS. The purpose of this software is to simulate the hydrological process in a complete way of watershed system. The combination of meteorological data and watershed characteristic were combine in this model to simulate the hydrological response[8]. The meteorological parameter contains information about rainfall and snowfall. The control model contains information regarding the required simulation time period [7]. Several studies have been approved the performance of HEC-HMS either for gauge or ungauged watershed. HEC-HMS model adopted the Soil Conservation Service - Curve Number (SCS-CN) method for the production function. The representation of hydrological process at the watershed consider by it production function depends on the CN value, the soil characteristic and the 5 day-antecedent rainfall. The formulation of SCS-CN method presents at the equation 1-5[9]:

$$\frac{F_a}{S} = \frac{P_a}{P - I_a} \quad (1)$$

from the continuity principle

$$\boldsymbol{P = P_e + I_a + F_a} \quad (2)$$

$$\boldsymbol{P_e = \frac{(P - I_a)^2}{P - I_a + S}} \text{ Where as } \boldsymbol{I_a = 0.2S} \quad (3)$$

$$\boldsymbol{P_e = \frac{(P - 0.2S)^2}{P + 0.8S}} \quad (4)$$

Where P is the total rainfall, I_a is the initial abstraction, Q is direct runoff and S is the retention capacity of catchment area. Value of S depend on the value of Curve Number (CN) which is around 0 to 100.

$$S = 25.4\left(\frac{1000}{CN} - 10\right) \quad (5)$$

Table 1. Watershed Parameter

grid code	Shape Length (m)	Name	Slope (%)	CN III	CN III	Area (km^2)	S CN II (mm)	S CN III (mm)	Ia CN II (mm)	Ia CN III (mm)	Percent Impervious (%)
1	42780	W80	9.74	74	85.7	20.81	3.57	1.67	0.71	0.33	61.9
2	38220	W90	26.90	64	79.5	25.67	5.72	2.58	1.14	0.52	47.1
3	7920	W100	13.20	74	85.8	1.10	3.50	1.66	0.70	0.33	47.1
4	45780	W110	27.27	64	79.8	48.86	5.63	2.53	1.13	0.51	40
5	38520	W120	19.24	64	79.6	16.28	5.72	2.56	1.14	0.51	37
6	45540	W130	35.58	62	78.3	23.16	6.21	2.77	1.24	0.55	57
7	41160	W140	39.64	60	76.9	16.97	8.87	3.00	1.77	0.60	5

E. Model Simulation and Calibration

Upper Ciliwung watershed was used to calibrate the model. Daily rainfall data for 4 (four) events and land cover in 2017 over the watershed was inserted to the model. First simulation was done by the CN value type II that usually used based on the CN table. Second simulation was considered the 5 days antecedent rainfall condition before the event. Last simulation (Simulation III) was calculated by take into account the 5 days antecedent rainfall, soil abstraction and percent impervious over each sub watershed.

The Nash-Sutcliffe Efficiency (NSE) method was used to define the comparison between relative values of residual variance with the measured data variance [10].

$$E = 1 - \frac{\sum_{i=1}^{n}(O_i - P_i)^2}{\sum_{i=1}^{n}(O_i - \bar{O})^2} \quad (6)$$

It gives indication of how well the observed data versus simulated data fits the linear regression (1:1). The value ranges from-∞ to 1.0. The closer value is to 1, means that the simulation close to the observation value.

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III. RESULT AND DISCUSSION

The objective of this step is to verify the coherence of the hydrological model HEC-HMS. For this step, a comparison of the modeled hydrographs and the measured hydrographs at the outlet (Katulampa Weir) of 7 sub-watersheds has been done for 4 events and 3 Simulation.

Using HEC-HMS we can simulate the rainfall-runoff processes in watershed for varied purposes such as water supply scheme, flood forecasting and so on. To develop a hydrological model, we use a project name to identify the project. A project has three models, basin, meteorological, and run control.

More than 30% land cover at Upper Ciliwung watershed is a buildup area (See Figure 2). For computation using HEC-HMS, the Upper Ciliwung watershed is divided into 7 sub-watersheds (Figure 3) by HEC-GeoHMS tools. The distribution of sub-watershed parameter, HEC-HMS input data, can be seen at the table 1.

The meteorological model obtained of 3 rainfall stations represent by Thiessen Polygon for area rainfall. This proses represent the semi distributed method of hydrological modeling.

The result of HEC-HMS model for 4 events present at the figure 4a to 4d bellow.

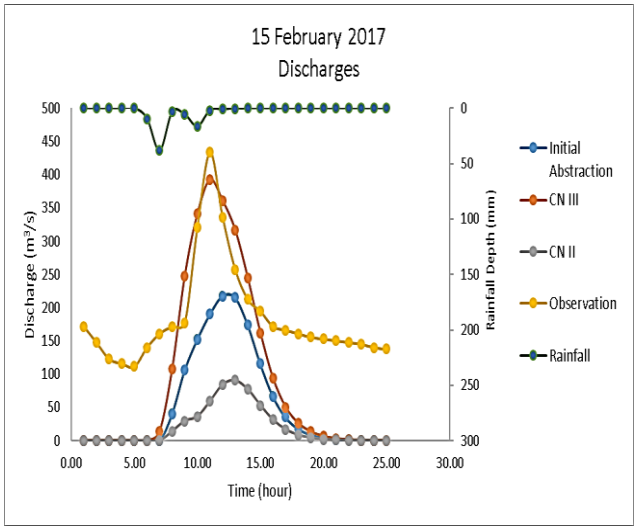

Figure.4a. Simulation and Observation hydrographs at 15 February 2017.

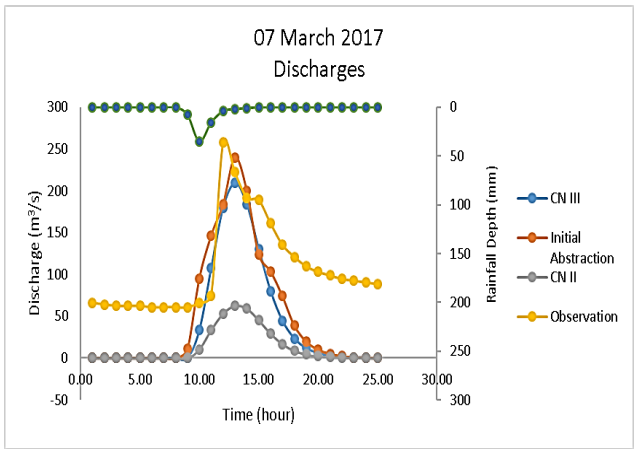

Figure.4b. Simulation and Observation hydrographs at 7 March 2017.

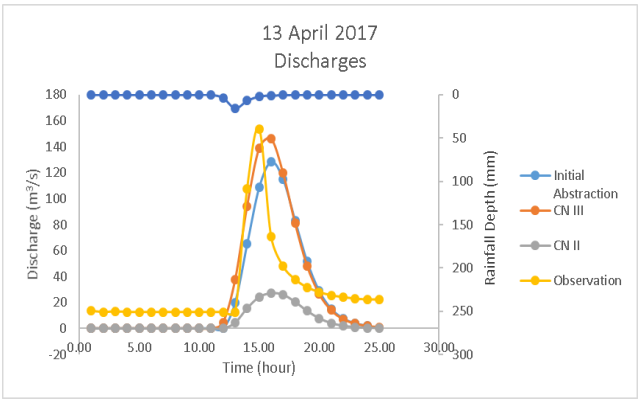

Figure.4c. Simulation and Observation hydrographs at 13 April 2017.

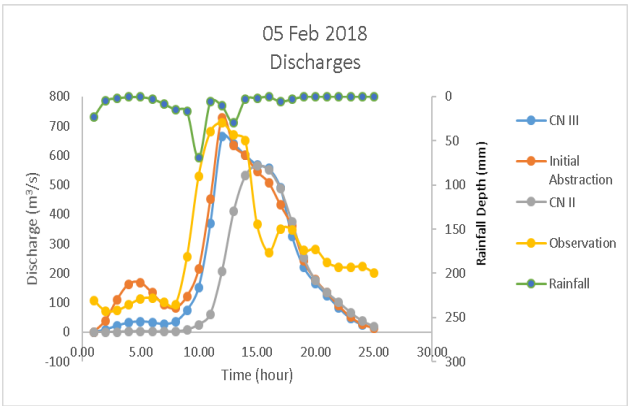

Figure.4d. Simulation and Observation hydrographs at 5 February 2018.

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Table 2. Simulation Result Summary

Events	Simulation (Peak Discharge (m^3/s))			Obs	Nash Coefficient		
	I	II	III	m^3/s	I	II	III
15-Feb-17	90.8	217.7	392.7	433.7	0.375	0.752	0.991
7-Mar-17	62.5	209.6	239.2	257.7	0.426	0.965	0.995
13-Apr-17	27	128.4	146.2	153.6	0.321	0.973	0.998
5-Feb-18	566	664.1	727.5	710.2	0.959	0.996	0.999

The summary result of the three (3) simulations are presented table 2 above. The result shown the magnitude peak discharge between 3 simulations. Furthermore, the simulation III obtain the nearby magnitude of peak discharge and the Nash value close to 1for all events. Its mean that the more optimal result is produced by the model.

CONCLUSIONs

This paper presented the watershed properties at Upper Ciliwung Watershed using HEC-GeoHMS tools in Arc.GIS. The results indicate the good performance of HEC-GeoHMS at Upper Ciliwung watershed for watershed parameter identification. HEC-HMS shown a good performance also for the third simulation that take into account to the rainfall, land cover, soil moisture, and initial abstraction. For that simulation, Nash value are close to 1. The watershed parameter interaction between the rainfall and other spatial watershed characteristic distribution, like soil properties, land cover and initial abstraction will make a better analysis of the watershed response [11].

V. ACKNOWLEDGEMENT

We would like to address our gratitude to Universitas Indonesia for giving financial support through the PITTA 2018 funding scheme number 2423/UN2.R3.1/HKP.05.00/2018. Also thanks to Ministry of Public Work for all supporting data.

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Multi-Agent Class Timetabling for Higher Educational Institutions (HEIs) using Prometheus Platform

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Abstract:-- **In a university setting, class scheduling is vital for teaching and learning process. Educational institutions rely on time tables in their day to day activities. Multi-agent systems can be applied in solving University Course Timetabling problem where the advantages of using multi agent systems based approach could include increasing the independency of scheduling each department, independence of departments in scheduling, scalability in a distributed environment and to prevent collision among events/resources and unplanned allocation by negotiation among agents in a distributed environment. Class timetabling in most of the Higher Educational Institutions is being done manually which is a very difficult and time-consuming task. The main aim of the study is to develop a multiple agent class timetabling system that automates the process of class scheduling of Higher Educational Institutions (HEIs), using Prometheus methodology. Adopting Prometheus methodology in developing the multi-agent system resulted to a complete and detailed system in the sense of covering all the stages of software development as applied to agent systems.**

KEYWORDS: Multi-agent system, class timetabling, Higher Educational Institutions, Prometheus methodology.

I. INTRODUCTION

In a university setting, class scheduling is vital for teaching and learning process. Educational institutions rely on time tables in their day to day activities. Time table management entails scheduling scarce resources in the most optimal way possible that guarantees effective teaching and learning while at the same time ensuring the comforts of the interest groups as much as possible Invalid source specified.. Timetabling process must be done every semester or term which is an exhausting and time-consuming job. According to Babei, Karimpour and Hadidi [1] multi-agent systems can be applied in solving University Course Timetabling problem where the advantages of using multi agent systems based approach could include increasing the independency of scheduling each department, independence of departments in scheduling, scalability in a distributed environment and to prevent collision among events/resources and unplanned allocation by negotiation among agents in a distributed environment. A multi-agent system is a set of software agents that interact to solve problems that are beyond the individual capacities or knowledge of each individual agent.

Agents are technologies inspired from global environment to develop initial instances of systems. Whenever a distributed multi agent system is considered, it means that there is a network of agents collaborates with each other to solve problems which are out of capability of each single agent [2]. In Srinivasan et al [2] , an agent could observe and receive anything through sensors from its environment and then performs over environment through a driver. Agents are classified into different classes based on their application, including 1) autonomous, 2) intelligent, 3) reaction able, 4) proactive, 5) learner, 6) mobile, 7) cooperative/communicative agents.

The goal of the university course timetabling problem (UCTTP) is to find a method to allocate whole events to fix predefined timeslots and rooms, where all constraints within the problem must be satisfied. Events include students, teachers and courses where resources encompass the facilities and equipment's of classrooms such as theoretical and practical rooms. Also timeslots include two main components, namely daily and weekly timeslots which it varies from one institution to another. However, each classroom also has its own components including audio-visual equipment's (video projector), number of chairs necessary for courses allocated to those classrooms (the capacity of theory and practical rooms), number of blackboards and whiteboards related to each theory and practice classroom and etc. [1]. Yanga et al [3] suggested that the mobile multi-agent system design can provide a feasible and flexible approach to performing course timetabling, which solves the problem in a distributed and dynamic way.

Using Multi-Agent Systems technique, the time tabling problem has been divided into a set of simpler problems, each of them is handled by a separate agent. It is very easy to handle very complicated situations by augmenting the agent with the knowledge and rules to handle these situations. Another benefit of using Multi-Agents is reusability. Due to the inherent modularity of Multi-Agent Systems, it is easy to use the same agents in solving problems related to resource allocation and management problems in general [4].

Class timetabling in most of the Higher Educational Institutions is being done manually which is a very difficult and time-consuming task. Other problems of a traditional manual system include lack of accuracy, slow speed, and poor information sharing. The goal of class timetabling is to find an appropriate timetable for a set of courses to be scheduled within limited resources such as classrooms and class time. This timetable must be found while simultaneously satisfying certain constraints such as efficient use of resources, convenience to students and instructors and so on [5]. The course timetabling problem has as its goal to find an appropriate timetable for a set of courses to be scheduled within limited resources such as classroom and class time. This timetable must be found while simultaneously satisfying other constraints such as efficient use of resources, convenience to students and instructors, etc. [3]. In this paper, a Class Scheduling System will be developed using Multi-Agent Based Architecture to automate the class scheduling system of the Higher Educational Institutions (HEIs) and to solve the problems encountered using the manual system.

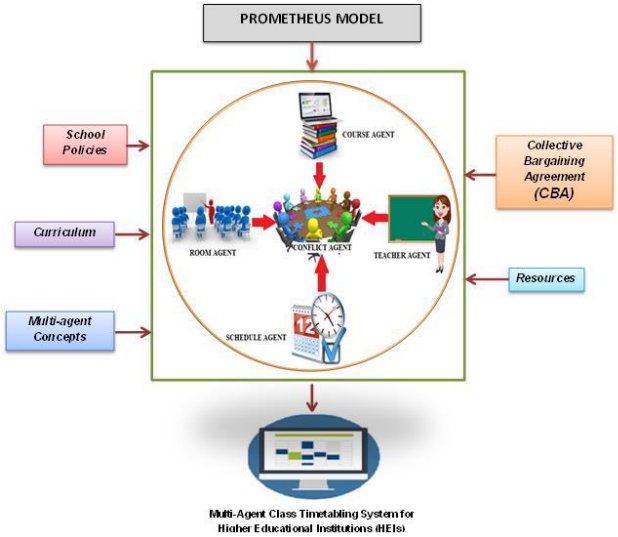

Figure 1 represents the proposed conceptual framework of the research. Multi-agent system will be used in developing the software; an automated class schedule for each year level will be generated based on the curriculum, resources, teacher schedule and specialization.

The main aim of the study is to develop a multiple agent class timetabling system that automates the process of class scheduling of Higher Educational Institutions (HEIs) using Prometheus platform. The system will optimize the use of resources and will create an efficient/effective timetabling in HEIs. In the study, the researcher will determine if there is a significant difference with the manual class scheduling and the automated class schedule generated by the system

II. MATERIALS AND METHODS

The design to be used is the developmental research. A developmental research was defined as the study of design, development, and evaluation of products, programs and processes that meets the criteria of effectiveness and consistency. The product-development process will be analyzed and described, and the final product will be evaluated [6]. The proponent used Prometheus methodology in developing the system. The Prometheus methodology defines a detailed process for specifying, designing, implementing and testing/debugging agent-oriented software systems. In Figure 2, Prometheus methodology includes three phases: (1) System specification phase which focuses on identifying the goals and basic functionalities of the system, along with inputs (percepts) and outputs (actions); (2) Architectural design phase uses the outputs from the previous phase to determine which agent types the system will contain and how they will interact; and (3) Detailed design phase looks at the internals of each agent and how it will accomplish its tasks within the overall system [7].

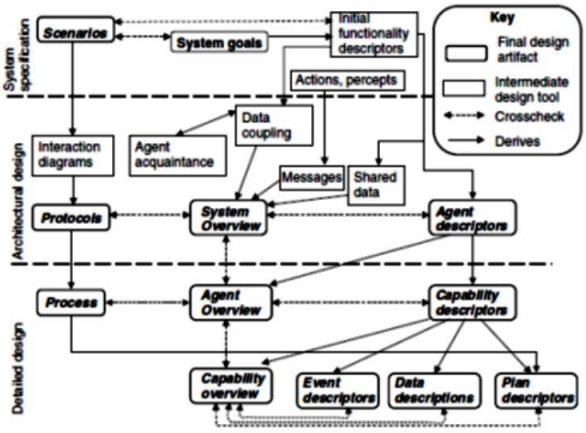

Figure 2. The phases of Prometheus Methodology [7]

In the study of Obit [8] and Lewis [9], constraints in UCTTP problem are classified into two hard and soft constraints. Hard constraints must be satisfied completely so that the generated solutions become possible and without conflict and violation is not permitted.

- There is only one course presentation session for each particular course every day.
- To consider the features of class over the presented course.
- Each student and lecturer is present only in one class at the same time.
- More than one course which has been scheduled to the same timeslot cannot be assigned to the same classroom.
- Lecturers must be available at times when their courses have been scheduled.
- Some courses require constant and specified number of sessions at every week (for example, 3, 2, 1 times per week).
- Each course which has been prescheduled has mark and the scheduling of those courses must be scheduled at a particular time (following the priority).

In soft constraints which are related with objective function and they must be satisfied as much as possible, but it not necessary that soft constraints are being satisfied as hard constraints.

- The lecturer considers a time priority to teach.
- Empty spaces must be eliminated within classrooms.
- The maximum continuous teaching hour for a lecturer must be 3 hours.
- The maximum continuous teaching hour for students is 4 hours.
- A subject (part of a course) must not be taught for more than two successive hours.
- Attempt to uniform distribution of courses among timeslots.
- Lecturers and students should have launch hours between 12pm to 1 pm or 1pm to 2pm.
- One or a group of students must not have only one timeslot (for one hour) for one class at a day.

To be able to solve these constraints, the researcher will be developing the following agents (shown in Figure 2):

- Course Agent is responsible for the course information. Curriculum template for each course will be added. This curriculum template will be the basis of course offering for each year level per semester of each course in the university.
- Teacher Agent is responsible for the teacher information like status (full-time or part-time), specialization and time preference. With these details, basis on scheduling the subjects and solving constraints can be established.
- Schedule Agent is responsible for the available timeslot for each course. This will handle the identification of allotted time per subject.
- Room Agent is responsible for the available room for each course and each timeslot. Type of classroom (eg. lecture or laboratory room), room capacity will also be handled by this agent. Available hardware resources (eg. projector, equipment etc.) and software resources (eg. Visual Basic, AutoCAD, Matlab etc.) per room will also be added.
- Conflict Agent is responsible for proper communication or negotiation of all the agents within the system. This will be the heart of the system because this will handle all the conflicts among the agents.

III. RESULTS

Figure 3 shows the illustrative diagram of the solutions to the research problems.

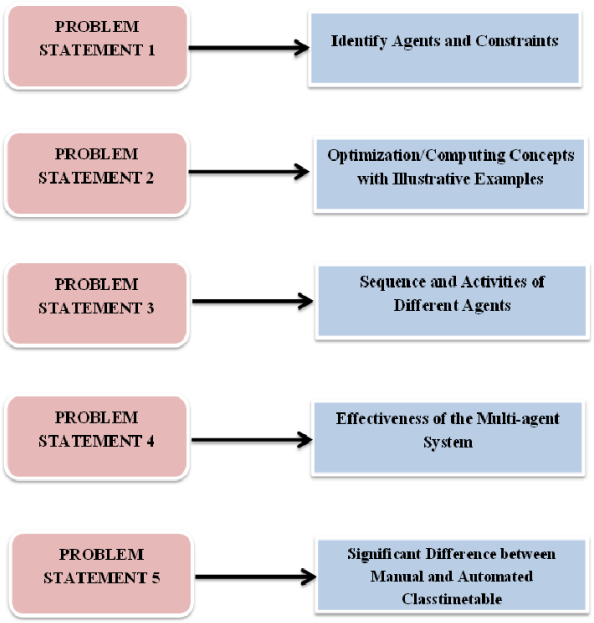

Figure 3. Illustrative Diagram of Solutions to Research Problems

The system comprises of five agents namely Course Agent, Room Agent, Teachers Agent, Schedule Agent and Conflict Agent. In the university setting, actual course timetabling focuses on achieving a reasonable distribution of courses over the timetable with minimal conflicts for

students progressing normally through their educational program, which has been categorized in terms/years. In order to develop an effective and powerful agent solution to any problems, the solution must map effectively into the innate and intrinsic characteristics and nature of agents and agent systems [10]. Therefore, for this research we have observed the above principle by mapping agent autonomy into five agents that comprises the system and are communicating with each other in order to produce an efficient timetable for classes in the HEIs.

The study [11] focuses on agents that are developed based on the Belief-Desire-Intention (BDI) Architecture as shown in Figure 4.2. The researcher adopts the BDI architecture in the design of the different agents:

1. B ← B0 /* B0 are initial beliefs*/
2. I ← I0 /* I0 are initial intentions*/
3. while true do
4. get next percept ρ via sensors
5. B ← brf(B, ρ)
6. D ← options(B,I)
7. I ← filter(B,D,I)
8. H ← plan(B,I,Ac) /* Ac is the set of actions*/
9. While not (empty(H) or succeeded(I,B) or impossible (I,B) do
10. α ← first element of H;
11. execute (α);
12. H ← tail of H;
13. observe environment to get next percept ρ;
14. B ← brf(B, ρ)
15. if reconsider(I,B) then
16. D ← options(B,I)
17. I ← filter(B,D,I)
18. end-if
19. if not sound(H,I,B) then
20. H ← plan(B,I,Ac);
21. end-if
22. end-while
23. end-while

Figure 4. A computational model of BDI

For the study, the researcher used Python as a tool for developing the proposed system. Python has proved to be a suitable programming language for implementing a multi-agent system.

The Multi-Agent Class Timetabling System for Higher Educational Institutions system should be able to do the following things as shown in Figure 5:

- Allow for input of student data
- Allow for input of teacher data
- Allow for input of courses data
- Allow for input of room data
- Allow for input of resources data
- Allow to automatically generate class schedules per section per course
- Allow for notification if there are errors in the creation of class schedules

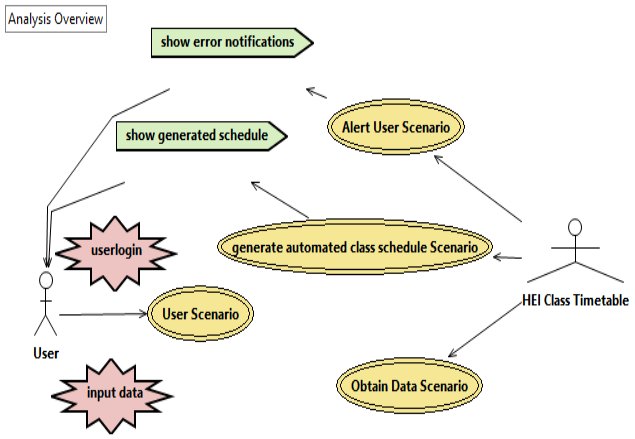

Figure 5. Analysis Overview of the System

A clear understanding of the system must be developed in this phase. We have to identify how the agent reacts (action) to the inputs from the environment (percept). We also have to identify the goals and sub-goals, appropriate scenarios and roles.

Sen [12] described a mathematical model for the class scheduling since it is a combinatorial problem. Solving a course scheduling problem is equivalent to finding a subset and satisfying the constraints.

Suppose there are set of ten classes and five faculty members and assume that all the faculty members can teach all the courses. Also, there are three rooms and five timeslots for each day. So we get the following sets:

• Classes, C = {C1, C2, C3, C4, C5, C6, C7, C8, C9, C10}
• Time Slots, T = {T1, T2, T3, T4, T5}
• Rooms, R = {R1, R2, R3}
• Faculty members, F = {F1, F2, F3, F4, F5}
• A solution for this will be a set:
Schedule, S = {S1, S2, S3, S4, … }
The Timetable formula will be : Timetablingi = (C×T×R×F) (1)

where C is the set of classes, T is the set of class time slots, R is the set of rooms, and F is the set of faculty members. Then Timesloti is a high-dimensional and multi-constraint combinatorial optimization problem. Where, each Timesloti is a four-tuple contained in C × R × T × F and satisfying the constraints. Since we have the mathematical model ready, we can proceed and introduce a few

constraints into the system. This mathematical model was adopted in the study.

Each sub-problem is tackled individually and then fed into the other sub-problem as depicted in Figure 4.4. By introducing modularity in the solution we can employ different algorithms to solve each sub-problem. Then we can feed the output of each sub-solution as the input to other and improve the results. For this research we have limited the scope to have similar algorithms at each node.

- Mapping of the courses to faculty member's specialization and time availability
- Mapping of the courses to rooms.
- Assigning a timeslot to the lecture.

The solution to the CSP consists of the following main sub-problems as depicted in Figure 6.

Table 1. Comparison between Manual and Automated Class Schedule

	1ST SEM SY 2018-2019		
FACULTY MEMBERS	*MANUAL SYSTEM*	*AUTOMATED SYSTEM*	*DIFFERENCE*
Faculty 1	21	20	1 (5% ↑)
Faculty 2	23	20	3 (15% ↑)
Faculty 3	7	7	0 (0%)
Faculty 4	13	15	-2 (13.33% ↓)
Faculty 5	2	2	0 (0%)
Faculty 6	14	17	-3 (17.65% ↓)
Faculty 7	24	24	0 (0%)
Faculty 8	24	24	0 (0%)
Faculty 9	10	10	0 (0%)
	2ND SEM SY 2017-2018		
FACULTY MEMBERS	*MANUAL SYSTEM*	*AUTOMATED SYSTEM*	*DIFFERENCE*
Faculty 1	11	11	0 (0%)
Faculty 2	4	7	-3 (42.86% ↓)
Faculty 3	6	6	0 (0%)
Faculty 4	11	11	0 (0%)
Faculty 5	3	3	0 (0%)
Faculty 6	6	6	0 (0%)
Faculty 7	24	21	3 (14.29% ↑)
Faculty 8	7	7	0 (0%)
Faculty 9	5	5	0 (0%)
	1ST SEM SY 2017-2018		
FACULTY MEMBERS	*MANUAL SYSTEM*	*AUTOMATED SYSTEM*	*DIFFERENCE*
Faculty 1	15	15	0 (0%)
Faculty 2	12	14	-2 (14.29% ↓)
Faculty 3	5	5	0 (0%)
Faculty 4	12	15	-3 (20% ↓)
Faculty 5	4	4	0 (0%)
Faculty 6	20	20	0 (0%)
Faculty 7	24	21	3 (14.29% ↑)
Faculty 8	29	27	2 (7.41% ↑)
Faculty 9	10	10	0 (0%)
	2ND SEM SY 2016-2017		
FACULTY MEMBERS	*MANUAL SYSTEM*	*AUTOMATED SYSTEM*	*DIFFERENCE*
Faculty 1	19	22	-3 (13.64% ↓)
Faculty 2	18	18	0 (0%)
Faculty 3	7	7	0 (0%)
Faculty 4	6	7	-1 (14.29% ↓)
Faculty 5	4	4	0 (0%)
Faculty 6	22	22	0 (0%)
Faculty 7	24	21	3 (14.29% ↑)
Faculty 8	26	25	1 (4% ↑)
Faculty 9	10	10	0 (0%)

To evaluate the system, a class schedule created manually was compared to the class schedule generated manually by the system in terms of the subject load for faculty members. Table 1 shows the difference in the no of units for each faculty members in the department using the manual system versus the automated class scheduling system.

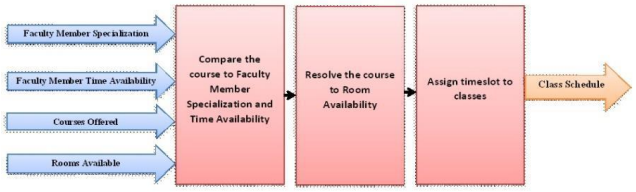

Figure 6. Course Scheduling Problem (CSP) solution model

This research also considered the difference between the manual and automated scheduling of the system in terms of the number of units per faculty. The researcher used the record of the Computer Engineering faculty composed of nine members and compared it to the number of units produced by the automated scheduling.

Table 2 shows the result of the test using independent sample t-test. The table had 9 respondents with 15.11 mean score and 8.038 spread of the scores in manual schedule while the automated scheduling produced the same mean compared to manual schedule with different standard deviation of 8.418. The test had 0.865 significant values and the testing accepted the null hypothesis. It means that the number of the units per professor in manual versus automated scheduling had no significant difference. It can say that the scheduling of automated was reliable and can produce an accurate loading of professors.

Table 2 Result of the Comparison Between the Manual and Automated Distribution of Unit per Professor

SCHEDULING	N	MEAN	ST. D.	Sig.	Remarks	Interpretation
Manual	9	15.11	8.038	0.865	Accept Ho	No Significant Difference
Automated		15.11	8.418			

IV. CONCLUSION

The developed system comprising of five agents solved the problem of minimizing if not eliminating the hardware constraints and as much as possible satisfy the soft constraint in handling class timetabling. Mapping the agent autonomy into five agents to communicate effectively with each other in order to produce an efficient timetable for the university is an important feature of the system.

The used of Prometheus platform helps the researcher come up with a detailed design of the system. It provided a detailed guidance in terms of process and notations, it is not intended to be prescriptive but rather an approach that has devolved by the experiences of researchers focusing on the use of multi agent system.

Since class scheduling is a coordination and combinatorial problem of finding an appropriate timetable for each course to be scheduled while avoiding conflicts simultaneously. The mathematical model used helps in the optimization process specifically the rooms, faculty schedule and student schedule. The Course Scheduling Problem (CSP) solution model provided modularity to employ different algorithm in the development of the automated class timetable.

In the evaluation of the effectiveness of the system, the comparison between the manually created class schedule and the generated automated schedule resulted to changes in the schedule and faculty loads due to the different conditions like faculty specialization and faculty time preference introduced in the system.

Concluding the complete performance of the system it can be understood that the multi agent system and Prometheus methodology is able to solved the course scheduling problem. Depending on how the individual steps within the algorithm have been implemented, the performance can be increased or decreased. Every solution will have some advantages and disadvantages along with them.

V. RECOMMENDATIONS

The development of a multiple agent class timetabling system that automates the process of class scheduling of Higher Educational Institutions (HEIs) using Prometheus Platform is open for further improvement. From the foregoing findings, and from the conclusion drawn, and within the scope and limitations of study, the following recommendations are proposed:

1. There is a need to do more intensive analysis into the differences in output across the set of instances, in order to find out which factors or characteristics of the instances cause these differences. This should aid with matching principles to particular timetable characteristics.

2. To add more real world constraints to the model. One idea is to organize hard constraints by applying an ordinal scale (must, should, could, would like) seems to increase more flexibility and avoid the clash over the shared courses that means the students are able to take more classes. The preferable date-time slots from the need of lecturers and the shortest pathways (distance between any two consecutive lectures) within the university could also be extended and implemented in the model. The more constraints the model can achieve, the much closer it comes to providing a response to the needs from the real world.

3. To make it more effective, student agent can be added to the conceptual framework. Student agent can complete the class schedule by listing down the students who can enrol per subject.

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Mitigating Risk of Revenue Leakages on the Customer and Vendor side in Ecommerce Sector

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***Abstract*:-- E-commerce is one of the rapidly booming sectors in India today, thanks to the rising internet user base and faster mobile penetration. The E-commerce industry is a complex ecosystem as it involves huge transaction volumes, complex procurement and logistics systems and reliance on new technologies for customer access and payment transactions. This complexity has given rise to frauds and revenue leakages which is impacting the revenue for the ecommerce companies. Hence the major concern facing the Ecommerce sector today is how to mitigate the revenue loss. Very few studies have been done in academic literature in this area hence the objective of this study is to understand the sources of revenue leakage in the ecommerce sector and propose solutions for mitigating these revenue leakages. The study focusses on 2 major areas of revenue leakage viz. Customer side, Vendor side. The proposed revenue assurance model will be helpful to Ecommerce companies for detecting the sources of revenue leakages in the abovementioned areas and plugging the same thereby reducing losses. The study can also be helpful for consulting companies who are in the business of revenue assurance and fraud management for the ecommerce companies.**

KEYWORDS: Ecommerce, Revenue Assurance, Revenue leakages, Customer side, Vendor side.

I. INTRODUCTION

The rapid urban sprawl brings the significant landscape E-commerce is one of the many industries which have observed an exponential growth since its inception. Along with skyrocketing growth rate, the competition in this sector has also become immensely intense. With every new entrant, a new technology comes into the industry and so does the pressure to be on par. The E-commerce ecosystem comes with its own set of complexities and challenges. Owing to the complexity of the organization processes, there is a likelihood that revenue loss occurs due to inefficiency in the execution of conditions agreed upon by customers. It becomes impossible to track such revenue losses due to the massive volume of transactions managed by E-commerce giants. The study of revenue assurance, particularly for E-commerce sector seems to be a daunting task. Many researchers recognized this gap and provided a foundation for fraud management and risk-mitigation. Duh, R. et al (2002) [1] presented a framework for analyzing control in online auction industry while using the control practices of eBay as an illustrative example. The paper covered three classes of risks prevalent in E-commerce – Privacy, Authentication and Denial-of-service attacks. In the article by EY (2016) [2], a detailed view of fraud-risk landscape of an e-commerce marketplace has been discussed. The paper has briefly provided solutions for such frauds by introducing their fraud investigation and Dispute services. The paper by Deloitte (2016) [3] on mitigating risk, has described a fraud-risk landscape of an E-commerce market place. The Ernst and Young (2015) [4] paper on revenue assurance discusses major areas of financial leakages and few revenue assurance strategies to curb them. The KPMG (2016) [5] paper, as a part of its E-commerce –Logistics research has identified challenges and major risk areas which can lead to revenue losses. A study by EKN (2017) [6] has identified some of the financial implications of E-commerce Frauds. Leyde, J. [7] in her book on Ecommerce fraud gives a detailed analysis of E-commerce Frauds like phishing, account takeover, malware etc.

Objective of research: It was observed in the literature review that there was a dearth of literature available in the Ecommerce sector pertaining to sources of revenue leakage and solutions for revenue assurance regarding the same. Hence the objective of this study is to understand the sources of revenue leakage in the ecommerce sector in the areas of customer side and vendor side and propose a conceptual Revenue Assurance model to curtail these revenue leakages in these areas.

II. LITERATURE REVIEW

2.1) Revenue Assurance:

As defined by Gartner IT Glossary [8], revenue assurance is "the application of a process or software solution that

enables a communications service provider (CSP) to accurately capture revenue for all services rendered." As per Deloitte (2017) [9], "Revenue Assurance as a continuous endeavor aims at improving operational efficiency and ensuring that all possible revenue is collected". It helps in minimizing enterprise risk, optimizes operational performance while assuring revenue for services provided and future leakages. As mentioned by Pantigoso P and José B (2016) [10], the term Revenue Assurance, developed in mid-1990s, was coined in prospect to telecommunications companies. The simple idea behind revenue assurance was to "charge the client correctly". There seemed a lot of revenue wastage happening between the defined way and the actual charging of the billing system. Baamann K. (2007) [11] explains the term revenue assurance as a set of different techniques and methodologies used to identify and repair revenue losses thereby improving profits, revenues and cash flow without hampering the actual demand. A revenue assurance project can also increase efficiency by detecting un-billed or mis-billed customers and thereby maintaining revenue as mentioned in the report by Sjölin, M., Damjanovic, I. and Burman. (2010) [12]. Tele Management Forum has defined revenue assurance as a branch, grouped under enterprise risk management along with processes to ensure business continuity, security, fraud, audit and insurance.

2.2 Importance of revenue assurance in the ecommerce sector.

As per the report by IBEF (2017) [13], India happens to be the fastest growing market with respect to Ecommerce sector with an expected growth rate of 44.7% for the years 2016-2020. One of the major reasons for this growth is the rising internet penetration amongst the Indian population. Because of the increase in number of users online, the task of security and fraud management has become very cumbersome. Expanding ecommerce market, higher flow of money online, and increasing online data transactions has raised the stakes of fraud at even higher rate which ultimately leads to revenue loss. Revenue maximization has always been the primary objective of any organization. The growth of the company is directly proportional to the quantum of revenue it converts. The ecommerce players face a different set of problems when it comes to revenue maximization. Absolute dependence on technologies, which keeps on evolving year on year have brought about barrage of gaps which has become the source of revenue leakages. As mentioned in the article by Bishnoi, A. (2017) [14], recent surveys indicate that because of fraud, businesses in North America expect to lose about 0.8% of their total revenue. In India the revenue loss due to frauds is comparatively lower in the range of 4-5%. As per the report of Global Fraud Index 2017 [15], there was an increase of 5.5% in total E-commerce frauds from quarter two of year 2016 to quarter two of year 2017. The same report also indicates that in quarter two of year 2017 alone, account takeover fraud rose by 45 percent, costing retailers $3.3 billion in losses. Businesses have recognized the need to curtail frauds while meeting ends with customers' expectations. As the market evolves, e-commerce companies will be the soft-target of intricate attacks. The attackers might be individuals, or could be a group. The industry competition will further worsen the scenario as new entrants might fight to get market leadership and may also resolve to create frauds for their competition. Hence, we feel there is need to understand in detail the revenue leakage in Ecommerce sector. Following research questions were formulated:

1) What are the sources of revenue leakage in the Ecommerce sector in the areas of customer and vendor side?
2) What is the impact of these revenue leakages on the ecommerce companies?
3) What are the probable solutions to Revenue Leakage in Ecommerce in the abovementioned areas?

III. SOURCES/AREAS OF REVENUE LEAKAGE IN THE ECOMMERCE COMPANIES

This section deals extensively with the sources of revenue leakages in the Ecommerce companies, uses cases, impact of such revenue leakages on the company and probable solutions for mitigating such revenue losses. There may be many sources of revenue leakages as far as ecommerce companies are concerned. This study concentrates on the two major sources of revenue leakage in the following areas: (1) Customer side (2) Vendor side.

3.1. REVENUE LEAKAGE ON CUSTOME SIDE:

This sub section deals with four major sources of revenue leakage on the Customer side, viz Customer Acquisition, Order placement, Returns & Refunds and Payments, use cases, impact of such leakages to the company and probable solutions for resolving the same:

3.1.1: Customer Acquisition:

Use case 1: Poor conversion rates:

Wayfair, a home goods and furnishing merchant, considers customer acquisition over retention. As per Daniel McCarthy and Peter Fader (2018), Wayfair's customer acquisition cost is nearly $69 which is double than its competitor Overstock (online home goods retailer) which spends nearly $38 on customer acquisition. Overstock earns approximately $9 per customer acquired whereas Wayfair incurred a loss of approximately $10 per customer for 2017 Q1. [16].

Impact: As per analysis by McCarthy and Fader (2018), Wayfair loses approximately $10 for every new customer it acquires. The company is considered unprofitable as it lost approximately $200 million in 2016 due to customer

acquisition cost leading to reduced overall company valuation. (Morell Alex, 2017) [17].

Probable Solution: To increase conversion rates, investments in customer retention should be increased with the help of loyalty programs which can increase the number of purchases from existing customers thereby saving expense on acquiring new customers. Loyalty programs is a method of encouraging existing loyal customers to return to shops by offering them personalized incentives like discounts, sample products, cashback etc. (Investopedia, 2018) [18].

Use case 2: Low repeat customer count:
Flipkart and Amazon, e-commerce merchants, spend Rs.845 per transaction as operational cost for which they receive mere Rs.175 net revenue per transaction per month. (Krishna, V. 2017). [19].

Impact: E-commerce giants like Flipkart and Amazon, lost Rs 2,306 crore and Rs 3,572 crore respectively, mostly because of the amount they spend on customer acquisition.
Probable Solution: To reduce the customer acquisition cost and increase count of repeat customers, retargeting method can be used. Retargeting also known as remarketing is a technology which uses cookies to anonymously follow the customers, once they visit the site. This cookie can capture the customer browser data like his searches, his browsing pattern etc. and help the marketer to push specific advertisements to these customers. (ReTargeter, 2018). [20].

3.1.2: Order placement:
Customers today are baffled by the number of choices for a single product category and number of sites offering variety of products. The impulse buying behavior is also very much prevalent in the web environment (Zhang et al, 2016). [21]. This impulse buying behavior of consumers is targeted by catering clustered product selection.

Use Case 1: Shopping cart Abandonment/Order processed in cart but not purchased:
Customers tend to save products in cart assuming this might save time whenever they wish to purchase that product. Customers also do not complete the purchase because of slow/non-dynamic shopping cart button, compulsory registration process, high shipping cost etc. (Corr James, 2015). [22]. According to a Statista, average cart abandonment rate for the year 2006 was 59.8% and it increased to 69.23% in 2017(Statista (2018). [23]
Impact: Companies lost over $4 trillion worth of products abandoned in 2017 and every year companies lose nearly $18 billion of sales because of cart abandonment (Digital Marketing Depot, 2017). [24]
Probable Solution: To reduce shopping cart abandonment, all charges/fees on shipping must be mentioned clearly on the product pages itself as surprise charges during checkouts is considered the major reason for cart abandonment.

Use case 2: Extensive use of expired promotion codes:
An expired promotional code gives same experience as fake code which leads to customer dissatisfaction. Similar customer will have a negative image about the brand from such an instance (Brandversity, 2017). [25]

Impacts: Customers dissatisfied from promo code offered can resort to complaining about the brand on different mediums which might indirectly turn up to loss in sales. Whilst offering a promo code or discount may drive customers to the site, but this kind of tactic indirectly reduces the margins of E-commerce owners. Further this may condition customers to never pay full again (Bustos Linda, 2018). [26]

Probable Solutions: To reduce use of expired promotion codes, an accurate database of coupon codes must be maintained. Creating your own company coupon landing page is another solution. Another solution is to disallow the coupon entry unless they do it through affiliate page or email campaign. Private promo codes can be issued to specific individual customers instead of sharing it with affiliates, on social networks etc. (Bustos Linda, 2018). [26]

3.1.3 Returns and Refunds:
A large margin of revenue loss for E-Commerce companies occurs due to Returns and Refunds. The cost involved in the entire process of returning the product and refunding the product price include delivery cost, seller's commission, payment fees depending on mode of payment etc. Returns and Refunds ensure customer loyalty but on the contrary it misses out Sellers Hygiene. As per Statistics by Invesp, 30% online products are returned as compared to traditional brick-and-mortar stores contributing only 8.89% product returns (Saleh, Khalid, 2018). [27] The cost of returns of delivery pushes the average cost by nearly 50 % because of two-way courier charges which is usually INR35 to 50 higher than forward logistics (Tanwar, P. and Doger, K, 2016). [28].

Use Case 1: Counterfeit product returns:
Customers can resolve to frauds by returning counterfeit products in lieu of original product by falsely claiming it as fake or defective. An Indian fashion retailer encountered such a case when some engineering students from Kanpur claimed for multiple refunds. They would replace original branded clothes with local replicas by simply stitching brand labels and then claim for refund form the retailer (Bansal, V. 2018). [29]

Impact: Such frauds account for 10% of the product returns and only 1% of returned products from customers are Genuine. (Bansal, V. 2018) [29]

Probable solution: Offer longer return deadlines as it would reduce the chances of customer returning the product. Typically, retailers allow returns within the period of 28-30 days of purchase. This creates a pressure on customers to initiate the return but if the return window is increased to 45-90 days customers tend to be attached to the product and would even cancel the return. A longer returning period increases leniency thus lead to fewer returns (Janakiraman, 2012). [30] Artificial intelligence and advanced technologies can be used for example some companies are using machine learning tools to predict user intent and to detect fraudulent /invalid addresses. Some companies are using 3D modelling systems for making size recommendations to customers. (Bansal, V. 2018). [29]

Use Case 2: Customer chargebacks /false claims:
Flipkart was duped by two Engineering students in Kota, Rajasthan for acquiring 152 expensive mobile phones by falsely claiming that they received empty boxes delivered (Livemint Epaper, 2016). [31]

Impact: Flipkart lost Rs.1.05 crore and 152 high-end mobile phones in the fraud case.
Probable Solutions: To reduce chargebacks, involving customers to leave a product review has also been beneficial. Review creates a perception about the product which increases the credibility of the brand. Many times, product reviews from informed customers provides in-depth detail about the product features (Mo Tanveer, 2017). [32]

Use case 3: Used Product Return/Wardrobing:
Customers return the product after using it temporarily even if the item was not defective. The customers claim for a full refund on such used products incurring extra cost of delivery and product maintenance to e-commerce merchants. According to an Amazon seller, the used products /duplicate product returned from customer's cause's major loss to sellers (Amazon Services Sellers Forum, 2015). [33]

Impact: Flipkart estimates a 15-20% product return rate, specifically in fashion category. In online fashion industry, damaged product frauds account up to 10% of total product returns.

Probable solution: To reduce used product returns, e-commerce merchants should invest in AR/VR technology and provide an online trial room experience by 3D virtual assistance. Amazon, went ahead to acquire artificial intelligence (AI) 3-D body scanning startup Body Labs. This approach will create 3-D human body models which shall offer trying on virtual clothes (PYMNTS.com, 2018). [34]

Use case 4: Absence of customer during delivery:
According to a discussion on Amazon Services (Amazon's seller forum), an Amazon seller has complained about extra shipping charges incurred in case of redelivery of product, due to absence of customer at the given location (Amazon Services Sellers Forum 2015). [35]
Impact: For Voonik (an Indian ethnic-wear online store), non-delivered products account nearly 15% of all orders. As per estimates, E-commerce companies pay 40% extra cost for the additional attempt for delivery as the single delivery attempt takes multiple rounds because of absence of customer at the provided delivery address (Livemint Ambre, A., 2016). [36].
Probable Solutions: To reduce returns based on delivery, the concept of lockers can be implemented. E-commerce majors outside India have their own lockers from where users can pick and drop deliveries. These lockers are set up at specific residential areas and corporate parks. The order is gathered at the nearest locker to customer's area and as it is delivered the customer is notified by an OTP.

3.1.4 Payments:
Payment remains the most vulnerable aspect in e-commerce. The economy of e-commerce relies on electronic transactions to charge customers for products and services. Payment methods are divided into 2 as online and offline. Online payments can be made via credit card, debit card, payment gateway, e-wallets, 3rd party payment processors etc. Offline payments are majorly through Cash on Delivery (COD).

Use Case 1: Cash on Delivery (COD):
E-commerce industry in India is highly dependent on Cash-on-Delivery method of payment. According to Statista, Cash-on-Delivery totaled to 57% of all online shopping transactions in 2015. Even after digital movement and demonetization in India, the estimated number has just lowered down to 45% for 2020 (Statista, 2018). [37]

Impact: COD restricts the working capital flow. The cash takes a long time to reach the seller and longer in case of returns/refunds. Further the courier companies charge extra on COD orders. These reasons cumulatively increase expenses and lower down returns (Tanwar, P. and Doger, K, 2016) [28]

Probable solution: To reduce COD based payments, merchants should start capitalizing on orders for high involvement products like electronics, smartphones etc.

This way customer will be encouraged to use digital payment method rather than Cash-on-Delivery.

Use Case 2: Friendly fraud:
Customers claim that they never made a purchase or that they did not receive the product or they received a damaged product. The customer resolves to chargeback request to customer service associate and his request is resolved immediately. The customer keeps the purchased product and even gets a refund for it.

Impact: According to a survey, $6.7 billion revenue was lost in 2016 due to chargebacks out of which 71% losses were due to friendly frauds owing to $4.8 billion for e-commerce industry (Shukairy, A, 2016). [38]

Probable solution: To reduce Friendly Frauds, 3D secure authentication should be enabled.3D secure (3 Domain Server) involves 3 parties (ecommerce merchant, bank of the merchant, card issuers like VISA and MasterCard) during the verification. The buyer creates a password for his card and while making a payment the card is verified at Domain of all the 3 parties involved, hence providing an extra layer of verification and secure payment (Sage Pay 2016). [39]

3.2 REVENUE LEAKAGES ON VENDOR SIDE:

This sub section deals with four major sources of revenue leakage on the vendor side, use cases, impact of such leakages to the company and probable solutions for resolving the same. The four major sources discussed in this section are (a) Delivery/logistics (b) Drop shipping Vendors, (c) Fraudulent vendors (d) Legal constraints.
Use cases, Impact and probable solutions of revenue leakages on vendor side:

3.2.1: Delivery/Logistics:

A major chunk of revenue is lost in the delivery of products by vendors and retailers. The cost of delivering to specific locations may sometimes be even more than the product cost which might go unnoticed and over a long period lead to major revenue losses.

Use case 1: Product intentionally not delivered / misplaced.
Amazon encounters threats from its new sellers. A fraudulent seller would sign up on Amazon seller account using false identity. These sellers create a product listing of high relevance and offer those products for sale. Customer places the order and is promised to receive the product in few weeks. The fraud seller has already received the money and would not deliver the product to customer. In this case Amazon had to pay the refund cost (Mann, S. 2017). [40]

Impact: The merchant bears the cost of refunds in case of fraud sellers as they do not deliver the product but have already received cost of product from the buyer.
Probable Solution: Implement a central system to carry out real-time stock management which ensures maintenance and safety of products.

Use case 2: Delivery of defective/fake products:
E-commerce vendors resort to selling fake or counterfeit products and pose legal issues for merchants. Like Flipkart and its sellers were charged by US based athletic footwear brand Skechers, for selling fake products. This came out after raids on warehouses of sellers in Delhi and Ahmedabad found more than 15000 pairs of fake shoes. Also, Snap deal's authorized vendor was arrested for selling fake HP Cartridges (Mukherjee, S. 2017) [41]
Impact: Fake or defective product create a dent in Brand image of the e-commerce merchant selling the product and the manufacturer.
Probable solution: To guarantee that a reliable vendor is associated with the company, an all-round vendor background check should be done. Any fraudulent activity linked in past to a vendor must not be ignored.

Use case 3: Theft of goods from warehouses:
Inefficient security and product maintenance at warehouses and retailer stores also lead to theft of products causing an unwanted risk and revenue leak. High involvement products are the most vulnerable. Sometimes the theft is attempted by internal employees of the sellers' company (DMS 2015). [42]
Impact: In case of theft of goods from warehouses, e-commerce Company and the seller both bear the losses. This creates an imbalance in inventory if the theft goes unnoticed.
Probable solution: Implement a Blockchain based tracing of goods to ensure right product reaches the customer. Each product is given a tag and is tracked along the delivery process so there is no misplacement of product even by the vendor or the delivery man (Uhlmann, Sacha. 2017). [43] Merchandising audits can be done at regular intervals in the warehouses by using bar codes and other technology (DMS, 2015) [42]

3.2.2 Drop shipping vendors:

Use case: Drop shipping vendors allow retailers to take orders from customers over their website and vendor would directly deliver the product to the customer. These vendors could deliver damaged products to meet the specified delivery time; this might also lead to wrong product delivery. Further, some vendors create legitimate sites and offer 1-2 months free services later as their products are listed they would intentionally deny commission to the retailer (Husak, S. 2014) [44]

Impact: Drop shipping can offer lesser margins. The quality of products may be compromised as owner is not involved in the warehousing and fulfilment of products.
Probable Solution: The best way to reduce expenses on drop shipping vendors is to implement in-house logistics and supply-chain system which will ensure higher margins and higher customer satisfaction.

3.2.3 Fraudulent vendors:
Vendors target festive seasons to earn extra by duping the e-commerce merchants. They resolve to product replacement, falsely raise prices on products and even initiate return on behalf of customer.

Use case 1: Inadequate vendor background check:
Use case: Ramesh Kumar, Bengaluru, fraudulently claimed Rs. 1.5 lakh from Flipkart as a vendor by ordering items at fake addresses and replacing the products with its replicas and later returned the fake product claiming the customers have provided wrong address (The Times of India, 2015) [45].
Impact: Flipkart initially paid the amount claimed by Ramesh to the settle the issue. The Brands image was at stake as its seller was involved in Fraud which compromised on Company Policies. Loss of Rs.1.5 Lakh was noted in this case.
Probable Solutions: To identify fraudulent activities by vendors, conduct surprise checks to evaluate the warehouse conditions and stock maintenance. This kind of physical checks can help in predicting any fraudulent practices by the vendor (Deloitte whitepaper 2016). [46]

3.2.4 Legal constraints:
E-commerce stores must abide by the compliances of area and regions. These constraints sometimes limit the approaches thereby reducing sales turnover.

Use case: UP and Uttarakhand Government in 2015 limited the selling of smartphones over 5000 in value from the E-commerce majors delivering the product from different states (Bailay, R., Sikarwar, D.2015). [47]
Impact: Loss of sales owing to large population in UP and Uttarakhand.
Probable Solution: To reduce hassles of restrictions by government in case of interstate shipments, the e-commerce companies can build their own warehouses and suppliers in such states and fulfil the orders.
1V. Conclusion:
The objective of this study was to understand the sources of revenue leakage in the ecommerce sector and propose a conceptual Revenue Assurance model to curtail these revenue leakages. The study focusses on 2 major areas of revenue leakage viz. Customer side, Vendor side. The paper discusses the use cases of revenue leakages in the abovementioned areas, impact of such leakages to the company and probable solutions for resolving the same.

This study will be beneficial to the Ecommerce companies to identify areas of revenue leakage in their company and how it can be resolved. Secondly it can be beneficial to consulting companies to understand the sources of revenue leakages and fraud management in Ecommerce companies who can be part of their clientele. The paper can also be useful to solution developing companies who are into Artificial intelligence, fraud management solutions etc. to develop solutions to the various revenue leakage problems faced by the Ecommerce companies.

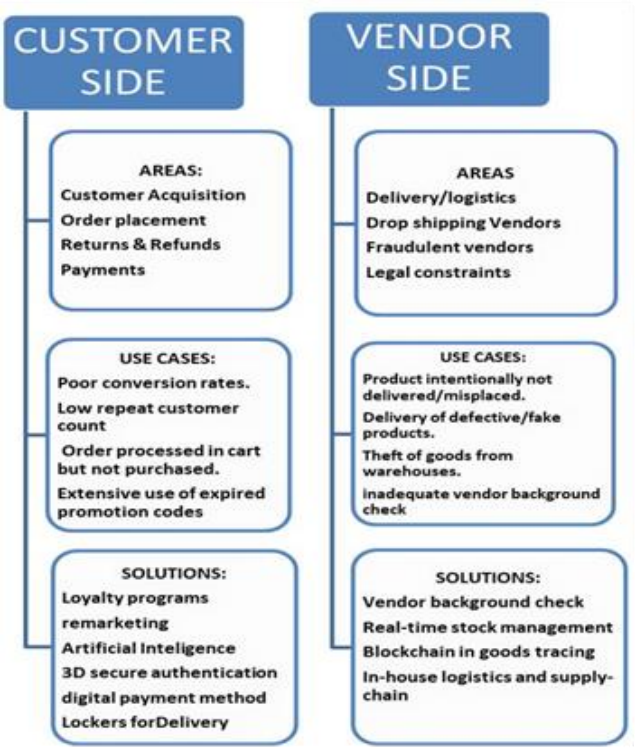

Figure 1: Revenue Assurance Model for the Ecommerce Industry: Sources of revenue leakage Areas of Customer side and Vendor side, Use cases and the probable solutions for the same

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Mobile Contactless Solution Using Near Field Communication (NFC)-Based Transport Payment Platform with Points Segmentation: An Improvement of Haversine Implementation

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Abstract:-- **The advent of global interoperability between Near Field Communication (NFC) smartphones and existing contactless technology can be a game changer for public transport infrastructure. A key application of NFC can be found in the field of contactless payment ecosystem. It can drastically change current systems of isolated technologies in public transport by providing new approaches for a national or international interoperable fare management scheme. In this study, a development of mobile contactless solution using NFC-based transport payment platform with points segmentation" was designed and developed to support public transport operators and passengers deploy NFC solutions that can enhance the efficiency of public transport system by allowing NFC-enabled mobile phone to read and write NFC card. Fares are calculated according to the distance travelled by generating consecutive pairs of distance traces called point segments where haversine algorithm was repeatedly applied for all the trace IDs. NFC enabled smartphone act as the contactless reader or a Ticket Vending Machine connected with the back end server that could provide online top-ups directly to the NFC card via payment gateway. Specifically, in this system, the Host Card Emulation (HCE) technology was used to allow tap-in and tap-out transactions to directly communicate with an NFC enabled smartphone instead of a physical sim or microchip card without collaborating with mobile network operator. The cloud-based application using Amazon web services was utilized to manage the computations of the encryption process and store sensitive data securely.**

KEYWORDS: Near Field Communication (NFC),Card Emulation Process, Haversine Algorithm,Transport Payment System.

I. INTRODUCTION

Near Field Communication (NFC) as a promising short range wireless communication technology which finds special application in the field of mobile consumer electronics and supports smartphone usage of billions of people throughout the world that provides diverse services ranging from payment system and loyalty applications to access keys for offices and houses.

It is intended for bidirectional data transmissions over a distance of up to 10 cm and a maximum data rate of 424 kB/s and works at an operating frequency of 13.56 MHz. NFC technology is based on Radio Frequency Identification (RFID) standards according to ISO/IEC 14443 that is compatible to present contactless smartcard technologies such as Mifare or NXP's Sony's Felica. NFC is standardized in ISO/IEC 18092 [1] and ECMA-340 [2] and ECMA-352 [3] respectively. The development of the specifications is driven by the NFC Forum, a consortium of financial services, developers, manufacturers among others [4].

Transport payment system is considered as one of the most promising applications of NFC [5]. Finkenzeller [6] stated that the public transport infrastructure is of great prospective for contactless chipcards and RFID. He recommends that transport associations can be improved using contactless chipcards through the combination of cashless payment, automatic fare management [7]. Today there are already some well-established transport NFC applications, such as the Oyster Card in London, ezlink Card in Singapore and the Super Urban Intelligent Card (Suica) in Japan and Octupus Card in Hongkong [8].

At present, the Philippine government has carried on its commitment to prioritize infrastructure development. It laid down strong foundations for the Build, Build, Build (BBB) Program by compelling several key steps to implement high-impact projects to address infrastructure backlogs and support economic productivity. There are on-going major infrastructure-related masterplans and roadmaps that are being conveyed to efficiently and appropriately address the infrastructure gaps and bottlenecks in the country. One of these project is the Philippine Transport System Master Plan (PTSMP) that

comprises further modernization of all transport infrastructures by developing modern technology, such as global positioning system (GPS) which will help in monitoring, tracking transport assets and lessen human error for a more seamless transportation.

Jeepneys and public utility buses in the Philippines uses two modes of payment process: the manual payment system where the conductor uses puncher to discharge tickets for the passenger, and through digital, in which the conductor uses a handheld device that print outs receipts. These prevailing methods are time-consuming, because some bus transport operators opt to calculate the amount of fare according to the distance and sometimes is the accuracy of giving change happens.

To lessen and somehow prevent these issues encountered, the researcher have come up with the idea of enhancing the methods of paying fares in the bus, by utilizing NFC-mobile payment system which consists of a phone to emulate the card to be used in the location detection mechanism via GPS. Based on the validations captured, the back end calculates an aggregated fare. NFC enabled smartphone act as the contactless reader that could provide online top-ups directly to the fare medium via payment gateway.

II. RELATED WORK

In today's world, technology is growing everyday and many networking communication technologies like blue tooth, Wi-Fi (wireless fidelity), infrared are existent. NFC is is a set of technologies that enable smart phones and other devices to establish radio communication with each other by bringing them all connected and provisioned with dedicated applications, which provides hundreds of millions of potential dedicated readers in contrast of the traditional dedicated payment infrastructure. All NFC peers can connect a third party NFC-enabled device with a server for any dedicated reconfiguration or action. [9] NFC device is classified into two categories:

A. I. Active Device: Those devices which require their own power supply. In this mode, initiator and target use self- established radio frequency to communicate.

B. II. Passive Device: Those devices which do not have their own power supply where target answer command are operated by initiator to call modulation scheme. Initiator do the radio frequency creation are known as Passive device[10] Different NFC tag type classifications are as follows: Tag 1 Type: The Tag 1 Type which is based on the IS0l4443A standard that are read and re-write capable which allows the users to construct the tag to become read-only. Memory availability is 96 bytes which is further sufficient to store other small amount of data or website URL with communication speed of 106 kbit/s. As a result of its simplicity this tag type is cost effective and ideal for many NFC applications Nevertheless, it is expandable up to 2k byte memory size. Tag 2 Type: The NFC Tag 2 Type is also based on IS014443A tags that are read and re-write capable and can be configured to become read-only. The basic memory size is only 48 bytes while this can be extended to 2 k byte with a communication speed of 106 kbitls. Tag 3 Type: The NFC Tag 3 Type is based on the Sony FeliCa structure and has a 2K byte memory size and has 212 kbitls data communications speed. Consequently, there is a higher cost per tag and is more suitable for multifaceted applications. Tag 4 Type: The NFC Tag 4 Type is considered to be well-matched with ISOl4443A and B standards, preconfigured at manufacture and can be either read 1 rewritable, or read-only. The memory capacity can be up to 32 kbytes and the communication speed is between 106 Kbit/s and 424 Kbitls [11].

Android is a mobile operating system (OS) based on the Linux kernel developed by Google. Based on direct manipulation user interface, Android is designed mainly for touch screen mobile devices such as computers, tablet and Smart phone with specialized user interfaces for wrist watches (Android Wear), cars (Android Auto) and televisions (Android TV). Despite being predominantly designed for touch screen input, it also has been integrated in digital cameras, game consoles and other electronic devices[14]. The proponent had gone through various existing systems and research papers that are related to this application, In this paper, transport payments are made using NFC contactless card emulated by NFC enabled smartphone via payment gateway which does not require any hardware or microcontroller device to set up the payment system which is more convenient and secure because the actual transaction between the passenger and the operator occurs in the cloud. The back end implements all the required logic for the primary fare collection processes [12]. The main drawback of this system is that it does not support offline capabilities where it should be able to use the system even when an Internet connection is not available. The main goal of another existing system is to establish payment transaction between two smartphone's SIM Cards. This application allows mobile operator to change the normal call center calls or auto attend to a nice look mobile application. The downside of this system is that NFC is only used to send a message to the receiver to tum on the Blue-tooth.[13]

Next is the web-based bus ticket reservation System that allows the passengers to check the bus ticket availability and pay the bus ticket fare online. The advantages associated with this system are that it allows the passengers aware of the availability of the ticket and avoids to line up

in a queue. But this system is a web based system and requires the user's to have a desktop system in place and user's should have a prior knowledge about the bus code (number) for their destination [14]. Another system is the BUS-TAP: A NFC based Travel Application which is consists of built in NFC service which utilizes Geo Locationing based on GPS. The current location of the bus can be monitored on its arrival at a specific stop. Also when the passenger taps on the NFC reader mounted at the bus door, the current location will be acquired and stored in the database and also while getting out off the bus the passenger taps the phone again to identify the destination location of the user. Based on the source and the destination the total travelling distance will be obtained and corresponding travel fare will be deducted from the user's account. The main difference of the existing system is that, a mobile phone is being used as a fare media which is to be tapped in the NFC reader. In this paper, NFC enabled mobile phone act as the contactless reader or a Ticket Vending Machine connected directly to the NFC card where the actual transaction occurs in the cloud. [15].

III. METHODOLOGY

A. Research Design and Framework

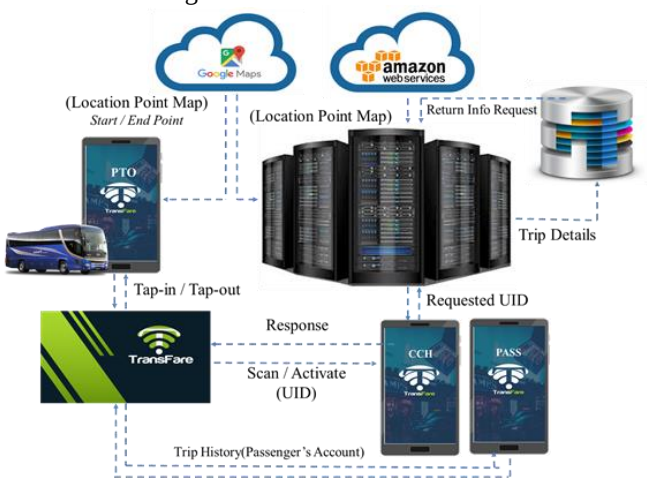

Fig. 1. Overview of the Project Methodology

Fig 1 presents the overview of the project methodology of TransFare application. This system was developed using the combined solutions of Android studio, React-native Framework, PHP, MySQL and AWS Web services. This research utilizes a hybrid System associated with Multi-Agent System, Mobile Cloud Computing and Web Service. The service-oriented architecture (SOA) and web services technologies are used in the system. SOA is a style of software design where services are distributed to the components by means of application components, using a communication protocol over a network. This architecture provides a model merging the benefits of both cloud computing and Mobile technology[17].

The above architecture describes the following process: The Admin application module writes and authenticate the NFC card with the passenger's information(initial card load balance and the card type). This NFC card is a Stored Value Ticket (SVT) and are of the credit card sized (ID-1) which conforms to the relevant ISO standards (ISO 144443). The device must be within 4cm to the NFC card before it can transmit account information. It reads the NFC card and extracts the data elements (Card's UID, Initial value, Validity Date, and Card Type. After reading the NFC card, the Admin application module sends the card's information to the server and register in the database The Public Transport Operator's (PTO)application module validates the check-in / check-out travel information of each passenger. Entry to the bus is through the use of NFC card by holding or tapping the card to the NFC-enabled smartphone situated at the designated area inside the bus.

Upon exit, the travel price is deducted from the stored value according to the distance travelled. The entry and exit validation taps are collected and priced according to the rules of Philippine bus fare matrix imposed by the Land Transportation and Regulatory Board (LTFRB). In case the remaining stored value prior to exit is below the price of travel, the passenger can pay cash instead. The central clearing house (CCH) will validate each transaction against another set of business rules. Each transaction passing these validations will be cleared. In case the transactions represent sales or usage (implying a transfer monetary value), the cleared transactions will be settled on a regular (e.g. daily) basis.

This system can only be used by an android NFC-enabled phone and must have an internet connection and a location provider or GPS. An important part of the PTO's mobile application module is the GPS location using the Google API; this module communicates with the Google server, by sending the authentication ID to access set of traces or point segments based from the start and endpoint of the passenger's journey.The server provides the general information in the MySQL database to generate a back up with all the travel's information. It stores NFC card's information and also forward it to the CCH in order to monitor the sales and revenue reports. Lastly, The passenger application module, allows the passenger to create an account validated by the CCH. It displays the current balance of the card including each trip history information.

B. Distance Calculation Algorithm

The distance travelled is computed from the coordinates of the origin up to the destination using the Haversine algorithm. As shown in Figure 2 is the route of the bus via

Manila East Road. It has a total of 24 kilometers from the terminal. Distance and fare calculations is consist of two stages. The first stage in this method is to divide the route in small segments as the vehicle change its direction thus, each point segment is given a unique serial ID from the start of the route.

Fig. 2. Point Segmentation

The second stage is matching the received GPS traces to point segments and each trace ID is then associated with a point segment ID. To get the coordinates associated with longitudes and latitudes, the distance computation and the haversine algorithm was repeatedly applied for all consecutive pairs of traces (Ti-1, Ti) in the set T'.

The Haversine formula is an equation significant in navigation, providing great-circle distances between two points on a sphere from their latitudes and longitudes. These names follow from the fact that they are usually written in terms of the haversine function, given by haversin (θ) = sin2 (θ/2). The haversine formula is used to calculate the distance between two points on the Earth's surface specified in longitude and latitude.This is perhaps the first equation to consider when understanding how to compute distances on a sphere.

The following equation below where λ is longitude, φ is latitude, R is earth's radius (mean radius = 6,371km) is how it translate to include longitude and latitude coordinates. Note that angles need to be in radians to pass to trig functions:

$a = \sin^2(\varphi B - \varphi A/2) + \cos \varphi A * \cos \varphi B * \sin^2(\lambda B - \lambda A/2)$

$c = 2 * \text{atan2}(\sqrt{a}, \sqrt{(1-a)})$

$d = R \cdot c$

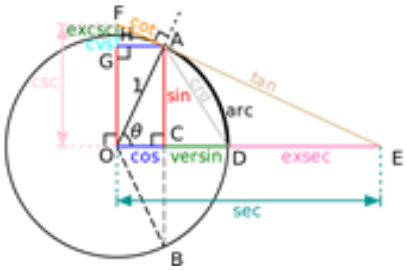

Fig. 3. Haversine Great Circle Distance

The algorithm works as follows:

1. Start
2. Tap-in to store the initial point
3. Tap –out to store the end point
4. Get displacement from polygon thru point segmentation
5. Calculate the Haversian distance between the coordinates obtained from step 2 to each of the coordinates obtained in step 3.
4. Calculate the minimum Haversian distance from the results of step 5.
5. Return the obtained distance from step 4 to the server.

IV. DISCUSSIONS

Functional requirements specify specific functions or behaviors on how a system component must be able to perform. The functional requirements of the system are:

A. Registration

The system is able to provide certain concessionary recognized goups in the Philippines as mandated by the Philippine government (i.e. extra loud for people with hearing impairments). The discount products trigger an audio signal at check-in and check-out. Procedural measures must be taken to detect fraud effectively, but not each passenger has to be checked. The card registration activation process can generate NFC Tag UID by placing the NFC card against the NFC-enabled mobile. A save button will insert the newly activated card in the database.

B. Provision

The system is be able to provide the user a way to authenticate into the application, such that only the right user has access to the system and user's own private data. The Central Clearing House can create dedicated PTO accounts in the cloud, as the equivalent load retailer and bus application module owner as in Fig 4. Also, NFC contactless card allows the merchants to modify its validity period.

Fig. 4. PTO and Passenger's Module

Moreover, the system allows the commuters to use the system's services, by creating a personal, individual account from his/her NFC enabled device authenticated by

the central clearing house or the merchants as in Fig 5. NFC-enabled devices provide convenience for both the transport operator and commuters. It can be used to purchase top-ups directly to the fare medium by tapping the NFC card against the mobile device. This ensures that the user no longer has to travel to find a ticket machine in order to top up his/her NFC card. The system provides a financial gateway platform that allows simple, private, and secure payments on a large number of websites.

C. Access Control (Validation)

The entry and exit validation taps are collected and priced according to the rules of Philippine bus fare matrix, and an over-all aggregated revenues is made to the linked bank card account of the PTO. Increasingly, this validation is being performed on the cloud. In case, a slow internet connection happens, the smartphone still performs reading of NFC cards but the private data is stored, secured, and accessed on the Cloud. The application displays audio and visual signals including the travel information of the passenger. These actions can be done after the authorization response is sent to the application for performance reasons.

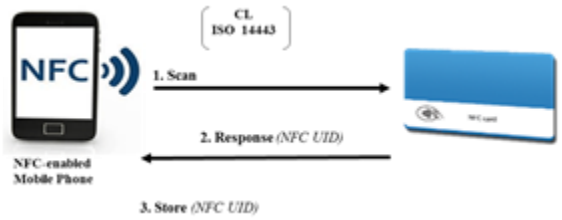

Fig. 5. NFC Read/Write

Fig 5 shows the reader/writer operating mode used in the location detection mechanism via GPS. It runs on 13.56 MHz frequency with a data transfer speed up to 242 Kbit/s. This makes it compatible to emulate the current contactless NFC cards. The key aspect of this period is to validate the proximity of the card to the NFC enabled device. Later in this process, a message was used to match it with the same message stored in the online real-time transaction monitoring module. The function of this phase is crucial to the process of preventing the relay attack.

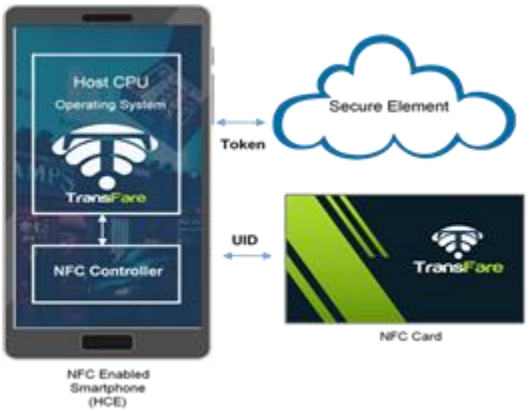

Fig. 6. Cloud-based HCE Solution of TransFare

Fig. 6 depicts the cloud based HCE system of the developed system, the data on actual usage of the public transport is real-time available for the PTO. Both during sales and during validation it is possible that sales are to be transferred from the account of the Merchants to the account of every PTO validated in the system. The PTO's TransFare mobile application in a cloud based ticketing system act as a relay between the fare medium and the back end. Transfare application communicate directly to the CCH terminal without having to go through a SE and Trusted Service Manager, and without having to conform to the many card provisioning restrictions often placed on issuers by mobile network operators when SEs are in place. HCE leverages tokenization to ensure data security and the intelligence associated with those transactions to the network and control over authentication to the issuer.This permits transport authorities the possibility to use existing NFC phones to load NFC cards securely. In all cases the passenger is enabled to do home-loading of cards by installing the TransFare application and placing the NFC card against the NFC-enabled phone for tops ups, this will automatically redirect the payment system via payment gateway.

Comparison Between Percentages of Changes:

The distance calculation were tested in two distance calculation methods namely Google Maps(on-road) and Open street map. Table 4.4 shows the comparison between the percentages and error rate of changes in distance.

Percentages of changes between On-road mobile application and TransFare.
=((Point segmentation-GM)/ GM)*100%
Percentages of changes between OSM mobile application and TransFare.
=((Point Segmentation-OSM)/ OSM)*100%

From the data it shows that between Point segmentation and Google Maps distance, the maximum changes in data

is 1.6990291%, minimum changes in data is -7.93650793% and average Changes in data is -0.62732549%. From the analysis it can be considered that this system, it has an error of +-0.006273255% average. So the error is very much little negligible. So the acceptance of the distance data is high.

Between Point segmentation method and OSM distance, the maximum changes in data is 37.50000 %, minimum changes in data is -19.61538 % and average Changes in data is 0.63294 %. From the analysis it can be considered that this system, it has an error of +- 0.006329433 % average. So the error is very much little negligible. So the acceptance of the distance data is high.

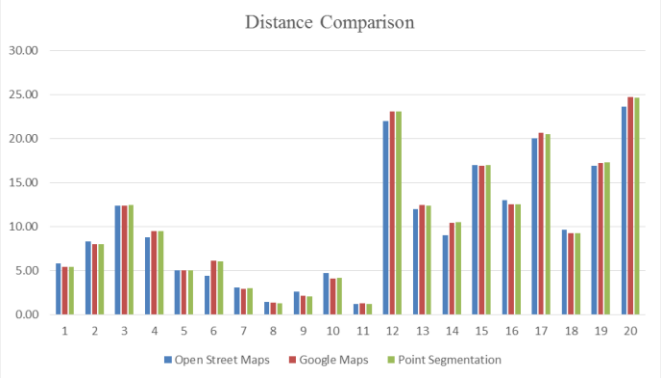

Fig 7. Distance Comparison

Table I. Comparison Between Percentages of Changes

Distance Comparison			**Error Rate**	
OSM	Google Maps	Point Segmentation	Error Rate Google Maps	Error Rate Open Street Map
5.80	5.38	5.40	0.003717472	-0.068965517
8.30	7.97	7.98	0.001254705	-0.038554217
12.35	12.39	12.42	0.002421308	0.005668016
8.80	9.46	9.44	-0.002114165	0.072727273
5.01	5.06	5.03	-0.005928854	0.003992016
4.40	6.08	6.05	-0.004934211	0.375
3.09	2.95	2.98	0.010169492	-0.035598706
1.40	1.33	1.26	-0.052631579	-0.1
2.60	2.11	2.09	-0.009478673	-0.196153846
4.70	4.12	4.19	0.016990291	-0.108510638
1.21	1.26	1.16	-0.079365079	-0.041322314
22.00	23.08	23.05	-0.001299827	0.047727273
12.00	12.43	12.37	-0.004827031	0.030833333
9.01	10.43	10.49	0.005752637	0.164261931
17.00	16.89	16.95	0.003552398	-0.002941176
13.00	12.54	12.52	-0.001594896	-0.036923077
20.00	20.63	20.51	-0.005816772	0.0255
9.60	9.25	9.23	-0.002162162	-0.038541667
16.87	17.21	17.28	0.004067403	0.024303497
23.59	24.71	24.63	-0.003237556	0.044086477

V. CONCLUSIONS

A new smart phone based and promising break-through service for NFC implemented public transport payment contactless solution has been designed and developed. This provision could fuel the growth of the NFC ecosystem and be lucrative by itself. Successful NFC processes between android-based smart phones and NFC card has been done. Payment collection system has been established based on the total distance travelled and corresponding travel fare was deducted from the user's account. The haversine algorithm was repeatedly applied for all consecutive pairs of traces to calculate the distance between two points considering the latitude and longitude of those places is very accurate. The results obtained showed a significant improvement over the manual process of issuing tickets to the passenger. The accuracy of the developed system relies on the GPS coordinates generated through satellites while reliability of the system depends on the GPRS facility. And lastly, HCE considerably changes card emulation execution requirements and introduces entirely new business plan considerations for service providers and PTOs.

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Effectivity of Ciawi and Sukamahi Dam on Jakarta Flood Control

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***Abstract*:-- Various infrastructures such as flood levees, dams and reservoirs of flood control began to be developed in the 19th century to the 20th century. These buildings are very effective in controlling the flow of rivers and preventing flood waters from entering residential areas located in flood-prone areas. Flooding in urban areas has a huge impact, covering all aspects of life as well as on the landscape. Ciliwung is one of the rivers that allegedly contributed to the problem of flood in Jakarta, various engineering done on Ciliwung to help control flooding in Jakarta. One of the engineering done is the construction plan of Ciawi Reservoir and Sukamahi Reservoir. In this research, the writer performed the flood calculation using Nakayasu while method of flooding is calculated using the pool routine level method. The effectiveness of these two reservoirs can be determined by simulating floods in the existing condition and comparing them with the flood simulation after the construction of the dam. The final test of this research is to determine the effectiveness level of Ciawi and Sukamahi dam infrastructure in reducing flood volume in Jakarta.**

Keywords: Effectivity, Flood infrastructure, Flood simulation, Pool routing level

I. INTRODUCTION

Jakarta is the capital city of Indonesia, the city is located between 5 ° 19'12 " - 6 ° 23'54 "LS and 106 ° 22'42" - 106 ° 58'18 "East longitude with an average height of approximately 7 ASL (Above the sea level). Jakarta has an area of ± 664 km2 with a population of 9.6 million inhabitants who are in 2.2 million families in 2010[1]. As the administrative, governmental and economic center, Jakarta has developed very rapidly to the surrounding buffer zone. The Ciliwung River is one of 13 rivers that passes through Jakarta and empties into the Java Sea. In addition, this river is a very influential river in Jakarta. Ciliwung has a river length of 120 km, with a watershed area of 400 km2. The Ciliwung watershed is one of the watersheds in Indonesia that falls into the watershed category with critical condition [2]. This is due to the transfer of land function in the upstream area from its initial function is as a catchment area into tourist areas and settlements.

Of the 13 rivers flowing in DKI Jakarta, the Ciliwung River has the greatest impact during the rainy season as it flows across many villages, densely populated housing, and slums. From population statistics of DKI Jakarta, it is known that the people who live on the banks of the River Ciliwung for 350,000 people with the number of buildings as many as 70,000 units. The river is considered a river that suffered the worst damage compared to other rivers in Jakarta and has the potential to cause flooding in Jakarta.

Flood is one of the disaster that almost every year hit Jakarta. The largest floods that occurred in the last decade occurred in 2007. This flood inundated more than 40% of Jakarta City, 80 people died and 340,000 were displaced [3]. Various efforts have been made by the government in flood prevention, both structurally and non-structurally. Structurally flood control systems in the Ciliwung River include the creation of a number of flood gates or flood observation posts. In addition, prevention of flood flooding to certain heights with embankments, as well as lowering the flood water level with normalization, sludge, canal flood, and interconnection. The core concept of the canal flood is the control of water flow from upstream and regulate the volume of water entering Jakarta. In addition, the government is also working to minimize flood discharge with reservoirs, as well as to reduce puddles with polders, pumps and drainage systems.

The main problem in controlling rainfall runoff in urban areas generally consists of the need to control peak discharge and flow depth throughout the system, in order to avoid undesired puddles. Peak discharge is a commonly chosen alternative. These additives have the added benefit of allowing for infiltration and evaporation so that in addition to reducing peak discharge also minimizes runoff volume. Temporary in-situ or pool-like containers as well as a sediment container, can also serve as a means of controlling water quality.

Many studies and flood control efforts have been undertaken to reduce the flood loss occurring in Jakarta.

Ciawi and Sukamahi Dam is one of the infrastructure designed by the government to reduce the peak flood and increase the peak flood time in Jakarta. Dry Dam Ciawi and Sukamahi are the first dry dams built in Indonesia. Dry dams can be used to temporarily withstand excess water during floods and freely deliver during normal conditions [4]. The purpose of this study is to calculate the effectiveness of the construction of Ciawi and Sukamahi reservoirs as one of the infrastructures that will function as one of the means to reduce the flood peak in Jakarta.

II. STUDY AREA DESCRIPTION

Astronomically, the Ciliwung River is located at 6^{O}05'-6^{O}50 'LS and 106^{O}40'-107^{O}00' BT. The Ciliwung River Basin area is limited by the Cisadane River Basin on the west and the Citarum River Basin on the east. From population statistics of DKI Jakarta, it is known that the people who live on the banks of the River Ciliwung for 350,000 people with the number of buildings as many as 70,000 units. The river is considered a river that suffered the worst damage compared to other rivers that flow in Jakarta.

Administratively, the location of the Ciawi Dam is located in the upper part of the Ciliwung River in Ciawi Village, Megamendung Sub-district, Bogor Regency. The Sukamahi Dam is located on the Cisukabirus River in Sukatii Village, Megamendung Sub-district, Bogor Regency. Geographically, Ciawi Dam is located at 106º52'20 "East Longitude, 06º39'28" South Latitude, Sukamahi Dam is located at 106º52'20 "East Longitude, 06º40'12" South Latitude.

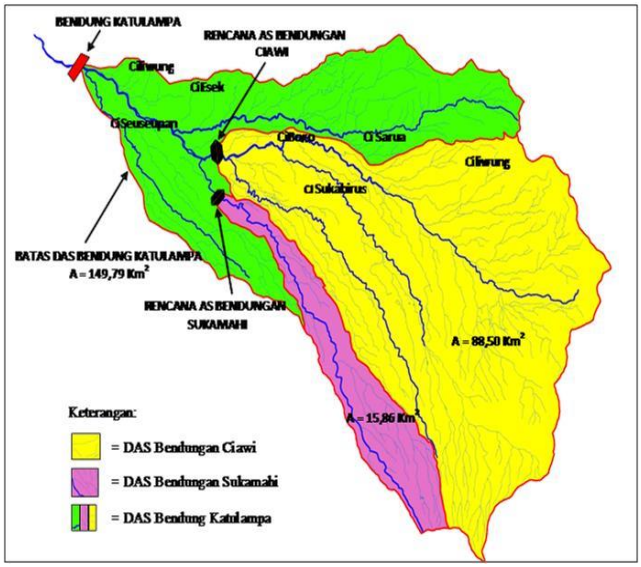

Fig. 1. Watershed division

III.BASIC THEORY

The use of HSS Nakayasu method requires some characteristics of the parameters of the stream region, as follows [5]:

$$R = 1 - (1 - P)^n \quad (1)$$

With P acting as time of peak, time lag, time base of hydrograph, watershed area, or length of longest channel. The formula to Nakayasu unit hydrograph is:

$$Q_p = \frac{C \,.A\,.\, R_0}{3.6\,(0.3T_p + T_{0.3})} \quad (2)$$

With

Q_p : Flood peak discharge (cms)
R_0 : Unit rainfall (mm)
T_p : Peak time (hour), formulated with $t_p = t_g + 0.8\, t_r$
$T_{0.3}$: Time required to reach 30% of peak flow (hour), formulated with $T_{0.3} = \alpha . t_g$
A : Drainage area (km^2)

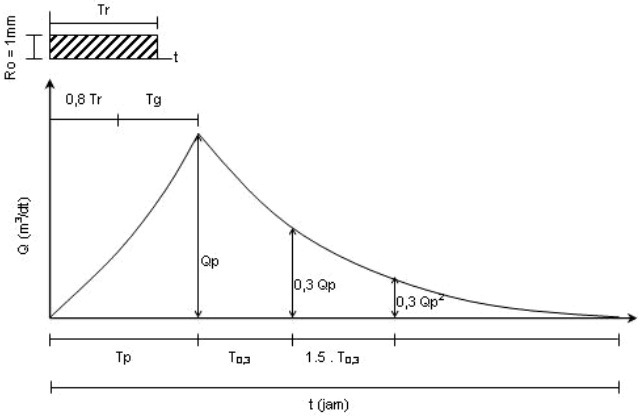

Fig. 2. Nakayasu unit hydrograph

Flood tracking through a reservoir is conducted to determine the effect of the discharge that enters the reservoir at a time against the discharge out through the reservoir at the same time. Water stored in a reservoir is removed through the reservoir through a spill system located on the dam body. The spill system on this dam may use a bottom outlet, a top weir system, or a combination of the two spill systems. Before performing flood tracking, a rating system of the spillway is firstly assessed to determine the relationship between the water level in the reservoir and the outflow through the spill system.

The level pool routing is a procedure for calculating the outflow hydrograph of a flat-faced reservoir, wherein the given inputs are inflow hydrograph and storage-outflow

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characteristics. Based on the following continuity equations [6]:

$$\frac{dS}{dt} = I(t) - Q(t) \quad (3)$$

If the variation of the inflow and outflow at an interval is estimated to be linear, then the change in storage at the interval, Sj + 1 - Sj, can be determined by rewriting the above equation to be:

$$S_{j+t} - S_j = \frac{I_j + I_{j+2}}{2}\Delta t - \frac{Q_j + Q_{j+1}}{2}\Delta t \quad (4)$$

In principle. the calculation used to approach the discharge going through the spill system is to use the principle of conservation of mass. The approximate formula for knowing the flowing discharge in this system at any water level is:

$$Q = C_d \,.\, A \,.\, V \quad (5)$$

Where:

Q : Discharge through bottom outlet (cms)
C_d : Discharge coefficient (0.6)
A : Intake area of bottom outlet (m^2)
V : Water velocity through bottom outlet (m/s)

The overflow system allows water to flow and to melt through the shrubs of a dam or dam. To know the relationship between water level with discharge discharge can be used formula:

$$Q = C_d \,.\, L \,.\, h^{3/2} \quad (6)$$

Where:

Q : Discharge over the weir (cms)
C_d : Discharge coefficient (1.28)
L : Weir width (m)
h : Water height above the weir (m)

IV. METHODOLOGY

As for the methodology used in this research, it will be explained here.
The first step to be done is to gather required data, such as thematic maps, especially that of upper Ciliwung area. The thematic maps should cover land use distribution, digital elevation model, river, and such. These maps are needed to determine the boundary of the watershed.

After determining the boundary, it is necessary to determine the properties of the watershed, such as slope, land use distribution, and area. Another information that should be gathered is the rainfall data from rainfall gages around the watershed which has influences over the watershed area. The combination of those data can produce the proper result for effectiveness calculation of Ciawi and Sukamahi Dam in Ciliwung River.

The complete steps for this research is in the following flowchart:

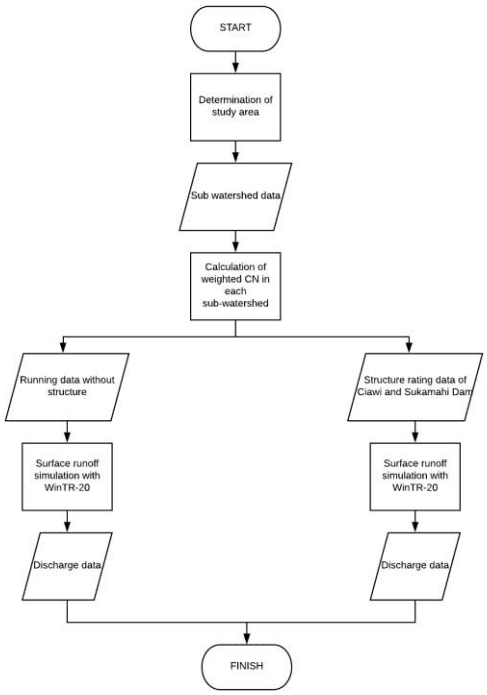

Fig. 3. Research flowchart

V. RESULTS AND DISCUSSIONS

From the results of flood calculations with return period of 100 years at 3 points ie Ciawi dam. as Sukamahi Dam and the water gate of katulampa. The resulting flood discharge on Ciawi Dam for 546.20 cms. Sukamahi Dam 143.22 cms and At Water Gate Katulampa of 734.51 cms.

	Discharge			
	Inflow (cms)	Outflow (cms)	Flood reduction (cms)	Effectivity (%)
Ciawi Dam	546.20	478.56	67.64	12.38
Sukamahi Dam	143.22	117.07	26.15	18.26
Katulampa Weir	734.51	664.32	70.19	9.56

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Hydrographs of flood tracking results at Katulampa gates that can show the effectiveness of the two infrastructures development can be seen in the following graph.

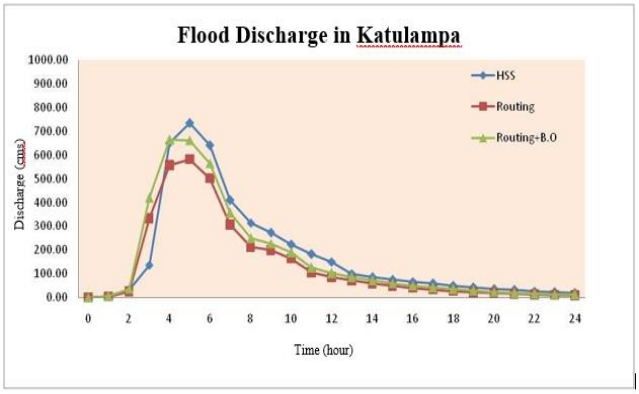

Fig. 4. Flood discharge in Katulampa

The maximum reduction rate of flood intensity that will occur in Jakarta area in Ciliwung watershed is 9%. Based on the terminology theory of Integrated Stormwater Management Plan (ISMP) [7] has been well recognized by local governments as well as by various agencies working in the environment agencies in British Columbia, Canada. ISMP is used as a tool for planning rainwater management and its runoff with a comprehensive and integrated approach as illustrated in the following diagram.

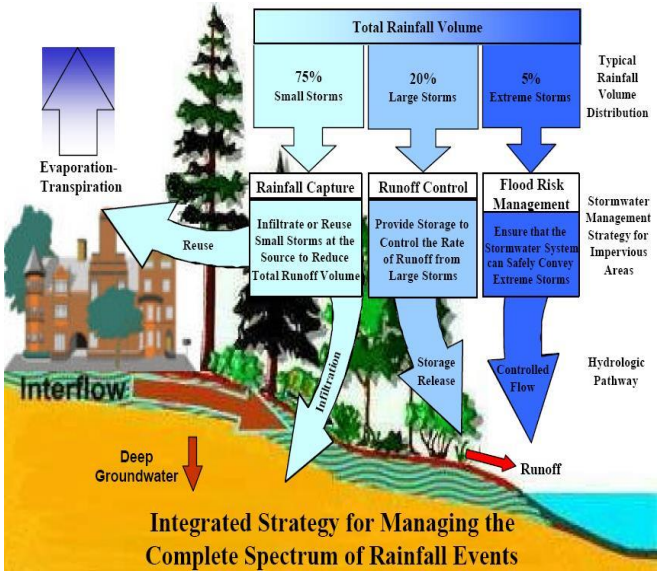

Fig. 5. Integrated strategy of stormwater management

Land development innovation and rainfall management, with catchment area-based ecosystem approach [8] is a new paradigm in rainfall management system that is expected to improve flood mitigation effectiveness. Appropriate as described in the following table:

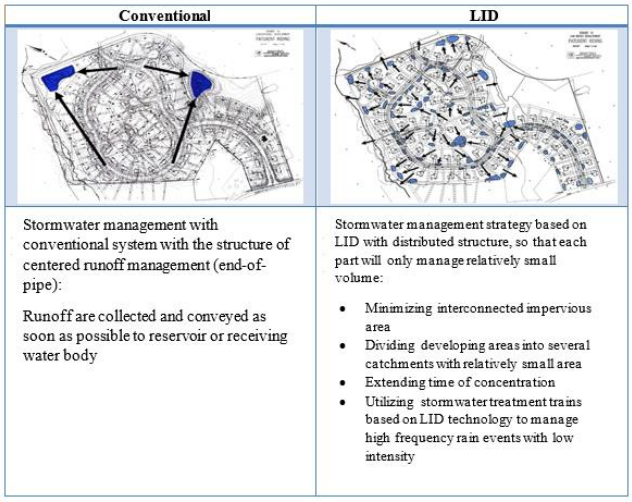

Fig. 6. LID concept

CONCLUSION

The above flood calculations are then routed with methods that generate outflow discharge at each dam is 478.56 cms at Ciawi and 117.07 cms on Sukamahi. Therefore. the effectiveness of the Dam to the Flood Debit with 100-year return period of 11.56% at the Ciawi Dam and 18.25% at the Sukamahi Dam.

After routing on both dams. then the flood discharge at the water gate Katulampa of 664.32 cms with flood reduction value 27.80 cms and the effectiveness 4.01%

Based on the results of this study, researchers will conduct further research that is by trying to apply the theory of integrated rainfall management using GIS (Geographic Information System) to map the spread of reservoirs in sub-sub areas. Planning of dam infrastructure with spatial distribution is expected to assist the process of flood reduction due to the placement of retention ponds in accordance with the basic concept of Low Impact Development.

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Wetland as Revitalization Pond at Urban Area Based on the Ecohydrology Concept

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***Abstract*:-- Universitas Indonesia (UI) has a campus in Depok with six ponds, five of which are artificial ponds and one of the catchment area that operates in the central Ciliwung Sub-watershed. The ponds (Kenanga, Agathis, Mahoni, Puspa, Ulin and Salam "KAMPUS") are designed as one of the catchment area, referring to Presidential Decree No. 32/1990 about the management of protected areas, ponds as catchment areas, flood controllers, and groundwater runoff. However, due to uncontrolled development in the catchment area of the UI pond system, KAMPUS cascade ponds transformed into a "toilet" which accommodates the liquid and solid waste of its catchment area. The mechanism designed for management in the KAMPUS cascade pond system is to utilize the cascade pond as a stabilization pond (improving water quality). One of them is utilizing Agathis cascade pond as a constructed stormwater wetland system, which is a pretreatment for the inflow to the KAMPUS pond system. This constructed wetland design is planned with several mechanisms: precipitation, filtering, chemical process by utilizing plants for absorption, nutrient transformation and eliminating pathogens. The result shows that this constructed wetland gives the water quality improvement percentage up to 87%. Water quality on effluent conforms with the water quality standards for irrigation and planting (grade 4) referring to Government Regulation No. 82/2001 about Water Quality Management and Pollution Control.**

Keywords: KAMPUS cascade pond; Constructed Wetland; Pond Management; water and environmental quality; Water Quality Standard.

I. INTRODUCTION

Universitas Indonesia (UI) is the only university in Indonesia ranked 79th of the top 100 best universities in Asia [1] and ranked 62nd of the best universities in the World by UI-Green Metric [2]. UI campuses are located in Salemba and Depok. UI campus in Depok has six cascade ponds, five of which are artificial cascade ponds. The six cascade ponds are named K.A.M.P.U.S which stands for Kenanga-Agathis-Mahoni-Puspa-Ulin-Salam, names of Indonesian endemic trees [3].

Fig. 1. UI Campus, Depok

Table 1. UI Depok Campus ponds

No.	Name	Area (m^2)	Established in the year
1.	Kenanga	28.000	1992
2.	Agathis	20.000	1995
3.	Mahoni	45.000	1996
4.	Puspa	20.000	1995
5.	Ulin	72.000	1998
6.	Salam	42.000	1998
	Total	227.000	

UI cascade pond system, established in the 90s, is designed as part of educational and recreational facilities, as well as water catchment area. As an educational facility, UI pond serves as a support tool for academic community research. As recreational facility, especially Salam and Kenanga cascade pond, they are often visited by both UI academic community and neighborhood. While as a water catchment area, referring to the Presidential Decree No.32/1990 about the management of protected areas, the ponds are acting as catchment areas, flood controllers, and groundwater runoff. After approximately twenty years since the cascade ponds were established along with the poorly planned development of Depok city, UI cascade pond is almost transformed into a massive garbage dump, with water quality continuously declining, and contaminated by various pollutants from its catchment area [3].

To improve the existing water condition on KAMPUS cascade pond, the collaborative rescue plan, water health audit has been conducted for water catchment area UI pond in 2016 and produced information of KAMPUS pond conditions. Assessment of water conditions based on recommendations from the Center for Watershed Protection, requires information of the percentage of impervious land cover.

Fig. 2. Catchment area of UI ponds and their surroundings

Based on the result of measurement of catchment area UI Depok Campus and impervious land cover map, it is known that the percentage of impervious land cover is 60%. The research from Center for Watershed Protection (CWP) in 2003 [4] indicates that the condition of catchment area KAMPUS pond is already in damaged condition with obvious decreasing water quality, especially in Agathis cascade pond, which is directly related to the sub-system outside UI Campus.

The purpose of this paper is to provide proposed management of cascade pond in urban area based on the ecohydrology concept by utilizing constructed wetland technology. The constructed wetland method will be applied to Agathis cascade pond with the aim of improving the water quality, restoring biotic integrity and making the landscape elements of UI Depok Campus.

II. METHODOLOGY

Wetland is an intermediate area between land and water bodies. Characteristics of wetland both natural and constructed according to United State Department of Agriculture (USDA, et al., 1995) is the availability of surface water in the area on a regular basis. Hydrologically, the stream present in wetlands is generally a stream with low velocity, shallow water and saturated soil conditions. Agathis cascade pond Constructed Wetlands are designed, planned, manufactured and operated to deliver various purposes. In accordance with its philosophy and approach, Constructed Wetlands are multi-purposely made, such as for waste treatment, provision of habitat and wildlife diversity, supporting recreational activities, storing water during the dry season, and adding aesthetic value to the environment [5].

Implementation of Constructed Wetland Technology has not been popular in Indonesia because the studies and publications are still lacking. Constructed Wetland is one of the water waste treatment solutions that rely on the roots of aquatic plants (swamp plants) for filtration, medium and bacteria to treat various water waste such as BOD, SS, pathogenic bacteria, nutrients and heavy metals. Constructed Wetland is an effective, inexpensive and easy maintenance technology [6].

Constructed wetland development on Agathis cascade pond is designed with more controlled treatment, by setting Hydraulic Retention Time (HRT) and Hydraulic Loading Rate (HLR) [7] to consider its dimensions. From the hydraulic aspect it can be classified into Constructed Wetlands with Free Water Surface (FWS) and Sub Surface Flow (SSF). Based on flow patterns, Constructed Wetlands can be classified according to horizontal and vertical flow directions [7].

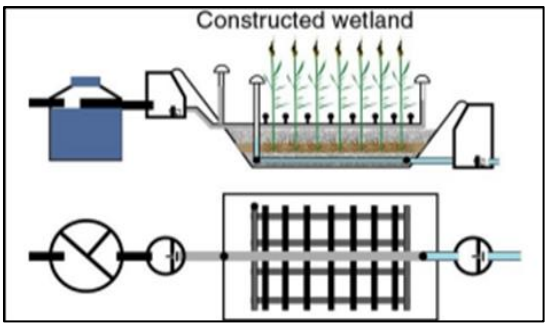

Fig. 3. Constructed wetland with horizontal flow pattern (HSSF)

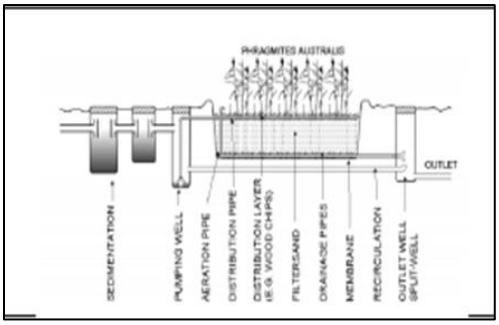

Fig. 4. Constructed wetland with vertical flow pattern (VSSF)

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The pollutant reduction mechanism designed in constructed wetland is carried out by physical, chemical and biological processes as listed in table below:

Table 2. Pollutants and their respective process in wetland

Pollutant	Process
• Organic Materials (measured through DO) • Organic Contaminant (pesticide) • Suspended Solid (TSS)	• Biological process, sedimentation, absorption by microbes • Adsorption, volatilization, photolysis, biotic/abiotic degradation • Sedimentation

Water management systems in this wetland system are affected by climate and weather, hydroperiod, hydraulic residence time, loading rate, groundwater exchange, and ET [8]. Wetland water balance calculations for FWS Constructed Wetland are shown in Equation below [9]:

$$\frac{dV_w}{dt} = Q_i + Q_c + Q_{sm} - Q_o - Q_b - Q_{gw} + (P - ET)\,A_w \quad (1)$$

Where V_w is the water volume or storage in wetland (m^3); t is time (day); Q_i is the level of water waste inflow (m^3/d); Q_c is the catchment area runoff discharge (m^3/d); Q_{sm} is melting snow discharge (m^3/ d); Q_0 is outflow discharge (m^3/d); Q_b is the berm loss rate (m^3/d); Q_{gw} is the soil infiltration (m^3/d); P is the rainfall (m/d); ET is the evapotranspiration (m/d); and A_w is the wetland water surface area (m2). In this design, groundwater, or discharge (Q_{gw}), berm loss rate (Q_b) and (Q_{sm}) melting snow discharge are negligible and the system is assumed to be steady state.

Water demand in wetlands are calculated by considering the dimensions of wetland, depth of design, porosity of soil medium and resident time. The water discharge demand to irrigate this wetland is 0.0043 m^3/s or about 4.3 liters/sec.

III.RESULTS

In the Agathis Constructed Wetland design, the water waste (gray water) enters the trash trap and sedimentation basin, so that the water is free of debris and the amount of incoming sediments has decreased significantly. Out of the sedimentation pool, water enters through the channel into Pool A. This pool serves as a controller for the discharge that enters the Wetland, and pool A also has a "by pass" channel to pass water in the rainy season. Based on the speed of water enters through the wetland, it can be known that the resident time in wetland is 10 days. Pollution removal is calculated based on the area of wetland, temperature, and flow rate in wetland using the following equation.

$$A_w = \left(\frac{0.0365\,.Q}{K_A}\right).\ln\left(\frac{c_1 - c^*}{c_e - c^*}\right) \quad (2)$$

where A_w is the required area (ha); Q is the water discharge; C_i is the inflow concentration (mg/L); c^* is the background concentration (mg/L) (1.0 BOD and TSS); and C_e is outflow concentration (mg/L); K_a is the first temperature-dependent constant of the first order of the area at temperature T. K_a can be calculated using the following equation.

$$K_A = K_{A,20}\,.\,\theta^{(T-20)} \quad (3)$$

Where $K_{A,20}$ is the first-order constant of the area at 20 ^oC, and θ is the design parameter.

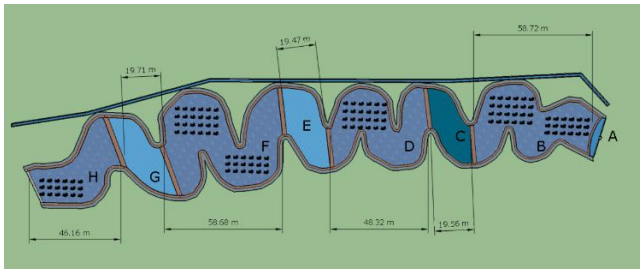

Fig. 5. Plan view of Agathis stormwater constructed wetland

In the calculation of Table 2, it can be seen that the effluent concentration of Agathis Stormwater Constructed Wetland conforms with the Class 4 Water Quality Standard.

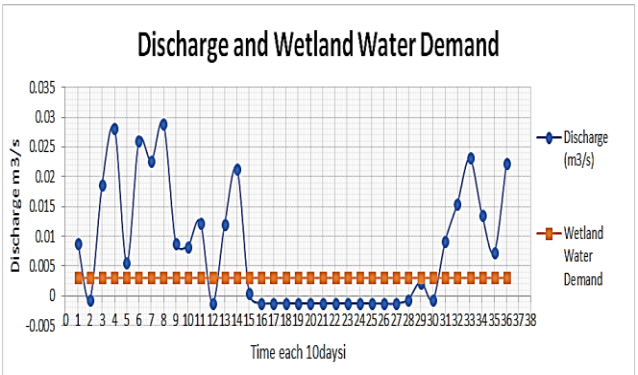

Fig. 6. Discharge and wetland water demand over the days

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Table 3. Pollutant removal of Agathis constructed wetland

Pollutant	Ci (ppm)	Ce (ppm)	Water Quality Standard (Grade 4)	% Removal	K_{20}	T (^oC)	θ	Ka	Qav (m^3/d)	A (ha)	A(m^2)
BOD	17.48	1.20	12	93.15	34	29	1	34	259.10	0.7455	7455.18
COD	50	3.43	100	93.15	34	29	1	34	259.10	0.7455	7455.18
TSS	96	0.39	400	99.60	70	29	1	70	259.10	0.7455	7455.18
Nitrat N	1	0.13	20	87.49	17	29	1.05	26.37	259.10	0.7455	7455.18
TP	12.8	4.97	5	61.17	12	29	1	12	259.10	0.7455	7455.18
Fecal Coli (cfu/100 ml)	2200	139.37	2000	93.67	35	29	1	35	259.10	0.7455	7455.18

CONCLUSION

This design demonstrates the feasibility of Stormwater Constructed Wetland for domestic (gray water) water waste treatment in Universitas Indonesia. This Wetland not only improves the quality of water waste but also stores large amounts of water that can be used for other purposes such as plant watering. The result shows that the level of pollutants in the water waste can be reduced to 61% after 10 days in the area of 0.745 ha of constructed wetland system.

Wetland needs water to continue throughout the year with a constant discharge of 0.0034 m3/s or about 3.4 liters/second including the calculation of water lost due to evapotranspiration.

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Theory of a quantum artificial neuron based on superconducting devices

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***Abstract*:-- An artificial neuron using superconducting devices, so-called rf SQUID, working at the quantum-mechanical domain is studied. It is shown that quantum rf SQUID regarded as flux qubit can act as an artificial neuron with sigmoid function generated by coherent quantum-mechanical transitions between wells in double well potential representing rf SQUID.**

Keywords: Artificial Neural Networks, Superconducting Quantum Interference Devices (Squid), Sigmoid Function, Superconducting Neurons.

I. INTRODUCTION

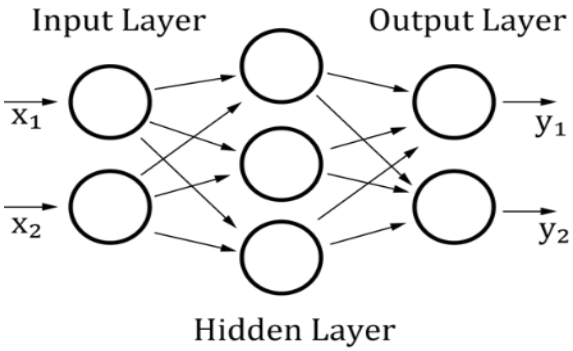
Artificial Intelligence has emerged as a practical technology, with successful applications in many fields like pattern recognition, especially when the underlying data relationship is unknown. An artificial neural network (ANN) inspired by biological nervous networks is a key technology to support artificial intelligence [1]. Basic building block of ANN is an artificial neuron with three simple sets of rules: multiplication, summation and activation. The typical ANN consists of huge number of interconnected such artificial neurons, which are stacked sequentially in rows that are known as layers as shown in Fig. 1 (a). An artificial neuron receives signals from other neurons through synapses located on the dendrites of the neuron and combines them and applies a nonlinear operation to the combined signal, in order to judge whether to activate the neuron for signaling the neurons in the subsequent layer. Therefore, the activation function is a heart of the artificial neuron.

So far, several activation functions suitable for each task have been considered. Among them, sigmoid or logistic functions are most effective for ANN on which the error backpropagation learning algorism is implemented [2] because of their simple mathematical handling, especially their differentiation.

The hardware implementation of sigmoid functions has been initially investigated using semiconductor integrated circuits. Later, superconducting circuits are considered to be an alternative candidate to overcome difficulties in semiconductors such as large power dissipation. In fact, ANN using superconducting circuits with their ultra-high-speed operation, ultra-low-power consumption and scalability enabled by nanotechnology has successfully been implemented in various ways [4]-[10]. However, the physical basis for generating the sigmoid function was not sufficient. In our previous paper [11], we clarified the physical basis for sigmoid function generation and applied it to artificial neurons based on superconducting quantum interference devices (SQUIDs).

Recent advances in nanotechnology have led the system size to nanoscale, where devices that have been operating on the principle of classical mechanics have to be dealt with quantum-mechanically.

(a)



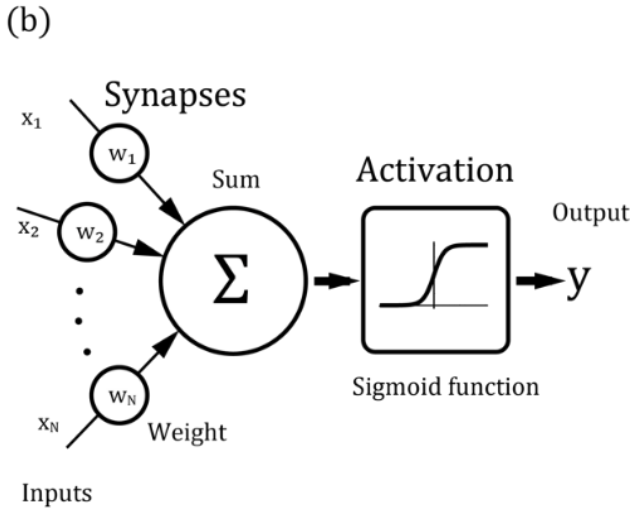


Figure 1 Schematic diagrams of (a) A typical three-layered feed-forward artificial neural network and (b) an artificial neuron.

In this paper, we reconsider the generation mechanism of the sigmoid function required for artificial neurons based on the principle of quantum mechanics and analyze SQUID-based artificial neurons which operate in quantum-mechanical domain.

II.CLASSICAL SQUID-BASED ARTIFICIAL NEURONS

Here we briefly review classical artificial neurons based on a radio frequency (rf) SQUID discussed in the previous paper [11] for the preparation to develop into neurons operating in quantum mechanical domain below.

A. Physical origin of sigmoid function generation

We showed that the physical origin of the sigmoid function generation was the transition processes between two states in double well potential. The probability of finding a particle in one of the two wells, p, in thermal equilibrium is derived from the rate equation on the transition between two states in the double well potential as shown in Fig. 2 as follows;

$$p = \frac{1}{1 + e^{-\Delta E/kT}} \ \#(1)$$

where ΔE is the energy difference between two states. k and T are the Boltzmann constant and temperature, respectively. This is the sigmoid function required for artificial neurons.

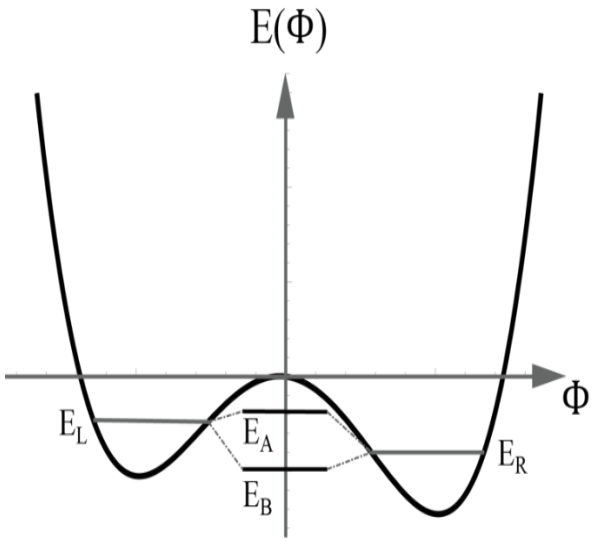


Figure 2 Schematic diagram of double well potential.

B. Classical SQUID-based artificial neurons

Based on the two-state transition scheme for generating the sigmoid function to artificial neurons, we analyzed an rf SQUID as a superconducting artificial neuron, which consists of a superconducting loop with the inductance L interrupted by a Josephson junction as shown in Fig. 3 (a).

The potential energy of rf-SQUID is given by

$$E = E_L\left(\hat{\Phi} - \hat{\Phi}_{ex}\right)^2 + E_J\{1 - \cos(2\pi\hat{\Phi})\} \#(2)$$

where $\hat{\Phi}$ and $\hat{\Phi}_{ex}$ are magnetic flux through the superconducting ring and an externally applied magnetic flux normalized by the quantum unit of magnetic flux $\Phi_0 = h/2e$ with h and e being Planck's constant and an elementary electric charge, respectively. The first term is magnetic energy accumulated in the loop with $E_L = \Phi_0^2/2L$. The second term expresses Josephson coupling energy given by $E_J = \hbar I_{C0}/2e$ with I_{C0} being the Josephson critical current. Fig. 3 (b) shows the potential profile as a function of $\hat{\Phi}$ with different applied magnetic flux values $\hat{\Phi}_{ex}$. The lowest two minima form a double well potential required to generate the sigmoid function.

The energy difference ΔE in (1) is given as

$$\Delta E\left(\hat{\Phi}_{ex}\right) \cong E_L\left[\frac{4\pi^2\alpha}{1 + 2\pi^2\alpha}\hat{\Phi}_{ex} + \text{const.}\right] \#(3)$$

where $\alpha = E_J/E_L$. Therefore, the rf SQUID generates a sigmoid function, where the external magnetic field as the integrated signal is an input determining the activity.

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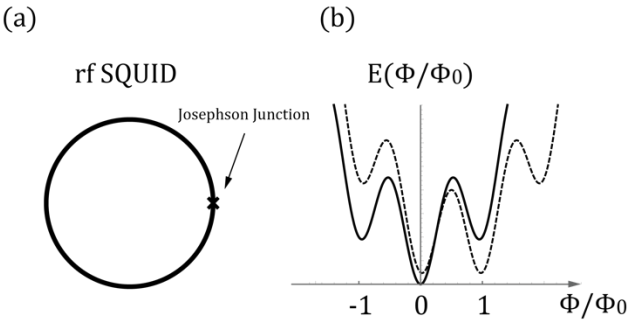

Figure 1 Schematic diagram of (a) an rf SQUID comprising of a superconducting loop interrupted by a Josephson junction and (b) its potential profile as a function of magnetic flux threading the rf-SQUID loop with $\widehat{\Phi}_{ex} = 0$ (solid line) and with $\widehat{\Phi}_{ex} = 0.5$ (dotted line).

III. QUANTUM SQUID-BASED ARTIFICIAL NEURONS

A. Quantum rf SQUID

Now let us consider a superconducting artificial neuron working at the quantum-mechanical domain, i.e., $E_J \leq E_c$ where $E_c = 4e^2/2C$. A conventional rf SQUID $(E_J > E_c)$ can be described by a classical particle moving in the potential in (2). Here, the junction capacitance C corresponds to the mass of the particle. Therefore, when the Josephson junctions are reduced by nanotechnology, the junction capacitance, equivalently the mass, becomes smaller, and as a result, the junctions behave quantum-mechanically. In the case of $E_J \leq E_c$, the rf SQUID behaves like a *quantum-mechanical* particle. As is well-known, mechanical variables are replaced by the corresponding operators in quantum mechanics, and commutation relations hold between conjugate operators, i.e., $[\theta, n] = i$ or $[\Phi, Q] = i\hbar$ where Q and n are the electric charge at the junction and the number of Cooper pair difference across the junction, respectively.

In the case that the barrier between wells in the potential (2) is much smaller than the Josephson coupling energy, the rf SQUID potential (2) can be approximated by the biased double well potential as

$$E \cong E_L\left[-(\alpha-1)\frac{\phi^2}{2}+\frac{\alpha}{24}\phi^4 - f\phi\right]\#(4)$$

where ϕ=Φˆ-0.5 and f=Φˆ_ex-0.5. As a further approximation, the whole Hilbert space of the full Hamiltonian can be mapped on to the subspace spanned by two levels. The resulting Hamiltonian is expressed as

$$H = -\frac{1}{2}(\epsilon\sigma_z + \Delta\sigma_x)\#(5)$$

where ϵ=E_L-E_R is the energy difference between energy levels in each well as shown in Fig. 2 and Δ stands for tunneling splitting. This Hamiltonian is nothing but qubit Hamiltonian that is a building block of quantum computer in quantum information science.

B.Sigmoid function in quantum rf SQUID

Now let us consider the sigmoid function required for artificial neurons in quantum rf SQUID. In the classical situation, the sigmoid function was originated from the two-state transition processes between states in double well potential. In quantum mechanical situations as well, the origin is assumed to be same as in the classical one. The probability of finding a particle in the left well of double well potential, p_L, is given by the coefficient of the left state $|L\rangle$ of the antibonding state $|A\rangle$

$$|A\rangle = \sqrt{p_L}|L\rangle - \sqrt{p_R}|R\rangle\#(6)$$

obtained by diagonalizing the qubit Hamiltonian (5) using unitary transformation

$$\widetilde{H} = D(\beta/2)HD(\beta/2)^{\dagger}\#(7)$$

and

$$D(\beta/2) = \exp\left[-i\frac{\beta}{2}\sigma_y\right]\#(8)$$

with $\beta = \tan^{-1}(\Delta/\epsilon)$. The energy spectrum of this diagonalized Hamiltonian is thus represented as

$$E_{B,A} = \mp\frac{1}{2}\sqrt{\epsilon^2+\Delta^2}\#(9)$$

as shown in Fig. 2. Here, $B(A)$ stands for bonding (antibonding). The bonding state is expressed as

$$|A\rangle = D(\beta/2)^{\dagger}|L\rangle = \cos(\beta/2)\,|L\rangle - \sin(\beta/2)\,|R\rangle.\#(10)$$

As a result, the desired probability is

$$p_L = \cos^2(\beta/2) = \frac{1}{2}\left[1+\frac{\epsilon}{\sqrt{\epsilon^2+\Delta^2}}\right].\#(11)$$

This can be approximated as

$$p_L \cong \frac{1}{1+\mathrm{e}^{-\epsilon/2\Delta}}\#(12)$$

within the second order of ϵ/Δ. Therefore, quantum rf SQUID also serves as an artificial neuron with the sigmoid function.

So far, we have discussed the sigmoid function generation of rf SQUID operating in the quantum

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mechanical domain based on coherent quantum transition. In the case of incoherent quantum transition, the probability in (11) is reduced to

$$p_L \cong \frac{1}{1+e^{-\epsilon/2\Delta}} \approx 1 - e^{-\epsilon/2\Delta}. \#(13)$$

This has been already observed in early stage of qubit experiment [12].

CONCLUSION

We have presented an artificial neuron using rf SQUID working at the quantum-mechanical domain, i.e., quantum rf SQUID. We have showed that quantum rf SQUID serves as an artificial neuron with the sigmoid function based on the model of the coherent quantum transition between quantum states in double well potential. Quantum rf SQUID is nothing but flux qubit that is a building block of quantum computer. Therefore, it might be applicable to artificial neural networks in quantum-mechanical domain, so-called quantum neural networks.

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A Machine Learning Approach to Distinguish Parkinson's Disease (PD) Patient's with Shuffling Gait from Older Adults based on Gait signals using 3D Motion Analysis

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Abstract:-- **In recent times the adverse impact of Parkinson's disease (PD) getting worse and worse with the increasing rate of old age population through out the world. This disease is the second common neurological disorder and has a tremendous economical and social impact because the cost associated with the healthcare as well as service is extremely high. The diagnosis process of this disease mostly done by closely observing the patient in the clinic as well as using the rating scale. However, this kind of diagnosis is subjective in nature and usually takes long time and assessment of this disease is complicated and cannot replicated in other patients. This kind of diagnosis method is also not suitable for the early detection of the PD. So, with this shortcoming it is necessary to find a suitable method that can automate the process as well as useful in the initial phase of diagnosis of PD. Recently with the invention of motion capture equipment's and artificial intelligent technique, the feasibility of the objective nature-based diagnosis is getting lot of attention, especially the objective quantification of gait parameters. Shuffling of gait is one of the important characteristics of PD patients and it is usually defined y shorter stride length and low foot clearance. In this study a novel method is proposed to quantify the gait parameters using 3D motion captures and then various feature selection algorithm have used to select the effective features and finally machine learning based techniques were implemented to automate the classification process of two groups composed of PD patients as well as older adults. We have found maximum accuracy of 98.54 %by using support vector machine (SVM) classifier with radial basis function coupled with minimum redundancy and maximum relevance (MRMR) algorithm-based feature set. Our result showed that the proposed method can help the clinicians to distinguish PD patients from the older adults. This method helps to detect the PD at early stage.**

Keywords: Shuffling gait, feature selection, machine learning, Parkinson's disease, wearable sensor

I. INTRODUCTION

Parkinson's disease is the second most common neurological disorder and around 7 to 10 million people have been affected by this disease [1]. It is one of the disease that affects the brain cell and that indirectly affect the movement, speech and other cognitive parts of the brain [2]. The number of undiagnosed people affected with PD is around 20% [3]. At the same time, it is very difficult for the clinician to clinically distinguish the PD patients with the older adults because some of the characteristics are observed among old people those are also associated with PD [4]. Gait analysis is treated as one of the important tool for the assessment of PD [5]. It was observed that the spatiotemporal parameters related to gait dynamics helps in objective assessment of PD because those parameters are one dimensional and the analysis can be observed in different dimension [6]. The objective of the feature selection method in the medical field is to identify the most important factor that is associated with the result and also remove the redundant features that provides better and quicker result at quick time [7]. Many researchers used different classifiers for prediction of disease to get good outputs while prediction coupled with good accuracy [8-10].

In this paper spatiotemporal parameter-based gait analysis is carried out using 3D motion captures for objective measurement of gait parameters and then feature selection algorithms are implemented to know the importance of the features. A performance comparison analysis is carried out with different classification techniques coupled with different feature sets obtained from various feature selection algorithm to clearly distinguish the PD patients with shuffling gait and older adults.

The structure of the paper is organized as follows: Section 2 presents the background. Section 3 describes about the

methodology. Section 4 describes about the result and discussions. Section 5 describes about conclusion.

II. RELATED WORK

In the past different researchers have used wearable devices as well machine learning techniques for the prediction of the chronic diseases. Some of the works are as follows. An inertial measurement units (IMU) which consists of gyroscope and accelerometer were used to do the gait analysis of healthy subjects and PD patients. The proposed algorithm was able to estimate the stride length from the data collected from the IMU. The results were validated by measuring the stride length using GAITrite walkway system data, which is mentioned as gold standard. The comparison has done with the algorithm and GAITRite system and it was found that the mean error over all the stride lengths were about 6 % for healthy subjects and around 10.3% for PD patients [11]. A novel method is proposed to measure the spatiotemporal gait parameters of children's those are suffered with cerebral palsy using wearable sensors. The signal processing algorithm is used to quantify the gait parameters from the data collected from the wearable devices and validated the result with optoelectronic system which is served as a gold standard. It was found that the wearable device-based method able to provide good result and having a good level of agreement between the two methods has given an assurance to the clinicians to recommend it in practical life [12]. A method is proposed that used ANN and SVM for distinguishing the walk pattern during the speed walking of PD patients. Three different parameters namely spatiotemporal, kinematic and kinetic were used to distinguish the pattern among PD patients. It was observed that spatiotemporal parameter used as feature vector contributed perfect classification using ANN and SVM classifier [13]. A method is proposed for automatic recognition of health problem using gait data with machine learning techniques. The method used neural network and k nearest neighbor classifier based on the gait data of people related to five different condition such as normal, with hemiplegic, with Parkinson's disease, with pain in the back and with pain in the leg. semantic features were used in their approach. It was found the classification accuracies ranging from 99% to 100 % by using the neural networks and k nearest neighbor classifier [14]. A method is proposed for the diagnosis of PD based on the characteristics features of a person's voice. The approach used decision tree-based classification approach using the threshold value. It also used mixed classification approach for the prediction of the Parkinson's disease using nonlinear classifiers and found classification accuracy of 90% [15]. The above past work motivated us to develop the current approach described in the later part of the paper.

III. METHODOLOGY

The study comprised of 40 individuals from both the groups. 20 patients from PD group with shuffling gait and 20 older adults mentioned as control group. 3D motion Analysis system is used to quantify the spatiotemporal gait parameters at Inje Paik hospital, Busan, South Korea. We have collected 12 features by measuring the spatiotemporal parameters. We have used four feature selection methods in this study such as minimum redundancy maximum relevance(MRMR), Fisher's score(FS) method, sequential forward selection(SFS) method and Principal Component Analysis (PCA) method. After feature selection methods each of feature sets is implemented in different classification technique such as support vector machine(SVM), random forest(RF), and Naïve Bayes(NB) for performance comparison. The performance measures those are included in this study are accuracy, sensitivity, specificity, positive predictive value(PPV), negative predictive value(NPV). Fig 1 shows the flow chart of the proposed methodology.

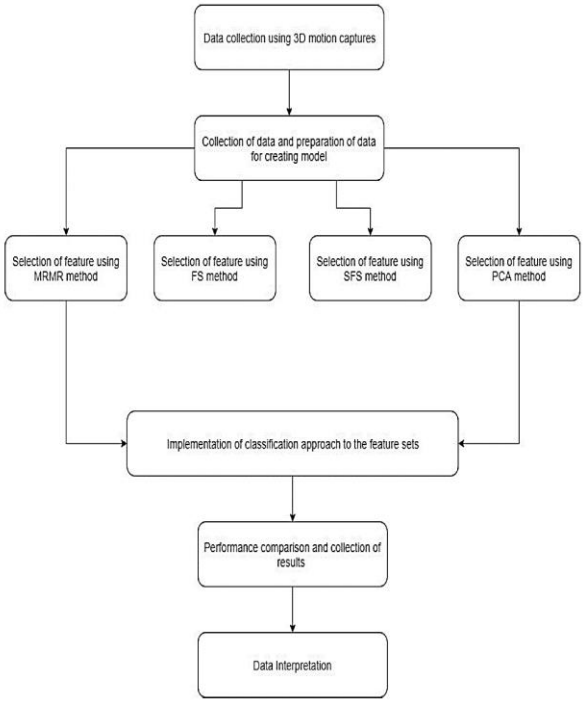

Figure 1: Flow chart of proposed methodology

IV. RESULTS AND DISCUSSION

In this study we have implemented different feature selection algorithm and we found MRMR feature selection algorithm performed well with different classifiers. We have used 80% of the data for training set and 20% of the data as test set. The comparison of accuracy with different feature sets are shown in the fig 2.

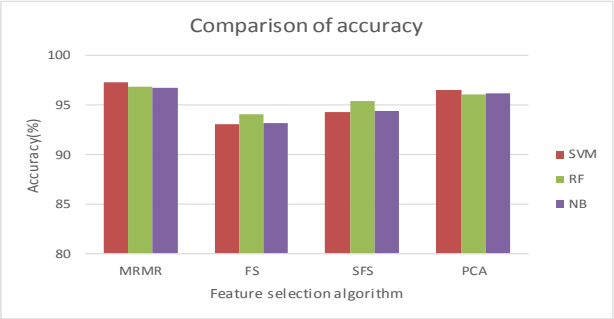

Figure 2: Accuracy of the MRMR, FS, SFS and PCA results.

In the above figure it is shown that the accuracy of SVM classifier with rbf kernel function coupled with MRMR feature sets has the highest accuracy of 98.54% followed random forest classifier and Naïve Bayes classifier with the accuracy of 96.89%, and 96.75% respectively. MRMR feature sets perform better compared to all other feature sets mentioned in our approach.

The comparison of sensitivity of different feature sets coupled with classifiers is shown in the figure 3.

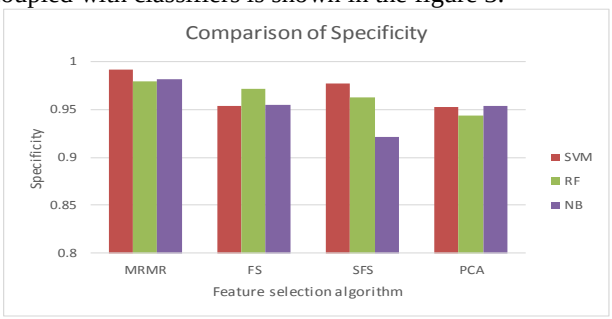

Figure 3: Sensitivity of the MRMR, FS, SFS and PCA results.

The figure 3 showed that the sensitivity of SVM classifier with rbf kernel function coupled with MRMR feature sets has the highest sensitivity of 0.9891 followed random forest classifier and Naïve Bayes classifier with the sensitivity of 0.9844 and 0.9722 respectively.

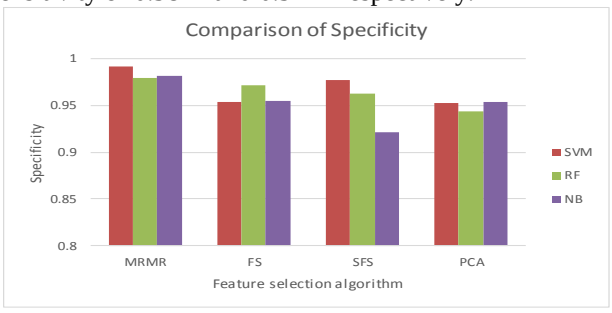

Figure 4: Specificity of the MRMR, FS, SFS and PCA results.

The figure 4 showed that the specificity of SVM classifier with rbf kernel function coupled with MRMR feature sets has the highest specificity of 0.9912 followed Naïve Bayes classifier and random forest classifier with the specificity of 0.9811 and 0.9789 respectively.

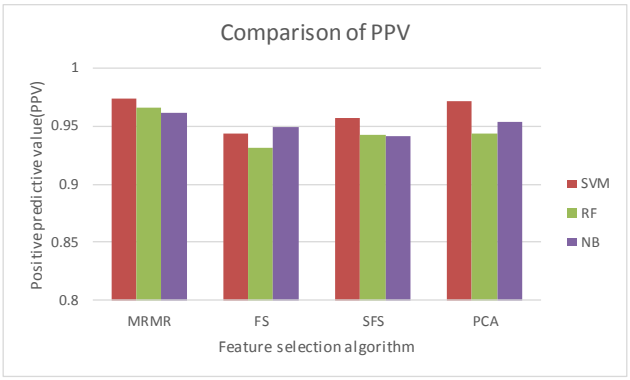

Figure 5: PPV of the MRMR, FS, SFS and PCA results.

The figure 5 showed that the positive predictive value(PPV) of SVM classifier with rbf kernel function coupled with MRMR feature sets has the highest PPV of 0.9734 followed random forest classifier and Naïve Bayes classifier with the PPV of 0.9654 and 0.9611 respectively.

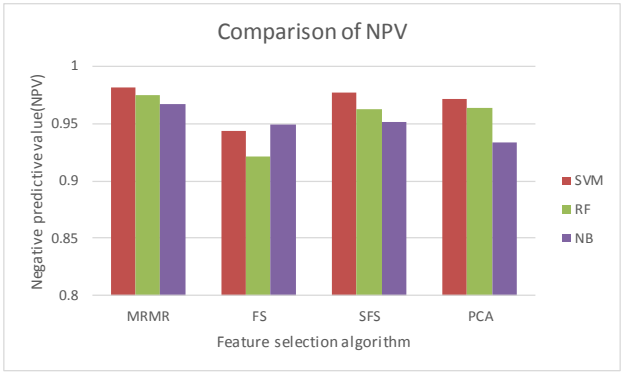

Figure 6: NPV of the MRMR, FS, SFS and PCA results.

The figure 6 showed that the negative predictive value (NPV) of SVM classifier with rbf kernel function coupled with MRMR feature sets has the highest NPV of 0.9815 followed random forest classifier and Naïve Bayes classifier with the NPV of 0.9754 and 0.9667 respectively.

From the above observation it was found that feature selection method has an important role to play that ultimately provide better result at quick time. It also removed the redundant features that will help clinicians to focus on important features during diagnosis of PD. Our proposed method has carried out a performance comparison-based study by using different classification

technique based on different feature sets. The performance measures help to identify the potential of each classifier as well as automatize the classification process that will help the clinicians to clearly distinguish between two groups. Our proposed study provides an accuracy of 98.54%, compared to the previous studies. One of the previous study used fuzzy c means clustering based feature weighting and KNN and found accuracy of 97.93% [16] and other study used particle swarm optimization and KNN and found accuracy of 97.47% [17]. In summary our proposed method has better accuracy and can be recommended for clinical trials.

CONCLUSION AND FUTURE WORK

This paper discussed about different feature selection algorithm as well as different classification techniques as well as their performance for better accuracy as well as for getting quicker results. Among the implemented feature selection algorithm and classification techniques MRMR algorithm coupled with SVM with rbf produced an accuracy of 98.54%. This development will help the clinicians and doctors to automate the whole process with short time and will help them to detect the Parkinson's disease at early stage and assess the patient's condition at different stages.

In the future we will develop the algorithm to quantify the spatiotemporal gait parameters from the data collected from the wearable sensors and then implement the same feature selection algorithm as well as classification technique to compare the difference between the two methods as well as to check the feasibility of the wearable sensors for objective quantification of gait parameters.

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Problems of Farmers in connection with the status of Modern Technological inputs in Agricultural Sector: A special reference to Chiwaula Sub-area in Mangochi District of Malawi.

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Abstract:-- **This paper focuses on the "Problems of Farmers in connection with the status of Modern Technological inputs in Agricultural Sector. Generally, the poverty and seasonal agricultural un-employment are the major problems of this study area in Mangochi District of Malawi. Even though, most of the people who have fertilized the agricultural land, sufficient water resources and also cultivate some agricultural products such as corn, sugarcane, cotton, potatoes, tomato etc. But, there is no sufficient growth in agriculture, due to lack of modern technological inputs in Agriculture; especially there is no scientific method of cultivation and lack of irrigation facilities.**

RESEARCH METHODOLOGY

The Universe of the study consists farmers in eight villages of Chiwaula Sub-area in Mangochi District. This study was conducted with the following objectives i) To describe the Socio- economic background of the farmers in these villages, ii) To explore the nature and type of cultivation in their agricultural field without modern inputs iii) To understand the problems of farmers with respect to in-adequate Irrigation system and scientific method of cultivation in agriculture iv) To suggest the implementation of modern technology and Scientific method of cultivation in Agriculture for economic sufficient and green revolution

A sample size 40 was achieved through adopting the non-probability /purposive sampling method with a decision of selecting 5 farmers from each village, to collect the pertinent primary data. Relevant secondary data were collected from the library books, Journals, newspapers, magazines, and websites. The primary data were collected through Interview and unstructured observations to understand the socio-economic background of the farmers, nature and type of cultivation in their agricultural field without modern technological inputs, and problems faced by farmers especially of an in-adequate scientific method of cultivation. The reference period for data collection was 1-29 June 2017.

Results show that most, farmers are very poor as a lack of the scientific method of cultivation and irrigation facilities in agriculture, lack of access to development, and require competency to market their Agricultural products. Farmers require more awareness on adopting modern technological inputs such as modern machinery, seeds, fertilizers, Pesticides and efficient irrigation management in the Agricultural sector. As the rain -fed agriculture is vulnerable to changes, irrigation agriculture to be intensified in Mangochi district through increased awareness on land and irrigation management with the help of technological development. Policies and funding should be properly implemented.

INTRODUCTION

This paper focuses on the Problems of farmers in connection with the Modern Technological inputs in the Agricultural sector: A special reference to Chiwaula sub-areas in Mangochi District of Malawi. It is a southernmost district of Malawi; Malawi is a sub-Saharan African country located to the south of the equator. It shares borders with Tanzania to the north and northeast, Mozambique to the east, south and southwest, and Zambia to the north and northwest. It has a population of about slightly over than seventeen million people. Divided into three regions of the North, Centre and South, The Malawi population is predominantly rural, with estimates suggesting that 86 percent of Malawians live in rural areas.

The poverty and seasonal agricultural un-employment are the major problems of this country, particularly in this study area of Mangochi District. Even though, most of the people who have own agricultural land, sufficient water resources and also cultivate some agricultural products

such as Maize, sugarcane, groundnut, tomato, sweet potato, peens, carrot and banana etc. The natural resources like fertilized agricultural land and groundwater facilities are available in this study area, because this area is surrounded by largest river connecting with three countries like Malawi, Zambia, and Mozambique. Even though, there is no sufficient growth in agriculture, due to lack of the scientific method of cultivation and modern technological inputs in the agricultural sector, especially the modern machinery and proper irrigation facilities.

Malawi is a member of several international organizations including the Commonwealth, the UN and some of its child agencies especially like UNICEF, the IMF, the World Bank, the African Union and the World Health organization. The economy is heavily based on agriculture. Malawian government faces various challenges particularly the Proper Irrigation and modern technological input in Agriculture.

Generally, there are some factors that affect the farmers in their socio-economic and cultivation of agricultural products in this study area of Mangochi District. The two major factors also noted here are:-

i) Socio-economic factors,
ii) Scientific factors

I) Socio-economic factors

The socio-economic characteristics of the people of this study area also been homogeneous. i.e. Socio-economic background is very poor. The poverty and un-employment are the major problems in Mangochi District, particularly in this study area. Because most of the farmers who have small land holdings and only poor yield in their agricultural field. They have holdings of two acres or less, which does not allow the use of scientific method of cultivation. The fragmented and small size of land holding is an important factor of low agricultural productivity. Most of the farmers are very poor as a result of helplessness, lack of access to inputs such as an old method of cultivation without modern machinery, lack of financial support, in-competent market to their Agricultural-products and lack of road networks for transportation of the agricultural products.

II) Scientific factors

a) Lack of mechanization

The use of mechanization i.e. modern technological and scientific method of cultivation was introduced in Malawi, yet most of the villages included in this study area do not access these new modern technologies. Old farming practices are still being used in agriculture.

b) Lack of irrigation facilities

Lack of Irrigation services also plays a crucial role in the failure of agriculture and also generates the poverty in Malawi, particularly in Mangochi District. There are no adequate functional facilities to the farmers adopt the proper irrigation facilities with the scientific method, because lack of electricity and inadequate supply of loans from institutional credits are mostly not able to adopt proper irrigation facilities. Most of the farmers practicing the old method of cultivation in their land and unable to purchase of modern inputs of agriculture in particular time. These are the major problems of seasonal unemployment and poverty among the farmers.

c) Inadequate supply of input

The supply of modern inputs like improve seeds, modern organic fertilizer, pesticides and modern machinery are not only costly but also inadequate and irregular. The inadequate availability of the modern inputs at the time and prices is also a problem of the expansion of agricultural production

d) Insufficient Agricultural research

Due to lack of sufficient fund allocated for particularly in agricultural research, the innovation of new varieties of crops, organic fertilizers, pesticide, modern farm machinery and animal health services remains slow.

e) Lack of extension service program

In order to raise farm productivity, the extension service program needs to be extended in the rural areas. There is need to increase the number of extension workers to educate farmers for the adoption of agriculture technology such as proper irrigation with the scientific method is an enormous work and has to be carried out systematically and an effect. The lack of funds again is a problem in the proper implementation of this programme. The result is slow growth in agricultural production.

g) Climate change

Climate change is also one of the elements that are leading to the poor or low yield of production in agriculture. In-sufficient rainfall pattern might be experienced in a year which could not be enough crops to mature. Sometimes rain might come in abandoned which could in turn produce runoff and washing away crops and humus in the soil. The people have a great impact that contributes to climate change such as deforestation, poor farming, and soil tillage.

Research Methodology

The Universe of the study is the Chiwaula sub-area consists of several villages like Chiwaula, Steven, Miseu, Nsamu, Namasano, Mbuluwata, and Sawasahaa etc, in Chimwala Traditional Authority, Mangochi District of

Malawi. This paper focuses on the Problems of Farmer's connection with Modern Technological inputs in Agricultural Sector.

Objectives of the Study

i) To describe the Socio-economic background of the farmers in these villages,
ii) To explore the nature and type of cultivation in their agricultural field without modern inputs
iii) To understand the problems of farmers with respect to inadequate modern types of machineries and Irrigation farming in agriculture
iv) To suggest the implementation of modern technology and Scientific method of cultivation in Agriculture for economic sufficient and green revolution

Sampling

A sample size of 40 was achieved through adopting the non-probability -purposive sampling method with a decision of selected 5 farmers from each village, to collect the pertinent primary data.

Secondary Data

Relevant secondary data were collected from the library books, Journals, newspapers, magazines, and websites.

Primary data

The primary data were collected from the selected farmers through Interview and unstructured observations to understand the socio-economic background of the farmers, nature and type of cultivation in their agricultural field without modern inputs, and problems faced by farmers especially of in-adequate modern types of machinery and Irrigation farming.

Period of Study

The reference period for data collection was 1-29 June 2017.

RESULTS AND DISCUSSIONS:

All the farmers of this study area are homogeneous characteristics of their socio-economic background is very low. Among the total population of this villages, nearly eighty percent of them depend on the agriculture, most of them have been own agricultural land and only a few of them are lease / rental agricultural land. Among the total population of the farmers in these villages, the educational background of the farmers reveals that nearly sixty-five percent of them are illiterates, while, nearly thirty percent of the farmers completed primary education up to VIIIth Standard, and rest of them run the small-scale business like chips stall, Potato stall, Tomato stall, etc.

There are no-sufficient basic amenities and infrastructural facilities such as safe drinking water, proper concrete road, public toilet, electricity, government primary health center. Mal-nutrition is one of the major problems among the people, particularly in farmers; it also leads to the formation of some diseases like Measles, pneumonia, anemia, etc, these predominantly affect the pregnant women and born children.

Nearly ninety-five percent of them have own house but in the dilapidated condition, rest of them living in the rental house. Religious wise distribution of the respondents reveals that most of them belongs to the Christians, particularly in Roman Catholic, rest of them belongs to different tribes like Yao (Islamic), remaining of them are one type of Christian, they are only followers of Jesus Christ, but they do not follow any Christian organizations like Roman Catholic, Assembly of God, Pentecostal mission etc. No caste system among these people in these villages, the socio-economic status also determined their status as lower or middle class etc.

Most of the farmers who have own and small size of agricultural land i.e. they have holdings two acres or less than two acres, they also cultivate some agricultural products such as maize, sugarcane, groundnut, tomato, sweet potato, beans, carrot, and banana, etc, The fragmented and small size of land does not allow the scientific method of cultivation with modern types machinery and also the important factors of insufficient development in the agriculture. A vast majority of the farmers do not have any sufficient knowledge about use the modern types of machinery and scientific method of cultivation in agriculture, particularly the irrigation farming. Because of the irrigation farming's system also successful and sustainable development in agriculture around the world. But this numerous attempt was a failure in African countries. All of them were confessed that there is nobody gave the awareness on agricultural research and extension service programs to the farmers.

Few of them do not have own agricultural land. But they are cultivating some crops in the lease or rental agricultural land. Among the total population of the farmers, nearly fifty percent of them only seasonal cultivation in the rainy season from the month of November to April. Rest of them also cultivates some crops all the season, because they can easily access water sources for their small pieces of land. Because the groundwater sources also nearest from the bottom of the land only a few feet as the area is close to Lake Malombe. They are also practicing the old method of cultivation and irrigation facilities like using treadle pump. They are also cultivating some crops like vegetables, sweet potato, paddy, and maize, etc.

As the rain-fed agriculture is vulnerable to changes in the present, Climate change also one of the major factors of reducing the yield in the field in the way that increase of rain upturn the runoff which washing away crops and humus in the soil. The people have a great impact that contributes to climate change such as deforestation, poor farming, and soil tillage.

No modern types of machinery and scientific method adopted in their cultivation, the use of mechanization not fully adopted in the entire country, most of them practice an old method of cultivation and still being used for agriculture. Modern inputs like improved seeds, fertilizer and pesticides do not fully available and also there are inadequate supplies of loans from institutional credits, the people are mostly not able to purchase the fertilizers and pesticides in particular time which result in low productivity.

These are contributing to the seasonal un-employment problem in agricultural sectors. In these factors also lead those to go for fishing work in nearest Lake, Molambe. Some people migrate to South Africa to get the employment opportunities in industrial and commercial sectors. Most of them have holding natural resources like natural fertilized agricultural land and sufficient groundwater facilities. But, there is no sufficient economic power to adopt the modern types of machinery and get the proper irrigation facilities in their agricultural land.

The entire farmers are poor and also they don't have any electricity facilities, not only in their houses but also in their agricultural sectors. Because electricity facilities are very essential to farming the irrigation and scientific method of cultivation in Agriculture. Another problem of the failure in agriculture is lack of infrastructural facilities like farm to market, roads, and shortage of transport facilities, etc.

This study reviews that people in this study area are poor and practices the local irrigation farming. To improve their life's there is need to assist them with modern irrigation farming technologies such as modern types of machinery, proper electricity, capacity buildings like agricultural research and extension services and enough financial support from international funding agencies to assist them to procure farm inputs.

CONCLUSION

Most of the developing countries have sustainable development in the cultivation of agricultural products, by the innovative and scientific methods like proper irrigation facilities and adopted the mechanization in the agriculture sector. There had been numerous attempts to introduce the successful concepts from the Mexican and Indian projects into African countries although with less successful efforts. Reasons cited for their failures include lack of financial support and policy, insecurity, wide corruption, lack of infrastructure, and lack of will power on the part of the politicians. In the most basic sense, the Green Revolution was a product of globalization as evidenced in the creation of international agricultural research centers that shared information, and with transnational funding from groups like the Rockefeller Foundation, Ford Foundation, and United States Agency for International Development (USAID).

The Green Revolution was a research establishment in Mexico and the Philippines that were funded by the governments of those nations and international donor organizations. Similar work is still being carried out by a network of institutes around the world. Proponents of the Green Revolution argued that it contributed to environmental preservation because it improved the productivity of land already in agricultural production and thus saved millions of acres that would otherwise have been put into agricultural use. These factors permitted these countries to diffuse both the new seeds and modern technology and to bring the products to market in an effective manner. Africa benefited far less from the Green Revolution than Asian countries and is still threatened periodically with famine. Therefore, it is right time to make the new policies for implement the modern scientific method of cultivation with proper irrigation facilities in Agriculture through International Agricultural Research and funding from the aforesaid international funding agencies and support from the World Bank.

The activities outlined by the network research could benefit countries like Malawi especially people of Chiwaula area in Mangochi District which the study in this project was carried out. It is envisaged that Malawi as a nation, located in Sub-saharan Africa is one of the countries where Green revolution is taking place, the majority of people are poor and could be assisted in the activities and thereby improving their economic status and uplifting standard of living.

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Customer Complaints Reduction for Gas Cookers

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***Abstract*:-- The analysis of this paper draws from customer service call to the gas cooker repair and service representative as they manage to keep service complaints from becoming overt. This paper considers how to recognizes and priorities and leverage type of issues, for representatives, working quickly to close down the service call from the customer. In addition improve the process to and prevent the process and product use FMEA to analysis to prevent the risk in the future.**

Index Terms—Customer complaints, Gas Cooker, PFMEA, Pareto Chart .

I. INTRODUCTION

Imagine you buy some expensive electronics and 48 hours after that the machine not working. A customer complaint highlights a problem, whether that's a problem with your product, employees or internal processes, and by hearing these problems directly from your customers, you can investigate and improve to prevent further complaints in the future Quality should be a defining reason why consumers choose our products over competition, whether it's a first-time buy, recommendation or repurchase. And while there are many things that consumers consider when buying an appliance, like functionality, performance, design and service, it's Quality that drives long-term consumer satisfaction and brand loyalty. When consumers are happy with their Quality experience, they'll choose product from our factory again and recommend to family and friends. For the first step since service representatives are a type of front line employee, they are responsible for tasks involving general information seeking questions about products and services, and to trouble shoot customers service problems. Part of the trouble-shooting may involve managing customers complaints about the service in a way that keeps the customer happy without impacting their overall satisfaction with the organization service. The analysis in this paper uses component service repair analysis the problems in a way that keeps service complaints from escalating. Data are drawn from telephone calls where customers phone to find out the repair status of equipment previously sent in for service then generate by internal system for the number as Fig 1. For the background of this research, the factory have received many complaints from the customer which actual SCR 3.8 % vs target SCR 1.5% (SCR= Service Call rate: the percentage, on product sales, of interventions at Consumer's homes required to solve Product Quality issues during the Product Warranty period)and the latest result after improvement 0.5 %. So, we have analysed the cause of them.

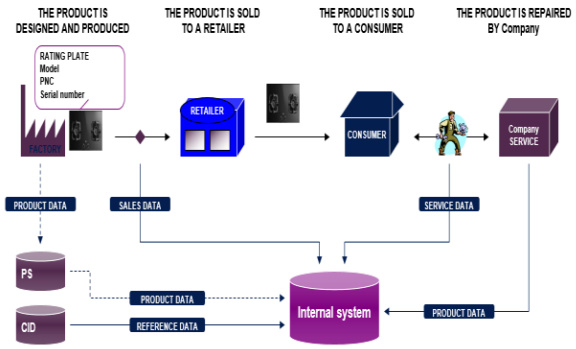


Fig 1. The source data is generated and collected during different stages of the product lifecycle

In the context of this work, those types of components are spare part repaired and their propensity to deform is explained by the characteristics and combination of the constitutive material, geometry, and location within an appliances. The categories of flexible components considered in this research are: Thermal gas valve, Spark generator, Burner, Thermal gas valve, Glass panel .

The technique adopted to analysed quality issues related to flexible components is Failure Mode and Effect Analysis (FMEA). Using FMEA, the different components of a system, the failure modes, their causes, and effects can be identified. Furthermore, the FMEA provides a formal structure to capture the failure causes and modes and the associated solutions to find out the preventive action for future.

In this paper a method is developed to support the standardization of FMEA information, extraction of rules that relate elements of this processed information, and query of improvements. The formalized knowledge is then implemented into a knowledge based FMEA tool that is intended to assist a car manufacturer in the effort of dealing with flexible parts quality issues, and provide

suggestions or opportunities of improvements in design, Production, or assembly production for the future.

II. DATA AND METHOD

A. Data

Data came from number of a customer care help line in an electronic repair facility located in the Vietnam. Data were collected over one year period where the author use data from internal system record. Each calls was automatically recorded when customer care had in-put the history of product and will closed the service when the technicians complete repair for the customer. In addition to the recordings, the author made field notes about the organizational procedures for call handling, the repair process, the website, and computer tracking system. Calls collected included inquiries about store hours, repair warranty information, information on how to send equipment in for repair service, and repair status inquires. The complaint result was 412 calls from customer during 6 months.

B. Call Handing Record

The standard procedure for reporting repair status included a first step where in representatives looked up the repair order on the computer tracking system. The system indicated the current status of the equipment within the actual repair process. The second step involved looking at the details, which listed the estimated repair timeframe for each equipment type (e.g. replace the top panel glass take approximately 10-15 business days for repair). The organization had a repair status tracking system by internal system where technician could enter their order number and find the spare part and due date for repair. Some dimension are common to all data, while other dimensions apply to service data only. The table below summarizes this.

Table 1. How to apply the service data

Dimension	Sales	Service	Production*
Report Periods	√	√	
Markets	√	√	
Plants	√	√	√
Products	√	√	√
Components		√	√**
Defects		√	√**
Service Types		√	
Warranty Categories		√	
Production Dates		√	√
Service Periods		√	
Time to Failure from Installation (TTFI)		√	
Time to Installation from Production (TTIP)		√	
Time to Failure from Production (TTFP)		√	
Time to Report from Service (TTRS)		√	
Time to Service from Failure (TTSF)		√	
Currency	√	√	

C. Method

Follow 4 steps below, Step 1 Selected a list of problems from the service system, items or causes to be compared. Step 2 Measure complained for comparing the items. Step 3 Choose a timeframe for collecting the data. Step 4 Tally, for each items, how often it repaired.

From data shown the quantity of complaints from the customer. The Pareto shown that thermal gas valve, Spark generator, Burner, Thermal gas valve, Glass panel are the most part repaired and customer complaints.

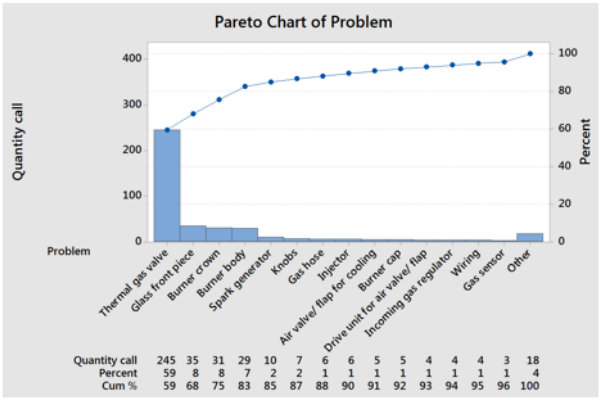
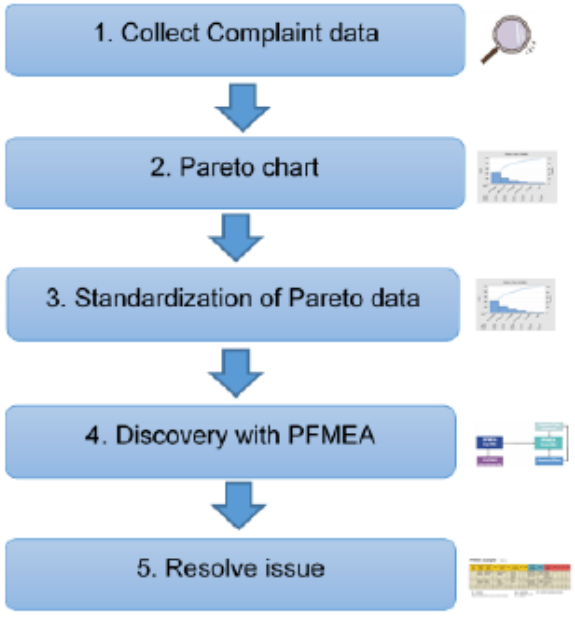


Fig 2 Quantity of service call complaint

The objective of this research is to support identification and management of flexible complaints issues. The method employed to achieve this objective was to use a knowledge based system to provide decision support while engineers perform PFMEA. A five step process to analyse the data and extract patterns from it (see Figure 3).



III. ANAYSIS

In the details of customer complaints and also technicians comment are not always so clear. For example, in cases like machine repaired customers will tentatively introduce a complainable matter regarding the repair time as part of their reason for calling. From the complaints result from Fig can see that the most complaints regarding Thermal gas valve 59%. After that we track back to the current PFMEA that use in the production line for this model.

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Table 2. PFMEA of product before improve

Line No.	Process Step / Function	Potential Failure Mode (Loss of Function or value to customer)	SEV	OCC	DET	RPN
1	valve assemble	used uncorrected valve	7	5	3	105
2	Valve position	The installation angle of the valve is not in accordance with the drawing requirements	8	4	4	128
3	Thermal couple	Thermocouple and valve plug is not in place	7	3	3	63
4	ignition	The ignition pin is not plugged in with the igniter	6	3	4	72
5	Glass top plate assy	The valve is not centred	7	5	3	105
6	Glass plate	The top plate is not properly positioned	7	7	1	49
7	package	lack attachment	2	5	5	50
8	top plate glue	water pan is sticking off	7	3	3	63

For the current PFMEA the factory concentrate with the valve assemble. The data from table 2 shown that RPN for Valve position is 128, valve assemble 105 and glass top plate 105. We were considering the major issue from part complaints from thermal gas valve which have not mentioned on the PFMEA also for another defect from the burner crown. We have brainstorm with the projects member to find out the possibilities cause base on the QFD diagram shown in Figure 3.

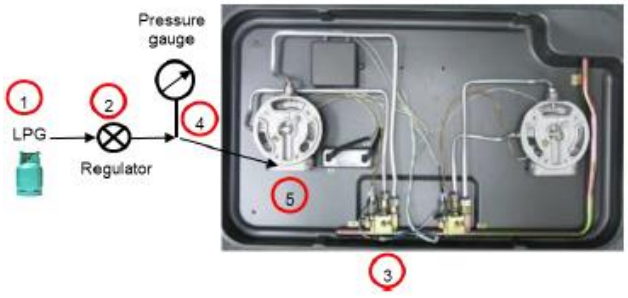

Figure 3. QFD diagram of Gas Cooker

QFD is a process and set of tools used to effectively define customer requirements and convert them into detailed engineering specifications and plans to each issues. From the data from Gas Cooker working system can explain started from no.1 when turn on the LPG gas will move to no.2 regulator when customer press the knob on the position 3 gas will move from no.4 to no. 5.

After understood the functional of product then find out the possibilities cause base on 5 factors
1. Product
2. Process
3. Material
4. User
5. Installation

First from the product found the potential risk that cannot detect if dirty or have some spider inside for the thermal gas valve stuck because of spider web inside. Second consider from the process didn't found the issue. Third with the material for this model passed the standard testing and user also for other models. Forth for the user or customer, normally for Gas Cooker product follow the international standard for domestic gas cooker EN-30-1-1:2008 in figure 5. So the gas pressure should be used around 25- 30 mbar for the safety range. In addition on the product also mentioned and indicated on the caution, nameplate and label for customer to aware on it. Even we have mentioned on the user manual but we found the issue that customers use the wrong regulator with the high pressure.

Controlled Goods	Definitions	Safety Standards
Gas cooker 	A domestic appliance combining burners for cooking by gas.	EN 30-1-1: 2008 or AS 4551: 2008 (gas cooker)
		EN 30-1-2: 2012 (forced-convection gas oven)
		EN 30-1-3: 2003 (glass-ceramic gas hob with enclosed covered burner)
		EN 30-1-4: 2012 and IEC 60335-2-102: 2004 (gas cooker with automatic burner control system)

Figure 5. Gas Cooker Standard

The last factor is the installation before installing the appliance need to check the location to provide the clearance from combustible materials and need to check for the gas supple to be connected to the location. Anyway we have the technician authorized from our company to install the appliance.

IV. SUMMARY OF ANALYSIS

According to the analysis customers can design their reason for calling in a way that makes complaints matter about their service experience so far but in a way that allows the service representative to tend to the non-complaints matter at hand. Such complaints matters set up two different, but related, problems for representatives.

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First the technician completed service need to input the clear comment in the system to track back the issue. From the analysis causes of incident came from the regulator and user, after use fish – bone diagram and why- why analysis to find out the possibilities cause. Found the regulator was the major issue to made appliance damaged. In addition, for the PFMEA not aware for this issues. So after found the causes of the complaints then revise the PFMEA to add 2 specific items in table 3. From the customers perspective, keeping their complaint from becoming overt places them in good graces with the representative This project included type of customer service environment, looking a very specific request. While this allowed for robust findings the cause to find out the preventive actions. After got the major causes then track back to the current the repaired history. PFMEA need to be revised to cover all the safety issues .Moreover, it would be interesting to see how customer satisfaction rates when representatives work to suppress complaints. This may give further insight into how complaint management contributes to customers varying perspectives on their service and product experience.

Table 3. PFMEA of product after improve

Line No.	Process Step / Function	Potential Failure Mode (Loss of Function or value to customer)	SEV	OCC	DET	RPN
1	valve assemble	used uncorrected valve	7	5	3	105
2	Valve position	The installation angle of the valve is not in accordance with the drawing requirements	8	4	4	128
3	Thermal couple	Thermocouple and valve plug is not in place	7	3	3	63
4	ignition	The ignition pin is not plugged in with the igniter	6	3	4	72
5	Glass top plate assy	The valve is not centred	7	5	3	105
6	Glass plate	The top plate is not properly positioned	7	7	1	49
7	package	lack attachment	2	5	5	50
8	top plate glue	water pan is sticking off	7	3	3	63
9	Installation	Regulator over spec	8	5	4	160
10	Thermal gas valve	Dirt and grease stuck	7	5	4	140

V. CONCLUSION

This paper presents a tool of FMEA for managing customer complaints information, intended to assist the production to priorities and severity of product issue also customer to aware of safety to use the appliance. The method presented can be useful for Production Engineers in appliance manufacturing plant to detect, analyse and solve quality issues related customer complaints on the gas cooker other models. In addition create the preventive action for product failure in the future. After implemented the PFMEA, bundle the correct regulator and add the caution on the product to remind customer to use the correct regulator. Customer complaints reduced from 412 calls to 109 calls, The reduction compare with before improvement 73.5%.

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"The science and medicine underlying cricket performance and injury: an overview"

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Abstract:-- **Research into the science and medicine underlying cricket performance and injury has progressed since the First World Congress of Science and Medicine in Cricket in 1999. This review covers material on the physiological and psychological demands of the game and preparation for it, the biomechanics and motor control of cricket skills, the psychology of team dynamics, performance analysis and cricket injuries. Technological aspects of cricket equipment are also covered, where such research could influence injury risk or player performance. Fielding remains the least studied of the skills. Much more research needs to be done before we can gain a full understanding of the scientific aspects of the game. There is a need to address common definitions of injury, along with more research into injury mechanisms. Research on batting needs to bring together motor control and biomechanics more fully. The fitness demands of the game are still poorly understood, along with the mechanisms causing fatigue. Evaluation of the efficacy of intervention strategies needs to continue and to develop. The applications of research need to be communicated more to coaches and players.**

Key Words: batting, bowling, cricket, equipment, fielding, injuries.

INTRODUCTION

Cricket is often thought of as a sport in which the main competitions are more individual-to-individual than in any other team sport. Much research has concentrated on the batters and bowlers, but far less on the fielders, rather than on team dynamics. This overview and update will follow a similar path and cover material published since the First World Congress of Science and Medicine in Cricket, held in Lille shall, England from 14 to 17 June 1999. Comprehensive reviews of batting (Stretch et al., 2000), bowling (Bartlett et al., 1996; Elliott et al., 1996; Elliott, 2000) and preventing cricket injuries (Finch et al., 1999) already exist. This review will draw on material from these, and earlier research papers, only to illuminate more recent research. The physiological and psychological demands of the game and preparation for it, the biomechanics and motor control of cricket skills, the psychology of team dynamics, performance analysis and cricket injuries are all covered. Technological aspects of cricket equipment are covered if that research could influence injury risk or player performance. This review draws on published material on cricket in the English language from science and medicine journals across the world. Coaching reports, publications from other sports, and 'mainstream' science and medical research that might have applications to cricket are not, in general, included.

Fielding

Despite the adage that 'catches win matches', research into fielding in cricket is sparse compared with that for batting and bowling. The main focus of such research has been the interceptive skill of catching (e.g. Morris,1976). This skill varies considerably from the wicketkeeper and slips, who mostly intercept a fast moving ball coming off the edge of the bat and reaching them below chest height, and outfielders, who mostly try to catch a ball falling from above head height. Other aspects of fielding have not been well researched. These include maintaining focus and concentration over 2hperiods, the fitness requirements of standing for such periods within a 6 h playing day, and the skills of stopping, retrieving and throwing the ball. The same is true for the very specific demands imposed on the concentrate for every ball delivered, adopt a body position that is far from ergonomically sound, catch and stop all balls within range, and move quickly to the wicket after any hit that required a fielder to stop and retrieve the ball. In the modern game, he is also expected to 'sledge' the batters to undermine their confidence and concentration. Little recent research exists on injuries to fielders. Finch et al. (1999)reviewed research into the whole gamut of cricketing injuries. Their review included little on fielding compared with the other skills in the game. Fielder shave the most upper limb injuries (26%; Stretch, 1993),possibly because of the forces involved in throwing long distances. The seasonal injury incidence rate for fielders in South African schoolboy cricket was less, at 23%,than for batters (30%) and bowlers (47%). Barton(1997) considered that most hand injuries in amateur cricketers are caused while trying to catch the ball, but he provided no corroborative data.

Cricket pundits generally agree that one of the benefits of the one-day game has been vastly improved standards of fielding, owing to both improved fitness sand, perhaps, better techniques. One of the most spectacular new techniques is the sliding stop. This isused for interception or retrieval before the ball reaches the boundary. Such retrieval might not have been possible using the conventional long-barrier interception or a conventional retrieval. Alternatively, use of the sliding stop might save time compared with the more traditional techniques; this time advantage might enable a return of the ball to save a run or effect a run out.

Von Hagen et al. (2000) reported the case of an English club cricketer, aged 17 years, who sustained a bucket handle tear of the medial meniscus in his left knee when performing a sliding stop incorrectly. When performed correctly, the technique, for a right-handed fielder, involves sliding on the left buttock and knee with the right leg extended out in front, the left knee flexed and the left hand aiding balance. The ball is then collected in the right hand and the right foot lands on the ground; the momentum of the slide and a push on the ground by the left hand brings the fielder upright ready to throw the ball, all in a smooth movement. In the case reported, the cricketer failed to bring his right foot into contact with the ground so that the momentum of the slide was not used to bring him upright; heal so did not use his left arm sufficiently to lift himself. Instead, his left knee extended actively, rather than passively in the correct technique, when all of his weight was on that leg in a fully flexed position. The large torque that resulted at the knee was considered by VonHagen et al. (2000) to have caused the meniscal tear. Their conclusion that 'The sliding stop should be discouraged as a means of fielding in cricket unless appropriately coached' might seem somewhat overdramatic, based only on a single incident. Nevertheless, careful monitoring of injuries caused by this technique is needed and it should be taught properly to younger players. Young cricketers will seek to emulate test players and the sliding stop is far more athletic and spectacular than its conventional rivals.

Myers and O'Brien (2001) considered that shoulder injuries in cricket were less than would be expected in as port that incorporates throwing. The shoulder injuries that do occur were largely attributable to fielders throwing accurately for distance; bowling could then further aggravate these injuries. Eccentric loading in the later phases of the throwing action can lead to rotator cuff lesions, most commonly from the mid-supraspinatus to the mid infraspinatus. Shoulder injuries were less common in bowling because of the rules governing the technique, although overuse injuries to the rotator cuff muscles do still occur. Myers and O'Brien (2001) did not link these injuries to training, although specific rotator cuff exercises are unlikely to form part of the training regimen of most sub-elite players. Other changes in the game of cricket as a result of the growth of the one-day game have been white (rather than red) balls, black (rather than white) sightscreens and artificial (rather than natural) lighting. Previous research (e.g. Koslow, 1985) supports changes in reaction time as chromatic cues change, with the luminance contrasts of the ball and background being particularly important. Ball colour had no effect when luminance effects were compensated for or for highly skilled catchers.

Batting

Reviewing the demands of cricket batting, Noakes and Durandt (2000) cited the results of Gore et al.(1993) that the mean heart rate during a day's cricket rarely rises above 128 beats _ min71 for batters (andfielders). They went on to estimate the peak activity of a batter during a one-day game. This hypothetical player scored 100 runs while the other batters also scored 100runs. With each player scoring 50 singles, 20 twos, 10threes and 20 fours, each would cover 3.2 km in anactivity time of 8 min – an average running speed of24 km _ h71 and with at least 110 decelerations. Fromthese hypothetical but quite representative data, Noakesand Durandt (2000) deduced that the physiological demands of batting in the one-day game are substantial. Players need to be fit to reproduce their performances over a long series of one-day games, which also subject each player to around 3.5 h of vigorous fielding. These series of one-day games often precede or follow a Test series of three to five matches, or are sandwiched between two three-match Test series. The picture of cricket as a leisurely activity is clearly fallacious for international batters. It also explains the excellent fitness of South African international batters reportedby Noakes and Durandt (2000). They found that these batters had an average body fat composition of about12%, the same as the bowlers. The batters, compared with the bowlers, had a higher predicted _VVO2max (basedon a 20 m shuttle run), were faster running a simulated three runs with quicker turn times, and had similar leg press, bench press and 35 m sprint performances. There were also no real physiological differences between the two cricket groups and international rugby players.

Noakes and Durandt (2000) went on to speculate that the stress of cricket is due to the repeated eccentric muscle damage resulting from the repeated decelerations that occur in batting (and fielding). Substantial muscle strength is needed to reduce muscle damage arising from repeated eccentric contractions. This observation is supported by the findings of Thompsonet al. (1999) for the similar activity of shuttle runs. No further research on the physiological demands of cricket batting is apparent since 2000.

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Far more research into cricket equipment has occurred, whether to reduce injury or enhance performance. In addition to the research reported by Stretch et al. (2000a), Alexander et al. (1998)reported progress on cricket glove design and Knowles et al. (1998) and Stretch (2000) have reported further developments on cricket helmets. Alexander et al. (1998) surveyed County cricketers. Of the 59 respondents, 66% used the 'sausage finger' style of glove and 34% the 'square finger' style. The main factors that led to selection of a glove were reported to be comfort, protection and contractual obligation to the glove supplier. Only 8% of the sample were happy with the protection the gloves afforded their fingers and thumbs. Hand or finger fractures were sustained by 39% of the group when batting. Twenty-five of the 44 breaks were on the bottom and 19 on the top hand. The thumb and first finger of the bottom hand plus the small finger of the top hand were most commonly fractured. After talking to players, physiotherapists and other experts, a new design of glove was specified. Current foams used in cricket gloves are unsuitable for cushioning impacts at the release speeds of the fastest bowlers, which can exceed 140 km_ h71. Although foams that absorb more energy could resist such impacts, they are too rigid and deform permanently. After testing various designs of glove and insert, the final preferred design incorporated a pre-bent double finger Kevlar insert protecting the first two fingers of the bottom hand. In addition, it had 'sausage' fingers – to maximize protection and eliminate the problem of hinged fingers opening up on impact, thereby exposing joints – and a Kevlar sheet over the back of the hand. Foam padding was used around the web between the thumb and first finger of the bottom hand and along the outside of the top hand. It will be interesting to see if any manufacturer takes up this design and, if so, what effect it has on injuries.

The performance of a cricket helmet depends on its two main components – a stiff shell to spread the impact force and a softer lining to cushion the blow and absorb impact energy. Stretch (2000) used a drop test equivalent to an impact of a ball released at44.4 m_ s71 (160 km _ h71). The impact sites were right temple, forehead and back of the helmet. An accelerometer recorded impact accelerations, for which the recommended safety standard is a maximum of 300 g. Of the 18 impact sites (three sites for each of six helmets), 11 met the safety standard. Three helmets met the standard at all three impact sites. These helmets featured, respectively, a multiple-density lining of ethylene vinyl acetate (EVA), a high-density EVA lining and a moulded polyurethane insert. The inner layers of the two helmets that failed at two impact sites, and the one that failed at all sites, had a low-density EVA lining. This unsuitability of low-density foam linings was also reported by Knowles et al. (1998), who tested combinations of shells and foams by firing a cricket ball from a bowling machine at 25 m_ s71. This bowling speed is about that of a spinner's quicker delivery and well below the speeds of up to 40 m_ s71 from fast bowlers from which helmets need to protect the batter. Nevertheless, Knowles et al. (1998) found that the stiffer the shell, the better the protection, although changes were small for flexural rigidities above 50 N_ m. The stiffer foam gave better results, but the effect was not as substantial as increasing foam thickness. However, thicker foam meets customer resistance because of the increased helmet size. The message from both of these studies is clear: batters should avoid using helmets that have low density foam linings. Batters should wear helmets if they are to avoid the risk of being killed from an impact of a cricket ball on the head, as reported, for example, by de Bruxelles (2002).

The performance of a cricket bat is rather restricted by conservative rules that have prevented novel designs(see Stretch et al., 2000a). The performance of the batmodelled as a rigid body depends upon various factors ,including the location of the 'sweet spot' and the coefficient of restitution between bat and ball. However, neither the ball nor the bat is a rigid body during impactand finite element analysis (FEA) should allow a deeper insight into the behaviour of the bat on impact. Grant and Davidson (1998) described the development of a test procedure to measure the coefficient of restitution of a bat at various impact points, but no results were reported. McKellar et al. (1998) reported a system using an instrumented bat that allowed the accurate measurement of the position of impact with the ball. The rationale behind this development was to analyse a batter's strokes with a view to improving coaching methods and batting technique. Al though examples of impact distribution along and across the bat were reported, and although it is clear that the distribution of impacts should be much less for good players, no applications to coaching or technique improvement were reported.

Bowling

Research into cricket bowling has, since the early days of the investigations of Elliott and his co-workers at the University of Western Australia (e.g. Foster et al.,1989), focused on low-back injuries in fast bowling. The current view is that these injuries are associated more with the mixed technique than with the front-onor side-on techniques. The reviews of Elliott et al.(1996) and Elliott (2000) have comprehensive coverage of the occurrence of back injuries in fast bowlers in cricket. Although the exact mechanisms of disc bulging and degeneration, and subsequent neural arch fractures, have not been established, the association between these injuries and the mixed bowling technique are very strong. Indeed, a statistically significant association between the two was reported by Elliott etal. (1992). The causes are probably:. greater rotational stress in the lumbar spine of mixed technique bowlers, owing to the counter-rotation of the shoulders with respect to the hips in thistechnique; the

hyperextension, or backward arching, of the lumbar spine that follows;. the high impact forces with the ground experienced by all fast bowlers. Rasch (1989) explicitly linked this triad – high compressive loading, rotational stress and backward arching – to low-back injury. Such a clear association between a sports technique and a specific injury is, to date, rare. It is encouraging that the cricket in authorities have taken these research findings seriously and have sought to reduce dramatically the incidence of this potentially injurious technique among young fast bowlers. For instance, the ECB now provides coaches with information on how to coach the front-on technique, how to recognize the mixed technique, and how to convert the latter technique into the far less injurious side-on or front-on technique. It is only recently that the Marylebone Cricket Club (MCC)Coaching Book has acknowledged the front-on technique(Lewis, 1994). Before that, the side-on technique was the only recognized bowling style. This might have contributed to the high incidence of mixed technique bowlers, as their teachers and coaches tried to convert front-on bowlers into side-on bowlers, but instead made them mixed. Even Lewis (1994) failed to mention the mixed technique, although Elliott and Foster (1989)and Bartlett (1992) had warned of the injury risks of this technique. This omission has since been rectified byECB posters and other coaching material. This close association is not to suggest that the mixed technique is the only factor in this injury. Hard floor surfaces in indoor nets, inadequately cushioned footwear, excessive deliveries, particularly by young bowlers, physical preparation and age are all facets of this overuse condition, but have not been researched to the same extent as the bowling style (Gray et al., 2000).Again, it is encouraging that the authorities of the game have acted to restrict the number of overs bowled by young fast bowlers (Bell, 1999). Measures have been taken to put shock pads into the floor surfaces in indoor cricket schools (see, for example, www. essexcricket.org.uk/facility.shtml). Scope still exists for research into what footwear would provide best protection from injury for fast bowlers performing on the variety of ground surfaces that they will encounter in practice and competition.

Walker et al. (1999) reported a 4 year prospective study of 79 young cricket fast bowlers using magnetic resonance imaging (MRI). These bowlers had a high observed incidence of stress fractures of the lumbar neural arch, as did 8 of the 13 elite fast bowlers in the study of Engstromet al. (1997). In companion studies, Engstromet al. (1999, 2000) proposed that paraspinalmuscle hypertrophy is an important intrinsic factor in these stress fractures. They reasoned that strenuous prolonged loading was a stimulus for asymmetric hypertrophy that, with a concomitant shear loading, predisposed bowlers to stress fractures of the neural arch. Twelve of the bowlers in this study had these fractures as well as more than 10% asymmetry of the quadratuslumborum volume on the bowling side Identification of a technique that is associated with injury is one thing; doing something to reduce or eliminate it is another thing altogether. A low-budget project with age-group fast bowlers of an English county cricket club over 5 years has had individual successes in changing young bowlers into side-on or front-on with concomitant reductions in low-back pain (R. Bartlett, unpublished observations). The process had much to recommend it, involving qualitative video analysis and an intervention to change technique based on independent analyses by the coaches and scientists involved. The next stage was to involve the bowler and his parents and to demonstrate specific activities to change technique. However, the low budget did not allow the intervention to be sufficiently frequent, to be closely followed up or to involve enough bowlers to draw meaningful conclusions. Burnett et al. (1996) reported the inability of a coaching seminar, which highlighted the dangers of the mixed technique, to decrease the rate of disc degeneration in young fast bowlers over a 2½year period. Elliott and Khangure (1999) looked at the effects of a coaching course plus group practice sessions on reducing shoulder counter-rotation and disc degeneration in young fast bowlers. Neither shoulder counter-rotation nor disc degeneration was changed to a satisfactory extent.

As well as being deceived by swing bowling, batter scan also be deceived by irregular ball bounce, for example depending on whether the ball hits the leadingor trailing edges of a crack on the pitch. Carre´ et al.(1998) reported the analysis of cricket ball impacts using digital stroboscopic photography. The system they developed was capable of showing differences in ball behaviour between different pitch types. The accuracy of the system was better than the inconsistencies within a type of pitch. The system is still undergoing development and improvement.

CONCLUSIONS

Research into the science and medicine underlying cricket performance and injury has progressed since the First Congress on Science and Medicine in Cricket in1999. However, much more research needs to be done until we have a full scientific understanding of the game. For example, we need both to address common definitions of injury and to carry out more research into injury mechanisms. Batting research needs to bring together motor control and biomechanics more fully. The fitness demands of the game are still poorly understood, along with the mechanisms causing fatigue. Evaluation of the efficacy of intervention strategies needs to continue and to develop. The applications of research need to be communicated more to the coach and players, in areas such as team dynamics, so that they can be applied, and tested further, in international matches.

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An Economic Study of Agricultural Farmers Affected by OCKHI Cyclone in Nagercoil of Kanyakumari District

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Abstract:-- **A cyclone is a large wind that affects the entire place. Cyclones are heavy winds that rotate everything in the universe. Ochki cyclone has a great impact in the field of agriculture in the district. Cyclone has made the people without treasure of life. A cyclone is a air that rotates around a strong center of low pressure .Cyclones are made by inward spiraling winds . Heavy cyclones likes as tropical cyclones and subtropical cyclones also lie within This situation describes the process of cyclone formation and intensification. Cyclone is the remarkable one in agriculture. Critical situation is created by Ockhi cyclone in the time.This paper shows the highlights of the cyclone.**

INTRODUCTION

Cyclone Ockhi crossed the sea near Kanyakumari, the southern tip of mainland India, on November 30. Though it changed direction near Kanyakumari and headed towards the Lakshadweep Islands in the Arabian Sea, it caused havoc and destruction in the southernmost districts of Tamilnadu and Kerala, particularly Kanyakumari District of Tamilnadu and Thiruvananthapuram District of Kerala. Damage throughout Kerala was initially estimated at Rs 1843 crore. In Tamil Nadu damage was estimated more than Rs 1000 crores. As a Deep Depression, the system lashed the coast of Tamil Naduand Kerala, damaging infrastructure and taking the lives of 34 more people. An estimated 52 in Kerala and 11 people in Tamil Nadu died in the cyclone with many others missing. On December 2, the cyclone hit the Lakshadweep islands. Cyclone Ockhi has crippled the entire power infrastructure of the Kanyakumari district of Tamil Nadu. Estimates say 4,000 power lines have been affected including 1,500 high tension lines leaving the district largely powerless. Many people have lost their lives, mostly due to trees falling because of heavy rain and wind. More than 30 fishermen from Kanyakumari are still missing. Severe crop damage has also been damage including destruction of banana plantations and inundation of paddy crops . A team led by the director of cooperation and farmers welfare K Manoharan visited paddy cultivation and coconut groves damaged by the cyclone at Thiruppathisaaram, Suchindram, Karkaadu, Vadakku .

REVIEW OF LITERATURE:

Regarding the surplus labour in agriculture, Mehra, S. (1966) states that the excess of actual over the required work force on farms constitutes such surplus population on farms. She also points out that the same workers, however, may be engaged in non-agricultural activities like household industry and may thus be performing a productive activity but they are surplus in respect of agriculture. Singh, G. (1980) found that even though the green revolution was ushered in Punjab in the mid-sixties, the condition of agricultural labourers in Ludhiana district had not improved because a large section of them was still living below the poverty line. NCAER study (1980), found that after adoption of new agriculture strategy (NAS), there was huge introduction of machinery like tractor and other equipments etc., which created employment opportunities in non-agricultural sectors due to the backward linkages. Factories concerned with manufacturing of agricultural machinery and its supporting units provided employment to more workers.

OBJECTIVES

1. To find out the socio economic conditions of the farmers
2. To analyze the working conditions of the farmers.
3. To identify the problems of the farmers Ockhi cyclone.

SIZE OF SAMPLES

In the present study 50 sample respondents have been chosen by using simple random sampling.

DATA ANALYSIS

Income level classification

Income and expenditure are the two edges of life. The purchasing power of an individual is based on income. Table 3.4 shows the income of the sample respondents.

Income level classification of sample respondents

Amount (in Rs)	No. of respondents	Percentage
Below 10,000	6	12
11,000-15,000	12	24
16,000-20,000	9	18
Above 21,000	23	46
Total	50	100

source :Primary data

The above table yearly income earnings of the 23 respondents reveal that 46 percentage of the respondents earn income above Rs21,000 per year. 6 respondents reveal that 12 percentage of respondents earn annual income of below 10,000. Thus variation in income per day is due to the skill of the workers and the years of experience that they have gained

. Expenditure level classification of sample respondents

Amount (in Rs)	No. of respondent	Percentage
Below 30,000	8	16
31,000-40,000	32	64
Above 41,000	10	20
Total	50	100

Source: Primary data

The expenditure level of the 32 respondents reveal that 64 percentageof the respondents spent within Rs31,000-40,000 each year. 10 respondents reveal that (20%) expenditure is above Rs41,000. 8 respondents reveal that 16 percentage spent below 30,000 each year. Only big farmers (who has own land)spent more on agriculture.

EFFECTS DURING OCKHI CYCLONE

Ockhi is a cyclone it affects kanyakumari district. The agriculture labours face many defects during ockhi cyclone. The water destroy their land, crops and also their cattle died during ockhi cyclone.

Effects during Ockhi cyclone

Defects	No. Of respondents	Percentage
Destructors of land/house	17	34
Detonation crops	23	46
Loss of cattle	10	20
total	50	100

Source: Primary data

Table shows during the attack of Ockhi cyclone 23 respondents 46 %faced destruction of crops. The houses 17 respondents 34 % were destroyed . 10 respondents 20 percentage lost their cattle due to Ockhi cyclone.

FINDINGS

Fifty six percentage of agricultural farmers are age group 51 to 60.Forty six percentage of the sample respondents income level is above 21,000.Sixty eight percentage of sample respondents borrow debt in private sector .Eighty percentage of the sample respondents should not have a job satisfaction .Fourty Four percentage who have tiled hous Forty six percentage of the sample respondents crops destroy during the attack of ockhi cyclone. Sixty four percentage of sample respondents expenditure level is between 21,000 -40,000. Sixty Eight percentage get loan from private sector. Sixty percentage of the sample respondents was affected their lands.

SUGGESTIONS

The government should conduct an awareness program to give the knowledge about cyclone and natural disaster.e government should help the people those who are affected by the cyclone.The price of the paddy must increased in order to raise the standard of living.The government must provide proper seeds and manure to increase the yield.

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Execution of Internal Curing Method on Concrete Using Pre-Soaked Light Weight Aggregate

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***Abstract*:-- Low water-cement proportion solid mixs have been progressively advanced for use in Civil Engineering foundation because of potential changes in quality and sturdiness. Notwithstanding their expanded quality and diminished porous nature, the structures are defenseless to early-age splitting. Techniques have been created to lessen the breaking in structures. One such strategy is interior curing. The utilization of internal curing operators can give an adequate volume of water by methods for light weight aggregates (LWA). Notwithstanding the volume of water gave by the LWA, the dispersion of the LWA assumes a fundamental part in the viability of interior curing. Recently, high-performance concrete (HPC) has been increasingly used in practice, with the development of concrete technology and the introduction of super plasticizer and silica fume. High performance concrete is a concrete, which has far super quality and sturdiness attributes when contrasted with regular cement. The present examination researches the quality related properties of HPC specimens like flexural quality utilizing silica fume, super plasticizer in the inward curing technique. The mix proportion of 1:1.76:2.52:0.36 is utilized to cast pillars (100mm X 150mm X 1700mm). The HPC specimens are thrown with supplanting of concrete with 12% of silica smoke and expansion of 6%,12%,20% LWA vermiculite. From the pressure test result, ideal rate substitution of LWA is discovered and utilized for throwing bar. The aftereffects of flexural tests directed on shaft specimens demonstrates that 6% substitution of vermiculite gives the higher quality in both water and inward curing conditions.**

Keywords - High execution solid, light weight aggregates, vermiculite, silica seethe, shrinkage.

INTRODUCTION

Strategies For CURING: 1)Water-showering at appropriate interims – however there are challenges in guaranteeing that this type of curing is really completed 2)Maintaining a mugginess at least 80% – not generally a down to earth arrangement 3) Internal restoring by utilizing uncommon added substances 4)Internal relieving by utilizing lightweight aggregates.

Internal CURING: "inward restoring refers to the procedure by which the hydration of cement happens as a result of the accessibility of extra interior water that isn't a piece of the mixing water." For some years, we have relieved cement from the outside in; interior restoring is for relieving concrete from the back to front. Inside water is by and large provided by means of internal stores, for example, lightweight aggregates (LWA), superabsorbent polymers, saturated wood fibres.

Cement kg/m^3	Fine aggregates kg/m^3	Coarse aggregates kg/m^3	Water/m	Silica fume (kg/m^3)
327	681.72	1181	140	58
1	2	3.61	0.364	0.18

SI.NO	TESTS	NO OF SPECIMENS
1	Flexure test	4

II.MATERIALS USED

Common Lwa – Vemiculite
Silica Fume
Superplasticizer – Conplast Sp430
Common LWA – Vermiculite is a sort of mica that will extraordinarily extend. It Produce lightweight protecting cement—250 to 1450 kg/m3 Vermiculite is a characteristic mineral that grows with the utilization of warmth. The

development procedure is called shedding and it is routinely proficient in reason composed business heaters. Shed vermiculite is utilized as a part of both hand and splash connected general building mortars to enhance scope, simplicity of taking care of, and grip to a wide assortment of substrates, imperviousness to fire, and protection from chipping, splitting and shrinkage.

III OBJECTIVE & METHODOLOGY

The following parameters are to be studied: › Deflection behavior › Initial crack load and its location › Load Vs deflection behavior › Stress VS strain characteristic.
Starter tests on cement, fine aggregates and coarse aggregates. 2. Mix Design for M40 concrete. 3. Mix extent for light-weight concrete by utilizing the vermiculite.4. Assurance of compressive quality of configuration mixes. 5. Throwing of pillars with light-weight concrete and typical cement. 6. Flexure test on specimens.

IV. MATERIALS AND MIX PROPORTIONS

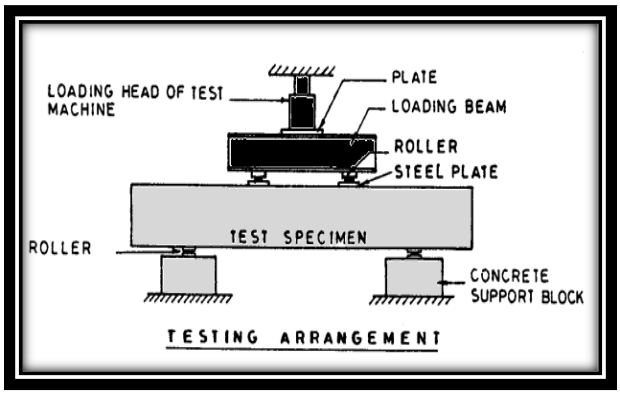
Concrete – Ordinary Portland cement of 43 review
Fine aggregates – Sand of particular gravity 2.65 Coarse aggregates – Gravel of particular gravity 2.76
Grade of concrete – M40
Mix Design - 1 : 2 : 3.6 w\c ratio 0.36

BEAM DETAILS :

Specimen details	% replacement of LWA				Curing condition	No of beams
	vermiculite	SF	SP	w/c ratio		
S1	-	-	-	0.36	WC	1
S2	-	-	-	0.36	IC	1
S3	6	12	1.2	0.36	WC	1
S4	6	12	1.2	0.36	IC	1

REINFORCEMENT DETAILS:
Provide 2 numbers of 10mm dia bars in main reinforcement at bottom of the beam.
Provide 2 numbers of 8mm dia bars in hanger reinforcement at top of the beam.
Provide 2 legged 6 mm stirrups at 100 mm throughout the beam.

EXPERIMENTAL SET UP



FLEXURE TEST

VI.LOAD DEFLECTION BEHAVIOUR

Load Vs deflection plot has been drawn for all test specimens from the trial information. The conduct of test specimens is analyzed the plots. The principal break and deflection cracks were recorded alongside the relating relocations and strains.

Load (KN)	Deflection			Remarks
	L/2	L/3	L/4	
0.00	0	0	0	
2.08	0.01	0.04	0.07	
4.92	0.94	0.92	0.89	
6.58	1.03	1.61	1.48	

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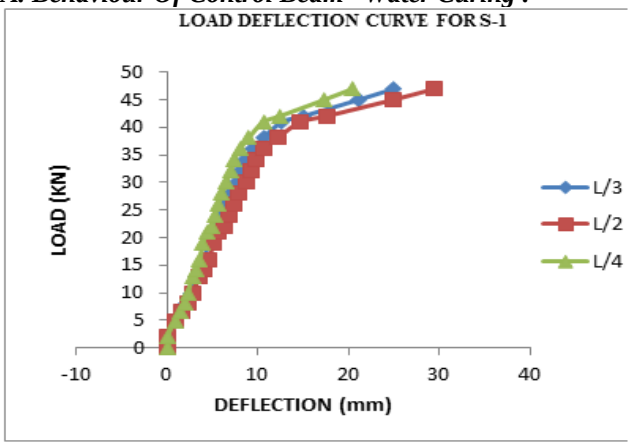
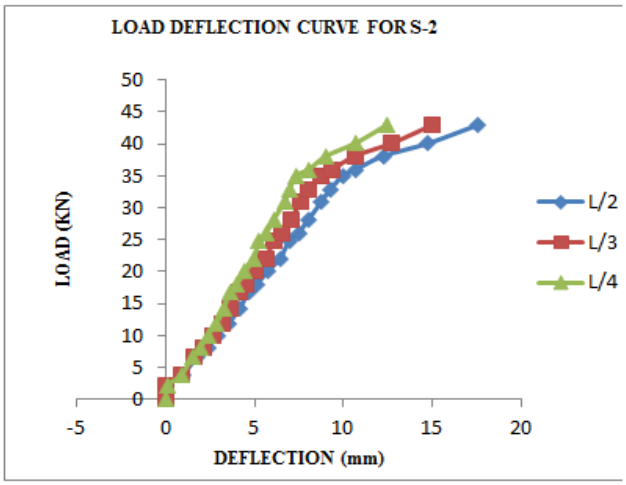
8.01	1.35	2.14	1.93	
10.00	1.91	2.62	2.33	
12.91	2.51	3.15	2.78	First crac
14.09	4.12	3.67	3.23	
16.04	4.67	4.15	3.64	
18.94	5.08	4.52	3.94	
20.98	5.68	5.01	4.38	
22.07	6.39	5.65	4.92	
24.11	6.85	6.03	5.21	
26.06	7.41	6.51	5.61	
28.00	7.98	7.01	6.05	
30.00	8.72	7.65	6.58	
32.04	9.21	8.09	6.97	
34.03	9.84	8.63	7.42	
36.08	10.73	9.38	8.04	
38.07	12.21	10.61	9.01	
40.97	14.72	12.67	10.62	
42.01	17.55	15	12.44	
46.92	20.88	21.08	17.29	
48.96	22.52	25	20.46	failure

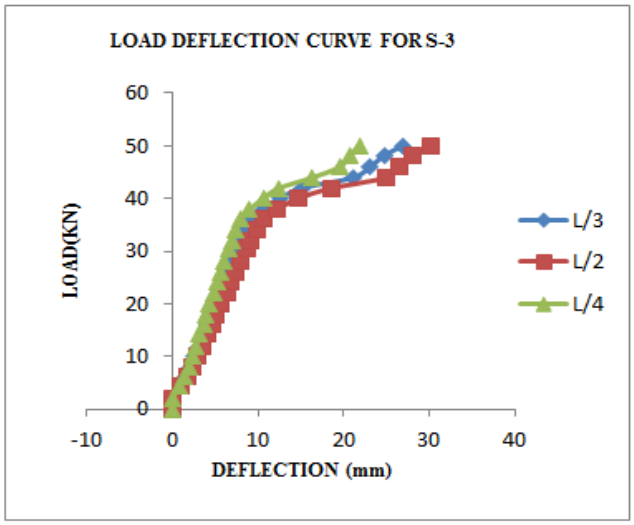
A. Behaviour Of Control Beam –Water Curing :



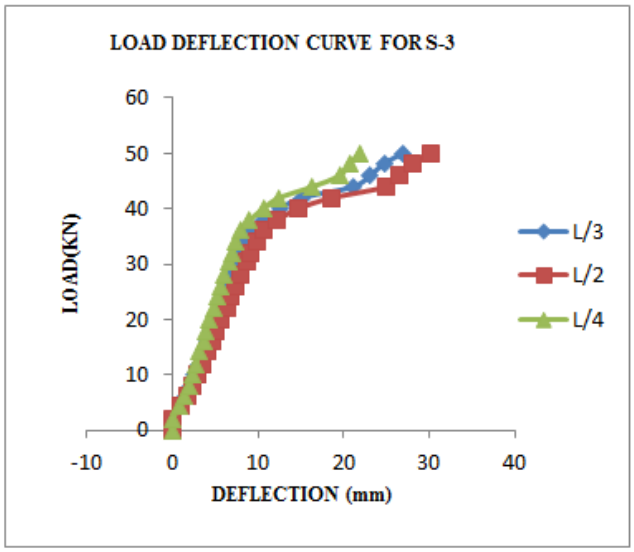
B)Behaviour Of Control Beam –Internal Curing :



C) Behaviour Of S-3 –Water Curing



D)Behaviour Of S-4 –Internal Curing



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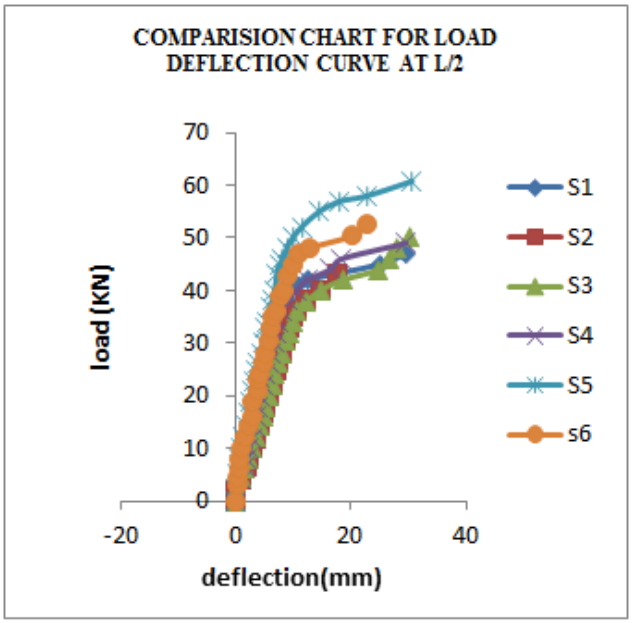
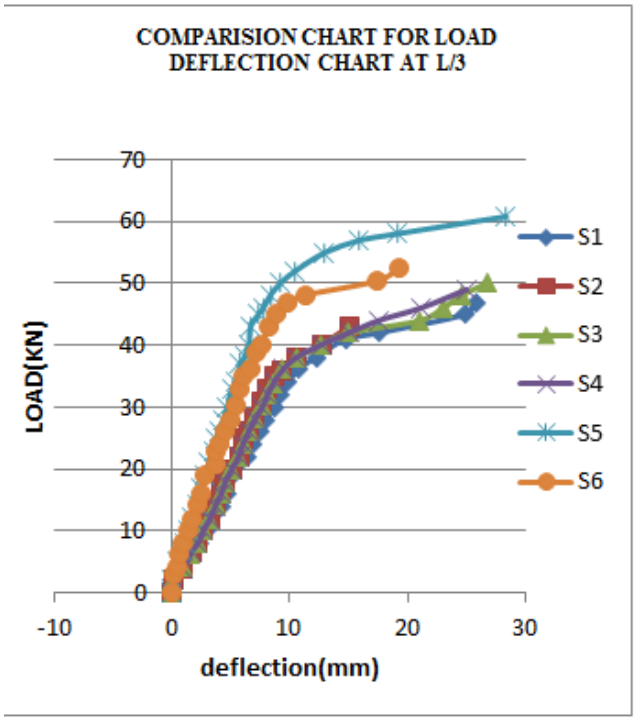
COMPARISION CHARTS

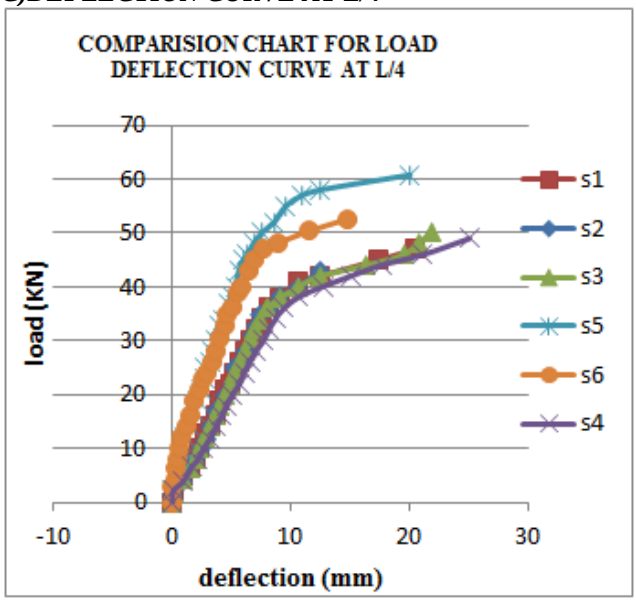
A)LOAD DEFLECTION CURVE AT L/2



B)DEFLECTION CURVE AT L/3



C)DEFLECTION CURVE AT L/4



VII.DISCUSSION

Internal
Curing With Water Curing

Contrasting the conduct of shafts subjected with the states of internal relieving and water restoring, the specimens S1& S3 subjected to water restoring, conveying high load and in the underlying stage itself going with high solidness and afterward achieves less esteem. On account of specimens S2 and S4 which were subjected to inside restoring condition display less quality contrasted with water relieving specimens, however there is a steady increment in solidness and they are said to be bendable in nature.

BREAKING BEHAVIOR AND MODE OF FAILURE

Conduct Of Flexural Failure:

- The under strengthened area of bar, the part approaches deflection because of slow diminishment of pressure zone, displaying vast redirections and breaks, which create at the soffit and advance towards the pressure confront.

- The region of cement in pressure zone is lacking to oppose the resultant compressive power; a definitive flexural deflection of the part happens through the devastating of cement.

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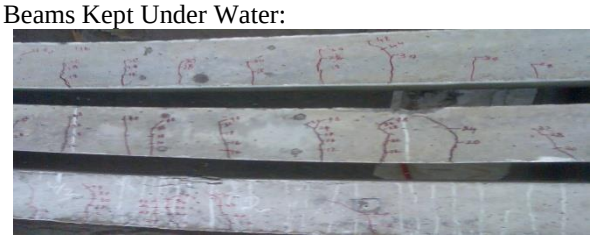
- Large redirection and wide splits demonstrate the qualities of the under fortified area at deflection.

- Cracks because of twisting minute are broadest at the base and smaller at the best pressure side.

CRACK PATTERN

Beams Kept Under Water:



Beams Kept for Internal Curing:

VIII.CONCLUSION

The physical and mechanical properties of vermiculite and silica seethe have been observed to be positive for the utilization in cement concrete as demonstrates by the compressive quality of solid specimens tried.

- The load relates to breaking is ostensibly more in all pillars contrasted with that of control shaft both as far as water relieving and as far as inward restoring.

- The most extreme load opposed by 6% substitution of vermiculite is more than that of control example.

- The specimens of internal restoring contribute 90% quality of pillars kept on the water.

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Intruder Detection and Recognition using Different Image Processing Techniques for a Proactive Surveillance

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Abstract:-- **In order to innovate a proactive surveillance camera, there is a need for an efficient and robust face detection and recognition algorithm. The researcher used one of the well-known, fastest and efficacious approaches in face detection, the viola-jones algorithm. The researcher also used different image processing techniques to identify if the face detected is an intruder or not. The goal of the research is to recognize the fastest way on how the home owners will be informed if there is an intruder or burglar enters in their home using proactive surveillance device. This device was programmed based on the different recognition algorithm and a criteria evaluation framework that could recognize intruders and burglars. The research design use was developmental research to satisfy the research problem. The researcher used Viola-Jones Algorithm for face detection and five algorithms for face recognition (eigenfaces, fisher faces, local binary pattern, template matching, and deep learning algorithm). The criteria evaluation was used to identify the best face recognition algorithm that is suited to any scenario of recognition. It is concluded that the system can recognize the intruders entered in the house and proactively notify the household members using the mobile applications and activate the alarm system of the house.**

Keywords - Deep Learning Algorithm, Viola-Jones Algorithm, OpenCV, AdaBoost, Proactive, Surveillance Camera

INTRODUCTION

Strategies For CURING: 1)Water-showering at appropriate In our modern world, the result of our capabilities can be greatly enhanced by computers. Technology is a vital aspect of a human condition. From mobile phones with a lot of applications, to supercomputers that acts as a server to a massive amount of users, local area networks to cloud technologies, and a lot more. It is concrete that the world is dominated by technology on an extensive scale with an exponential rate in development because of curious minds that seeks for innovation.

Digital Image Processing (DIP) is one of the major breakthroughs in digital signal processing technologies in computer industry. Because of the cheaper computers and dedicated hardware most of the advanced technologies concerning images and its used are now created with the use of DIP [3]. With this, images are digitized and can be stored in computer storage and other storage media [1] [3] for pre-processing of data and data mining [18]. Image processing can format and correct data, improve visual interpretation and automatized target features and classifications [1] [17]. One of the innovative applications of DIP is Image Mining using Image Mining Technologies. Image Mining is the process of extracting features of every image that deals with image relationship and image patterns, image retrieval, and databases [18]. It is an expanded data mining using image processing [25]. Its purpose is to save and retrieve all considerable patterns whether correlation patterns, description patterns, classification patterns, spatial patterns, or temporal patterns[25] [29]. These patterns can be compared and used for different purposes that include digitalized Closed-Circuit TV (CCTV) systems for a real-time and proactive security for future crime prevention [22] [6].

Living in a new era where crimes are increasing and everyone wants to secure their belongings at their home. In that scenario, a person could have a system with advance technological implementation for a person not to worry when they are far from their home [8]. One area of technology that could be used in that context is the field of computer vision. Computers are starting to imitate human abilities. That is where the notion of face detection and recognition takes the spotlight.

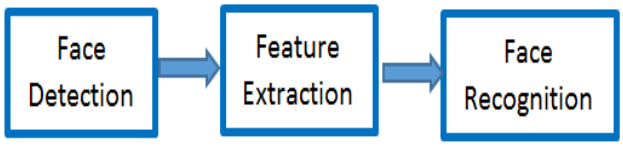

Figure 1. Face recognition Process [9]

In recent years, face detection using image processing has been one of the major topics in research that deals with the analysis of the different features of the face using digital devices like cameras and computers [19]. Either static images or video images can be used in detecting faces [21]. There are various approaches for face detection in images like face color, texture or motion, but can easily collapse due to the intricacy of the actuality [10] [16] hence, surveillance cameras and Closed-Circuit Television (CCTV) cameras should have high resolutions to give clear images of faces. Face detection means finding the different features and occurrences of faces [16]. Viola and Jones algorithm was the first algorithm specialized in face detection. It has four stages: creating integral images, Haar feature selection, cascading classifiers and AdaBoost training [34]. This feature focuses on the rectangular groups of pixels by identifying the dark and light areas, known as the feature of Haar-Like algorithm. The examined pixel group can effortlessly be scaled by decreasing and increasing the size of it [34]. Face recognition is one of the most widely-used and efficient image processing techniques and researchers have developed different face recognition algorithm through the years. After the face detection algorithm detected images of face, the face recognition algorithm extracts the different face features. These face features can be used to identify and authenticate the detected face by comparing it with other faces in a database to find its identity and approve it [7]. These features can be used in creating a proactive surveillance camera that could be a big help to solve crimes in real time. Weak security allows the robbers to enter the houses unnoticed by the people around them. Sometimes they do it to houses located in an environment where not much people pass by so that they can enter unnoticed. With that said, there are also some robbers who does it by casually walking inside homes with open or unlocked doors while people think that he/she lives in that house. These can easily be done by robbers even to houses protected by security cameras [24]. A Webcam-based intelligent surveillance system using image processing can be a big help in creating a proactive CCTV system for a real time monitoring of houses with alarm and global system for mobile communications (GSM) [13]. The objective of this research is to create a proactive surveillance camera that could help solve crimes. Using the Viola-Jones algorithm, the face recognition can easily be processed and gives real-time information by sending images captured by the camera. Bigdeli, et. al. (2009) reiterated that CCTV surveillance systems are treated as major tool in tracking the movements of suicide bombers days before the London Underground terrorist attack in July 2005. But most of the surveillance systems are used only after incidents happened in one place or area, though incidents like thefts and robberies in the areas with the installed CCTV in South Korea reduced by 47.4% [22]. It became a common strategy and major weapon in some other countries [2] [11]. Security cameras, during its first boom in the community, were seen as very good solutions to such criminal acts [24]. The problem is that the criminals, being notorious and do not mind about CCTV, do whatever crime they want just to satisfy their evil doings. The face of any individuals may catch in CCTV but its ability to identify is not always easy [32]. What is needed is a system that helps prevent future attacks of criminals [6] [12]. Robbers are usually people who lurk around houses which they believe have a very weak security system [30]. Weak security allows the robbers to enter the houses unnoticed by the people around them. Sometimes they do it to houses located in an environment where not much people pass by so that they can enter unnoticed. With that said, there are also some robbers who does it by casually walking inside homes with open or unlocked doors while people think that he/she lives in that house. These can easily be done by robbers even to houses protected by security cameras [24]. A Webcam-based intelligent surveillance system using image processing can be a big help in creating a proactive CCTV system for a real time monitoring of houses with alarm and global system for mobile communications (GSM) [13].The main idea of the research is to become aware of any intruder or unrecognized face entering your house and report it to the administrator of the system. The system will feature the use of an image processor for the face recognition and a GSM module. The system will have a database of images of family members which will serve as the basis of the image processor whether someone entering the house is an intruder, a visitor, or just a family member. Once someone enters the premises of the house, the image processor will scan whether or not that person is an intruder. If the image processor fails to see a match with any image stored in the database, it will then capture the image of that said person and signal the GSM module to notify the administrator of the system. The module will send a message with the picture of the person and ask him/her if the system should turn the alarm on or ignore the person if he/she is just your visitor.

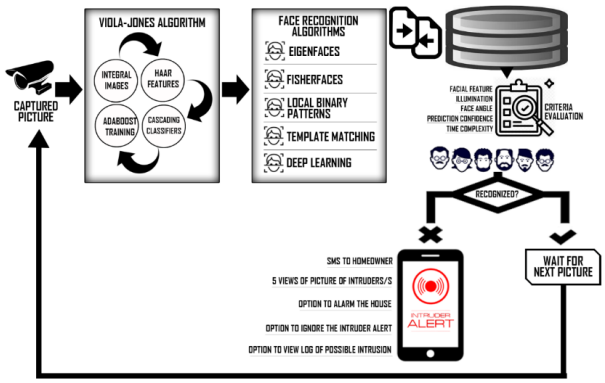

Figure 2. Conceptual Framework

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Figure 2 represents the proposed conceptual framework of the research. The system will capture images and perform detection of faces (using Viola-Jones Algorithm) through the captures images. Once the system detects faces coming from the images, the faces detected will be recognized using the five face recognition algorithms (Eigenfaces, Fisher faces, Local Binary Pattern, Template Matching, and Deep Learning) and match it to the database of faces. It will iterate until there is unmatched faces detected by the system. It will then send messages using Short Message System (SMS) to the homeowners; the mobile applications will view five sets of picture for five algorithm results; it will give options to the users to ignore the unrecognized faces or activate the alarm system of the house; and an option to view logs of possible intrusion. The system also has a feature of criteria evaluation module that would give evaluation for illumination, face angle, confidence level, time complexity, and facial feature.

OBJECTIVES OF THE STUDY

The main objective of the study is to develop a proactive surveillance device that is used to detect and recognize intruders. This device use different image processing techniques and criteria evaluation for an accurate recognition of intruder/s. specifically, this research provides the following objectives:

1. To identify the different image processing techniques that proactively sized for surveillance.
2. To detect and recognize an intruder by different image processing techniques.
3. To create a framework that chooses an image processing technique as an algorithm to proactively perform surveillance.
4. To monitor and notify the household owners and authorities when there are theft incidents using mobile application.

MATERIALS AND METHODS

Research Design

The design to be used is the developmental research. A developmental research was defined as the study of design, development, and evaluation of products, programs and processes that meets the criteria of effectiveness and consistency. The product-development process will be analyzed and described, and the final product will be evaluated [27]. It facilitates the study of new tools, models and procedures so that the proponent can anticipate the efficiency and effectiveness of the system.

Hardware Development Process

The proponent used agile methodology that is used to develop products through iterations of the process. This methodology is effective especially when the project can be divided into many small tasks, with lots of creativity, and must be developed to fit with the stakeholder's expectations. The agile methodology in hardware development is best used for projects where most requirements that are not fully known can evolve as the project progresses. The agile welcomes and deals with changes that provide adaptive framework.

Hardware Requirements. A raspberry pi NoIR camera with a minimum of 8MP quality was used to fetch the video feed and process the video feed frame by frame. The Raspberry Pi 3 is a circuit module that has the capabilities of a computer. It has USB ports and an Ethernet port. This will be responsible for conducting the comparing and the sending of email to the home owner containing the image of the suspected intruder inside the house. The IR Illuminator shall be the one responsible for allowing the raspberry pi camera to be able to detect faces in dark places which shall allow us to get better results and higher accuracy. An android phone was used to fetch the image of an intruder.

Software Development Process

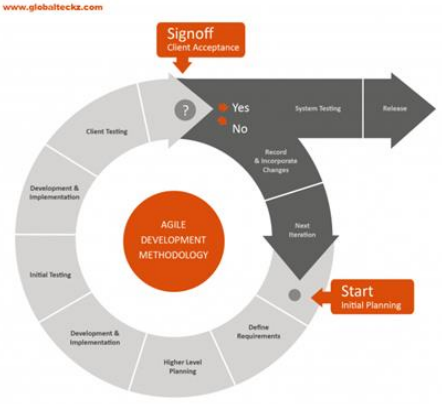

Figure 3. Agile Development Methodology

Agile Development methodology is an intangible framework that helps to maximize the development of the system. It divides the projects into small iterations and is mostly adapted method in every software development.

Software Components. The proponent use python, a high-level programming language to develop the face recognition program. It will be integrated with the Open Source Computer Vision (OpenCV) library. MongoDB, a document-based database management system will serve as storage of data that are necessary for the functionality of prototype.

Algorithm

The proponent used different algorithms for face detection and face recognition to identify if the person inside the

house is an intruder or not. For face detection, viola-jones algorithm was used and five image processing techniques (eigenfaces, fisherfaces, local binary pattern histogram, template matching and deep learning algorithm) was used in face recognition.

Criteria Evaluation

The components of the criteria evaluations are (1) Face Angle, (2) Illumination, (3) Confidence Level, (4) Time Complexity, and (5) Facial Features. These criteria evaluation will be used in assessing the performance of the different algorithm and to which algorithm will be suited for every real time situation.

RESULTS AND DISCUSSION

Different Image Processing Techniques for a Proactive Surveillance

The researcher identified the different image processing techniques and algorithms that are sized for a proactive surveillance. Five algorithms were identified:

Face Detection Algorithm. The algorithm that the researcher used was developed by Viola and Jones. This algorithm uses the Haar-like face features. The possible face detected by the said algorithm will go to the next process of detection. The recognition of the face detected by the algorithm is named as sub-window. The rectangular section of the image is known as the Sub-window. It has a typical size of 24 x 24 picture elements (Wilson & Fernandez, 2006). This feature is often scaled to obtain combination of pixel values and sizes of face and mark each section of the detected face [31].

Face Recognition Algorithm. Eigenfaces Algorithm uses Principal Component Analysis (PCA). It is an appearance-based approach to capture variation of sets of face images and used it to compare images of individual faces in a holistic manner [36]. Fisher Faces Algorithm uses Linear Discriminant Analysis (LDA). It is used to find the subspace in mapping the sample vectors to represent a set of image faces [36]. Local Binary Pattern Algorithm (LBP) is an efficient texture operator. This algorithm uses binary number in representing each pixels of an image picture by means of thresholding the neighborhood of each pixel [23]. Template Matching is a technique in image processing where it finds small part of an image that will match the template image. It can be subdivided into feature-based approach which uses the features of edges and corners of the images and use as the primary measuring metrics in finding the best matching template in the database of images [18]. Deep Learning Algorithm uses multi-layer neural networks to classify task of diving images into classes and layers by developing training techniques and parameter initialization techniques for the prevention of over fitting [28].

Intruder Detection and Recognition using the Different Image Processing Techniques

The first step for intruder detection is the identification of face captured by the camera. The automated procedure embedded to the system was responsible in searching face using an image frame of video information processing.

Figure 4. Sample Face Detection

The Viola-Jones algorithm was used to detect the faces. It uses Haar-like feature that performs the scalar product of the Haar-like templates and the captured picture. Given the pattern X of image A with the same size of N x N, it is defined by:

$$\sum_{1\le i\le N}\sum_{1\le j\le N} A(i,j)1_{X(i,j)} \text{ is white} = \sum_{1\le i\le N}\sum_{1\le j\le N} A(i,j)1_{X(i,j)} \text{ is black}$$

The image should be normalized beforehand by its means and variance for the different lighting position of the captured image (Wang, 2014).

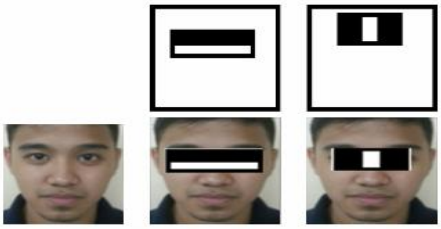

Figure 5. Example Haar-Feature

Some Haar feature classifier includes stages. The stage threshold will be compared to the sum of all Haar-like features classifier results using stage comparator. Threshold can be identified using the AdaBoost algorithm. The data can be set using the OpenCV data set that uses 2135 features in 22 stages.

The system was composed of five face recognition algorithm, and these have its own unique way on how to recognize an image. The main target of the system was to know if the person enters the house is an intruder or not, and it will be based on the images saved in the database. If the captured face image is not on the database, then that

person is an intruder. But there are many constraints to be considered like the illumination of the image, the face angle and others [21].

Table 1. The Different Face Recognition Algorithms and its Features

Algorithm	*Face Angle*	*Illumination*	*Confidence Level*	*Time Complexity*	*Facial Feature*
Eigenface		✓	✓	✓	✓
Fisherface		✓	✓	✓	
Local Binary Pattern		✓	✓	✓	
Template Matching	✓		✓		✓
Deep Learning	✓	✓	✓		✓

Table 1 shows the five face recognition algorithm and the different features to be considered in face recognition. It shows that the Principal Component Analysis (PCA) of the Eigenfaces Algorithm focus on the four features, the illumination, the confidence level, its time complexity and the facial feature. The Linear Discriminant Analysis (LDA) of the Fisher faces algorithm overcomes the limitations of the eigenfaces algorithm because of linear discriminant factors [5]. The Local Binary Pattern (LBP) focuses on the binary pattern of pixels on the regions of the face. It is provides good result because of its time complexity. And because the shape and the texture are described in this algorithm, the confidence level is much higher than the first two algorithms [26]. Template Matching Algorithm can be divided into two approaches, the feature-based and the template based approach. This algorithm is very much particular about face features with high confidence level [18]. The system also used Deep Learning Algorithm based on the OpenCV format. The algorithm has higher confidence level than the other algorithm, with high recognition possibilities but has poor performance in time complexity [35].

Criteria Evaluation Framework

Face Angle. A camera could only capture an image in a single line of sight, because of it the camera could not get all the facial angle of a face that was detected. Facial angle is an important factor in facial recognition because values that are extracted by face recognition algorithms changes depending on the facial angle of an input image [4].

Illumination. Illumination is another factor that is considered in face recognition [14]. For example, changing the direction of the illumination leads to changes to contrast, location of shadows, and et cetera. With these changes, the texture that defines the spatial location of colors in an image may also change, changing the values used by the face recognition algorithms [15].

Confidence Level. Confidence level is the prediction percentage of the algorithm which is relative to defined threshold. Confidence level defines if a face known or not. For instance, the defined threshold is 100, if the confidence level returned by the algorithm during the face recognition method is above 100; it is considered that the face that was detected is not present in the dataset or an unknown face.

Time Complexity. In developing real-time applications, time is an important factor. Every algorithm has their time complexity in terms of execution. Calculating the time complexity of each algorithm is important to know which algorithm could perform the best when it comes to time.

Facial Feature. A face is defined by its features; one feature is facial hair. This criterion could evaluate which algorithm could accurately recognize a face that has changes in facial features such as facial hair and etc.

Notification of Household Owners and Authorities for Theft Incidents

The camera captures an image that serves as an input for raspberry pi. The raspberry pi then prepares the image to be processed into the 5 algorithms. The 5 algorithms are Local Binary Pattern Histogram, Fisher faces, Eigenfaces, Template Matching, and Deep Learning.

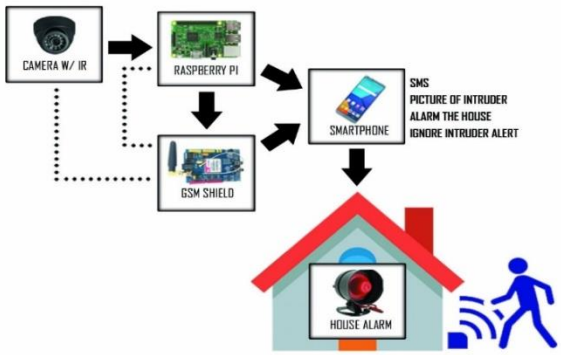

Figure 4. Operational Diagram

The purpose of the five algorithms was to detect the faces present in an image, then the system evaluates the image if the faces present were an intruder or not. If the algorithm detects that a face is unknown, the raspberry pi then sends a notification to the homeowner through internet and short messaging service (SMS). When the users receive the notification, they could view the picture of the possible intruder that was detected and the alarm will be automatically activated.

CONCLUSION AND RECOMMENDATION

Conclusion

The real-time recognition and notification of household intruders is a system developed specifically for the use of homeowners. The software used the different image processing techniques. Intruder notification through a web-based mobile application reported by the server is real-time. Household owners could response to notification by identifying if the person detected is an intruder or not, if it is an intruder or the user did not response with given time limit the house alarm will be activated.

1. It is concluded that the five image processing techniques used by the proponent are evident in recognizing the image and to identify whether the picture captured by the system is an intruder or not. The different algorithms have its unique characteristics that may be highlighted in the process of giving decision if the captured picture can be identified as intruder or not.
2. The face detection and recognition of the system is dependent to the algorithm and its features. Each face recognition algorithm has its unique features that are used in every scenarios or types of detected images.
3. The criteria evaluation is used to let the system know the best image processing algorithm to prioritize in giving results. The different features of the each face recognition algorithm were used to determine the best algorithm to use in any situation, in any scenario.
4. The devices used in the system were very evident to produce result. It can notify the user of the system by means of mobile applications and Internet of Things (IoT) framework. The alarm system inside the house is also helpful to inform not only the people inside the house but also their neighbors beside them.

Recommendation

The development of intruder detection and recognition using different image processing technique for surveillance is open for improvements. From the findings, conclusions, and with its scope and limitation, the following are the proposed recommendation:

1. There are other different image processing techniques available. It is recommended to search for other algorithms that can be added to the system. For face detection, there are other algorithms that can be used. Conducting comparative study between the existing face detection algorithm and other algorithms is recommended. For face recognition, it is recommended to use other library (e.g. mathlab, LabVIEW) in implementing the different algorithms.
2. Adding more features to consider in face detection and face recognition is recommended. Criteria that can be used in much larger set-up and can be used in a larger community.
3. It is recommended that the criteria evaluation can be enhanced and add more criteria that focuses on bigger community. It is also recommended to conduct another research of the effectiveness of the criteria evaluation in making decision on choosing the best algorithm to use in any situation or scenario.

The researcher recommends purchase of high-end devices for utility model and applies for patency of the system. It is recommended also to present the system to government agencies and private companies for mass production of the system.

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Service Index Modelling of Urban Drainage Network

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Abstract:-- **This research objective is to develop an index to determine the condition of infrastructure service of urban drainage network based on the technical and non-technical aspect. This index developed by elaborate the variable and indicator which gives the values to each aspect both the technical and non-technical one. The three variables that give the important aspect to the technical aspect namely system capacity, puddle problems and drainage patterns, each indicated by an indicator. Non-technical aspects influenced by five variables are institutional management, legal and regulatory aspects, socio-cultural and economic, public and private roles and flood losses. The research conducts in the Citepus drainage network that has 16 primary channels. Collecting data from the technical aspects is carried out by the direct site visit measurements as well as the secondary data collection. The non-technical aspects use questionnaire as the qualitative data that converted to the quantitative one. Furthermore, an analysis using the GRG-Generalized Reduced Gradient method is used by allowing the non-linier constraints and arbitrary bounds on the variables. The result of this research is "Suprayogi" index model, with regard of the urban drainage index model that is developed using the technical and non-technical aspects involving the variables and indicators affecting the service level of the drainage network. The result shows, for the technical aspect: capacity system has the largest influence with the determinant coefficient of 0.853, followed by the puddle problems (0.127), and the drainage patterns (0.07). For the non-technical aspects: socio-cultural and economic aspect has the greatest influence with the determinant coefficient of 0.47, followed by flood losses (0.604), legal and regulatory aspect (0.306), the institutional management (0.087), the public and private roles (0.0026).**

KEYWORDS: Capacity System, Generalized Reduced Gradient (GRG) Methods, Optimal, Service Index, Technical and Non-Technical Aspect, Urban Drainage.

I. INTRODUCTION

The rapid urban sprawl brings the significant landscape modifications, of which the most pervasive hallmark is considered to be the transformation from the natural lands to the imperviousness [1]-[2]. This alteration leads to the negative hydrologic impacts that result in the enhanced hydraulic efficiency and it can increase the stormwater runoff volumes, the flow rates and the peak flows and the flow-time reductions in the urban catchments [3]-[4]. While the climate change predictions are inherently uncertain, the predictions of the future changes in the precipitation patterns seem fairly robust [5].

The anticipated climate change will increase the extremes precipitation, leading to an increase in the design intensities of at least 20 % [6]-[7]. This poses a challenge to the urban drainage design as the future drainage systems will have to deal with the increased frequency and the volume of the stormwater flows. As a result, the urban drainage capacity needs to be significantly increased in many parts [8], including the case area in Indonesia addressed in this study. However, there are the increased concerns that expanding the underground pipe system is not a sustainable solution for the climate adaptation in the long term or that the attractive alternatives exist [9]-[11].
Due to the global climate change and intensive urban construction, although the increasing efforts have been made in the urban infrastructure construction including the drainage system, the problem of the urban waterlogging is still serious. Therefore, an accurate assessment of the service performance of drainage system and simulation of its operation status have become an urgent problem [12]. To date, there has not been a service assessment system of the urban drainage that can be become as a reference. In addition, there has not been a network service index of the urban drainage too by considering the technical as well as the non-technical indicator that can be become as a reference in determining the priority of the handling as well as the maintenance. However, the condition of drainage network can also influence the water quality in the river [13].

It is unfortunate, remembering that the Indonesian government has made the reference of the irrigation network assessment in the General Work Ministry Rule No 01/PRT/M/2014 which is useful in the development and maintenance of irrigation network although it is not based

on the scientific approach; however, it is based on the agreement. The technical as well as the non-technical aspect has the important role. The both aspects integrate each other to support the water resources management in the future [14].

The technical aspect can be used to show the areas which are not underserved by the drainage network. Dewi et al. [15] has shown the channel capacity analysis in handling flood. However, Mefri [16] has studied the relation between the drainage system damage and the inundation and finding that both of them are very related. The presence of the unsure on the technical aspect (for example: legal and regulatory, society) in determining the index, will show the continuity of an urban drainage network. Andayani and Yuwono [17] try to see the influence of the two aspects without carrying out the detail discussion; however, the assessment is only based on the questionnaire that less can represent the actual condition, so it cannot be applied directly. Even though the research shows that there is the significant relation between the two aspects with the drainage service level.

Based on that description, the objective of this paper are to develop the service index of drainage network in the urban area in order to help the determination of handling and operational priority. The index has will able to represent the technical as well as the non-technical aspect in order to guarantee the integrity and the continuity of a drainage network performance.

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II. MATERIALS AND METHODS

Bandung city topographically is as highland and lowland on the Bandung Watershed with the average slope is around 0-30%. Based on the altitude, the study location is on the highland with the elevation 791 m MSL (Mean Sea Level).

The slope in the Bandung city is divided into two part as follow: 1) the area with the relative steep slope (more than 7%) in the northern; and 2) the area with the flat slope (less than 2%) in the southern side with. Therefore, the drainage flow pattern in the Bandung area is divided into two flow patterns based on the slope condition. Different gab of slope and also the bad condition of operational and maintenance caused the inundation in many area of the case study. Schematic of drainage system and the Discretization of Bandung City catchment area into sub catchment area present in the Figure 1.

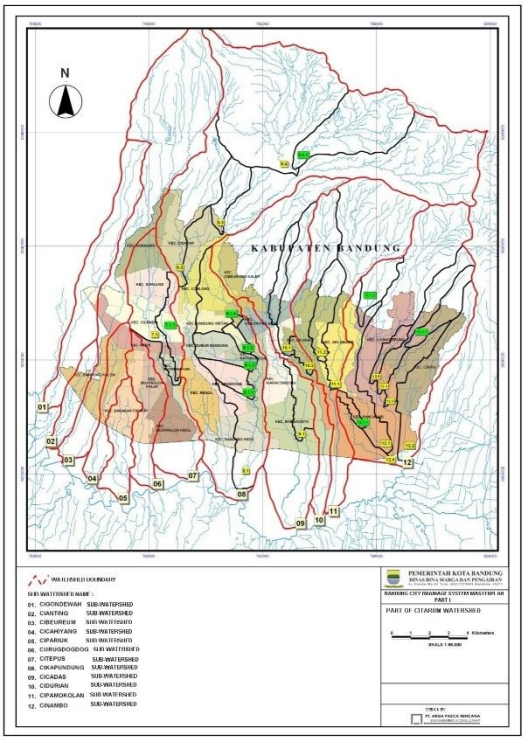

Figure 1. Schematic of Drainage System and Bandung City Discretization

A. The performance assessment of drainage network

Performance of drainage network system is success level of drainage system which has been developed for fulfilling the inundation problem. Based on the masterplan urban drainage network system preparation, the aspects which has to be attended in the design of drainage network system are the technical, operational, and management aspects [18]. Vadlon [19] suggested the assessment component of drainage network physical condition and the weighting value based on the assessment guidance of irrigation network condition which is issued by the Directorate General of Water Resource Management (Jakarta, 1999). The assessment of drainage network physical condition overall is obtained by analyzing the condition of outlet or estuary building (%), complementary building (%), facility building (%), and drainage channel (%) by using the formula as follow [19]:

$$KJD = Kbom + Kbp + Kbf + Ksd \quad (1)$$

Where:

KJD : condition of drainage network (%),
Kbom : condition of outlet/ estuary building (%),
Kbp : condition of complementary building (%),
Kbf : condition of facility building (%)
Ksd : condition of drainage channel (%)

B. The service level Indicator of urban drainage

The service level of urban drainage is a latent variable or a variable that cannot be measured directly (Unobserved variable). Based on the references and experiences, the variable consists of 3 technical dimensions of level-1 to 5 non-technical dimensions which is contributed on the service level of drainage [17]. The three variables (technical aspects) are as follow: 1) the system capacity, 2) the drainage pattern, and 3) the puddle problem. The five variables (non-technical aspects) are as follow: 1) the institutional management, 2) the public and private roles, 3) the aspects of legal and regulatory, 4) socio-cultural and economic, and 5) losses due to the inundation. Then, the three dimensions (technical aspect) and the five dimensions (non-technical aspect) of level-1can be described into the dimension of level-2 and more detail into 26 indicators which can be measured (observed indicator). Furthermore, the indicator is analyzed by using Structural Equation Model (SEM) with the help of Partial Least Square (PLS). The result of simulation model produces the weight factor of every indicator.

C. Technical aspect

The technical aspects are as follow:

1. The system capacity: the assessment is carried out to the condition of water building and the channel in the system. The hydraulic condition will influence the capacity of a drainage system.
2. The puddle problem: the assessment is carried out to the inundation scale that consists of the area or the height and duration. The puddle problem which is happened in the location will give the illustration on the drainage service of a system.
3. The drainage pattern: the assessment is carried out to the flow parameter that influences the hydrograph of drainage system. The flow parameter consists of the land cover and the time of flow.

D. Non-technical aspect

The non-technical aspects are as follow:

1. The institutional management: the presence of active institutional management with supporting by the adequate human resources will give support to the system drainage service.
2. The public and private roles: the public and private roles can follow to play an active role in maintaining and increasing the drainage service by forming the independent forum which can help the legal institution to increase the drainage service.
3. The aspects of legal and regulatory: the presence of law enforcement, the clear rule and it is obeyed, will increase and maintain the drainage service.\
4. Socio-cultural and economic: the socio-cultural condition of Indonesian will have the influence to the drainage service. For example: the garbage problem and the wild house are as the drainage problem which is generally appearing from the socio-cultural and economic factor.
5. Losses due to the inundation: the inundation will give the different losses. It is depended on the location of inundation. The good drainage service will minimize the losses due to the inundation in an area which on turn will give the feedback to the drainage network performance.

III. RESULT AND DISCUSSION

a. Assesment of Technical Criteria

The survey is conducted in the 16 main drainages that located at the Citepus watershed. The survey intends to obtain the value (score) from each variable and index of technical as well as non-technical criteria. The variables of technical criteria are as follow: 1) T1 – the system capacity consists of: $t_{1.1}$ –channel capacity, $t_{1'2}$ –channel age, $t_{1.3}$ – channel condition, $t_{1.4}$ –complementary building condition, $t_{1.5}$ –drainage density, $t_{1.6}$ –land use change rate; 2) T2 –the flow condition consists of: $t_{2.1}$ –time concentration, $t_{2.2}$ – land cover, $t_{2.3}$- drainage system; 3 T3 –the puddle problem consists of: $t_{3.1}$ –inundation area, $t_{3.2}$ –mean depth of inundation, $t_{3.3}$ –mean duration of inundation. However, the technical criteria have 3 sub-criteria which consists of 12 indicators.

The variables of non-technical criteria are as follow: 1) N1 –institutional management consists of: $n_{1.1}$ – organization committee, $n_{1.2}$ –human resources, $n_{1.3}$ – supervisor committee, $n_{1.4}$ –standard operational procedure, $n_{1.5}$ –master plan; 2) N2 –public and private roles consists of: $n_{2.1}$ –society forum which is involved, $n_{2.2}$ –the involving of society and private; 3) N3 –legal and regulatory consists of: $n_{3.1}$ –monitoring to the rule, $n_{3.2}$ –the effort of law enforcement, $n_{3.3}$ –reward to the society; 4) N4 –socio-culture and economy consist of: $n_{4.1}$ –boundary line condition, $n_{4.2}$ –education level, $n_{4.3}$ –operational cost, $n_{4.4}$ –maintenance cost. However, the non-technical criteria have 4 such-criteria which consists of 14 indicators.

Based on the second circle of structural model by using the SEM PARTIAL LEAST SQUARE (PLS), the relation between the technical variables (system capacity, flow pattern, and puddle problem) and the non-technical variables (institutional management, society and private role, legal aspect and regulatory, socio-culture and economy) has the significant influence to the drainage infrastructure service. It can be seen on the inner model number of technical variable is 4.241 and non-technical variable is 2.698. Each variable has the value more than 0.5. Based on the result of the SEM-PARTIAL LEAST SQUARE (PLS), there are 6 variables are almost not influencing the drainage service index such as: 1) technical aspect: $t_{1.2}$ –channel age, $t_{1.4}$ –complementary building condition, $t_{2.3}$ –drainage system, $t_{3.1}$ –area of inundation; 2) non-technical aspect: $n_{4.2}$ –education level, $n_{4.4}$ – maintenance cost. Therefore, the 6 variables are not used in the modelling. The questionnaire result about the selected

variables due to the result of the SEM PARTIAL LEAST SQUARE (PLS) is presented as in Table 1 and 2, each for technical and non-technical aspect.

Table 1. The selected criteria assessment and coefficient value of technical aspect

No.	Name of primary channel	T1				T2		T3		t calc.
		0.853				0.127		0.021		
		t_{11}	t_{13}	t_{15}	t_{16}	t_{21}	t_{22}	t_{32}	t_{33}	
		0.188	0.429	0.493	0.144	0.246	0.190	0.090	0.389	0.73
1	Cipedes hilir	5	3	2	5	1	1	1	3	3.437
2	Sarijadi	5	4	2	5	1	1	5	4	3.819
3	Cibogo	5	4	1	5	1	1	3	4	3.395
4	Citepus	4	3	2	5	1	1	1	4	3.285
5	Supadio	5	4	2	5	1	2	5	4	3.843
6	Cikakak	5	3	2	4	1	1	1	4	3.322
7	Cilimus	5	4	2	4	1	1	1	4	3.688
8	Waringin	4	3	2	4	2	1	5	4	3.200
9	Ciroyom	4	4	2	5	1	1	1	4	3.651
10	Babakan Tarogong	3	4	2	4	3	2	5	5	3.469
11	Arjuna	3	3	2	4	1	2	5	5	3.041
12	Otista	5	2	3	4	2	1	1	4	3.408
13	Leuwisari	3	4	2	4	2	1	5	5	3.414
14	Kurdi	4	3	2	5	2	1	5	5	3.332
15	Muara	4	3	2	5	1	1	5	5	3.300
16	Curug Candung	3	4	2	5	4	1	5	5	3.599

Source: own study

Table 2. The selected criteria assessment and coefficient value of non-technical aspect

No.	Name of primary channel	N1					N2		N3			N4		NT calc.
		0.6046					0.0026		0.0868			0.3060		
		n11	n12	n13	n14	n15	n21	n22	n31	n32	n33	n41	n43	
		0.33	0.29	0.06	0.06	0.26	0.21	0.17	0.16	0.19	0.28	0.34	0.27	0.27
1	Cipedes hilir	3	2	1	1	1	1	1	3	2	1	4	1	1.719
2	Sarijadi	1	1	1	1	1	2	1	1	2	1	4	1	1.116
3	Cibogo	3	2	1	1	1	1	1	3	2	1	5	1	1.825
4	Citepus	3	2	1	1	1	1	1	3	2	1	5	1	1.825
5	Supadio	3	2	1	1	1	1	2	3	2	1	3	2	1.696
6	Cikakak	3	2	1	1	1	1	2	3	2	1	3	2	1.696
7	Cilimus	1	1	1	1	1	1	1	1	2	1	3	2	1.092
8	Waringin	3	2	1	1	1	1	1	1	2	1	3	2	1.668
9	Ciroyom	1	1	1	1	1	1	1	1	2	1	3	1	1.010
10	Babakan Tarogong	2	4	1	1	1	2	1	1	1	4	2	1	1.695
11	Arjuna	3	4	5	5	5	2	2	4	3	1	5	1	2.902
12	Otista	4	2	1	1	3	1	1	4	1	1	5	1	2.340
13	Leuwisari	3	2	1	1	1	1	1	3	2	1	5	1	1.825
14	Kurdi	3	4	5	5	1	2	2	5	5	1	5	1	2.311
15	Muara	3	4	5	5	1	2	2	3	4	1	3	1	2.056
16	Curug Candung	3	2	1	1	1	2	5	4	3	1	3	1	1.647

Source: own study

Explanation:
1) N1 –institutional management consists of: n1.1 –organization committee, n1.2 –human resources, n1.3 –supervisor committee, n1.4 –standard operational procedure, n1.5 –master plan; 2) N2 –public and private roles consists of: n2.1 –society forum which is invilved, n2.2 –the involving of society and private; 3) N3 –legal and regulatory consists of: n3.1 –monitoring to the rule, n3.2 –the effort of law enforcement, n3.3 –reward to the society; 4) N4 –socio-culture and economy consist of: n4.1 –boundary line condition, n4.3 –operational cost.

The formula of technical urban drainage service is as follow:

ILtechnical = a1.T1 + a2.T2 + a3.T3

Where as : ILtechnical = technical urban drainage service, T1 = flow pattern index, T2 = puddle problem index, T3 = system capacity index, an = weight index.

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The formula of non-technical urban drainage service is as follow:
ILnon-technical = b1.N1 + b2.N2 + b3.N3 + b4.N4
Where as: ILnon-technical = non-technical urban drainage, N1 = institutional management index, N2 = legal aspect and regulatory index, N3 = socio-cultural and economic index, N4 = society and private role, N5 = losses due to the inundation index. Bn = weight index.
However, based on the data as presented in the Table 1 and 2, the formula of technical and non-technical urban drainage service is as follow:

ILtechnical = 0.853 T1 + 0.127 T2 + 0.021 T3
T1 = 0.188 t11 + 0.429 t13 + 0.493 t15 + 0.144 t16
T2 = 0.246 t21 + 0.190 t22
T3 = 0.090 t32 + 0.389 t33

ILnon-technical = 0.6046 N1 + 0.0026 N2 + 0.0868 N3 + 0.3060 N4
N1 = 0.33 n11 + 0.29 n12 + 0.06 n13 + 0.06 n14 + 0.26 n15
N2 = 0.21 n21 + 0.19 n32 + 0.28 n33
N4 = 0.34 n41 + 0.27 n43

The index value of 16 primary drainage channels for technical and non-technical aspect is as follow:
ILtechnical = 0.853 T1 + 0.127 T2 + 0.021 T3
ILnon-technical = 0.6046 N1 + 0.0026 N2 + 0.0868 N3 + 0.3060 N4
The weight index is analyzed by using the Generalized Reduced Gradient (GRG), the results is as follow:
IL = α ILtechnical + β ILnon-technical
IL = 0.73 ILtechnical + 0.27 ILnon-technical
The comparison of urban drainage service index due to the formula (modelling) and observation is presented as in the Table 3.

Table 3. The comparison of $IL_{modelling}$ and $IL_{observation}$

No	Name of primary channel	$IL_{modelling}$	$ILD_{observation}$	Relative error (%)
1	Cipedes hilir	2.975	3	0.05
2	Sarijadi	3.091	3	0.83
3	Cibogo	2.972	3	0.08
4	Citepus	2.892	3	1.17
5	Supadio	3.265	3	7.01
6	Cikakak	2.884	3	1.34
7	Kopo	2.989	3	0.01
8	Waringin	2.788	3	4.51
9	Ciroyom	2.940	3	0.36
10	Babakan Tarogong	2.991	3	0.01
11	Arjuna	3.003	3	0.00
12	Otista	3.120	3	1.44
13	Leuwisari	2.986	3	0.02
14	Kurdi	3.057	3	0.32
15	Muara	2.965	3	0.12
16	Curug Candung	3.073	3	0.54

Source: own study

The maximum standard relative error in this study is 10%, so the analysis as above can be accepted. The maximum error as presented in the Table 3 is 7.01% (< 10%) such as in the SP Supadio and the minimum error is 0.02% (< 10%) such as in the SP Leuwisari. It indicates that the indicator coefficient of SP Leuwisari is more suitable than SP Supadio.

IV. CONCLUSION

Based on the analysis as above, the conclusion of this study is as follow:
1. The service mean assessment of an urban drainage network due to the technical aspect is as follow: the system capacity is 3.55 (good), the flow pattern is 1.375 (bad), and the puddle problem is 3.844 (good). However, for the non-technical aspect is as follow: the institutional management is 2 (less), the society and private roles is 1 (bad), the legal aspect and regulatory is 1.95 (less), and the socio-culture and economy is 3 (moderate).
2. Based on the analysis by using Partial Least Square (PARTIAL LEAST SQUARE (PLS)), the 8 technical and non-technical variables which consist of 26 indicators is filtered into as follow:
a. The technical aspect: in the beginning has 3 variables which consist of 12 indicators, however, the PARTIAL LEAST SQUARE (PLS) result becomes into 3 variables which consist of 8 indicators as follow: 1) variable-1: system capacity consist of channel capacity, channel condition, drainage density, and land use change rate; 2) Variable-2: flow pattern consist of time concentration and land cover; and 3) variable-3: puddle problem consist of mean depth of inundation and mean duration of inundation.
b. The non-technical aspect: in the beginning has 5 variables which consist of 14 indicators, however, the Partial Least Square (PLS) result become into 4 variables which consist of 10 indicators as follow: 1) variable-1: institutional management consist of organization committee, human resources, supervisor committee, standard operational procedure, and master plan; 2) variable-2: society and private role consist of society forum which is involved, the involving of society and private; 3) variable-3: legal aspect and regulatory consist of monitoring to the rule, the effort of legal ascendance, reward to society; and 4) variable-4: socio-culture and economy consist of boundary line condition and economic activity.
3. Based on the analysis by using the Partial Least Square (PLS), the result of service index modeling of the urban drainage is as follow:
a. ILtechnical = 0.853 T1 + 0.127 T2 + 0.021 T3
T1 = 0.188 t11 + 0.429 t13 + 0.493 t15 + 0.144 t16

T2 = 0.246 t21 + 0.190 t22
T3 = 0.090 t32 + 0.389 t33
b. ILnon-technical = 0.6046 N1 + 0.0026 N2 + 0.0868 N3 + 0.3060 N4
N1 = 0.33 n11 + 0.29 n12 + 0.06 n13 + 0.06 n14 + 0.26 n15
N2 = 0.21 n21 + 0.19 n32 + 0.28 n33
N4 = 0.34 n41 + 0.27 n43
Based on the Generalized Reduced Gradient (GRG), the weight index for the service index modeling of urban drainage is as follow: IL = 0,73*Iteknis + 0,27*Inon-teknis and it can be concluded that the technical as well as non-technical aspect have contribution to the service index of urban drainage.

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A Novel Approach to Identify the Best Practices of Quality Management in SMEs Based on Critical Success Factors using Interpretive Structural Modeling (ISM)

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***Abstract*:-- In recent years, most small and medium scale enterprises (SMEs) worldwide looking for improvement in their business practices in order to gain competitive advantage and total quality management(TQM) as a means by which SMEs could achieve the desired result. The objective of this study is to discover the critical success factors that are affecting the quality management practices in SMEs. In this work eight factors were identified through the literature review and experts from academic as well as industries. The factors are commitment to quality, employee involvement, customer focus, information technology, improved production planning and control, recognition system, supplier quality management, and management vision and mission. Interpretive structural modeling(ISM) is used to understand the complex relationships among the factors and classify the factors into various categories as per the driving and the dependence capacity. The result shows that information technology (IT) is a key success factor for implementing TQM in SMEs. It is observed that SMEs have to increase the use of IT to improve the quality of the product and productivity.**

KEYWORDS: Total Quality Management, SME, IT, Critical Success Factor

I. INTRODUCTION

In recent years the demand of the small and medium scale enterprises touched to a new height because of the development of technology that makes it easier to connect to the big industries which indirectly increase the amount of contribution towards the economy across the world. According to the latest report of 2017 Indian SMEs contributes around 45% towards the total manufacturing output,40% towards the export, and 8% towards GDP of the country [1].

The effect of globalization changes the perspective of total quality management in such a way that every industry would like implement total quality management to improve the performance across sectors in SMEs as well as in big industries [2]. Indian Cement Industry has shown positive effect because of effective implementation of the TQM [3].

It is important to understand the significance of critical factors of TQM for the success of Indian automobile industries. The failure of TQM practices happens because of deficiency of understanding of the complex relationships among the key factors [4]. The implementation level of TQM in Indian manufacturing industries is low, but the level of awareness is high [5].

Implementation of TQM has shown positive impact on Indian service Industries [6]. ISM is easy to use and widely used approach for most of the complex situation [7]. The structure of the paper is as follows: Section 2 represents the past work related to the factors affecting TQM in a tabular form and Section 3 describes about the methodology.

The Questionnaire survey has been discussed in Section 4 and Section 5 focuses Interpretive Structural Modeling Approach. MICMAC analysis has been carried out in Section 6 and section 7 presents the ISM model. Section 8 and 9 discusses the results of MICMAC analysis and conclusion drawn based on ISM respectively.

II. LITERATURE REVIEW

The critical success factors are identified from the previous literature and presented in Table 1.

Table 1: Critical Success Factors for TQM identified by previous researchers

Critical Success Factors	Authors
Top Management Commitment	Crossby,1979; Deming, 1982; Garvin, 1986; Brown et al., 1994;Siam et al,2012; Siddiqui and Rahman, 2006; Jórgensen, K.B., Nielsen, A.F.(2013)
Employee Involvement	Raiborn and Payne, 1996; Juran and Gryna, 1993; Zhang, 1999
Customer Focus	Ishikawa, 1985; Karuppusami & Gandhinathan, 2006; Saravanan & Rao, 2006; Rahman and Bullock, 2005; Jórgensen, K.B., Nielsen, A.F.(2013)
Information Technology	Pearson et al., 1995; Matta et al., 1998; Ang et al, 2000; Brah and Lim, 2006;Khanam et al 2013
Improved Production Planning and Control	Porter and Parker, 1993; Zhang, 1999; Kanji, 2002; Jórgensen, K.B., Nielsen, A.F.(2013)
Recognition System	Dale and Plunkett, 1990; Brown et al., 1994; Zhang, 1999
Management Vision and Mission	Zhang, 1999 ; Mallur & Hiregoudar, 2010
Supplier Quality Management	Saraph et al., 1989; Flynn et al., 1995; Demirbag, 2006; Turkyilmaz et al., 2010; Jórgensen, K.B., Nielsen, A.F.(2013)

III. METHODOLOGY

The flowchart of the methodology is shown in Figure 1

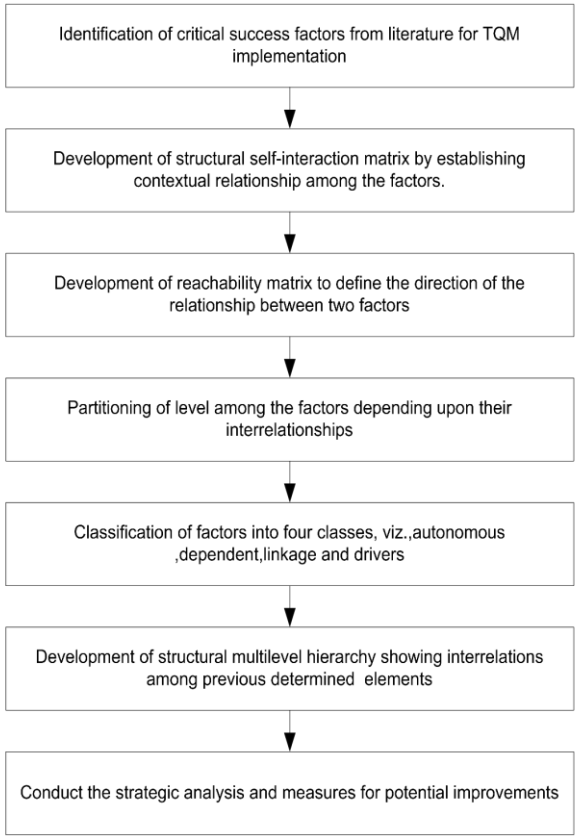

Figure 1: Flow chart of Methodology

IV. QUESTIONNAIRE SURVEY

The analysis of the profiles of the correspondents reveals that 35 selected SMEs from different parts of India participated in the questionnaire survey, those having quality control departments. All the firms belonged to the private sector and mainly from the automobile part manufacturing sector. The characteristics of the manufacturing firms, which are represented by the respondents, are summarized in Figure 2.

Out of all the firms surveyed, 45.71% had a workforce less than 50, 42.86% had a workforce in between 50 and 200 and the remaining 11.43% firms had a workforce of more than 200. Referring to the employees who filled up the questionnaire, 17.14% had a diploma degree, 42.86% held undergraduate degree, and 40% had a post graduate degree to add to their accolade. As far as their industrial experience is concerned, 11.43% had an experience below 3 years, 8.57% had 3-6 year's experience, 17.14% had 6-12 year's experience, 37.14% had 12-18 year's experience and 25.74% had more than 18 years of industrial experience to decorate their arsenal. Talking in terms of the turnover of these SMEs, 34.28% earned revenue of less than 5 crore. per annum, 51.42% earned in between 5 and 50 crores, and 14.28% of the firms had revenue exceeding 50 crores.

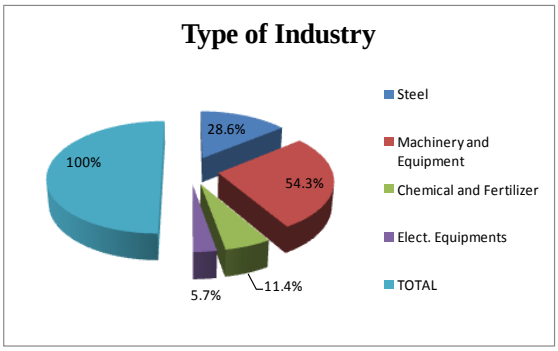

Figure 2: Respondents based on type of Industry

V. ISM APPROACH

Identification of the structure within a complex system is of great value in dealing efficiently and effectively with the system and better decision making. Interpretive structural modelling (ISM) is an approach that can be used in any situation, regardless of its content. A set of elements should be identifiable and an appropriate contextual relation must be established. The set of elements may be measurable in ordinary scale of measurement or even beyond it. So, we can say that ISM is more flexible compared to other modeling approaches that works only on the quantitative data. Hence, ISM extends a qualitative

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modeling approach enabling the users to build a structural model to map their thought on an issue after going through a process of taking expert opinion. Eight factors have been identified by early literature review and it is essential to develop a structure of interrelationship among the identified critical success factor using an interpretive structural model. The steps are 1) Structural self-interaction matrix 2) Framing of reachability matrix 3) Drawing out level partitions 4) Classification of factors 5) ISM formation. The MICMAC analysis is done using the diagram shown in the figure 3.

VI. MICMAC ANALYSIS

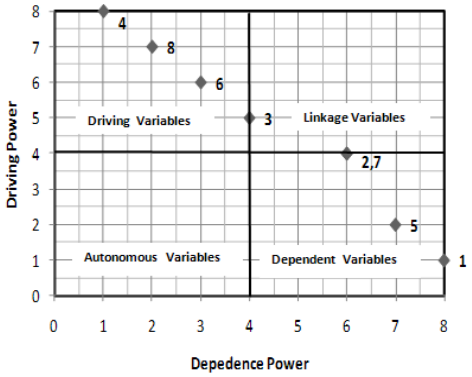

Figure 3: Classification of factors for implementing TQM in SMEs

VII. ISM MODEL FORMATION

The structural relationships among the different CSFs are represented in the Interpretive Structural Modeling shown in the figure 4

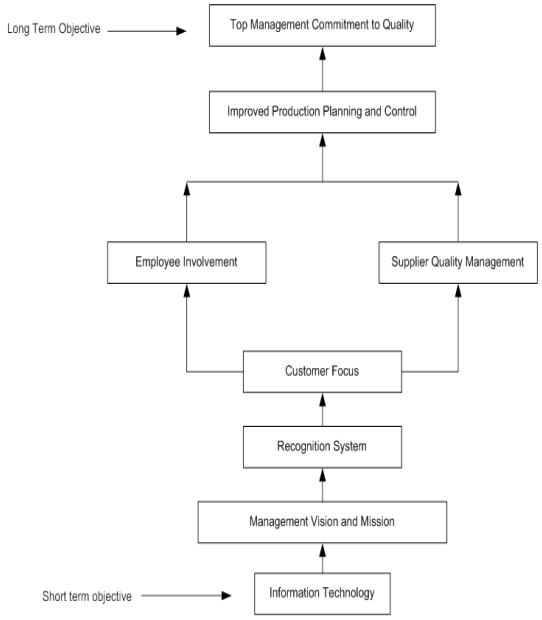

Figure 4: ISM model of factors for implementing TQM in SMEs

VIII. RESULTS AND DISCUSSION

In the present study, eight critical factors have been identified for implementing the TQM in Indian SMEs. The different hierarchy shows the classification and categorization of different critical success factors. The important findings of this research are as follows.1) There is no autonomous variable. Autonomous variables are unfocussed and disconnected from the system due to their weak dependencies and weak driving powers. So, selected eight factors are rightly significant for Indian SMEs.2) There are four factors such as Top Management Commitment to Quality, Improved Production Planning and Control, Employee Involvement, and Supplier Quality Management (figure 3), appear at the top level of the ISM hierarchy (figure 4) come under dependent category as the desired long-term objectives of the Indian SMEs. Out of these factors, Employee Involvement, Supplier Quality Management factors are slightly unbalanced because of its closeness towards the linkage factor and it should be more focused by the managers of Indian SMEs for a better TQM structure. The ISM model shows that Top Management Commitment to Quality and Improved Production Planning and Control depend on the other factors.3) Linkage factors are unstable due to strong driving powers and dependencies. In this paper all the selected eight factors are stable because there are no linkage factors (figure 3).4) In the ISM model (figure 3), four factors such as Information Technology, Management Mission and Vision, Recognition System, and Customer Focus are classified as drivers due to their high driving powers and less dependency and they are appeared at the bottom of the hierarchy. These factors are considered as independent and the key drivers to achieve the organizational objectives. So, the decision makers should emphasize more weightage to information technology, so that it influences Management Mission and Vision and finally persuades other factors.

CONCLUSION

In this research paper a detailed study has been carried out to identify the critical success factors for implementing quality management practices in Small and Medium Enterprises (SMEs). A hierarchical structure has been developed to find out the position of the critical success factors and the complex relationship among them using Interpretive Structural Modeling.

The study will assist the quality managers of SMEs to pay more focus to the above eight critical success factors for implementing TQM to enhance the efficiency and effectiveness of the organization. The research is a systematic approach to visualize the short term and long-

term objective of TQM and it establishes the interdependencies among the selected eight success factors. So, it is a strong road map for the managers of Indian SMEs to know the drivers and dependents from the complex relationship of different factors to move forward the organization in a right path. This research shows that information technology influences management vision and mission to achieve the top management commitment towards quality.

The proposed model has been tested with limited number of factors in the Indian SMEs, which are competitive in nature. In future, more factors can be added to get a better and transparent view of Indian SMEs in implementing TQM.

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Kanis and their Faiths in South India

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Abstract:-- **In ancient time the man is satisfied with the fulfillment of his basic needs. Then he prepared weapons to fight against the barriers that he faces. While them collecting food. He assumed that there is a super power beyond all. Nature possesses immense potential. He started analyzing the reasons for this. He scared of the power of nature. He wanted to cool it. So he developed certain faiths. Believes are related with customs most of believes are related with emotions. This believes persists in sub conscious mind and this stage is mental creation says Steven Sam. Based on the above statements man try to eliminate the evils and to reach good values. These are the basic criteria for believes. Kanis living in South India also adapt certain faiths based mainly on the fear and they follow their tradition.**

Key Words: Kanis, Faith, Super Power

INTRODUCTION

The faith in God commenced from the fear of nature. Man first started to worship earth, water, air, fire and sky. The faith in God and worship are based on the fear and out of love. Faith in God commence when man started his life on the earth. The people living in jungle fears more than the people in plains. This may be due to the environment and also out of fear. The Kanis are afraid of the nature and they believe that the spirit of dead person survive with them forever, says (Nirmal Kumar Bose 1971:63) Proto materialism and animism still prevails in the life style of Kanis. The worship is of two types viz worshiping little Gods and worshipping great Gods. To protect them from enemies, to control nature, to makes their enemies sick, to get cured from illness are the reasons for their worship Dr.V.I.Subramainum 1978:6 says that the idol worship of common man is due to fear of nature and the fear of the souls of dead. The religious believers of Kanis are clearly related with ancient Tamils. Kanis usually worship nature, souls and little Gods. The cultured people worship great Gods. The cultured people worship great Gods. As the Kanis do not mingle with civilized society, mostly they worship little Gods.

The Gods of Kanis

In addition with Panchaputham (Air, earth, sky, water and fire) they also worship sun, moon, stones and trees. They also worship the souls of dead, Goddess of forests, Pathirakali, Mariyamman and Pechiammals. They worship more than a hundred little Gods. Among the Gods of nature worshiping sun as a God is a major tradition among Kanis, when they start with anything new in their life they offer pongal to the sun God. While asking the importance of worshiping Sun, Kanis, reply that if there is no sun there is no life science also agrees with this fact. Neem, Vengai, Banyan and Jackfruit trees are the trees in which Gods reside, so that they produce later. This is the firm beleives of Arugani Kanis. Malankali is the chief among the little Gods. The Kanis do not make the idols of little Gods. They keep a cone shaped stone and worship. In recent years Kanis mingle with the people of Planis. So they started worshiping Siva, Vishnu, Murugan, Iyyappan, Pillaiyar and Parvathi. Some of the Kanis follow Christianity.

Offering to the Rain God

The Kanis of hilly area consider rain as a great blessing. They believe that the rain God Marriayaman bless them with rain. The elders living in Kani hamlet. Worship the God on every night before they go for sleep. If in their dreams they are ordered to give koduthi they tell to other Kani about their dream. All Kanis assemble and discuss the date and place of Koduthi Mutukkani takes the final decision. Villakain announces about koduthi to all the kanis. They spread seven plantain leaves in front of the hut and keep boiled rice, tender coconut, liquors, alcohol, banana, flowers any beetles leaves. At 12 noon the leaders of kanis and other Kanis offer their prayers.

Heaven-Hell

People of all religions beleive heaven and hell is awarded after death. Thiruvalluvar also insist this in his Thirukkural. If a man's deeds are for noble cause he goes to heaven after his death. If he does crime and do evil to other he goes to hell after his death. The same principle is deeply rooted in the minds of Kanis of Arugani.

The heaven is an external life awarded to the people who had lead a noble life on earth. The people who reached heaven on seeing the Holy tree (Karpagavericham) they ask whatever they want and it is granted by that holy tree. The doors of heaven are always opened for good souls. So they descend from heaven and come to earth to bless and help their relatives. This is the firm beleif of Kanis of Arugani.

The hell is a dwelling of the evil ghosts and dangerous arkkarar. A huge fire burns continuously. In contrast the evil souls are captured by ghosts and they put it in hell fire. The hell always has battles and chaos. These bad spirits spoils the human mind. This is the faith of Kanis of Arugani.

Fate

Kanis are firm believers of fate. The Kanis beleive that fate is determined by God. This fate is based on the life that he led in his previous birth. Due to this superstitious beleives. Some Kanis stay lazy at their home without doing any job.

Rebirth

Kanis believe that when a person is dead his flesh becomes water, his bones become powder and his soul becomes Vapour. His soul has rebirth. This is not only the belief of Kanis but also believed by ancient Tamils says Kural.

The believe of Kanis

Kanis family believe in rebirth. A man who leads a noble life with good values enjoys a good life in his rebirth. A man who leads a mean life and do not have good values is punished in his rebirth. Their rebirth will be in the form of a cat, a dog, a pig or a monkey. This is the common believe of Kanis.

Superstitious believes

Faith is an important life of humans. Some faith leads man in right path. Religious faith binds the family relationship. Respecting parents, loving the life partner are emphasized by religion. Sometimes these faith leads to superstitious believes. As kanis are not civilized society these believes are deeply rooted in their minds. Kanis are mostly indulged in Superstitious believes.

Good Omens

A woman carrying a filled kudam with a child is a good Omen. Married couple coming in opposite, sneezing while discussion. Dreaming of death, butterflies flying in day time, cry of certain animals, building of nests of certain birds in the huts are the good omens.

Entry of flies and animals

Animals such as squirriles and bees entering their huts and building their nests or hives are considered to be good omen. They fore tell the good fortune.

Cry of a Crow

When the Kanis discuss about some good issues, if a crow cries, it is believed that some important guest would come to their home.

Sound produced by lizard

The sound made by lizard is considered to be good omen from the period of sangam for the Tamils. This is emphasised in (Natinai Poem No: 333)11 ancient Tamil literature. This is firmly believed by most of the community and Kanis also beleive the same.

Bad Omen

When Kanis get themselves ready to go out of their hut for a good event if their head hit the entrance frame, it is considered to be a bad omen. Similarly a widow coming across is also considered as bad omen. A lady with open hair, taking a dead person, carrying a snake bit person on the way are some of the bad omens according to Kanis. The cry of animals and birds such as cat, snake and owl are considered to be bad omen by kanis.

Cry of an Owl in evening

Owl is referred as kukai by Kanis. If the owls cry in the evening near their hut, it is prediction for death says Kanis of Arugani.'

Cat Coming across

If any Kani steps out of the door for a noble cause, and if a cat come across his way is considered to be a bad omen and he beleives that the day is not good for him.

Falling of lizard on a kanis

Kanis beleive that if a lizard falls on his head or his body, they suspect some evil things will happen in their life shortly.

Calling of a dead person in dream

When a Kani sleeps, if he dreams of his relative calling him in dream is a prediction of that Kani's death and Kanis are scared of this dreams.

Seeing a snake in dream

Everyone knows that snakes are poisonous, so they are mostly disliked by humans. Seeing a snake in dreams is a sign of bad thing that is going to happen very shortly.

Sneezing

When the Kanis think of some good deeds or while they are planning discussing about some good things, if a Kani of same sex sneezes, it is said to a bad omen.

Fortune tellers

Still now Kanis are considered to be good fortune tellers. We can see them in tourist places especially at kanyakumari. This is encouraged even by the people who live in country side. If a Kanis decides to do something, he asks Pillathi to predict whether he has to do or not? Three types of fortune telling is famous among Kanis.

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Predicting future using flowers

Pillathi prays to God and he keeps some flowers which are varied in colours. A Kani who wishes to know whether his desire will be fulfilled. Pillathi tells the Kani to select a single flower. If the flower is same as the one already in Pillathi's mind, the action will have good end otherwise, the God does not give permission for his mission. So the Kani stops his mission.

Using rice for predicting future

Pillathi thinks of a particular matter in his mind he prays to God a takes a handful of mountain rice (Malai Nel). If the number of rice is odd, he allows to do that matter. If the number is even he tells that God does not give permission. As Kanis always beleive the fortune telling they do not use their wisdom. They are unaware of the new trends. They are very lazy to know about what happens around them and are ready to lead a lazy life. This is the reason behind the barriers in the improvements of Kanis life style.

Anger of Gods

Kanis have taken the Goddess of mountain as their main God. In addition they also take Malankali, Kalattu Thampuran, Malaivathai, Marriyammal and the ghosts of their ancestors. They offer pongal and Keduthi to cool these Goddesses. They firmly beleive that these offerings reduce the anger of their Goddesses. Otherwise Kanis are harmed by them, Says Kunchamma Kani of Arugani.

Gealousy

Kanis believe that the vision of some people is harmful. If a man has Gealous in his mind and if he sees children or adults it may spoil their health.

Thettu

'Thettu' means impure. A girl who has attained puberty, ladies in mensus period and a lady who has given birth to a child is said to be impure. They are isolated from others. They spend these days in a separate place. They do not mingle with others unless they are purified. Other Kanis also do not touch or mingle with them. During these days the ladies are prohibited from cooking and working in fields and farms.

Believing Devil or Ghost

If a person dies in young age due to accidents or the attack of wild animals their soul do not rest in peace. It is said to be roaming around. It is believed that if a person comes out of the home and walk alone in a road at nights, if the ladies in theettu period comes out of the hut, especially ladies, these ghosts catch hold of them. The person affected in this way. Stay without laking food and they are very sad the laugh alone and wander without sleep. They vomit after taking food. They shout loudly and stay at home lazily. These symptoms show that the person is affected by ghost. Kanis call upon peyooti to send out the ghost in the body of affected person.

Manthira

Formerly man is afraid of nature, he firmly beleived that some force control this nature. They also beleived that these ghosts or devils can be controlled by certain hypnotic activities. These become Manthras later these manthras can control many activities. This technology is purely out of imagination, says (Thomson George 1980:11)13 People all around the world do manthra based on certain believes. Kanis do manthras purposely. Based on the results the manthras are of two types 'Oththa Manthra' and 'Thoththu Manthra'.

Tribals and Manthras

The people who are down troadan and illiterate have a lot of superstitious beleives. The tribes live along with nature they have many such beleives. Kanis also have faith in foolish manthras. They do black manthras to do harm and to cause diseases to their enemies. They also do pure manthras to eradicate the effects of black manthra.

Hypnotism

This is used to attract or to keep a person into one's control or love. This is usually done by telling manthra in the spit or dirt collected from concerned person and telling some manthras on it and mixing with the person's diet. The Kannis beleive that through this hypostising activities the bond between a husband and a wife and a loving bond between lovers get more stronger and they stay together longer.

Black Magic (Seivinai)

Kannis are very famous for doing Black magic. The Pillathis of Kanni society knows the manthras. He never tells the secrets to others. They mostly prefer new moon days for doing black magic. Kanis of Arugani use egg of a hen, or lemon for doing black magic against their enemies.

Puttu Seivinai

In order to case fatal disease to the opponent, this Puttu Seivinai is used. They collect the fallen hair, soil beneath the foot of the enemy. They mix it with bone remains from cremation yard and make a small bundle. Tells the manthra and the enemies name thrice and keep it in ant hill (puttu) and close it with a stone. They beleive that this black magic causes very dangerous and incurable diseases the cancer to the enemies.

The bones collected from cremation yard

There is a universal belief that the sand or bone collected from the cremation yard. The thieves cover the bone of a cremation yard with molten wax and use it as a candle. When the thief enters a house he lits the candle. This

includes a good sleep to the people at home. (Frazer George 19676:30)15

Vasiya Manthra (Hypnotism)

Hypnotism is an ancient tradition of most of the people in this world. Chineese are famous for hypnotism. This is done to bring a person to one's control. This is used to win a lover, to separate a husband and a wife, and to cause enemity among relatives. The hypnotism has mostly spread over the villages of Tamilnadu. These is an alternate method for sucking out medicine send in through manthra. When the opponent is walking on the street if he steps on the manthra articles he becomes very weak day by day and die pathetically. For doing evil manthra, Kanis we the hair, the soil beneath the feet, a thread from the used cloth, urine of the opponent, skull, sand and bones collected from cremation yard. Usually Kanis and other tribes have the faith that the waste of humans have evil effect. This is the reason for avoiding the usage of toilets and laterines by trib.

Kanis live a life attached with nature. Their traditions and faiths cannot be easily uprooted from their lives. As the Kanis are mostly illiterate they give importance to superstitious believes. They are afraid of civilized society and do not mingle with them.

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Land Use Change Impact on Flood Reduction Capacity of Lake Sentani, Jayapura

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Abstract:-- **Flood is a natural phenomenon that occurs in certain places due to natural causes and human activities. However, the imbalance in hydrological cycle will cause the flood to do damage, both materially and non-materially. Therefore, it is important to control the occurrence and magnitude. Human activities that can cause such imbalance, one of them, is land use change. Many areas of pervious area are shifting into impervious areas, which will increase the amount of surface runoff generated. This research will cover about how land use changes over the year can influence the surface runoff generated in a certain area. This research is conducted in Sentani watershed, Jayapura, Papua, Indonesia. Calculation with the aid of ArcMap 10.1 and WinTR-20 results in around 6% changes in flood discharge in the outlet for land use in year 2007, 2010, 2012, and 2016. The reservoir capacity in reducing flood discharge is also increasing over the years.**

KEYWORDS: Flood, Lake Sentani, Land use change, SCS-CN model

I. INTRODUCTION

Flood is a natural phenomenon that occurs in certain places. It is caused both by natural forces and human activities. By natural forces, flood can occur due to heavy rain in such short amount of time. Aside from natural causes, flood can also be caused by the expansion of human activities. One of the example is the change of land use due to the increment of human activities. Such cause may directly cause shifting in land cover from pervious cover to impervious cover in order to fulfill the rapidly growing demands of human activities. This phenomenon can happen everywhere, not only in urban areas but also suburban and rural areas can suffer from it too. flood occurs when a river bursts its banks and the water spills onto the floodplain. Flooding tends to be caused by heavy rain: the faster the rainwater reaches the river channel, the more likely it is to flood. The nature of the landscape around a river will influence how quickly rainwater reaches the channel [1] (River Flooding and Management Issues, n.d.).

Flood certainly brings damage both material-wise and non-material-wise. In material aspects, there are damages which sum up to hundreds of billion rupiah, depending on the location and density of the area. The denser and more important the flood location, the damage will also be more latent. As for the nonmaterial-wise, one of the example is casualties in the form of human lives caused by flood. This depends also on location and density in the area. One of the causes in imbalance in hydrologic cycle is changes in land use. Over the year, along with the rapid development of human activities, they will demand more area to hold activities, hence changes in land use. The main point of this change is how previously pervious area are shifting into impervious area, which obviously will affect how the area reacts to the same rainfall event.

Sentani watershed has gone through land use change as the years go by. According from the land use distribution data in Sentani watershed throughout the years, there is an increment of 5.35% from 2007 to 2010, and 5.08% from 2010 to 2012. This is mainly caused by the development of human activities that are centered in the surrounding area. Lately, Sentani Lake also suffers from shallowing due to land erosion, considering that the slope between Cyclops Ridge and Sentani Lake is quite steep. Aside from that, the activities in the catchment area which triggers land use change also increase critical land potential within the watershed.Along with land use change phenomenon, it is certain that there will also be changes in terms of rainfall runoff pattern occurred in the watershed. The problem with pervious cover area turning into impervious cover area possess great threat, that is the increment of surface runoff volume.This research will find out about the impact of land use change to surface runoff pattern in Sentani watershed, which has 14 sub-watersheds. This paper will also discuss about the effectivity of Sentani Lake in flood reduction.

II. STUDY AREA DESCRIPTION

This research revolves around Sentani Lake, Jayapura. This lake has the watershed, Sentani watershed, which consists of 14 sub-watersheds around it. All of these sub-

watersheds are emptying into Sentani Lake. Sentani Lake's location is surrounded by Cyclops Ridge with extremely steep slope, hence it is to be expected that the lake suffers a lot from sedimentation which makes the lake's depth decrease.

Lake Sentani is one of the lakes located in Jayapura District, Papua. This lake is located between Jayapura City and Jayapura District, with the coordinates of 140o 23' – 140o 50' BT dan 2o 31' – 2o 41' LS. Geographically, Sentani Lake is surrounded with East Sentani district, Sentani district, West Sentani district, Kemtuk district, Kemtuk Gresi district, Abepura district, and Jayapura city.

Fig. 1. Sentani lake

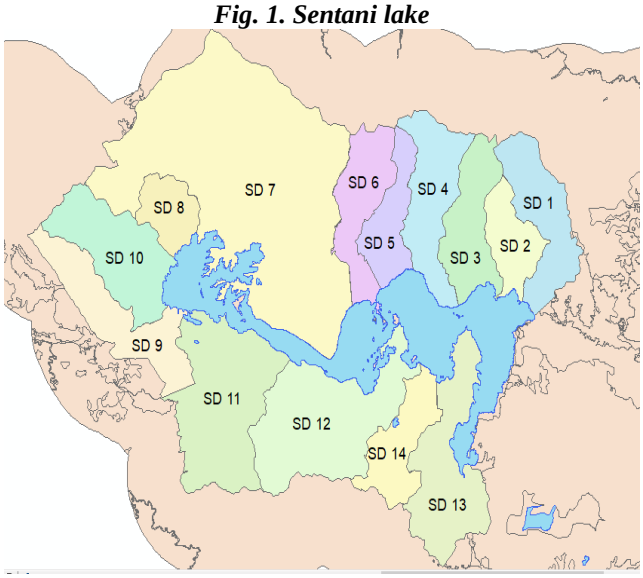

Fig. 2. Sub-watershed of Sentani watershed

Last year in 2013, Lake Sentani water level increase of 1 - 2 m caused the inundation area around Lake Sentani. The puddle has resulted in billions of rupiah losses as reported by the tempo Wednesday, March 27, 2013. The phenomenon of rising water levels according to Tempo, quoting from Papua Governor Constant Karma, is one of the reasons that exist around Lake Sentani. lake as high as less as 2 m Said phenomenon is known as groundwater flood (Levi, 2013). [2]

Another analysis states that in Sentani watershed especially on Lake Sentani, water level increase is caused by high rainfall, the rate of erosion and slope of the Sentani basin is greater than 5%. These conditions lead to erosion and sedimentation that impact on the rise of waterfront Sentani lake [3].

Another analysis suggests that increasing critical land and high rainfall intensity in the upper reaches of Lake Sentani can lead to an increase in lake water levels, as upstream rainfall runoff will enter as an inflow on Lake Sentani [4].

III. BASIC CONCEPTS

The amount of water in Earth will relatively be the same from time to time. This is because the amount of water is going through a natural cycle called hydrologic cycle [5]. To put it simply, the heat transfer from sun and other climate factors will cause water to evaporate into the atmosphere. Evaporation occurs not only in water body, but also from plants' transpiration. This evaporation will result in condensation in the atmosphere when the temperature is cold enough. The result of this condensation is precipitation in other parts of the earth, if the resulting condensation is brought to other parts of the earth by wind. The result of precipitation will also go through several alternatives of process. Some will be retained by vegetation and absorbed, some will infiltrate into soil layer and the rest will produce surface runoff. The infiltrated water will also have two options, either the water will be percolated into deeper layer of rock soil or forming groundwater layer.

All the water going through hydrologic process will eventually be flowing back into water bodies, in which the cycle will start all over again. This process happens continuously.

Although the cycle is balanced by default, disturbances from external factors will overthrow the balance. One of the resulting phenomenon from hydrologic cycle imbalance is flood.

One of the methods used to calculate flood discharge is SCS-CN method. Although there are many other methods to calculate flood discharge, it depends on the study area and circumstances. In this research, SCS-CN method is used. This method was developed by USDA Soil Conservation Service, which is basically a hydrological model to estimate the amount of flood by adopting watershed characteristics. This method estimates the

volume of flood based on land cover type, humidity of the soil based on preceeding rainfall of five days in the area, and soil type [6]. The equation for SCS-CN model according to rainfall height calculation [7] is as follows:

$$Q = \frac{(P - I_a)^2}{((P - I_a) + S)} \qquad for\ P > 0.2\ S \tag{1}$$

$$Q = 0 \qquad for\ P > 0.2\ S \tag{2}$$

Where:

Q : Discharge (cms)
P : Rainfall accumulation (mm)
S : Maximum reservoir capacity after runoff occurrence (mm)
I_a : Initial abstraction (mm), can be predicted with empirical formula ($I_a = 0.2\ S$)

WinTR-20 is a hydrological modelling tools developed by United States Department of Agriculture. WinTR-20 uses SCS-CN method-based calculation. This model is a storm event surface water hydrologic model applied at a watershed scale. This model assists in the hydrologic evaluation of flood events for use in the analysis of water resource projects (USDA, 2015) [8]. Based on this, this program can also model several changes or design alternatives and the impact within the watershed.

IV. METHODOLOGY

In order to acquire each sub-watershed properties, such as land cover, slope, and area, a geographical-based software is needed. In this case, ArcMap v10.1. This program which was developed by ESRI is used to determine the geographical properties of the watershed.

After the collection stage of geographical properties of the watershed, a further analysis is needed. For the rainfall input, data from rain gage stations are gathered. There are three rain gage stations which has influence on the watershed: Genyem, Sentani, and Jayapura. All three of them each has different (USDA, 2015)percentage of impact on Sentani watershed.

Combining both geographical information of the watershed and rainfall data requires yet another software. WinTR-20 is a rainfall-runoff simulation model. It is meant to perform a hydrological model in a watershed with the area of minimum 0.1 acre or minimum time of concentration (Tc) of 0.6 minute [8]. WinTR-20 adapts the calculation method of SCS-CN (Soil Conservation Service – Curve Number).
The complete steps for this research is explained in the following flowchart.

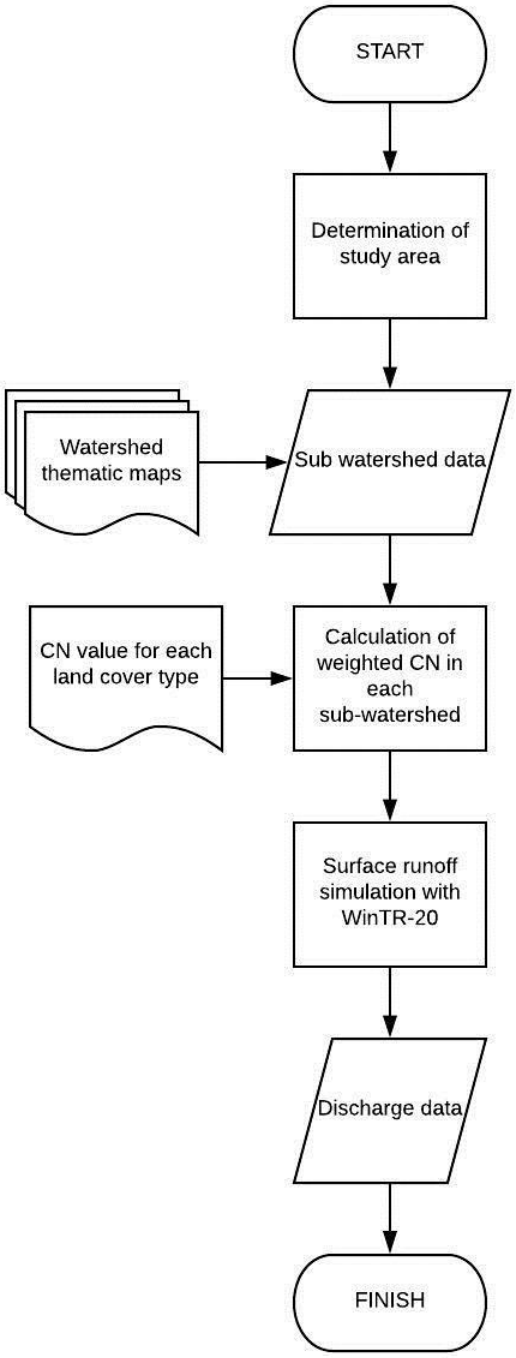

Fig. 3. Research flowchart

V. RESULTS AND DISCUSSIONS

The first step of this research is to determine how changes in land cover composition over the year can affect the amount of runoff produced by a certain rain event. The rain event will be determined as hypothetical data taken from one of the data in the rain gage stations that affects Sentani

watershed. The rain is considered as uniformly distributed throughout the whole area. Although this may not happen frequently. After determining the rain that will be simulated, the next step is to run the simulations with different landcover for each time.

As for the available data, the land cover data for Sentani watershed is obtained from Balai Wilayah Sungai Papua. There are three years variation of land cover map, which are from year 2007, 2010, and 2012. As for the newest land cover map, the year 2016, it is obtained from Geography Department, Faculty of Mathematics and Natural Science, Universitas Indonesia.

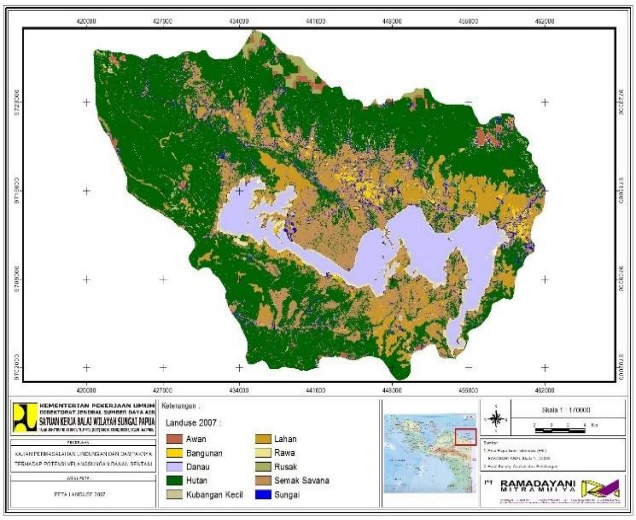

Fig. 4. Sentani watershed land cover in 2007

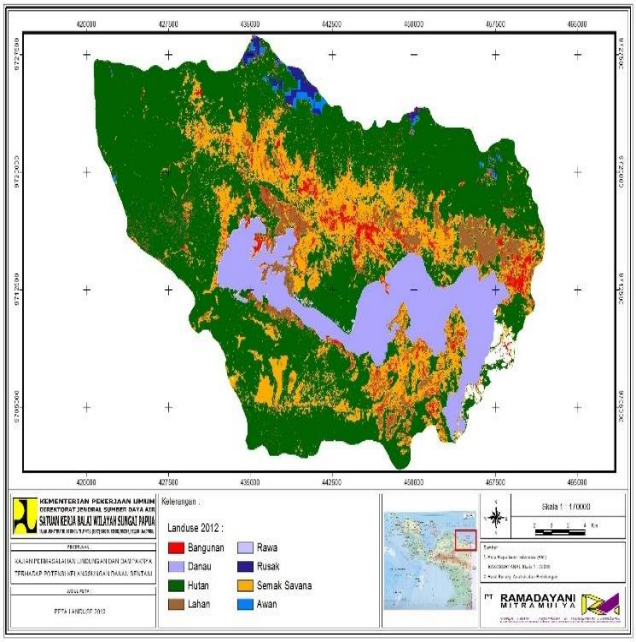

Fig. 5. Sentani watershed land cover in 2010

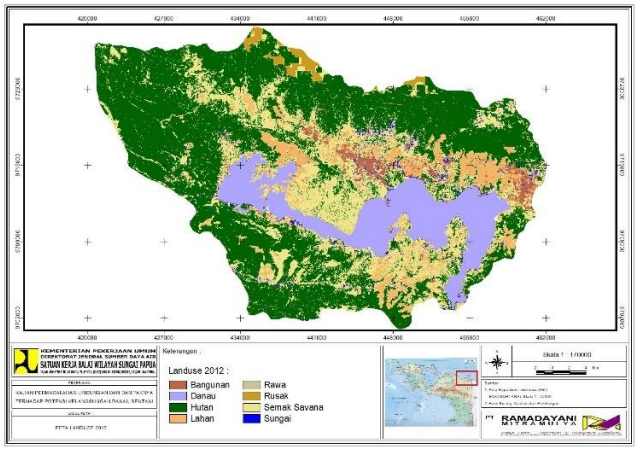

Fig. 6. Sentani watershed land cover in 2012

It can be seen from above that there are several changes in terms of land cover in Sentani watershed. There is a bit of noticeable growth in terms of impervious cover area, which increases about 5.3% from 2007 to 2010, and 5.1% from 2010 to 2012. As the consequences, the forest area is decreasing for about 4.75% from 2007 to 2010, then decreasing yet again to almost 5% in the span of just two years.

In order to determine the amount of surface runoff produced by each sub-watershed, it is of the essential to determine the properties of each sub-watershed first. The table below explains the properties of each sub-watershed, which is assumed to not change throughout the years.

Table I. Sub-watershed properties of Sentani watershed

Sub-watershed	Area (sq km)	Length of main river (m)	Slope	Tc (hour)
Expo	34500	14877.028	0.066	1.507
Tlaga Ria	24380	7769	0.067	0.912
Harapan	18887	9070.911	0.107	0.856
Yakembeng	32553	13061	0.072	1.325
Netar	24809	12243	0.103	1.094
Kuruwaka	23480	12165	0.128	1.004
Yahim	236089	33670	0.042	3.360
DAS 1	17161	5010.262	0.058	0.686
DAS 3	29682	6822.837	0.048	0.941
DAS 2	25545	6281.181	0.072	0.753
DAS 4	64168	14099.335	0.053	1.577
Hendo	40271	5815	0.025	1.060
Belo	23777	6733.888	0.015	1.459
Waisyake	24892	10598	0.014	2.120

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These parameters are assumed to not change throughout the year, therefore they do not change in the WinTR-20 input. The only parameter that changes in the WinTR-20 input is the CN value for each year of simulation.

The changes of CN value in each sub-watershed is determined by two ways. As for 2007, 2010, and 2012 data, the table has already been done by Balai Wilayah Sungai Papua. Although the composition for each type of land cover has been determined, a further calculation is still needed nevertheless. By multiplying the percentage of each land cover type with corresponding CN value, the weighted CN value for each watershed is determined.

All that is left is to determine the land cover composition in 2016 data. This step needs aid from ArcMap 10.1, as the land cover map available for the year is in the format of .shp. After determining each land cover composition for each watershed, the calculation is the same with above. Multiplying each percentage of land cover with its corresponding CN value will produce the weighted value of CN for each watershed.

The result for all calculations regarding CN value is presented in the table below.

Table II. Changes in CN value for each sub-watershed

Sub-watershed	CN 2007	CN 2010	CN 2012	CN - 2016
Expo	54.951	57.639	60.327	52.646
Tlaga Ria	51.494	53.244	54.995	55.603
Harapan	52.497	51.969	51.441	54.924
Yakembeng	51.498	51.429	51.360	52.762
Netar	56.071	57.004	57.936	61.02
Kuruwaka	58.218	58.833	59.447	58.339
Yahim	53.095	53.500	53.904	55.301
DAS 1	51.900	52.065	52.229	52.415
DAS 3	48.557	48.371	48.184	45.867
DAS 2	48.194	49.058	49.921	46.73
DAS 4	51.001	51.308	51.614	49.229
Hendo	52.429	52.799	53.170	54.286
Belo	59.682	60.549	61.417	54.975
Waisyake	56.955	57.384	57.813	57.75

The next step is to simulate the rainfall-runoff simulator using WinTR-20. This program is based on SCS-CN calculation method. It is necessary to determine first the parameters needed to simulate the whole system.
As much as the properties of each sub-watershed is of the essence, physical representative of the system is also as important. This can be described by schematic system of Sentani watershed. To put it simply, the whole schematic is that all sub-watersheds around the lake will meet their outlet in the lake, and then the lake will also have an outlet. Said schematic can be described with the figure below.

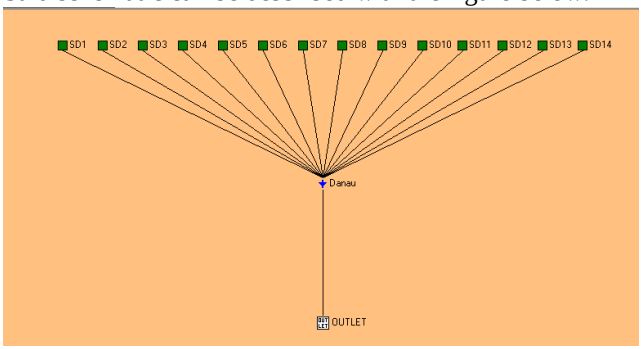

Fig. 7. Schematic system of Sentani watershed

The function of schematic is to determine where the outflow will come and go into and out of the system. Each of the system will be described with smaller system, called sub-watershed. The sub-watershed has their own properties, such as area, slope, CN, and time of concentration. Time of concentration is the time needed for a drop of water to reach the outlet of the sub-watershed all the way from the upstream.
After determining the schematic and giving out properties in each sub-watershed, all that is left to do is to run the system. The program WinTR-20 will produce peak time and peak flow for each sub-watersheds in each scenarios, along with the discharge-time plot.

Table III. Peak time and peak flow simulation results for each sub-watershed in each scenarios

Sub-watershed	CN 2007		CN 2010		CN 2012		CN 2016	
	Peak Time (hour)	Peak Flow (cms)	Peak Time (hour)	Peak Flow (cms)	Peak Time (hour)	Peak Flow (cms)	Peak Time (hour)	Peak Flow (cms)
Expo	13.32	7.11	13.18	12.15	13.15	18.64	13.76	4.14
Tlaga Ria	13.47	2.39	12.97	3.89	12.81	6.24	12.75	7.25
Harapan	13.08	2.48	13.21	2.13	13.44	1.84	12.76	4.87
Yakembeng	13.9	3.01	13.99	2.96	13.99	2.9	13.53	4.15
Netar	12.91	7.55	12.9	9.15	12.81	10.95	12.77	18.21

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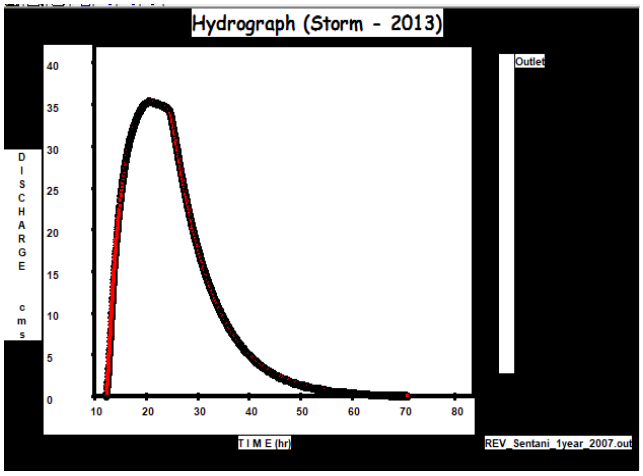
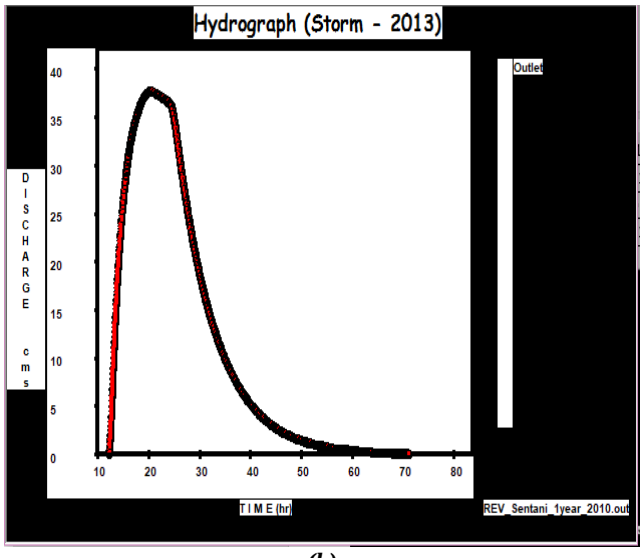
Kuruwaka	12.73	11.46	12.72	12.81	12.71	14.23	12.73	11.72
Yahim	12.76	39.02	12.7	44	12.65	49.56	12.58	73.81
DAS 1	13.01	1.96	12.96	2.07	12.91	2.17	12.86	2.3
DAS 3	15.57	1.29	15.67	1.22	15.73	1.17	18.86	0.63
DAS 2	15.59	1.01	15.25	1.25	13.86	1.63	18.14	0.68
DAS 4	13.94	7.22	14.27	5.46	14.16	5.91	15.8	3.22
Hendo	13.36	4.96	13.21	5.47	13.14	6.03	12.98	8.13
Belo	13.11	11.91	13.1	13.54	13.09	15.32	13.27	5
Waisyake	13.74	6.5	13.73	7	13.72	7.53	13.72	7.45
Danau	13.1	96.14	13.01	109.61	12.91	128.87	12.71	131.17
Outlet	20.56	35.37	20.33	37.71	20.06	41	20.08	39.73



(a)



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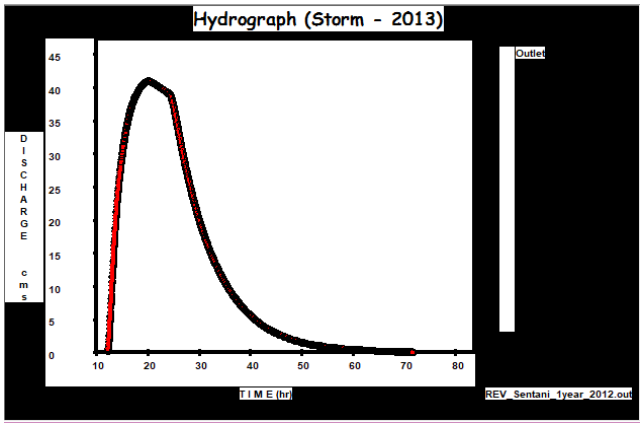
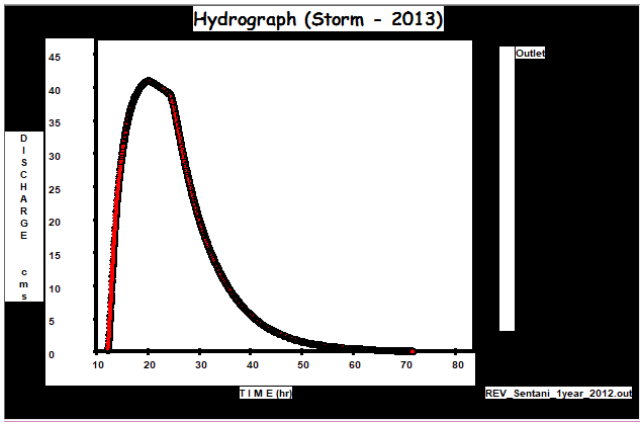


(c)



(d)

Fig. 7. Hydrograph produced from each year simulations; results are shown in the outlet. (a) is the simulation result for 2007 land cover composition, (b) is for 2010 land cover composition, (c) is for 2012 land cover composition, and (d) is for 2016 land cover composition.

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As it can be seen from above figures, the differences in between those years are not as distinct that it can be determined with naked eye. According to the calculation, from 2007 to 2010 there is an increment of about 6.616% in terms of outlet discharge, and 8.724% increment from 2010 to 2012, just in the span of two years. As for year 2016, in the past four years, the discharge produced by the simulation shows a declining trend of about 4%, in other words the discharge produced in 2016 is 3.098% lower than the one produced in 2012.

In terms of Sentani's capability to reduce flood, it will also be discussed here. In year 2007, the capability is at 63.21%, it means that Sentani lake acting as a reservoir can reduce up to 63.21% of the surface runoff flowing into the system. In year 2010, the capability is raised by about two percent, which is about 65.60% of total surface runoff. In 2010, the result raises even higher, that is 68.18%, and for the last scenario of year 2016, the effectivity is reaching 69.71%.

CONCLUSION

This paper revolves around the land use change issue and how it affects the hydrological response in an area. It also discusses about the retention capacity of Sentani lake acting as reservoir in terms of flood discharge reduction. The simulation is done over the years, taking year 2007, 2010, 2012, and recent 2016 as samples. The differences in between those years are not as distinct that it can be determined with naked eye. According to the calculation, from 2007 to 2010 there is an increment of about 6.616% in terms of outlet discharge, and 8.724% increment from 2010 to 2012, just in the span of two years. As for the year 2016, the discharge produced by the simulation shows a declining trend of about 4%.

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