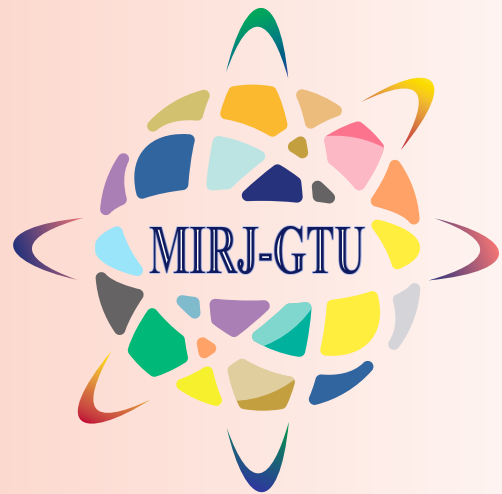


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From the Desk of Editor-in-Chief



I feel pride in publishing the second issue of 'Multidisciplinary International Research Journal of Gujarat Technological University'.

This issue concentrates on Engineering and Management disciplines in which articles are written in different areas such as information technology, retrofitting techniques, manufacturing technology, financial literacy and ethical practices followed by cooperative banks.

I hope all these articles will be useful for their range of applications and will also open up new directions for further research.

I take this opportunity to thank the GTU editorial board members & international editorial board members for their efforts in upgrading the articles in this issue.

Dr. Pankajray Patel
Director
Graduate School of Management Studies
Gujarat Technological University

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INTERNET OF THINGS (IOT): TECHNOLOGIES AND RESOURCE ALLOCATION USING AUCTION THEORY

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ABSTRACT

Today, as we know that sensing, actuation, communication, and control become more classy and ever-present, there is significant overlap in these communities, sometimes from slightly different perspectives. The Internet of Things at large will promote billions of devices, people and services to interconnect and exchange information and useful data. As IoT systems will be omnipresent and persistent, a number of security and privacy issues will arise. Credible, economical, efficient and effective security and privacy for IoT are required to ensure strict and accurate confidentiality, integrity, authentication, and access control, along with others. In this paper, we have discussed Resource allocation technique in which auction theory is used for resource sharing.

Keywords- IoT, Security, Privacy, Devices, Omnipresent

1. INTRODUCTION

Smart phones. Smart cars. Smart homes. Smart cities. A smart world. These ideas have been adopted for many years. Achieving these goals has been reviewed, to date, various and often disjoint research communities. There are such projecting study communities are the Internet of Things (IoT), Mobile Computing (MC), Pervasive Computing (PC), Wireless Sensor Networks (WSN), and most recently, Cyber-Physical Systems (CPS). However, as technology and solutions improve in each of these fields there is growing overlap and consolidation of principles and research proposals. Conventional definitions of each of these fields are no great appropriate. Further, research in IoT, WSN, MC, often relies on underlying technologies such as real-time computing, machine learning, security, privacy, signal processing, big data, and others. Consequently, an image of the world involves much of computer science, computer engineering, and electrical engineering. Greater communications among these communities will speed progress[2]. The overall IoT connection will consist of billions of selves, individual devices, and services that can interconnect to exchange data and useful information[1]. With the accelerated increase in IoT application use, infrequent security and privacy issues are recognized. When nearly everything will be connected to each other, this problem will only become more obvious, and repeated appearance will literally reveal additional security flaws and weaknesses. Such controls may subsequently be exploited by hackers, and in a statistical sense, all revealed flaws and weaknesses may be damaged in an environment with billions of device[3].

2. THE IoT TECHNOLOGY

Many people [4], including myself, endure the view that cities and the world itself will be covered with sensing and actuation, many embedded in “things” creating what is as a smart world. But it is

important to note that one key problem is the degree of the density of sensing and actuation coverage. I believe that there will be a transition a point when the degree of coverage triples or quadruples from what we have today. At that time there will be a qualitative modification. For example, now many structures already have sensors for attempting to save energy [5]; home automation is occurring, cars, taxis, and traffic lights have devices to try and improve protection and carriage, people have smartphones with sensors for running many useful apps, industrial plants are connecting to the Internet, and healthcare services are relying on increased home sensing to support and wellness [6]. Nevertheless, all of these are just the tip of the iceberg. They are all still at the early stages of development. The steady growing density of sensing and the elegance of the associated processing will make for an important qualitative change in how we work and live. We will truly have systems-of-systems that synergistically interact and unpredictable services.

In an IoT world, there will exist a data being continuously handled. It will be necessary to develop techniques that within proper knowledge.

For example, in the health area, fresh streams of sensor values must be changed into semantically significant activities performed by or about a person such as eating, poor inhalation, or manifesting signs of depression. Primary purpose of data analysis and the layout of knowledge have addressing noisy, real world data and drawing new inference techniques that has not the criteria of Dempster-Shafer schemes. Having limitation include to know about deductive probabilities and the cost of estimation. Rule-based systems may be accepted, but may also be too ad hoc for some applications

The IoT vision is to revolutionize the Internet, to create networks of billions of wireless identifiable objects and devices, communicating with each other anytime, anyplace, with anything and anyone using any service. The growing enhanced processing inclinations of RFID technologies, wireless sensor networks (WSNs) and storage capacity at lower cost may create an extremely decentralized collective pool of resources interconnected by a vibrant system of networks.

In fact, communications in the IoT will take place not only between devices but also among people and their environment. All different objects of our everyday life such as people, vehicles, computers, books, TVs, mobile phones, clothes, food, medicine, passports, luggage, etc., will have at least one individual identification allowing them to correspond with one another. Moreover, since these objects can sense the environment, they will have the capability to verify identities and communicate with each other, such that they will be able to exchange information and become a means for perception complexity, and may often enable autonomic responses to difficult scenarios without human association.

Intrusion detection in IoT is separate important research field which has received a high interest of researchers. Some studies [8,9] have discussed intrusion detection systems (IDS) in wireless sensor networks and the Internet of Things and have contributed analysis and comparison of the main existing IDSs.

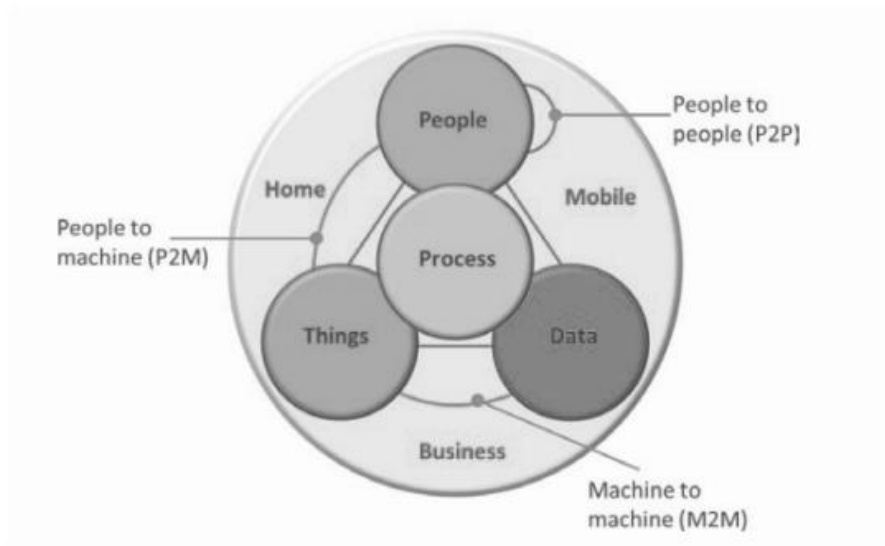


Fig:1 Internet of Everythings[7]

3. RESOURCE ALLOCATION IN IOT

In IoT auction theory used for resource allocation. Auction is a process of selling goods or services where people who want to buy goods or service place bids and highest bidder wins the object or service he has bid for.

Combinatorial auction:

- Multiple items of various kind are being sold.
- Bidders may bid for individual items or combinations of them.
- Auctioneer finds a combination which maximizes his revenue.
- Following two mechanism are very popular for combinatorial auction [17]
 - Single round (Sealed Bid) first price combinatorial auctions
 - VCG auction

Single round (Sealed Bid) first price combinatorial auctions

Users bid before the auction starts.

- The combination which gives the highest revenue is selected.
- Winners pay the value of their bid.

Required item	bid
{x}	1
{y}	3
{z}	2
{x, y}	5
{x, z}	5
{y, z}	4
{x, y, z}	6

Fig:2 Sealed Bid

On the other hand VCG mechanism is used which is also known as price auction.

Requested item	Bid of user 1	Bid of user 2
{a}	10	1
{b}	5	6
{a, b}	15	12

Fig:2 VCG MECHANISM

There are many cloud providers such as Amazon EC2, Microsoft provides resources on lease for computation and storage. Here below mentioned amazon price table.

VM Type	CPU*	RAM	Disk	Virginia	Ireland	Tokyo
m1.medium	2	3.75GB	410GB	\$0.120	\$0.130	\$0.175
m1.large	4	7.5GB	840GB	\$0.240	\$0.260	\$0.350
m1.xlarge	8	15GB	1.68TB	\$0.480	\$0.520	\$0.700
c1.medium	5	1.7GB	350GB	\$0.145	\$0.165	\$0.185
c1.xlarge	20	7GB	1.68TB	\$0.580	\$0.660	\$0.740
m2.2xlarge	13	34.2GB	850GB	\$0.820	\$0.920	\$1.101

Fig:3 AMAZON EC2 PRICE TABLE[18]

Above mentioned table states some limitation like fixed pricing policy and fixed number of virtual machine instances are available to users.

4. RESOURCE ALLOCATION IN EDGE COMPUTING

Mobile devices are becoming progressively capable computing platforms with significant processor power and memory. However, mobile compute capabilities are often underutilized. In this section how a collection of co-located devices can be composed to provide a cloud service at the edge.

Let us assume that there are many mobile devices at a place and some of them needs resources others are giving resources and a controller for task assignment. Our objective is to allocate tasks to mobile devices such that computational load is increased. [19]

There are some constraint to it like:

- 1) Each task should be allocated to at most one mobile device.
- 2) Each task should be assigned enough time.
- 3) Mobile devices are energy constraint

Here the heuristic approach might be used: Task with higher computation load per unit data transfer is prioritized. Task is assigned to mobile device which can give the result earliest. Assign as many tasks as possible.

There are some limitations of it: Task assignment problem should also depend on energy consumption. Incentive mechanism should be designed. Resource allocation should be distributed.

5. AUCTION THEORY FOR RESOURCE ALLOCATION

The mobile device who needs resource initiates a session and requests for resources. Those who are interested will send their incentive demand, duration for which their available, battery level available, time needed for computation. The client application selects n devices depending on some combination of following factors:

1. Minimum incentive required.
2. Minimum delay required.
3. The device who has higher battery level should be given more priority.
4. The device should not leave before completing task.

How Information sharing in AgriFood supply chain [20]

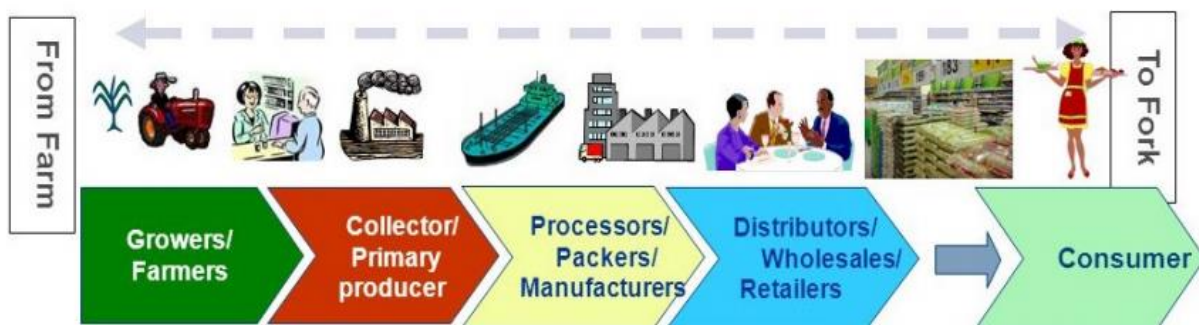


Fig:4 AgriFood supply chain

Majority of these components are working as individual system in IoT. These systems need to be connected to make the Food supply chain but the difficulty might be Smart farming is closed system.

Farmobile provides majority of data management service but it has fixed pricing policy for providing services as well for selling data. We should design some pricing mechanism which has variable pricing policy depending on demand of data. There should be some kind of mechanism in which user and system owner both bids to each other for service and data respectively and finds a middle point which satisfies both of them.

6. CONCLUSION

Auction theory can be applied to solve problems of IoT like resource provisioning or data sharing. In future we will do detailed understanding of both the problem. Select one of them to design a model using auction theory to solve the problem and Implement the designed model.

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APPLICATION OF RETROFITTING ANALYSIS TO AMMONIA PRODUCTION PLANTS

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ABSTRACT

Retrofitting analysis of an existing network of chemical plant is carried out to ensure the minimum requirement of utilities, heat transfer area and total cost. Since the development of various retrofitting techniques, it has been applied to various chemical plants and enjoyed the success. Ammonia is a basic chemical for production of (1) nitric acid which is used for production of dyes, fibres, plastic and explosives and (2) ammonium nitrate a fertilizer. Ammonia is produced in plants which were installed before the introduction of pinch technology. The objective of the study is to critically study the development of various retrofitting techniques and their applications to various types of plants. Ammonia production plants are highly energy consuming plants. Therefore, more emphasize is given to the application of retrofitting analysis to ammonia production plant. It has been found that out of total fifty-five publications available in open literature related to the retrofitting analysis of a chemical plant; only 18% are in the field of application of retrofitting analysis to ammonia production plants. This reveals the fact that retrofitting analysis can be implemented to various ammonia production plants to reduce the energy consumption of the plant.

Keywords: Retrofitting, Chemical Plant, Ammonia Plant, Pinch Technology.

1. INTRODUCTION

In a chemical or fertilizer manufacturing units, feed has to pass through the sequence of heat exchangers. The inlet temperature of the stream to the next heat exchanger depends on the previous heat exchanger design, effectiveness and process data. In such cases, even if all the heat exchangers are designed accurately, they may not work with their proper effectiveness and may result in increase of total cost of the manufacturing unit. The problem is known as the problem of heat exchanger network synthesis in a chemical plant. Briefly the problem of heat exchanger network synthesis (HENS) may be defined as the determination of a cost-effective network to exchange heat among a set of process streams, where any heating and cooling not satisfied by exchange among these streams must be provided by external utilities (e.g., steam, hot oil, cooling water, refrigerants etc.). Additional constraints like plant layout, safety, flexibility, operability and controllability must be accounted for. Pinch technology developed by Linnhoff [1] is one of the tools for solving the above problem. It recognizes the necessity of setting targets, i.e., predicting what is the best performance that can be possibly be achieved by the process, before actually attempting to achieve it. Thus, targeting allows the process engineer to determine the minimum utility requirements, area, number of unit, number of shell and cost prior to actual design of a heat exchanger network.

Pinch analysis is the method to design the heat exchanger network prior to set up any chemical or fertilizer manufacturing unit. The big question comes to any layman's mind is that "*What about the chemical plant*" that have been designed and set up without incorporating the fundamentals of pinch analysis. The problem is known as the problem of modification of existing chemical plant. Modification of existing plants can be

achieved by various retrofitting techniques. The various retrofitting techniques adopted so far are discussed and compared in the paper.

2. DEVELOPMENTS IN RETROFITTING ANALYSIS

The concept of energy saving and energy conservation came into existence in early 80's. Willem van Gool [2] has discussed about the fundamental aspects of energy conservation policy. According to him, issues involved in energy deficit should be fundamentally analyzed. Information transfer, more intensive use of data, and good housekeeping can all contribute to reduced energy use. The major choice, however, is between producing the present mix of materials, commodities and services more efficiently or decreasing demand for them. The first option is referred to as the "technical fix", and the second one as "change of lifestyle". If the first option fails, changes in life-style might become mandatory. The time scales involved pose the major problem to achieve conservation by means of a technological fix. An increase in the price of energy will lead to higher capital investments in accordance with the economic lifecycles in the different sectors. For applications with a short life-time, such as in the chemical plant, energy conservation will mainly take place through the modification of the chemical plant i.e. retrofitting.

To achieve the heat recovery in an existing plant, some of the investigators have critically studied the overall flow diagram of the plant and found some modifications based on their experience. Boland [3] have achieved the modification of ICI plant by matching certain streams that seemed likely candidate and saving energy in the plant. Linnhoff and Vredeveld [4] have carried out retrofitting analysis of Union Carbide plant using pinch technology. Tjoe and Linnhoff [5] have explained the application of pinch technology for process retrofits. David A. Reay [6] has also considered the problem of energy conservation by comparing two alternatives viz. (1) to redesign the chemical plant or (2) to retrofit the chemical plant. According to him, the sectors where energy usage is significant, conservation measures may be implemented without recourse to extensive plant or building redesign. This applies to heat recovery in the industry. For a design engineer, however, has considerably greater incentive to redesign his process when faced with the opportunity to incorporate heat recovery equipment. Retrofitting an existing chemical plant is another alternative. Both can lead to cost savings, the second-one generating a more rapid return of possibly lower magnitude. Both provide the engineer with challenges to his technical and managerial skills.

Pinch technology developed by Linnhoff [1] can also be applied to retrofit the existing plant. Linnhoff and Witherell [7] have carried out retrofitting analysis of an ethylene plant using pinch technology. Jones et al. [8] have studied practical synthesis techniques for retrofitting heat recovery systems. According to them, computer search technique can be used to choose from a number of simulated maximum energy recovery networks with the most favorable economics and with minimal change. While Lee et al. [9] have applied the pinch technology to retrofit a refinery.

Using mathematical programming techniques, network modification can also be achieved. Ciric and Floudas [10] have proposed mixed integer linear programming model for retrofit at a level of matches based on a classification of the possible structural modifications. While Yee and Grossman [11] have proposed mixed integer non-linear programming model for retrofitting an existing plant. Lakshmanan and Bañares-Alcántara [12] have described visualisation tool for developing retrofit solutions by inspection. According to them this method relies heavily on the ingenuity of the designer but has proved to be very flexible-handling a wide variety of problem formulations.

Based on above review, retrofitting techniques can be classified into four broad categories like computer search, mathematical programming, inspection and pinch technology. The computer search method may not prove efficient in many cases due to three reasons: The element of chance in hitting or missing the best network, the large amount of computational effort involved in simulating many networks and the difficulty

in retrofitting to identify a design having a structure reasonably close to the existing one and simultaneously transferring zero heat across the pinch. The methods of retrofitting by inspection and computer search carry the potential risk of the network not being the optimum. While the use of mathematical programming makes strong computational demands. Retrofitting by pinch analysis provides a promising alternative.

3. REVIEW OF APPLICATION OF RETROFITTING

Based on the development of different retrofitting techniques to minimize the energy requirements of the chemical plant, many investigations have been carried out after the year 1990 to retrofit the existing chemical plant. In the present study, these investigations are grouped as retrofitting technique applied to chemical plant (batch type and continuous type both), alternative approach for retrofitting analysis and retrofitting of an existing ammonia production plant.

The review of retrofitting of an existing ammonia production plant is separated from chemical plant due to the fact that ammonia is one of the largest volume industrial chemicals in the world and is essential to meet the food production of growing population. It is the highly energy consuming product requiring from 6 to 12 Gcal/MT of ammonia depending on the raw material used and the process route adopted. Since the development of the Haber-Bosch process for industrial Ammonia synthesis, the energy requirement of Ammonia has been continuously reduced from approximately 20.335 Gcal/MT of NH_3 in early 1950s to a current level of about 6.459 Gcal/MT of NH_3 .

4. APPLICATION OF RETROFITTING TO CHEMICAL PLANTS

Chemical plants are broadly classified as batch type plant and continuous plant. In batch type chemical plant, more than one product is manufactured using the same equipment one after another as per the market demand. In this type of chemical plant, layout is not fixed. While, in continuous type chemical plant, only one type of product is manufactured and plant layout is product type. Retrofitting analysis can be applied to both the types of plants.

4.1 Batch Type Chemical Plant

Antonio España and Luis Puigjaner [13] have addressed the problem of retrofitting of multiproduct batch type or semi-continuous chemical plant. Their procedure calculates new units sizing in order to integrate them into the existing plant structure and maximize plant profit, taking into account capital investments and other production costs. J. Corominas et al. [14] have systematically studied an energy saving grass-root design and retrofitting technology based on process integration for the batch mode of operation. They have identified the solution to the changeover product problem in order to achieve a feasible and optimized heat exchange network design for multiproduct batch plants. They have presented a new methodology which is based on: (a) the campaign-mode of plant operation, (b) the study of energy integration for each campaign. They have presented the algorithm based on the test case-studies.

4.2 Continuous Type Chemical Plant

Ciric and Floudas [15] have presented retrofit approach for heat exchanger network. They have presented two stage procedures for optimal redesign of existing heat exchanger networks. In the first stage structural modifications have been proposed by using MILP model and in the second stage superstructure is proposed based on the information generated in the first stage. They have demonstrated the procedure using three example problems. Wang and Chen [16] have proposed rapid analysis method for heat recovery in industrial plants. S. Ahmad and G. T. Polley [17] have presented systematic procedure for the

debottlenecking of heat exchanger networks of crude unit using pinch technology to predict the near-minimum energy and capital requirements before retrofitting the network for increased throughput.

Z. Fonyo et al. [18] have extended hierarchical decision procedure for retrofitting problems based on the experience. They have selected case studies based on the publication of the Fribourg Group of German and Swiss chemical firms. They have evaluated the cases and used to refine, improve and extend the hierarchical synthesis procedure for waste minimization to process retrofitting. Nilsson and Sunden [19] have analyzed crude distillation system using pinch technology and the MIND method. They have optimized the HEN using the pinch technology first and the results from the pinch analysis are given as input to the MIND optimization. Their result showed that the steam demand from the boiler unit in the energy supply part of the system can be reduced by 20 % in the optimized HEN and by 21 % when a heat pump is added to the system. Marechal et al. [20] have employed Effect Modelling and Optimization (EMO) model to optimize the energy efficiency of the methanol production process. The stated method allows identifying different ways of improving the energy efficiency of the process. They have found that classical methane conversion of 60 % can be increased up to 93 % when they have transformed the net mechanical power produced into methane savings at the country level. Miguel J. Bagajewicz [21] has expanded the energy savings horizons for the retrofit of crude fractionation units. He adopted the methodology to take the advantage of two facts: (a) Pinch-type calculations can be performed using operator type representations and (b) Processes like crude fractionation offer large flexibility in the operating/design parameters.

Badr Abdullah AL Riyani et al. [22] have carried out the retrofitting analysis of a fluid catalytic cracking plant using pinch analysis and showed the energy saving potential in the plant. Matijasevica and Otmaevic [23] have studied the heat exchanger network of a nitric acid plant using the pinch technology. They have found the possibility of reduction in requirements for cooling water and medium pressure steam. They have found that utility saving is associated with the replacement of three heat exchangers. Thus, energy consumption increases slightly but final result is reduction of energy cost with a payback period of 14.5 months. Zhaolin Gu et al. [24] have pointed out some improper heat exchanger settings and retrofit modifications by the process integration using pinch technology, studying the case of the five column alcohol distillation section, which is broadly used in new distilleries in China. Sung-Geun Yoon et al. [25] have retrofitted the heat exchanger network (HEN) for an industrial ethylbenzene plant by pinch analysis. They have achieved the alternative HEN by adding a new heat exchanger and changing operating conditions. It reduces the annual energy cost by 5.6%. In order to achieve it, the capital investment is necessary but the annual cost saving will be enough to recover the cost in less than one year. Sujo-Nava et al. [26] have presented a case study of the retrofit of a sour water network in a petroleum refinery. After modification, they have found that 83 % of freshwater and 52 % of energy can be saved.

Kaj-Mikael Björk and Roger Nordman [27] and Ebrahim Rezaei and Sirous Shafiei [28] have retrofitted the heat exchanger network problem with mathematical programming method combined with genetic algorithms. R. Bochenek and J.M. Jezowski [29] have applied genetic algorithms approach for retrofitting heat exchanger network with standard heat exchangers.

5. ALTERNATIVE APPROACHES FOR RETROFITTING ANALYSIS

Jos L. B. van Reizen et al. [30] have presented a prescreening and decomposition method to analyze heat exchanger networks for retrofitting. They called the method as Path Analysis which selects and analyses fractions from the existing network, either by heuristics or by an algorithm. By comparison of all fractions, the critical parts of the network that should be adapted can be identified. The adaptations can be done independent of the remaining network. Thus according to them, Path Analysis enables a considerable reduction of the effort in retrofit design. They have applied Path Analysis to an aromatics case. They have found that solutions tend to be less complex, while the profitability is sometimes higher than that was expected from global analysis.

Asante and Zhu [31] have described a new automated procedure for retrofit heat exchanger network design which minimizes the modifications in the existing HEN. Asante and Zhu [32] have presented two stage, systematic and automatic method for the retrofit design of heat exchanger networks. The first stage is diagnosis the HEN bottleneck and MILP formulation is used to select a single modification which will best overcome the identified bottleneck. In the second stage, the HEN is optimized using non-linear optimization techniques to minimize the cost of additional surface area employed.

Jos L. B. van Reisen et al. [33] have presented a new targeting method for the retrofit of heat exchangers networks. It combines existing targeting and design methods for retrofit with the concept of zoning used in grassroots design. Zoning also includes practical aspects like functionality; lay-out and operability. They have adopted their zoning methodology for aromatics case. They have found that the retrofit design effort is significantly reduced compared to existing methods. Athier et al. [34] have presented two level approach for the automatic determination of the optimal retrofit of an existing heat exchanger network considering the placement/reassignment of existing exchangers to different process stream matches, their need for additional area, the placement of a new heat exchanger and the cost of stream re-piping. In the first stage optimization has been carried out using simulated annealing and in the second stage optimized by a NLP algorithm. They have illustrated their approach by two examples.

Brioness and kokossis [35] have extended the conceptual programming technology for retrofit design problems. They have discussed the HEAT and TAME model formulations and optimized as MILP problems. They have reported up to 40% improvements in several examples. Abbas et al. [36] have described a novel approach to the retrofit problem using constraint logic programming. They have found that in most of the case studies on which program was tested; the solutions were superior to others reported in the literature. X. X. Zhu et al. [37] have retrofitted heat exchanger network using heat transfer enhancement. As a result of HEN retrofit, additional surface area is required for some heat exchangers. There are a number of options to provide additional area, such as installing new shells or new units, adding new tubes to an existing bundle, etc. According to them, if heat transfer enhancement (HTE) is applied, additional area can be reduced significantly. This can result in a great reduction in capital cost and implementation time for modifications. They have demonstrated the new procedure using a case study.

Ma et al. [38] have proposed two step solution method based upon mathematical programming for heat exchanger network retrofit. In the first step HEN is optimized using constant approach temperature model. In the second stage, they have used MINLP model which takes into consideration of actual approach temperatures to finalize the HEN design. Varbano and Klemes [39] have presented simple heuristics based on heat exchanger network retrofit techniques, developed by Tjoe and Linnhoff and extended by Asante and Zhu. According to them, this approach is useful when the direct application of the classic network pinch concept and rules is not possible to implement. F. Nourai et al. [40] have addressed the problem of finding environmentally clean alternatives for retrofitting existing processes. They have applied their method to an existing local production facility as a case study and risk-based pollution prevention targets. F. S. Liporace et al. [41] have proposed an alternative procedure to retrofit an industrial plant based on a new heat exchanger network synthesis and evolution algorithm. According to them, first a lower bound for HEN total annual cost is determined and new HEN is synthesized using pinch design method. Then, a comparison between this HEN and the actual one is performed to search for structural similarities, forming the set of match constraints. Then after, a new HEN keeping those similarities is proposed. The comparisons among the three HENs indicate the recommended structural modifications. They have applied the proposed alternative to a case study and found that retrofit can be performed without many changes.

B. L. Yeap et al. [42] have carried out retrofitting analysis of crude oil refinery heat exchanger networks to minimize fouling while maximizing heat recovery. They have showed that, at both the exchanger and

network levels, designing for maximum heat recovery using traditional pinch approaches results in a less efficient system over time due to fouling effects.

Igor Bulatov [43] has proposed an overall framework for the retrofit of a plate fin heat exchanger network and applied for the debottlenecking of a liquefied petroleum gas cold box. He has also incorporated pressure drop parameters into the optimization framework. Ozgur Korkmaz et al. [44] have retrofitted the coal-fired power plants with carbon capture in order to meet strict climate protection aims. Nordman and Berntsson [45] have presented the theory and concept of a graphical method for heat exchanger network retrofit. By employing the approach, one general result they predict is that the closer to the pinch the existing heaters/coolers are located, the higher potential for cost-effective retrofit. Nordman and Berntsson [46] have employed the graphical method for cost-effective heat exchanger network retrofit to two cases. In the first case, they have compared the calculations with the results from the graphical method; while in the second case, they have compared graphical method is compared with the earlier published results. In both the cases, they have found the possibility of heat recovery.

6. APPLICATION OF RETROFITTING TO AMMONIA PLANTS

Shah and Weisenfelder [47] have described computerized control of a single train, large capacity ammonia plant. They have employed the computer to perform supervisory, interfacing control for various control loops in the plant as well as periodic on-line and off-line optimization of the profit function. They have found that the economic benefits achieved with the use of computer control because of improved plant performance and profit, on a monthly basis, easily justified the cost associated with the computer. A. D. Stephens and R. J. Richards [48] have described steady state and dynamic analysis of an ammonia synthesis plant. According to them, the analysis help in (1) better understanding of the operation of the plant, (2) designing a simple experimental scheme for optimizing and (3) indicating criteria which ensures optimization never enters in inoperable regions.

Radgen [49] has carried out exergy analysis of the ammonia plant and the urea plant of the fertilizer complex. They have found that existing overall exergetic efficiency is 60 % which includes 68.83 % exergetic efficiency of ammonia plant and 87.89 % exergetic efficiency of urea plant. They have found that the possible improvements are mainly equipment based and not due to the unfavorable positioning or matching of individual unit.

Penkuhn et al. [50] have presented a model that enlarges the well-known linear optimization model for joint production planning problems. The model is based on thermodynamic equilibria calculations and therefore they have formulated as a non-linear optimization model. They have implemented the model with the help of process simulation system ASPEN PLUS and applied as an example to a real world ammonia synthesis plant. The results showed that it is possible to improve the operating margin of the AMV ammonia process. De Wit and Riezebos [51] have revamped a 25-year-old ammonia plant which resulted in a lower energy consumption and higher production capacity. Haitham M. S. Lababidi et al. [52] have studied the energy retrofit of the front end of the ammonia plant using recent advances in pinch technology. They have inspected the front end of the ammonia plant and combined it with pinch technology. Yao Wang et al. [53] have performed the total process energy integration in retrofitting an ammonia plant using modified pinch analysis. Panjeshahi et al. [54] have performed a retrofit study of an ammonia plant to improve the energy efficiency. They have applied the combined pinch and exergy analysis and found reasonable saving (15 %) in power consumption without the need for the new investment.

Singh [55] has discussed that more than 150 KBR technology based ammonia plants installed globally in the 1960-1980. In the plants, ammonia synthesis converter with an internal heat exchanger is used for energy recovery. He has found that these plants still consume high energy and one key reason for this

inherent deficiency is that all the waste heat in the synthesis loop of these plants is recovered by preheating boiler feed water rather than by producing high pressure steam. Recovering waste heat by raising medium pressure steam or by only preheating BFW makes these plants inherently energy deficit. According to him, new proprietary KBR technology can now upgrade heat recovery synthesis loop by implementing a simple modification in the existing ammonia converter and incorporating a HP steam raising boiler in the synthesis loop. He has found that depending upon current specific configuration; plant energy consumption can be reduced by 0.18 to 0.30 Gcal/MT of Ammonia. Through cooperation with the plant owners in Russia, such an upgrade is planned to incorporate.

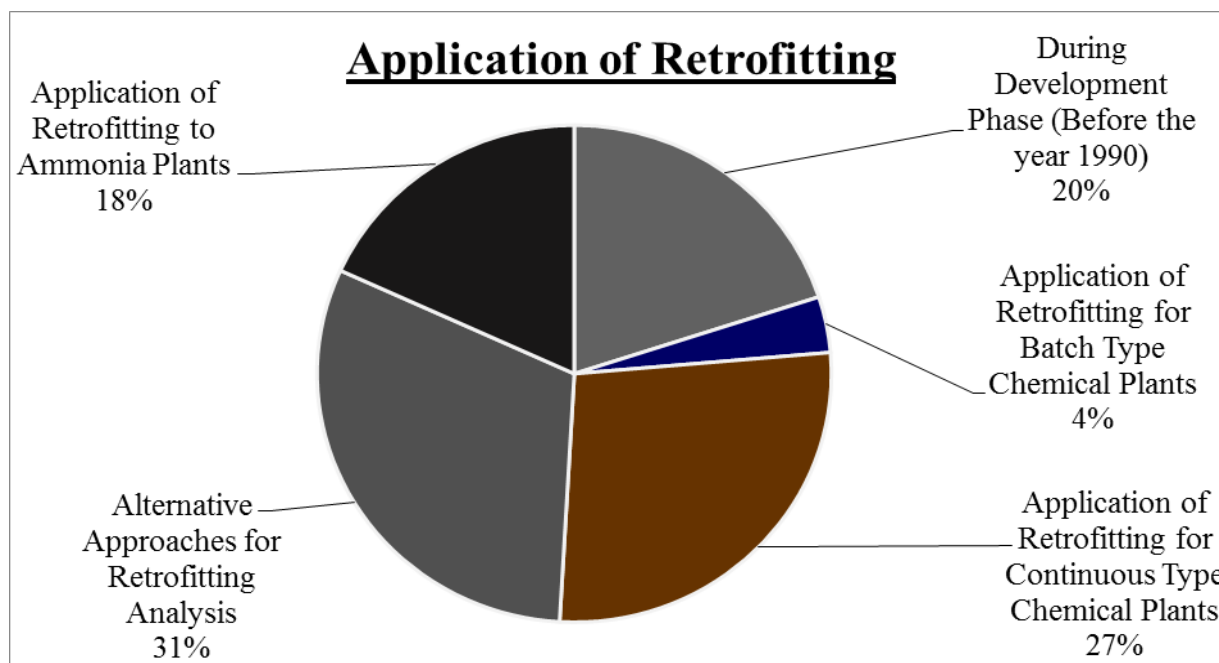
Nand and Goswami [56] have reviewed the developments in ammonia and urea industries and the energy conservation efforts. They have found that energy consumption was reduced from 12.48 GCal/MT in 1987-1988 to 8.97 GCal/MT in 2007-2008 for ammonia plant. Chavda and Prabhakaran [57, 58] have implemented the fundamentals of the pinch technology and synthesized the ammonia production plant using two methodologies (1) minimum temperature approach and (2) minimum flux approach. The parameter is then optimized using Genetic Algorithms. They have applied network pinch method and retrofitting analysis method to modify the ammonia production plant. They proposed the network pinch method to modify the plant under study and achieved 1.71 % reduction in total annual cost.

7. APPLICATION OF RETROFITTING

The above study of application of retrofitting can be summarized in Table 1. It is also represented by pie chart in Graph 1.

Table: 1 Application of Retrofitting

Sr. No.	Application of Retrofitting	Number of investigations as found in open literature.
1	During Development Phase (Before the year 1990)	11
2	Application of Retrofitting for Batch Type Chemical Plants	2
3	Application of Retrofitting for Continuous Type Chemical Plants	15
4	Alternative Approaches for Retrofitting Analysis	17
5	Application of Retrofitting to Ammonia Plant	10
Total		55

Graph 1 Application of Retrofitting

8. OUTCOME OF THE REVIEW

Form the investigations found in open literature on application of retrofitting analysis to Ammonia plant; it is observed that first two investigations are based on computerized control and behavioral pattern of ammonia plant. While the third one, describes the exergy analysis of fertilizer plant and found that exergetic efficiency of ammonia plant is critical which can be increased for overall increase in production of fertilizers. Fourth and fifth investigations are based on optimization of ammonia plant using non-linear model and inspection. Sixth investigation describes the front end analysis of ammonia plant. Seventh and eighth investigations are based on pinch analysis and pinch combined with exergy analysis. Ninth investigation describes the new technology for ammonia synthesis and last one describes the reviews of different modifications in ammonia plant and percentage saving associated with the modifications. There seems a possibility of combining pinch analysis with non-traditional optimization technique to retrofit the ammonia plant.

9. CONCLUSIONS

The necessity of implementation of retrofitting techniques has been understood in early 80's and various techniques for retrofitting analysis have been formulated in next decade. Application of retrofitting analysis after its development has been studied. Out of total fifty-five publications found in open literature, 58 % are related to the application of the retrofitting for continuous type chemical plant and alternative approaches for retrofitting analysis. Ammonia is the highly energy consuming plant. Therefore, the energy saving retrofit of the existing ammonia plant is essential. The present study shows that only 18 % of the total retrofitting application is in the field of retrofitting of ammonia plant. Yet more efforts in the direction of retrofitting the ammonia plant can conserve more energy.

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OPTIMIZATION OF CONTINUOUS CASTING PROCESS IN STEEL MANUFACTURING INDUSTRY

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ABSTRACT:

Steel Industry has given a wide exposure for the researchers, academicians & professionals to deal with even minute plethora and dots to come up with new innovations and creativity. In order to increase the affordability and accessibility the continuous casting is optimized through various process and levels to overcome the drawback parameters which make this process complicated and expensive. The purpose of making this research paper is to find optimization on discovering a range of water flow rate, material properties, thermal heat transfer factors and oscillation parameters research areas which has been done till date. This continuous casting process helps in eliminating many steps like ingot teeming, stripping, primary rolling, etc.

Keywords: Optimization, Water flow rates, Quality-Material properties, Thermal heat transfer factor, Oscillation parameters, Algorithm & Numerical Simulation, ingot teeming, stripping and primary rolling.

1. INTRODUCTION

Continuous casting is also popularly called as strand casting. It is the procedure by virtue of which the liquid metal is solidified into a semi-finished billet, bloom and slabs for ensuing rolling in the mills. In early 1950s, steel was poured into molds which were held stationary in order to form ingots [1]. Continuous casting has emerged out as a fantastic and economic way to achieve improved quality, productivity, and yield and cost efficiency. This procedure is utilized most often to cast steel. Aluminum & copper are also additionally casted continuously.

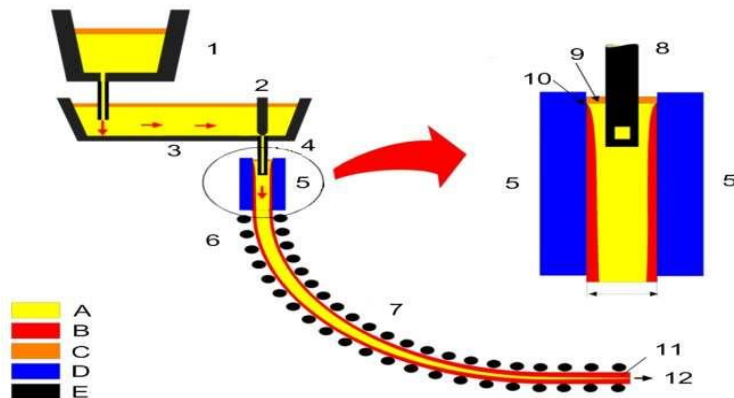


Figure 1: Elements of Continuous Casting

1: Ladle 2: Stopper 3: Tundish 4: Shroud 5: Mold 6: Roll support 7: Turning zone 8: Shroud 9: Bath level
10: Meniscus 11: Withdrawal unit 12: Slab

A: Liquid metal B: Solidified metal C: Slag D: Water cooled copper plates E: Refractory material.

2. RESEARCH METHODOLOGY

A tundish is a container that is situated over the mould, it holds the fluid metal for casting in which the liquid metal is poured. This specific casting task utilizes the power of gravity to fill the shape and to help move along the nonstop metal casting. It is found high over the ground level, more or less around eighty or ninety feet. It is the activity of the tundish to keep the mould filled to the correct level all through the assembling task. Since the metal casting is continually travelling through the mould where slag and pollutions are expelled from the melt thus, form passage might be loaded up with a latent gas for example argon. The inactive gas will push away some other gases for example oxygen that may respond with the metal [2]. The metal casting moves rapidly through the shape, in the nonstop fabricate of the metal part. A metal casting will initially cement from the mould wall or outside of the casting, at that point solidification will advance internally. The mould in the continuous casting process is water cooled, this helps to accelerate the solidification. Moreover, the constant casting does not totally solidify in the mould. A gathering of unique rollers might be utilized to twist the strand to a 90⁰ point, so another set will be utilized to fix it, once it is at that edge [2-3]. The temperature field of the slab is described by Fourier-Kirchhoff equation is given by

$$\partial/\partial T (\rho(T)c(T)T) = \nabla(\lambda(T)\nabla T) + \partial/\partial T (V_z \rho(T)c(T)T) + Q \quad (1)$$

Where the velocity component v_z [m/s] is considered only in the direction of casting, τ is time [s], T is the temperature [K], ρ is the density [kg/m³], c is the specific heat capacity [J/kgK], λ is thermal conductivity [W/mK] and Q represents heat generation. Usually rollers utilized as a part of the assembling business, this procedure will alter the course of the stream of the metal strand from vertical to horizontal.

3. LITERATURE REVIEW

Optimization Parameters: The following are some of the Process Parameters which have been optimized by researchers all around the globe till date:

1. Water Flow Rate [4]
2. Quality–Material Properties [5]
3. Thermal Heat Transfer [6]
4. Oscillation Parameters [7]
5. Algorithm & Numerical Simulation [8]

3.1 OPTIMIZATION OF WATER FLOW RATE

The continuous casting process is utilized for solidifying liquid steel into semi-finished steel. The innovation for Secondary Cooling Zone (SCZ) is critical for the yield of the CCM and billet quality [4]. Events of interior imperfections e.g. edge splits are generally known as diagonal cracks in the continuous cast product of steel Grade H is usually identified with the consistency of the water stream rate control in SCZ. Design of Experiment, DOE is utilized as a part of breaking down the parameters that impact the quality of the billet generation [5]. Which leads to the upgrading of yield as the research improvement throws light on discovering the reasons for diagonal cracks which usually happens amid the casting procedure in the Continuous Casting Machine (CCM). With the guide of Design-Expert Software, improvement is completed to find a scope of ideal setting for optional zone first, second and third segment water stream rate.

3.2 OPTIMIZATION OF QUALITY CAST STEEL SLABS

The quality of the steel produced by the continuous casting process is impacted by the controlled components for example, the casting rate or cooling rates. The researchers have depicted a calculation or algorithm for acquiring a black-box-type solution arrangement which keeps up a high generation rate and the high quality of the items. The mathematical model contains Fourier-Kirchhoff condition and incorporates limit conditions. Phase and structural changes are displayed by the enthalpy process. The researchers have successfully managed reasonable instruments for enhancement & optimization of the slab casting process. They have developed an algorithm for the quick and viable casting of top-notch steel. The calculation controls the cooling rates in the created numerical model and upgrades it by utilizing the supposed firefly calculation [6-7]. The entire technique is extremely adaptable and can be changed for a discretionary review of steel or quality conditions. Once the required metallurgical composition or the grade of steel is achieved at a certain temperature of 1590°C-1600°C, the molten steel is then transferred via nozzle into a ladle.

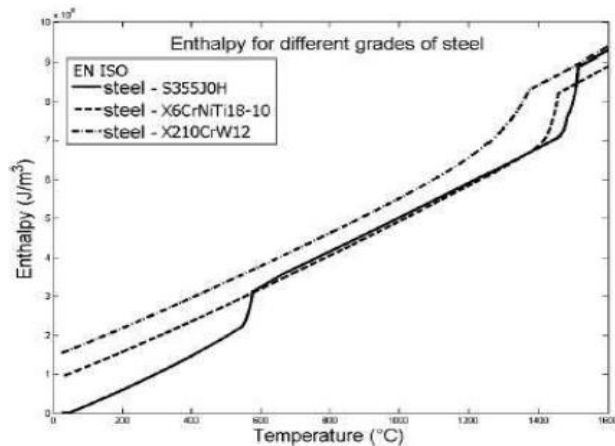


Figure 2: Relationship between the temperature and the enthalpy for three grades of steel

3.3 THERMAL OPTIMIZATION

The objective is to locate the ideal appropriation of the temperature and interfacial heat transfer coefficients relating to the essential and optional cooling frameworks, notwithstanding the pulling speed, to such an extent that the hardening along the primary pivot of strand ways to deal with the unidirectional cementing mode[8]. Dissimilar to numerous warm enhancements of stage change issues in which the attractive (target) temperature slope or interface position are thought to be a-need known, an alluring shape highlight of the solidifying interface thought to be known in the present investigation. Stage change is a vital physical marvel that occurs amid numerous issues in science and designing, e.g. the shape casting, ingot casting and crystal growth advancements. In these cases, the solidifying conditions significantly affect the nature of items. The temperature field is figured by comprehending a quasi-steady state nonlinear heat transfer condition.

3.4 OPTIMIZATION OF OSCILLATING PARAMETERS

The continuous casting manner itself is facilitated by means of interlinked sub-strategies specifically, mould oscillation and lubricant addition. The mould is made to sway along its longitudinal hub with an amplitude of under 10 mm & frequency somewhere in range of 50 and 250 cycles for each moment (CPM) [9]. Oil is poured from the best onto the meniscus where it dissolves in contact with the hot material. The fluid 'grease'

at that point infiltrates into the hole amongst strand and shape since the strand inside the shape is continually moving downwards with a specific speed, in relative terms the form moves to descend just when its descending velocity is more noteworthy than strand speed. This piece of the wavering cycle is alluded to as "negative strip" while its supplement is "positive strip".

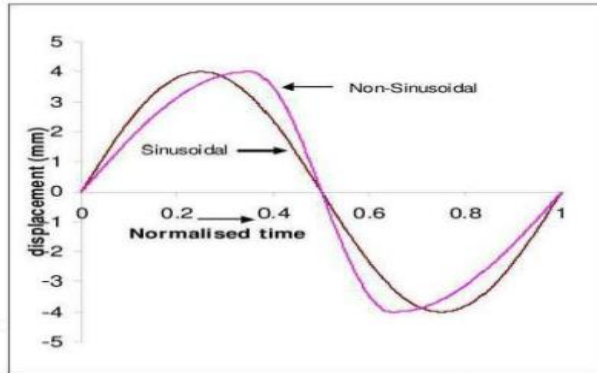


Figure 3: Variation of mold displacement in an oscillation cycle – sinusoidal versus non-sinusoidal wave pattern

Figure shows the variation of mold displacement in an oscillation cycle – sinusoidal versus non – sinusoidal wave pattern [10]. The connections between oscillation execution measurements like lubrication, oscillation mark depth and peak friction and the outline parameter set comprising of stroke s , recurrence f and deviation from sinusoidal waveform t , are communicated in a scientific structure which can be found out from it.

3.5 OPTIMIZATION OF ALGORITHM & NUMERICAL SIMULATION

Two numerical models were exhibited. The principal demonstrates is the numerical model of temperature field where the stage and auxiliary changes are displayed by an enthalpy strategy, while the second one speaks to a heuristic streamlining calculation [11-12]. The entire strategy has exceptionally broad nature and along these lines, it can be effectively altered for the subjective level of steel, quality conditions or particular caster geometry including rollers and spouts positions [13-15]. Many researchers have done commendable works in the field of Optimization as described above. The Optimization of Continuous Casting Process or machine sees its future in Artificial Intelligence and some more hybrid strategies are being worked upon. Moreover, apart from optimizing the optimum available some new Optimization parameters is the objective.

4. ANALYSIS PART

So from the above discussion we can analyze the thermal optimization was done for the heat transfer rate during the process, also for the Oscillation Parameters, Algorithm, Numerical Simulation, Mold and Strand. Artificial Intelligence and Hybrid strategies are the hot topics of research. Keeping the constant rate the long metal strand is moved by the rollers it will help to manage the strand and aid the smooth stream of the metal cast out of the shape and along its given way. Indeed, the objective is identical to achieve an almost at the strong fluid interface that is included by its zero mean ebb and flow.

5. CONCLUSION

The researchers have done really a commendable work by studying the optimization of process parameters in continuous casting process. Optimization was done to discover a possible range of optimum setting for

secondary zone water flow rate. Firefly Algorithm was used for optimization of the quality and production rate.

Overall the research work was great having seen its wide applications and demand this research work added much contribution to both academicians as well as industries. The detailed review was done to find out solutions to little flaws and limitations in the above mentioned research works. The idea is to take this Optimization sequence a little further ahead in the research world.

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A STUDY ON INTRERNAL AND EXTERNAL ETHICAL PRACTICES FOLLOWED BY COOPERATIVE BANKS: EMPLOYEE AND CUSTOMER PERSPECTIVE

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ABSTRACT:

Banks formed on the principle of co-operation are called co-operative banks. The organization in which I have taken the industrial training is Nawanagar Co-operative Bank Ltd., which is one of leading Co-operative banks in Jamnagar city. Nawanagar Co-operative Bank Ltd. provides various types of services to the customers. The services provided by the bank will be discussed later in the project.

Ethics, also known as moral philosophy, is a branch of philosophy that addresses questions about morality—that is, concepts such as good and evil, right and wrong, virtue and vice, justice, etc. In internal ethics we have covered all the ethical practices that are to be followed by Bank. In external ethics we had an interaction with the customers of all the co-operative banks in order to get the idea whether the bank follows all the ethical practices or not.

As this topic ethics in Co-operative Banks is not done before by anyone so we have done the primary data collection through questionnaire and it has been filled up by the 100 staff among all the co-operative banks and also 100 customers of all eight co-operative banks in order to come up with the finding and conclusion about which banks have been found ethical and which banks are lacking behind in following ethical practices.

It is found that Bank investment pattern is good but still the proportion of investment in RBI and other co-operative is 1:1. It is also found that all the banks running on the ethical path as no bank is investing in anti-social activities. As the study has been done on all the co-operative banks it is found that they are working on time basis and also on need basis as a part of CRM activity.

Keywords:

Ethics, Cooperative Banks, Employee, Customer, CRM

1. INTRODUCTION

Banking in India originated in the first decade of 18th century with The General Bank of India coming into existence in 1786. This was followed by Bank of Hindustan. Both these bank are now defunct. The oldest bank in existence in India is the State Bank of India being established as “The Bank of Bengal” in Calcutta in June 1806. A couple of decade later foreign bank like credit Lyonnais started their Calcutta operation in the 1850s. At that point of time, Calcutta was the most active trading port, mainly due to the trade of British Empire, and due to which banking activity took roots there and prospered. The first fully India owned bank was the Allahabad Bank, which was established in 1865.

By the 1900s, the market expanded with the establishment of bank such as Punjab National Bank, in 1895 in Lahore and Bank of India, in 1906, in Mumbai- both of which were founded under private ownership.

The Reserve Bank of India formally took on the responsibility of regulating the India banking sector from 1935. After India's independence in 1947, the Reserve Bank was nationalized and given broader powers.

2. REVIEW OF LITERATURE

“Ethical issues and attitude in the Turkish banking sector” by Hortacsu, Ayfer, Ozkan Gunay, E. Nur

This study concentrates on the ethical issues and conditions prevailing in the Turkish banking environment. A self-administered mail survey was conducted with 554 top bank managers in Turkey. Scenarios that were developed after a pilot study were factor analyzed. The objective of the study was to identify ethics related organizational, cognitive and affective dimensions that are likely to affect perceptions of bank managers in interpreting the eight factors and the remaining four scenarios. The findings indicate a consensus on ethical sensitivity among the Turkish bank managers. The Banks Association of Turkey has a code of ethics that favorably influences the banks, and the regulatory agency (BRSA) is perceived to enhance the ethical values in the sector. An optimistic view maybe to interpret the ethical banking climate as a desirable after effect of the banking crisis and the regulatory intervention. This development may indicate a deterrence-based shift to a more virtuous Turkish banking sector.

“Banking Ethics” by Elisabeth Paulet, (ESCEM, Poitiers, France)

Since the 1980s, the global financial system has faced several crises that have led regulators to consider new conjectural and structured problems. These crises have led economists and financial analysts to the following conclusions. First of all, systemic risk has increased during the last 30 years, which had led regulators to devise rules to evaluate information more efficiently. Second, the recent collapse of stock markets despite the national rescue measures shows the importance of preventative procedures. The third point is that aggressive capitalism has demonstrated its limits. The aim of this paper is to show that regulation is a necessary but not sufficient condition to ensure the efficiency of banking institutions, financial markets and the management of companies. Through the analysis of the Swiss banking sector, the paper provides an insight for banks to satisfy social pressure on more ethical behavior. This case could be an example for another functioning for financial institutions. By refocusing on their core business, banking institutions will be capable of realizing profit and creating value for the community.

3. RESEARCH METHODOLOGY

3.1 Statement of Problem:

Ethics have taken place in all the fields like in accounting, finance, hospital, business, and schools. Ethics is such a concept which has led to great success and also benefited both the business as well as customers. Ethics acts as an arm for the protection. And co-operative banks is increasing their importance day by day. They run with the motive of customers' satisfaction and cooperation in the staff. But along with that ethics is also needed to build their place in it to go hand in hand with the customer satisfaction. Ethics is a developing topic for the banking sector. And through this research bank can also run their business through ethics .That's why the statement of problem is on the topic. “A STUDY ON INTRERNAL AND EXTERNAL ETHICAL PRACTICES FOLLOWED BY COOPERATIVE BANKS: EMPLOYEE AND CUSTOMER PERSPECTIVE.”

3.2 Objectives of the Study:**A) PRIMARY OBJETIVES**

To analyze the internal and external ethical practices followed by Cooperative Banks in Jamnagar city.

B) SECONDARY OBJECTIVES

1. To measure the Designation wise and Bank wise internal ethical practices of all the Employees of Cooperative Banks in Jamnagar city
2. To check the ethical practices from viewpoint of staff, management and customers of each Co-operative Banks.
3. To check the hidden unethical practices that are followed in all Cooperative Banks at Jamnagar city.
4. To check the fairness and transparency of all Cooperative Banks at Jamnagar city.
5. To check how far the ethics is been followed in Co-operative Banks
6. To know where the bank uses the public's deposit.

3.3 SCOPE OF STUDY:

Geographical scope is limited to eight co-operative banks in Jamnagar city. In internal ethics age group of staff is taken between 18 to 60 and for the external ethics our scope is limited to the age of 75. Our study includes all the employees and customers but excluded shareholders and B.O.D. In all the co-operative banks the major proportion of customers are having the following accounts: Current, Savings, Overdraft, Cash credit. So our scope is limited to above four accounts only.

3.4 DATA COLLECTION AND SAMPLING METHOD:

In this research study, the data has been collected through Structured Questionnaire and also had the conversation with the customers in all co-operative banks.

3.5 POPULATION AND SAMPLE SIZE:

All eight Cooperative Banks in Jamnagar city would formulate Population for this research and conveniently 100 Employees for internal ethics and 100 customers from all the Cooperative Banks at Jamnagar city for external ethics have been selected as sample for this study.

3.6 TOOLS AND TECHNIQUES OF ANALYSIS:

Current study is based on primary data so collected data have been analyzed in two sections. Section – A is for Graphical Analysis and Section – B is for Hypothesis testing.

For Section – A: Charts have been used for the purpose of analysis. For Section – B: statistical tools like Average and Two Way ANOVA test have been used for testing of hypothesis. Here, Section – A is not presented because it is related only with graphs.

3.7 HYPOTHESIS OF THE STUDY:**Internal ethics**

H0: There is no significant difference within the designation of the staff of all the Cooperative banks and their pattern of doing routine operation.

H0: There is no significant difference within all co-operative banks and the base with which they do their routine operations

H0: There is no significant difference within the designation of all the staff of all co-operative banks and the training they get before and after they join the bank.

H0: There is no significant difference within all co-operative banks and the funds where they are investing

H0: There is no significant difference within the designation of all the staff of all co-operative banks and working overtime.

H0: There is no significant difference within the designation of all the staff of all co-operative banks and the partiality that they have experienced among staff.

External

H0: There is no significance difference between the types of accounts and their passing of cheques even if there is in-sufficient balance in the customer's account.

H0: There is no significance difference between the co-operative banks in Jamnagar city and passing of the cheques of the accounts with insufficient balance

H0: There is no significance difference between all co-operative banks and the completion of KYC of their customers.

H0: There is no significance difference between all co-operative bank and their informing to customer about charging the penalties them.

3.8 LIMITATIONS OF THE STUDY:

- Many banks were not disclosing their proportion of investment pattern.
- As many customers were not aware about the KYC so it was difficult to explain them.
- Most of the respondents were not aware about the ethics so it was difficult to make them fill the questionnaire.
- Many customers didn't answer some questions so it was becoming difficult in analyzing.
- In these co-operative banks most of the customers were accountants so the proper information about the account holder was not able to get.

4. DATA ANALYSIS AND INTERPRETATION

(A) INTERNAL ETHICS:-

4.1. Designation wise type of basis for carrying out routine operations.

Table No. 1

Designation	Time Basis	Need Basis	Both
Manager	2	2	8
Clerk	6	9	29
Officer	10	9	14
Sub Staff	0	0	11
Total	18	20	62

From the above table, we can conclude that mostly officers do their job or routine operations till the working hours. While on need basis that is doing their job even after the working hours is over, there also

officers are the one who are doing their job on need basis if their work is pending then only. Lastly clerks are the one who is doing the routine operation with the combination of both time and need basis.

H₀: There is no significant difference within the designation of the staff of all the Cooperative banks and their pattern of doing routine operation.

Table No. 2
One Way ANOVA Analysis

Source of Variation	SS	Df	MS	F	F crit
Between designation	263.3333	3	87.77778	1.628027	4.066181
Within designation	431.3333	8	53.91667		
Total	694.6667	11			

Here the ANOVA table with the d.f. (3, 8) and at 5% level of significance, F_c is 1.628027 and F_t is 4.066181 so as F_c is lower than F_t. So null hypothesis is accepted. Therefore there is no significance within the designation of all the staff of all the Cooperative banks and their pattern of doing their routine operations.

4.2. Bank wise pattern of doing the routine operation

Table No. 3

Name of the Bank	Pattern of work			
	Time Basis	Need Basis	Both	Total
Rajkot Nagrik Bank	3	1	5	9
Co. Co. Bank	3	4	5	12
J.P Bank	2	0	8	10
Jamnagar Mahila Sahakari Bank	1	2	7	10
Raj Bank Ltd	1	0	9	10
Nawanagar Co-operative Bank	5	8	13	26
J.D Co-operative Bank	2	7	4	13
Vardhaman Co-operative Bank	1	1	8	10

As the co-operative name it-self suggests to provide services to the customers with co-operation. As all the private and public banks works on time basis and not on need basis. As we can see from the above table that all the co-operative banks in Jamnagar works on need basis and not on time basis so as to maintain customer relationship.

H₀: There is no significant difference within all co-operative banks and the base with which they do their routine operations

Table No.4
One Way ANOVA Analysis

Source of Variation	SS	Df	MS	F	F crit
Between banks	125.0833	2	62.54167	9.364528	3.4668
Within banks	140.25	21	6.678571		
Total	265.3333	23			

Here the ANOVA table with the d.f. (2, 21) and at 5% level of significance, F_c is 9.364528 and F_t is 3.4668 As F_c is higher than F_t. So null hypothesis is rejected therefore it can be said that there is significance difference within all co-operative banks and the base with which they do their routine operations.

4.3. Designation of staff wise training given by the bank.**Table No. 5**

Designation	Always	Sometimes	Never	Total
Manager	6	5	0	11
Clerk	5	25	16	46
Officer	5	15	11	31
Sub Staff	1	7	4	12

Training is important to provide to the staff people in order to impart the technique, skills, knowledge related to the job. So bank manager should organize training programme for their staff. Manager is the main key to the bank he is given training always, while clerks are been provided not regularly but at the time of need. Officers and sub staff people are been given training as per the need.

H₀: There is no significant difference within the designation of all the staff of all co-operative banks and the training they get before and after they join the bank.

Table No. 6**ANOVA table of Designation of staff wise training given by the bank.**

Source of Variation	SS	Df	MS	F	F crit
Between designation	155.1666667	2	77.58333333	1.680505415	4.256494729
Within designation	415.5	9	46.16666667		
Total	570.6666667	11			

Here the ANOVA table with the d.f. (2, 9) and at 5% level of significance, F_c is 1.680505415 and F_t is 4.256494729. As F_c is lower than F_t . So null hypothesis is accepted that shows that there is no significance within designation of all the staff of all the Cooperative banks and the training they get before and after they join the bank.

4.4. Bank wise investing the funds.**Table No.7**

Bank Name	RBI	Anti-Social Business	Private Banks	Govt. Securities	Nationalized Banks	Other Co-operative Banks
Rajkot Nagrik	3	0	0	4	4	3
Co. Co. Bank	4	0	2	10	9	5
J. P Bank	0	0	2	s3	2	2
Mahila Sahakari	4	0	0	6	3	3
Raj Bank	0	0	0	0	0	0

NCBL	7	0	5	12	15	6
J.D Bank	6	0	2	6	6	1
Vardhaman Bank	1	0	1	5	4	4
Total	25	0	12	46	43	24

In order to judge the true ethical practices in banks, the main source is to find out where the bank is investing the funds which they have got from the customer's deposit. We can see that all the banks invest most of the deposits in government securities, nationalized banks and also RBI. As compared to government securities and nationalized banks invest in RBI is low but it is advisable to invest more in RBI.

H₀: There is no significant difference within all co-operative banks and the funds where they are investing

Table No.8

ANOVA table of all co-operative banks and the funds where they are investing

Source of Variation	SS	df	MS	F	F crit
Between banks	218.5833333	7	31.22619048	3.777361751	2.249024326
Within banks	330.6666667	40	8.266666667		
Total	549.25	47			

Here the ANOVA table with the df (7, 40) and at 5% level of significance, F_c is 3.777361751 and F_t is 2.249024326 higher than F_t , so null hypothesis gets rejected Therefore there is significant difference within all co-operative banks and the funds where they are investing.

4.5. Designation of staff and their working overtime.

Table No. 9

Designation	Yes	No
Manager	10	2
Clerk	40	7
Officer	23	8
Sub Staff	8	2
Total	81	19

As motivation is very much necessary in every organization to get work done from so as to get work done from workers and make them work overtime they must be given some extra benefits so they motivated to do work overtime. In most of the organization people are been told to work overtime but they are been paid. In all these banks all the designation of staff are doing overtime and are not been paid for it. This is what an unethical practice mean.

H₀: There is no significant difference within the designation of all the staff of all co-operative banks and working overtime.

Table No.10**ANOVA table of Designation of staff and their working overtime**

Source of Variation	SS	Df	MS	F	F crit
Between designation	480.5	1	480.5	4.217996	5.987378
Within designation	683.5	6	113.9167		
Total	1164	7			

Here the ANOVA table with the d.f. (1, 6) and at 5% level of significance, F_c is 4.217996 and F_t is 5.987378 As F_c is lower than F_t . So, null hypothesis is accepted and that shows that there is no significance within designate on of all the staff of all the Cooperative banks and working overtime.

4.6. Designation of all the members of all the Co-operative Banks and the Partiality that they have experienced among staff

Table No.11

Designation	Always	Sometimes	Never
Manager	3	1	7
Clerk	9	20	13
Officer	3	14	13
Sub Staff	2	8	0
Total	17	43	39

If in the banks or in organization, staff is not treated well then level of dissatisfaction increases and this affects the work. So as a part of ethical practices, bank should see to it that their staff should not be treated badly or no biasness should be done among staff.

From all the Co-operative banks highest proportion with twenty clerks have experienced partiality sometimes not always and this should be removed by the all the members working in the bank.

H₀: There is no significant difference within the designation of all the staff of all co-operative banks and the partiality that they have experienced among staff.

Table No.12

ANOVA table of Designation of all the staff of all the Co-operative Banks and the partiality that they have experienced among staff.

Source of Variation	SS	Df	MS	F	F crit
Between designation	324.9167	3	108.3056	4.303532	4.066181
Within designation	201.3333	8	25.16667		
Total	526.25	11			

Here the ANOVA table with the df (3, 8) and at 5% level of significance, F_c is 4.303532 and F_t is 4.066181 as F_c is higher than F_t it comes to the conclusion that null hypothesis is rejected and there is significant difference within the designation of all the staff and sub staff of all co-operative banks and partiality that they have experienced among staff.

(B)EXTERNAL ETHICS**4.7. Accounts wise passing of cheques with insufficient balance****Table No.13**

Type of Account	Yes	No
Current	23	9
Cash Credit	13	6
Savings	17	21
Over Draft	6	5
Total	59	41

We can see that cheques of current accounts i.e. (23) are passed more even if there is insufficient balance in their account because of the daily routine transactions and less cheques are passed of savings i.e. (17) because due less interaction and transactions made by customers they have less trust on them. So it is unethical practices done by bank. As passing such cheques of high amount is risky for bank. So bank must not do such things in order to maintain relationship with customer.

Ho: There is no significance difference between the types of accounts and their passing of cheques even if there is in-sufficient balance in the customer's account.

Table No.14**ANOVA table of account wise passing of cheques**

Source of Variation	SS	Df	MS	F	F crit
Between the types of accounts	225	3	75	2.290076	6.591382117
Within the types of accounts	131	4	32.75		
Total	356	7			

Here in the ANOVA table with the df= (3, 4) at 5% level of significance, F_c is 2.290076 and F_t is 6.591382117. As F_c is lower than F_t so null hypothesis is accepted. Therefore, there is no significance difference between the types of accounts and their passing of cheques even if there is in-sufficient balance in the customer's account

4.8. Bank wise passing of cheques of those accounts which have insufficient balance**Table No.15**

Bank Name	Yes	No
Nawanagar Co-operative Bank	7	5
Co. Co. Bank Ltd.	8	9
Mahila Sahakari Bank Ltd.	9	6

Jamnagar Peoples Bank	9	4
Vardhaman Bank	5	10
Raj Bank	4	8
Rajkot Nagrik Ltd.	7	5
Jamnagar District Bank	1	3

As we are doing the comparison between the passing of cheques of insufficient balance in the customer account and the bank so from the above table we can say that more no. of cheques are passed by Jamnagar Mahila Sahakari bank and Jamnagar peoples bank. Ratio of passing of cheques is more than the rejecting the cheques. It should not be done it is risky for bank if they pass such cheques and if bank is not able to get that amount than it will decrease the profit of the bank.

Ho: There is no significance difference between the co-operative banks regarding passing of the cheques having insufficient balance

ANOVA table of bank wise passing of cheques of those account which have insufficient balance

Table No.16

Source of Variation	SS	Df	MS	F	F crit
Between Banks	53	7	7.571429	1.376623	3.500464
Within Banks	44	8	5.5		
Total	97	15			

Here in the ANOVA table with the $df = (7, 8)$ at 5% level of significance F_c is 1.376623 and F_t is 3.500464. As F_c is lower than F_t so null hypothesis is accepted. There, there is no significance difference between bank wise passing of cheques with insufficient balance in the account.

4.9. Bank wise completion of KYC of their customers.

Table No.17

Bank Name	Yes	No
Nawanagar Bank	8	4
Commercial Co-operative	11	5
Mahila Sahakari Bank Ltd.	5	10
Jamnagar Peoples Bank	5	8
Vardhaman Bank	10	5
Raj Bank	6	6
Rajkot Nagrik Bank Ltd.	10	2
Jamnagar District Bank	3	2

As we are doing comparison of different co-operative banks and the no. of customers whose KYC is complete. We can compare that how many customers are aware of KYC and from that how many of them KYC is complete. So we can see that highest no of customers who are aware of KYC is in co-co bank i.e. 13 customers and from that 11 customers KYC is complete and the bank whose customers are aware about the KYC and KYC is not complete is J.P. bank i.e. 7 are aware of KYC and out of that only 2 of them KYC is complete. So we can say that J.P. bank is not ethical as it is necessary for the bank to know their customers means that they are not misusing the facility given by bank. It is to know from where they are getting money.

Ho: There is no significance difference between all co-operative banks and the completion of KYC of their customers.

Table No.18
ANOVA table of Bank wise completion of KYC of their customers

Source of Variation	SS	df	MS	F	F crit
Between Bank	12.25	1	12.25	1.548532731	4.60011
Within Bank	110.75	14	7.9107143		
Total	123	15			

Here in the ANOVA table with the $df = (1, 14)$ at 5% level of significance F_c is 1.54853271 and F_t is 4.60011. As F_c is lower than F_t so null hypothesis is accepted. Therefore there is no significance difference between all co-operative and the completion of KYC of their customers.

4.10. Bank wise informing of charging of penalties from customers.

Table No.19

Bank Name	Yes	No
Nawanagar Co-operative	9	4
Commercial Co-operative	5	8
Mahila Sahakari Bank Ltd.	8	8
Jamnagar Peoples Bank	9	5
Vardhaman Bank	7	8
Raj Bank	8	5
Rajkot Nagrik Bank Ltd.	4	8
Jamnagar District Bank	2	3

As it will be unethical if the bank will not inform about their charging penalties to customers. So from the above table we see that the highest no. of customers who are not informed about charging the penalties from their customers is in Co-Co bank, Jamnagar Mahila Sahakari Ban, Vardhaman Bank and Rajkot Nagrik Bank and the banks who inform about charging penalties from customer is NCBL and J.P. Bank.

Ho: There is no significance difference between all co-operative bank and their informing to customer about charging the penalties them.

Table No.20**ANOVA table of bank wise informing to their customers about charging penalties**

Source of Variation	SS	df	MS	F	F crit
Between Bank	38.9375	7	5.5625	1.15584416	3.500464
Within Bank	38.5	8	4.8125		
Total	77.4375	15			

Here in the ANOVA table with the $df = (7, 8)$ at 5% level of significance F_c is 1.15584416 and F_t is 3.500464. As F_c is lower than F_t so null hypothesis is accepted. Therefore, there is no significance difference between bank and their informing to the customers about charging their penalties.

5. FINDINGS OF THE STUDY:

- It is found that the routine operation of the bank is not checked regularly by the top committees.
- In all the co-operative banks there is no gender discrimination in the pay rates which is good and also ethical.
- It is found that Bank investment pattern is good but still the proportion of investment in RBI and other co-operative is 1:1
- It is also found that all the banks running on the ethical path as no bank is investing in anti-social activities.
- All the co-operative banks have not disclosed the proportion of their investment.
- Regarding the adhesive stamp most of the banks are printing the stamp of other banks.
- It is also found that almost all the banks employees are working overtime but they are not being paid for it.
- As the study has been done on all the co-operative banks it is found that they are working on time basis and also on need basis as a part of CRM activity.
- It is found that major customers are having current account in the bank for doing their routine operation.
- As a part of ethical practices bank is informing about the new schemes to the customers and mostly they do this through direct contact.
- Cheques of those accounts which are having in-sufficient balance which are not to be passed but these banks are passing which is unethical.
- It is found that most of the customers are aware about the KYC but bank has not done their responsibility of completing the customers KYC.
- After sanctioning the loan to the customer banks never take visit to the place of customer for checking about utilization of loan amount

6. CONCLUSION

It can be concluded that these eight Co-operative banks are following ethics but they give more importance to the co-operation. Out of all the eight co-operative banks, Nawanagar co-operative Banks is found to be ethical in all the questions asked them such as they are working on time basis which means they are following the rules and laws made for working hours, they are investing most of the funds in RBI and government securities as it is the safest place to invest the customers deposits while in Raj Co-operative

Banks to committees is checking the work of staff regularly which can protect bank as well as customers from fraud. But one thing to criticize about every bank is this that they are not sharing or telling to the staff about where the bank is investing their funds. But yes all the Cooperative banks are ethical in investing as none of the banks are investing in anti-social business which is very harmful for the customer's funds. Mostly in all the co-operative banks, the staff is working overtime and employees are not being paid for it. And especially clerks are the one who are most of the time doing overtime and they are also experiencing partiality among staff which is not fit to be ethical. About the gender discrimination too, all the eight banks are giving equal pay rates to both the gender people. At last it can be said in few words that the no bank is fully on the ethical path as their motto is service with co-operation. As we know that both cannot be run together therefore these Cooperatives banks can be called as ethical banks but due to CRM activities and their relation with the customer makes them behind from the US Co-operative Banks and Private Banks.

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WOMEN EMPOWERMENT THROUGH FINANCIAL LITERACY: A STUDY AMONG WORKING WOMEN IN GUJARAT

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ABSTRACT:

Today, women are making their mark in every field. Their contribution to the society as well as in the economy of any country is remarkable. Till the date literacy amongst the women is the most discussed issue for women empowerment. Time and scenario is rapidly changed where only literacy is not sufficient but financial literacy is play vital role when talking about women empowerment. So many women are serving on the highest position of many financial institutions. Financial literacy refers to the set of skills and knowledge that allows an individual to make informed and effective decisions with all of their financial resources.

Even educated women are found to be illiterate in financial matters. The term financial literacy has huge importance and impact in women empowerment. Women often have lower financial knowledge either lower interest and access to formal financial products than men. Such gender disparity curbs the extent to which women can enhance their knowledge and skills about economic and financial issues. This paper highlights the need to bridge the financial literacy gap among women and foster confidence in their financial skills, thereby augmenting empowerment. This paper will discuss the financial literacy among working women in Gujarat which can be used as tool to empower women.

Keywords:

Financial Literacy, Women Empowerment, and Financial Decision

1. INTRODUCTION

“यत्र नाययस्तु पूज्यन्ते रमन्ते तत्र देवता: |” women are always treated specially with honour in Indian tradition from ancient time. But value towards women are varied during different era. In India we are realizing to support women even after 71 years of independence. Our ranking is very poor in Gender Inequality Index (GII) i.e. 130 rank, as per human development report 2018, at a same time women workforce participation is also drastically declined from different perspective. After focusing on literacy and giving education is not enough but financial literacy is one of the sources to empower women in India and which may lead to change current scenario. This paper attempts to study participation of women in financial decision, their financial literacy and various factors affecting their involvement in Investment Decision through financial knowledge, financial behaviour and financial attitude.

India has considered as most emerged country yet least financially literate. Indians were ranked low for several reasons, including the lack of household budgets, money management discussions with family members, financial education or an understanding of money management and its basics. One of the survey said that Indian families discuss money matters including budgeting, saving and responsible spending habits

with their children only just 10 days per year. Many people did not understand basic difference between financial inclusion and financial literacy. It is very easy to give advice on financial planning but very difficult to understand personal money management among men and women both. As per statistics 43% women and 20% men said they did not understand well enough to discuss the person management with their children. Financial literacy means possessing one's ability and knowledge to understand how money has earned, saved and invested again. A financially literate person knows the importance of diversifying risk of losing their money, may be compound interest, and what the impact of inflation is. A lack of understanding and approach towards learn the things of these makes one financially illiterate. A financially illiterate person becomes easily victim to frauds and scams. Even on gender counts, Indians surpass the global averages. 80% of Indian women were financially illiterate as compared to only 65% women worldwide. Similarly, 73% of Indian men were financially illiterate compared to only 70% worldwide

1.1 Concept of Financial Literacy

The financial literacy is very wide subject and includes the following parameters such as financial knowledge, financial behaviour and financial attitude. The basic meaning of the financial literacy is linked with the knowledge and understanding of financial products and also the risk and the returns associated with it there in.

As per Reserve Bank of India, "Financial literacy can broadly be defined as the capacity to have familiarity with an understanding of financial market products, especially reward and risks in order to make informed choices".

The National Financial Educators Council defines financial literacy as: "Possessing the skills and knowledge on financial matters to confidently take effective action that best fulfils an individual's personal, family and global community goals."

Noctor et.al (1992) defined financial literacy as 'the ability to make informed judgments and to take effective decisions regarding the use and management of money'. Moore (2003) stated that "Individuals are considered financially literate if they are competent and can demonstrate they have used knowledge they have learned. Financial literacy cannot be measured directly so proxies must be used. Literacy is obtained through practical experience and active integration of knowledge. As people become more literate they become increasingly more financially sophisticated and it is conjectured that this may also mean that an individual may be more competent".

Mandell (2007) defined financial literacy as "The ability to evaluate the new and complex financial instruments and make informed judgments in both choice of instruments and extent of use that would be in their own best long-run interests".

Lusardi (2008) define financial literacy as "Knowledge of basic financial concepts, such as the working of interest compounding, the difference between nominal and real values, and the basics of risk diversification".

The Organization for Economic Co-operation and Development (OECD) has defined financial literacy as "a combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual wellbeing". Similar to literacy, it can be viewed as an expanding set of knowledge, skills and strategies, which individuals build on throughout life, rather than as a fixed quantity. An individual is said to be financially literate if he/she is able to perform the following:

Financial knowledge and understanding: The individual should be at least aware of the products available in the market and belonging from. It should possess adequate knowledge about the basics of the products, the related concepts like risk and returns, consumer rights of such products and its use.

Choosing appropriate products: Should be able compare similar products with other products available in same category and choose the product which suits their requirement and within their limit. Financial knowledge about the various products would enable this.

Financial Planning: planning about the future requirement is major concern for all the people who are doing financial planning. What should be the amount to save to meet that future requirement and plan for the same is major concern with the intensity to save and plan for their retirement. Investing in proper avenues or saving through various investment plans shows their attitude and behavior towards financial matters. The studies show that the financial attitude and behavior is highly influenced by financial knowledge possessed by an individual.

Day to day money management: Financial literacy helps an individual to have control over their day to day transactions with financial matters. It enables an individual to frame appropriate budgets which in turn helps them to track his finances and meet the ends over the month and year.

Financial literacy can be understood as the ability to know how money can earn the money and works in a normal course of action. Specifically it refers to the set of skills and knowledge that allows an individual to make informed and effective decisions with all of their financial resources. Financial literacy is directly help the individual for wellbeing and wellbeing society as a whole, since it helps an individual to manage their personal financial matters like savings, investments part, tax planning, retirement planning, etc. and enables them to understand how more money can be generated and used in more effective and efficient manner with the fund individual have.

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Moore (2003) stated that “Individuals are considered financially literate if they are competent and can demonstrate they have used knowledge they have learned. Financial literacy cannot be measured directly so proxies must be used. Literacy is obtained through practical experience and active integration with involvement and knowledge. As people become more financial literate they become increasingly more financially sophisticated and it is conjectured that this may also mean that an individual may be more competent”.

Although the definitions given by different organisations and authors are varied from understanding perspective, some similar components in each financial literacy’s definition are found. Each definitions of the financial literacy have focused on the importance of having the financial skills and knowledge to make informed and wise decisions.

1.2 Importance of Financial Literacy among women in India

In today’s scenario, emerging as well as developed economies like India has started giving very much focus on the level of literacy and financial literacy of their people. The financial system plays a very important role in the development of any developing nation. Financial ignorance carries significant costs to individual and nation as well. Consumers who fail to understand the concept of compounding interest spend more on transaction fees, may run up bigger debts, and incur higher interest rates on loans (Lusardi and Tufano, 2009; Lusardi and de Bassa Scheresberg, 2013). The consumers need to be financially literate for which they need to understand the financial world and make well-informed decisions that will be profitable for them. Moreover, there are several theoretical arguments that support that women should be financially literate to take rationale financial decisions. Such arguments are:

Longer Life Expectancy: The study by OECD (2013) clearly exhibit that on an average, looking across 121 countries representing a wide mix of developing and developed nations, women live five years longer than men. Hence, it is essential that women should develop an in-depth understanding about the concept of financial planning and investment avenues to protect her from the financial challenges she may face in the future. It has been observed, in US and cross-national research in developed countries that older single women continue to be is proportionately poor as compared with older single men and older married couples. Hence, lack of knowledge can be more costly for women because they tend to live longer (Wall Street Journal).

Economic Growth: The nation's overall development needs women involvement as investors as well which will enhance the liquidity in any the market and will have scope of trade to boost up the economy. This can be only happened if women are financially literate.

Self-Independent: It is essential for women to acquaint themselves as financial independent with the finance world. This will lift up their status and presence in the society as they will match up with the male section of the society as far as financial decisions and independence are concerned.

Freedom from exploitation: Explication is the major area where women growth has been stuck up. Financial literacy will help them in protecting society and individuals against moneylenders who exploitative charged rates in financial schemes and exorbitant interest

Family wellbeing: It is believed and assumed that if there is a difference in the financial literacy level of men and women, it may affect the relative economic power within the household and even nation. Since men and women will allocate household resources according to different preferences this have implications for the well-being of the family. Research in many countries suggests that households do not act as a single unitary decision maker. Instead, it has been observed that household resources in women's hands has been observed to be more likely spent on improving family well-being, particularly that of children

1.3 Problems with financial illiteracy

Falling prey to Ponzi schemes: These are collective investment schemes which promise either misguided to give sky-high returns in a short span of time. It pays returns to existing investors out of money collected from new investors instead of paying out of profits. The Saradha Chit Fund Scam, Sahara Scam, etc. are classic examples. Financial illiteracy and insufficient knowledge with greed make individuals put whole life savings in these schemes.

Choosing wrong products: Due to financial illiteracy, individuals avoid the risk-return-liquidity aspect while investing. Most of the times they are dependent for decision on friends or family or to fulfill immediate tax-saving needs. As a result, they digress and stay away from personal financial planning goals. Ultimately, the money gets blocked and chance of higher risk in unproductive investments.

Lack of clarity between Saving, Investment & Insurance: Financially illiterate people can't differentiate between saving, investment & insurance. They get fooled due to their financial illiteracy by the marketing gimmicks of agents. They buy insurance with an investment and fail in both aspects. Neither they get reasonable Return on Investment nor do they get sufficient cover of all risk.

Low participation in structured financial products like Mutual Funds: India has one of the highest Gross Domestic Savings rates at 28% of GDP but one of the lowest mutual fund (MF) penetration levels at only 6% of GDP. Mutual funds give investors manifold advantages. Financial illiteracy prevents people from getting into mutual funds. Hence, they are unable to get returns corresponding to their risk profile.

In an article on Financial Inclusion published in Economic Times, Rajat Gandhi rightly says that “No matter how many banks you open and how many boots you have on the ground, if a person does not know about the financial options that are open to him, policies, schemes and financial instruments will mean little. It is important for a person to firstly know what to look for and only then think of the benefits that he can obtain from it. “To make things clear, financial inclusion focuses on volume or quantity whereas financial literacy is more about quality.

2. LITERATURE REVIEW

Women generally find it more difficult or complicated to manage their money effectively and efficiently attain financial independency as compared to men. Also, women are more trained to be dependent on the male members of their family for financial decisions from childhood, even though they are contributing financially for their households. Furthermore, previous studies also suggest that women are less likely to go out for financial education and don't feel confident about investing their money (Lusardi & Mitchell, 2008). The reasons for the same could be attributed to factors such as income disparities (Anthes & Most, 2000); or less exposure to outside world compared to men, more household responsibilities and thus, less availability of time etc. In India, a woman becomes eligible to vote or for marriage at the age of 18 years as this age is considered as a matured age, but, unfortunately, till this age, they are not conscious about their financial decision-making. According to Hung et al., (2012) in their study on gender differences regarding financial literacy, women's financial knowledge is worse than that of men and they are less confident in financial skills. The fact has been accepted globally that empowering women with financial knowledge has become a necessity now, given the poor status of women in the country, so that both genders can be at par. Recently, OECD and its International Network on Financial Education (INFE) also emphasized the need to promote financial literacy as part of their financial education strategies.

Working women are considered as financially literate and have positive financial attitude. In today's world, women are also consuming financial products and services independently as well as in conjunction with the family members, partner and spouses (Zinman 2009). This increased participation of women in financial decision is not astonishing because of the recent revolution in socio-economic level, family, demographics and economic lives of women in the last 50 years (Goldstein, 2008). Nevertheless, major portion of working women are still unaware of integrated financial terms and those individuals who understands financial literacy can do better saving, budgeting and control spending (Perry and Morris, 2005; Moore, 2003); participate in financial integrated markets (Lusardi et al., 2011), can handle debts and other mortgages (Campbell, 2006; Lusardi and Tufano, 2009); retirement planning (Lusardi and Mitchell, 2008; Lusardi and Mitchell, 2007a); and eventually, results in accumulating affluence (Zinman, 2009).

Financial Literacy is inherent with the human rights and considered as the basic and fundamental privilege of human beings. Thilakam, (2012) stated that “financial literacy is the ability to understand finance Empowerment is a journey not a destination (UKAID from Department of International Development). Individual empowerment is a complete and through process of personal development in a social context, it is shift from the feeling of powerlessness to the ability to take action, from the feeling of being in shadow to the active participation in environment and positive future. The economic empowerment of women can be defined as the increased control over and access to markets and resources and increased choice and agency, along with the control and improvement in the specific achievements or outcomes (WIEGO, 2009). The empowerment of women in different countries and context are different. The empowerment of women should be start from women's own personal experience rather than already established set of out imposed

by external environments or organizations (DFID, 2012). Women's economic empowerment is vital to recognize women's right. Economy and organizations start to realize that women empowerment is a win-win situation not only for women but also for economy as a whole. Economically empowered women are able to enjoy wellbeing and also help in increasing productivity, economic growth, reducing poverty and enhancing efficiency.

Mace (2014) reported that According to a Women & Money Magazine survey, 50 percent of women find it difficult to talk with others about personal finances. The survey also reveals that just one-third of all women have a detailed financial plan. For women aged 25–34, this number drops to 10 percent. An even more sobering statistic from the survey is that for women of all ages who earn more than \$30,000 a year, 12 percent have not yet even begun saving for retirement.

Kaur, Vohra, and Arora (2015) studied that the financial literacy level of the university students with a commerce and management background is fairly good and has nothing to do with their demographic profile. In fact, it is the curriculum that is helpful in addressing the issue of financial literacy among students.

Annamaria Lusardi (2006) conducted a study on Planning and Financial Literacy: How Do women Fare? The objectives of the study were to examine the saving behaviour of women, to analyse how women plan for retirement, tools & sources of information used for planning and to analyse the financial literacy of women. Study was conducted on 1,264 respondents, among which 60% are women who are of 50 yrs. old or older and 64% are married.

3. RESEARCH METHODOLOGY

Single cross sectional descriptive research design method is used for this study. A total of 239 working women participated in the present study. Samples were selected on the basis of convenience sampling method. Data were collected from primary and secondary sources. Secondary data were collected from books, journals, newspaper internet source etc., Structured Questionnaire was administered to respondents to get primary data. Financial literacy measured through the OECD financial literacy questionnaire. Research instrument measured the three aspects of the financial literacy – financial knowledge, financial behavior and financial attitude.

4. ANALYSIS

Characteristics for the respondents show that the respondents of our questionnaire are by and large young working women having age below 35 (i.e. 55%), have the education level up the graduation (i.e. 75%), Married (61%) and have the work experience of 2-7 years (66%).

Financial Knowledge

Financial knowledge implies that women are able to make rational choice among different financial alternatives based on their inclusive knowledge of everyday financial matters. The level of financial knowledge of the working women is assessed using a series of eight questions by examining their familiarity with simple and compound interest, basic principles of savings and investment, the impact of inflation on price and risk-return relationship etc.

		Responses	Percent of Cases
		N	
Financial Knowledge	Time Value of Money	84	35.1%
	Interest paid on loan	84	35.1%
	Interest plus principal	155	64.9%
	Compound interest	84	35.1%
	Risk and return	96	40.2%
	Inflation	131	54.8%
	Diversification	131	54.8%
	Division	168	70.3%

The performance on different dimensions of financial knowledge is shown in Table 1 which suggests working women are unaware of the basic money management principles also in their everyday life. Basic knowledge of the interest, compound interest and time value of money is very low amongst the working women. Concept of Risk and return, inflation and diversification is also not widespread among the working women. The lack of understating of the basic investment and money management concept among the working women is matter of great concerns.

Financial Behavior

The survey also attempts to capture the financial behavior of the women in the way they handle their personal finances. For this purpose, respondents were asked eight questions in total to understand the important dimensions about how women behave while handling with money in their daily lives. These dimensions included the questions which were asked in OECD survey.

		Responses	Percent of Cases
		N	
Financial Behavior	Household budget	167	69.9%
	Active saving	155	64.9%
	Considered Purchase	132	55.2%
	Timely bill payment	108	45.2%
	Keep watching on financial affairs	179	74.9%
	long term financial goal setting	131	54.8%
	Product awareness	143	59.8%
	Borrowing to make ends meet	155	64.9%

The table depicts financial behavior of women suggesting that most of the respondents are engaged in positive financial behavior when dealing with money and household finances. It can be clearly seen that around 75% of the women keep watching on financial affairs and 70% of the women manage all in household budget. Women focusing on the active saving more but half of the women cannot think about the

long term financial goal setting. Despite of this good financial behavior still more than half of the Indian women don't pay bills timely.

Financial Literacy

Financial literacy is the combination of financial knowledge, attitude and behavior. A financially literate women means that she has the essential knowledge of money related matters and has attitude and behavior which helps her in taking financial decisions. We attempt to record the financial literacy score of working women using the combination of these three parameters- financial knowledge, behavior and attitude. This score is obtained by adding the scores of these three dimensions- financial knowledge, attitude and behavior.

	N	Minimum	Maximum	Mean	Std. Deviation
Financial Literacy Score	239	6.33	15.67	11.7671	2.57350

The average financial literacy score comes out at 11.76 as obtained in the survey conducted for assessing the financial literacy level of working women. The maximum possible score that can be obtained for financial literacy in this survey is 21 (i.e., 8 for financial knowledge, 8 for financial behavior, and 5 for financial attitude). It seems that the level of financial literacy has improved over a period of time but still requires further improvement.

Age	N	Mean	
Financial Literacy Score	Above 35	131	10.6590
	below 35	108	13.1111
T value = -8.31 P value 0.000			

Age has the significant impact on the financial literacy score. T test between age and literacy score among the working women indicate that age is statistically significant influence on the score. Mean score indicate that lower age women have performed well compare to the older one.

Education	N	Mean	
Financial Literacy Score	Graduation and less	167	11.3792
	More than graduation	72	12.6667
T value = -3.63 P value 0.000			

Education level is directly related to financial knowledge, in this study education founded statistically significant impact on the financial literacy score. Women who have the higher education have score more compare to the low education level.

Financial Decision		N	Mean
Financial Literacy Score	By Family member	179	11.1527
	By Herself	60	13.6000
T value = -6.98 P value 0.000			

High level of the financial literacy create the confidents among the working women to take financial decision by own. This study also concludes the same. T test between financial literacy and financial decision conclude that women who has scored higher on financial literacy they take statistically higher significant financial decision by own compare to other working women.

5. CONCLUSION

This study concludes that Working women are unaware of the basic money management principles also in their everyday life. Basic knowledge of the interest, compound interest and time value of money is very low amongst the working women. Concept of Risk and return, inflation and diversification is also not widespread among the working women. This study also concludes that most of the respondents are engaged in positive financial behavior when dealing with money and household finances. It can be clearly seen that around 75% of the women keep watching on financial affairs and 70% of the women manage all in household budget.

The average financial literacy score comes out at 11.76 as obtained in the survey conducted for assessing the financial literacy level of working women. Mean score indicate that lower age women have performed well compare to the older one. Women who have the higher education have score more compare to the low education level. Women who have scored higher on financial literacy they take statistically higher significant financial decision by own compare to other working women.

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