



# Impact of Annealing Time on Structural and Optical Properties of TiO<sub>2</sub> Thin Films Deposited by Spray Pyrolysis Technique

A.Mathi Vathani<sup>1</sup>, A.Saranya<sup>2</sup>, J.Pandiarajan<sup>1</sup> and N.Prithivikumaran<sup>1\*</sup>

<sup>1</sup>Department of Physics, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.

<sup>2</sup>Department of Physics, Karpagam Academy of Higher Education, Coimbatore.

**Abstract** - Titanium dioxide (TiO<sub>2</sub>) thin films were prepared by Spray Pyrolysis technique on microscopic glass substrates at 350 °C and 400 °C with annealing time of 1 hour and 2 hours. The structural study was analyzed by XRD technique, which shows that all the TiO<sub>2</sub> thin films were of anatase phase and nanocrystalline in nature. The absorbance measured using UV-Vis spectroscopic method have notable shift to the lower wavelength region with increase in annealing time. The optical band gap value calculated from Tauc's plot was found to increase with increase in annealing time. The PL study showed emission peaks in visible region attributed to the impurities, defects and oxygen vacancy. The prepared TiO<sub>2</sub> thin films reveal that the annealing time has impact on the structural and optical properties.

**Keywords:** TiO<sub>2</sub> thin films, Spray Pyrolysis, Annealing time, XRD, UV, PL

## 1. INTRODUCTION

TiO<sub>2</sub> have been investigated widely and used in many applications due to its good crystalline structure, particle size, surface area, chemical stability, non-toxicity and low cost [1] TiO<sub>2</sub> thin films were synthesized by various methods including Spin coating method, Spray pyrolysis technique, RF-magnetron sputtering, Pulsed Laser Deposition (PLD), Chemical bath deposition etc.,[2]. Among these Spray Pyrolysis method is a simple and low-cost technique which has the capability to produce large area, high quality adherent films of uniform thickness [3].

Thin film properties highly depend on the various parameters involved in the preparation technique and processing factor. Annealing is a heat treatment that alters the physical and chemical properties of the material. It involves heating a material above its recrystallization temperature, maintaining a suitable temperature for a suitable amount of time and then cooling [4].

In the present work TiO<sub>2</sub> thin films were synthesized on glass substrates using Spray pyrolysis technique and the effect of annealing

time on the structural and optical properties of the TiO<sub>2</sub> thin films was analyzed.

## 2. METHODS AND TECHNOLOGY

The Precursor solution was prepared using titanium tetra isopropoxide (TTIP, Sigma Aldrich, 97%), ethanol (AR, 99.9%) and acetyl acetone (AcAc, CH<sub>3</sub>COCH<sub>2</sub>COCH<sub>3</sub>, Spectrum, 98%) by the following method. Ethanol was mixed with TTIP in a well cleaned beaker and the mixture was stirred using magnetic stirrer for 10 minutes. Then AcAc was added to this mixture for stabilizing the solution and stirred for 10 minutes. Again ethanol was added to this solution and vigorously stirred for 1 hour. Here the proportion of TTIP, ethanol and AcAc was maintained as 1:10:1 ratio.

Well cleaned microscopic glass slide was placed on the metallic plate and prepared TiO<sub>2</sub> solution was atomized into the Spray unit. TiO<sub>2</sub> solution was sprayed for 1 minute to the glass slide and then the film was annealed at 350 °C for 10 minutes. Again the solution was sprayed for 1 minute after that the film was annealed at 500 °C for 1 hour. To analyze the effect of annealing time another sample was prepared which was annealed for 2 hours. The same procedure was followed for coating of the TiO<sub>2</sub> thin films with substrate temperature of 400 °C and annealing time of 1 hour and 2 hours. The TiO<sub>2</sub> thin films were deposited under the following conditions: Nozzle to substrate distance = 15Cm; Spray deposition rate = 4ml/min; carrier gas = air; carrier gas pressure = 1 bar, Substrate temperature = 350 °C, 400 °C.

### 3. RESULT AND DISCUSSION

#### Structural Properties:

The thickness of the TiO<sub>2</sub> thin films was measured using Stylus profilometer. The thickness of the TiO<sub>2</sub> thin films coated at 350°C for 1 hour and 2 hours annealing time are found to be 3.63 μm and 3.58 μm respectively and the thickness of the films coated at 400 °C for 1 hour and 2 hours annealing time are 2.96 μm and 2.91 μm respectively. It can be seen that there is no much variation in the film thickness for films coated with various annealing time. The same trend has also been reported by Vigil et al for their CdO thin films coated by Spray pyrolysis method [5].

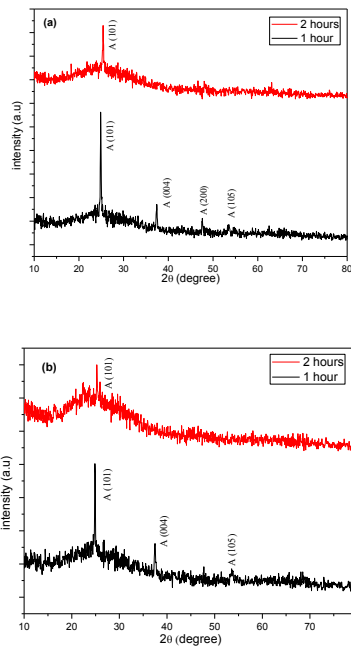


Figure 1: (a) XRD images of TiO<sub>2</sub> thin films prepared at 350 °C for 1 hour and 2 hours annealing time (b) XRD images of TiO<sub>2</sub> thin films prepared at 400 °C for 1 hour and 2 hours annealing time.

Table 1: Thickness, Average crystalline size, Strain and Dislocation density of the TiO<sub>2</sub> thin films prepared at 350 °C and 400 °C with 1 hour and 2 hours annealing time.

Substrate temperature	Annealing time	Average crystalline size (nm)	Thickness (μm)	Strain	Dislocation density (lines/m <sup>2</sup> )
350 °C	1 hour	36.83	3.63	0.0682	7.37 x 10 <sup>14</sup>
	2 hours	34.27	3.58	0.0729	8.52 x 10 <sup>14</sup>
400 °C	1 hour	34.06	2.96	0.1598	8.62 x 10 <sup>14</sup>
	2 hours	31.39	2.91	0.1786	1.02 x 10 <sup>15</sup>

#### Optical Properties:

The absorbance spectra of the TiO<sub>2</sub> thin films prepared at 350 °C and 400 °C with

annealing time of 1 hour and 2 hours observed from UV spectrometric measurement were shown in figure 2 (a) & (b). In the UV-Vis

Figure 1(a) and (b), show the XRD patterns of TiO<sub>2</sub> thin films prepared at 350 °C and 400 °C for 1 hour annealing time, (101), (004), (200) and (105) were obtained with tetragonal crystal structure (200) peak is absent for 400 °C. The results match well with JCPDS file no. 21-1276. For films with the annealing time of 2 hours, only (101) peak has appeared and the intensity of the peak is also lower compared to film annealed for 1 hour. The average crystallite sizes calculated by using the Scherrer formula for the films prepared at 350°C with annealing time of 1 and 2 hours are 36.83 nm, 34.27 nm and for the films prepared at 400 °C are 34.06 nm, 31.39 nm respectively.

The microstrain values of the films were calculated using the relation,

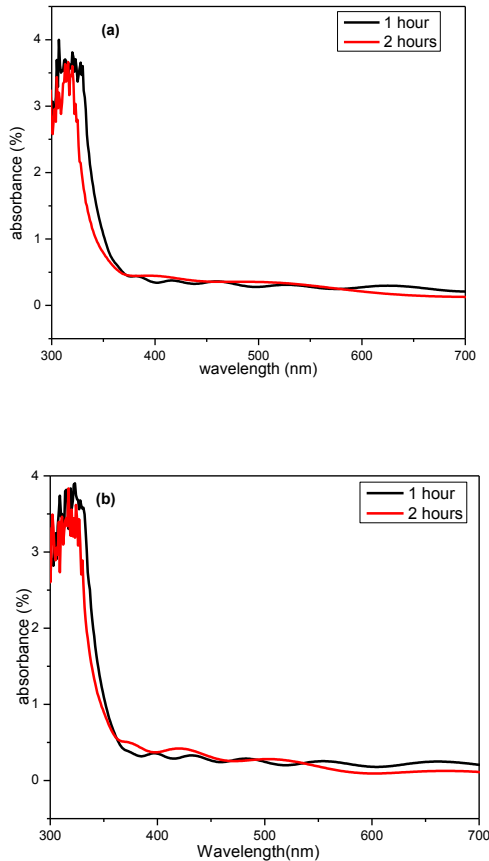
$$\epsilon = \frac{\beta \cos \theta}{4} \text{----- (1)}$$

and the values of Dislocation density (δ) were calculated using the formula,

$$\delta = \frac{1}{D^2} \text{----- (2)}$$

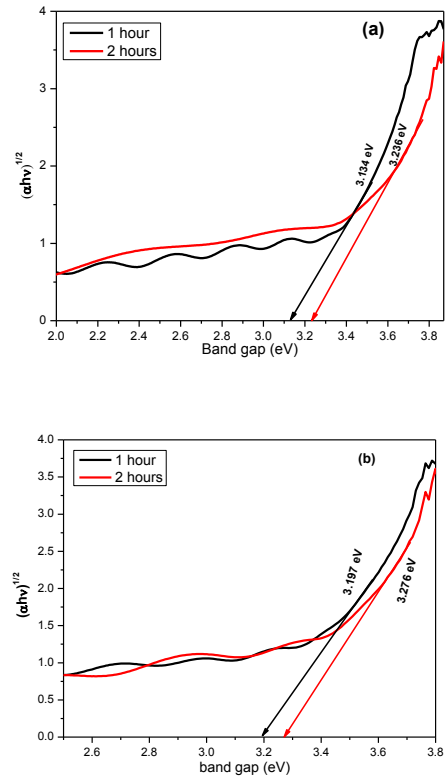
The intensity of the diffraction peaks, crystallite size and thickness decreases with increase in annealing time for both the set of thin films prepared at 350 °C and 400 °C. Dislocation density and strain increases with increase in annealing time for both the temperatures. It shows that the annealing time has an effect on the structural properties of TiO<sub>2</sub> thin film.

absorbance spectra, a notable shift to a lower wavelength occurs. But there is no notable change in the percentage of absorbance for both substrate temperatures with change in annealing time.



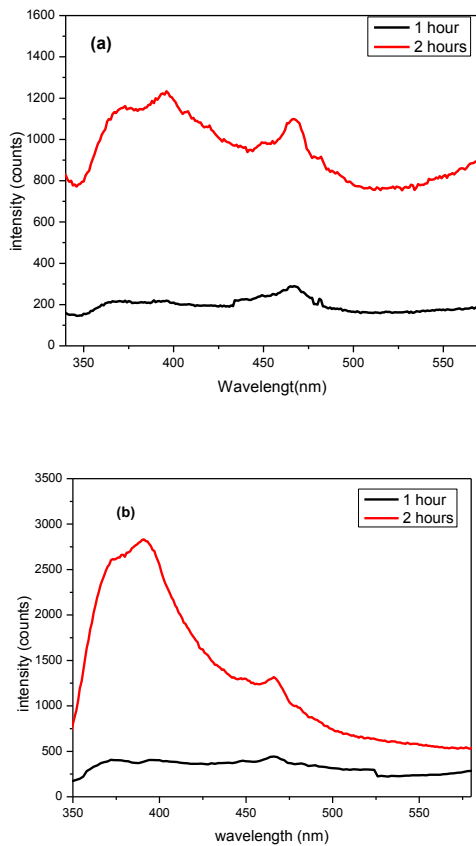
**Figure 2:** (a) absorbance spectra of TiO<sub>2</sub> thin films prepared at 350 °C for 1 hour and 2 hours annealing time (b) absorbance spectra of TiO<sub>2</sub> thin films prepared at 400 °C for 1 hour and 2 hours annealing time.

Anatase TiO<sub>2</sub> exhibits an indirect band gap which is smaller than its direct band gap [6]. The band gap values calculated using the Tauc's relation for the TiO<sub>2</sub> thin films prepared at 350 °C for 1 and 2 hours annealing time are 3.134 eV & 3.236 eV and for the films prepared at 400 °C are 3.197 eV & 3.276 eV respectively. The band gap value decreases for both the temperature with change in annealing time which agrees well with the XRD results which show the quantum confinement effect [7]. The change in annealing time can be attributed to morphological change.



**Figure 3:** Tauc's relation of TiO<sub>2</sub> thin films prepared at 350 °C for 1 hour and 2 hours annealing time (b) Tauc's relation of TiO<sub>2</sub> thin films prepared at 400 °C for 1 hour and 2 hours annealing time.

Photoluminescence spectra of TiO<sub>2</sub> thin films prepared at 350 °C and 400 °C for 1 hour and 2 hours annealing time show three emission peaks at 370, 395 and 465 nm shown in Figure 4(a) & (b) which are due to deep level emission in visible region. The violet emission peak at 395nm is due to impurities and surface defects. The blue emission peak at 465 nm can be attributed to oxygen vacancies [8]. It is noted that, the intensity of the PL emission peaks is low for 1 hour annealing time sample, which shows that the defect is less. This is also confirmed by the XRD results which show that the Dislocation density and strain were lesser for 1 hour annealing time sample.



**Figure 4: (a) Photoluminescence spectra of TiO<sub>2</sub> thin films prepared at 350 °C for 1 hour and 2 hours annealing time (b) Photoluminescence spectra of TiO<sub>2</sub> thin films prepared at 400 °C for 1 hour and 2 hours annealing time.**

#### 4. CONCLUSION

TiO<sub>2</sub> thin films were successfully prepared by using spray pyrolysis technique at 350 °C and 400 °C with annealing time of 1 hour and 2 hours.

The XRD study showed that the TiO<sub>2</sub> thin films were of anatase phase and nanocrystalline in nature with tetragonal structure. The crystalline size decreases and the dislocation density and strain increases as the annealing time increases. The optical energy gap increases and PL emission peak intensity decreases as the annealing time increases. This is in confirmation with the XRD results. Hence annealing time has impact on the structural and optical properties of the prepared TiO<sub>2</sub> nano crystalline thin films.

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# Synthesis and Antimicrobial Investigation of Transition Metal Complexes Having Tryptophan

M.Nazeer<sup>1</sup> and N.Raman<sup>2</sup>

<sup>1</sup>Department of Chemistry, Sri Kaliswari College (Autonomous), Sivakasi.

<sup>2</sup>Department of Chemistry, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.

**Abstract** - A new family of four mixed ligand Cu(II), Ni(II), Co(II) and Zn(II) complexes of 2-amino-3-(1H-indol-3-yl)propanoic acid (L-tryptophan) incorporating benzaldehydes (Schiff base) and 2,2'-bipyridine have been synthesized and characterized. In view of *in vitro* biocidal activity observations of tryptophan derivative, there is an enhancement in the antimicrobial activity of the complexes when compared to that of ligand. A comparative study of the MIC values of the ligand and its complexes indicate that the copper(II) complex exhibits higher antibacterial/antifungal activity than the other compounds.

**Keywords:** Complex, Schiff base, Tryptophan, Antimicrobial activity.

## 1. INTRODUCTION

The chemistry of coordination compounds has always been a challenge to the inorganic chemists as it has more branches nowadays. Coordination compounds play a very significant role in our lives. The study of them has contributed to the highest degree of understanding the chemical bond in inorganic chemistry. Metals play an imperative role in an immense number of extensively differing biological processes<sup>1-9</sup>. Metal ion dependent processes are found throughout the life science and vary tremendously in their function and complexity. It is now appreciated that metal ions control a vast range of processes in biology. Many new and exciting developments in the field of biochemistry create interest out of inorganic chemists to court in the new area called "Bioinorganic Chemistry".

Schiff bases have been playing an important part in the development of coordination chemistry<sup>11</sup>. Schiff base metal complexes have been studied extensively because of their attractive chemical and physical properties and their wide range of applications in numerous scientific areas<sup>12</sup>. These types of complexes have been vigorously explored in recent years and such studies have

been the subject of many papers and reviews. The most popular metal analogues on the market today are those that contain platinum and ruthenium. Other metal analogues containing copper, nickel, cobalt and zinc are still under development.

Amino acids are key precursors for synthesis of hormones and low-molecular weight nitrogenous substances with each having enormous biological importance. The presence of amino acids also enables vitamins and minerals to perform all their important functions. Without these essential amino acids, the human body is unable to function normally and in some extreme cases, cause death. Tryptophan, a precursor of serotonin and melatonin, plays an important role in health and disease and its deficiency may underlie many types of brain disease such as quality of sleep and disturbance in sleep mediated by melatonin. It is a natural relaxant.

Antimicrobial resistance is fast becoming a global concern with rapid increase in multidrug-resistant bacteria<sup>13-15</sup>. Throughout history, there has been a continual battle between humans and the multitude of microorganisms that cause infection and disease. Many of the crude drugs, which are the sources of medicinal preparations, still originate from wild growing plants. However, the plant based drugs have shortened the life span of the source of material. There is a continuous search for more potent and cheaper raw materials to feed the industry. So, nowadays pharmaceutical industries are looking for synthesizing the alternative compounds which act as drugs. During the past decades, much attention has been given to the synthesis of new metal complexes and the

evaluation of these agents for antibacterial activity. This revival interest has been generated by the discovery of the antibacterial activity of several metal complexes.

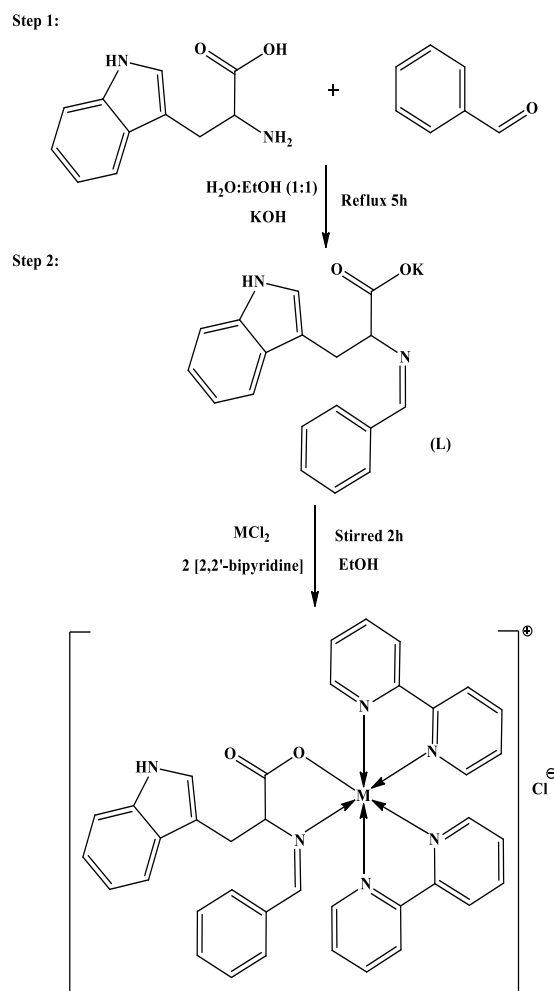
The transition metal complexes of tryptophan derivatives have been extensively examined due to their wide applications in various fields like biological, analytical and therapeutically<sup>16-20</sup>. Further, they have been investigated due to their diverse biological properties as antifungal, antibacterial, analgesic, sedative and anti-inflammatory agents<sup>21</sup>. Mainly, copper complexes containing amino acids have been studied as models for the behavior of copper enzymes and some copper complexes with amino acid ligands were reported to exhibit potent anti-tumor and artificial nuclease activities.

Keeping the above facts in mind, we have already synthesised similar type of Cu(II), Ni(II), Co(II) and Zn(II) complexes having 2-amino-3-(1H-indol-3-yl)propanoic acid (L-tryptophan) incorporating benzaldehydes<sup>22</sup>. They were characterized by usual analytical and spectral data. The aim of the present work is to investigate the antimicrobial and antifungal activities of the Schiff base complexes synthesised using tryptophan and 2, 2'-bipyridine. As we know amino acids having Schiff bases readily form complexes with metal ions which play an important role as the basic compounds for modeling more complicated amino acid Schiff bases. They are the key intermediates in a variety of metabolic reactions involving amino acids. Due to such a wide range of applications, it is thought to investigate the antimicrobial activities of the metal complexes having tryptophan derived Schiff base as a main ligand and 2, 2'-bipyridine as a co-ligand.

## 2. EXPERIMENTAL

**Scheme 1.** Synthesis of ligand and its metal complexes

M= Cu (II), Ni (II), Co (II) and Zn (II)



## 2.1. Synthesis

### 2.1.1. Preparation of Schiff base ligand (KL)

The potassium salt of 2-amino-3-(1H-indol-3-yl)propanoic acid was prepared by following general procedure. The 2-amino-3-(1H-indol-3-yl)propanoic acid (0.01 mol) dissolved in 1:1 water – ethanol (40 mL) was added to a hot ethanolic solution (30 mL) of KOH and the resulting solution was stirred to obtain a homogeneous solution. Then, to this solution an ethanolic solution of benzaldehyde (0.01 mol) was added drop-wise and the resultant mixture was refluxed for *ca.* 5 h. The pale yellow colored solution was obtained. Then the solution was reduced to one-third on a water bath. The solid compound precipitated was filtered off, washed thoroughly with ethanol and dried in *vacuo*. It is presented in Scheme-1.

### 2.1.2. Synthesis of mixed-ligand metal complexes

The complexes were prepared by mixing the appropriate molar quantity of the above ligand and the metal salts using the following procedure. An ethanolic solution of Schiff base (0.003 mol) was stirred with the ethanolic solution (5 mL) of anhydrous metal (II) chlorides (0.003 mol) for *ca.* 1 h. To the above mixture, a methanolic solution (5 mL) of 2, 2'-bipyridine (bpy) (0.006 mol) was added in a 1:1:2 molar ratios and the stirring were continued for *ca.* 1 h. The solid product obtained was filtered and washed with ethanol (Scheme 1). Yield 71-86 %.

## 3. RESULTS AND DISCUSSION

### 3.1. Antimicrobial activity

The procedure for the antimicrobial activity of the above synthesised complexes (Scheme-1) has been discussed in our previous work<sup>22</sup>. The diffusion agar technique was used to evaluate the antimicrobial activity of the synthesized mixed-ligand complexes. The Schiff base and its metal complexes have been screened for their *in vitro* antibacterial activities against five bacterial strains. The microorganisms used in the present investigations included *S. aureus* and *B. subtilis* (as Gram-positive bacteria) and *P. aeruginosa*, *E. coli* and *S. typhi* (as Gram-negative bacteria)<sup>23</sup>. The microorganisms used in the antifungal activity included *A. niger*, *A. flavus*, *C. albicans*, *R. stolonifer* and *R. bataticola*. All the metal complexes have been showing promise in inhibiting microbes. From the data it is very clear that the complexes are having higher antibacterial and antifungal activities than the free ligands. The enhanced activity of the complexes can be explained on the basis of Overtone's concept and Tweedy's Chelation theory<sup>24</sup>. According to Overtone's concept of cell permeability, the lipid membrane that surrounds the cell favors the passage of only lipid soluble materials due to which liposolubility is an important factor that

controls antimicrobial activity. On chelation, the polarity of the metal ion is reduced to a greater extent due to the overlap of the ligand orbital and partial sharing of the positive charge of the metal ion with donor groups. Further, it increases the delocalization of  $\pi$ -electrons over the whole chelate ring and enhances the lipophilicities of the complexes. This increased lipophilicity enhances the penetration of the complexes into lipid membranes and blocking of metal binding sites on the enzymes of the microorganisms. These complexes also disturb the respiration process of the cell and thus block the synthesis of the proteins that restricts further growth of the organism. The variation in the effectiveness of the different compounds against different organisms depends on the impermeability of the cells of microbes or difference in ribosome of the microbial cells. Moreover; it is found that the copper(II) complex is having superior activity than the other synthesised complexes.

**Table 1.** Minimum inhibitory concentration values of the synthesized compounds Against the growth of five bacteria ( $\mu$ M)

Compound	<i>S. aureus</i>	<i>P. aeruginosa</i>	<i>E. coli</i>	<i>B. subtilis</i>	<i>S. typhi</i>
L	28	31	26	30	33
[CuL(bpy) <sub>2</sub> ]Cl	13	18	16	15	20
[NiL(bpy) <sub>2</sub> ]Cl	15	16	20	18	23
[CoL(bpy) <sub>2</sub> ]Cl	14	19	17	17	18
[ZnL(bpy) <sub>2</sub> ]Cl	16	15	18	21	20
Kanamycin	12	16	14	16	19
DMF	-	-	-	-	-

**Table 2.** Minimum inhibitory concentration values of the synthesized compounds Against the growth of five fungi ( $\mu$ M)

Compound	<i>A. niger</i>	<i>A. flavus</i>	<i>C. albicans</i>	<i>R. stolonifer</i>	<i>R. bataticola</i>
L	30	32	28	31	27
[CuL(bpy) <sub>2</sub> ]Cl	14	17	15	17	19
[NiL(bpy) <sub>2</sub> ]Cl	18	16	20	20	23
[CoL(bpy) <sub>2</sub> ]Cl	16	19	17	19	21
[ZnL(bpy) <sub>2</sub> ]Cl	15	14	18	21	20
Clotrimazole	12	16	14	16	19
DMF	-	-	-	-	-

#### 4. CONCLUSION

The present work is centered on the synthesis of tryptophan derived Schiff base and its metal complexes. The present work concludes that metal complexes will be used as good drugs of choice to manage the bacterial and fungal diseases after evaluating the *in vivo* effect of metal complexes on experimental animals and clinical trials.

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# Antibacterial Studies of Copper Complex Derived From Isoniazid Schiff Bases

J. Porkodi<sup>1</sup>, S. Vellaithai<sup>1</sup> and N.Raman<sup>2</sup>

<sup>1</sup>Department of Chemistry, S. F. R. College for Women (Autonomous), Sivakasi

<sup>2</sup>Department of Chemistry, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.

**Abstract** - The heterocyclic hydrazones constitute an important class of biologically active drug molecules which have attracted the attention of medicinal chemists due to their wide-ranging pharmacological properties including iron scavenging and anti-tubercular activities. Isoniazid, also known as isonicotinylhydrazide (INH), is an antibiotic used for the treatment of tuberculosis. In the present study a few mixed ligand copper complexes of isoniazid Schiff base have been synthesized. The synthesized compounds are characterized by elemental analysis, magnetic susceptibility, magnetic moment, UV and FT IR spectroscopic methods. PASS prediction analysis shows that the synthesized ligand possesses higher antituberculosis activity than the free isoniazid. All the synthesized compounds are screened for antimicrobial activity.

**Keywords:** Hydrazones; Isoniazid; Metal complex; Anti-microbial activity.

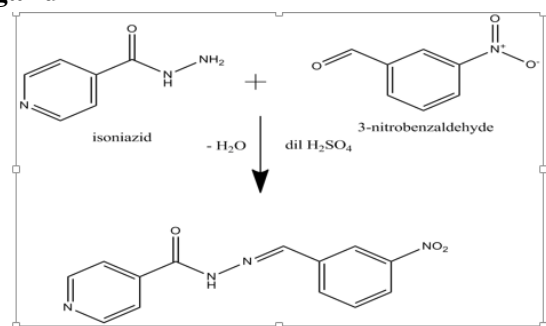
## 1. INTRODUCTION

Schiff base compounds and their metal complexes have been extensively investigated due to their wide range of applications including catalysts, medicine, crystal engineering, anti-corrosion agent<sup>1</sup>. Isoniazid is one of the primary drugs used in combination with ethambutol, rifampin, streptomycin and pyrazinamide to treat tuberculosis<sup>2</sup>. Common side effect of isoniazid includes increased blood levels of liver enzymes and numbness in the hands and feet. Serious side effects may include liver inflammation. It is unclear if use during pregnancy is safe for the baby and use during breastfeeding is likely okay. Pyridoxine may be given to reduce the risk of side effects. It has been reported that, its side effects can be reduced after forming Schiff base (due to the deactivation of NH<sub>2</sub> group)<sup>3,4</sup>. Mixed ligand complexes can be a synthetic challenge to tune the properties of the transition metal complexes<sup>5</sup>. Most active mixed ligand metal complexes of 1,10-phenanthroline derivatives that have been reported to prove considerable pharmacological activity. Transition metal complexes of 1,10-

phenanthroline or their modified variants have been extensively employed in DNA studies due to their applicability in several areas of research, including bioinorganic and biomedical chemistry<sup>6</sup>. *In silico* analysis using cheminformatics techniques can actually reduce the risks of developing a drug. Such techniques as virtual screening, library design, and docking figure into the analysis. By keeping all these facts, this work emphasizes the synthesis of copper complex from isoniazid Schiff base. The synthesized compounds are characterized by elemental analysis, magnetic susceptibility, magnetic moment, UV and FT IR spectroscopic methods. Biological activity of the synthesized ligand can be predicted by PASS online software. The antibacterial activity of these compounds is examined by well diffusion method.

## 2. EXPERIMENTAL SECTION

### 2.1. Synthesis of Isoniazid - Schiff's base ligand



*N*<sup>1</sup>-(3-nitrobenzylidene)isonicotinohydrazide

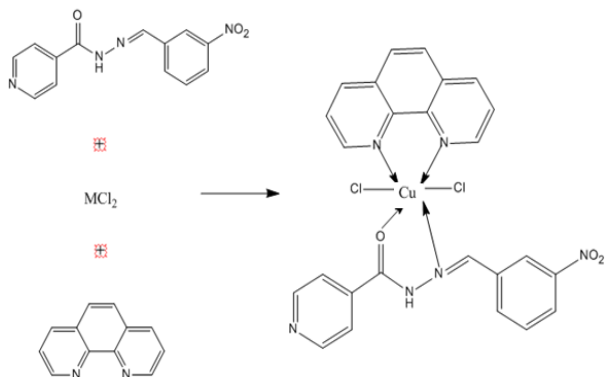
Scheme: 1 Schematic diagram for the synthesis of isoniazid Schiff Base

1 mmol of isoniazid and 3-nitrobenzaldehyde was dissolved in 10 mL of ethanol and it was heated in a mantle for *ca* 3 h in RB flask by adding 3 drops of dilute sulphuric acid. A yellow coloured precipitate was

obtained. The precipitate was filtered, dried and recrystallized in ethanol.

## 2.2. Preparation of Mixed Ligand Complexes

About 1:1:1 ratio of ligand, copper(II) chloride and 1,10 phenanthroline was allowed to stir in ethanol for *ca* 3 h. The colored product was obtained. It was filtered, dried and recrystallized in ethanol.



Scheme: 2 – Schematic route for the synthesis of mixed ligand copper complex

## 2.3. *In silico* biological activity prediction

### 2.3.1. PASS online biological activity prediction software

PASS is commonly used online software in drug discovery and development environment. It provides a way to find the most probable lead with essential activity among the compounds from commercial data base. It is used to predict the biological activity of the synthesized Schiff base. PASS Web tool predicts the 3678 type of pharmacological effects based on its structure. This tool interprets the biological active spectra using 2D structure of molecule<sup>7,8</sup>.

## 2.4. Antibacterial studies - Well diffusion method

The Agar diffusion method was used to determine the antibacterial activity of the ligand and copper complex. 20 mL of Mueller Hinton agar was distributed into sterile petri dish. 1 mL of *S.epi* (Gram-positive bacteria), Methicillin Resistant *Staphylococcus aureus* MRSA (Gram-positive bacteria), *E.coli* (Gram-negative bacteria) and *S.Mar* (*Streptococcus marcescens* Gram-positive bacteria) - organism was spread on Mueller Hinton agar in petri dish separately.

Three wells were made in agar of each petri dish by a steel borer. The ligand and complex of 0.2 mg/mL was applied in each culture plates. The plates were left on the bench for 1 h for adequate diffusion of the complexes and incubated at 37°C for 24 h. After the incubation the diameter of the Zones of inhibition around each well was measured along two axes (*i.e* 90°). Zone of inhibition was recorded in millimeter.

## 3. RESULTS AND DISCUSSION

The structure of the synthesized compounds was confirmed by UV, IR, elemental analysis and magnetic moment studies.

### 3.1. Elemental analysis and molar conductance

Both the theoretical and observed values in the elemental analyses are correlated to the proposed formula of the complex (Table 1). About 10<sup>-3</sup> M of the copper complex was dissolved in DMSO and the molar conductivity was measured at room temperature. The non-electrolytic nature of the complex is confirmed by its lower molar conductance values<sup>9</sup> (10 Ω<sup>-1</sup>cm<sup>-2</sup> mol<sup>-1</sup>). They are found to be stable in solid and solution state also.

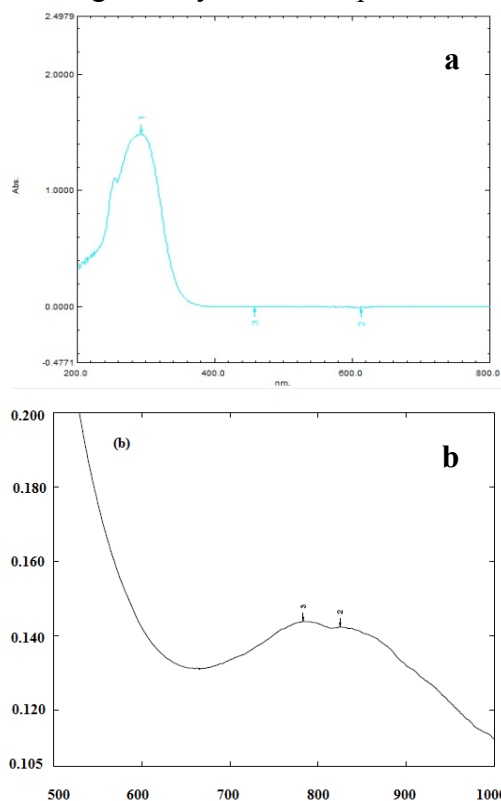
Table 1. Physicochemical characterization of the synthesized Compounds

Empirical formula	Form. Wt.	% of Yield	Color	Elemental Analysis %						Mol. Cond.
				C	H	Cl	M	N	O	
C <sub>13</sub> H <sub>10</sub> N <sub>4</sub> O <sub>3</sub>	270	85	Pale Yellow	57.7 (57.5)	3.7 (3.6)	-	-	20.7 (20.1)	17.7 (17.5)	-
C <sub>27</sub> H <sub>24</sub> Cl <sub>2</sub> CuN <sub>6</sub> O <sub>3</sub>	614	74	Green	52.7 (52.7)	3.9 (3.6)	11.5 (11.3)	10.3 (10.2)	13.6 (13.5)	7.8 (7.4)	10

### 3.2 Electronic absorption spectra of ligand and mixed ligand complex

The electronic spectra can often provide reliable information about the geometry of the synthesized metal complex. The electronic absorbance spectra of the Schiff base ligand and its metal complex were recorded in DMSO solution and the electronic absorption spectra were recorded from 200-1200 nm range. The typical electronic absorption spectra are shown in Fig. 1.

The ligand showed electronic absorption band at 293 nm. This is due to  $n \rightarrow \pi^*$  transition. The copper complex shows absorption band at 781 nm which is due to  ${}^2E_g \rightarrow {}^2T_{2g}$  transition<sup>10</sup>. It was strongly favors the octahedral geometry of the complex. Magnetic susceptibility value of Cu(II) complex is found to be 2.46 BM which also confirms the octahedral geometry of the complex.



**Fig.1.** UV Spectrum of Isoniazid Schiff base ligand (a) and its copper complex (b)

### 3.3. IR spectral data of ligand and the Mixed Ligand Complex

The IR spectra provide valuable information regarding the nature of the functional group attached to the metal atom. Imine ( $-C=N-$ ) stretching frequency of ligand was appeared at  $1580\text{ cm}^{-1}$ . The Imine ( $-C=N-$ ) Stretching frequencies was lowered in copper complex as compared to ligand. This was due to lowering of electron density on the N atom in the imine group. The ligand also shows an  $-C=O$  stretching frequency at  $1676\text{ cm}^{-1}$ . This stretching is frequency also lowered in Copper complex. This was due to lowering of electron density on the C atom in the  $C=O$  group. In mixed ligand copper complex, two new peaks are appeared at  $520\text{ cm}^{-1}$  and  $688\text{ cm}^{-1}$  respectively. This is due to the formation of new M-N and M-O bond. This stretching frequencies were absent in the IR spectrum of ligand.

Similarly the appearance of stretching frequency in complex around  $318\text{ cm}^{-1}$  which is due to the formation of new M-Cl bond. This stretching frequency also absent in IR spectral data of ligand (Table 2; Fig.2 and Fig.3).

**Table 2.** IR spectral data of ligand and mixed ligand copper complex

Compound	$\nu\text{ C=N}$ ( $\text{cm}^{-1}$ )	$\nu\text{ C=O}$ ( $\text{cm}^{-1}$ )	$\nu\text{ M-N}$ ( $\text{cm}^{-1}$ )	$\nu\text{ M-O}$ ( $\text{cm}^{-1}$ )	$\nu\text{ M-Cl}$ ( $\text{cm}^{-1}$ )
L	1580	1676	-	-	-
Copper complex	1528	1668	520	688	318

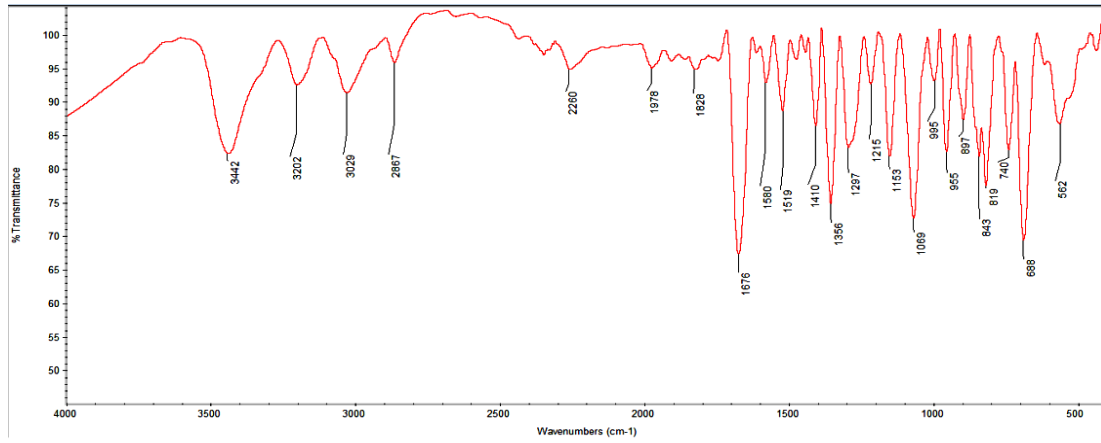


Fig.2. IR Spectrum of Isoniazid – Schiff base ligand

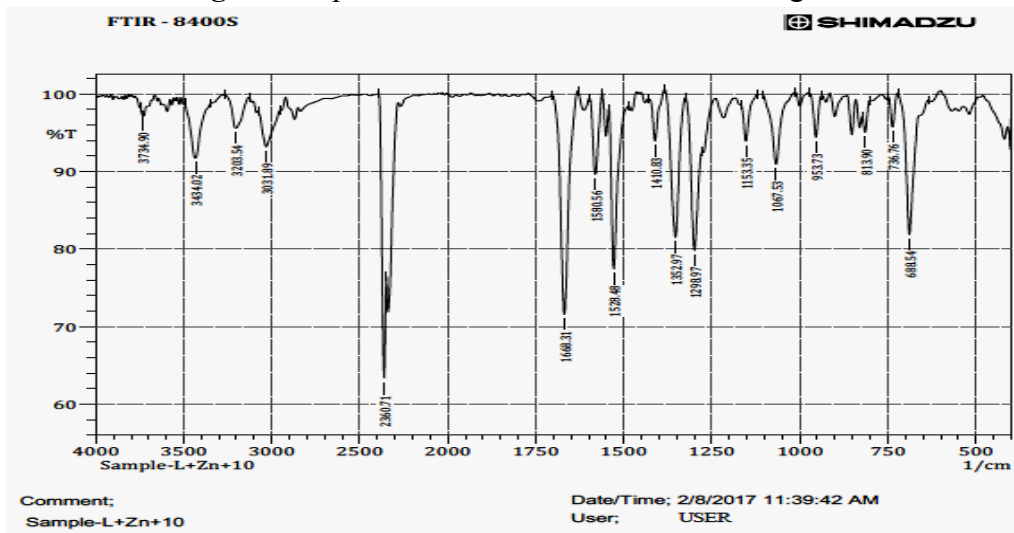
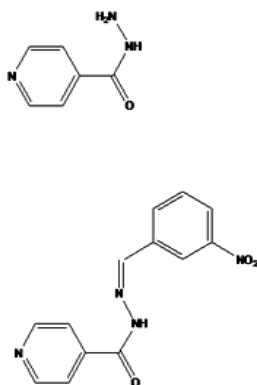


Fig. 3. FI IR Spectrum of copper complex

### 3.4. PASS prediction analysis for Isoniazid and Isoniazid Schiff's base

The biological activity of the free isoniazid and isoniazid Schiff base are predicted by means of PASS online software. From the  $P_a$  value (probability of active value), it is found that the Schiff base possesses antituberculosis (0.93) than the free isoniazid.

Pa	Pi	Activity
0.813	0.003	Antituberculosic
0.801	0.004	Antimycobacterial
0.794	0.002	CYP2E1 inducer
0.790	0.003	Nitrilase inhibitor
0.781	0.002	Maillard reaction inhibitor
0.778	0.001	Polyamine oxidase inhibitor
0.930	0.002	Antituberculosic
0.896	0.003	Antimycobacterial
0.863	0.002	Antiviral (Picornavirus)
0.854	0.003	Phosphatidylserine decarboxylase inhibitor
0.851	0.004	HMGCS2 expression enhancer
0.839	0.008	Taurine dehydrogenase inhibi



### 3.5. Antibacterial activity

The copper complex possesses higher antibacterial activity towards Gram-positive and Gram-negative bacteria than the ligand. This is due to the lipophilic nature and chelation effect<sup>11-13</sup> of the copper complex. The bacterial cell wall can be easily damaged and thereby its growth is inhibited (Fig.4).

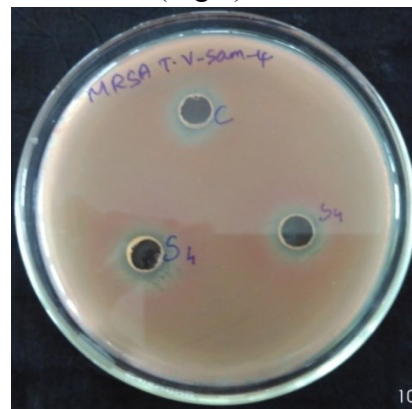


Fig. 4. Pictorial representations – Antibacterial activity of copper complex

#### 4. CONCLUSION:

In the present study, isoniazid Schiff base compound is synthesized. Its mixed ligand copper complex is synthesized by using 1,10-phenanthroline, newly synthesized Isoniazid Schiff's base and copper chloride in 1 : 1 : 1 ratio. They are characterized by molar conductivity, elemental analysis, magnetic moment studies and also by UV, and IR spectroscopy. All these studies confirm the formation of copper complex of Isoniazid Schiff base which possesses an octahedral geometry. PASS prediction was used to predict the biological activity of newly synthesized Isoniazid Schiff base. This analysis shows that isoniazid's biological activity is increased after the formation of Schiff base without doing real analysis. The antibacterial activity study shows that copper complex has biologically active towards Gram-positive and Gram-negative bacteria than the ligand.

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# A Study on Factors Influencing Youngsters towards Digital Wallets in Chennai City

Gowtham Ramkumar

*Department of Commerce, Madras Christian College, Chennai*

**Abstract – Purpose:** The purpose of this study is to identify the most preferred digital wallets among youngsters in Chennai city. The other purposes of this study include identifying the factors influencing youngsters towards digital wallets and rank the challenges faced by them while those wallets.

**Methodology:** The data for the study is collected through 100 youngsters in Chennai city. IBM SPSS 22 version software is used to process and analyze the collected data for the study. **Findings:** The study identifies Pay Tm as the most used digital wallets among youngsters in Chennai city. Further the study identifies three major factors with its own sub factors influencing youngsters towards digital wallets and accessibility as one of the challenges faced by the respondents. **Implications:** The results of the study indicate movement of economy towards digitalization and cashless society. The factors identified by the study can be used as a base to frame marketing program for digital wallet companies.

**Originality:** This is the first paper to use factor analysis with Varimax rotation to group various factors influencing usage of digital wallets using youngsters alone as target population.

**Keywords:** Cashless society, Digitalization, Digital wallet companies and Challenges ahead.

## 1. INTRODUCTION

There is a tremendous growth of mobile technology across the world over the years. This growth is of immense importance for youngsters due to prepaid model. This has contributed to the enormous digitalization initiative among various countries. This digitalization initiative has resulted in accessibility to the financial services and people are increasingly becoming familiar to mobile payment systems. In fact, mobile technology, viewed as a payment or banking channel, has the potential to allow two important questions to be addressed at the same time: on the demand side, it represents that are various factors influencing youngsters towards digital wallets. On the supply side, it opens up opportunities for wallet companies to provide a wide range of services at low cost and gain a significant market share for them.

Digital wallets play an important role in financial services in current business scenario in India. Digital wallets are defined as electronic devices that help either individuals or association of persons to carry out electronic transactions. Digital wallets offer so many advantages and disadvantages. Mobile wallets enable the youngsters to carry out financial transactions in a more easy and convenient way. Further it also creates big business opportunities for wallet companies. Cashless services are increasing indicating that in future there will be minimum or no use of physical cash in the country. Digital wallets are of increasing importance on account of the following reasons

- Moving of Indian economy towards cashless society
- Speed and convenience benefits offered by digital wallets
- Increasing number of purchases made online.
- Encouragement of online payments made by digital wallet providers.

The rise of the Smartphone as a payment tool is reflected in the brisk growth of mobile wallet transactions in the country, according to RBI data and the trend is only expected to grow with the introduction of unified payment interface and payment banks. M-wallets have emerged as the most significant contributor in pushing cashless and electronic payments. Foreseeing this big opportunity, a bunch of youngsters has kick-started a movement by launching mobile wallets and is slowly changing the way Indians transact. A mobile wallet app is a virtual wallet where a registered customer can preload a certain amount of money with any service provider, which can be used for various bill

payments and recharges. Broadly, there are four kinds of wallets in India - open, semi-open, semi-closed and closed. Open wallets allow users to redeem money and withdraw cash, apart from buying goods and services, including financial services. Only issued by banks e.g.: ICICI Bank Pockets, HDFC Bank Payzapp, SBI Buddy. Semi-closed wallets can be used to buy goods and services, including financial services, at select merchant establishments. Closed wallets can be used only for buying goods and services from a particular merchant. Refunds have to be used for further transactions with same merchant. No redemption or cash withdrawals are allowed. A mobile wallet is the digital equivalent of a physical wallet in which we store cash and make payments from. It is your electronic prepaid account, which can be used to pay for anything from grocery to movie tickets without having to swipe a card. Paytm, Mobikwik, Freecharge, PayU, Oxigen and Citrus are a few leading mobile wallet companies in India. While the leading players are talking about growing market share, many smaller ones too are entering the market to grab their pie. With different wallets and their significance as background, the primary objective of this paper is to identify the factors influencing youngsters towards digital wallets and rank the challenges faced by them while using these wallets. The study also has other objectives which is stated in the later part of this research paper.

## 2. REVIEW OF LITERATURE

Poonam Painuly and Shalu Rathi (2016) in their research paper "Mobile wallet :An upcoming mode of business transaction "have analysed that ease of transaction ,secured profile and convenience in handling application put forth the benefits of wallet money and also concluded that business sectors like banking ,retail, hospitality etc., are making use of wallet money and mobile payment instruments including contactless and remote payment in

the customers –business and customers to customers areas

Dr.Hem Shweta Rathore (2016) in her research paper "Adoption of Digital wallet by consumers" have analysed about the factors that influence consumers in adoption of digital wallet and also analysed the risk and challenges faced by consumers in usage of digital wallet and concluded that shoppers are adopting digital wallet largely due to convenience and ease to use and in the future years digital wallet will gain more widespread acceptance.

Rajesh Krishna Balan, Narayan Ramasubbu, Giri Kumar Tayistudied in their paper "Digital Wallet: Requirements and Challenges" (2006) that the requirements and challenges of deploying a nationwide digital wallet solution in Singapore. Further they discussed why Singapore is ready for a digital wallet and identify the key challenges in building and deploying a digital wallet. Then discussed one of the key challenges, supporting peer -to-peer cash transactions between individuals using a digital wallet, in more detail and end the paper with their proposed solution. Studying adoption, Venkatesh, et al.(2015) explored the variables affecting consumer integration of new information technology innovations. They collectively formed a model called the Unified Theory of Acceptance and Use of Technology (UTAUT) and suggested that individual reactions to using information technology directly affect intentions to use information technology that in turn influences the actual use of information technology.

Lu, Yao and Yu (2005) suggested that behavioral sciences and individual psychology are strong determinants of adoption of mobile technology. They suggested that while perceived usefulness and perceived ease of use are strong variables in consumer willingness to adopt mobile technology, variables such as personal innovativeness and social influence must also be taken into consideration in determining consumer acceptance.

Carlsson, et al.(2006) explored the variables concerning adoption rates of mobile devices and services, conducted by testing the applicability of the UTAUT model. They found that variables such as performance expectancy, effort expectancy, and attitude toward using were directly related to behavioral intention.

Lin and Wang (2006) examined the factors that contributed to customer loyalty in mobile commerce; perceived value and trust were found to be directly related to customer satisfaction and customer loyalty; customer satisfaction was also suggested to positively affect customer loyalty; and habit was proposed to determine customer loyalty. They also found that customer loyalty was directly affected by perceived value, trust, habit, and customer satisfaction. Customer loyalty was evaluated to be a strong determining factor in acceptance of mobile commerce.

Pavlou, et al.(2007) studied the drivers of consumers to participate in mobile commerce by examining three interrelated behaviors including getting information, giving information, and purchasing with mobile devices. Mobile purchasing involves a satisfying exchange relationship between products/ services offered and the mobile device that uses WAP (Wireless Application Protocol).

Pousttchi and Wiedermann (2008) evaluated what key influences affected consumers to use mobile payments and found that subjective security was not a primary driver of mobile payment acceptance. They found that perceived confidentiality of payment details and perceived trustworthiness were strongly correlated. Four key variables were found to directly impacting consumer intention and usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions.

Mbogo (2010) studied the various factors that contribute to success with use of mobile payments within micro businesses in

Kenya, concluding that convenience of the money transfer technology plus its accessibility, cost, support and security factors are related to behavioral intention to use and actual usage of the mobile payment services.

Shin (2009) examined mobile wallet adoption by using the UTAUT model and proposed four additional constructs of security, trust, social influence, and self-efficacy. He confirmed that familiar factors such as perceived usefulness and ease of use are key determinants toward consumer acceptance and that consumers' attitudes toward accepting mobile wallets are strongly influenced by perceived security and trust. They found that perceived security and trust are key determinants in customer intention to accept mobile wallets, which in turn determines user behavior. The research results also suggested that security and trust are enhanced by social influence.

Chen (2008) examined which determinants affected consumer use of mobile payments (m-payments). Consumer acceptance was determined by four factors: perceived use, perceived ease of use, perceived risk, and compatibility. The strongest factor to sway consumer acceptance was compatibility. Compatibility refers to the extent to which mobile payment is consistent with the prospective user's lifestyle and the way he or she likes to shop

### **3. STATEMENT OF THE PROBLEM**

Digitalization is increasing in our country. Government is encouraging a cashless society. Large number of purchases by consumers is made online. While cash on delivery option is still available, many prefer to make payments online through digital wallets. Understanding the prevailing situation, many wallet companies offer different benefit which induces consumers to use their wallets. Thus there is a need to identify the factors that influence youngster to adopt digital wallets.



#### 4. SCOPE OF THE STUDY

The study titled “A Study on factors influencing youngsters towards digital wallets in Chennai city” as indicated by the title is limited to the respondents in Chennai city. Further the study considers youngsters between the age group of 21 and 30 for its responses to conduct data analysis and arrive at findings of the study.

#### 5. RATIONALE OF THE STUDY

Various research studies were carried out regarding the consumer perceptions towards digital wallets. These studies focused on the most preferred digital wallets among the Indian consumers. However very few research studies tried to focus on the most preferred digital wallets among youngsters. This study is unique not only because it identifies the most preferred digital wallets among youngsters but the study also groups the various factors influencing youngsters towards use of digital wallets while at the same time ranks the challenges faced by them in while using digital wallets. Thus the study takes itself the neutral position rather than producing single sided results.

#### 6. OBJECTIVES OF THE STUDY

- To understand the importance of digital wallets in current scenario.
- To identify the most preferred digital wallet among youngsters in Chennai city.
- To identify the factors influencing adoption of digital wallets by youngsters.
- To rank the challenges in using digital wallets.
- To offer suggestions on overcoming the identified challenges in using digital wallets.

#### 7. SIGNIFICANCE OF THE STUDY

This study seeks to benefit wallet companies as it identifies the most preferred digital wallets among youngsters and groups the various factors influencing to use digital wallets. The following are the beneficiaries of the study

#### Digital wallet Financial Technology Companies

This study will enable digital wallet financial technologies companies to plan their marketing programs in such a way that the concerned wallet better satisfy their customer needs. The study identifies the most preferred digital wallets among youngsters in Chennai city. This will help them to have an idea about current market scenario and challenges identified by the study will help the wallet companies to understand the difficulties faced by the customers and companies can work these aspects so that customers do not face the same difficulties in the future.

**Government:** Some of the challenges identified by the study cannot be overcome without the active cooperation of the government. As such, this study also benefits government as it enables them to understand the challenges faced while using wallets and helps them to take necessary actions to overcome those issues.

#### 8. RESEARCH METHODOLOGY

The data required for this study is collected from both primary and secondary sources.

##### SOURCES OF DATA

##### Primary data

Primary sources are original sources from which the researcher directly collects the data not collected earlier. The data obtained from these sources are called primary data. The primary data for the study is collected through survey method using structured questionnaire.

##### Secondary data

The secondary sources represent those data that has been already collected and compiled for some other purpose. The secondary data for the study has been collected from various books, magazines and journals related to banking and finance.

##### SAMPLING DESIGN

**Sample Size:** The Sample represents the unit of the population under the study. The determination of sample size is important task

for the researcher as it will have a significant impact on the results arrived by the study. The sample size for the study is 300 respondents from Chennai city. The sample size for the study is arrived through G-power statistics 3.1 software which helps in determining the sample size based on the analytical tool used for the study. The sampling adequacy is also tested through KMO test along with factor analysis and the results indicate a good consistency in the sample used for the study.

**Sampling Technique:** This research study is based on Stratified random sampling method. Under this method, the researcher divides the entire population into strata and selects one particular stratum for conducting research study. Lottery method has been used to select the strata. The population is divided into four strata based on the age group namely 21- 30, 31- 40, 41- 50 and Above 50 and the first strata is selected for the study.

**10. DATA COLLECTION**

**Field work:** The data for the study has been collected during the month of November 2017 in Chennai city. At most care has been taken to ensure that all the respondents come under age category suitable to be classified as youngsters. Further it should also be noted that the

respondents are not chosen on hit and mass basis and they are surveyed ensuring that they have a sufficient exposure to digital wallets and its benefits. The surveyed areas include perungalathur, Tambaram, Tharamani and Guindy.

**Data processing and Analysis plan:** To enable the data suitable for further analysis, all the efforts are taken at the framing of questionnaire itself so that it lends itself easy for factor analysis. The questionnaire is framed using Likert’s five point scales to ensure the scales are ordinal in nature which is one of the conditions to be satisfied to perform factor analysis. The statistical design used in this study is **factor analysis with Varimax rotation**. Factor analysis is an extremely powerful to approach psychological, behavioral, and financial and other types of data. It is a statistical technique for determining the underlying factor for large number of variables used in the study. It should be noted that the factor analysis is done through SPSS 21 version software and principal component method is used to conduct the analysis.

**TESTING VALIDITY AND RELIABILITY OF FACTORS USED FOR THE STUDY**

**Validity Testing**

**Table 1 Showing the validity analysis of the variables used for the study**

Correlations					
		Factor1	Factor2	Factor3	Overall Factor
Factor1	Pearson Correlation	1	.392**	.313**	.848**
	Sig. (2-tailed)		.000	.002	.000
	N	300	300	300	300
Factor2	Pearson Correlation	.392**	1	.272**	.740**
	Sig. (2-tailed)	.000		.006	.000
	N	300	300	300	300
Factor3	Pearson Correlation	.313**	.272**	1	.609**
	Sig. (2-tailed)	.002	.006		.000
	N	300	300	300	300
Overall Factor	Pearson Correlation	.848**	.740**	.609**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	300	300	300	300

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 1 shows the validity analysis of the variables used in the study. The term overall

factor represents the all the factors affecting youngsters towards digital wallets. The validity

of the each factor can be studied with reference to its significance with the overall factors affecting the youngsters to use digital wallets. The factor 1, 2 and 3 seems to have significant relationship with the overall factors affecting the study. The significance value of factor 1 is .000 which indicates that it is highly significant with the overall factors influencing the youngsters affecting digital wallets at 1% significant level.

**Table 1.1 showing Reliability of the variables used for the study.**

Reliability Statistics	
Cronbach's Alpha	N of Items
.738	10

Table 1.1 shows the results of the reliability analysis of the variables used for the study. Reliability analysis is the analysis technique of testing the consistency of the variables used for the study. Cronbach's Alpha is considered to be the good measure of internal consistency of scales. The Cronbach's Alpha value is 0.738 indicating moderate level of internal consistency of scales used for the study. The sampling adequacy of the study is tested along with the factor analysis indicating 0.730 which is also moderately significant.

## 12. RESULTS AND DISCUSSIONS

**TABLE 2 SHOWING DESCRIPTIVE STATISTICS ON MOST PREFERRED DIGITAL WALLETS BY YOUNGSTERS**

Digital Wallets		
	Frequency	Percent
Pay Tm	126	42.0
Airtel Money	84	28.0
Free Charge	27	9.0
Others	24	8.0
HDFC Payzap	18	6.0
OLA Money	9	3.0
State Bank Buddy	6	2.0
Citi Master Pass	3	1.0
ICICI Pockets	3	1.0
Total	300	100.0

### INTERPRETATION

Based on frequency and percentage analysis, it is clear that Pay Tm is the most preferred and used digital wallets among youngsters in Chennai city. Nearly 42% of the

respondents prefer pay Tm digital wallet for payment transactions. Followed by Pay Tm, Airtel money is the second most preferred digital wallet among Chennai city as 28% of the respondents use airtel money next to Pay Tm. Pay Tm is most preferred because of its convenience in using and the company much utilized the opportunity at the time of demonetization. In fact, it was most accepted digital wallets among retailers in Chennai city. Further they came up with so many offers to initially attract customers and finally better satisfied the customers. Airtel money is also preferred because of the variety of options and facilities it offers to the customers. Further it encourages its own customers to use their wallet. Since Airtel is one among the top telecommunication companies and with considerable size of market share along with company's good reputation with customers, it is able to make airtel money reach customers with much less marketing efforts

### FACTOR ANALYSIS

**Table 3 shows the results of KMO and Bartlett's Test**

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.730
Bartlett's Test of Sphericity	Approx. Chi-Square	190.941
	Df	45
	Sig.	.000

**Source: Computed Data**

The table 2 shows the results of the KMO and Bartlett's Test of sampling adequacy. The dependence of the considered variables is measured by the Kaiser-Meyer-Olkin measure of sampling adequacy which is based on chi square distribution. The computed test value 190.941 indicates a minimal probability of 0,0001 of being wrong by rejecting the null hypothesis that the correlation matrix is not statistical different from an identity matrix. Kaiser- Meyer-Olkin divides the sum of squared correlation values to the sum of partial correlation values with the purpose of estimating the amount of common variance of the considered data set. Kaiser (1974) settles

that a test value above 0.5 is proper for continuing the analysis. The KMO value of 0.730 computed for the considered data set is

due to the large partial correlation coefficients between variables.

**Table 3.1 shows the Total variance Explained**

Total Variance Explained									
Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.097	30.966	30.966	3.097	30.966	30.966	2.049	20.487	20.487
2	1.341	13.414	44.380	1.341	13.414	44.380	2.006	20.061	40.548
3	1.200	12.004	56.384	1.200	12.004	56.384	1.584	15.836	56.384

Source: Computed Data

The table 3.1 shows the total variance of the factors used for the study. It can be noticed from the above table that two components (the three factors) contain 56.384% of the total variation of the extracted factors. Field (2005) recommends to retain those factors with an

Eigen value higher than 1 (the initial variables were standardized, having therefore a variation of 1, thus a factor's Eigen value of more than 1 explains more than a single factor variable. The procedure is followed by retaining the three factors.

**Table 3.2 shows the rotated component matrix**

Rotated Component Matrix <sup>a</sup>			
	Component		
	1	2	3
Offers and Discounts	.724		
Synchronization of data	.680		
Locating stores	.574		
Superior shopping experience	.573		
Reduce queuing time	.531		
Low Risk factor		.720	
Free transfer of money		.715	
Increase transaction security		.536	
Reduce burden of carrying physical wallets			.852
Faster transactions			.729
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 10 iterations.			

Source: Computed Data

The various factors influencing youngsters towards usage of digital wallets are as follows

**INTERPRETATION**

Interpretation of results has two parts namely, statistical interpretation and subjective interpretation. The statistical interpretation is discussed below the various tables for factor analysis and subjective interpretation is discussed below. Based on the loadings in the rotated component matrix, the factors are labeled accordingly.

**FACTOR I : PROMOTION MIX INFLUENCERS**

Offers and Discounts is the one of the major promotional tools used by the wallet companies to attract customers to use their digital wallets. Understanding the local consumer behavior is the important task to be undertaken by the company. In fact the success

of a company depends on how well it takes advantage of the local consumer behavior. However it should be noted that offers and discounts are just a way to attract the customers but the lifetime success of the companies depend on perceived service quality of the customers.

Digital Wallets enables synchronization of data. Data synchronization enables customers to use data available locally rather than those to use data that are expensive, less reliable and sometimes may get lost due to slow connections. Thus it improves response time for data request as the retrieval rates become faster on one side and processing time is decreased on the other side.

Digital wallets are not only used in making payment options but also help in locating the nearby store for customers. This benefit the customers as they need not spend much of their time in searching a appropriate store from where they can get their product that best satisfies their needs. So store locating advantages also influences youngsters towards digital wallets.

Superior shopping experience is one of the advantages of using digital wallets. Now a days trials and samples of the products are displayed online. So the disadvantage of inability to examine physical product is also now overcome through better strategies of marketers. So shopping through digital wallets offers superior shopping experience as in the case of physical store visit shopping.

The biggest and basic advantage of digital wallet is that it reduces queuing time in the retail store. Previously customers have to wait in long queues after their shopping in order to make payments at the cash counter. Much of the time of customers will be wasted by standing in long queues. Now this is avoid as customers can scan the bar codes made available in front of the store and make payments easily. However it should be noted

that payment modes are different in terms of different digital wallets.

## **FACTOR II: PRIVACY ISSUES**

Carrying physical cash may lead to number of risks like theft, robbery and other criminal activities. Digital wallets help to reduce these risks to some extent. Low risk factor of digital wallets because electronic money much of the customers money cannot be looted unless and otherwise the criminals are tech savvy. This influences youngsters towards use of digital wallets.

Digital wallets enable free transfer of money. Money can be transferred to any person or can be received from any person at any time because of the availability of digital wallets for the whole time. This is particularly useful when the individual has to make or transfer money in case of emergency situations caused by happening of emotionally affecting events like accidents, marriages etc. This induces youngsters to use digital wallets.

Increased transaction security is one of the key advantages of the digital wallets. This is because several password, security questions and alphanumeric codes are requested to make payments. This ensures that the particular transaction is carried out in safe and secure manner.

## **FACTOR-III: CONVENIENCE FACTORS**

Digital wallets reduce the burden of carrying physical wallets to the retail store. This is because customers can make payments from their home and need not necessarily have physical cash to make payments. Further it also reduces much of risks associated with the physical wallets caused due to negligence and demographic variables in case of old aged people. Many working youngsters do not find much time to withdraw funds from the bank because of working conditions and digital wallets are of fruitful advantage to the youngsters.

Further digital wallets enable financial transactions faster and easier. This is because

much of the payments can be made within few seconds and all the parties involved in financial transactions get benefitted because of the

convenience it offers for the customers. The statistical results of the rotated component matrix is shown by the table 3.2

**TABLE 4 SHOWING THE RANKING OF CHALLENGES FACED WHILE USING DIGITAL WALLETS**

<b>Challenges in Digital Wallets</b>			
	<b>Mean</b>	<b>Std. Deviation</b>	<b>Rank</b>
<b>Inability to access</b>	<b>4.11</b>	<b>1.543</b>	<b>1</b>
<b>Difficulty in transferring money to different payment system</b>	<b>3.99</b>	<b>1.508</b>	<b>2</b>
<b>Reimbursement of money</b>	<b>3.55</b>	<b>1.540</b>	<b>3</b>
<b>Purchase can be made only from compatible retailers</b>	<b>3.43</b>	<b>1.641</b>	<b>4</b>
<b>Security Concerns</b>	<b>2.72</b>	<b>1.558</b>	<b>5</b>
<b>Network Issues</b>	<b>2.55</b>	<b>1.702</b>	<b>6</b>

Source: Computed Data

**INTERPRETATION**

Based on Mean score of 4.11, it is cleared that the inability to access to digital wallets is the major challenge faced by the respondents. This problem is quite often when the wallet is used for the first time but gradually reduces as frequency of usage increases. The next challenge is difficulty in transferring the money to different payment system. This is because payments were enabled for similar payment system rather than different payment system. In other words, some payments does not support particular wallet and are wallet specific. This hinders customers from transferring payments to different payment system. Reimbursement due to false payments or due to failure on the part of counter party takes much time. Though the transactions are made faster reimbursement takes a considerable period of times which frustrates customers with immediate need for money.

Digital Wallets are not available at all the retailers. Some small retailers still preferring cash transactions while other are accepting cards. Very few retailers accept digital wallets as payment mode. This is one of the major challenges faced by the youngsters while using the digital wallets. Security concerns are another important common concern which is faced while using electronic

money and network issues reduce the transaction speed and success.

**MANAGERIAL IMPLICATIONS**

The study throws valuable insights to the decision makers of digital wallet companies regarding various challenges faced by the youngsters while using digital wallets. Marketing team of Pay Tm and Airtel Money can feel happy as they the top two most preferred digital wallets in Chennai city among youngsters today. However the decision makers should ensure that various challenges for example difficulty in transferring money should never arise in future and the various challenges identified by the study can either be due to negligence on the part of the digital wallet companies or due to infrastructure facilities available in Chennai. If this so, government should take steps to improve or upgrade present IT based infrastructure facilities to facilitate digitalization process. The study also throws lights on various factors influencing youngsters towards digital wallets which can be used by the marketing managers to plan their marketing programs especially 4Ps of marketing emphasizing the competitive advantage they have compared to other players in the market.

**CONCLUSION**

To conclude, digital wallets has got big role to play digitalization driven economy. However initial concerns and queries have to be

addressed while moving towards digitalization. It lowers cost and act as a competitive advantage for the companies as a differentiating strategy. It also offers convenience in the form of faster check outs at the retail stores. This study finally enabled to get a practical touch with the topic and enabled to understand the benefits and challenges in using digital wallets.

### 13. SCOPE FOR FURTHER RESEARCH

1. The study can be replicated with different target population as the respondents. It might result in coming out with some more different factors than what is being identified by the study.
2. The study can be replicated with different perspective by studying the significance of technologies in management process like recruitment and selection process.
3. The study can also be replicated by studying the impact of marketing efforts of digital wallets companies in influencing youngster's preferences towards digital wallets.

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# Work Life Balance in the Context of Time Management

S.Muthulakshmi and P.Sundara Pandian

*Department of Commerce, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.*

**Abstract - Purpose :** The paper considers the impact of work life balance in the context of time management To analyze the problems faced by the managerial women in managing their time. To know the satisfaction level of women managers in time management. To provide suggestions to manage their time in an effective manner.

**Design/ methodology/ approach:** The paper is a empirical research on work life balance and Time Management. It involves women managers The overall aim of this study is to explore time pressures of managerial women with regard to their family and managerial roles in service sectors in Tamil Nadu. The study intends to portray the experiences of the women managers in their dual role performance. The study also seeks to examine suitable suggestions to manage their time in an efficient manner. **Findings:** It is argued that women managers face a difficult task in balancing their time. Thus it can concluded that managerial women strive hard to manage their time to effectively balance their work and life. **Practical Implications:** Deeply ingrained social assumptions about time management. The time based factors and the satisfaction level towards work life balance is examined. **Originality/ Value:** The paper moves forward the debate of work life balance in the context of time management. The managerial women must be self- motivated, follow and achieve effective time management.

**Keywords:** MSME, Growth, Performance, Problems

## 1. INTRODUCTION

The growing number of educated women in India - who are now participating in the urban, organized, industrial sector in technical, professional and managerial positions has been accompanied by the a steady growth in dual career families (Kommaraju 1997). Research on career women in India shows that work and family dilemmas are often different from those reported by women in the west (Sekaran 1986). As compared to their counterparts in other parts of the world, Indian employees face a lot of difficulties in managing their work and life.

The human resources approach to issues of life work balance various according to institutional sectors, individual organizational policies and historical practices. In most of the societies, work life conflict seems to be quite high in case of working women. Although men

also face this challenge of balancing work and other priorities, it effects women more since they do most of the work associated with the household activities, apart from taking care of children, older family members and other dependents. Though multiple roles in work and family can be the source of multiple satisfaction for employed women. The centrality of family as an institution in the Indian culture is an important contextual note in this research (Carlson and Kacmar 2000). The family role structures and larger societal beliefs within this society can generate gender-based social pressures whereby men are expected to excel in their career and for women to be a good mother, good wife and good homemaker even if she is working in full employment.

## 2. TIME MANAGEMENT AND WORK-LIFE BALANCE

The greatest problem of a managerial woman is the time constraint to cope up with multiple activities. The problem of coping with multiple activities in a limited time has affected the managerial women personally because one have to stay late in office which amounts to a lot of physical strain as well as neglect home responsibilities. Women are affected professionally as it is difficult to finish projects on the given deadline because of the limited time available to them which causes stress. This leads to crashed expectation from the superiors as they expect a lot out of them. Therefore, managerial woman are constantly under pressure to prove them. Managing time better, therefore, implies a philosophy and a strategy to apportion equitable time for physical, mental, emotional, spiritual, familial, social and professional demands and responsibilities of life, and to get the best value of time through proper planning and prioritising.



### 3. REVIEW OF LITERATURE

Brady (2002) noted that technological revolution which was supposed to free people from the office has in practice eroded the boundaries between work and leisure, giving greater prospects on individuals to work at anytime and anywhere. Women in dual role, negotiate housework and childcare by providing support to their relationships. The multiple roles create negative implication for women but not for men. Over a period of time women started losing interest in anything that is related to work. This syndrome is conventionally called 'Burnout' and academically is researched as 'Work and life balance'.

Greenhaus et.al. (2003) has comprehensively defined the work life balance as 'The extent to which an individual is equally engaged in and equally satisfied with ones work role and family role'.

The definition of work and life balance covers the positive and negative balance. Work and family balance is further categorized by Greenhaus et.al (2003) as:

- Time Balance – Equal amount of time spent between work and family.
- Involvement Balance – Equal Level of psychological involvement in work and family roles.
- Satisfaction Balance – Equal amount of satisfaction with work and family roles.

Van Fleet and Saurage (1984) in their research findings stated that although women can embark on a business career, they experience difficulty in shedding their role as housewife or mother. Today's working women is torn between a career and the home. Every woman has a dream- a dream of success and fulfillment, be it at home or in any other field. Like a man, she too has a purpose and an aim in life. In case of working women, even when the husband is co-operative, the children self-sufficient, the fact remains that women cannot devote as much time as they would like to their

home life. While some women accept this and start believing in quality time others are continually ridden by feelings of guilt, especially in regard to their children. Many working women suffer from guilt. They hold themselves solely responsible for their child behaviour, illness or failures.

Fischer (2004) in his doctoral work, suggested that work life balance includes both work/ personal life interference as well as work/ personal life enhancement. In a nutshell, it can be said that "Work life balance is about people have a measure of control over when, where and how they work, leading them to be able to enjoy an optimal quality of life". Work life balance is achieved when an individual's right to fulfill life inside and outside paid work is accepted and respected as a norm, to the mutual benefit of individual, business and society.

### 4. OBJECTIVES OF THE STUDY

The overall aim of this study is to explore time pressures of managerial women with regard to their family and managerial roles in service sectors in Tamil Nadu. The study intends to portray the experiences of the women managers in their dual role performance. The study also seeks to examine suitable suggestions to manage their time in an efficient manner.

1. To analyze the problems faced by the managerial women in managing their time.
2. To know the satisfaction level of women managers in time management.
3. To provide suggestions to manage their time in an effective manner.

### 5. RESEARCH DESIGN

The present study attempts to examine the time management of the women managers and identify the factors that lead to work life imbalance. Empirical research is carried in the present study -

1. To test the hypotheses based on existing knowledge on research findings regarding managerial women.

2. To know the association between the dependent variable and the independent variable.

Primary data was collected and used in the present research. The primary data was collected from women managers in Tamil Nadu by using the interview schedule method by structured questionnaire. The secondary sources of data for this study were collected from journals, souvenirs, books and publications in newspapers and articles presented in workshops and seminars.

**5.1 Sampling Design**

The present study is based on the responses elicited from the selected managerial women in Tamil Nadu. For the purpose of identifying the target population, the researcher has selected five industries namely Banking, Insurance, IT & BPO, Hotel and Communication sector. From the list of companies who agreed to co-operate with the research work, 20 companies from each sector were randomly selected. However, care is also taken in the selection of companies so as to represent the major cosmopolitan cities of the state.

The table furnished below exhibits a detailed account of the selection of respondents in all the five industrial sectors.

**Table – 1 Distribution of the Respondents according to the Sectors**

Sector	Companies	Number of Respondents	%
Banking	20	108	21.6
Insurance	20	104	20.8
IT and BPO	20	103	20.6
Hotel	20	98	19.6
Communication	20	87	17.4
<b>Total</b>	<b>100</b>	<b>500</b>	<b>100</b>

Source: Primary Data

Different service sectors were chosen for the study. The respondents of the present study belong to the fields of Banking, Insurance, IT & BPO, Hotel and Communication sector. With regard to sector

wise classification of the respondents, it is evident that 21.6 percent of the respondents belong to banking sector, 20.8 percent of the respondents are working in the Insurance sector, 20.6 percent of the respondents are working in IT & BPO sectors, and 19.6 percent are in Hotel sector and 17.4 percent are working in Communication sector.

**6. ANALYSIS OF DEMOGRAPHIC FACTORS AND TIME MANAGEMENT**

Managing time is not an easy task especially for the women who are taking care of both the responsibilities of household and outdoor work. The traditional pull in Indian women remains unabated. For working women, family priorities are expected to prevail over their work. Indian women appear to face more cultural pressure to 'drop out' of their careers after marriage or after having children. Married women face guilt of leaving their children at home when they are at work and many face responsibilities of taking care of their elders. Abraham (2002) stated that women who work, carry a double load as employee and housewife. They are supermoms playing varied roles and reconciling between tradition and modernity. The greatest danger resulting from woman being career-oriented was disharmony within her family. Even the so-called 'Modern Husbands' expected the wife to serve him and the household irrespective of the fact that she was a working woman. The following table shows how demographic factors influences in managing their time.

**6.1 Marital Status and Time Management**

Women managers had major concerns about their work overload, showing that the quality of family life suffers because of that workload. Time pressure is the greatest problem for women managers in their dual role performance. Overtime spent at the working place takes away quality time they could have with their children. A few respondents remarked that even when they get some free time; they wanted to read to their children, to

play with them or to take them out, it so happens that they cannot keep their eyes open to do it. It can therefore be concluded that it is the women's regard for familial roles that determine the ease or difficulty associated with dual role, the greater the identification the greater would be the difficulty and vice-versa.

The following table denotes the satisfaction of time management among married and unmarried women managers.

**Table – 2 Satisfaction with Time Management**

Satisfaction Level	Marital Status		Total
	Married	Unmarried	
Highly Satisfied	30 (10.1%)	100 (48.5%)	130 (26.0%)
Satisfied	44 (15.0%)	30 (14.6%)	74 (14.8%)
Neither Satisfied nor Dissatisfied	57 (19.4%)	30 (14.6%)	87 (17.4%)
Dissatisfied	77 (26.2%)	26 (12.6%)	103 (20.6%)
Highly Dissatisfied	86 (29.3%)	20 (9.7%)	106 (21.2%)
<b>Total</b>	<b>294</b> <b>(100.0%)</b>	<b>206</b> <b>(100.0%)</b>	<b>500</b> <b>(100.0%)</b>

Source: Primary Data

It is evident from the above table that compared to unmarried respondents married respondents due to their dual-role performance are not satisfied with their time management. It is found that among the unmarried respondents 48.5 percent of the respondents are highly satisfied with the time management when compared to married respondents only 10.1 percent of them are highly satisfied. It is also noted that 29.3 percent are highly dissatisfied compared to unmarried respondents which were 9.7 percent.

Chi-Square test was applied to know the association between time management and marital status.

H0: There is no significant association between the satisfaction on time management and the marital status of the respondents.

H1: There is a significant association between the satisfaction on time management and the marital status of the respondents.

**Table – 3 Associations between Satisfaction with Time Management and Marital Status**

Factor	Time Management
Calculated Chi-square Value	30.487
Table Value	9.49
Degrees of freedom	4
Level of Significance	Significant at 5%

Source: Computed Data

The chi-square test reveals that the calculated chi-square value (30.487) is greater than the table value (9.49) and the result is significant at 5 percent level. Hence the null hypothesis is rejected and alternative hypothesis is accepted. There is a significant association between time management and the marital status of the respondents. It can be concluded that married women are not satisfied with their time management.

## 6.2 Marital Status and Planning

Planning bridges the gap between where one is now and where to be at some future point. This will enable one to connect to the future points with today.

**Table – 4 Planning Vs Execution**

Performance	Marital Status		Total
	Married	Unmarried	
Execution as per plan	109 (37.1%)	132 (64.1%)	241 (48.2%)
Execution not according to plan	185 (62.9%)	74 (35.9%)	259 (51.8%)
<b>Total</b>	<b>294</b> <b>(100%)</b>	<b>206</b> <b>(100%)</b>	<b>500</b> <b>(100%)</b>

Source: Primary data

It is inferred that out of 294 married respondents, 62.9 percent are not able to perform according to their plan. This is due to their heavy dual workload at office and at home. Working women are being simultaneously confronted with the multiple demands of home and profession. In the processes of adjustment between these two roles married women are unable to perform their task according to their plan. The spillover effect is common for married respondents.

Chi-Square test is applied to know the association between the marital status of the respondents and their performance according to plan.

H0: There is no significant association between the marital status of the respondents and their performance according to plan.

H1: There is a significant association between the marital status of the respondents and their performance according to plan.

The following table shows the association between the marital status of the respondents and their performance according to plan.

**Table – 5 Associations between Marital Status and Performance According to Plan**

<b>Factor</b>	Marital status
<b>Calculated Chi-square Value</b>	35.374
<b>Table Value</b>	3.84
<b>Degrees of freedom</b>	1
<b>Level of Significance</b>	Significant at 5%

Source: Computed Data

The chi-square test reveals that the calculated value (35.374) is greater than the table value (3.84) and the result is significant at 5 percent level. Hence the null hypothesis is rejected and the alternative hypothesis is accepted. So, the hypothesis that there is a significant association between the marital

status of the respondents and their performance according to the plan holds good.

**6.3 Personal Interest and Hobbies among Sectors**

Women managers even though they are interested in their personal interest and hobbies are not able to spare time for it. Prior research (Mainiero 1994; Lyness & Thompson 2006) indicates that the ambition and involvement of working women causes them to make sacrifices and compromises in their personal lives as consequences of their high profile careers. This in turn impacts their work life balance. Women were not able to pursue personal interest due to the commitments of work and family that were imposed on them.

Women were willing to make sacrifices for the greater cause of achieving work family balance by forgoing their personal interest and hobbies. The table below states the satisfaction level of the respondents towards their involvement in personal interest and hobbies.

**Table – 6 Personal Interest and Hobbies**

Satis facti on level	Sector					Total
	Bank	Insurance	IT and BPO	Hotel	Communication	
Highly satisfied	18 (16.7%)	11 (10.6 %)	15 (14.6%)	8 (8.2%)	8 (9.2%)	60 (12%)
Satisfied	21 (19.4%)	4 (3.8%)	18 (17.5%)	13 (13.3%)	20 (23.0%)	76 (15.2%)
Neither satisfied nor dissatisfied	20 (18.5%)	31 (29.8%)	29 (28.2%)	19 (19.4%)	14 (16%)	113 (22.6%)
Dissatisfied	28 (25.9%)	17 (16.3%)	20 (19.4%)	36 (36.7%)	22 (25.3%)	123 (24.6%)
Highly dissatisfied	21 (19.5%)	41 (39.5%)	21 (20.3%)	22 (22.4%)	23 (26.4%)	128 (25.6%)
<b>Total</b>	<b>108</b>	<b>104</b>	<b>103</b>	<b>98</b>	<b>87</b>	<b>500</b>

Source: Primary Data

It is inferred from the table that in Hotel sector, 59.1 percent of the respondents are dissatisfied with their time spent for personal interest and hobbies. It is also noted that 55.7 percent of the respondents working in Insurance sector, and 51.7 percent of the respondents working in Communication sector are dissatisfied with their time spent for personal interest and hobbies. It is also noted that 50.2 percent of women managers totally

are dissatisfied with the time spend for personal interest and hobbies. Thus, it can be concluded that women employees are not able to spend their time for personal interest and hobbies which they pursue as interesting.

**7. TIME BASED CONFLICT**

Time based conflict arise when time spent on role performance in one domain precludes time spend in the other domain

because of depletion of energy or stress (Greenhaus & Butell 1985).

Working women face the challenge of prioritizing their time. Time management becomes critical for working women who must devote 40 -50 hours a week to do a job. In the book, 'Working Mom's: How to Manage Kids, Career & Home', author Michelle Larowe notes that many moms with full-time jobs are left with about 40 hours a week to get all of these things accomplished like, cleaning the house, shop for groceries, take care of errands, which may include paying bills and handling financial matters, help kids with homework, be present at kids' activities, spend time with the spouse, spend time with friends and family members and pursue personal interest of any kind.

Research indicates that working wives experience only slight, non-commensurate redistribution of family role expectations and are expected to retain primary home responsibilities (Pleck & Rustad 2005). Fully employed husband and wives do not share household duties equally. Time based factors includes important factors as time management, Multiple roles, personal interest and hobbies, planning vs Execution, Time to travel, Time for vacation and Time for workouts.

### **7.1 Multiple Roles**

Multiple role-playing has been found to have both positive and negative effects on the mental health and wellbeing of managerial women. In certain instances, women wellbeing of managerial women. In certain instances, women with multiple roles reported better physical and psychological health than women with less role involvement (Doress-Wortes 1994). However, multiple roles have also been found to cause a variety of adverse effects on women's mental and physical health, including loss of appetite, insomnia, over indulgence, and back pains (Hughes 1994).

### **7.2 Planning Vs Execution**

Planning helps the women to take advantage of the opportunities as they arise.

The problem in the past is that most of the people have been reasonably successful without much planning. The business climate was positive and reasonably predictable (Merill and Donna 2009). Clearly, it was possible to do well in spite of proper planning. Many have developed a mental block about planning. Women view it as complex, time-consuming activity. Planning need not be a complex undertaking. It means thinking about the future in some systematic way. Hessing (1994)

### **7.3 Time To Travel**

Most of the service organizations are located on the outskirts of cities, and therefore most women managers spend a long time travelling to and fro from their offices. This is a unique problem in the Indian service sectors. Most of the IT & BPO sectors are situated in the outskirts. They require large manpower in order to scale up and grow, and to support such huge workforces, they need lot of space. Exorbitant land prices in cities necessitate their movement to the outskirts.

As activities paid for outside home, replaced a number of activities traditionally performed at home, inevitably more trips were made. Women managers have to travel a long distance for their work after completing their household duties, which leads to strain and ill-health.

### **7.4 Time For Vacation**

Planning a holiday or vacation can be difficult for working women. It can often seem easier to keep on working rather than attempt the task of organizing a family holiday. Leisure time such as holidays and vacations is needed to allow people to dislocate themselves from their work. In a casualised working environment, leisure activities are needed as part of our identity formation and to make sure that all parts of life are lived.

According to Singh and Pandey (2005), the thought of returning from vacation to stacks of files, tons of emails, and unanswered voicemails in today's 24/7 business world

makes many working mothers not to leave for a vacation. In today’s economy, women are afraid to leave on a vacation as they are concerned, they could lose their job because of the demands put on them with heavier workloads since they have seen their departments and companies down sized and have had to pick up that slack. A well-rested worker is a productive one, so one needs to take time for vacation since taking a vacation will help to increase their productivity.

**7.5 Time For Workouts**

Sedentary behavior contributes to an increase in obesity and other health problems. According to the Centers for Disease Control (CDC), overweight individuals are at risk for hypertension, osteoarthritis, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, sleep apnea, respiratory problems, forms of cancer, and reproductive disorders. Working women need to recognize how exercise favorably affects multiple systems, including reducing the risk for obesity,

preventing disease, and decreasing stress. To maintain the health, early morning exercise is very important (Verbrugge 1989). Women have a sedentary lifestyle than men. Women compared to men have no regular exercise routine. Also, as women grow in age, their activity levels decline. Indian women have such problem as dual family earners grows.

**8. IMPACT OF TIME BASED FACTORS AND SATISFACTION LEVEL TOWARDS WORK LIFE BALANCE**

In order to examine the time based factors on the satisfaction of work life balance by the respondents, a multiple regression analysis was undertaken. The dependent variable taken was work life balance. The independent variable selected were multiple roles, personal interest and hobbies, planning vs execution, time to travel, time for vacation and time for workouts. These variables selected were based on the previous studies referred in the literature. The results of multiple regression is presented below.

TABLE – 7

Regression Model Summary for Time Based Factors and Satisfaction Level Towards Work Life Balance

R Square	Source of variation	Sum of Squares	Df	Mean Square	F	Significant Value
.662	Regression	91.384	6	15.231	9.128	.000
	Residual	822.616	493	1.669		
	<b>Total</b>	<b>914.000</b>	<b>499</b>			

Source: Computed Data

$$Y=3.426 + 0.091x1 + 0.113x2 + .006x3 + .193x4 - 0.481x5 - 0.621x6.$$

a) **Predictors (Constant):** multiple roles, personal interest and hobbies, planning vs execution, time to travel, time for vacation and time for workouts.

b) **Dependent Variable:** Satisfaction level towards work life balance.

The power of the regression model is represented by the R<sup>2</sup>. It is healthy with .662, and the F test of the model shows that the significance of the model is high as the significance of F is .000 which is less than .05.

TABLE – 8

Regression Co-Efficients for Time Based Factors and Satisfaction Level Towards Work Life Balance

Demographic factors	Un standardised coefficients		Standardised coefficients	T	Sig.
	B	Std Error	Beta		
Constant	3.426	.429		7.994	.000*
Multiple roles	.113	.042	.116	2.701	.007*
Personal Interest and Hobbies	.006	.051	.005	.123	.903
Planning Vs Execution	.193	.075	.111	2.581	.010*
Time to travel	-.481	.145	-.175	-3.313	.001*
Time for Vacation	-.621	.120	-.224	-5.197	.000*
Time for Workouts	.091	.040	.112	2.270	.023*

Source: Computed Data

\*= Significant at the level of 5 %

From the regression equation, it is clear that multiple roles, personal interest and hobbies, planning vs execution, time to travel, time for vacation and time for workouts are statistically significant at 5 percent level of significance. Thus it can be concluded that managerial women strive hard to manage their time to effectively balance their work and life.

## 9. CONCLUSION

It would be concluded that time management factors ranks as the first important factor by managerial women in balancing work and life. From the above analysis it is clear that married women are unable to manage their time compared to unmarried women. The time based factors such as multiple roles, planning vs execution, time spent for personal interest and hobbies, time to travel, time for vacation, time for workouts have a great impact on the managerial women.

Some techniques could be followed by the managerial women, a SWOT analysis could be conducted by the managerial women. It an individual scan. The findings of SWOT analysis must be incorporated in the process of planning. It must be realistic and feasible. The buffer time for each activity is often overlooked but offers a great deal of help in time management. In professional or personal lives, an elderly or expert advice is like an anchor. A word from those who already been in the situation is a guide for proper planning, avoiding commonly made mistakes. Employees must not feel how about taking advice but rather see that as a learning experience. Talking to people can definitely be motivators to follow the time plan consistently. The enthusiasm shown at the beginning must be shown throughout by the managerial women. Finally, but very important is the commitment by the managerial women to strive for time management. The managerial women must be self- motivated, follow and achieve effective time management.

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# A Study on Work Life Balance in Safe and Healthy Working Conditions among Workers on Knitted Garments Industries in Tirupur District

P.Murugan<sup>1</sup> and R.Rajan Babu<sup>2</sup>

<sup>1</sup>Department of Commerce, Vivekananda College, Tiruvedakam West

<sup>2</sup>PG & Research Department of Commerce, A.V.C. College (Autonomous), Mannampandal, Mayiladuthurai.

**Abstract** – The research paper study the work life balance among the workers of knitted garment industries, analysis the safe and healthy working condition among the workers of knitted garment industries and to find the remedial measures to solve the issues faced by the employees in Tirupur District. This study is based on both primary and secondary sources. The primary data 50 employees were selected conveniently. This paper concluded that the success of any organization depends on the efficiency of labor are increasing the efficiency. The organization promote of Quality of Work Life in the employee. The project indicates the management has taken the job environment into the concern and has done the best to keep their employees happy. A man happy and a happy working atmosphere make a happy man to contribute more.

**Keywords:** Work life balance, Safe and healthy working conditions, Garments industries.

## 1. INTRODUCTION

The development of every business concern is depending on the ability and skill of the employees. So almost all the business concern gives due importance to the welfare of the employees. They try to satisfy the reasonable demands and requirements of the workers. Whenever the employer provides better working conditions to the employees, it will help the management to retain the existing employees and to avoid frequent turnout of the employees from one organization to another. The concern which does not take necessary care about the workers face many problems in the production process like shortage of labor, problems in good finishing of the finished products, delay in supply the finished goods and unrest of the existing employees, etc. Due to globalize era the man power is considered more important in all sectors of the industry. Further in all possible ways the employees are motivated so that they can feel happy and will harmoniously work together to achieve the

target and the long run goal of the organization. Further, the employees can perform their work satisfactorily and they will feel job security when they discharge their duty with commitment. Irrespective of the size and nature of business the employees are motivated by providing better working conditions and reasonable salary and wages based on the work performed by the employees. It is the normal practice followed by the business concerns nowadays. The organization where well-equipped system is adopted by the management to safeguard the interest of the employees there functions of the businesses is carried out successfully which helps to achieve the main objectives of the organization easily.

India being one of the developing countries in the world has potential human power to cope up with all nature of works in industrial sectors. Further, it is reported that the human resources in India is considered as the talented employees in the world. Likewise, the textile industry in India also is familiar for its quality in textile and knitted garments. The employees in textile industry are empowered well by motivating them in all possible ways. However, some of the employers in textile industries did not provide better working conditions to the workers and do not take much care on the welfare of the employees, which led to become sick unit and finally closure of the business. Many cases have been witnessed for the above statement.

Nevertheless, in the recent past in almost all textiles concerns necessary effort has been taken by the management to ensure quality of work life to the employees to avoid

unnecessary turnover of the employees. Until there is frequent turnout in labour force particularly in textile industries as they, (employees) are not satisfied with quality of work life provided by the management. The employees argue that they could not develop personally, as there is no proper motivation and better working condition to the workers. Frequently they are forced to search for another industry for getting job and better working condition in the factory to ensure quality of work life. In all textiles industries both in urban and rural parts of the country similar problem is going on. Though the employers take necessary effort to provide quality of work life, they face many problems in managing the workers. Textile industries in Tirupur district is one of the reputed business concerns in the southern states of India. Tirupur district is not excuse for this issue. The management of the textile and knitted garment industries in Tirupur district frequently faces problems in enhancing quality of work life of employees. Further the employees in Tirupur textile industries are not feeling well regarding the quality of work life prevailing in their work places. What is the reason behind it? Why these are happening? How these problems can be solved? To get proper answers for the above questions a thorough study is to be undertaken. By keeping the above views in mind, the researcher selected the topic “A Study on the Quality of Work Life of Employees in Textile and Knitted Garment Industries in Tirupur District” for his research work.

## **2. OBJECTIVES OF THE STUDY**

- ✓ To study the work life balance among the workers of knitted garment industries of Tirupur.
- ✓ To analysis the safe and healthy working condition among the workers of knitted garment industries of Tirupur.
- ✓ To find the remedial measures to solve the issues faced by the employees

## **3. ORIGIN OF THE CONCEPT OF WORK LIFE BALANCE**

After Industrial Revolution, the importance of human factor reduced because of the vast mechanization. Various problems like job dissatisfaction boredom, absenteeism, lack of commitment etc came up. Most management theories give emphasis on production, manipulating the skills of employees. Tavy stock Institute of Human Relations conducted a research on “workers problems in Industrial world” and they produced a study approach called Socio-technical system in which they gave great importance to “job design” to satisfy human needs adequately and the need for Q.W.L. in an organization was emphasized.

## **4. SIGNIFICANCE OF THE STUDY**

The development of the business concern depends on the skill and ability of the employees in the organization because when an employee works in the same organization for long time, he is specialized in the job in which he is involved. This helps to bring the product with good finishing, which is attracted by consumers. Hence, the organization can easily improve the sales and profit of the organization within short period. Almost all the employers try to satisfy the reasonable necessities of the employees, for retaining the existing employees and to avoid turnout of the employees and provide better working conditions to the employees to maintain better quality of work life of the employees. However, few organizations till do not consider better working conditions of the organization which leads to the frequent turnout of employees. Further it will affect the economic status of the employees as they search for better job in another organization for a long period without employment. The employers also try for skilled labors in various nature of work. If the working condition is made good there is no need for searching of employment by the workers and skilled labors by the employers. As there is more competition for hiring skilled labors it is

the right time to have a thorough study on the quality of work life of the employees to run the organization successfully and to achieve the target of the organization.

## **5. SAMPLING**

As the population for the research work in the study area is numerous, out of the total population, 50 employees were selected for the research work at random by using convenient sampling method. The sample constitutes of employees working in various process of knitted garment industries of Tirupur district.

## **6. DATA COLLECTION**

The data was collected from both primary sources and secondary sources

### **Primary data**

Primary data was collected by framing questionnaire and interview schedule with the sample respondents. Necessary corrections, additions were made in the questionnaire with the help of the experts and supervisor to make the research more effective and useful.

### **Secondary data**

Secondary data was collected from the books and records maintained by the organization and the journals and magazines published in the relevant topic.

## **7. RESEARCH DESIGN**

Descriptive research was undertaken in the research for making the study effective and useful analysis of data and for finding the result in the research.

The knitted boom in Tirupur is recent. Tirupur used to be a center for cotton trading a few decades ago. Over the years a few small units were established to manufacture vests. It was said that the water in Tirupur was of such good quality that the vests made here were the whitest of them all. The fact that the town was located so close to Coimbatore, which was an established knitted manufacturing and trading center, ensured that adequate skills were available. This business grew steadily. It was only in the early 1980s that some enterprising businessman got the idea that the same facilities

could be used to manufacture colored T-shirts, which had become a range all over the world. Tirupur is one of the developed cities India which provides employment opportunities to more than 6 lakhs employees and workers at all level in various processes of textiles and knitted garment industries, and private offices. Hence the employees have more opportunities for investment and savings as they get considerable amount as the family income per month.

## **8. Tirupur and its Industry**

Tirupur is a relatively big town and newly bifurcated district from the Coimbatore district of Tamil Nadu. It has a resident population of around 400,000. An additional 500,000 people come in from nearby towns and from all over Tamilnadu and India to work in Tirupur's booming textile industry. The rainfall in the area is low and erratic. The groundwater in most parts of the town is now polluted through years of effluent discharge by the textile industry. The entire town's economic activity is centered on the manufacture of cotton knitwear: for use as banians (mostly sold in the Indian market), and for use as Tshirts (mostly exported).

Tirupur is one of the well known cities in India which provides employment opportunities to more than 6 lakhs employees in various processes of knitting industries and allied industries of textiles related job , contributes considerable volume of income to our nation through foreign exchange. Most of the employees in Tirupur textiles and knitted garment industries are floated and migrated from various districts of Tamilnadu and also from others states.

If we consider the income source to the normal public, the employees have more sources of income apart from their salary. As it is newly constituted District from Coimbatore and also having more number of export businesses. There are many business units starting from fabrication to packing of manufactured knitted garment material. There

are number of processes involved to make finished goods from the raw material cotton like, spinning, ginning, weaving, spinning/weaving, fabrication, dyeing and bleaching, compacting, streaming, printing and also manufacturing different knitted garments frequently used by all the human being irrespective of the age and tastes of the individual. The employees are scattered in all parts of the district

**9. HYPOTHESIS**

1. There is no association between the age of the respondents and their opinion about the safe and healthy working condition employees
2. There is no association between the educational qualification of the respondents and their satisfaction regarding the facilities provided by the safe and healthy working condition employees

**10. STATISTICAL TOOLS**

To make the research work effective and find the result of the research, the researcher applied the statistical tools like chi-square test, related to the quality of work life, of the employees in knitted garment industries in Tirupur District.

**TABLE 1 AGE WISE CLASSIFICATION OF THE RESPONDENTS**

S.No	Group	No of respondents	Percentage
1	Below 20 years	2	4
2	21 to 30 years	14	28
3	31 to 40 years	16	32
4	Above 40 years	18	36
Total		50	100.0

(Source: Computed from primary data)

Table 1 shown that most (36%) of the respondents belong to the age group of above 40 years,(32%) of the respondents are 21 to 30 years, (28%) of the respondents are 31 to 40 years and the remaining (4%) of the respondents are below 20 years. The age group of 21 to 55 is considered as independent working group and other age’s people are depending to this group. The study shows that

most of the respondents from the age group of working class.

**TABLE 2 GENDER WISE CLASSIFICATION OF THE RESPONDENTS**

S.No	Group	No of respondents	Percentage
1	Male	16	32
2	Female	34	68
Total		50	100.0

(Source: Computed from primary data)

Table 2 clearly indicates that, most (68%) of the respondents are female and the remaining (32%) of the respondents are male

**TABLE 3 MARITAL STATUS OF THE RESPONDENTS**

S.No	Status	No of respondents	Percentage
1	Married	27	54
2	Unmarried	23	46
Total		50	100.0

(Source: Computed from primary data)

Table 3 shows that, most (54%) of the respondents are married and the remaining (46%) of the respondents are unmarried.

**TABLE 4 EDUCATIONAL QUALIFICATION OF THE RESPONDENTS**

S.No	Educational level	No of respondents	Percentage
1	School level	34	68
2	Graduates	9	18
3	P G graduate	2	4
4	Diploma/ITI	5	10
Total		50	100.0

(Source: Computed from primary data)

Table 4 shows that, most (68%) of the respondents has studied up to school level, (18%) of the respondents has completed Under Graduate degree, (10%) of the respondents has completed Diploma/ITI, and the balance (4%) of the respondents has completed Post Graduate degree.

**TABLE.5 MONTHLY INCOME OF THE RESPONDENTS**

S.No	Income	No of respondents	%
1	Below Rs 10,000	38	76
2	Rs 10,001 to 20,000	7	14
3	Above Rs 20000	5	10
Total		50	100.0

(Source: Computed from primary data)

Table 5 indicates that, majority (76%) of the respondents are belong to the income level of below Rs 10,000 per month, and (14%) of the respondents are belong to the income level of 1001 to 20000, remaining (10%) of the respondents, income range is above Rs. 20,000 per month.

### 11. CHI-SQUARE TEST

There are numerous uses for this test. Our example shows its use in the simplest way possible. All chi-squared tests are concerned with counts of things (frequencies) that you can put into categories. There is no significant difference between the observed and expected frequencies. The only difficult part of a chi-squared test is working out what the expected values are. In our example, this is very simple. It can get more complicated in different circumstances. If you use this test, each measurement has to be independent of the others and all your expected frequencies should be bigger than 5.

**The formula for chi square is:**

$$X^2 = \sum \frac{(O - E)^2}{E}$$

**Where:  $X^2$  is the value for chi square.**

**$\Sigma$  is the sum.**

**O is the observed frequency**

**E is the expected frequency**

**TABLE: 6 Chi square analysis between the opinion towards the current status of work life balance and the demographic characteristics**

Characteristics	Chi-square value	Significance
Age	1.650	0.370*
Gender	6.110	0.000
Material status	15.180	0.000
Educational status	11.320	0.000
Income wise	44.410	0.000

(\*  $H_0$  accepted)

**Hypothesis 1:** There is no association between the opinion towards the current status of work life balance and the demographic characteristics of respondents such as gender, marital status, income, age, educational status,

The significance of the Chi square statistic is more than 0.5 for the characteristics such as gender and type of wage marital status,

age, educational level, income wise, so the opinion towards the current status of work life balance is not associated with gender and type of is associated with marital status, educational status, age, and income level at 5%. So the opinion towards the current status of work life balance is affected by demographic and work related characteristics such as marital status, educational status, age, income level of the respondents and is not affected by gender of the respondents

**Table 7 Descriptive statistics for the statements that describe working conditions related aspects**

	Statements	Mean
1.	Workplace, equipment, devices and systems are maintained, in working order and in good condition	4.0518
2.	Enclosed workplaces are ventilated and have enough fresh and purified air.	<b>3.7388</b>
3.	Reasonable temperature is maintained inside the work space	4.2306
4.	Lighting is suitable and efficient and natural	4.0259
5.	Workplaces and furnishings clean without accumulation of wastages	3.9082
6.	Workrooms have enough floor area, height and unoccupied space	<b>4.3153</b>
7.	Workstations are suitable for the worker and work.	<b>4.3247</b>
8.	Floors are even and not slippery	3.8165
9.	Handrails are provided on staircases	3.7835
10.	Pits and tanks are securely covered and fenced where there is a risk of a person falling into a dangerous substance	<b>4.2400</b>
11.	Windows are transparent and translucent surfaces, consist of safe material, are clearly marked, and safe when open	4.1271
12.	Workplaces allow safe traffic circulation	3.8941
13.	Doors and gates are suitably constructed	3.8541
14.	Escalators function safely, are equipped with necessary safety devices	3.9553
15.	Toilets are provided suitably and sufficiently with sanitary conveniences at readily accessible places	<b>3.6494</b>
16.	Washing facilities are provided	<b>3.5224</b>

	sufficiently at readily accessible places	
17.	Adequate supply of wholesome drinking water and cups, readily accessible and conspicuously marked.	3.9835
18.	Sufficient accommodation for clothing, as well as changing facilities where special clothing is worn.	3.8424
19.	Suitable and sufficient rest room facilities at readily accessible places for workers to eat meals	3.9365
20.	Suitable arrangements to protect non-smokers from discomfort	3.9435
21.	Conditions on my job allow me to be as productive as I could be	4.0682
22.	Suitable facilities must be provided for pregnant or nursing workers to rest	3.9482
23.	The safety of workers is a high priority with management where I work	3.9459

(Source: Computed from primary data)

The statement with highest level of agreement is 'Workstations are suitable for the worker and work' with a mean agreement score of 4.3247, followed by 'Workrooms have enough floor area, height and unoccupied space' with a mean agreement score of 4.3153, and the third highest agreement is observed for the statement 'Pits and tanks are securely covered and fenced where there is a risk of a person falling into a dangerous substance' with a mean agreement score of 4.2400. The statement with lowest level of agreement is 'Washing facilities are provided sufficiently at readily accessible places' with a mean agreement score of 3.5224, followed by 'Toilets are provided suitably and sufficiently with sanitary conveniences at readily accessible places' with a mean agreement score of 3.6494, and the third lowest agreement is observed for the statement 'Enclosed workplaces are ventilated and have enough fresh and purified air' with a mean agreement score of 3.73

## 12. SUMMARY OF FINDINGS, SUGGESTIONS AND CONCLUSION

- Table 1 that most (36%) of the respondents belong to the age group of above 40 years, (32%) of the respondents are 21 to 30 years, (28%) of the respondents are 31 to 40 years and the remaining (4%) of the respondents are below 20 years. The age group of 21 to 55 is considered as independent working group and other age's people are depending to this group.
- Table 2. Most (68%) of the respondents are female and the remaining (32%) of the respondents are male
- Table 3 Shows that, most (54%) of the respondents are married and the remaining (46%) of the respondents are unmarried.
- Table 4 shows that, most (68%) of the respondents has studied up to school level, (18%) of the respondents has completed Under Graduate degree, (10%) of the respondents has completed Diploma/ITI, and the balance (4%) of the respondents has completed Post Graduate degree.
- Table 5 indicates that, majority (76%) of the respondents are belong to the income level of below Rs 10,000 per month, and (14%) of the respondents are belong to the income level of 1001 to 20000, remaining (10%) of the respondents, income range is above Rs. 20,000 per month.
- The significance of the Chi square statistic is more than 0.5 for the characteristics such as gender and type of wage marital status, age, educational level, income wise, so the opinion towards the current status of work life balance is not associated with gender and type of is associated with marital status, educational status, age, and income level at 5%.
- The statement with highest level of agreement is 'Workstations are suitable for the worker and work' with a mean agreement score of 4.3247, followed by 'Workrooms have enough floor area, height

and unoccupied space' with a mean agreement score of 4.3153, and the third highest agreement is observed for the statement 'Pits and tanks are securely covered and fenced where there is a risk of a person falling into a dangerous substance' with a mean agreement score of 4.2400. The statement with lowest level of agreement is 'Washing facilities are provided sufficiently at readily accessible places' with a mean agreement score of 3.5224, followed by 'Toilets are provided suitably and sufficiently with sanitary conveniences at readily accessible places' with a mean agreement score of 3.6494, and the third lowest agreement is observed for the statement 'Enclosed workplaces are ventilated and have enough fresh and purified air' with a mean agreement score of 3.73

### 13. FINDINGS AND SUGGESTIONS

- The organization can be improving infrastructure facilities.
- The organization can be providing training program for the employees.
- The organization can be concentrate incentive schemes for employees.
- The organization has to contribute to its positive efforts to make their employee satisfaction.
- It is recommend that a complaint box should be kept in the organization. It helps to become aware of the employee grievance.

### 14. CONCLUSION

The success of any organization depends on the efficiency of labor are increasing the efficiency. The organization promote of Quality of Work Life in the employee. The project indicates the management has taken the job environment into the concern and has done the best to keep their employees happy. A man happy and a happy working atmosphere make a happy man to contribute more.

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# Growth and Performance of Micro Small Medium Enterprises in Virudhunagar District

P. Rajmohan and A.A. Magesan

*Department of Commerce, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.*

**Abstract** - The Micro, Small & Medium enterprises (MSMEs) has often been termed as 'engine of growth' for all developing economies including India. MSMEs have been playing a momentous role in economic development of a country like India where millions of people are unemployed or underemployed and facing the problems caused by poverty. MSMEs occupy a position of prominence in Indian economy as they provide immediate large-scale employment, with lower investments and prove to be a second largest manpower employer, after agriculture. The significant growth of MSMEs has been taken place over a period of time. This sector is the major donor to gross domestic product (GDP), employment and exports in Indian economy. The main aims of the present study are growth, performance and problems faced by MSMEs in Virudhunagar District. This study is primarily based on secondary data collected from various secondary sources such as magazines, annual reports, District Industries Center and Department of MSMEs. This study upshots that though micro enterprises have registered good progress in terms of number of units, investment and employment opportunities, their performance is challenged by Lack of availability of adequate and timely credit, Procurement of raw material at a competitive cost, Inadequate infrastructure facilities.

**Keywords:** MSME, Growth, Performance, Problems

## 1. INTRODUCTION

The Micro, Small and Medium enterprises (MSMEs) have been accepted as the engine of economic growth for promoting equitable development of countries all over the world. The Micro, Small and Medium enterprises of India are a key driving force for the growth of Indian Economy. These MSMEs not only provide the employment opportunities but also facilitates the process of industrialization in rural areas. Simultaneously it enables the reduction of the unequal income distribution of wealth among the residents of a place. The MSMEs contribute significantly in the development of Indian economy through export promotion, domestic protection, low investment requirements, operational flexibility, technology adoption and so on. The SMEs are complimentary to large industries

operating in the economy and contribute significantly in the fast development of the country. On an average this sector has almost 36 million units that provide employment to about 80 million individuals. This sector, through the production of 6000 products, contributes 8% to GDP of the country. It contributes 45% of the total manufacturing output and 40% of the total exports of the country. This research paper discusses the methodology, objectives, definition of MSME, year wise growth of MSME, block-wise performance of micro, small and medium enterprises in terms of employment creation and investment, product wise growth of MSME and challenges faced by the MSMEs in Virudhunagar District.

## 2. METHODOLOGY

The research paper is based on the formal analysis made using secondary data collected from various secondary sources such as magazines, annual reports, District Industries Center and Department of MSMEs. A review of notable previous researches undertaken related to the field of study is presented below.

**Ghatak, Shambhu**, in his paper titled "Micro, small and medium enterprises (MSMEs) in India: an Appraisal" highlighted that status of Indian MSMEs is better than its counterpart in Bangladesh & Pakistan. About 36% of Pakistani SMEs have bank accounts where as about 46% Bangladeshi's SMEs have Bank accounts. In comparison to them about 95% of Indian SMEs have their bank accounts. He further stated that Indian Govt. should accelerate its initiatives to provide further support to these Small scale industries.



**Singh et al.**, analyzed the performance of Small scale industry in India and focused on policy changes which have opened new opportunities for this sector. Their study concluded that SSI sector has made good progress in terms of number of SSI units, production and employment levels. The study recommended the emergence of technology development and strengthening of financial infrastructure to boost SSI and to achieve growth target.

**Venkatesh and Muthiah**, found that the role of small & medium enterprises (SMEs) in the industrial sector is growing rapidly and they have become a thrust area for future growth. They emphasized that nurturing SME sector is essential for the economic well-being of the nation. The above literature highlights the various aspects, namely performance, growth and problems of MSMEs in Indian economy and induces for continued research in this field.

**Srinivas, K. T.**, in his paper entitled Role of micro, small and medium enterprises in inclusive growth concluded that the MSMEs has been termed as the engine for the growth of the Country. In the last few years, there has been tremendous change in the national and State level for consolidating this sector. Poor infrastructure and lack of marketing linkages are the key reasons for the poor growth of the MSMEs in India. The support provided by the State as well as Central Government is not adequate for the uplifting the MSMEs in India. Therefore the entrepreneurs in India and Government should initiate specific initiatives for further development of these MSMEs in India.

### 3. OBJECTIVES OF THE STUDY

1. To examine the growth and performance, in terms of investment and employment generated of MSMEs in Virudhunagar District.
2. To ascertain the relationship between the working enterprises and employment

opportunities generated by the MSMEs in Virudhunagar District.

3. To make an account of product wise distribution of MSMEs in Virudhunagar District
4. To identify the various challenges faced by MSMEs in Virudhunagar District.

### 4. DEFINITION OF MSMEs

The Government of India has revised the definition, of small scale industries over the years, presently as per the enactment of the Micro, Small and Medium Enterprises Development (MSMED) Act, 2006 in terms of which the definition of micro, small and medium enterprises are as under the following table

Micro, Small and Medium Enterprises Development Act, 2006		
Enterprises	Manufacturing	Services
Micro	Upto Rs. 25 lakhs	Upto Rs. 10 lakhs
Small	Between Rs. 25 lakhs to 5 crores	Between Rs. 10 lakhs to 2 crores
Medium	Between Rs. 5 crores to 10 crores	Between Rs. 2 crores to 5 crores

Source: Ministry of MSME

### 5. YEAR WISE GROWTH OF MSME

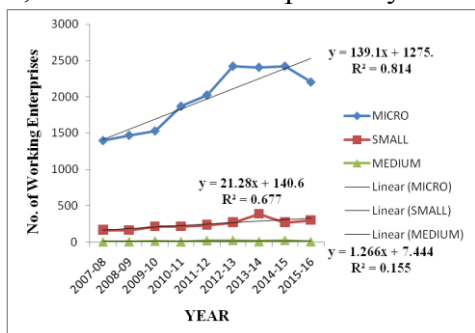
As per the provisions of the Act, all MSMEs are required to file Entrepreneurs Memorandum (Part-I) at District Industries Centres (DICs). After commencement of the project, the entrepreneur concerned is required to file Entrepreneurs Memorandum (Part-II) [EM (Part-II)]. Prior to enactment of the MSMED Act, 2006 there was a system of registration to small scale industrial units by the DICs. The below table shows that category wise entrepreneurs under Micro, Small and Medium for the last nine years ending 2015-16 those who filed their memorandum to DICs.

**Table-1 Year Wise Growth of MSME**

Year	Micro	Small	Medium	Total
2007-08	1399	166	4	1569
2008-09	1472	163	8	1643
2009-10	1532	214	15	1761
2010-11	1871	214	6	2091
2011-12	2024	235	22	2281
2012-13	2420	270	26	2716
2013-14	2404	388	10	2802
2014-15	2420	270	26	2716
2015-16	2202	304	7	2513
<b>Avg.</b>	<b>1971.56</b>	<b>247.11</b>	<b>13.77</b>	<b>2232.44</b>
<b>CAGR</b>	<b>5.17%</b>	<b>6.95%</b>	<b>6.42%</b>	<b>5.37%</b>
<b>Total</b>	<b>17744</b>	<b>2224</b>	<b>124</b>	<b>20092</b>

Source: Brief Industrial Profile Virudhunagar District 2015-16.

The table 1 clearly shows that there is a notable fall in the ‘Micro’ and ‘Medium’ enterprises by 118 (2420-2302) units in micro sector and 19 (26-7) units in case of the medium enterprises. It also upshot that the average growths of Micro, Small and Medium enterprises are 1971.56, 247.11 and 2232.44 respectively with compound annual growth rate of 5.17, 6.95 and 5.37% respectively.



**Figure – 1 Linear Trend Line of MSME**

**Table-2 Performance of Block wise Micro Enterprises**

S. No	Blocks	No. of working enterprises	Investment (Rs. in crore)	Employment (Numbers)
1.	Aruppukottai	1468	1395	4715
2.	Kariyapatti	312	74	716
3.	Narikudi	67	44	224
4.	Rajapalayam	1916	1395	5754
5.	Sattur	2663	1123	7511
6.	Sivakasi	3630	11419	1011
7.	Srivilliputhur	914	921	2311
8.	Tiruchuli	179	69	376
9.	Vembakkottai	115	349	1254
10.	Virudhunagar	2669	1036	6754
11.	Watrap	201	120	475
	<b>Avg.</b>	<b>1284.91</b>	<b>1631.36</b>	<b>2827.36</b>
	<b>Total</b>	<b>14134</b>	<b>17945</b>	<b>31101</b>

Source: Brief Industrial Profile Virudhunagar District 2015-16.

The Linear model fitted to the observed trend in the Micro enterprises is given by the equation  $Y=139.1x + 1275$ .

The trend line shows that annual increase in the number of micro enterprises by 0.12 per cent. The  $R^2$  value shows that about 81 per cent variation growth in micro enterprises is explained by the time factor (Year) through the linear model. The Small Scale enterprises is given by the equation  $Y=21.28x + 140.6$ . The trend line result shows that annual increase in the number of small scale enterprises by 0.14 per cent. The  $R^2$  value shows that about 67 per cent variation growth in small scale enterprises is explained by the time factor (Year) through the linear model and so on.

**6. PERFORMANCE OF BLOCK WISE MICRO ENTERPRISES**

The below table shows that the performance of micro enterprises in the various blocks of Virudhunagar District. Sivakasi block have more number of registered industrial units (3630) and Narikudi block have least number of registered industrial units (67) compare to other blocks.

Sivakasi block have invested more money (11419 crore) and Narikudi block have invested smallest amount of money (44 crore) in Micro enterprises in Virudhunagar District. Regarding the employment generation in micro enterprises Sattur block provide more employment (7511) in Virudhunagar District. The correlation coefficient between Numbers of Working Micro enterprises & Employment generated is (+) 0.630 and is not significant at 0.05 level of significance as p value, 0.38, is more than 0.05. It implies that an increase in number of working micro enterprises may not result in an increase in the employment generation in Virudhunagar district, as the correlation is normal and that too is insignificant.

**Correlations**

		No. of working Micro enterprises	Employment
No. of working Micro enterprises	Pearson Correlation	1	.630*
	Sig. (2-tailed)		.038
	N	11	11
Employment	Pearson Correlation	.630*	1
	Sig. (2-tailed)	.038	
	N	11	11

\*. Correlation is significant at the 0.05 level (2-tailed).

**7. PERFORMANCE OF BLOCK WISE SMALL SCALE ENTERPRISES**

**Table-3 Performance Block wise Small Scale Enterprises**

Blocks	No. of working enterprises	Investment (Rs. in crore)	Employment (Number)
Aruppukottai	2	3031	474
Narikudi	233	5971	894
Rajapalayam	137	3461	1551
Sattur	384	9677	2757
Sivakasi	113	2855	315
Srivilliputhur	2	54	26
Tiruchuli	2	60	24
Vembakkottai	16	418	64
Virudhunagar	6	55	54
<b>Avg.</b>	<b>99.44</b>	<b>2842.44</b>	<b>684.33</b>
<b>Total</b>	<b>895</b>	<b>25582</b>	<b>6159</b>

Source: Brief Industrial Profile Virudhunagar District 2015-16.

Table 3 clearly shows that the performance of small scale enterprises in the various blocks of Virudhunagar District. Sattur block have more number of registered industrial units (384) and aruppukottai, srivilliputtur, sattur block have least number of registered industrial units (2) compare to other blocks. Sattur block have invested more money (9677 crore) and srivilliputtur block have invested smallest amount of money (54 crore) in small scale enterprises in Virudhunagar District. Regarding the employment generation in small scale enterprises sattur block provide more employment (2757) in Virudhunagar District. The correlation coefficient between Numbers of working small scale enterprises and Employment of the district is 0.905 which is positively correlated and is significant at 0.05 level of significance as p value, 0.001, is less than 0.05. It implies that increase in number of working small scale enterprises and the proportionate increase in the employment of the district was positively correlated and is significant.

**Correlations**

		No. of working enterprises	Employment
No. of working enterprises	Pearson Correlation	1	.905**
	Sig. (2-tailed)		.001
	N	9	9
Employment	Pearson Correlation	.905**	1
	Sig. (2-tailed)	.001	
	N	9	9

\*\* . Correlation is significant at the 0.01 level (2-tailed).

## 8. PERFORMANCE OF BLOCK WISE MEDIUM ENTERPRISES

**Table-4 Performance Block wise Medium Enterprises**

Blocks	No. of working enterprises	Investment (Rs. in crore)	Employment (Numbers)
Rajapalayam	1	836	175
Sivakasi	3	2428	266
Srivilliputhur	1	789	194
Watrap	5	--	--
<b>Avg.</b>	<b>2.5</b>	<b>1351</b>	<b>211.66</b>
<b>Total</b>	<b>10</b>	<b>4053</b>	<b>635</b>

Source: Brief Industrial Profile Virudhunagar District 2015-16.

The above table clearly shows that the performance of medium enterprises in the various blocks of Virudhunagar District. Watrap block have maximum number of registered industrial units (5) and Rajapalayam,

Srivilliputtur, block have only one medium enterprises registered in Virudhunagar District. Sivakasi block have invested maximum amount (Rs. 2428 crore) in medium enterprises in Virudhunagar District. Regarding the employment generation in medium enterprises Sattur block provide more employment (266) in Virudhunagar District.

## 9. PRODUCT WISE MSME IN VIRUDHUNAGAR DISTRICT

Table 5 gives the product wise MSMEs functioning in Virudhunagar District. Food Products (1120), Beverages and Tobacco Products (48), Cotton Textiles (1540), Wool, Silk, Synthetic fibres (203) Jute, Hemp Mest Textiles (23) Hoisery Garments (3651) and so on.

**Table-5 Product Wise MSME in Virudhunagar District**

S. No	Classification	Details of Classification	Units	% to total
1.	Food Products	Flour Mills, Dhall Mills, Oil Mills	1120	4.59
2.	Beverages and Tobacco Products	Soft drinks, Tobacco products	48	0.19
3.	Cotton Textiles	Cotton Textiles	1540	6.32
4.	Wool, Silk, Synthetic fibres	Wool, Silk, Synthetic fibres	203	0.83
5.	Jute, Hemp Mest Textiles	Jute, Hemp Mest Textiles	23	0.09
6.	Hoisery Garments	Textile products	3651	14.98
7.	Wood Products	Wood Products	2314	9.49
8.	Paper and paper Products	Paper and paper Products	3105	12.74
9.	Leather Products	Leather Based Products	103	0.42
10.	Rubber Products	Rubber and plastic products	960	3.94
11.	Chemical and Chemical products	Chemical Based Products	6214	25.50
12.	Metallic Mineral Products	Metallic Mineral Products	412	1.69
13.	Basic Metal Products	Basic Metal Products	186	0.76
14.	Metal Products	Metal Products	545	2.23
15.	Machinery and Parts	Machinery and Parts except electrical	312	1.28
16.	Electrical Products	Electrical Machinery and Apparatus	221	0.90
17.	Transports and Equipments	Transports and Equipments	328	1.34
18.	Miscellaneous Service Activities	Miscellaneous Service Activities	3077	12.63
<b>Total</b>			<b>24362</b>	<b>100.00</b>

Source: Brief Industrial Profile Virudhunagar District 2015-16.

The above table shows that the product wise MSME functioning in Virudhunagar District. Chemical based products have more number of 6214 (25.50%) in Virudhunagar District and Textile products 3651 (14.98%),

Paper and paper products 3105 (12.74%), Miscellaneous service activities 3077 (12.63%),

Wood products 2314 (9.49%), Cotton textiles 1540 (6.32%), Flour mill, Dhall mills, Oil mills 1120 (4.59%) and so on.

## 10. CHALLENGES FACED BY THE MSMEs

Though MSMEs are very important in the economic growth of our nation, this sector is not getting extensive support from the concerned banks, financial institutions and other corporate bodies as narrated below

- **Lack of credit from banks:** The MSMEs are presently facing the problems of credit from the banks. The banks are not providing the adequate amount of loan to the MSMEs. The loan providing process of the banks is very long. The owners of the MSMEs have to produce different types of documents to prove their worthiness. The banks are providing on an average 50% total capital employed in fixed assets. The cost of credit is also high.
- **Competition from multinational companies:** In present era of globalization, the MSMEs are facing the great threat from the international manufacturing companies who are proving quality goods at cheapest price. Therefore, it is very difficult to compete with the multinational companies.
- **Poor infrastructure:** Though, MSMEs are developing so rapidly but their infrastructure is very poor. With poor infrastructure, their production capacity is very low resulting in higher production cost as the economies of scale could not be availed.
- **Unavailability of raw material and other inputs:** MSMEs require quality raw materials skilled work force and other inputs. Due to unavailability of these essentials, it is very difficult to produce the products at affordable prices.
- **Lack of advanced technology:** The owners of MSMEs are not aware of advanced technologies of production. Their methodology of production is highly traditional and outdated. The owners are

using older method, particularly in the fields of fabricated metal and textile.

- **Lack of distribution marketing channels:** The MSMEs are not adopting the innovative channels of marketing. They adopt traditional standard channel, agency and distributorship for bringing goods to their consumers. Consequently their market spread is very limited.
- **Lack of training and skill development program:** The training and development programs for the benefit of the MSME entrepreneurs are very low. Consequently, the owners are not aware of the innovative methods of production, marketing and administration.
- **Complex labor laws and red-tapism:** All the laws related to the different aspects of manufacturing and service concerns are very complex. Compliance with these laws are practically difficult for MSMEs. The process of obtaining license and permission from the Factory Commissioner and Inspector is often affected by red tapism.

## 11. CONCLUSION

Micro, Small and Medium Enterprises contribute to economic development in various ways such as creating employment opportunities for rural and urban population, providing goods and services at affordable costs by offering innovative solutions and sustainable development to the our national economy. This study upshots that though micro enterprises have registered good progress in terms of number of units, investment and employment opportunities, their performance is challenged by Lack of availability of adequate and timely credit, Limited access to equity capital, Procurement of raw material at a competitive cost, Inadequate infrastructure facilities, including power, water, roads. Planned, scheduled and detailed action plan is to be implemented by the government and other promotional bodies to assist the MSMEs for

their phenomenal growth and contribution to Indian economy.

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# Money and Marriage in Edith Wharton's *The House of Mirth*

J. Saravana Kumar and A.K. Muthusamy

Department of English, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar

**Abstract:** The present paper discusses two prominent features of Edith Wharton's fiction as Wharton has carefully portrayed in her first and most famous novel *The House of Fame*. They are marriage and money. Money and marriage have played a definite and decisive role in Edith Wharton's life. This autobiographical touch has infused into her novel a characteristic fervour and significance that are personally interesting and creatively luminous. They bring before the readers a vivid picture of her bubbling, bright youth and of how the fashionable New York society of her times has flourished fastening itself on financial prosperity and prominence and proper marital status and connections of men and women.

**Key Words:** money, marriage, aristocracy, societal

Edith Wharton (1862-1937) is one of the famous American Women Novelists whose contribution to American literature is exemplarily significant. She was born Edith Newbold Jones in 1862. As she was born in an aristocratic family, it was not easy for her to take up the profession of writing. There were social restrictions and inhibitions. The society looked upon the practice of art as mean and undignified. As Candace and Clare Colquitt put it, "Edith Wharton, born Edith Newbold Jones in 1862, entered into the careful and closed ranks of the New York aristocracy, defied the limitations of a society that did not condone the practice of art for men and women, and for over forty years seized her life through writing" (537).

Edith Wharton's passion for reading and writing did not diminish "though as a young girl, she had been explicitly forbidden to read novels" (Waid 539). Wharton has displayed her expertise in visual arts like painting, sculpture, architecture and gardening but she is popularly known and acclaimed for her fiction. She is the author of twenty-two books – novels and novellas and nearly a hundred short stories. Among her novellas, *Ethan Frome* (1911) and *Summer* (1917) have redefined much attention and acclaim. Of her novels, the best known and appreciated are *The*

*House of Mirth* (1905), *The Reef* (1912), *The Custom of the Country* (1913) and *The Age of Innocence*. She also wrote poems at the age of sixteen and her early poems were published in the Atlantic and New York newspaper. The reader can come across passages and descriptions in her novels which reveal her inherent poetic imagination and power.

Wharton belonged to the closed ranks of the New York aristocracy and she was very well aware of the customs of the elite. Her novel *The House of Mirth* develops a critique of American society at the beginning of the twentieth century. In *Mirth* Wharton focuses her attention mostly on two themes – money and marriage. Money is the be-all, end-all symbol to most of the characters in the novel. Wharton depicts the upper-class society which is built on money. Marriage, one may say, is one important and imperative stage in a woman's life strongly recommended and advocated for the fulfilment of a woman's life by the society. Eileen Connell, commenting on the theme of marriage, remarks: "Wharton explores some of the disastrous consequences of a marriage institution that is founded on spurious notions of a woman's place in society" (558).

Lily Bart is the protagonist of the novel *The House of Mirth*. Wharton has portrayed her heroine as a beautiful young woman of twenty-nine years old. Lily is a well-born and well-educated. Wharton unveils a part of Lily's past and details about her wealthy family are presented. Wharton describes Lily in such a way that one can notice her own presence as a representation of a wealthy life:

As she moved beside him, with her long light step, Selden was conscious of taking a luxurious pleasure in her nearness: in the modeling of her little ear, the crisp upward wave of her hair – was it ever so slightly

brightened by art? – and the thick planting of her straight black lashes. Everything about her was at once vigorous and exquisite, at once strong and fine. He had a confused sense that she must have cost a great deal to make, that a great many dull and ugly people must, in some mysterious way, have been sacrificed to produce her. . . . and was it not possible that the material was fine, but that circumstance had fashioned it into a futile shape? ( Wharton 7)

Lily's parents leave her with nothing but stunning beauty which she has to be used to gain a wealthy husband. Lily's mother has given her the advice to marry a wealthy man. Her mother has taught her the value of life which is strictly tied to how money one has. Lily's main instrument is not money but beauty. She is badly in need of money to sustain her position in the upper class society.

To Lily, money means the ability to gain a permanent footing in society and she always wants more of it. Her goal is always to marry a wealthy man and live in the upper ranks of society. Lily is always in search for the right and suitable husband who will provide her money and social status to remain in the aristocratic class –New York social circles. Her primary focus is on money and social status of potential suitors. She strongly believes that when it comes to marrying she can always do better than current situation offers her. That is the reason why she casts asides many options. She is more confident that she can do better and so she delays marrying Gryce, Rosedale and Seldon.

The following conversation between Lily and Seldon shows that Lily always relates money in terms of freedom, Seldon's definition of success.

Selden pushed his hat back and took a side-glance at her. 'Success – what is success? I shall be interested to have your definition'.

'Success?' She hesitated. 'Why, to get as much as one can out of life, I suppose. It's a relative quality, after all. Isn't that your idea of it?'

'My idea of it? God forbid!' He sat up with sudden energy, resting his elbows on his knees and staring out upon the mellow fields. 'My idea of success', he said, 'is personal freedom'.

'Freedom? Freedom from worries?'

'From everything – from money, from poverty, from ease and anxiety, from all the material accidents. To keep a kind of republic of the spirit – that's what I call success'. (67-8)

Lily pursues after money because it serves as a prerequisite for admission to the upper-class world of the Trenors and Dorsets. She ties money into ideas about freedom. Unfortunately, whenever she has money, she feels free and whenever she falls in debt, she feels enslaved. She is always enslaved to money because it is the basis for her emotions. That is why Lily has rejected Lawrence Seldon, a young lawyer, who is in love with her and has a distant relationship with money. If Lily had followed her heart and married Seldon, she would have led a happy life. Lily struggles to stay in favour of money. She tries some risky investment with the help of Gus Trenor, a notorious flirt. It becomes a failure and she is thrown out of the upper-class society. She is forced to join the middle class, working as a hat-maker. Her slide into poverty and depression continues and eventually, Lily takes too large a dose of sleeping medication and dies in her sleep:

She had long since raised and the addition of a few drops to the regular dose would probably do no more than procure for her the rest she so desperately the dose to its highest limit, but tonight she felt she must increase it. She knew she took a slight risk in doing so she remembered the chemist's



warning. If sleep came at all, it might be a sleep without waking But after all that was but one chance in a hundred: the action of the drug was incalculable, needed. (Wharton 313)

Wharton depicts the malice and bitter realities of life in upper-class society in all its grim reality. Through the characters presented in the novel she criticizes New York City's aristocracy. Money can cause a lot of problems. One should be careful when pursuing money. One ought to be true to one's feelings, rather than play a societal game of money, power and marriage.

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# Factors Influencing Customer Retention in Kanchipuram Hotel Industry

K. Sridevi<sup>1</sup> and P.Sundara Pandian<sup>2</sup>

<sup>1</sup>Department of Commerce, Sri Malolan College of Arts and Science, Madhurantagam

<sup>2</sup>Department of Commerce, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.

**Abstract** - In a country like India, having a huge size of population, services sector has its huge potential. Development of services sector can transform the burden of large size of manpower into an asset by its proper utilizations and thereby can generate a huge size of income for the nation as a whole. The Indian tourism and hospitality industry has materialized as one of the key drivers of growth among the services sectors in India. Without the tourism industry there would be no hospitality industry and without the hospitality industry the tourism industry would have a large gap. Due to the large gap, there would be no fixed place for tourists to stay and there is a decreasing trend to travel the particular area. So it creates tourism activities such as tours, excursions and tourist attractions. Tourism contributes to 6.23 percent to the National GDP and 8.78 percent of the total employment in the country for the year 2016. Constant transformation, functional growth and improving standards have gained the hospitality industry of India approval all over the world. Among this hotel industry is a highly flourishing, lucrative and competitive market. To compete in such a market, the hotels should focus on maintaining good relations with the customers and in satisfying the customers. Customer retention refers to the ability of a company or product to retain its customers over some specified period. Customer retention is an important factor in today's increasingly tourism competitive markets which should be concerned seriously. The aim of this study is to empirically explore the factors influencing on customer retention in the hotel industry. A simple random sampling method was adopted to collect data from the study of kanchipuram district and the analysis of the influencing factors based on the integrated research approach for the hotel industry. A company's ability to attract and retain new customers is related not only to its product or services, but also to the way it services its existing customers, the value the customers actually generate as a result of utilizing the solutions, and the reputation it creates within and across the marketplace.

**Keywords:** Customer Retention, hotel industry, Technology factor, Cost factor, service factor, customer retention factor and loyalty factor.

## 1. INTRODUCTION

Among the service sector, hotel industry is an important service industry in India. Excellent customer service is vitally important in the hospitality industry. The hospitality industry is a broad category of fields within service industry that includes lodging, event

planning, theme parks, transportation, cruise line, and additional fields within the tourism industry. The hospitality industry is a multibillion-dollar industry that depends on the availability of leisure time and disposable income. A hospitality unit such as a restaurant, hotel, or an amusement park consists of multiple groups such as facility maintenance and direct operations such as servers, housekeepers, porters, kitchen workers, bartenders, management, marketing, human resources etc. (Service Sector in India 2014).

The hotel industry is highly competitive and the right knowledge about customer values and demands is essential to differentiate from competitors and gain sustainable competitive advantage. Implementing traditional marketing strategies is often no longer enough to achieve this goal. Relationship marketing has increasingly become more important, as this concept suggests more focus on retaining the customer and creating a win-win situation with a long-term perspective (Oscar H. Pedraza Rendón, Rubén Molina Martínez, María S. Ramírez Flores). In traditional marketing there is more focus on acquisition. Most importantly a good balance between acquisition and retention directed to the right segments is essential for future success. The hotel business is rapidly developing due to growing demand for such services as well as the growing opportunities for travel. As a result, hotels face demanding customers, since the requirements for quality grow with an increased use of hotels' services, in order to increase the competitive ability of a hotel, the issue of customer loyalty is also important. Some of the characteristics of the successful activity of the business organisation are presentation and

constant improvement of qualitative services, which meet the expectations of customers. (E.Jasinskas). Therefore, under hospitality industry, hotel industry holds an important place compared to other industries. Therefore the researcher had studied the factors influencing Customer Retention and Acquisition in Hotel Industry.

### **Customer Retention**

Customer retention is the maintenance of continuous trading relationships with customers over the long term. Customer retention is the mirror image of customer defection or churn. High retention is equivalent to low defection (Ahmad, R. and Buttle F. 2001). Customer retention is the number of customers doing business with a firm at the end of a financial year, expressed as percentage of those who were active customers at the beginning of the year (Dawkins, P.M. and Reichheld, F.F. 1990)

Successful customer retention involves more than giving the customer what they expect. Generating loyal advocates of the brand might mean exceeding customer expectations. Creating customer loyalty puts 'customer value rather than maximizing profits and shareholder value at the centre of business strategy'(Reichheld, Frederick 1996). The key differentiation in a competitive environment is often the delivery of a consistently high standard of customer service. Furthermore, in the emerging world of Customer Success Retention is a major objective (Mehta N., Steinman D. and Murphy L 2016).

## **2. REVIEW OF LITERATURE**

**Petzer D.J and Steyn T.F.J and Mostert P.G (2009)** in their study, "Customer retention practices of small, medium and large hotels in South Africa: An exploratory study" explains that establish the perceptions of hotel management of all sizes of hotel regarding the importance of customer retention practices. The study contributes to the relatively limited knowledge of services marketing in the

hospitality industry, specifically in the hotel sector. The findings indicate that no significant associations exist between the research variables and hotel size. It is evident, however, that significant differences exist between medium and large hotels when it comes to weekend guests who stay for business, as well as leisure, purposes.

**Thomas Chacko and Merlin Thanga Joy A (2016)**, "Customer Retention Strategies in Hotel Industry in Trivandrum" explains **hotel** industry is a highly flourishing, lucrative and competitive market. To compete in such a market, the hotels should focus on maintaining good relations with the customers and satisfying the customers. Increasingly, the organizations are using Customer Relationship Management (CRM) to help boost sales and revenues by focusing on customer retention and customer loyalty. The present research was undertaken to study the Customer Relationship Management (CRM) practices in hotel industry. For the purpose of the study, a sample of 10 hotels was selected from the list obtained from Restaurant and Hotel Association of Ludhiana on random basis. The managers/owners of the hotel were contacted to satisfy the objective of the study. It was found that most of the managers had a positive attitude towards CRM practices and the most common activities undertaken were studying the existing database of the customers and personal counseling. The benefits of CRM are increased customer satisfaction and increased customer loyalty.

## **3. OBJECTIVES OF THE STUDY**

The present research was undertaken with the following specific objective:

1. To study the factors influencing customer retention in Hotel industry.

## **4. RESEARCH METHODOLOGY**

The population for the study consists of the Hotels in Kanchipuram. From the list, the hotels were categorized into two categories i.e. high/medium tariff category hotels and low tariff category hotels based on the single room

tariff. A sample of 80 hotels were selected from the list of hotels on the basis of single room tariff, forty hotels each from high/ medium tariff and low tariff category based on simple random sampling. The managers of these hotels were contacted and interviewed. The primary data was collected with the help of structured, non- disguised questionnaire. The questionnaire was designed on the basis of the Customer Relationship Marketing Model (Dash, 2003). Questions were asked relating to CRM practices like customer need assessment and acquisition, customer development through personalization and customization, customer retention, new customer referrals and benefits from CRM approach, etc. After collection of data, master tables were constructed and analysis of collected data was done by using various statistical techniques like percentage method, Kaiser-Meyer-Olkin Measure and Bartlett's Test and Factor Analysis.

**5. FACTORS THAT AFFECT CUSTOMER RETENTION**

It is vital for all organizations especially those in the service sector to realize that without customers, their establishments would not be able to continue existing. The hotel industry which is a service industry has become globally competitive due to destination growth. Due to the stiff competition, it is therefore important to create awareness of the products offered at the destinations and deliver promises so as to keep customers happy and satisfied. This is because happy customers are likely to come back for more services and even more likely to bring potential customers to the establishments. Therefore it is important that hotel organizations satisfy current customers by understanding their needs as this may act as a costless strategy for generating new business.

The factors and issues regarding customer acquisition and retention are analyzed using Principal Component Factor Analysis. To ensure the suitability of the instrument and to increase its validity and reliability, the 55

statements were subjected to pre test. The results were discussed with the academic experts and Hotel managers to further refine the instrument. It contained 25 statements related to the customer relationship issues in the service sectors. Respondents were asked to rate their level of agreement with each statement from 1 (Strongly disagree) to 5 (strongly agree). The response to this statement is considered as dependent variable in the multiple regression analysis for determining the predictors, or underlying dimensions of customer acquisition and retention.

The 25 statements regarding customer relationship in Table 4.18 were factor analysed using Principal Component Analysis and the varimax rotation method to determine the underlying dimensions. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were also implemented to test the fitness of the data. Multiple regression analysis was carried out to determine the strength of association between the independent and dependent variables regarding customer retention in hotels.

**6. KMO AND BARTLETT'S TEST**

Kaiser-Meyer Olkin measure of sampling Adequacy value is .885. Bartlett's Test of Sphericity is significant at 0.000.

**TABLE 1 KMO AND BARTLETT'S TEST**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.885
Bartlett's Test of Sphericity	Approx. Chi-Square	4.673E3
	Df	300
	Sig.	.000

Source: Computed data

There are two main stages in factor analysis. As the first stage in the factor analysis, Principal Component Analysis was used for the initial extraction of the factors. Principal Component Analysis is a technique for forming a set of new variables that have linear combinations of the original set of variables. The new variables are called 'principal components'.

### Technology Factor

Technology developments pave the ways to keep up with recent changes and improve the hospitality in a rapid development. Calum McIndoe 2013 in his study has detailed many technological improvements that the hotel managers and directors need to follow some factors such as Cloud / Software as a Service (SaaS), Mobility, Social, Personalised systems, Integration and Globalization. This technology factor includes Internet access, Good customer relationship, Perfect technology, Electronic Automated Communications, Strategic identification of customer's expectations and Reliable and friendly hotel staff. It is one of the important factor that influence the customer retention in the hotel industry.

**FACTOR – 1 TECHNOLOGY FACTORS**

Variables	Factor Loadings	Eigen Value	% of Variance
Internet access	<b>.695</b>	<b>8.577</b>	<b>13.616</b>
Good Customer relationship	<b>.693</b>		
Perfect Technology	<b>.660</b>		
Electronic and automated communications	<b>.640</b>		
Strategic identification of customer's expectations	<b>.632</b>		
Reliable and friendly hotel staff	<b>.561</b>		

Source: Computed data

The variables such as Internet access, Good Customer relationship, Perfect Technology, Electronic and Automated communications, Strategic identification of customer's expectations and Reliable and friendly hotel staff are loaded in Factor 1. Hence F1 is termed as TECHNOLOGY FACTORS. The Eigen value for the above Factor 1 was 8.577 and the percentage of variance was 13.616. It would be concluded that technology factors ranks as the first and most important factor that influence customer retention in the hotel industry.

### Cost Factor

Customers who are willing to pay higher prices for a product or service tend to be brand conscious and prestige sensitive. They also believe price is an indicator of quality or prestige (Sproles and Kendall, 1986) once customers are convinced that they are getting the best quality product or service, they will tend to develop loyalty to it in the long run. Hotels are increasingly challenged to find ways to reduce costs without sacrificing quality. Most of the respondents believe that good management and cost accounting practices are associated with the financial success of hotels. This cost factor is second main factor that influence customer retention in the hotel industry.

**FACTOR – 2 COST FACTORS**

Variables	Factor Loadings	Eigen Value	% of Variance
Smooth handling of customer grievances	<b>.673</b>	<b>1.921</b>	<b>11.150</b>
Customer Relationship Management	<b>.671</b>		
Cost of Customer Relationship Management	<b>.651</b>		
Infrequent customers are converted into frequent	<b>.606</b>		
Change in the hotel facilities	<b>.526</b>		

Source: Computed data

The variables such as Smooth handling of customer grievances, Customer Relationship Management, Cost of Customer Relationship Management, Infrequent customers are converted into frequent and Change in the hotel facilities are loaded in Factor 2. Hence F2 is termed as COST FACTORS. The eigen value for the above Factor 2 was 1.921 and the percentage of variance was 11.150. It would be concluded that cost factors ranks as the second

important factor that influence customer retention in the hotel.

**Time and Efficiency Factor**

Now competitiveness between hotels is increasing, so hotel managers are starting to realise that improving their performance can become their advantage and with competitive benchmarking these improvements can be identified and made (Min and Min, 1997). Sources of inefficiency should be determined first so that hotel managers can devote their attention on areas that will result in better performance. This is particularly significant for the hotel industry where there is a high degree of seasonality. Efficiency is one of the key factors of management control and a prerequisite for making improvements. There are many different approaches on how to measure the efficiency of hotel companies (Baker and Riley 1994, Van Doren and Gustke 1982).

**FACTOR – 3 TIME AND EFFICIENCY FACTORS**

Variables	Factor Loadings	Eigen Value	% of Variance
Knowledgeable and answerable staff	.730	1.533	10.873
Friendly and reliable staff	.707		
Efficient and timely room service of staff	.660		
Clean and comfortable room	.631		

Source: Computed data

The variables like Knowledgeable and answerable staff, friendly and reliable staff, Efficient and timely room service of staff and Clean and comfortable room are loaded in Factor 3. Hence F3 is termed as TIME AND EFFICIENCY FACTORS. The eigen value for the above Factor 3 was 1.533 and the percentage of variance was 10.873. It would be concluded that time and efficiency factor ranks as the third important factor that influence customer retention in the hotel industry.

**Services Factor**

The various services’ marketing mix provided by the hotel owners to their customers and the various services availed by the customers from the hotels. Majority of the hotels are boarding and lodging hotels which provide catering and restaurant facilities, first aid facility etc. Only star hotels provide gym facilities, beauty parlour facilities, cultural shows etc. The hotel owners use various advertising media, sales promotion tools and discount facilities to attract their customers. In hotel industries catering and restaurant services is one of the important things, because the hotel industries’ main aim is to provide hospitality services to its customers. In resort hotels and star hotels cultural shows are arranged to entertain the customers. This will increase the goodwill and hospitality services of the customers. Most of the star hotels and resorts have beauty parlours. It is one of the service mixes to attract the customers. Regular customers and rich customers are regularly using these beauty parlour facilities. For communicating information from one person to another person the telephone facility is provided by the hotels for their customers. Nowadays even internet facility is also provided to hotel rooms. First aid facility is a basic facility in each and every organization; likewise the hotels also provide first aid facility to its customer.

**FACTOR – 4 SERVICE FACTORS**

Variables	Factor Loadings	Eigen Value	% of Variance
Cleanliness services	.871	1.464	10.838
Food services	.764		
Parking services	.614		
House keeping services	.582		

Source: Computed data

Cleanliness services, Food services, Parking services and House keeping services are loaded in Factor 4. Hence F4 is termed as SERVICE FACTORS. The eigen value for the above Factor 4 was 1.464 and the percentage of

variance was 10.838. It would be concluded that service factors ranks as the fourth important factor that influence customer retention in the hotel industry.

### Customer Retention Factor

CRM has been defined in numerous ways and with many descriptions. It can generally be defined as the art of acquiring customers and having a long-lasting relationship with them. As well, CRM can be referred to as the combination of people, processes, and technology used to understand and obtain customers for a company. It focuses on customer relationships and retention. To benefit fully from the implementation of CRM, companies must have efficient CRM strategies to ensure satisfying outcomes for the company (Chen and Popovich, 2003). Retention refers as a commitment to continue to do business or exchange with a particular company on an ongoing basis. Retention also can be defined as the customers' liking, identification, commitment, trust, willingness to recommend, and repurchase intentions, with the first four being emotional-cognitive retention constructs, and the last two being behavioural intention (Strauss et al. 2001). Later, Chatura (2003) defines customer retention is the propensity of the customer to stay with their service provider. Many organization today having difficulty to attract new customer so the restructures their marketing department and appoint managers to give attention to their existing customer (Ahmad and Buttle, 2002). Customer retention is very important for the hotel in order to ensure hotel sustainability and growth for a long time; therefore, it is the hotel's duty to ensure that they had been able to fulfil all the customer's needs and wants from time to time. (Z. Nurul Syaquirah and Z. Putra Faizurrahman).

### FACTOR – 5 CUSTOMER RETENTION FACTORS

Variables	Factor Loadings	Eigen Value	% of Variance
Fulfil customers needs and wants	.808	1.336	10.089
Strategies of the Hotels aim to avoid Loss of customers.	.749		
Periodic communication increases the customers	.684		
Customers likes, willingness and repurchase intentions	.554		

Source: Computed data

The variables like Fulfil customers needs and wants, Strategies of the Hotels aim to avoid Loss of customers, Periodic communication increases the customers and Customers likes, willingness and repurchase intentions are loaded in Factor 5. Hence F5 is termed as CUSTOMER RETENTION FACTORS. The eigen value for the above Factor 5 was 1.336 and the percentage of variance was 10.089. It would be concluded that Customer retention factors plays as a dependent variable for customer retention the hotel.

### Loyalty Factor

One of the best ways to boost the hotel's repeat business is to establish a guest loyalty program. Typically a hotel loyalty program will offer guests (depending on the amount of points they have earned) value-added benefits such as free room upgrades, early check-in and late check-out, free spa treatments and guaranteed room availability. Generating new business and attracting new guests requires significant investment in marketing and advertising. The hotel owners will have to make sure there are attractive rewards on offer to all guests and not just guests with big wallets to get the most out of a loyalty program. They will have to find an effective and efficient way to communicate with program's members to build loyalty and generate repeat business among members of

loyalty program. The members of loyalty program will need to know how many points they have, how they can redeem them, and what rewards they are entitled to. Some hotels have introduced a standalone app for reward management, while other hotels communicate with members through general hotel management apps that also provide guests with information about check-in and check-out as well as information about loyalty points. (Importance Of loyalty Programs in Hotel Industry).

**FACTOR – 6 LOYALTY FACTORS**

Variables	Factor Loadings	Eigen Value	% of Variance
value added benefits	.667	1.031	6.881
Loyalty exhibited through Frequent visits to Hotels	.527		

Source: Computed data

The variables Value added benefits and Loyalty exhibited through frequent visits to Hotels is loaded in Factor 6. Hence F6 is termed as LOYALTY FACTORS. The Eigen value for the above Factor 6 was 1.031 and the percentage of variance was 6.881. It would be concluded that Loyalty factors ranks as the fifth important factor that influence customer retention in the hotel.

**Multiple Regression Analysis**

In order to analyze the linear relationship between a dependent variable and multiple independent variables, employing multiple regression analysis approach is an appropriate technique. By examining the technique, it can differentiate the significance of the individual.

**Table No: 2 REGRESSION MODEL SUMMARY FOR FACTORS INFLUENCING CUSTOMER RETENTION**

R	R Square	Source of variation	Sum of Squares	DF	Mean Square	F	Sig.
.739	.859	Regression	404742.236	6	67457.039	1.688E3	.000 <sup>a</sup>
		Residual	16106.554	403	39.967		
		Total	420848.790	409			

Source: Computed data

**Predictors:** (Constant), Technology Factor, Cost Factor, Time and Efficiency Factor, Services Factor, and Loyalty Factor

**b. Dependent Variable:** Customer Retention Factor.

**TABLE No: 3 REGRESSION COEFFICIENT SUMMARY FOR FACTORS INFLUENCING CUSTOMER RETENTION**

FACTORS	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	9.938	2.186		4.547	.000
Technology Factor	1.910	.097	.273	19.605	.000
Cost Factor	1.801	.118	.200	15.246	.000
Time and Efficiency Factor	2.548	.139	.227	18.358	.000
Services Factor	1.829	.112	.194	16.380	.000
Customer Retention Factor	2.363	.116	.253	20.294	.000
Loyalty Factor	2.622	.222	.151	11.793	.000

Source: Computed data

The model's 't' test shows that the predictors, namely Technology factor, Cost factor, Time and efficiency factor, services factor, Customer retention factor and Loyalty



factor are statistically significant at 95 % confidence level as their significance levels are less than .05.

Therefore, it indicates that Technology factor; Cost factor, Time and efficiency factor, services factor, and Loyalty factor that contribute to the factors influencing customer retention are statistically significant implying that their influence is stronger than the other variables.

The value of the multiple correlation coefficients (R) between the independent variables and the dependent variable was 0.739. The  $R^2$  for the model was 0.859, thus showing that about 73.9% of the variability in the outcome is accounted for by the predictors (independent variables). The 'F' statistic obtained is 1.688E3 (p-value = 0.000), thus indicating that the independent variables have a significant influence on the dependent variable at 5% level of significance and that the model is effective.

## 7. CONCLUSION

It is concluded that the five variables namely, Technology factor, Cost factor, Time and efficiency factor, services factor, and Loyalty factor, the performance of Multiple-regression analysis shows all the five independent variables are significant in influencing the customer retention in hotel industry. Whenever there are crises arise, the hotel owners need to be alerted to the current situation and be able to respond to it quickly. Besides that, hotel's management needs to ensure that individual customer to be as satisfy as they can be. If management is serious about helping customers succeed, retention is a necessary one but not sufficient component to their satisfaction.

In fact, retention should be the minimal expectation for customer success that they simply return to the hotel after their first year (Kahrig, 2005).

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# Emotional Intelligence and Marital Satisfaction of Law Enforcement Officers and Others in Virudhunagar District – A Comparative Study

R.Shobana Devi and P.Sundara Pandian

*Department of Commerce, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.*

**Abstract** - The family has always been one of the most important parts of each society in the history of mankind and in all countries. Marital satisfaction means adaption of person's expectation from matrimony and what he himself experience in life, which is also important. Nowadays, for many employees, successfully combining work and non-work has become a major challenge that sometimes creates problems or conflicts. Law Enforcement Officers work long hours (shifts) assigned to patrol or investigations. Officers also work part-time jobs as private security when they are not on the department clock. To study the different elements of emotional intelligence and marital satisfaction among the Law Enforcement Officers and others in virudhunagar district for that Standard Deviations of Demographic Variables, the Comparison of average score of Marital Satisfaction Subscales, the Comparison of the average rate of Emotional Intelligence's Subscale Score and Regression Model for Impact of Emotional Intelligence on Marital Satisfaction was studied. The present research showed a positive and strong relation between the soundness of emotional intelligence and marital relations quality.

**Keywords:** Emotional Intelligence, Marital Satisfaction, Law Enforcement Officers

## 1. INTRODUCTION

The family has always been one of the most important parts of each society in the history of mankind and in all countries. Consequently, this very important factor plays a very important role in the progress and stability of the society. Anyway, the formation of family is based on marriage. Marriage is a mutual, delicate, and complicated relationship between two humans which has a basic role in meeting man and woman's emotional-psychological and physical demands Marriage is a symbiosis of a man and a woman, who has made a commitment and takes an oath, and accordingly has changed themselves. With the evolution of cultures, marriage has become a religious and sacred rite and tradition. However, any failure in marriage, as a commitment and oath, will socially label the sides. Not all marriages,

necessarily, are successful and prosperous and some of them result in a separation. Some of the couples solve their sense of dissatisfaction and grievance through separation and divorce. All in all, from the second half of the 1970s, satisfaction has been declining; but many couples also prefer to stay in a state of conflict or mere indifference. In spite all these discouraging information about marriage, many people opt to marry. John Gottman's states that when there is no problem to make a crisis in a married life couples urge to report a high level of satisfaction. Consequently, many researchers have revealed that a perfect marriage will cause people to have a healthier and happier life

Marriage is a pleasing bond but findings of researches show that more than half of the marriages in the United States lead to disappointment and separation. Therefore, a majority of researchers try to figure out the elements which affect the level of satisfaction and persistency in interpersonal relationships including marriage. According to the researches done about the spouses' relationships it seems that components of emotional intelligence can be influential on marital satisfaction. Couples' intimate relationship needs communication skills such as: paying attention to other person's viewpoint, being able to empathize perception with what their partner has experienced, and also being sensitive and aware of his / her needs. Marital satisfaction means adaption of person's expectation from matrimony and what he himself experience in life, which is also important. Winch believes marital satisfaction is adjustment between the current condition and the expected or ideal condition. Some of the authorities define marital satisfaction as a

subject to the natural cycle of life. In particular, for example, Alice believes that there are different ways to define and describe marital satisfaction and the best definition is provided by Hagins. He defines marital satisfaction as: feeling happiness, pleasure and satisfaction by the wife or the husband, when considering all the aspects of conjugal life. Satisfaction is an attitudinal variable so it is highly considered as an individual feature. With the reference to what was stated, marital satisfaction is in fact a positive and pleasing attitude which is possessed by the couple from the parts of a conjugal life. Lastly, it is essential to be stated that different factors have been identified to be effective on marital satisfaction including: marriage age, marriage duration, children, educational suitability, financial issues, sexual issues, relatives and acquaintances, religious beliefs, personality traits, the ability to understand the partner, communication skills, spare time, and commitment. Marriage and family researchers have always been looking for factors of satisfaction and dissatisfaction of marriage. It has been years that researchers have been trying to figure out the maladaptation elements in conflicting families. But recently, researchers - instead of insisting on variables which depend on maladaptation - have focused on obvious inter and intrapersonal factors in everyday communication of happy and pleased couples. The researchers state that factors like emotional awareness, emotional expression, emotional regulation, and sympathy affect the marriage communication and quality.

Salovey and Mayer's theoretical structure of emotional intelligence includes many positive experimental characteristics that researchers relate them to the quality of marriage. Emotional intelligence is the recognition capacity, application, understanding, and management of the emotions. Even more in particular, Salovey and Assistants state that, by thinking into his own and others' emotions, people can share the

emotions and understand and manage the emotional information. Furthermore, Salovey and Assistants state that, in marriage therapy, emotional intelligence can be taught, consequently, the more skills couples learn, the more they improve their communications and insight. Grieco has also studied the links between the factors of emotional intelligence and marital satisfaction and figured out that in the first marriage there is a dependency and a correlation between the dimensions of emotional intelligence and satisfaction. Inter and intrapersonal communications, adaptation, stress management, and the general temper are meaningfully predictors of marital satisfactions especially in the components of emotional intelligence. But among the many different components of emotional intelligence, only about the general temper, sub-scales of happiness, optimism, general feeling of satisfaction and life perspectives is predictors of meaningful quantity of variance in marital satisfaction. Grieco even adds that the link between emotional intelligence and marital satisfaction may be of a reciprocal nature, and marital satisfaction may inculcate a sense of happiness and optimism in an individual. Furthermore, happiness and satisfaction may be conditions to increase the sense of satisfaction. In today's society, couples are coping with a large number comprehensive and innumerable problems to get their spouse to make a relationship, preserve intimate relationships, and understand the emotions.

Existing deficiencies in emotional and affectional competence of couples, in addition to other factors, will have unpleasant effects on their matrimony life. Some of these deficiencies can be listed as: inability in self consciousness, lack of self-control, lack of sympathy and the inability to sympathize with each other, and in general, deficiency in establishing a fruitful relationship.

## Law Enforcement Officers

Nowadays, for many employees, successfully combining work and non-work has become a major challenge that sometimes creates problems or conflicts. The process whereby work demands negatively affect one's functioning in the home domain is defined as 'work-home interference'. This situation is assumed to be associated with health complaints since prolonged mental and/or physical preoccupation with work during non-work time limits the opportunities to recover from the effort expended at work. A sustained lack of recovery will eventually manifest itself in health complaints. The reverse process – that is, health complaints leading to work-home interference – may also emerge, because it is possible that employees suffering from health complaints are more susceptible to experiencing a negative influence of work on their private life.

Many Law Enforcement Officers have problems managing a healthy work-life balance. This is not surprising given the nature of law enforcement and the personality types that are attracted to careers in law enforcement. The alpha personality and characteristics traits are suited well for Law Enforcement Officers who are responsible for law and order. Some of the characteristics of an alpha personality are confidence, mental toughness, competitive, command presences, strong body language, position themselves, dominant, take chances, vocal, physical, calm under pressure, and perseverance. These same traits that help officers perform efficiently, also influence officer's attitudes towards long work hours. Not managing a healthy work-life balance can have many negative effects on health and relationships.

Law Enforcement Officers work long hours (shifts) assigned to patrol or investigations. Officers also work part-time jobs as private security when they are not on the department clock. The tradition of law

enforcement holds officers who work long hours in high regard. The mentality being the harder and longer an officer works the more valuable that officer becomes to the department. It is just not the department scheduling that has officers working fatigued.

Many officers indicated they are forced to work part-time jobs (moon-lighting) to provide financial security for their families. The tradeoff for earning extra income is time away from the spouse and children, and this can build to resentment and relationship problems. Striking a work-life balance can provide financial stability and enhance your personal relationship with spouse and children. Establishing work-life balance can be achieved with open and frequent communicating with your spouse and setting financial and personal goals together.

## 2. OBJECTIVES OF THE STUDY

To study the different elements of emotional intelligence and marital satisfaction among the Law Enforcement Officers and others in virudhunagar district

## 3. SAMPLING DESIGN

This study was performed on 120 people, consisting of 60 persons (21 women and 39 men) having marital conflicts who had referred to the administration of justice, with simple random sampling, and 60 persons (31 women and 29 men) having marital satisfaction, with cluster random sampling, from virudhunagar district.

## 4. REVIEW OF LITERATURE

**Anghel and Teodora C.** in their Article captioned "Emotional Intelligence and Marital Satisfaction" aims at finding out the relationship between Marital Satisfaction and Emotional Intelligence. Two tools were used namely Marital Satisfaction Scale (MSS) and Exploring Emotional Abilities (EEA). A fairly representative data of 316 respondents (age 25 to 65) was collected. The analysis indicates a significant positive relationship between emotional intelligence and marital satisfaction.

The comparison of people high and low on emotional intelligence with respect to their marital satisfaction supports the finding. The analysis of couples in the sample also throws more light on the relationship. This research has tried to explore the interplay of various dimensions of emotional intelligence with marital satisfaction. This has helped in understanding the core traits of one's emotionality, which influence the marital relationship.

**Javad Khalatbari.a and Shohreh Ghorbanshiroudi**, in their article captioned “The Relationship between Emotional Intelligence and Marital Satisfaction: 10-Year Outcome of Partners from Three Different Economic Levels, Emotional communication and economic factors play an important role in having a satisfying relationship and a more successful marriage. In this regard, we investigated the 10-year outcome of partners from three different economic levels regarding the relationship between emotional intelligence (EI) and marital satisfaction. The research was designed as a descriptive-correlative survey and data were analyzed using Pearson correlation test and stepwise regression. Participants were 159 couples (N = 318) who were randomly selected through clustered sampling. The questionnaires included: Bar-on Emotional Intelligence (1997) and Enrich Marital satisfaction (1989). The findings revealed that the average values of emotional intelligence ( $m = 333.1$ ) and marital satisfaction ( $m = 300.77$ ) were high in the under-rich region ( $p < 0.05$ ). Moreover, there was no significant relationship between interpersonal and marital satisfaction within the under-rich region. On average, emotional intelligence accounted for 40.8% of marital satisfaction within those three regions ( $p < 0.01$ ). The results of the regression analysis showed that general mood is the most effective factor changing marital satisfaction in the three studied regions ( $R^2 = 0.34$ ), rich ( $R^2 = 0.42$ ) and semi-rich ( $R^2 = 0.52$ ) regions ( $p < 0.01$ ). The

most influential factor changing marital satisfaction in the under-rich ( $R^2 = 0.28$ ) region was found to be stress management ( $p < 0.01$ ).

**Zohre Nasiri Zarch, PhD, Sayed Mahdi Marashi, MD, and Hojatollah Raji, MD** in their study captioned “Relationship between emotional intelligence and marital satisfaction in couples” Specialists and researchers believe that emotional intelligence can have important applications and effects on different human activities such as leadership and direction of others, professional growth, mental health, family life, and marital life. Therefore, the aim of this research was to study the relationship between emotional intelligence and marital satisfaction in married women and their husbands. 500 married women employed in Tehran state administrations, organizations, and companies and their husbands were selected by random stratified sampling. The necessary information was collected using Petrides and Furnham's Emotional Intelligence Scale and Najarian Family Assessment Tool. To analyze data statistically, Pearson's correlation coefficient and multivariate regression were employed. The results showed that there is a significant positive correlation between emotional intelligence and marital satisfaction of women and their husbands. In addition, emotional intelligence of women and their spouses can explain 35% of women's marital satisfaction variance and 6% of their husbands marital satisfaction variance. Considering the significant positive correlation between emotional intelligence and marital satisfaction in married women and their husbands, quality of emotional intelligence can be considered as influential and fundamental construct in improving and reinforcing satisfactory marital relationships. Therefore, effective measures can be taken by training of the emotional intelligence role in improving interpersonal and marital relationships.

**Kiomars Niaz Azari.b, Nikta Bazleh, Niayesh and Safaryazdi** in their research

captioned "The Relationship between Marital Satisfaction (Based on Religious Criteria) and Emotional Stability", this paper aims to examine the relationship between marital satisfaction and emotional stability with an analytical approach. According to the aim of the study, 110 students from the Imam Sadegh University were selected by a random cluster method and then responded to two questionnaires namely Islamic Marital Satisfaction and the five factor Personality Questionnaire of NEO-FFI. The research results were analyzed using descriptive analysis and inferential analysis. The results indicate that there is a significant relationship between marital satisfaction and emotional stability. This means that the more their marital satisfaction grade, the less their neuroticism grade and people are more acquired with emotional stability. It is achieved by this research that there is a relationship between marital satisfaction and emotional stability.

**5. GENDER FREQUENCY DISTRIBUTION**

The Table 1 shows gender frequency distribution on two group samples including 60 persons (21 women and 39 men) is having marital conflicts who had referred to the administration of justice, with simple random sampling, and 60 persons (31 women and 29

men) having marital satisfaction, with cluster random sampling, from virudhunagar district.

**Table 1 Gender Frequency Distribution**

Gender	Law Enforcement Officers		Others	
	Men	39	65	29
Women	21	35	31	51.67
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100.00</b>

Source : Primary Data

**7. STANDARD DEVIATIONS OF DEMOGRAPHIC VARIABLES**

The Table 2 reveals that average and standard of demographic variables in married people of Law Enforcement Officers and married people of other than Law Enforcement Officers, in virudhunagar district. Independent *t*-test in this table showed that average age, spouse's age, marital life duration had no significant differences between the two groups, also, independent *t*-test showed that the average number of children, monthly income and monthly costs had significant differences between the two groups, hence number of children and monthly costs of married people of Law Enforcement Officer were more than the similar data for married people of other than Law Enforcement Officer in Virudhunagar District, but average of monthly income of married people who had gone to Law Enforcement Officers was less than the married people of Non-Law Enforcement Officer.

**Table 2 Standard Deviations of Demographic Variables**

Demographic Variable	Law Enforcement Officers		Others		Independent t-test	
	Age	33.8	8.1	33.3	8.2	0.49
Spouse's age	33.5	8.6	33.7	8	0.14	0.889
Duration of Married life (year)	8.9	7.7	9.3	8	0.33	0.745
Number of Children	1.76	0.95	1.48	0.6	2.1	0.044
Monthly income	8,01,384	3,93,370	9,97,638	6,28,372	2.17	0.032
Monthly costs	7,45,614	51,926	9,40,277	85,857	1.8	0.035

Source : Primary Data

**6. THE COMPARISON OF AVERAGE SCORE OF MARITAL SATISFACTION SUBSCALES**

Regarding the relationship between emotional intelligence and interpersonal communications, it is perceived that emotional

intelligence has an important relationship with people's level of stress and also their psychological health. In the same way, Whisman states that anxiety and stress level of people is the predictor of the marital satisfaction level, and meanwhile, depression

plays a far more important level. Therefore, regarding the more complicated mechanism of anxiety, it has a more effective impact on different aspects of life and inter and intrapersonal communications of an individual. Also, in the current study, impulsion control, stress tolerance and happiness, which are components of emotional intelligence, have direct and meaningful relationship with either

total score of marital satisfaction or marital satisfaction subscales. Hafner recognizes personality factors, including assertiveness, as one of the most important factors, which affects the level of marital satisfaction. Regarding the meaning fullness of this component - along with the total score of marital satisfaction and its components- this seems to be a true fact.

**Table 3 The Comparison of Average Score of Marital Satisfaction Subscales**

Marital satisfaction subscales	Law Enforcement Officers mean ± SD	Others mean ± SD	P Value	t
Independence	22.88 ± 4.30	23.49 ± 3.70	0.0408	0.83
Stress Tolerance	20.70 ± 4.95	10.92 ± 5.01	0.817	0.232
Reality testing	22.12 ± 4.78	21.08 ± 4.20	0.215	-1.236
Interpersonal Relationship	24.70 ± 3.11	22.28 ± .70	<0.0001	-3.665
Impulse Control	19.84 ± 5.26	19.89 ± 5.77	0.959	0.052
Empathy	21.79 ± 2.65	19.33 ± 3.35	<0.0001	-4.191
assertiveness	21.47 ± 4.39	21.35 ± 4.62	0.303	-0.579
Flexibility	21.07 ± 4.46	20.11 ± 4.86	0.282	-2.089

Note: Significant at P<0.01

Of all different aspects of marital satisfaction, the following results were obtained. As the P value in this case of Independence (P=0.0408), Stress Tolerance (P=0.817), Reality testing (P=0.215), Impulse Control (P=0.959), assertiveness (P=0.303) Flexibility (P=0.282), which is higher than 0.01, the assumed level of significance, there is an enough evidence to reject the null hypothesis. Therefore, we can conclude that there is no significant relationship in the different aspects of marital satisfaction for Law Enforcement Officers and other than Law Enforcement Officers, only the one related to friends and relatives has a significant relationship with Law Enforcement Officers and other than Law Enforcement Officers.

Of all different aspects of marital satisfaction, the following results were obtained. As the P value in this case of interpersonal relationship and empathy are 0.0001, which is lower than 0.01, the assumed level of significance, there is not enough evidence to reject the null hypothesis. Therefore, we can conclude that there is a

significant relationship in the different aspects of marital satisfaction for Law Enforcement Officers and other than Law Enforcement Officers.

### **8. THE COMPARISON OF THE AVERAGE RATE OF EMOTIONAL INTELLIGENCE'S SUBSCALE SCORE**

Marriage is an effective tool in self-fulfillment process. Here emotional intelligence plays a very important role. The satisfaction level a person feels from his/her marriage may have an impact on his / her verdict of communication types. Most of gloomy and unhappy couples experience a higher level of stress and therefore are exposed to more physical injuries. The components of emotional-social intelligence showed a statistically meaningful relationship with components of marital satisfaction.

**Table 4 The Comparison of the Average Rate of Emotional Intelligence’s Subscale Score**

Emotional Intelligence’s Subscale	Mann-Whitney		Mean Rank	
	P value	Z	Law Enforcement Officers	Others
Problem solving	P=0.998	-0.003	63.51	63.49
Happiness	P=0.131	-1.511	70.29	59.98
Self-Actualization	P=0.054	-1.929	72.17	59.01
Self-Awareness	P=0.174	-1.365	69.64	60.32
Optimism	P=0.790	-0.266	64.70	62.88
Self-Reliance	P=0.487	-1.313	66.63	61.88
Responsibility	P=0.022	-2.283	73.73	58.20

Note: Significant at P<0.05.

Of all different aspects of Emotional Intelligence, the following results were obtained. As the P value in this case of Problem solving (P=0.998), Happiness (P=0.131), Self-Actualization (P=0.054), Self-Awareness (P=0.174), Optimism (P=0.790), Self-Reliance (P=0.487), which is higher than 0.05, the assumed level of significance, there is an enough evidence to reject the null hypothesis. Therefore, we can conclude that there is no significant relationship in the average rate of Emotional Intelligence for Law Enforcement Officers and other than Law Enforcement Officers.

Of all different aspects of marital satisfaction, the following results were obtained. As the P value in this case of Responsibility 0.022, which is lower than 0.05, the assumed level of significance, there is not enough evidence to reject the null hypothesis. Therefore, we can conclude that there is a significant relationship in the average rate of Emotional Intelligence for Law Enforcement Officers and other than Law Enforcement Officers.

**9. IMPACT OF EMOTIONAL INTELLIGENCE ON MARITAL SATISFACTION**

Marital satisfaction can be defined as the process of adaptation of the both partners in such a way as to avoid or resolve conflicts sufficiently so that the mates feel satisfied with the marriage and each other. Moreover, factors related to marital satisfaction have aroused

special interests for psychologists, family researchers and sociologists during the past few decades. Existing literature has posed various factors as potential influences on marital satisfaction. Such factors include Personality issues, Marital communication, Conflict resolution, Finance Management, Pleasure activities, Sexual relation, Marriage and children, family and friends, Religious orientation, Self sentiment, realistic expectation and Social Responsibility.

Communication in marriage is the primary vehicle through which couples relate to and manage each other; their social and cognitive processes underlying their communication assume a leading role in their ability to adapt to ongoing relational developments and satisfaction. The presence of children emerged as a significant factor associated with marital satisfaction. Children are positive influence in their life. “Couples with children had significantly less verbal communication and that their interaction rates were lower and involved talking more about their children and less about themselves and their relationship. They felt less close to each other than childless couples, who were more responsive to conflict, and experienced lower marital satisfaction”

A longstanding finding in the marital satisfaction literature is compromise in the relationship. According to literature, to make a successful marriage, the common factor that required is compromise. As relationship



develops, partners establish understanding between them, about issues such as money, recreation, home environment, parenting and relationship with others in their lives, while it may not be necessary that to agree in all matters of life, it is tiring. A certain level of agreement is necessary for partnerships to function well, and this usually requires willingness to compromise. The sexual satisfaction has emerged as another significant factor associated with marital satisfaction. According to literature, “sexual satisfaction, frequency of sex and sexual activities, sexual interest and satisfaction of one’s spouse has a great deal to do with marital satisfaction. Indeed, sex is so important to marital satisfaction that sexual inactivity may be a sign that there are other problems within the marriage”

According to the literature on marriage it is found that to predict marital satisfaction there is need to understand the level of couples.

It includes the perceived sharing of values, sharing of leisure time; agreement on various issues and the ability to resolve differences. There is evidence that understanding is associated with relationship satisfaction in married couples for conflict, attachment, and self-attributes. Another important factor leading to marital satisfaction is self-sentiment. According to a research, “the self sentiment is special frame work that influence how we process information about the social world around us along with information about ourselves”. There are individual differences in people’s views of themselves. People with positive self-view, experience satisfaction in their marriage as compared to people with negative self-views will find less satisfaction. According to the previous researches, “individual who view their partners positively; the relationship satisfaction is higher”

**Table 5 Regression Model Summary for Marital Satisfaction**

R	R Square	Source of variation	Sum of Squares	DF	Mean Square	F	Sig.
0.851	0.724	Regression	13.671	12	1.139	1.145	.357
		Residual	36.829	37	.995		
		Total	<b>50.500</b>	<b>49</b>			

**Impact of Emotional Intelligence on Marital Satisfaction** = a + b<sub>1</sub>X<sub>1</sub>+ b<sub>2</sub>X<sub>2</sub>+.....+ b<sub>12</sub>X<sub>12</sub>

**a. Predictors:** (Constant), Personality issues, Marital communication, Conflict resolution, Finance Management, Pleasure activities, Sexual relation, Marriage and children, family and friends, Religious orientation, Self sentiment, realistic expectation and Social Responsibility.

**b. Dependent Variable:** Marital Satisfaction Factors.

The power of the regression model represented by the R<sup>2</sup> is a healthy 0.724, and the ‘F’ test of the model shows that the significance of the model is high as the not significance of F is .357 which is more than .05.

The model’s ‘t’ test shows that the predictors, namely family and friends, Personality issues, self sentiment and financial management are statistically significant at 95 % confidence level as their significance levels are less than .05. Marital communication, Conflict resolution, Pleasure activities, Sexual relation, Marriage and children, Religious orientation, realistic expectations and Social responsibility are statistically not significant at 95% confidence level as their significance levels are more than .05. Therefore it indicates that Marital communication, Conflict resolution, Pleasure activities, Sexual relation, Marriage and children, Religious orientation, realistic expectations and Social responsibility that contribute to the impact factors of emotional intelligence involved in marital satisfaction are

statistically significant implying that their influence is stronger than the other variables.

**Table 6 Regression Model Summary for Factors Involved in Marital Satisfaction of Law Enforcement Officers**

Model	Unstandard Co- efficients		Standardized Co-efficients		Sig.
	B	Std. error	Beta		
1(Constant)	6.259	1.515		4.130	.000
Personality issues	-.209	.078	-.161	-2.659	.008
Marital communication	-.158	.137	-.203	-1.154	.256
Conflict resolution	-.151	.172	-.142	-.877	.386
Finance management	.247	.066	.193	3.727	.000
Pleasure activities	.024	.141	.031	.171	.865
Sexual relation	-.116	.130	-.148	-.896	.376
Marriage and children	-.131	.141	-.156	-.931	.358
Family and friends	-.340	.133	-.403	-2.550	.015
Religious orientation	-.151	.168	-.170	-.902	.373
Self sentiment	-.263	.089	-.177	-2.948	.003
realistic expectations	-.118	.118	-.156	-.999	.324
Social responsibility	-0.24	.131	-.033	-.187	.853

Source: Primary Data

**10. CONCLUSION**

Since the present research showed a positive and strong relation between the soundness of emotional intelligence and marital relations quality, this variable could be used in improving human relations and increasing marital satisfaction between couples, via instructing the skills related to improving emotional intelligence in law enforcement department and family clinics.

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# Consumer Behaviour towards the Products of Hatsun Agro Product Limited

M. Subasini

*Department of Commerce, V.V.Vanniaperumal College for Women, Virudhunagar*

**Abstract** – Milk and milk products are basic requirement for day to day life. Hatsun Agro Products Limited is a company processing milk product for the past five decades and captures a prevailing position in the market. The company procures around 1.65 million liters of liquid milk per day by directly collecting it from farmers spread over 4500 villages in south India. It has its own infrastructure of milk collection centre and chilling centre for procuring and handling of raw milk. Quality, tasty and purity are the prime mantras of the company. Arokyia and Gomatha are two milk product lines of HATSUN Agro selling liquid milk to the markets in TamilNadu, Karnataka, Andhra Pradesh and Goa. Even though it faces competition from local and multinational companies, it lies in the top position because of the support of the consumers. Hence, an attempt has been taken by the researcher to study the consumer behavior towards Hatsun Agro Products Limited.

**Keywords:** Consumer Behaviour, Hatsun, Agro Product

## 1. INTRODUCTION

Hatsun Agro Product Limited is based in South India and was incorporated in 1970. R.G.Chandramohan is the founder of this company. Hatsun is the largest private sector dairy company in India and hence has a distinct advantage of dealing in cow's milk. The company procures around 1.65 million liters of liquid milk per day by directly collecting it from farmers spread over 4500 villages in south India. It has its own infrastructure of milk collection centre and chilling centre for procuring and handling of raw milk. Over 350 field staffs are employed to ensure timely collection, testing of milk at the point of collection, weekly payment, cattle feed sales, encouraging farmers to grow their herd size, bank loans, animal insurance, training farmers on a better animal management and clean milking. It is having high-tech processing plants operating at 7 locations. This is the only company in India using Bactofuge Technology (from West Falia-Germany) to clarify liquid milk. Hatsun started marketing fresh milk in

pouches from 1993 and manufacturing dairy ingredients from 2003. In 1970, Hatsun began with the pioneering effort of producing Arun ice cream, which still continues to be the most popular ice cream brand in South India. In 2012, Hatsun Agro Product started selling of new range of Ice Creams under the Brand name "IBACO".

Arokyia and Gomatha are two milk product lines of HATSUN Agro selling liquid milk to the markets in TamilNadu, Karnataka, Andhra Pradesh and Goa. The company procured and marketed about 1.40 lakh liters milk in Belgaum unit. It had become a billion dollar company by mid of 2016. The Company was also awarded "The Fastest Growing Asian Dairy Company". The Dairy product maker has been bagging the Golden Trophy from the Indian Government for largest dairy products exporter for the last many years.

## Product Portfolio of Hatsun Agro Product Limited

The product portfolio of Hatsun Product Limited are as follows:

- Ice cream – Arun Ice Cream, Make Your Own Sunday, Arun Unlimited
- Milk Products – Hatsun Cooking Butter, Hatsun Cow Ghee, Hatsun Butter Milk , Hutsun Curd , Hutsun **Paneer**
- Beverages – Aaros Milk/ Badam Milk, Aaros Tea/ Masala Tea , Aaros Coffee, AarosRagi
- Dairy Ingredients

## 2. STATEMENT OF THE PROBLEM

Milk and milk products are basic requirement for day to day life. Hatsun Agro Products Limited is a company processing milk product for the past five decades and captures a prevailing position in the market. Quality, tasty and purity are the prime mantras of the

company. The company's products are preferred by all age group of people due to its taste and hygienic. It widens the distribution channels all over the nation and succeed in it. Even though it faces competition from local and multinational companies, it lies in the top position because of the support of the consumers. Hence, an attempt has been taken by the researcher to study the consumer behavior towards Hatsun Agro Products Limited.

**3. SCOPE OF THE STUDY**

The present study is limited to study the consumer behavior towards the products of Hatsun Agro products Limited. It does not consider the financial position, competitive advantage and strategies adopted by the firm. It studies the consumer behavior and factors influencing the consumer to buy Hatsun Agro Products Limited.

**4. OBJECTIVES OF THE STUDY**

The objectives of the study are as follows:

1. To study the socio-economic profile of the respondents
2. To identify the Hatsun Agro products preferred by the respondents
3. To analyse the consumer behavior towards Hatsun Agro Products
4. To examine the factors influencing the consumers to buy Hatsun Agro Products
5. To give suggestions on the basis of findings of the study

**5. RESEARCH METHODOLOGY**

The present study is based on both primary and secondary data. The primary data has been gathered from 300 respondents through a well-structured questionnaire by adopting convenient sampling technique. The secondary data has been collected from journals and websites. The primary data has been analysed by using percentage analysis, mean score analysis and Likert's five point scaling technique.

**6. RESULTS AND DISCUSSION**

In this section, socio-economic profile of the respondents, Hatsun Agro products preferred by the respondents, consumer behavior towards Hatsun Agro products and factors influencing the consumers to buy Hatsun Agro products.

**SOCIO-ECONOMIC PROFILE OF THE RESPONDENTS**

Table 1 shows the socio-economic profile such as age, gender, education and monthly income of the respondents.

**Socio-Economic Profile of the Respondents**

Socio-Economic Profile		No. of Respondents	%
Gender	Male	131	43.67
	Female	169	56.33
Age (in years)	Below 25	143	47.67
	25-35	67	22.33
	35-45	56	18.67
	Above 45	34	11.33
Education	School level	101	33.67
	College level	118	39.33
	Others	81	27.00
Monthly income (in Rs.)	Below 10,000	92	30.67
	10,000-20,000	85	28.33
	20,000-30,000	79	26.33
	Above 30,000	44	14.67

Source: Primary data

**Gender wise Classification of the Respondents**

Out of 300 respondents, 169 (56.33%) are female and 131(43.67%) are male.

**Age wise Classification of the Respondents**

Out of 300 respondents, 143 (47.67%) fall under the age group of below 25 years, 67 (22.33%) belong to the age group of 25-35 years, 56 (18.67%) come under the age group of 35-45 years, 34 (11.33%) are in the age group of above 45 years.

**Education wise Classification of the Respondents**

Out of 300 respondents, 118 (39.33%) have finished their education upto college level

and 81 (27%) fall under others category, 101 (33.67%) have completed their education upto school level.

### Monthly Income wise Classification of the Respondents

Out of 300 respondents, 92 (30.67%) have earned below Rs. 10,000/- per month, 85 (28.33%) have come under the monthly income category of Rs. 10,000/- to Rs. 20,000/-, 79 (26.33%) have earned Rs. 20,000/- to Rs. 30,000/- per month and 44 (14.67%) have belong to the month income category of above Rs. 30,000/-.

### HATSUN AGRO PRODUCTS PREFERRED BY THE RESPONDENTS

Table 2 shows the Hatsun Agro products preferred by the respondents.

It is clear from Table 2 that 96 (25.13%) have preferred Hatsun Cow Ghee, 76 (19.90%) have preferred Hatsun cooking butter, 56 (14.66%) have preferred Hatsun butter milk, 39 (10.21%) have preferred Hatsun Dairy Whitener, 34 (8.90%) have preferred Arun ice cream, 33 (8.64%) have preferred Hatsun Curd,

26 (6.81%) have preferred Hatsun skimmed milk powder and 22 (5.76%) have preferred Hatsun Paneer.

**Table 2 Hatsun Agro Products Preferred by the Respondents**

Hatsun Agro Products	No. of Respondents	%
Arun Ice cream	34	8.90
Hatsun Cooking Butter	76	19.90
Hatsun Cow Ghee	96	25.13
Hatsun Butter Milk	56	14.66
Hatsun Curd	33	8.64
Hatsun Paneer	22	5.76
Hatsun Dairy Whitener	39	10.21
Hatsun skimmed milk powder	26	6.81
<b>Total</b>	<b>382</b>	<b>100.00</b>

Source: Primary data

(Note: As the respondents give more than one response, the total exceeds 300)

### CONSUMER BEHAVIOUR TOWARDS HATSUN AGRO PRODUCTS

Table 3 points out the consumer behavior towards Hatsun Agro Products.

**Table 3 Consumer Behaviour towards Hatsun Agro Products**

Consumer Behaviour towards Hatsun Agro Products		No. of Respondents	%
Years of using Hatsun Agro products	Below 5	79	26.33
	5-10	173	57.67
	Above 10	48	16.00
Source of knowledge about Hatsun Agro Products	Advertisements	101	33.67
	Friends	171	57.00
	Relatives	28	9.33
Amount spent for buying Hatsun Agro Products per month (in Rs.)	Below 500	33	11.00
	5,00-1,000	147	49.00
	1,000-2,000	102	34.00
	Above 2,000	18	6.00
Frequency of buying Hatsun Agro Products	Daily	139	46.33
	Weekly	89	29.67
	Monthly	72	24.00
Habit of watching ingredients and date of expiry of the products	Yes	194	64.67
	No	106	35.33

**Years of Using Hatsun Agro Products**

Out of 300 respondents, 171 (57%) have gathered knowledge about Hatsun Agro products from friends, 101 (33.67%) have obtained information about Hatsun Agro products from advertisements and 28 (9.33%) have gathered information about Hatsun Agro products from relatives.

**Source of Knowledge about Hatsun Agro Products**

Out of 300 respondents, 173 (57.67%) have bought Hatsun Agro products for a period of 5-10 years, 79 (26.33%) have bought Hatsun Agro products for a period of below 5 years and 48 (16%) have bought Hatsun Agro products for a period of above 10 years.

**Amount Spent for Buying Hatsun Agro Products PerMonth**

Out of 300 respondents, 147 (49%) have spent Rs. 500/- to Rs. 1,000/- per month, 10 (34%) have spent Rs.1,000/- to Rs. 2,000/- per

month, 33 (11%) have spent below Rs. 500/- per month and 18 (6%) have spent above Rs. 2,000 per month for buying Hatsun products.

**Frequency of Buying Hatsun Agro Products**

Out of 300 respondents, 139 (46.33%) have bought Hatsun Agro products daily, 89 (29.67%) have bought Hatsun Agro products weekly and 72 (24%) have bought Hatsun Agro products monthly.

**Habit of Watching Ingredients and Date of Expiry of the Products**

Out of 300 respondents, 194 (64.67%) have a habit of watching ingredients and date of expiry of products and the remaining 106 (35.33%) do not have a habit of watching ingredients and date of expiry of products.

**FACTORS INFLUENCING TO BUY HATSUN AGRO PRODUCTS LIMITED**

Table 4 illustrates the factors influencing the respondents to buy Hatsun Agro Products.

**Table 4 Factors influencing to buy Hatsun Agro Products Limited**

Factors	Strongly Agree	Agree	No opinion	Disagree	Strongly disagree	Mean score
Healthy and hygienic	550	136	168	128	36	3.39
<b>Quality of the product</b>	690	344	156	20	14	<b>4.08</b>
Brand loyalty	420	344	120	120	30	3.45
Celebrity endorsement	590	200	114	56	66	3.42
<b>No adulteration</b>	600	488	138	20	2	<b>4.16</b>
More number of products	660	184	306	32	4	3.95
Suitable, eco-friendly and attractive packaging	420	80	408	104	8	3.40
Reasonable price	380	456	192	36	28	3.64
Offers and discounts	445	136	210	38	88	3.06
Availability	805	224	78	70	22	4.00
More number of distribution channels	825	140	60	56	52	3.78
Wide area coverage	590	268	105	68	46	3.59
<b>Taste of the product</b>	740	396	111	24	4	<b>4.25</b>
Advertisements in popular media	440	516	42	20	59	3.59
Sales promotion strategies	410	180	87	94	97	2.89

**Source: Primary data**

Most of the respondents are influenced by ‘Taste of the product’ (4.25) followed by ‘No adulteration’ (4.16) and ‘Quality of the product’ (4.08).

**7. SUGGESTIONS**

On the basis of findings of the study, some suggestions are offered.

- ♣ Hatsun Agro Products Limited has to improve the sales promotional strategies to improve the sales.
- ♣ It has to give offers and discounts to attract the customers
- ♣ It has to use eco-friendly packing materials to ensure pollution free environment.
- ♣ It has to engage celebrities in their advertisement to popularize the product.

## 8. CONCLUSION

Hatsun Agro products are known for its quality. The company has to extent their distribution channels via well planned placing strategies.

It conducts consumer survey every year to know about the taste and preference of the customers and redesign their strategies as per the needs of the customers. This activities of the company will add more feathers in the victory crown of Hatsun Agro products limited.

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# Consumers Satisfaction towards Electronic Goods in Virudhunagar District

M.Suresh and P.Sundara Pandian

*Department of Commerce, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar.*

**Abstract** - India is witnessing a noteworthy development in manufacturing industries since 1947. Though various industries are producing different kinds of products, electronic goods occupy a predominant position in Indian market. Electronics is one among the world's largest and fastest growing industries. In the past two decades, the electronic sector has been growing faster than any other sectors. The objective of the study is to know the level of satisfaction of consumers about the electronic goods and to analyse the factors influenced for selecting electronic goods. For this study, 200 respondents were selected from the study area Virudhunagar district by convenient sampling method. In order to find the association between the level of satisfaction about electronic goods based on gender, family income and age group. The orders of merit given for factors influenced for selecting electronics goods by the respondents were converted into Henry Garret Ranking and an attempt was made to analysis the features of electronic goods on a weighted average ranked basis. The producer must be paid special attention at least with regard to price and distribution system to cover the large number of customers. The idea must be build for better brand image and the quality is also must be checked frequently for a better customer satisfaction.

**Keywords:** Awareness, Consumers Satisfaction, Electronic Goods Awareness

## 1. INTRODUCTION

India is witnessing a noteworthy development in manufacturing industries since 1947. Though various industries are producing different kinds of products, electronic goods occupy a predominant position in Indian market. Hence, new industries have emerged and concentrating more on technological up gradation on a par with the leading electronic manufacturing countries such as Japan, Korea etc., The consumer electronics industry has witnessed a unique growth over the past few years. This growth can be attributed to the increasing effect of state of the art electronic devices on the market. The consumer electronics industry is ushering in the dawn of convergence. It is the confluence and merging of hitherto separated markets of digital based audio, video and information technology, removing entry barriers across the market and

industry boundaries. Technological changes, especially in the electronic sector, have paved the way for the new opportunities. The political, socio-economic and technological changes as the global scenario reflected in the performance of Indian electronic industries. A long recession in the demand of consumer electronic products, especially television, audio systems, refrigerator, washing machine etc., has affected this industries lot.

Electronics in one among the world's largest and fastest growing industries. In the past two decades, the electronic sector has been growing faster than any other sectors. The growth in the electronic sector is associated with the increasing demand for existing products. Introduction of new products, opening new markets in the rural and sub-urban areas, penetration of electronics into rest of the economy of a nation. This global marketing strategy creates good awareness among the consumer of electronic goods and through these products, standard of living has enhanced. By seeing advertisements in the television and in other medias the rural and suburban customers come forwards towards a change of lifestyle by purchasing electronic goods even installment basis.

Based on the above issues the following questions were probed:

1. To what extent the consumers are aware of electronic goods.
2. What is the level of utilizing the electronic goods?
3. What are the common problems faced in electronic goods marketing.

## 2. REVIEW OF LITERATURE

Rizwana Ahmed (1992) In her thesis entitled "Consumer buying decision for consumer durable goods" opined that, the



durable goods are generally purchased in recognition of a need that has to be fulfilled of the durable goods, those that fall in category of what we term as 'gadgets' or appliances are generally purchased for they offer come convenience by way of reducing labor or time or effort involved in a process such as a food processor, microwave cooking oven or refrigerator, washing machine etc. She of the new that the consumers are more reluctant to admit the intangible appeals of the durable goods especially those pertain to their status or social standing but more admit that the practice aspects of the products attracted them to purchase it. The consumer behavior is always subject to change and a host of factors influence the purchase decision of consumer for durable goods. The study looks into the internal determinate of consumer behavior such as need, motive perception attitudes, learning & personality whereas the present scare investigated into the environment factors, a buyers characteristics their decision process and buyer's response in regard to the marketing strategy adopted by the electronic companies.

Dr. S. Sarvana (2010) In his article in "A study an consumer behavior of woman with special reference to durable goods in coimbatore city- Tamil Nadu", found that education plays a keyrole in shopping behavior and higher income group respondents shop as and when they like; In majority women plays a major role in purchase decision and they prefer to prepare an item list before purchasing. Family influences the consumer's behavior to a greater extent while purchasing. Majority of the respondents prefer to purchase products from departmental store rather than any other shop. Most of the people recommend the product purchased by them to others. People give preference to product quality. Most of them satisfied with the factors such as price, quality, and availability of service and design of durable goods. In the present study we are internal to know wither people in Allahabad City as

satisfied with the price, quality, availability, service and design of electronic goods.

Paramanand Dasar, Hundekar, S.G. and Mallikarjun Maradi10 (2013) made a study entitled, "Consumer Behaviour on Consumer Durables With Reference To Bijapur District", which explains that consumer is the nerve centre of the modern marketing, understanding his behaviour is quite essential for efficient and effective marketing management. Customers may state their needs and wants, but act otherwise. They may not be in touch with their deeper motivations. Indian consumer market is riding the crest of the country's economic boom. Driven by a young population with access to disposable incomes and easy finance options, the consumer market has been throwing up staggering figures. Marketing problem enhanced from the consumers' behaviour has a greater degree of similarity in behavioural problems relating to the consumer durables. Hence, the present study has been chosen to identify and ascertain the impact of consumer behaviour problems on the marketing of consumer durables in the fast growing Bijapur District (Karnataka State). The consumer behaviour in relating to consumer durables is strongly affected by some economical, social, cultural and psychological factors; the research had been selected for an intensive empirical survey of the various factors influencing the buyer's behaviour on consumer durables in Bijapur District (Karnataka State).

### **3. OBJECTIVES OF THE STUDY**

- To know the level of satisfaction of consumers about the electronic goods
- To analyse the factors influenced for selecting electronic goods

### **4. SAMPLING DESIGN**

For this study, 200 respondents were selected from the study area Virudhunagar district by convenient sampling method.

**5. AWARENESS ON ELECTRONIC GOODS**

An attempt has been made to study the level of consumers' awareness on electronic goods. The table below shows that 21% of the respondents have low level awareness about the electronic goods; 34% of the respondents have medium level awareness about the electronic goods and the remaining 45% of the respondents have high level awareness about the electronic goods.

**Table –1 AWARENESS ON ELECTRONIC GOODS**

Awareness	No.of Respondents	Percentage
Low	42	21%
Medium	68	34%
High	90	45%
<b>Total</b>	<b>200</b>	<b>100%</b>

Source: Primary Data

Most 45% of the respondents have high level awareness about the electronic goods

**6. PURPOSE OF USING ELECTRONIC GOODS**

An attempt was made to identify the purpose for which the electronic goods were used by the respondents. As far this analysis concerned, the purpose of the use of the electronic goods is divided into four categories, namely personal use, business use, Entertainment and the use for status. The following table shows that 46% of the respondents buy the electronic goods for personal use; 24% of the respondents buy the electronic goods for business use; 13% of the respondents buy the electronic goods for entertainment and the remaining 17% of the respondents buy the electronic goods for status.

**Table – 2 PURPOSE OF USING ELECTRONIC GOODS**

Purpose of using	No.of Respondents	Percentage
Personal	92	46%
Business	48	24%
Entertainment	26	13%
Status	34	17%
<b>Total</b>	<b>200</b>	<b>100%</b>

Source: Primary Data

Most of the 46% of the respondents buy the electronic goods for their personal use.

**7. SOURCE OF KNOWLEDGE ABOUT ELECTRONIC GOODS**

The following table shows that 31% of the respondents are know the product through their friends/relatives. 20% of the respondents are know the product through advertisement; 15% of the respondents are know the product through shop owner and the remaining 34% of the respondents are know the product through their family members.

**Table – 3 SOURCE OF KNOWLEDGE ABOUT ELECTRONIC GOODS**

Source	No.of Respondents	Percentage
Friends/Relatives	62	31%
Advertisement	40	20%
Shop owner	30	15%
Family members	68	34%
<b>Total</b>	<b>200</b>	<b>100%</b>

Source: Primary Data

Majority 65% of the respondents are know the product through their Friends/Relatives and family members.

**8. GENDER AND LEVEL OF SATISFACTION ABOUT ELECTRONIC GOODS**

In order to find the association between the gender and level of satisfaction about electronic goods, the following hypothesis has been framed.

Ho: There is no significant association between the gender and level of satisfaction about electronic goods.

H<sub>1</sub>: There is a significant association between the gender and level of satisfaction about electronic goods.

With the view to find the association between the gender and level of satisfaction about electronic goods, Mann -Whitney ‘U’ test is used. The result of the test is shown in the following table.

**Table – 4 GENDER AND LEVEL OF SATISFACTION ABOUT ELECTRONIC GOODS**

Gender	Size	Mean	Mann-Whitney value	Z value	P value
Male	43	103.84	3232.000	-.437	.662
Female	157	99.59			
<b>Total</b>	<b>200</b>	<b>203.43</b>			

The Mann-Whitney ‘U’ test reveals that the calculated P value is .662. Since the P value is greater than .05, the null hypothesis is accepted at 5% level of significance. So, the null hypothesis holds good, thus the researcher concludes that there is no significant association between the gender and level of satisfaction about electronic goods.

### 9. FAMILY INCOME AND LEVEL OF SATISFACTION ABOUT ELECTRONIC GOODS

In order to find the association between the family income and level of satisfaction about electronic goods, the following hypothesis has been framed.

Ho: There is no significant association between the family income and level of satisfaction about electronic goods.

H<sub>1</sub>: There is a significant association between the family income and level of satisfaction about electronic goods.

With the view to find the association between the family income and level of satisfaction about electronic goods, Krushkal-Wallis test is used. The result of the test is shown in the following table.

**Table – 5 FAMILY INCOME AND LEVEL OF SATISFACTION ABOUT ELECTRONIC GOODS**

Family Income	Size	Mean Rank	Chi-square value	Sig
Upto ₹3000	12	71.96	15.567	.004
₹3001-₹6000	26	67.37		
₹6001-₹9000	64	112.18		
₹9001-₹12000	81	106.25		
Above ₹12000	17	99.97		
<b>Total</b>	<b>200</b>			

As the P value is (.004) less than the .05, at 95% confidence level, the null hypothesis is rejected. So the researcher

concludes that there is a significant association between the family income and level of satisfaction about electronic goods.

### 10. AGE AND LEVEL OF SATISFACTION ABOUT ELECTRONIC GOODS.

In order to find the association between the age and level of satisfaction about electronic goods, the following hypothesis has been framed.

Ho: There is no significant association between the age and level of satisfaction about electronic goods.

H<sub>1</sub>: There is a significant association between the age and level of satisfaction about electronic goods.

With the view to find the association between the age and level of satisfaction about electronic goods, Krushkal-Wallis test is used. The result of the test is shown in the following table.

**Table – 6 AGE AND LEVEL OF SATISFACTION ABOUT ELECTRONIC GOODS**

Age	Size	Mean Rank	Chi-square value	Sig
Below 20	23	133.96	37.825	.000
20-40	87	73.38		
40-60	62	122.06		
Above 60	28	109.55		
<b>Total</b>	<b>200</b>			

As the P value is (.000) less than the .05, at 95% confidence level, the null hypothesis is rejected. So the researcher concludes that there is a significant association between the age and level of satisfaction about electronic goods.

### 11. FACTORS INFLUENCED FOR SELECTING ELECTRONIC GOODS

The orders of merit given by the respondents were converted into Henry Garret ranking technique by using the following formula.

$$\text{Percentage position} = [100 (R_{ij} - 0.5) / N_{ij}]$$

The percentage position of each rank thus obtained is converted into scores by referring to the table given by Henry Garret ranking technique. Then for each factor the

scores of individual respondents are added together and divided by the total number of respondents for whom the scores were added.

**Table – 7 FACTORS INFLUENCED FOR SELECTING ELECTRONIC GOODS**

Factors	Total Score	Garrett mean Score	Rank
Need	10454	52.27	<b>I</b>
Status	10294	51.47	<b>II</b>
Affordability	9978	49.89	<b>III</b>
Economical	9868	49.34	<b>VI</b>
Advertisement	9788	48.94	<b>V</b>
Friends/relatives recommendable	9706	48.53	<b>VI</b>
Attractive schemes/ Offers	9312	46.56	<b>VII</b>

The above table reveals that the first rank given by the respondents was “Need”, its total score and the mean score were 10454 and 52.27 respectively. The second rank was given “Status”, where the total score is 10294 and mean score is 51.47. “Affordability”, was ranked III with the total score is 9978 and mean score is 49.89. “Economical”, was ranked IV with the total score is 9868 and mean score is 49.34. “Advertisement”, was ranked V with the total score is 9788 with a mean score is 48.94. The VI rank was given to “Friends/Relatives recommendable”, with the total score is 9706 and mean score is 48.53 and the last rank was given to “Attractive schemes/offers”, ranked VII with the total score is 9312 and mean score is 46.56.

**12. FEATURES OF ELECTRONIC GOODS**

During the survey, it was observed that the sample respondents getting the features of electronic goods are ranked. An attempt was made to analysis the features of electronic goods on a weighted average ranked basis. The respondents were desired to rank the following features namely headed

1. Performance
2. Technology
3. Durability
4. Overall brand image
5. Price

6. Service
7. Guarantee

The investigation discloses the order of preference by the respondents regarding the features of electronic goods such as Performance, Technology, Durability, Price, Overall brand image, Service, Guarantee are ranked 1,2,3,4,5,6 and 7 respectively. The following table highlights the ranking of features of electronic goods.

**Table – 8 FEATURES OF ELECTRONIC GOODS**

Features	Weighted Score	Rank
Performance	4.32	<b>I</b>
Technology	4.205	<b>II</b>
Durability	4.05	<b>III</b>
Price	3.96	<b>IV</b>
Overall brand image	3.935	<b>V</b>
Service	3.88	<b>VI</b>
Guarantee	3.65	<b>VII</b>

The above table reveals that the first rank given by the respondents was “Performance”, its weighted average score 4.32 respectively. The second rank was given “Technology”, where the total score is 4.205. “Durability”, was ranked III with the total score is 4.05. “Price”, was ranked IV with the total score is 3.96. “Overall brand image”, was ranked V with the total score is 3.935. The VI rank was given to “Service”, with the total score is 3.88 and the last rank was given to “Guarantee”, ranked VII with the total score is 3.65.

**13. SUMMARY**

The electronic industry makes a hall mark in the development of economy of the nation and providing a good standard of living to Indian consumers by offering highly sophisticated electronic goods which makes more comfortable life to Indian citizens. It is found that the level of awareness of 45% of the consumers have high level awareness. It is found that 46% of the consumers buy the electronic goods for their personal use. There is no significant association between the gender and level of satisfaction about electronic goods and age and level of satisfaction about

electronic goods. There is a significant association between the family income and level of satisfaction about electronic goods. Factors influenced to buy the electronic goods are ranked in the following order: Need ranks first, Status comes second, Affordability comes third, Economical comes fourth, Advertisement, Friends/Relatives recommendable, Attractive schemes/offers are ranked fifth, Sixth and Seventh respectively. The investigation discloses the order of preference by the respondents regarding the features of electronic goods such as Performance, Technology, Durability, Price, Overall brand image, Service, Guarantee are ranked 1,2,3,4,5,6 and 7 respectively.

Despite the basic characteristics of consumers the behavior pattern of consumers are more or less similar to each other, particularly in the aspects like quality, preference and decision making. However it is evident that the present approaches to draw the attention of customers are not adequate. The consumers are particular about the appropriate system of distribution and hence there is a great need for change in the electronics buying system. It may not be always correct to say that consumers behave in the same way as it much depends on type of products, quality of the products and price of the products. Consumer attitude towards electronics based on age group, income group and price leads major role while purchasing the electronic goods.

Therefore the producer must be paid special attention at least with regard to price and distribution system to cover the large number of customers. This is mainly because of the fact that the buying capacity of the consumers may not be equal to the buying capacity. Now- a- days products are customized to digital. In this occasion, the idea must be build for better brand image and the quality is also must be checked frequently for a better customer satisfaction. A regular communication and announcement of product to the customers by using advance media techniques is inevitable.

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# Exploration on DNA binding ability of heteroleptic ligand metal complexes: Synthesis and characterization

V. Anandh Kumar, R. Asokarajan and R. Paulpandiyan\*

\*Research Department of Chemistry, VHNSN College (Autonomous), Virudhunagar

**Abstract** - Two heteroleptic ligand metallointercalators (Cu(II) and Zn(II)) have been synthesized using Knoevenagel condensate  $\beta$ -diketone ligand (obtained by the condensation of acetylacetone and cinnamaldehyde) as primary ligand and 1,10-phenanthroline as co-ligand in order to find out whether there is an enhancement in the efficacy of biological activities. They have been characterized by elemental analysis, magnetic susceptibility, molar conductance measurements, UV-Vis., FT IR and  $^{13}\text{NMR}$  spectral studies. These complexes show higher molar conductance values, supporting their electrolytic nature. Spectroscopic and other analytical data of the complexes suggest square planar geometry around the central metal ion. The binding properties of these complexes with DNA have been explored by electronic absorption spectra. It reveals that the complexes have the ability to interact with calf thymus DNA (CT DNA) by intercalative mode. The binding constant values ( $K_b$ ) clearly signify that the copper(II) complex have more intercalating ability than zinc(II) complex. The *in vitro* antibacterial and antifungal assay indicates that these complexes are good antimicrobial agents against various pathogens. It has been investigated by Minimum Inhibitory Concentration (MIC) method.

**Keywords:**

## 1. INTRODUCTION

Several ligands derived from  $\beta$ -diketones are also known to form metal complexes. These ligands derived from  $\beta$ -diketones have been employed for the preparation of new complexes. The  $\beta$ -diketone ligands are considered as potential ligands due to their enolising ability.  $\beta$ -diketone and its metal complexes have been widely used in diverse areas because of their unique structural features, chemical functionalities, and toughness for light and heat as electroluminescence materials [1].  $\beta$ -diketone derivatives possess a broad spectrum of biological effects such as antiinflammatory and antimicrobial activity effects [2,3]. But being incapable of enolisation, the condensates have

not perhaps been considered earlier as potential ligands towards transition metal ions.

Nowadays, special attention has been paid for the synthesis of effective conjugative and versatile chelating systems with metal ions due to their novel structural features, unusual redox behaviour and relevance to biological processes [4]. Amongst various systems, the compounds derived from Knoevenagel condensate ligand have gained much interest due to their delocalized  $\pi$ -orbitals, flexible behaviour, multifunctional ligand sites *etc.* In order to form the higher degree of conjugated versatile ligand system, Knoevenagel condensate ligand is designed for the formation of stable complexes. Studies of these structure, spectral and redox properties would be optimum models for the metalloproteins, which are essential to address the structure-redox relationship [5].

Keeping the facts in mind, herein the synthesis and characterization of Cu(II) and Zn(II) metal complexes containing Knoevenagal condensate ligand and 1,10-phenanthroline (heteroleptic ligand complexes) are described. These complexes have been characterized by physicochemical and various spectral techniques. Their DNA binding analysis has been carried out *via* electronic absorption titration method. Further, all the synthesized compounds were screened for their *in vitro* antimicrobial activity against various bacterial and fungal strains.

## 2. EXPERIMENTAL PROTOCOLS

### 2.1 Materials and Methods

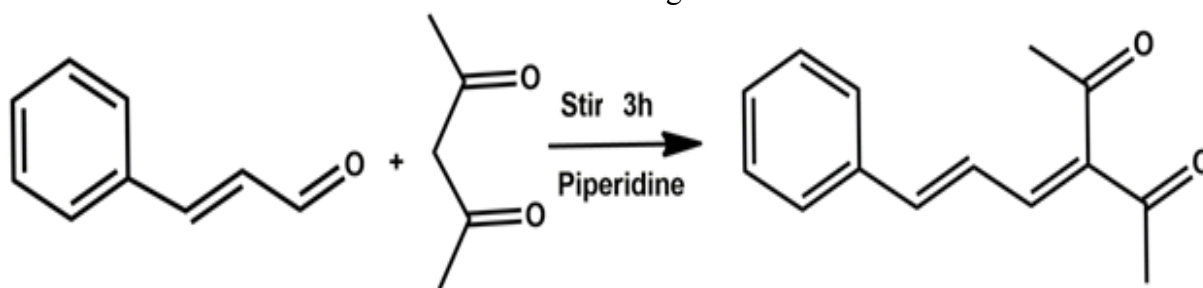
The chemicals involved in this work were of AnalaR grade and were used without further purification. However, the solvents were purified by the standard procedure. Acetylacetone, cinnamaldehyde and 1,10-

phenanthroline were SD fine products and used as supplied. All the metal salts were received from E. Merck. Elemental analysis (C, H and N) data were obtained using a Perkin-Elmer 240 elemental analyzer. Vibrational spectra were performed on FT IR–Shimadzu model IR-Affinity-1 spectrophotometer using KBr discs.  $^1\text{H}$  NMR of ligand and its Zn(II) complex were recorded on a Bruker 400MHz Avance III HD Nanobay NMR spectrometer using DMSO- $d_6$  as the internal standard. The room temperature molar conductivity of the complexes in DMSO solution ( $10^{-3}$  M) was measured using a deep vision 601 model digital conductometer. The absorption spectra were recorded by using Shimadzu model UV-1601 spectrophotometer at room temperature in DMSO solution.

## 2.2 Synthesis

### 2.2.1 Synthesis of Knoevenagel Condensate $\beta$ -diketone Ligand ( $L_1$ )

The Knoevenagel condensate  $\beta$ -diketone ligand (3-(cinnamyl)-pentane-2,4-dione) was synthesized by acetylacetone (1.0 g, 10 mmol) was mixed with cinnamaldehyde (1.3 g, 10mmol) and piperidine (0.05 mL) in ethanol (50 mL). The reaction mixture was stirred thoroughly for a period of 3 h with occasional cooling. Yellow colored crystalline solid was obtained after kept in refrigerator for two days, which was filtered and washed with ethanol followed by an excess of petroleum ether to remove any unreacted reagents. Washing was repeated for three times and the compound was recrystallized from ethanol. Schematic route for the synthesis of ( $L_1$ ) is given in Scheme 1.



Scheme 1. Schematic route for the synthesis of Knoevenagel condensate  $\beta$ -diketone ligand ( $L_1$ )

### 2.2.2 Synthesis of mixed ligand complexes

The complexes were prepared by mixing the appropriate molar quantity of ligand and the corresponding metal salts using the following procedure. A solution of metal(II) chloride in ethanol (2 mmol) was stirred with an ethanolic solution of cinnamidine-4-aminoantipyrine (L) (2 mmol), for 30 min on a magnetic stirrer at room temperature. To the above stirring solution 1,10-phenanthroline (2 mmol) was added slowly and refluxed for ca 3 h. Then the mixture was reduced to one-third on a water bath and cooled. The solid product formed was filtered and then recrystallized from ethanol and dried in *vacuo*

## 3. RESULTS AND DISCUSSION

The Cu(II) and Zn(II) complexes have been synthesized from mixed ligands having cinnamidine-4-aminoantipyrine and 1,10-phenanthroline. They are found to be stable in air. The Knoevenagel condensate ligand ( $L_1$ ) is soluble in common organic solvents, but the complexes are soluble only in DMF and DMSO. The complexes have been characterized by the microanalytical data, IR and UV-Vis. spectra. Physical characterisation, microanalytical and molar conductance data of the complexes are given in Table.3.1. The analytical data of the complexes accord well with the formula  $[\text{ML}_1\text{L}_2]\text{Cl}_2$ ; where M=Cu(II) and Zn(II). The high conductance of the chelates supports their electrolytic nature.

**Table 3.1.** Physical characterization, analytical and molar conductance data of the synthesized compounds

Compound	Yield (%)	Color	calc (Found) %				Formula weight	$\Lambda_m$ ( $\text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$ )
			M	C	H	N		
L <sub>1</sub> [C <sub>14</sub> H <sub>14</sub> O <sub>2</sub> ]	78	yellow	-----	78.48 (77.14)	6.59 (5.58)	-----	214	-----
[CuL <sub>1</sub> L <sub>2</sub> ]Cl <sub>2</sub> [C <sub>26</sub> H <sub>22</sub> CuN <sub>2</sub> O <sub>2</sub> ]Cl <sub>2</sub>	70	Green	13.87 (13.01)	68.18 (67.56)	4.84 (3.68)	6.99 (5.11)	458	106
[ZnL <sub>1</sub> L <sub>2</sub> ]Cl <sub>2</sub> [C <sub>26</sub> H <sub>22</sub> ZnN <sub>2</sub> O <sub>2</sub> ]Cl <sub>2</sub>	68	Bluish green	14.22 (13.54)	67.91 (67.09)	4.82 (4.01)	6.09 (5.99)	458	110

### 3.1 FT-IR spectroscopy

The functionalities of free ligands and their coordinating capability to form metal complexes were investigated by FT-IR spectroscopy. The IR spectra for the ligands and metal complexes have been recorded in the region 400-4000  $\text{cm}^{-1}$ . The spectrum of L<sub>1</sub> shows absorption band in the region 1652  $\text{cm}^{-1}$ , a characteristic feature of the  $\nu(\text{C}=\text{O})$  stretching mode. This band is shifted towards lower frequencies in the spectra of metal complexes 1620-1640  $\text{cm}^{-1}$  indicating the role of the carbonyl oxygen in coordination with metal ion [6]. The coordination of the carbonyl oxygen was further supported by the appearance of new bands around 510-540  $\text{cm}^{-1}$  and 450-490  $\text{cm}^{-1}$  which are due to  $\nu(\text{M}-\text{O})$  and  $\nu(\text{M}-\text{N})$  respectively. These bands were not identified in the spectrum of L<sub>1</sub> [7]

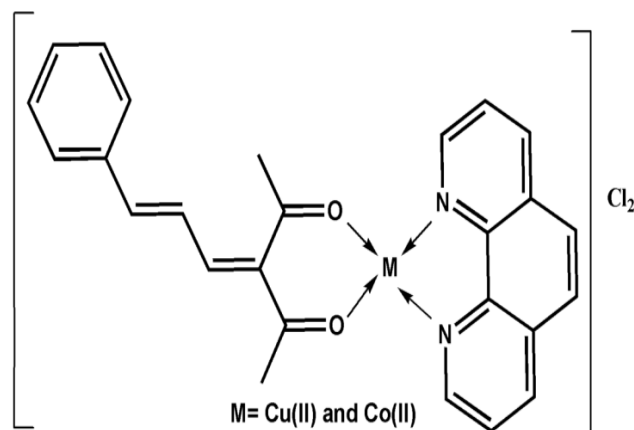
### 3.2 Electronic Spectroscopy

The geometry of these metal complexes has been deduced from electronic spectral data of the complexes. Electronic spectra of Schiff base ligand (L<sub>1</sub>) and its metal(II) complexes were recorded at room temperature in DMSO medium in the range of 200 – 1100 nm. The absorption spectrum of the L<sub>1</sub> exhibits two characteristic bands at 35,842 and 29,412  $\text{cm}^{-1}$  which correspond to the intraligand charge transfer transitions of  $\pi \rightarrow \pi^*$  and  $n \rightarrow \pi^*$  respectively. These two transitions are shifted due to the complex formation, either bathochromic or hypsochromic shift. In case of copper(II) complex, a strong absorption d-d band appeared at 16,233  $\text{cm}^{-1}$  is assigned to  ${}^2\text{B}_{1g} \rightarrow {}^2\text{A}_{1g}$  transition, which is characteristic of square planar geometry [8]. Obviously, Zn(II)

complex does not exhibit any d-d band because of its completely filled  $d^{10}$  configuration [9].

### 3.3 <sup>13</sup>C NMR spectra

The NMR spectrum is exploiting to determine the identity of prepared ligand and its diamagnetic metal complexes. The <sup>13</sup>C NMR spectra of Schiff base ligand (L<sub>1</sub>) and its Zn(II) complex have been recorded in DMSO-d<sub>6</sub> using TMS (tetramethylsilane) as the internal standard. The <sup>13</sup>C NMR spectrum of L<sub>1</sub> shows multi signals within the range of 130-140 ppm (m) and 125 ppm (s), concord to the phenyl multiplet and (-CH=CH-) of cinnamaldehyde moiety. Moreover, the carbonyl (C=O) carbons are appeared at 196 ppm. In Zn(II) complex, it is identified that carbonyl peaks are shifted to upfield region, representing the coordination of (C=O) groups towards metal center. There is no such significant difference noticed with other signals in this complex. Based on the above spectral data, the Knoevenagel condensate mixed ligand metal complex is given in Figure.

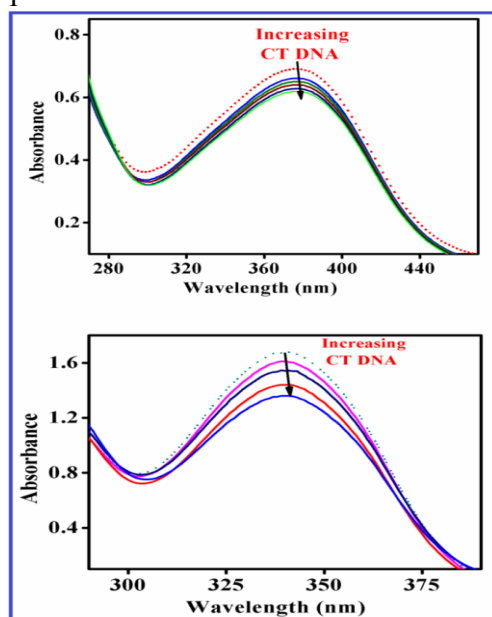


**Fig.3.1.** Proposed structure of the Knoevenagel condensate mixed ligand complex



### 3.4 DNA binding studies - Absorption Spectral Titrations

For the determination of binding mode of these metal complexes with DNA, electronic absorption spectroscopy has been used widely [10]. Thus the absorption spectra of these complexes in the absence or presence of calf thymus DNA (CT DNA) at different concentrations were measured. The intercalation or electrostatic interactions among the metal complex and DNA lead to hypochromism and bathochromic shift. This indicates the intercalative binding mode, due to the strong intercalation between the metal complexes and the base pairs of DNA, whereas the hyperchromic shift indicates the breakdown of the secondary structure of DNA [11]. With the increase of [DNA], the absorption intensity of the complex decreases (hypochromic effect) and the  $\lambda_{\text{max}}$  values shift to red region (bathochromic shift) [12]. This occurs while the binding induces a strong stacking interaction between the planar aromatic chromophoric groups of the ligand with DNA base pairs.



**Fig.3.2.** Absorption spectra of (a) Cu(II) and (b) Zn(II) complexes in the absence (dashed line) and presence (solid line) of CT DNA in 5mM Tris-HCl/50mM NaCl (pH = 7.2) at 25°C. Arrow indicates the changes in absorbance upon increasing the DNA concentration

Fig.3.2 represents the absorption spectra of Cu(II) and Zn(II) complexes in the absence and presence of CT DNA in the UV region. With the increase in DNA concentration, the MLCT transition band of copper complex exhibits 12.5% hypochromism at 376 nm and bathochromism of 2 nm. Further the intense absorption bands with maxima ( $\lambda_{\text{max}}$ ) at 340 for cobalt complex exhibit hypochromism of about 10.2% and bathochromism of 3 nm. Therefore, these spectral characteristics suggest a mode of binding that involves the stacking interaction between the aromatic chromophore with DNA base pairs. These shifts confirm that the metal complexes interact with DNA by intercalation *via* strong stacking interaction between the aromatic rings of the complexes and base pairs of DNA [13].

The intrinsic binding constants ( $K_b$ ) of the metal complexes with CT DNA have been estimated by monitoring the shift in the intraligand band with increasing concentration of DNA. The  $K_b$  values are entered in Table.3.2. The determined intrinsic binding constants for  $[\text{CuL}_1\text{L}_2]\text{Cl}_2$  and  $[\text{ZnL}_1\text{L}_2]\text{Cl}_2$  are  $2.8 \times 10^5$  and  $1.2 \times 10^5$  respectively. Obviously, the observed  $K_b$  value of the present complexes is lower than that for a classical intercalator, such as EB and higher than those of some Schiff base metal complexes [14] indicating that the present complexes strongly bind with DNA through an intercalation mode into the double helix structure of DNA.

**Table 3.2.** Electronic absorption parameters for the interaction of CT DNA with synthesized complexes

Complex	$\lambda_{\text{max}}$		$\Delta\lambda$ (nm)	$^a\text{H}\%$	$K_b \times 10^5$ ( $\text{M}^{-1}$ )
	Free	Bound			
$[\text{CuL}_1\text{L}_2]\text{Cl}_2$	376	378	2	12.5	2.8
$[\text{ZnL}_1\text{L}_2]\text{Cl}_2$	340	343	3	10.2	1.2

$$^a\text{H}\% = [(A_{\text{free}} - A_{\text{bound}}) / A_{\text{free}}] \times 100\%$$

### 3.5 Antimicrobial screening

The *in vitro* antimicrobial actions of the synthesized  $\text{L}_1$  and its metal complexes were tested against perceptive organisms such as one

Gram-positive bacteria (*Staphylococcus aureus*) and one Gram-negative bacteria (*Escherichia coli*) and three fungi (*Aspergillus niger*, *Fusarium solani* and *Curvularia lunata*)

by well dilution method. The minimum inhibitory concentration (MIC) values, measured in antimicrobial studies of the synthesized compounds are given in Table 3.3.

**Table 3.3** Minimum inhibitory concentration of the synthesized ligand (L) and its complexes against the growth of bacteria and fungi ( $\mu\text{M}$ )

Compound	Minimum inhibitory concentration ( $\times 10^4 \mu\text{M}$ )				
	<i>S.aureus</i>	<i>E.coli</i>	<i>A.niger</i>	<i>F.solani</i>	<i>C.lunata</i>
L <sub>1</sub>	14.8	15.4	15.2	16.2	18.3
[CuL <sub>1</sub> L <sub>2</sub> ]Cl <sub>2</sub>	5.6	5.8	5.4	6.2	6.5
[ZnL <sub>1</sub> L <sub>2</sub> ]Cl <sub>2</sub>	7.4	7.2	7.0	7.8	8.2

The ligand and all its complexes have inhibitory action against all microorganisms. The metal complexes exhibit higher inhibition against all microorganisms tested compared to the free ligand. The rate of antimicrobial activity of the metal complexes depends on the following five principal factors [15,16]. They are (i) the chelate effect, (ii) the nature of coordinated ligands, (iii) the total charge of the complex, (iv) the nature of the ion neutralizing the ionic complex and (v) the nuclearity of the metal center in the complex. The increased activity of the metal chelates than the bare ligand can also be explained on the basis of chelation theory. This theory states that chelation reduces the polarity of the metal ion by the partial sharing of its positive charge with donor groups and possible  $\pi$  electron delocalization over the whole ring. This results in increasing lipophilic character of the complex and favors the penetration of the complex through the lipid layer of cell membrane. The complex may block the binding sites of microorganisms; consequently it disturbs the metabolism pathways and respiration process in the cell, and thus blocks the synthesis of proteins, which restricts further growth of the organism and resulting in the extinction of microorganisms.

#### 4. CONCLUSION

A Knoevenagel condensate ligand has been prepared by the condensation of cinnamaldehyde and acetylacetone. Its mixed

ligand complexes of Cu(II) and Zn(II) have been synthesized and characterized by microanalytical data, IR, UV-Vis. and NMR spectra. The data show that they have composition of the type  $[\text{ML}_1\text{L}_2]\text{Cl}_2$  where M=Cu(II) and Zn(II). The spectral data of the complexes suggest square planar geometry around the central metal ion. They show good electrical conductance which reveals that these chelates are electrolytes. Absorption spectral titration has been carried out on the interaction of the complexes with DNA. The results suggest that the mixed ligand complexes can cleave DNA through intercalation binding mode and have good binding ability. The binding constant ( $K_b$ ) values clearly signify that the copper complex has more intercalating ability than zinc complex. The minimum inhibitory concentration (MIC) values of the compounds against the growth of microorganisms are interesting to observe that in all the cases, the synthesized complexes have higher antimicrobial activity than the free ligand.

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