

JIMS JOURNAL OF SCIENCE & TECHNOLOGY

Vol 4 | No 1 | January to June 2020

ISSN-2581-6691

JIMS Engineering Management Technical Campus 48/4, Knowledge Park-III Greater Noida 201308 www.jimsgn.org

A TRUE VISIONARY

"You see things and you say Why? But I dream of things that never were and say Why not?"

- George Bernard Shaw



Shri Jagannath Gupta (1950 - 1980)

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EDITOR's Desk

Dear Reader,

"Wisdom is to know that we don't know."——Socrates, 469–399 BC

On behalf of the JJST Editorial Team, I would like to extend a very warm welcome to the readership of JJST. I take this opportunity to thank our authors, editors and anonymous reviewers, all of whom have volunteered to contribute to the success of the journal. An enormous amount of work has done into the development of this journal and I believe you will see that effort reflected in this edition and in the impact it will have on the field. It has been an interesting journey in many aspects.

JJST is dedicated to the rapid dissemination of high quality research papers on how advances in Science and Technology can help us to meet the challenges of the 21st century, and to capitalize on the promises ahead. We welcome contributions that can demonstrate near-term practical usefulness, particularly contributions that take a multidisciplinary / convergent approach because many real world problems are complex in nature.

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Besides frequent informal contacts, once a year we will conduct a survey of all Board members to solicit their candid feedback regarding the direction, philosophy, and operation of the journal. I am committed to personally responding to all email/phone/letter messages from them.

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Finally, we wish to encourage more contributions from the scientific community to ensure a continued success of the journal. Authors, reviewers and guest editors are always welcome. We also welcome comments and suggestions that could improve the quality of the journal.

Prof. (Dr.) R.K. Raghuwanshi

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Sustainability of Microfinance Institutions working in Greater Noida and Noida

Shruti Saxena Research Scholar JJT University shrsax1@gmail.com

Abstract: The aim of this paper is to identify sustainability of MFIs working in Greater Noida and Noida. This study followed by the various statistical manipulations such as the descriptive research and the hypothesis testing through t-test of 280 respondent. The study found that sustainability of microfinance in Greater Noida and Noida is working well.

Keywords - Microfinance Institutions, Financial sustainability, Greater Noida and Noida.

I. INTRODUCTION

The term sustainability broadly used in microfinance to give more service to the borrowers along with to maintain the internal financial sustainability and operational sustainability in MFIs. Microfinance is the method to help small income group people to give them various services such as small credit and small insurance. According to Rahman.at. all (2015), sustainability is a very important unit of any microfinance institutions. It conveys the knowledge of old experiences to new situation with the help of accounting and management. Accounting and management are the essential part of the any MFIs organizations. It also helps to check whether all the external sources are fully utilized or not, and it is very beneficial for the shareholders, borrowers and the stakeholders. The transformation factors on sustainability can only improve the MFIs function effectively. If the sustainability of any MFIs increases, it will reflect in terms of criteria of successful MFIs, In terms of so many affordable business plans for the poor people, In terms of skilled management, high quality marketing plans and techniques and a solid management of finance. If the prospective of accounting, sustainability gives long vision to understand the management, a very good practice of accounting. It will make MFIs in to a strong position in to the market. According to the Pollinger et.al. (2007), sustainability is the quality of any Microfinance Institutions who can manage the all expenses of annual budget in terms of fund receiving from external sources, If the sustainability of any MFIs are increases it means MFIs can launches more business plan can make itself stronger in MFIs market. They also suggested that any MFIs stand on three pillars of S, survival, sustainability and self-sufficiency. All these pillars help to any MFIs to give their best services to the borrowers. Sustainability and self-sufficiency are the most useful term for the successful practice of MFIs. According to

Dr. Harish Purohit Associate Professor JJT University Jhunjhunu (Rajasthan)

Hossain&khan(2016), they emphasis that those MFIs which has good financial position, only that institution can help the poor with sustainability because financial sustainability is the essential part of any organization. Unsustainability might help poor people for a short period of time but can't help to poor people in a long term due to not capable to operate in future. Sustainability can be defined in General term as a performance and also the capability of doing performance again and again without taking any support from outside or any subsidy. Financial sustainability is also divided into two parts first one is operational sustainability and other one is financial selfsufficiency. Operational sustainability is the sustainability which covers the operational only the operational cost of the institutions from its operating income and the self sufficiency are to manage both cost whether its operational cost or financial cost. There are some other factors which establish the high financial sustainability. Ex- Profit Margin, Gross loan portfolio to total asset ratio and Return on asset. The financial sustainability of MFIs is the important factor of the MFIs because MFIs which are unsustainable can help to their borrowers for some times but can-not help them for a long period. According to Kinde(2012), there are some MFIs factors which affect the financial sustainability of MFIs are breath of outreach, depth of outreach, length of outreach and the cost of users all these factors also affect the financial sustainability, so all the above definition of financial sustainability suggest that the if any MFIs which suffers loss has low financial performance can't be consider as financial sustainability but any MFIs which is making profit means it covers their operational cost by using their subsidiesfund and external resources, all of them are classified as a financial sustainability, so the financial self-sufficiency is the ratio of adjusted revenue and adjusted expensesIf the financial self sufficiency is greater than or equal to 1. This show that Microfinance institution is financial self-sufficient. The financial self-sufficiency also measures the ability of any MFIs.

1.2 Statement of problem:

Microfinance Institutions are having problems with sustainability.

1.3 Objective of the study:

To analyse the sustainability of microfinance institutions

working in Greater Noida/Noida.

1.4 Hypothesis:

H0: Customers are not satisfied with the sustainability of MFIs. H1: Customers are satisfied with the sustainability of MFIs.

1.5 Research Gap:

This research aims at the improving the sustainability of MFIs of Greater Noida and Noida.

2. LITERATURE REVIEW

According to **Rahmal et.al.(2015)**, sustainability is defined as It is the ability of the MFIs which cover the all-activity cost to generate the income. The aim of this research paper is to give some tips will be beneficial for MFIs owners to understand the business of performance. This case study also analysis the development of the sustainability between accounting management and the financial management. This study also found that the how any MFIs can increase their sustainability through new programs launched and applied successfully.

According to Hossain & Khan (2016), this article is about the analysis of the sustainability of MFIs in Bangladesh, also this paper found the factors influencing the financial sustainability of MFIs in Bangladesh in the period of 2008 to 2012. By statistical tool and interpretation, they found the factors are to be applicable on MFIs in Bangladesh. On the basis of the empirical analysis, it shows that MFIs capital asset ratio, operating expenses and write-off ratio affect the financial sustainability of the MFIs of Bangladesh. The result is also significance at the different level of significance. Here capital asset ratio and write off ratio are significant at 1 percent level of significance and the operating expenses are thesignificant at the 5 percent level of significance. In this article researcher took 29 MFIs in Bangladesh and researcher found that only 4 MFIs are less than 100 percent of self-sufficiency because MFIs in Bangladesh are over dependency on equity and subsidy to cover their operational cost. Although MFIs in Bangladesh have large asset power which can help them to make strong sustainability.

According to **Gashayie & Singh (2015),** the researcher explain the factors that affect the microfinance financial sustainability by analyzing the 15 articles and also give the guideline and make possible framework to MFIs to make strong their sustainability. Financial sustainability of MFIs are divided in to three parts. First one is Macroeconomic related factors second one is Microfinance related factors and last one is borrower related factors. In Macroeconomics related factors are Per capita income, Interest rate, competition and the degree of economic freedom. And the second one microfinance related factors are breadth of outreach, staff of outreach, age of MFIs, depth of outreach Portfolio at risk, size of MFIs. etc. The last one is the borrower related factors are cost per borrower, Number of borrowers, women borrowers and the group lending. According to **Ejigu (2012)**, this study is related to sustainability and outreach performance of Ethiopian MFIs . Here data are collected from 2003 to 2008 of 13 MFIs in Ethiopia. The result shows that MFIs in Ethiopia facing problem related to the women policies. The researcher also compares the mix average, local benchmark and through time to analyze the sustainability and outreach performance. Through local comparison researcher found that small MFIs are better in depth of outreach and the large MFIs are better in sustainability. There results shows that the outreach scale are directly related to the performance of MFIs. There are so many groups of social and commercial MFIs which has so many different plans and have different mode of operations. Due to this group of MFIs, Institutions faces difficulties in reaching the poor people and being sustainable.

According to **Bayai & Ikhide (2016)**, this study is found that the relationship between MFIs financing and the financial sustainability. After studied a lot of theory which is related to financial sustainability and doing empirical work on MFIs financing and financial sustainability, the researcher realized that the MFIs are more interested in the Commercial financing. This paper also helps to give detailed information regarding financial sustainability. Researcher cover the settlement between the MFIs and the financial sustainability.The relationship between financing plans and financial sustainability are fated. For the success of any organization sustainability is the necessary elements of the MFIs.

3. RESEARCH METHODOLOGY

Total number of respondents are: 280

Total number of questions: 8

Sources of data: Data are collected from the primary sources in the form of questionnaires. Researcher has taken all the questions related to the sustainability which obstruct the growth of sustainability in greater Noida and Noida region and checked the validity of the questionnaires and the reliability of the questionnaires.

Research limitation: Data has been collected from the primary source so researcher has been facing difficulties to reach many people.

Method of data analysis: Descriptive research is used to analysis of data and through SPSS 23.0 has been used to interpret the data. The result is shown in the form of statistical standard deviation and mean. For testing of hypothesis t-test has been used. Here confidence level is 95% at 5% of level of significance. In greater Noida and Noida branch there are many borrowers n MFIs but researcher has selected only 280 respondents to check the sustainability of MFIs.For making of questionnaire researcher has selected the questions which is related to the sustainability and affected the sustainability. (Saxena2019).

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ISSN: 2581-6691

4. ANALYSIS OF DATA

Descriptive research is analysing the data the way things to find. It is also known as survey research.

- Age of borrowers
- Gender of borrowers
- Income of borrowers
- Expenditure of borrowers

Age of the borrowers:

<20	80	
20-30	38	
30-40	34	
40-50	55	
>50	73	



Source: Author

Maximum number of borrowers lies in less than 20 years.

Gender of the borrowers:

Male	127	
Female	153	



Source: Author

Figures show that percentage of females are more than male.

Income of the Borrowers:

0-10000	58
10001-20000	29
20001-30000	93
30001-40000	100



Sources: Authors

Figures show that maximum earning is between 30000 to 40000.

Expenditure of Borrowers:

0-10000	69
10001-20000	58
20001-30000	66
30001-40000	87



Source: Author

Figures shows that maximum borrowers expenses lies between 30000 to 40000 also.

۰,

Hypothesis testing: for testing the hypothesis we use the one sample t-test.

Question	Mean	Standard Deviation	P Value	Rankings
5	4.987	.069	.043	1
7	4.890	.060	.046	2
8	4.845	.067	.046	3
6	4.789	.065	.037	4
3	4.677	.069	.038	5
2	4.570	.068	.037	6
1	4.489	.063	.030	7
4	4.367	.067	.040	8

In this research mean value of all question has been calculated on the basis of the questionnaire prepared with the help of 8 questions. According to the mean value ranking has been prepared from top to bottom. Since we have taken 5% significance level and we find p value is less than of .05, so the alternative hypothesis customers are satisfied with the sustainability of MFIsis selected.

5. RESULTS AND DISCUSSION

This section deals with the result of the study. The result is divided in to two parts. First part is analysed the data through survey research and the second part is analysed the data through SPSS 23.0 and tested the hypothesis with the help of t-test. In this research null hypothesis is rejected because it is significant at the level of 5% and the alternative hypothesis has been selected which is customers are satisfied with the sustainability of MFIs.

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6. CONCLUSION AND RECOMMENDATION

This study analysed the sustainability of MFIs in Greater Noida and Noida. On the basis of this research, researcher found that sustainability of MFIs in greater Noida and Noida is in a good position because customers are borrowing money and paying at a regular interval and also suggested that if MFIs in Greater Noida and Noida increases their sustainability the more customers are getting benefitted from the MFIs.

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ISSN: 2581-6691

Interplay of Strategy, Marketing and Project Management concepts in Warfare: A Case of South African warlord Shaka Zulu at the battle of Gqokli Hill in Southern Africa

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Abstract- This paper is a jusxtaposition of project management concepts with strategy and leadership practices involving the Zulu Chieftain-Shaka Zulu, the mighty tribal warlord in Southern Africa.It also tries to map some of the Strategic innovativation in warfare by using project management tools into the historical battle of Gqokli Hill in the old Southern African continent, which the author considers it as a project, and tries to develop a Strategic Risk Response Plan used in a typical project, for a war situation in a historical context prevailing in Souther Africa in the early 18th (Eighteenth) Century. The project satisfies the intellectual curiosity as well as enriches the business literature by the fusion of a historical perspective with recent project management literature using strategic marketing tools. The author here tries to develop a theoretical framework to Shaka's Battle of Gqokli hill, henceforth known as a project, and explores further to use a Risk Response Plan from Project Management literature, to have an enriching business context. In the subsequent part of the article the author compares the typical portfolio of skills of a project manager with that of the skills exhibited by the mighty Zulu King the Shaka Zulu in his battle in Civil War Unification. The typical portfolio of skills in business is compared with the military tactics/strategy of Shaka Zulu to present a meaningful and enriching literature from historical concept

Keywords: Strategy, Marketing, Project Management, Shaka Zulu, Risk Response Plan, Innovation, Strategic Marketing

I. INTRODUCTION

This paper aims to draw a parallel between the mighty warlord Shaka Zulu ,his battle strategies in particularl the battle of Gqokli Hill, and seek to discuss as wel as compare with the project management practices of today. This paper is an integration of modern day project management practices with the battle Strategy/tactics of the tribal warlord Shaka Zulu to present a rich discussion in the topic of Project Management and Strategy with a blend of Marketing. It attempts to show that in ancient warfare there are concepts of project management well entrenched with concepts of Strategy and Marketing although the actors in this context might themselves be unaware of it. In this paper the author has tried to integrate the tools used in project management such as risk registers/project managers role and responsibilities to a typical war which is akin to modern day project management practices. The methodology used in this study is based on the literature and the author's perceptual notion of Project Mangement as well as Marketing and Strategy practices which is integrated in this paper to have a valid and meaningful discussion. Here the author has used concepts from Strategy, Marketing and Project Mangement to depict its application in a crude form in a historical warfare of ancient tribes/warlords in the context of Southern African.

II REVIEW OF LITERATURE

The Rise of King Shaka:

Shaka Zulu(akaSigidi ka Senzangakhona), emerged in the earlier part of the 19th (Nineteenth) century and came to be recognized as a legend as a warrior and a political leader within the zulu kingdom, reigning as a monarch in the Southernmost part of the African continent. His lineage can be traced from his legendary warrior father who was the Chief of Zulus and was banished from the clan at a very early age only to return at a later stage to reclaim/re-establish him(Shaka) as the King of the Zulu Nation. Under his Chieftainship he mobilized his warriors into a formidable army who subsequently conquered and unified several tribes into the mighty Zulu Nation. As a leader he emphasized on systematic organization of the military by developing skills necessary for closed combat in the erstwhile Southern Africa. He eventually introduced a process/system of conscription and regimentalised the military into clusters of trained soldiers called Ammabutu. He is acknowledged in military history in Africa for changing the warfare in Southern Africa with his mighty and powerful army leading to a minimal loss of lives amongst the enemies or if need be a total annihilation of the enemy forces in the battleground. Shaka rapidly expanded his Military which a generated a ripple effect acroos the Southern African continent and lead to the consolidation/integration of more smaller clans into the mighty Zulu army and gave them a strong foothold in the battle. He is widely remembered in the context of Zulu warriors amongst Southern Africa for his famous military strategy such as modification of the long thrusting spear

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the "Assegai" to the short assault spear for closer combat and the "Bullhorn" (impondo zankomo) technique of ambush of the enemy forces leading to their total anihiliation in the battleground. This innovation of Shaka Zulu led to the unification of several neighbouring clans and establish a strong foothold rather dominance of the Zulu empire throughout Southern Africa. His contribution nevertheless, lied in the creation of a Zulu nation and he was applauded in Military chronicles as a Military genius of his time credited with superior operational art/ warfare techniques in the battlefield.

Despite his successful military reforms, historian's label Shaka as a heartless, savage, bloodthirsty tyrant seeking his passion to mobilize his army to launch a massive invasion across the continent of southern Africa. However his creation of a Zulu nation is widely recognized by historians who credited him of being a military genius par execellence for his time, because of his traits in military warfare or that of operational art. Shaka was born to the Zulu Chieftain Senzangakhona, and mother Nandi from the eLangeni clan. Shaka's mother was exiled by the Zulu king after years of mistreatment by the Zulus and sought refuge in the eLangeni clan. But it was shortlived as they were treated badly and shaka was treated miserably being an illegitimate child. Finally Shaka and his mother Nandi was evicted and got refuge in the Mtethwa clan. As a child, who has faced so much of atrocities, he grew up to be lonely, ambitious and ruthless and determined to overcome any obstacle in his path. He was inducted into the army of the Mtethwa clan at the young age of Twenty Three(23) and was subjected to a rigorous military training which challenged him both physically and mentally. Impressed by the courage of Shaka, the Mtethwa King Dingiswayo and within a short span of time became the commander of King Dingiswayo's army and honed himself in the art of strategy and battle tactics. His idealogy was to reform the assault strategy into closed combat to defeat the enemy.

Accordinly he redesigned the traditional spear, the *Assega*i, which he nicknamed later as the *iklwa*. Shaka realized that a bigger full length shield offered the warrior more protection against attack from the enemy in close combat.

Discipline, speed and agility became the hallmark of shaka's army in a close quarters combat. Shaka trained soldiers in bare feet as using sandals, would reduce their speed in a combat situation. After Senzangakhona's death he was released from King Dingiswayo's army and subsequently returned to claim the throne which fell vacant after his father's demise. The first two things he initiated was taking initiative to solve the food problem and consolidate political power through the use of his military.

Battle Tactics of Shaka Zulu-Improvisation in the Army

As the newly appointed head of the Zulu clan he redesigned the

military system and made them into four age restricted regiments (amabutho) and made them identifiable with their own colour and headed by a commander. In addition to male regiments he also had female regiments under the command of Female warriors.Shaka changed the concept of War in Africa by adding a new dimension to his war tactics using the BullHorn Technique.(impondo zankomo). He also made changes to his military in terms of military intelligence and procurement to make his army a formidable force in the continent.

Shaka Zulu and The Battle of Gqokli Hill

In the year 1818 a fiercest battle ensued between Shaka and his rival Zwide when Shaka was still struggling to establish himself as the Supremo of the mighty Zulu clan. A new principle underlined all his military tacticswhen infiltrating enemy organizations in a battlefield. Under the guidance of King Zwide a massive army of 10000(ten thousand) invaded the Zulu territory. In the fighting that ensued, Shaka devised numerous strategies and tactics thus displaying the superiority of his military concepts, from past experiences since his ascension to the throne of the Zulu kingdom. His tactics relied on a new principle which involved infiltrating an enemy's organization in times of war and understanding his every move(the enemy's move) as well as strenths and weaknesses. The battle of Gqokli Hill put Shaka's strategy and tactics to a greater test of his military skills and led to the evolution of a superior battle strategy. The battle concluded with the retreat of Zwide's army and shaka's troop enjoying the taste of victory over a superior force.

This ushered in the complete breakdown of the Ndwandwe clan, and established Shaka's courage as a Military genius for his superior tactical abilities in warfare and marked the rise of the mighty Zulu kingdom. Prior to this Chieftain Zwide was defeated 3(three) times by Dingiswayo's army and was released on grounds of acknowledging supremacy and maintaining peace with neighbours. Subsequently, King Dingiswayo was treacherously killed by Zwide when the latter visited him to amicably settle a local dispute.Within a short span of time, rather months Shaka merged the army of King Dingiswayo with his own clan and raised a huge army of soldiers and established a fierce Military stronghiold in Southern Africa. This aroused concern from Zwide and he invaded Shaka's territories and engaged Shaka in a fierce battle. The fierce battle that ensued was considered as one of the most famous battles as Shaka's forces of 4000 (four thousand) soldiers was greatly outnumbered by Zwide's forces of 10000 (ten thousand) soldiers and put Shaka's military strategies to test.

Shaka's forces were outnumbered by Zwide's army. Accordingly Shaka strategically placed his forces in a defensive formation at Gqokli Hilltop alongside the bank of the great Mfolozi River and awaited Zwide's army for a fierce combat.

(Figure Below):



Source: INTERLINKING OF STRATEGY AND TACTICS FROM SHAKA ZULU: DEPICTION OF OPERATIONAL ART (Allen, 2014)

The rough terrain in the Gqokli hill was surrounded by boulders which restricted the movement of Zwide's Army to a great extent in moving up the hill to a point of advantage. Shaka engaged a defensive formation of Five to Six ranks deep on the Gqokli hilltop and subsequent attempts made by Zwide's army to attack Shaka's warriors met with fierce resistance and thus was unsuccessful. Thus Shaka achieved a position of advantage vis-a- vis his enemy. In their subsequent climb to the hill Zwide's army had to negotiate with a narrower font and subsequently when the army reached the wall of resistance put up by the Zulu army, Zwide's troops were tightly bunched together causing a severe restriction in the movement of the forces. Shaka used a technique of maneuvering known as deceptive maneuvering to attack Zwide's army with close combat tactics from unexpected directions which made Zwide's forces severely vulnerable to Shaka's forcesIt is in this battle Shaka used his famous "Bullhorn" technique to have the desired envelopment of Zwide's Army and subsequently defeating him.(Figure Below)



Diagram Depicting Shaka's Army going for Bullhorn Formation (1)

Source: INTERLINKING OF STRATEGY AND TACTICS FROM SHAKA ZULU: DEPICTION OF OPERATIONAL ART (Allen, 2014)

III PROJECT AND PROJECT MANAGEMENT

Project Management:- According to Gido & Clements (2015) project management is concerned with the skilfull planning, coordination (with stakeholders), leading as well as controlling of various resources to attain a specific task or objective. In project management a task is planned meticulously before setting out to achieve it according to the set guidelines. Project : The above reference gives interpretation of a Project as any activity concerned with achievement of a task comprising of a unique set of activities interlinked with each other through an optimal use of resources. It has a beginning and a specific end time as its essential feature.

Examples of projects include construction of a soccer stadium, baking cake in an oven etc.

Network Diagram and Critical Path:-

Network diagram according to Gido and Clements(2015) involves the occurrence of a sequence of interrelated activities to attain a specific task/ objective. It is used in relation to the planning process in the project management scenario. An important tool for a project is a network diagram which arranges the specific activities for a project in an appropriate sequence.

Below is an example of a sample project:-



Diagram 1: Source: Gido and Clements (2015)

The above network diagram comprises of activities which are individually represented by a box and appropriately described within the brackets. Activities are represented by individual boxes with unique numbers assigned to each box indicating the direction/flow of interdependent relationships. Usually activities start with a verb. An activity cannot begin unless all other preceeding activities linked by arrows have been completed. The boxes in the diagram are linked by arrows indicating the flow of dependent relationship. A new activity cannot start unless all the other preceeding activities (linked by arrows in the above diagram 1) has been successfully completed. In the above diagram some of the activities are done concurrently (at the same time) as "Buy Matereials" and "Get Volunteers" as they can be performed simultaneously and once they are finished the subsequent activity.

STRATEGIC MAPPING OF NETWORK DIAGRAM WITH BATTLE OF GQOKLI HILL:



Diagram 2: Source: Author's Perception

Explanation:

°.9

Here the author considers the Battle of Gqokli Hill as a typical project with respources as manapower and weapons for attack. The phase starts with a crafted strategy of mobilizing soldiers and garnering resources for war (like Spears, Assegai etc) and when they are finished the next phase, taking positions at strategic locations in Gqokli Hill starts, which subsequently leads to launch of an assault resulting in defeat/ extermination of the enemy and ends with disbanding of the soldiers who then return to their own clans.

IV STRATEGY AND ITS CONNECT WITH SHAKA'S WARFARE

Shaka's Dual Strategy For Warfare

His first strategy was to raise a powerful and efficient Military to win wars and establish his dominance over the Southern African region. He was careful about not to be considered a threat to Dsingiswayo while mobilizing his troops to build a powerful army. King Shaka found that to make his vision a reality he needed to establish both political and a social identity of a unified zulu nation. He introduced new weapons and tactics in the art of warfare and there was a paradigm shift in the methods of war. The Zulu clan, which was therwise known as an agrarian tribe, thus evolved into a force of fierce and deadly warriors able to take on mighty challenges in a closed combat warfare. He created a military structure by allocating positions of command through merit and not by any other means(as for e.g. family orientation). Thus, he transformed an old archaic society bound by traditions to a modern one comprising of well disciplined military warriors through his strategic approach.

The second strategy of Shaka was to consolidate the erstwhile neighbouring clans and make them an integrated one-nation with a power to dominate the lands of Southern Africa. He regimentalised his army based on age. He dealt with disorder by taking punitive actions swiftly against chieftains who are troublesome. He created a court constantly dealing in reviewing disputes and handed out justice swiftly as a judge.

V PROJECT RISK AND THE BATTLE OF GQOKLI HILL

Risk:

✓ Risk refers to any unexpected event which might affect people, processes, technology, and resources adversely in the successful operation of a project.Project risk, because of its inherent uncertainty, requires effective management to handle it efficiently.

Project Risk:

It refers to the process undertaken by project managers to minimize/mitigate the nature of any potential problems that might have a negative on the timelines of a project. Key members are usually leveraged by the Project Manager in his/ her project team in order to ensure its success by identifying probable risks and act thereupon.

Risk Response Plan

A risk response plan is concerned with a actions to prevent the occurrence of a risk, by implementing a corrective action in the event of occurrence of the same. Risk response planning addresses individual risk elements and taking corrective actions to mitigate such risks through carefully chosen individuals in the process.

Risk Register – It is a scatterplot often used as a tool in risk management tool as well as to to fulfil regulatory compliance for each type of risk identified in the process and includes additional information for each type of risk identified in the process e.g. the risk nature, ownership as well as reference and finally the mitigation measures strategies (ISO Guide 73:2009).

An example of risk response plan is mentioned below:

Risk	Description of the Specific Risk	Response /Mitigating Risk through Actions	BackUp Or Contingency Plan	Trigger Events in Risk	Accountability or Individual Responsible for Taking Action
1	Rain on day of Festival	Avoid nsk	Reserve indoor space now Recruit extra volunteers to set up indoors	Weather Forecast 2 (Two) days before event	Jane

Diagram : Sample Risk Response Plan

The below table outlines the Risk Register for the Battle of Gqokli Hill:-

Description	Probability	Impact	Risk Score
Enemy Force Outnumbering Shaka's Forces 10000:4000 (2.5 times)	High (Nearly 80%)	Losing the Battle Loss of Lives/ Land/ Livestock say 10000	8000 (80%×10000)
Zwide three pronged attack to break the Zulu defense	Moderate (60%)	Zulus being outnumbered and killed and subsequently defeated say 6000	3600 (60%×6000)
-	-	-	-

Diagram : Risk Register for the Battle of Gqokli Hill (Source: Author's Perception)

8

A sample Risk Response Plan is drawn by the researcher below to illustrate the concept. In the Plan Risk element is the assault of King Zwide's army on Shaka's army. The Risk response is to reduce the threat by eliminating possible loopholes. The Contingency Plan is to have a unique formation to match up with KingZwide's army through the technical elements mentioned in the diagram (Ring of defense comprising five/six ranks deep) and carry on an assault using Bullhorn Technique. The risk trigger is the assassination of King Dsingiwayo by Zwide which prompted the war between the two(Shaka and Zwide). The people responsible in Shaka's brigade are him and his Chieftain's who are at the battleground.

RISK RESPONSE PLAN					
Risk No.	Risk Element (Description)	Risk Response	Contingency Plan	Risk Trigger	Responsible Person
1.	Zwide assault on Shaka's Army	Mitigate Risk	Preparing a Counter Attack on rival army of King Zwide by forming a defensive ring consisting of a depth of five/six ranks deep on the summit of the GqokliHill. Assault to be carried on using Bullhorn technique to envelop Zwide's Army	Assassination of King Doingiwayo by Zwide. Zwide's mammoth army of 10000 (ten thousand) soldiers outnumbering Shaka's that of 4000 forcing Shaka to use flanking attack and take a defensive position at White Mfolozi River	Shaka and his chieftain /commanders.

(N.B.Hypothetical Example based on author's perceptions)

Connect of War Strategy with Nuances of Marketing in a Corporate World :

To begin with the field of marketing has drawn up valuable lessons from the battlefield. Marketing risks are characterized for the potential for losses and failures in marketing. This can be related to a) pricing b) branding c)product development d) promotion e) distribution f)customer experience and g) sales.

In essence Shaka used a Flanking attack in his warfare to outnumber Kig Zwide's army which is an old tactic used in Marketing as for.e.g back in 1950s Daimler Benz company used a flanking attack using its Mercedes-Benz model against its arch rival General Motors, in the premium market so far dominated by the Cadillac brand. As a part of a shrewd marketing strategy, Daimler Benz priced their Benz luxury higher than Cadillac which was the prevailing market leader at that time. As a part of their promotional strategy Daimler represented the Mercedes brand as a superior car with a world class technology and heavily supported by their ongoing marketing campaign. This flanking strategy helped Mercedes Benz to successfully outplay their arch rival the Cadillac in the market. Even after the lapse of four decades, the monthly sales for Chevrolet (which is one of General Motors successful brands)outnumbered that of Mercedes Benz's sales in the same market. General Motors never had a decisive strategy to counter or rather answer this move by rival Mercedes Benz. But things changed quiet drastically in 2004, when Mercedes started outselling Cadillac in the US markets; and Cadillac by then had long lost its reputation as a premium luxury car in such markets.

A General Risk Response Plan is also described below by the researcher taking into consideration the various elements of marketing involved in it.Here the risk element is the Barnd Risk itself which can be tackled through a flanking attack on the rival(example of Merc and Cadillac from USA). The Risk trigger is the plummeting of sales in the market consequently leading to a loss of significant market share. The responsible persons who are involved in this phases are the people from Brand and Product management in a company(e.g. Brand Manager and the product Manager)

Risk No.	Risk Element (Description)	Risk Response	Contingency Plan	Risk Trigger	Responsible Person
1.	Risk to Branding/Brand Risk	Mitigate Risk	Adopt a flanking technique to guard the main brand and take on head on with the rival brand(as for e.g. Mercedes outplayed Cadillac with its flanking attack)	Continuously sliding market shares for the branded segments	Marketing Manager /Product Developmen Manager etc.

Sources: Illustration of a Risk Response Plan for General Marketing Function (Author's Perception)

Another example can be cited from that of the Fast Moving Consumer Goods Industry which is a most popular one in the retail segment. Below is an example of a Risk Register for an FMCG company.

Here the situations described are a) Rivals had a larger salesforce and b) Price war between the players in the market. A probability is arrived at ranging from quite high(70%) to moderate(60%). The impact in both the cases are noted. The risk score is obtained by multiplying the probability with the sales force on hand and a numerical value is obtained as the final Risk score.

Description	Probability	Impact	Risk Score
Rivals had large number of sales people a.k.a Foot on Streets approximately 5000:3000 (approx. 1.5 times)	Quite High (Nearly 70%)	Decreasing Revenue in form of sliding market shares in the so called marketing territory	3500 (70%×5000)
Price war starts between the rival companies	Moderate (60%)	Loss of Market Share of say 5% translating to 50000 Rands	30000 (60%×50000)
-	-	-	-

Source: Illustration of a Risk Response Plan for an FMCG company (Author's Perception)

VI CONCLUSIONS

Thus through the discussions it is evident clearly that there is a manifestation or rather interplay of concepts of Marketing, Project and Strategic Mangement which are infused into this research paper to give it a holistic approach in the broader gamut of management. Here the researchers have used concepts from Marketing, Strategy and Project Management and had mapped it into the concept of war to draw a parallel between modern day concepts in the business world and the crude form of old war tactics of the tribal warlords in the continent of Southern Africa. It is a reflective paper which tries to build on the abstract ideas from a reality concept (war) finally linking it to useful concepts in Marketing and Strategic Management.

VII FURTHER RESEARCH DIRECTIONS

- A focused research can be undertaken by fusing it with Shaka Zulu's tactical warfare thus aligning it with deeper conceptual levels like Five Forces Framework, Internal Factor Evaluation /External Factor Evaluation etc in Strategy as well as areas like Flanking, Marketing Analysis using McKinsey 7S and SWOT (Strength, Weaknesses, Opportunities and Threats) as well as external analysis.
- 2) Secondary data can be used by resorting document analysis through Government archives, historian's account, books and other war archives.
- 3) A focused in depth interview can be resorted to have a larger grasp to the research by using participants who are project managers and marketing and strategy professionals which might yield a wider perspective and add new theme to the literature. In this respect qualitative research using thematic analysis will be a good option.

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ISSN: 2581-6691

Factors Affecting Internet Banking Adoption in Developing Economies

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Abstract - The study aimed at examining factors affecting the adoption of internet banking with n in Ethiopia. A total population of 266 customers who are internet banking users at North West region including 26 branches was considered using census method. The self-administered questionnaire relying on a 5-point likert scale was used to get the primary data. The average variance extracted and Heterotrait-monotrait (HTMT) criterion technique were used to determine the validity of items Cronbach's Alpha was used for measuring reliability, tolerance and the variance inflation factors (VIF) were carried out to test multicollinearity, whereas logistic regression was employed to determine the relative influence of usefulness, ease of use, risk, prior internet knowledge, convenience, and information on Internet banking adoption. Usefulness, ease of use and convenience has significant impact on internet banking adoption. Banks are recommended to improve their infrastructure from connectivity to interface simplification for ease of use the technology. Banks should also use different languages like Amharic and other local languages and include some additional feature on the system to make the service user-friendly.

Key words: Internet banking, Technology adoption and Ethiopia

I. INTRODUCTION

As we are living in digital era. Information and communication technology changes in a very fast pace every day. Now a days, due to rapidly changes in information and communication technology every organization adopt this with whole heartedly. According to (Bultum,2014) In the phase of internet banking accepted by the all over the world, Ethiopian government also started the internet banking system in their banks. Due to technology innovation increases, customer make transactions without coming to the branches. On the other side banks are easily connected to the rest of the world and present their product and services in a very effective manner. Ethiopia wanted to bring E-commerce system in the country but still they are facing lack of technology. All the banks of Ethiopia are very slow to upgrade themselves. Some of the banks of Ethiopia are still running their old pattern and not develop their own website, so they can-not connect to the world and they cannot offer their product and services to the customers of other banks, so the Ethiopians customers are very disappointed by their financial services of their banking systems. Due to nonintegration of banking system, Ethiopian banking customers wastes a lot of time to search their bank branch and long

waiting time to access their account and it is compulsory to visit their branch physically while access their accounts. There are some factors which obstruct the growth of information and communication technology in Ethiopia such as low level of internet facility and very poor telecommunication infrastructure. According to him Most African countries have internet facilities only their big cities. Another issue is having obstruction of legal and regulatory frame work of Ecommerce and E- payment for the adoption of new technology in the banking industry. Ethiopia did not form a law which will deal an E-commerce and it could not make policy which deal with the validity of electronic contracts, digital signatures and intellectual copyrights and restrict the use of encryption technology and high rate of illiteracy. One of the major issues is the low literacy rate in Ethiopia so they can not use the facility of E-banking facility. According to (Al-Smadi 2012) Banks play very important role through giving financial services to the customers of any country. They encourage individuals for small saving and make them in to a big investment. For a decade banks have been affected by the several changes connected with the globalization and the financial liberalization. Banks are directly affected by the evaluation of technology. There is very hard competition between banks, so banks need to find new way of expansion and electronic banking products help banking industry to help them. The major benefits of E-banking systems are to improve the effectiveness of distribution channels through reducing the transaction cost and increase the speed of service of the banking systems. Now a days the role of E-banking increases in many countries, whether its developed or underdeveloped countries. From the customers point of view there are so many benefits customers has taken from the E-banking such as: It is easier to access their account rather than go to physically bank and operate. It takes less time to manage their all works related to the banking. New evaluation in E-banking forces to many banks to develop new strategy in order to stay froward. Successful implementation of information system gives full benefit to the banking industry. In order to Motivate customer to use electronic banking banks must develop the security while operating the banking system, so it is very necessary to understand what are the customer concern to adopt the Ebanking system because customer still have fear to adopt Ebanking systems. According to Alwan & Al-Zubi (2016) In

the present scenario there is a lot of competition and the banks need better and convenient channels to deliver verity services to the customer to compete in the Banking industry. Now bank has changed their traditional activity and become digital with the help of online services. Internet facility also allowed the banking system to practice new application without investing huge amount in physical branches and also reduce the operating cost of banks, improve banking services and retain to the customer by giving fast services of banking. Internet banking also improve the customer and bank relationship because it satisfies the customer unlimited needs. Through internet banking services with lesser cost and time.

II. LITERATURE REVIEW

According to Bultum (2014) This article reveals that the factors that obstruct the adoption of E-banking in the Ethiopian banking industry. For this researcher has gathered data from four bank in Ethiopia. Out of four banks there are three private banks (Dashen bank, Zemen bank and Wegagen bank) and one state bank (commercial bank of Ethiopia). Researcher has used to mixed approach used to find the answer of all questions related to the E-banking systems in Ethiopia. The researcher statically analyses the survey data and developed the research framework based on the technology-organizationenvironment model (TOE) which ids developed by Tornatzky and Fleischer, so the major findings of this articles which obstruct the adoption of E-banking are: Security risk, lack of trust, lack of legal and regulatory frame work, lack of ICT infrastructure and absence of competition between national and foreign banks. This study also suggests a guideline to take action against the challenges identified, such as: make a clear and strong set of legal frame work on the use of technology in banking industry. Inviting more investors to invest on ICT infrastructure and bank needs to focus on technological innovation in banking industry.

According to **Al-Smadi(2012)** This article suggest that what are the problems which affect the bank customers to use the Ebanking facilities and services. This study also tell about the TAM(Technology acceptance model) and the TPB (theory of planned behaviour model). The researcher has collected primary data from 387 valid questionnaires which were taken from 26 licensed bank in Jordan. Researcher has applied multiple regression analysis to test the hypothesis. The major findings of this study are: Customer attitude is affected by the perceived risk which in turn influences customers and uncertainty avoidance has positive and significant impact on perceived usefulness.

According to Alwan & Al-Zubi (2016) This study aims to examine the how customer adopt the internet banking in Jordanian commercial banks, what are the barriers which obstruct the growth of E-banking in Jordanian commercial banks. Researcher also suggest that what are the solutions of ISSN: 2581-6691

impediments that faces this innovative technology. For this researcher has selected the 476 customers having their accounts in thirteen local commercial banks and they are using banking facility. Researcher has used self-administered questionnaire relying on a 5 – point scale gathered the primary data. Simple regression is used to determine the relative influences of the perceived privacy and security, uses, service quality, customer trust and customer feedback on internet banking adoptions. Researcher has found that all independent variables have significant impact on internet banking adoption, while website of any which is properly made and maintain attract more customer interest. However only those customers adopted the E-banking facility which are highly educated or they are having high ability to use customer applications and internet experiences. The researcher also gave some recommendation for future researcher to sole the hurdles facing by the banking industries of Jorden.

According to **Gerrard & Cunningham (2003)** said that internet banking is a form of self- service technology, which cost a lot of dollars. In recent past banks uses a lot internet banking. Researcher identified that why customers and bank industry adopted internet technology very fast due to self service technology and what are the eight characteristics which influences the rate of adoption of E-banking. Two of eight characteristics are accessibility and confidentiality make the internet more adoptive, service to be more easy and less complex and very comfortable for them who are more efficient to operate this. Researcher also found that adopter of internet banking are more financial innovative.

According to **Bali, Shanko & Feyisa (2020)**The researchers conclusively proved that the effect of E-banking on customers satisfaction with reference to commercial bank of Ethiopia found in Nekemte town, Oromia region. Researchers have used the survey method to achieve the objective of the research they have taken 164 customers of bank whose operate the banking system from more than one year. A questionnaire was prepared related to E-banking problems. Data was collected from the primary sources and analysed the Data through SPSS version 23.0 where different statistical tool were used to analysed the data and elaborate the objective of the research. The result of this study shows that the customer satisfaction increases when the transaction efficiency is getting high.

2.2 Variables and hypotheses

2.2.1 Perceived Usefulness

Perceived usefulness means a person can increase the performance of his task by using IT in his work

H₁: usefulness has a positive and significant effect on customers' towards the use of internet banking services.

2.2.2. Perceived Ease of Use

Perceived ease of use means using the various IT tools easily without any efforts

 H_2 : Ease of use has a positive and significant effect on customers towards the use of internet Banking services.

2.2.3. Perceived Risk

Perceived risk means when applying a technique we have chances of not getting the desired results.

H₃: Perceived Risk has a negative and significant effect on customers 'towards the use internet banking services.

2.2.4 Prior internet Knowledge

Prior knowledge of Internet means when doing banking transaction we should know how to use information Technology to get the results.

 H_4 : Computer knowledge has a positive and significant effect on customers' towards the use of internet banking services.

2.2.5 Convenience

Convenience means while purchasing any goods how it is easy to get the products.

 H_5 : Convenience has a positive and significant effect on customers' towards the use of internet banking services.

2.2.6 Information on online Banking

Information about online banking means the way we will use it to get the desired results.

 H_6 : information about online Banking has a positive and significant effect on customers towards the use of internet banking services.

III. METHOD AND TYPE OF DATA COLLECTION

3.1 Population and sampling technique

The respondents were addressed through one internal email or outlook to staffs that use this service because out of 266 customers 162 the 60.9% of the respondents are use internal outlook so they are staffs of united bank and the rest of respondents were getting by their email because the customers register for this service must email to gate password and other remainders. First the researcher used purposively from the 16 private and 2 government Banks list of registered internet Banking providers in Ethiopia. United Bank S.C selected from the list of internet Banking provider due to the availability of list of registered customer's information on internet Banking. From United Bank customer the researchers were selected North West region due low number of customers registered for this service and also low rate of adoption. Among the population of 266 of the internet Banking user at North West region customers of United Bank the researcher has used Census sampling technique.

3.2 Data analysis

When the raw data is collected it has no meaning so data should be processed and convert into the information. Before empirical analysis preliminary tests such as instrument validity, reliability and Multicollinearity were conducted. Reliability was tested using the *Cronbach* alpha value. Validity was tested by exploratory factors analysis; Multicollinearity test is tested by variance inflation factors. The following table summarizes the general demographic background of the responds of the study is summarized by focusing their gender, age group, and education status.

Table 2: Description of demographic data, n = 214

Variable	Category	n	%age
	Diploma holder	42	20%
Level of	First degree holder	152	71%
Education	More than first degree holder	20	9%
	Less than 21 years old	8	4%
	21 - 30 years old	81	38%
	31 - 40 years old	111	52%
Age	More than 40 years old	14	6%
	For less than a year	36	17%
Year of Bank	Between 1 to 3 years	98	46%
Service Usage	For more than 3 years	80	37%

The K-M-O test and Bartlett's Test of Sphericity were used to test the sampling adequacy K-M-O test is significant because test value is greater than .600 at .768) and Bartlett's Test of Sphericity also found significant at $\chi = 2,227$ with a p-value of P<.001.

For checking the validity of collected data, in factors analysis, varimax rotation was applied at 0.5 threshold.

Table 3: Rotated Component Matrixes

			Compon	ent		
	1	2	3	4	5	6
RK4	.924					
RK2	.912					
RK1	.907					
RK3	.895					
CN1		.873				
CN3		.870				
CN4		.847				
CN2		.562		Q.4.	9 ¹² - 1 ¹	
UF3			.718			
UF2			.704			
UF4			.683			
UFI			.657			
UF5			.640			
PR1				.883		

		Component					
	1	2	3	4	5	6	
PR2				.851			
PR3				.817			
PK1					.849		
PK2					.833		
PK3					.816		
EU2						.844	
EU1						.827	
EU3						.801	

Table 4: Convergent validity test

Variables	Sums of Loadings	Sums of Squared Loadings	AVE
Perceived Risk	3.638	3.309194	0.827299
Connivances	3.152	2.552282	0.638071
Perceived usefulness	3.402	2.5614	0.51228
Prior knowledge	2.498	2.080546	0.693515
Information	2.551	2.171379	0.723793
Perceived ease of use	2.493	2.072081	0.690694

Researcher has used Cronbach's Alpha to know the over all consistency of the data. The minimum value should be .70.From the table it is visible that all values are more than .70.So data collected is consistence.

Table 5: Reliability and multi collinearity tests

VARIABLES	No. of items	Cronbach alpha	VIF
Perceived usefulness	5	0.728	1.162
Perceived ease of use	3	0.774	1.040
Perceived Risk	4	0.937	1.068
Prior i nternet knowledge	3	0.788	1.012
Convenience	4	0.846	1.239
Information on online Banking	3	0.840	1.131

Based on this data all values are within range of 1.012- 1.162, hence, there was no multicollinearity problem.

Table 6: Hosmer and Lemeshow Test

	Hosmer and Lemesho	w Test	
Step	Chi-square	Df	Sig.
1	9.026	8	.340

So the significant of Hosmer and Lemeshow is >0.05 which is 0.340 so we accepted data for the model.

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Table 7: Model Summary

		Model Summary	
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	141.683 ^a	.192	.330

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hypostasis Testing Results

In the first hypothesis value of p is .025 which is less than .05 so this hypothesis is accepted

In the second hypothesis p<0.05 which is .000 the relationship can be considered significant. This hypothesis is also accepted.

In the third hypothesis, p>0.05 which is .0.229 the relationship can be considered not significant. Therefore, hypothesis third is rejected.

In the fourth hypothesis, p>0.05 which is .214. The relationship can be considered not significant. Therefore, hypothesis forth is rejected.

In the fifth hypothesis, p<0.05 which is .001 the relationship can be considered significant. Therefore, hypothesis fifth is supported.

In the sixth hypothesis p>0.05 which is .0.331 the relationship can be considered not significant. Therefore, hypothesis sixth is rejected.

Table 8: Hypothesis testing results

Variables	В	S.E.	Wald	Sig.	Exp(B)
PR	-0.266	0.222	1.445	0.229	0.766
CN	0.692	0.217	10.185	0.001	1.998
UF	0.464	0.207	5.035	0.025	1.591
INFO	0.193	0.199	0.946	0.331	1.213
РК	0.277	0.223	1.542	0.214	1.32
EU	1.001	0.265	14.296	0	2.72
Constant	2.153	0.268	64.406	0	8.612

V. SUMMARY OF THE FINDINGS

Based on the analysis Perceived ease of use, Perceived usefulness and convenience has supported the hypothesis and the rest Perceived Risk, prior internet knowledge, Information on online Banking not supported the hypothesis.

5.2 Conclusion, recommendation and future research

The purpose of this study is to analyse the factors affecting Bank customers' decisions to adopt Internet Banking in Ethiopia. The results showed that all the factors considered (Perceived usefulness, Perceived ease of use and convenience

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have significant positive effects on adoption to use online Banking.

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Automatic RF Alert System for Rescue of Human and Animals Using Wireless Control Techniques

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Abstract: Whenever an accident happens in our country there is problem that ambulance cannot reach at that spot due to traffic or lack of information about that accident. Moreover road accident in the city have been continuous process, the more crucial process is to protect the loss of life due to accident and due to this accident most of the time animals suffer as they get injured and no one is there to help them and main reason is the lack of information. So our main concern is to provide facilities to help the human as well those who cannot share their pain to someone.

Keywords: Intelligent traffic systems, GPS, GSM RF Module.

I. INTRODUCTION

As we all know that accident increasing day by day due to overcrowding in cities which causes loss of life as well a many people (humans as well as animal) suffers. And generally, traffic signals are busy due to which ambulance face this problem to reach that location and as a result we loss someone's life which is more precious than someone's urgent work. Urgent work can be delayed but someone's life cannot wait for that much of time. So this system will provide a smooth flow to the ambulance to reach with the help of main authorities near that place.

II. EXISTING WORK

At a recent time, whenever an accident happens then a message is received is by the control unit with the help of gps system and gsm-modem and then this control unit passed this message to the nearest ambulance and police station with the proper navigation of shorter path to reach that spot and also control the traffic signal near that point so that ambulance can easily reach that spot but this whole process is about only humans .if a vehicle comes in contact with any animal (cow, buffalo, dog, cat, etc) in this case no message is received by the control unit and at this point a animal get injured as well as the people but no can take any action due to lack of information.

III. SYSTEM MODELING

And now, this paper will take care of the animal as well as the human during the time of accident. Firstly when the vibrating sensor gets higher vibration then a siren is ON and it all on the owner/driver if they pressed that siren in the given time slot so there no signal will be send to the control unit, but if they there were any contact with animal happen in which high vibration generate in this case also the concept of siren will generate and message is passed to the control unit so that if any animal is injured so they also get proper treatment through the medical department and we can take care of our animal as well.

cannot then a signal is receive to the control unit and also if



A. Vehicle Unit

When vehicle comes in any kind of Fig.1 Functional Block Diagram contact with an object. the vehicle gets destroyed and the persons sitting inside the car gets injured and sometimes, the person might be not get proper first aid and their life is in risk. so for this problem, we put some sensors in vehicle in respect of the threshold energy with a range and whenever this sensors cross the range of given threshold energy, and then we consider this as an accident. When the vehicle crosses the range of threshold energy at that case if the person fails to press that button within the time limit which is the given time period then the signal goes to the respected authorities and if the person switch that button then no signal should assign to that authorities. So a signal passed through GSM-Modem to the control unit i.e. the main authorities that plays a vital role through this process and after getting the sign the respected authorities can do their respected works.

Fig.1 Functional Block Diagram



Fig.2 Vehicle unit accident detection Block Diagram

B. Control Unit

The main key of our project is to make the hub where all the information of sensors, GPS, GSM-modem would be kept and it has also the information of the vehicles would be there. So all type of information about the vehicle in which we put the sensors are kept safely and securely. Now whenever an accident occurs then the sensors sense the situation and gives the signal to the hub and then the hub have the location of the accidental area. By checking the location the hub can check that which hospital is closer than the accidental area gives the signal to the hospital as well as gives the information to the police station then both of the authorities should play theirr role and we can save the life. By situating the hub we can also increase the rate of employment.

C. Ambulance unit

The controller receives accident information from vehicle unit and also accident spot .then it starts search the nearest ambulance to the nearest accident spot and also find the shortest path between sourcee and destination location send the path information to available ambulance unit, which ensures that the ambulance reaches the hospital without delay. At the same time, the ambulance unit turns ON the RF transmitter. This will lead to communicate with the traffic section.

D. GPS -global positioning system

A GPS is a device that is used to find someone's location or to track any person and we can properly navigate our destination with the timing as well. So ,we use this as the owner/driver GPS system is ON and if the owner/driver has an accident .so through this system the control unit know about the accident ISSN: 2581-6691

location and also this system helps the ambulance to reach that spot within golden timing and try to save someone's life.



Fig.4 Working of Satellites

E. GSM-Modem

A GSM modem is a device which is used to send or receives the signal from the other electronic devices . As this device helps to transfer the signal from that spot to the control unit; via, messages. so it will be easy to locate that spot through this device.



Fig. 5 GSM Module

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Fig. 6 GSM-GPRS simulator module

F. Sensors

Sensors basically, sense the situation i.e. when the vibration range extend it pass a signal through siren and that siren indicates that the accident happen and pass this signal to the control unit. And in case of animal accident, the sensors will work on the ultrasonic waves, and to sense this ultrasonic wave and the range of vibration it will send the signal to the control unit. Means in both the cases humans as well as animals it help to reach that spot and help the injured person(animals and human being), and we can save someone's life.



Fig. 7 Vibrating sensor

IV. EXPERIMENTAL ANALYSIS

Step I: the system will initialize.

Step II: It checks for the normal system, if yes the system is reinitialized else it checks for the vibration sensor output.

Step III: If the sensor senses the vibration exceeding the threshold value then if will confirm that something is wrong and then it will wait for the user based switch to provide some output.

Step IV: the owner will press that siren or not.

Step V. If they press nothing will happen.

Step VI. If they not then a message is received by the control unit.

Step VII. The control unit send this message to nearest ambulance, police station and the traffic signal with the navigation of shorter route.

Step VIII. This shorter route will help the ambulance to reach that spot within golden hours.

Step IX. And finally we rescue that accident person (animal as well as human) to save their life

By this analysis we can conclude that whenever the system will be initialized it will sense the vibrations with the help of the vibration sensor. If the vibration frequency will be exceeding in comparison to the threshold value provided to the system it will initialize the user based button with the help of which the user can stop the signal to be transmitted to the control unit if nothing serious is happened else the signal will be sent to the control unit which will pass this signal to the police station as well as hospitals located nearest to the accident spot so that the authorities will take action as soon as possible to save the life of humans or animals injured in the mishap.

V. LIMITATIONS

The main limitation of our project is that there is a time limit in which the user can off the siren otherwise the signal would be sent to the control unit and further action would be taken. To overcome this limitation we can connect the car cameras with the sensors so that when the sensor senses any object in the range which is assigned then the function of camera will play a major role to capture the shots of the situation and share it with the memory attached to the system/cloud.

VI. CONCLUSION

By the completion of this project we can save the life of humans as well as animals as whenever an accident occurs then the sensors senses any problem (accident) it then directly sends the signal to the control unit about the accident after providing a short delay to stop the signal if nothing serious has happened. After the delay provided if signal is sent to control unit, it then passes the signal to the nearest hospitals and police station with the help of the GPS they can get the location of the accident and will help to provide the shortest and clear path so thatt ambulance can reach at the location of accident to take action to save the life of humans or animals. At last we conclude that we can save life of victim either it is human or animals with the help of this project.

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ISSN: 2581-6691

Mechanical Modules for Modular Reconfigurable Machine(MRM)

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Abstract: Reconfigurable Machine Tools (RMTs) are emerging as new generation machine tools which will bring a new paradigm in manufacturing industry by tackling changes in demand and immense competition between manufacturers. New approaches and designs are necessary for bringing about the change required for the development of these machine tools. This paper presents a modular approach to RMT. The focus is to design Modular Reconfigurable Machine (MRM) tools which will allow the machine to be adapted to the production of multiple part families, while still being customizable to the machining task at hand. The modular approach for designing is used not only to configure the modules in a certain way for a specific task but to develop a new type of machine which can incorporate all the features of reconfiguration and thus generate all kinematically feasible solutions for multiple tasks. The mechanical design for such a machine is presented and its multiple configurations discussed. The design includes multiple spindles to achieve greater scalability and robustness. A module library of RMT is also made for the proposed machine to explain the features (i.e. reconfigurability, convertibility and flexibility). Finally, the approach and design are demonstrated through examples, and the benefits and future scope of this approach is discussed. The paper presents to show that the proposed design is a novel machining solution in the RMT paradigm, and this idea of machine can close the gap in developing a feasible RMT for industrial as well as academic purposes.

Keywords - Modular Reconfigurable Machine Tool, Drilling, Milling, Basic and Auxiliary Modules

I. INTRODUCTION

The competition in manufacturing industry has increased in recent years it has become tough as every manufacturer strives to satisfy the customers need and rapid change in demands. But to do so, the manufacturers have to deal with problems like short product life-cycles, short ramp-up times and frequent changes in product mix and volume, without compromising product quality and cost.[1]

Dedicated machining systems are designed for production of a specific part and uses transfer line technology with fixed tooling and automation. DMS is used to cost-effectively produce one specific part type at high volumes and with the required quality. Whereas Flexible Manufacturing Systems have a configuration with fixed hardware and fixed but programmable, software to handle changes in work orders, Devendra Jha Mechanical Engineering Deptt. JIMS Engineering Management Technical Campus, Gr. Noida Affilated to GGSIPU, New Delhi deanme.gn@jagannath.org Ashutosh Singh Mechanical Engineering Deptt. JIMS Engineering Management Technical Campus, Gr. Noida Affilated to GGSIPU, New Delhi ashutosh.singh@jagannath.org

production schedules, part-programs, and tooling for several types of parts. If we need to make several types of parts, on the same system at required speed and quantity, which can change over time FMS is the cost-effective solution. [2] FMSs and DMSs have become economically infeasible by rapidly changing market demands. FMSs, though being able to adapt to change in demands, do not provide the robustness of DMSs and often have wasted resources making them uneconomical in many production situations. The shortcoming of these conventional machine tools is evident and is being highlighted. Therefore, a machine with better functionality and robustness is needed. Reconfigurable Manufacturing Systems (RMSs) that combine the advantages of DMS and FMS provides an economical solution. They can accommodate only a specific range of product mix and volumes. [3] Instead of building a machining system from scratch each time a new part is needed; an existing system can be reconfigured to produce the new part. To meet such requirements the most important part of any manufacturing system, the machine tools, should be developed.

Reconfigurable Machine Tools (RMTs) can be used to build a manufacturing system that quickly responds to changes in product design and is inherently reconfigurable and customizable. [4] A reconfigurable machine tool can be quickly modified to suit the production requirement without any extra expenses. Thus, a new type of machine which is capable of manufacturing a family of parts depending upon the magnitude of part demand can be developed which is called a Reconfigurable Manufacturing Machine (RMM). RMT or RMM can perform a pre-designed set of required operations as specified for the specific part family with high reliability, repeatability and high productivity. In order to provide exactly the functionality and capacity needed to process a family of parts, RMTs are designed around a given family of parts. Using the required machine modules, RMTs can be assembled for performing a given set of machining operations. [5] These modules are nothing but different parts of the machine. They are classified with respect to their properties which make their assembly easier. These modules can be arranged in different combinations to achieve different configurations to manufacture different parts of a family but are not restricted to one specific family of parts.

The reconfigurable machinery has been the focus of development in the recent years and has been the topic of further research because of its vast potential. The development of reconfigurable equipment has yet to reach a point where its successful implementation will result in bringing a new paradigm in manufacturing technology.

This paper aims at reviewing the current practices and approaches and suggesting the possible future research of modular reconfigurable machine (MRM) tools for RMS, which uses their property of modularity to rapidly adapt to fluctuating demands and product changes. Section II of this paper presents the basic overview of reconfiguration requirements. Sections III presents MRM design from mechanical perspective and its advantages. SectionIV presents a small Case Study, highlighting the operational achievement of MRMs. Section V concludes the paper with discussions on MRM performance and a description of future work.

II.UNDERSTANDING RECONFIGURATION

A. Reconfigurable Machine Tools

DMT are designed for specific operation requirement and thus are best for rapid production but they fail when the parts change, as we would need a customized station for each new part. To overcome the challenge CNC machines were used, but the problem with them was that they were designed before the operation requirements were known and, thus, they had features which were there but could not be used and were a waste of resources. This problem was solved by the concept of RMT, which combined both the features of DMT and CNC. RMT concept uses DMT approach in a way that the machine is designed around a part family or a set of parts rather than a specific part, so conversion by rapid reconfiguration of the machine is possible and uses CNC technology to drive the machine. This new machine (i.e., the RMT) exhibits a customized flexibility which makes it less expensive and more robust than general-purpose CNCs.

B. Reconfiguability of System – An Example

Let's take the following example for consideration:



Figure 1: Part A (left), Part B (right)

Figure 1 illustrates two parts belonging to two different products. Part A is a part which is being phased out of production. Part B is the part which is replacing the old product. Part A requires a 3-axis milling machine for its fabrication, while Part B requires a 4-axis milling machine for the machining of additional inclined surfaces and holes. Thus, to successfully absorb this change in production the system resources need to be redistributed so that they suit better for the production of Part B. A 5-axis CNC machine with ability to perform orthogonal cutting is required for this change in production. But the extra DOF and tools are a waste of resource and capital in the sense that they are not relevant to the manufacturing of these parts. In the arch-type RMT an alternative reconfigurable solution is presented where the machine is capable of 3-axis kinematics with one passive degree-of-freedom available for reconfiguration. [6] But the Arch Type RMT does not exhibit modularity, machine modules could not be added to or removed from the platform to increase or decrease the machine's functionality.

III. MODULAR RECONFIGURABLE MACHINE

RMT is only feasible when we can readily change its configuration as the demand changes thus reconfigurable manufacturing systems need a modular structure to meet the requirements for changeability. The main reason in developing reconfigurable manufacturing systems is to develop machine modules, which can be quickly added or subtracted within a system or between systems to provide a modular system structure. This exchangeability is only possible when the machines including their control system and interfaces joining the modules are similar, which enables a short-term adaptability to market changes by reconfiguration of the manufacturing system. [7] Thus to make a Modular Reconfigurable Machine (MRM) we need to make a number of modules or parts which can be assembled to form a machine required for machining task. Best example of an RMT which is designed from a library of modules is the Arch Type RMT. This machine tool was developed around a part family of V8 and V6 engine blocks, and performed machining operations on various inclined surfaces. But the only drawback was that it did not show modularity as modules could not be added or subtracted thus making its ability to reconfigure inept and reducing its functionality.[8]

MRMs provide reconfigurable functionality i.e., they can perform various machining operations facilitated by interchangeability of machine tools. Moreover, structural reconfigurability adds additional DOF allowing machining to be performed through various tool paths. MRMs have the minimum required specifications for performing the task at hand. Additional modules can be removed and distributed to other machines in the system. This "ensures that the manufacturer can slowly ramp up the production of component in high demand at a given time without investing capital in the purchase of new machine equipments.[9]

A. Module Library

A reconfigurable machine or a modular machine can be build by using the required set of modules which best match the

machining operations to be performed from a library of machine modules. A set of required modules can be chosen from the library of precompiled mechanical modules to assemble the required machine tool which will perform the required operation and fabricate the part. An example of module library is given by Figure 2. Modules within a library are classified basically into two categories, namely, basic and auxiliary module which are further classified into three categories: Function, Motion, and Accessory.[10]

Function modules are modules which can be changed to provide a new machining process. Each function enables one of the following machining processes: drilling, milling, tapping, boring, grinding, polishing, engraving, and turning.

Motion modules are modules which through their integration enables some kind of motion, whether it be liner or angular. Thus, they help in positioning and feeding of the tool post.

Accessory modules are those modules which are not necessary for the machining operation but are used to make machining easier and simpler, like work clamps and stabilizers.

Ten different operations, namely; facing, slotting, forming, key milling, chamfering, drilling, reaming, tapping, boring, and grinding can be performed on the MRM by using the corresponding tools on the machining spindle and the additional DOFs that can be acquired by the integration of Mechanical Motion Modules.[9]



Figure 2: An Example of Library for MRM

B. Design

Modular Reconfigurable Machines (MRM) are constructed using modules, which can be added to or subtracted from the machine in order to achieve the required functionality.[11] The MRM discussed in this paper consists of the Basic Structure (Figure 3) to which the modules are added and also supports the Work table and the Arch-Shaped Guideways.



Figure 3: Basic Structure

The Arch-Shaped Guideways (Figure 4) are symmetrically located around the table and can be moved perpendicular to the surface of the table with help of Telescopic Lifts. On the Arch-Type Guideways, modules for the motion of tool in X- and Y-Direction (parallel to the plane of the work table) are placed.



Figure 4: Arch-Shaped Guideways

Each module has arrangement so that they can be attached to a fellow module or another module. This is done by making each module independent of extra accessories i.e. the module itself consist of motor or actuator which makes them less dependent and since they are similar in their build they can be integrated together with minimal extra accessories. Each additional DOF is added through the integration of a motion module. By adding a new motion module, a new degree of freedom is achieved which, by the use of multiple spindles increases the modularity. A 360 Degree Rotating Module is attached on top of the Y-Axis Motion Module which can conveniently make fine angular variations to the direction of feed (Figure 5).



Figure 5: Mechanical Motion Modules on Arch-shaped Guideways

ISSN: 2581-6691

Tool changing is done 180-degree rotation of The Multi-Tool Spindle (Figure 6). The Multi-Tool Spindle contains modular interface for attaching two different tools on either side (front and back) of the spindle. The motor which drives the spindle can be accommodated within the spindle housing in such a way, that power is transferred across both the tools. Hence two different machining operations can be performed by the same spindle alternately as per the machining requirement.



Figure 6: Multi-Spindle Tool Post

The modules or combination of modules and the multi-tool spindle can be arranged independently on each of the Arch-Shaped Guideways. Hence, two faces of a workpiece can be machined simultaneously. The machining operations can be independently performed by each spindle so that asymmetric parts can be machined in a single pass. On the other hand, a symmetric part can be machined quickly by performing identical operations on both the spindles. A vertical column (Figure 7), that can slide in only one direction, carries a third spindle for machining the top face of the workpiece. An Arch-Plate is attached to the column which enables angular placement of the spindle, by changing the plate we can also change the type of machining operations which can be achieve by using the vertical column. This Spindle can be used for drilling holes or milling cylinder bores on surfaces inclined to the horizontal.



Figure 7: Motion Modules Along with Arch Plate Module

When using the machine at its full potential it will have all the motion and function modules assembled together (Figure 8).

Multiple spindles will ensure speedy production and independent operations will ensure the fabrication of a complete part in one go. Along with fabrication of another part of the same family.



Figure 8: Complete Assembly of All Modules on the MRM

We can use any of the four different configurations as shown in Figure 9 which best matches the production requirement. If drilling on inclined surfaces is the only requirement, the First Configuration may be used. If only the lateral sides of the workpiece need to be machined, the Second Configuration may be used. If a product requires both side as well as top faces to be machined the Third Configuration may be used.



Figure 9: Configurations of Proposed MRM

C. Advantages

- As the machine has customizable modular components and multiple spindles with varying degrees of flexibility, it can be used to machine very complex contours and shapes. Hence its application is not restricted to a single part family but can be effectively used for machining multiple part families.
- Since this machine can be customized after the time of purchase the cost of flexibility is not a part of initial

investment. Thus, this machine can work economically well if there are fluctuating market demands.

- A minimum of but not limited to sixteen kinematic configurations were achievable on this single platform. Such reconfigurability has thus far not been displayed by any commercial machine tools or academic prototypes. This can also be increased by increasing the number of spindles and designing a more robust work table.
- A total of ten different operations or processing functions can be achieved on the MRM. The machine was able to achieve sixteen different kinematic configurations. In total we were able to achieve 160 different functional states. DNCs and CNC based systems cannot effectively distribute machine resources based on job requirements and machine tool dynamics.

The biggest advantage is that the system resources are distributed efficiently across the required tools and none of the DOF or tools are extra or redundant as we can only use the modules which we need to do a certain operation.

VI. CASE STUDY

The various configurations of the proposed modular machine and their applications are explored, with the help of a part oriented case study.

A. Machining a Symmetric Part



Figure 10: A Symmetric Component Machined on the Proposed MRM

Consider a part as shown in Figure 10. It has steps cut on either side. On the vertical surfaces of the steps there are closed key seats, one horizontally oriented and the other vertically on each of the surfaces. This part is symmetric as it has identical geometrical features on both left as well as right side. Each side of the workpiece can be machined simultaneously by attaching milling cutters on both the spindles. The steps can be machined using a Shell-type Face Milling cutter, starting from the bottom of the workpiece and moving up. Major cutting is done by the teeth on the periphery and the teeth on the end are used for finishing the vertical surfaces. The key seats can be cut immediately after machining the steps using an end milling cutter, which can be attached to the same Multi-tool Spindle. After face milling is over, the end milling cutter can be used for machining, by rotating the Multi-tool Spindle by 180 degrees. Then the horizontal key seat can be machined by moving the spindle along the horizontal guideway. For machining the vertical key slot, the Arch-shaped Guideways can be actuated along the vertical axis.

Every corner of the given part has been chamfered. This can be achieved by rotating the axis of the spindle, using the 360 Degree Rotating Module and then moving the spindle horizontally, by keeping its angular position fixed.

The inclined surface on the top face of the workpiece can be machined by, attaching an end milling cutter to the vertical spindle attached to the Arch-plate, setting its proper inclination with respect to the top face and moving the vertical column along the horizontal guideway.

To drill holes perpendicular to the inclined surface, that has been milled, a drill can be attached the vertical spindle, after detaching the end milling cutter and fed perpendicular to the inclined surface, at correct inclination of the spindle. The drill can be positioned for drilling the second hole by moving the vertical column horizontally. The hole can be further machined to have fine surface finish and accurate size by attaching a reamer to the same spindle for reaming.

Thus, we see that symmetric parts can be easily machined on the proposed Modular Machine. We get a clear idea about the various degrees of freedom, the tool spindle has and how they can be utilized to perform manifold machining tasks. Moreover, we see how rapid tool change and modular interface for tools help in performing multiple machining operations on a single platform.

B. Machining an Asymmetric Part



Figure 11: An Asymmetric Component Machined on the Proposed MRM

Now consider the part as shown in Figure 11. It has steps on one side and a T-slot, plain slot on the other. Hence, the part is asymmetric. In order to machine this part, a Shell-type Face Milling Cutter is required on one spindle and a T-slot Cutter, End Milling Cutter on the other. The machining operation to cut the steps would be same as discussed in Case -1.

Milling of T-slot is carried out in three stages. Firstly, a plain slot is milled from one end of the workpiece to the other, by moving tool spindle in the horizontal direction. In the Second Stage, the T-shape is machined using a T-slot Cutter. The T-slot cutter is fixed on the opposite modular interface of the spindle to allow rapid change of tool. The T-slot cutter can also be moved in the same direction along the horizontal guideway. The top surface of the workpiece can be machined as discussed in case of Case-1.

Thus, we see that asymmetric parts can be easily machined, by using different tools on the two Multi-spindle Tool Posts and performing different operations. The machine is thus capable of machining symmetric as well as asymmetric parts and can also hold a variety of cutting tools like face milling cutters, Tslot cutter, End milling cuter, drill, reamer etc.

So, we can see that, the application of the Modular Reconfigurable Machine is not restricted to a single Part Family but can also be applied to the machining of multiple Part Families.

V. CONCLUSION

The frequent changes in the demand and design of products have put strain on the manufacturers and thus they are looking for a new manufacturing system. The RMS methodology seems to be the feasible solution which not only improves the systems responsiveness but also enhances its functionality and production capacity. The paper presents Modular Reconfigurable Machines as, a subset of Reconfigurable Manufacturing System, an economical and robust machining solution for the disproportionate resource distribution of manufacturing machines for production changes. The MRM modules created during this research could be assembled into a machine which can perform up to ten different machining operations. The 12 modular units of hardware that formed the library of modules were used to create 16 unique machine configurations which resulted in more than 160 different machining states. This level of customized flexibility with limited hardware is exhibited by MRMs which increases its feasibility of implementation in RMS paradigm. Also, the reconfigurability of MRM make the machine more cost effective, which can be used to make manufacturing configurations needed for short-term manufacturing of small product batches and then modifying it as the demand increases as the company becomes more profitable.

But the MRMs are still not ready for implementation in

ISSN: 2581-6691

industry. There are certain qualms about its design and functioning which need to be addressed before it is implemented in the industry. Like, for example, if two nonsimilar or uncomplimentary modules are attached with each other it would affect their motion. Also, as the number of modules assembled together increases, the complexity increases. There is also a problem of mass distribution and power connection or transfer interface as they can't always be effectively connected. Thus, provided their promising benefits of reconfigurability MRMs still remain a topic for further research.

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ISSN: 2581-6691

Design and Costing of an Green Airport

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Abstract: This research work aims to design a "Green Airport" to meet the energy requirements for day to day functioning of the airport. For this purpose the device thermoelectric generator is being used to generate the electricity using temperature gradient and also the solar energy. The runway will be designed to utilize the kinetic and potential energy of the aircraft and convert it into heat/electrical energy.

The airport taken into consideration for design is the Indira Gandhi International Airport. The electricity cost incurred by an airport using non renewable source of energy is calculated and compared to the cost incurred if non renewable sources were replaced by thermoelectric generator on the runway.

I. INTRODUCTION

Electricity has become one of the most required amenities in the present day. The various resources from which electricity is being generated in present days include coal, fossil fuels, oil etc which are non renewable in nature. Non renewable resources are the natural resources which will not replenish themselves once it has been used. Non renewable resources are the primary sources of the tremendous wealth surpluses required to perpetuate industrialized societies. Over 70% of energy used in industries comes from non renewable sources. They do substantial harm to the environment, including air and water pollution, damage to public health, wildlife and habitat loss, water use, land use, and global warming emissions. Even the extraction and processing of these resources of energy degrades our environment. The major harmful effects are green house gas emissions, air pollution, waste generation etc.

However over the years, an increasing gap between the demand and supply of electricity has been observed and has become a matter of concern for us.

Therefore keeping in mind the growing electricity problem, a solution in this regard is needed to meet the growing energy demands without hampering the environment further. This leads to the use of renewable sources of energy which includes solar, geothermal, wind etc. There are many forms of renewable resources like solar which can be trapped and converted into other forms of energy i.e wind power, geothermal powers etc. Solar power can be used directly for heating and producing electricity or indirectly via biomass, wind, ocean thermal and hydroelectric power. To meet our increasing demands with the help of renewable source of energy civil engineers have introduced the concept of "Green Buildings".

The whole project includes the following agendas-

- Design of an energy efficient airport.
- Generation of electricity using TEG on runways.
- Study of energy requirements at the IGI airport.
- Comparative cost analysis using the solar technique and the TEG technique.
- Study of Site feasibility and availability.

2. MATERIALS USED

- 1. <u>Copper plate</u> –It is used for the heat transfer from the pavement to the TEG. The reason for opting for copper place is its high thermal conductivity which will help in transferring the heat from pavement surface to the TEG.
- 2. <u>TEG</u> –It is used for electricity generation. The model of TEG used is SP 1848-27145
- 3. <u>Heat sink</u> –It is used for maintaining a temperature gradient on the either side of the TEG. It is a passive heat exchanger that transfers the heat generated by an electronic or a mechanical device to a fluid medium, often air or a liquid coolant, where it is dissipated away from the device, thereby allowing regulation of the device's temperature at optimal levels.
- <u>Multimeter</u>- for determining the current and voltage produced.

3. METHODOLOGY

3.1 EVALUATION OF AIRPORT ENERGY <u>REQUIREMENTS</u>

- a. We have carried out an evaluation study of the energy requirements of the airport so as to analyze that how much percentage of this requirement can be met using TEG. Also, it will help us to carry out the cost analysis of two methods.
- b. According to a NASA technical note NASA TN D-8094, the average rate of heat generation by friction of an aircraft on the runway is around $1.135*10^6$ W/m^2 . The energy that could be generated with the help of friction will be calculated using the mentioned value.

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c. According to the GreenCo Best Practices at Delhi Airport (June 2016), energy statistics for the year 2015-2016 is-

IGIA net consu	mption	134964MWh	
Generation solar(2.84MW)	from	3289MWh	
Generation solar(5MW)	from	1525MWh	
Total generation(7.84)	solar	4814MWh	

Table 1 ENERGY REQUIREMENTS AT IGIA

The cost economics for the implementation of the 5 MW solar project is 32 Crores.

3.2 PROPOSED MODEL

The model being proposed included following components:

- 1. Copper plate –It is used for the heat transfer from the pavement to the TEG. The reason for opting for copper place is its high thermal conductivity which will help in transferring the heat from pavement surface to the TEG.
- 2. TEG –It is used for electricity generation. The model of TEG used is SP 1848-27145
- 3. Heat sink –It is used for maintaining a temperature gradient on the either side of the TEG. It is a passive heat exchanger that transfers the heat generated by an electronic or a mechanical device to a fluid medium, often air or a liquid coolant, where it is dissipated away from the device, thereby allowing regulation of the device's temperature at optimal levels.
- 4. Multimeter- for determining the current and voltage produced.



Figure 1 Proposed Model

3.3 FIELD SETUP

A pit of around 20cm depth was excavated and the set up including heat sink, TEG and copper plate"s transferring part was placed and the bricks after applying thermocol sheets was placed so as to ensure the proper touch of plate and TEG is maintained throughout the reading interval. The heat collector plate was left open to collect solar heat and the temperature was measured using thermometer. The readings of voltage and current were noted down at various temperatures of the plate which changes due to change in day temperature.



Figure 2 Field Setup

4. RESULTS

Table 2 Field Setup Observations

	Temperature			
S.No.	(°C)	Voltage(V)	Current(A)	Watts(W)
1.	49	0.44	0.015	0.0066
2.	50	0.46	0.016	0.00736
3.	48	0.42	0.014	0.00588
4.	44	0.34	0.01	0.0034
5.	47	0.40	0.013	0.0052
6.	46	0.38	0.012	0.00456
7.	45	0.36	0.011	0.00396

Average Watt Calculated = 0.00528W

5. CALCULATIONS

As mentioned earlier, the calculation has been done for, Indira Gandhi International (IGI) Airport. Number of runways at IGI airport=3

Length of total 3 runways= 2813+3810+4430=11053m Providing setup along the runway alternatively at both the sides at a distance of 10m for initial trial,

Therefore, number of setups that can be arranged alternatively at both sides=2210

Average electricity generated =0.00528watts/sec For a single setup,

• For Solar -

Electricity generated in 8hours= 0.00528*60*60*8=152.064W

Electricity generated in 1year=152.064*365

=55503.36W/year

=0.05550336MW/year

1MW=0.024 mu

For 2210 setup electricity generated =2.94Mu

For Friction-

Average rate of heat generated due to friction= $1.35*10^{\circ}$ W/m²

Area of the plate provided at surface =(0.45*0.12)m² Electricity generated due to 1 setup=0.0729 W

Electricity generated due to 2210 setups=161.109MW=3.866Mu

Therefore, total amount of electricity generated due to 2210 setups in 1 year =2.94+3.866=6.806Mu

6. COST ANALYSIS

Investment needed for 5.7MW solar plant is 32 Crores. Investment needed for a single proposed setup =2000 rupees Therefore, investment needed for 2210 setups = 4420000rs

7. COST COMPARISON

The graph depicts that the cost incurred for the TEG setup is very less than the investment needed for the solar plant



Graph 1: Graph for the Cost Comparison b/w TEG and solar

8. CONCLUSION

In this project, a TEG-Runway design model has been proposed to generate electricity using frictional energy of the aircrafts as well as the solar energy. ISSN: 2581-6691

The proposed model uses the temperature gradient within asphalt pavements of the runway and the taxiway. It has the potential for sustainable generation of electricity. The energy harvesting process is green and environment friendly as well as economical. It does not interfere with the airport movements and aircraft take-off and landing.

The experimental setup of the proposed TEG model shows that around 6.86Mu electricity could be generated considering that the setup will receive solar energy during 8 hours of the day and friction will be provided by the aircraft movement on the Runway.

Furthermore, this electricity generated has a very low investment cost as compared to that of solar panels. An investment of 50 lakhs can produce an electricity of 6.86Mu, which covers about 34.3% of the electricity demands of the airport.

The proposed method is not only reasonable but also is very feasible at site and can be easily installed.

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Printed, Published and owned by Amit Gupta. Printed at Shubham Enterprises, 129, DSIDC Sheds, Okhla Indl. Area, Phase-I, New Delhi - 110020. Published at JIMS Engineering Management Technical Campus 48/4, Knowledge Park-III, Greater Noida. Editor: Amit Gupta