

Joice Punitha M Department of Mathematics, Bharathi Women's College, Chennai, Tamilnadu-600108, India **E-mail:** joicepunithabwcmath@gmail.com

Beulah Angeline E. F Department of Mathematics, Nazareth College of Arts and Science, Chennai, Tamilnadu-600062, India **E-mail:** efbeulahenry@gmail.com

ABSTRACT

In a graph G , a set of vertices form a dominating set, if every vertex in the complement of the set is adjacent to some vertex in the set. Coloring is the process of allotting colors to the vertices of the graph under the condition that the end vertices of any edge cannot be allotted the same color. The above two concepts have been used to define the dom-coloring set. The dom-coloring set of any graph is a non-empty subset of the vertex set which has to be a dominating set with a minimum of one vertex from every color class of the given graph. Among all such dom-coloring sets, the set with minimum number of vertices is called the dom-chromatic number of the graph and is denoted by γ_{dc} . In this paper, the dom-chromatic number of central, middle and total graphs of path, cycle and star graphs are determined.

Keywords: Domination, Coloring, Dom- coloring set, Dom-chromatic number, Central graph, Middle graph, Total Graph.

INTRODUCTION

In graph theory, the notion of domination along with coloring have found diversified applications across several areas of research. It was in the year 1958, the concept of domination was introduced in graph theory by C. Berge [1]. Succeeding him, in the year 1962, Ore coined the term "domination" and gave the notation for domination number as $\delta(G)$ [2]. He also introduced the concepts of minimal and minimum dominating sets of vertices in a graph. In 1977, Cockayne and Hedetniemi introduced the notation $\gamma(G)$ to denote the domination number [3]. For any graph G , a non- empty subset D of the vertex set V is a dominating set if all the vertices in the complement of D and some vertex in D share a common edge. Such a set with least number of vertices is a minimum dominating set whose cardinality is termed as the domination number which is represented by $\gamma(G)$.

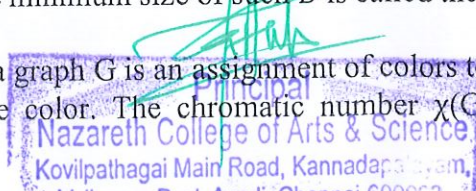
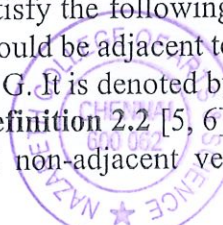
Graph coloring has its origin in the famous conjecture four-color conjecture in 1852. Coloring can be stated as the method of allotting colors to every single vertex included in the vertex set of G , in which vertices sharing a common edge are allotted mismatched colors. The lesser number of such colors used in coloring the graph is termed as the chromatic number, $\chi(G)$. Until 2016, the above two concepts were dealt separately by many researchers, whereas, the above two concepts were blended to form a new problem called dom-coloring, which was put forth by Chaluvvaraju B. and Appajigowda C in 2016 [4]. For a graph G with minimum coloring whose vertex set is V , a dominating set of G can be regarded as a dom-coloring set (dc – set) if it constitutes at the least of one vertex from every possible color class of G . The dc – set with the least cardinality is the dc – number of G which is symbolized as $\gamma_{dc}(G)$.

In literature, domination and coloring have been separately dealt for central, middle and total graphs. In this paper both the concepts are applied together to determine the dom-chromatic number of central, middle and total graphs of certain graphs.

PRELIMINARIES

Definition 2.1 For a subset D from the vertex set of the graph $G(V, E)$ to be a dominating set, D should satisfy the following property of adjacency that each vertex of G , should be included either in D or should be adjacent to some vertex in D . The minimum size of such D is called the domination number of G . It is denoted by $\gamma(G)$.

Definition 2.2 [5, 6]: A proper coloring of a graph G is an assignment of colors to its vertices, so that all non-adjacent vertices receive the same color. The chromatic number $\chi(G)$ is defined as the



Definition 2.3 A dominating set $S \subseteq V(G)$ forms a dom-coloring set if it contains at least one vertex of each color class of G . The dom-chromatic number is the minimal cardinality taken over all dom-coloring sets and is denoted by $\gamma_{dc}(G)$.

Definition 2.4[7, 8] The middle graph $M(G)$ of a graph G is the graph with vertex set $V(G) \cup E(G)$ and any two vertices are adjacent in $M(G)$ if one of the following condition holds.

$x, y \in E(G)$ and x, y are adjacent in G .

$x \in V(G), y \in E(G)$ and x, y are adjacent in G .

In other words, the middle graph $M(G)$ is obtained by subdividing each edge of G exactly once and joining all the adjacent edges of G .

Definition 2.5 [7, 8] The central graph $C(G)$ of a graph G is the graph whose vertex set is $V(G) \cup E(G)$. The central graph $C(G)$ is obtained by subdividing each edge of G exactly once and joining all the non-adjacent vertices of G . If G is a graph with n vertices and m edges, then the central graph $C(G)$ has $n + m$ vertices and $\frac{n(n-1)+2m}{2}$ edges.

Definition 2.6 [7, 8]: The total graph $T(G)$ of a graph G is the graph whose vertex set is $V(G) \cup E(G)$ and any two vertices are adjacent in $T(G)$ in case one of the following holds.

- $x, y \in V(G)$ and x is adjacent to y in G .
- $x, y \in E(G)$ and x, y are adjacent in G
- $x \in V(G), y \in E(G)$ and x, y are incident in G .

MAIN RESULTS

Dom-chromatic Number of Middle, Central and Total graph of certain graphs

In this section, the dom-chromatic number of central, middle and total graphs of path, cycle and star graphs are determined.

3.1 Dom-chromatic Number of Middle graph of Path, Cycle and Star graph

Theorem 3.1.1: Let $M(P_n)$ be the middle graph of path P_n , $n \geq 3$ Then

$$\gamma_{dc}(M(P_n)) = \begin{cases} \left\lceil \frac{n}{2} \right\rceil + 1, & 2 < n \leq 4 \\ \left\lceil \frac{n}{2} \right\rceil, & n > 4 \end{cases}$$

Proof: Let P_n be a path of length $n - 1$ with

$$V(P_n) = \{u_i: 1 \leq i \leq n\} \text{ and } E(P_n) = \{e_i = u_i u_{i+1}: 1 \leq i \leq n - 1\}.$$

Let $V(M(P_n)) = \{u_i: 1 \leq i \leq n\} \cup \{e_i: 1 \leq i \leq n - 1\}$ &

$$E(M(P_n)) = \{e_i, u_i, e_i u_{i+1}: 1 \leq i \leq n - 1\} \cup \{e_i e_{i+1}: 1 \leq i \leq n - 3\}$$

Define $f: V(M(P_n)) \rightarrow \{1, 2, 3\}$ such that

$$f(u_i) = 1 \text{ for } n = 3, 1 \leq i \leq n$$

For $n > 3$,

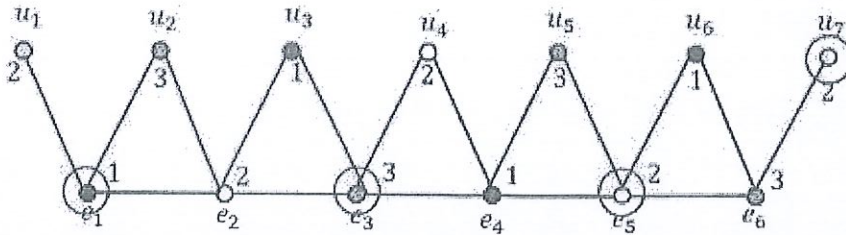
$$f(u_i) = \begin{cases} 1 & \text{if } i \equiv 0 \pmod{3} \\ 2 & \text{if } i \equiv 1 \pmod{3}, 1 \leq i \leq n \\ 3 & \text{if } i \equiv 2 \pmod{3} \end{cases} \quad \& \quad f(e_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{3} \\ 2 & \text{if } i \equiv 3 \pmod{3}, 1 \leq i \leq n - 1 \\ 3 & \text{if } i \equiv 0 \pmod{3} \end{cases} \quad \text{This}$$

mapping yields a proper coloring to the vertices of $M(P_n)$, where $\chi(M(P_n)) = 3$.

Case 1: For $n = 3$, let $D = \{e_1, e_2, u_2\}$ be a set of vertices such that every vertex in $V(M(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $M(P_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(M(P_n)) = 3$.

Case 2: For $n = 4$, let $D = \{e_1, e_2, e_3\}$ be a set of vertices such that every vertex in $V(M(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $M(P_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(M(P_n)) = 3$.

Case 3: For $n > 4$, let $D = \{e_{2i-1}: 1 \leq i \leq \left\lfloor \frac{n-1}{2} \right\rfloor\} \cup \{e_n\}$ be a set of vertices such that every vertex in $V(M(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one



Theorem 3.1.2: Let $M(C_n)$ be the middle graph of cycle C_n , $n \geq 3$. Then

$$\gamma_{dc}(M(C_n)) = \begin{cases} \left\lfloor \frac{n}{2} \right\rfloor + 1, & 2 < n \leq 4 \\ \left\lfloor \frac{n}{2} \right\rfloor, & n > 4 \end{cases}$$

Proof: Let $C_n: u_1 u_2 u_3 \dots u_n u_1$ be a cycle of length n with

$$V(C_n) = \{u_i: 1 \leq i \leq n\} \text{ and } E(C_n) = \{e_i, e_i = u_i u_{i+1}: 1 \leq i \leq n-1\}.$$

Let $V(M(C_n)) = \{u_i, e_i: 1 \leq i \leq n\}$ &

$$E(M(C_n)) = \{e_i u_i, e_i u_{i+1}: 1 \leq i \leq n-1\} \cup \{u_n e_n, e_n u_1, e_n e_1\}$$

Define $f: V(M(C_n)) \rightarrow \{1, 2, 3\}$ such that

Case 1: When $n = 4$, $1 \leq i \leq n$

$$f(u_i) = 3, f(e_i) = \begin{cases} 2 & \text{if } i \equiv 1 \pmod{2} \\ 1 & \text{if } i \equiv 0 \pmod{2} \end{cases}$$

Case 2: When $n > 4$, if anyone of the below mentioned conditions are satisfied,

$$n \equiv 0 \pmod{3}, 1 \leq i \leq n$$

$$n \equiv 1 \pmod{3}, 2 \leq i \leq n-1$$

$$n \equiv 2 \pmod{3}, 2 \leq i \leq n$$

$$\text{Then } f(u_i) = \begin{cases} 1 & \text{if } i \equiv 0 \pmod{3} \\ 2 & \text{if } i \equiv 2 \pmod{3} \\ 3 & \text{if } i \equiv 1 \pmod{3} \end{cases} \text{ \& } f(e_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{3} \\ 2 & \text{if } i \equiv 0 \pmod{3} \\ 3 & \text{if } i \equiv 2 \pmod{3} \end{cases}$$

Also, if $n \equiv 1 \pmod{3}$ then $f(u_1) = 2, f(u_n) = 1$ and if $n \equiv 2 \pmod{3}, 2 \leq i \leq n$ then $f(u_1) = 2, f(e_1) = 1$

$$f(u_i) = \begin{cases} 1 & \text{if } i \equiv 0 \pmod{3} \\ 2 & \text{if } i \equiv 2 \pmod{3} \\ 3 & \text{if } i \equiv 1 \pmod{3} \end{cases} \text{ \& } f(e_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{3} \\ 2 & \text{if } i \equiv 0 \pmod{3} \\ 3 & \text{if } i \equiv 2 \pmod{3} \end{cases}$$

This mapping yields a proper coloring to the vertices of $M(C_n)$ with $\chi(M(C_n)) = 3$.

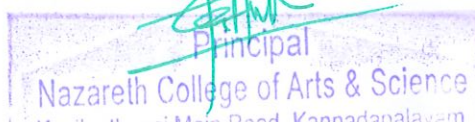
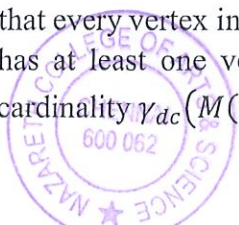
We now find the dom-chromatic number of the graph. Here we have 3 cases.

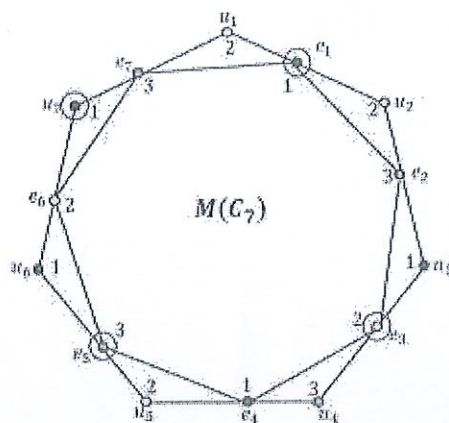
Case 1: For $n = 3$, let $D = \{u_1, u_2, u_3\}$ be a set of vertices such that every vertex in $V(M(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $M(C_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(M(C_n)) = 3$.

Case 2: For $n = 4$, let $D = \{e_1, u_3, e_4\}$ be a set of vertices such that every vertex in $V(M(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $M(C_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(M(C_n)) = 3$.

Case 3: For $n > 4$, let $D = \begin{cases} e_{2i-1}: 1 \leq i \leq \frac{n}{2} & \text{when } n \text{ is even} \\ \{e_{2i-1}: 1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor\} \cup \{u_n\} & \text{when } n \text{ is odd} \end{cases}$ be a set of vertices such

that every vertex in $V(M(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $M(P_n)$. Hence, D is a dom-chromatic set with cardinality $\gamma_{dc}(M(C_n)) = \left\lfloor \frac{n-1}{2} \right\rfloor + 1 = \left\lfloor \frac{n}{2} \right\rfloor$.





Theorem 3.1.3: Let $M(K_{1,n})$ be the middle graph of star graph $K_{1,n}$, $n \geq 2$. Then $\gamma_{dc}(M(K_{1,n})) = n + 1$.

Proof: Consider a star graph $K_{1,n}$ whose vertex and edge set are given by

$$V(K_{1,n}) = \{u_0, u_i: 1 \leq i \leq n\} \text{ and } E(K_{1,n}) = \{e_i = u_0 u_i: 1 \leq i \leq n\}.$$

Let $V(M(K_{1,n})) = \{u_0, u_i, e_i: 1 \leq i \leq n\}$ &

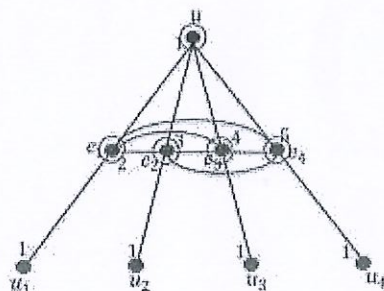
$$E(M(K_{1,n})) = \{e_i u_0, e_i u_i: 1 \leq i \leq n\} \cup \{e_i e_j: 1 \leq i \leq n-1, i+1 \leq j \leq n\}$$

Define $f: V(M(K_{1,n})) \rightarrow \{1, 2, 3, \dots, n+1\}$ such that

$$\begin{aligned} f(u_i) &= 1 \text{ for } n \geq 2, 0 \leq i \leq n \\ f(e_i) &= i+1 \text{ for } n \geq 2, 1 \leq i \leq n \end{aligned}$$

This mapping yields a proper coloring to the vertices of $M(K_{1,n})$ using a minimum of $n+1$ colors.

Let $D = \{e_i: 1 \leq i \leq n\} \cup \{u_0\}$ be a set of vertices such that every vertex in $V(M(K_{1,n})) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $M(K_{1,n})$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(M(K_{1,n})) = n+1$.



3.2 Dom-chromatic number of Central Graph of Path, Cycle and Star graph:

Theorem 3.2.1: Let $C(P_n)$ be the central graph of path P_n , $n \geq 3$. Then

$$\gamma_{dc}(C(P_n)) = \begin{cases} \left\lceil \frac{n}{2} \right\rceil + 1, & 2 < n \leq 4 \\ \left\lceil \frac{n}{2} \right\rceil, & n > 4 \end{cases}$$

Proof: Let P_n be a path of length $n-1$ with

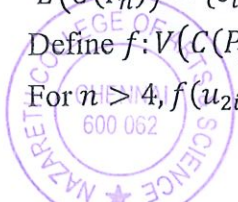
$$V(P_n) = \{u_i: 1 \leq i \leq n\} \text{ and } E(P_n) = \{e_i = u_i u_{i+1}: 1 \leq i \leq n-1\}.$$

Let $V(C(P_n)) = \{u_i: 1 \leq i \leq n\} \cup \{e_i: 1 \leq i \leq n-1\}$ &

$$E(C(P_n)) = \{e_i u_i, e_i u_{i+1}: 1 \leq i \leq n-1\} \cup \{e_n, u_1\} \cup \{u_i, u_j: 1 \leq i \leq n-2, i+2 \leq j \leq n\}$$

Define $f: V(C(P_n)) \rightarrow \{1, 2, 3, \dots, \left\lceil \frac{n}{2} \right\rceil\}$ such that

For $n > 4$, $f(u_{2i-1}) = f(u_{2i}) = i, 1 \leq i \leq \frac{n}{2}$, n is even



$$f(u_n) = \left\lfloor \frac{n}{4} \right\rfloor, f(u_{2i-1}) = f(u_{2i}) = i, 1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor, n \text{ is odd}$$

$$\text{For } n \geq 5, f(e_1) = 2, f(e_2) = 3, f(e_i) = 1, 3 \leq i \leq n-1$$

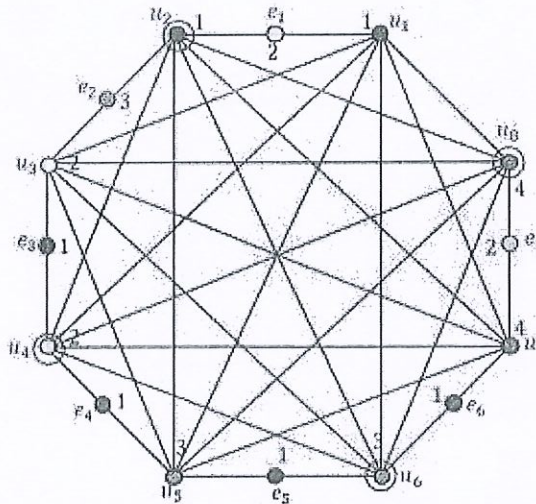
This mapping yields a proper coloring to the vertices of $C(P_n)$ using $\left\lfloor \frac{n}{2} \right\rfloor$ minimum colors.

We now find the dom-chromatic number of the graph. Here we have 2 cases.

Case 1: For $n = 3, 4$ let $D = \{u_i: 1 \leq i \leq 3\}$ be a set of vertices such that every vertex in $V(C(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $C(P_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(C(P_n)) = 3$.

Case 2: For $n > 4$, let $D = \begin{cases} u_n, u_{2i}: 1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor & \text{when } n \text{ is odd} \\ u_{2i}: 1 \leq i \leq \frac{n}{2} & \text{when } n \text{ is even} \end{cases}$ be a set of vertices such that

every vertex in $V(C(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $C(P_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(C(P_n)) = \left\lfloor \frac{n}{2} \right\rfloor + 1 = \left\lceil \frac{n}{2} \right\rceil$.



Theorem 3.2.2: Let $C(C_n)$ be the central graph of cycle C_n , $n \geq 3$. Then

$$\gamma_{dc}(C(C_n)) = \begin{cases} \left\lfloor \frac{n}{2} \right\rfloor + 1, & 2 < n \leq 4 \\ \left\lfloor \frac{n}{2} \right\rfloor, & n > 4 \end{cases}$$

Proof: Let $C_n: u_1 u_2 u_3 \dots u_n u_1$ be a cycle of length n with

$$V(C_n) = \{u_i: 1 \leq i \leq n\} \text{ and } E(C_n) = \{e_i, e_i = u_i u_{i+1}: 1 \leq i \leq n-1\}.$$

Let $V(C(C_n)) = \{u_i, e_i: 1 \leq i \leq n\}$ &

$$E(C(C_n)) = \{e_i u_i: 1 \leq i \leq n\} \cup \{e_i u_{i+1}: 1 \leq i \leq n-1\} \cup \{e_n, u_1\} \cup \{u_i, u_j: 1 \leq i \leq n-2, i+2 \leq j \leq n\}$$

Define $f: V(C(C_n)) \rightarrow \{1, 2, 3, \dots, \left\lfloor \frac{n}{2} \right\rfloor\}$ such that

$$\text{For } n > 4, f(u_{2i-1}) = f(u_{2i}) = i, 1 \leq i \leq \frac{n}{2}, n \text{ is even}$$

$$f(u_n) = \left\lfloor \frac{n}{4} \right\rfloor, f(u_{2i-1}) = f(u_{2i}) = i, 1 \leq i \leq \left\lfloor \frac{n}{2} \right\rfloor, n \text{ is odd}$$

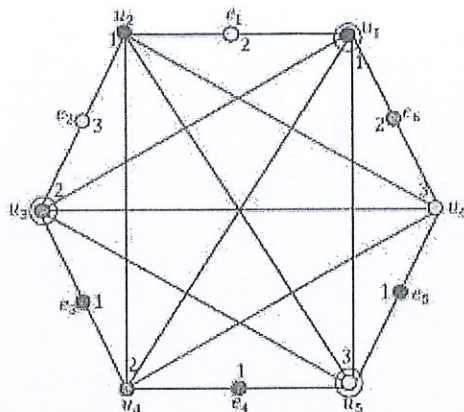
$$\text{For } n \geq 5, f(e_1) = f(e_n) = 2, f(e_2) = 3, f(e_i) = 1, 3 \leq i \leq n-1$$

This mapping yields a proper coloring to the vertices of $C(C_n)$ using a minimum of $\left\lfloor \frac{n}{2} \right\rfloor$ colors.

Case 1: For $n = 3, 4$ let $D = \{u_i: 1 \leq i \leq 3\}$ be a set of vertices such that every vertex in $V(C(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $C(C_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(C(C_n)) = 3$.

Case 2: For $n > 4$, let $D = \begin{cases} u_n, u_{2i}: 1 \leq i \leq \lfloor \frac{n}{2} \rfloor & \text{when } n \text{ is odd} \\ u_{2i}: 1 \leq i \leq \frac{n}{2} & \text{when } n \text{ is even} \end{cases}$ be a set of vertices such that

every vertex in $V(C(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $C(C_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(C(C_n)) = \lfloor \frac{n}{2} \rfloor + 1 = \lceil \frac{n}{2} \rceil$.



Theorem 3.3.3: Let $C(K_{1,n})$ be the central graph of star graph $K_{1,n}$, $n \geq 2$. Then $\gamma_{dc}(C(K_{1,n})) = n + 1$.

Proof: Consider a star graph $K_{1,n}$ whose vertex and edge set are given by

$$V(K_{1,n}) = \{u_0, u_i: 1 \leq i \leq n\} \text{ and } E(K_{1,n}) = \{e_i = u_0 u_i: 1 \leq i \leq n\}.$$

Let $V(C(K_{1,n})) = \{u_0, u_i, e_i: 1 \leq i \leq n\}$ &

$$E(C(K_{1,n})) = \{e_i u_0, e_i u_i: 1 \leq i \leq n\} \cup \{u_i u_j: 1 \leq i \leq n-1, i+1 \leq j \leq n\}$$

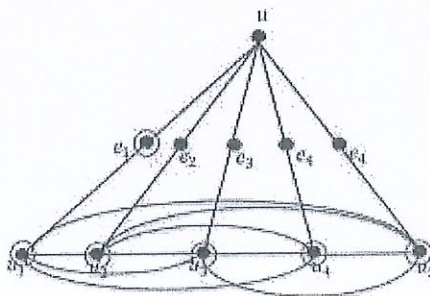
Define $f: V(C(K_{1,n})) \rightarrow \{1, 2, 3, \dots, n+1\}$ such that

$$f(u_0) = f(u_1) = 1, f(e_i) = 2, 1 \leq i \leq n$$

$$f(u_i) = i+1 \text{ for } n \geq 2, 1 \leq i \leq n$$

This mapping yields a proper coloring to the vertices of $C(K_{1,n})$ using $n+1$ colors.

Let $D = \{u_i: 1 \leq i \leq n\} \cup \{e_1\}$ be a set of vertices such that every vertex in $V(C(K_{1,n})) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $C(K_{1,n})$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(C(K_{1,n})) = n + 1$.



3.3 Dom-chromatic number of and Star graph

Total Graph of Path, Cycle

Theorem 3.3.1: Let $T(P_n)$ be the total graph of path P_n , $n \geq 3$. Then $\frac{n}{2} - 2 \leq \gamma_{dc}(T(P_n)) \leq n$.

Proof: Let P_n be a path of length $n-1$ with

$$V(P_n) = \{u_i: 1 \leq i \leq n\} \text{ and } E(P_n) = \{e_i = u_i u_{i+1}: 1 \leq i \leq n-1\}.$$

Let $V(T(P_n)) = \{u_i: 1 \leq i \leq n\} \cup \{e_i: 1 \leq i \leq n-1\}$ &

$$E(T(P_n)) = \{e_i u_i, e_i u_{i+1}, u_i u_{i+1}: 1 \leq i \leq n-1\} \cup \{e_i e_{i+1}: 1 \leq i \leq n-3\}$$

Define $f: V(T(P_n)) \rightarrow \{1, 2, 3\}$ such that

$$f(u_i) = 1 \text{ for } n = 3, 1 \leq i \leq n$$

For $n > 3$,

$$f(u_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{3} \\ 2 & \text{if } i \equiv 2 \pmod{3} \\ 3 & \text{if } i \equiv 0 \pmod{3} \end{cases}, 1 \leq i \leq n \quad \& \quad f(e_i) = \begin{cases} 1 & \text{if } i \equiv 0 \pmod{3} \\ 2 & \text{if } i \equiv 1 \pmod{3} \\ 3 & \text{if } i \equiv 2 \pmod{3} \end{cases}, 1 \leq i \leq n-1$$

This mapping yields a proper coloring to the vertices of $T(P_n)$ such that $\chi(T(P_n)) = 3$.

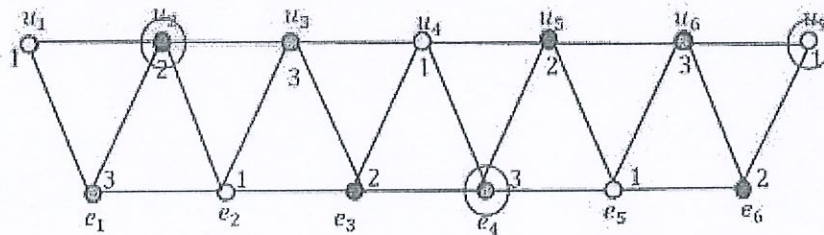
Case 1: For $n = 3$, let $D = \{e_1, e_2, u_2\}$ be a set of vertices such that every vertex in $V(T(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(P_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(T(P_n)) = 3$.

Case 2: For $n = 4$, let $D = \{e_1, e_2, e_3\}$ be a set of vertices such that every vertex in $V(T(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(P_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(T(P_n)) = 3$.

Case 3: For $n > 4$, let

$$D = \begin{cases} u_n, u_{5i-3}, e_{5i-1}: 1 \leq i \leq \frac{n-1}{5} & \text{when } n \equiv 1 \pmod{5} \\ u_{5i-2}, e_{5j-1}: 1 \leq i \leq \left\lfloor \frac{n}{5} \right\rfloor, 1 \leq j \leq \left\lfloor \frac{n-3}{5} \right\rfloor & \text{otherwise} \end{cases}$$

be a set of vertices such that every vertex in $V(T(P_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(P_n)$. Hence D is a dom-chromatic set with cardinality $\frac{n}{2} - 2 \leq \gamma_{dc}(T(P_n)) \leq n$.



Theorem 3.3.2: Let $T(C_n)$ be the total graph of cycle C_n , $n \geq 3$. Then $3 \leq \gamma_{dc}(G) \leq \left\lceil \frac{2n}{5} \right\rceil + 2$.

Proof: Let $C_n: u_1 u_2 u_3 \dots u_n u_1$ be a cycle of length n with

$$V(C_n) = \{u_i: 1 \leq i \leq n\} \text{ and } E(C_n) = \{e_n, e_i = u_i u_{i+1}: 1 \leq i \leq n-1\}.$$

Let $V(T(C_n)) = \{u_i, e_i: 1 \leq i \leq n\}$ &

$$E(T(C_n)) = \{e_i u_i, e_i u_{i+1}, e_i e_{i+1}, u_i u_{i+1}: 1 \leq i \leq n-1\} \cup \{u_n e_n, e_n u_1, e_n e_1, u_1, u_n\}$$

Define $f: V(T(C_n)) \rightarrow \{1, 2, 3, 4\}$ such that for $n > 2$

Case 1: When $n \equiv 0 \pmod{3}$, $1 \leq i \leq n$

$$f(u_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{3} \\ 2 & \text{if } i \equiv 0 \pmod{3} \\ 3 & \text{if } i \equiv 2 \pmod{3} \end{cases} \quad \& \quad f(e_i) = \begin{cases} 1 & \text{if } i \equiv 2 \pmod{3} \\ 2 & \text{if } i \equiv 1 \pmod{3} \\ 3 & \text{if } i \equiv 0 \pmod{3} \end{cases}$$

Case 2: When $n \equiv 1 \pmod{3}$, $1 \leq i \leq n$

$$f(u_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{2} \\ 3 & \text{if } i \equiv 0 \pmod{2} \end{cases} \quad \& \quad f(e_i) = \begin{cases} 2 & \text{if } i \equiv 1 \pmod{2} \\ 4 & \text{if } i \equiv 0 \pmod{2} \end{cases}$$

Case 3: When $n \equiv 2 \pmod{3}$, $1 \leq i \leq n-1$

$$f(u_i) = \begin{cases} 1 & \text{if } i \equiv 1 \pmod{2} \\ 3 & \text{if } i \equiv 0 \pmod{2} \end{cases} \quad \& \quad f(e_i) = \begin{cases} 2 & \text{if } i \equiv 1 \pmod{2} \\ 4 & \text{if } i \equiv 0 \pmod{2} \end{cases}$$

$$f(u_n) = 3, f(e_n) = 2$$

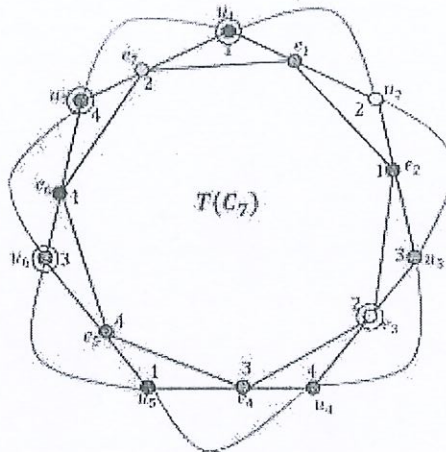
This mapping yields a proper coloring to the vertices of $T(C_n)$ with $\chi(T(C_n)) = 4$.

Case 1: For $n = 3$, let $D = \{u_1, u_3, u_5\}$ be a set of vertices such that every vertex in $V(T(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(C_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(T(C_n)) = 3$.

Case 2: For $n = 4, 5, 6$, let $D = \{u_1, e_1, u_2, e_4\}$ be a set of vertices such that every vertex in $V(T(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(C_n)$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(T(C_n)) = 3$.

Case 3: For $n > 6$, let $D = \begin{cases} e_n, e_{5i-2}: 1 \leq i \leq \lfloor \frac{n}{5} \rfloor & \text{when } n \equiv 1 \pmod{6} \\ e_{5i-2}: 1 \leq i \leq \lfloor \frac{n-2}{5} \rfloor & \text{when } n \not\equiv 1 \pmod{6} \end{cases}$ be a set of vertices such

that every vertex in $V(T(C_n)) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(P_n)$. Hence D is a dom-chromatic set with cardinality $3 \leq \gamma_{dc}(G) \leq \lfloor \frac{2n}{5} \rfloor + 2$.



Theorem 3.3.3: Let $T(K_{1,n})$ be the total graph of star graph $K_{1,n}$, $n \geq 2$. Then $\gamma_{dc}(T(K_{1,n})) = n + 1$.

Proof: Consider a star graph $K_{1,n}$ whose vertex and edge set are given by

$$V(K_{1,n}) = \{u_0, u_i: 1 \leq i \leq n\} \text{ and } E(K_{1,n}) = \{e_i = u_0 u_i: 1 \leq i \leq n\}.$$

Let $V(T(K_{1,n})) = \{u_0, u_i, e_i: 1 \leq i \leq n\}$ &

$$E(T(K_{1,n})) = \{e_i u_0, e_i u_i: 1 \leq i \leq n\} \cup \{e_i e_j: 1 \leq i \leq n-1, i+1 \leq j \leq n\} \cup \{u_i u_0: 1 \leq i \leq n\}$$

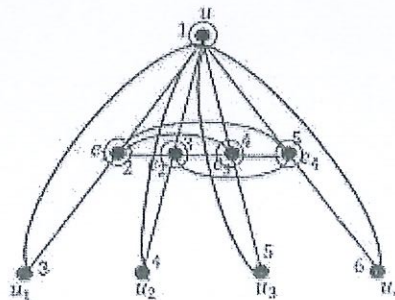
Define $f: V(T(K_{1,n})) \rightarrow \{1, 2, 3, \dots, n+1\}$ such that

$$f(u_0) = 1, f(e_i) = i + 1 \text{ for } n \geq 2, 1 \leq i \leq n$$

$$f(u_n) = 2, f(u_i) = i + 2 \text{ for } n \geq 2, 1 \leq i \leq n-1$$

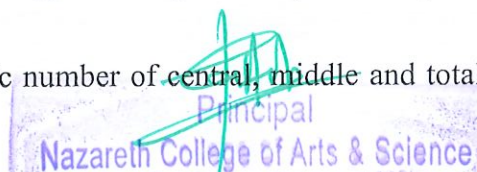
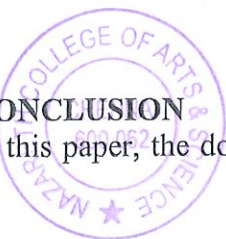
This mapping yields a proper coloring to the vertices of $T(K_{1,n})$ using $n + 1$ minimum colors.

Let $D = \{e_i: 1 \leq i \leq n\} \cup \{u_0\}$ be a set of vertices such that every vertex in $V(T(K_{1,n})) - D$ is adjacent to some vertex in D . Hence D is a dominating set which has at least one vertex from each color class of $T(K_{1,n})$. Hence D is a dom-chromatic set with cardinality $\gamma_{dc}(T(K_{1,n})) = n + 1$.



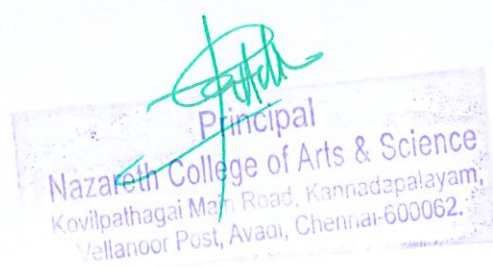
CONCLUSION

In this paper, the dom-chromatic number of central, middle and total graphs of path, cycle and star



REFERENCES

- [1] C. Berge, Theory of Graphs and its Applications, Methuen, London, 1962.
- [2] Ore O., Theory of Graphs, American Mathematical Society Colloquium Publication, 38 (American Mathematical Society Providence RI) 1962.
- [3] T. W. Haynes, S. T. Hedetniemi and P. J. Slater, Fundamentals of Domination in graphs, Marcel Decker, Inc, New York 1998.
- [4] Chaluvvaraju B. and Appajigowda C., "The Dom-Chromatic number of a graph," Malaya Journal of Matematik, 2016, 4(1), pp. 1-7.
- [5] T. R. Jensen and B. Toft, Graph Coloring Problem, John Wiley & Sons, Inc, New York, 1995.
- [6] E. Sampathkumar and G. D. Kamath, A Generalization of Chromatic Index, Discrete Mathematics 124, 173-177, 1994.
- [7] N. Murugesan and Deepa S. Nair, (1,2)-domination in Middle and Central Graph of $K_{1,n}$, C_n & P_n , Applied Mathematics, 2013.
- [8] Farshad Kazemnejad, Behnaz Pahlavsay, Elisa Palezzato and Michele Torielli, Domination number of middle graphs, Research Gate, August 2020



Enhancing Tuberculosis Modeling: The True Positive Vaccinated Approach Utilizing a Specialized Runge-Kutta Method

Gunasekaran M.¹, Alamelu K.^{2*}

¹PG Department of Mathematics, Sri Subramaniya Swamy Government Arts College, Tiruttani- 631 209, India.

²Department of Mathematics, Nazareth College of Arts and Science, Avadi, Chennai-600062, India.

²PG Department of Mathematics, Sri Subramaniya Swamy Government Arts College, Research scholar,
Tiruttani-631 209, India.

Abstract

The paper presents the True Susceptible-Vaccinated-Infected-Recovered (SVIR) model for TB control, utilizing a novel methodology that incorporates the 6th Order Runge-Kutta method for precise and effective simulation. The approach focuses on four primary areas: true positive susceptible, true positive vaccination, true positive infected, and true positive recovered. The model's true positive susceptible component identifies individuals at risk who have not yet contracted an infection, enabling targeted preventative treatments. Herd immunity is bolstered by the genuine positive vaccination element, ensuring that effectively immunized individuals are accurately represented in the model. The component that is truly positive for TB accurately tracks the disease's spread, providing crucial information for containment strategies. The truly positive recovered component monitors individuals who have overcome the illness, offering valuable insights into recovery patterns.

Keywords: True positive susceptible (TPS), True positive vaccinated (TPV), True positive infected (TPI), True positive Recovered (TPR), Runge Kutta 6th order, SVIR model.

1. Introduction

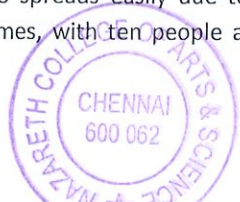
According to the World Health Organization (WHO), 95% of TB infections and 98% of TB fatalities occur in underdeveloped countries. In 2009, there were 9 million new cases of tuberculosis (TB) and 3 million TB-related deaths globally. Without proper treatment and management, TB is projected to claim the lives of 35 million individuals over a 20-year period [3].

Recognizing the problem, the WHO declared TB a global emergency in 1993 [12]. Over the past decade, tuberculosis (TB) has caused more deaths than any other microbe, averaging over 1.65 million fatalities annually between 2010 and 2019. South Sulawesi Health Ministry's data revealed 8,939 major cases of TB in 2011, an increase from 7,783 cases the previous year. Notably, Takalar Regency saw the highest growth in cases (almost 109%), followed by Pare-Pare (79%), Pinrang (75%), Makassar (70%), with Luwu (33%) and Jeneponto (36%) at the lower end. Multiple factors contribute to the high number of patients, including poor home environments. The disease also spreads easily due to the lack of lighting in homes, with ten people at risk of contracting TB

from a single patient. Risky behaviors contribute significantly, especially for those with HIV/AIDS, with an annual harmful behavior contribution of 5–10%, and the prevalence of food malls exacerbating the situation.

Various researchers have constructed models of infectious diseases. For instance, a TB-transmission model was conducted, albeit without seeking the model's numerical solution. Instead, the perturbed ascetic method was employed to find a numerical solution, omitting the use of Runge-Kutta. Therefore, this research aims to establish the numerical solution [3, 12, 14, 19-20, 23-26]. Mathematical modeling provides valuable insights into epidemic dynamics and aids in their control. Interest in studying such models has increased since the 20th century. The mathematical modeling of infectious diseases has evolved significantly.

The initial analysis of mathematical modeling for epidemic spread dates back to 1766 when Bernoulli proposed the idea of illness. Kermack and McKendrick suggested a deterministic model in 1927 known as the Susceptible-Infected-Recovered (SIR) model, although it lacks additional



compartments and control techniques such as age and sex effects, vaccination, therapy, isolation, and quarantine. Consequently, numerous researchers have focused on developing more accurate models [11–28].

2. Mathematical Model

The transmission of infectious diseases is quantitatively modeled using the compartmental SVIR model in epidemiology. This model creates four compartments within the population: Susceptible (S), Vaccinated (V), Infectious (I), and Recovered (R).

The equations presented depict a variation of the SIR (Susceptible, Infected, and Recovered) model in epidemiology that accounts for vaccination. Here is the breakdown of what each parameter represents:

TP S: Represents susceptible individuals susceptible to contracting the disease.

TP I: Represents infected individuals who have contracted the disease and have the potential to spread it.

TPR: Signifies recovered individuals who have recuperated from the disease and gained immunity, or have deceased.

TPV: Signifies vaccinated individuals who have developed immunity against the disease.

N: Total population, where $N = S + I + R + V$.

2.1 Stability Analysis

The Jacobian matrix are used to find the stability analysis

$$\begin{bmatrix} -\frac{\beta TPI}{N} - \mu - \rho & 0 & -\frac{TPS\beta}{N} & 0 \\ \frac{\rho}{N} & -\mu & 0 & 0 \\ \frac{TPI\beta}{N} & 0 & -\gamma - \mu + \frac{TPS\beta}{N} & 0 \\ 0 & 0 & \gamma & -\mu \end{bmatrix}$$

The characteristic equation coefficients are

$$[1, \mu + \gamma + \beta, \beta * \gamma + \beta * \mu + \rho - N * \mu,$$

$$N * \mu * \gamma - \gamma - \beta * \rho, -1]$$

The values are $\lambda_1 = -2$, $\lambda_2 = -2$, $\lambda_3 = -1$

Therefore, the system is stable.

2.2 The Parameters and initial conditions of the model

The values are obtained from the reference [10, 23]

$N = 8034776$ (Total number of population),

$\rho = 3.267e^{-3}$ (infection Rate)

$\gamma = 3.5e^{-4}$ (Recovery rate)

β : The transmission rate of the disease, indicating how easily the disease spreads from infected individuals to susceptible ones.

γ : The recovery rate, determining how swiftly infected individuals recuperate and transition to the recovered class.

μ : The natural death/birth rate, signifying the rate at which individuals perish (and are replenished by births) in the population.

ρ : The vaccination rate, indicating the speed at which susceptible individuals are vaccinated and move into the vaccinated class.

The equations themselves illustrate the movement of individuals between these compartments (Susceptible, Vaccinated, Infected, and Recovered) over time.

$$\frac{dTPS}{dt} = \frac{(TPS)(TPI)}{N} - P(TPS) + \mu(TPV + TPR) \quad (1)$$

$$\frac{dTPV}{dt} = \rho * TPS - \mu * TPV \quad (2)$$

$$\frac{dTPI}{dt} = \frac{\beta(TPS)(TPI)}{N} - \gamma * TPI \quad (3)$$

$$\frac{dTPR}{dt} = \gamma * TPI - \mu * TPR \quad (4)$$

The initial conditions involved

$$(0) \geq TPS_0 \geq 0, T(0) \geq TPV_0 \geq 0, TPI(0) \geq TPI_0 \geq 0,$$

$$(0) \geq TPR_0 \geq 0$$

$$\sigma = 3.1e^{-3} \text{ (natural mortality rate) } t_{\max} = 200$$

$$dt = 0.1$$

N represents the total population, which is 8,034,776.

ρ is the infection rate, set at $3.267e^{-3}$

γ denotes the recovery rate and is given as $3.5e^{-4}$.

σ^* is the natural mortality rate, set at $3.1e^{-3}$.

$t_{\max}$ is the maximum time for the model, set at 100, 200, 300, 400.

dt is the time step, set at



T	dt	TPS	TPV	TPI	TPR
100	0.1	892.0622	23091.88	4457.969	402.0853
100	0.2	892.1251	23093.54	4456.398	401.9404
100	0.3	892.2131	23095.85	4454.201	401.7376
100	0.4	892.4504	23102.08	4448.276	401.1927
100	0.5	893.2079	23121.97	4429.364	399.4542
100	0.6	-479786	449457.6	59116.13	56.4787
100	0.7	22373986	-3295858	-1.9E+07	17517.43
200	0.1	884.3652	22889.57	4650.295	419.7694
200	0.2	884.4156	22890.9	4649.034	419.6533
200	0.3	884.4934	22892.94	4647.089	419.4742

200	0.5	885.2947	22914.02	4627.054	417.6299
200	0.4	884.6787	22897.82	4642.455	419.0477
200	0.6	1.16E+08	7405887	-1.2E+08	-38815.5
300	0.1	878.1672	22726.41	4805.363	434.0553
300	0.2	878.2069	22727.46	4804.371	433.9638
300	0.3	878.2573	22728.79	4803.109	433.8475
300	0.4	878.4157	22732.96	4799.144	433.482
300	0.5	878.9073	22745.91	4786.838	432.3477
300	0.6	1.16E+08	7405887	-1.2E+08	-38815.5
400	0.1	873.2577	22597.02	4928.323	445.3967
400	0.2	880.6935	22792.94	4742.136	428.2281
400	0.3	885.7029	22924.76	4616.848	416.6905
400	0.4	873.4516	22602.14	4923.465	444.9484
400	0.5	873.8381	22612.33	4913.782	444.0548
400	0.6	1.16E+08	7405887	-1.2E+08	-38815.5

Table1: TPS,TPV,TPI,TPR values for tuberculosis using Runge Kutta sixth order method

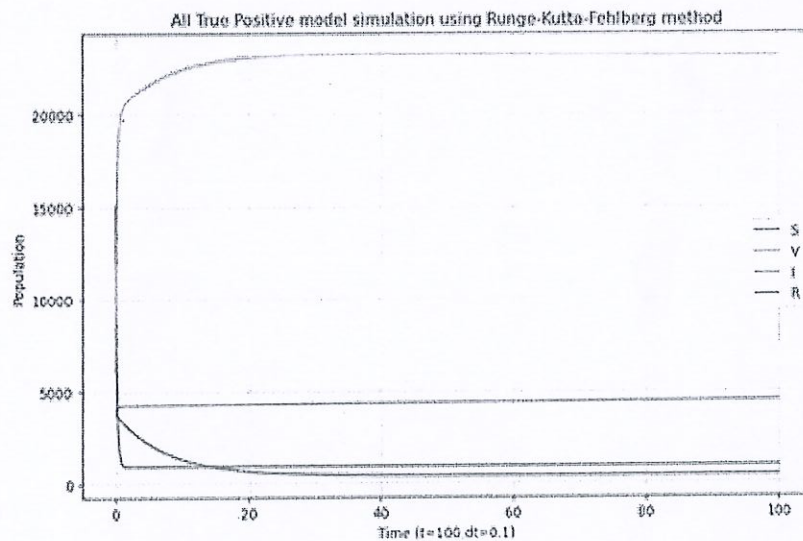


Figure 1: All True Positive Value $t = 100$, $dt = 0.1$

The immunization starts at a high point and gradually declines. In an epidemiological model, this trend could symbolize a susceptible population that diminishes as individuals either become immune or get infected. As time progresses, the numbers of the Recovered and the Infected elevate from their initial low points. In the same scenario, these could represent an immune

or recovered population (R) and an infected population (I). The count of affected individuals increases as more people acquire the disease, and then diminishes as more individuals recover or succumb. As individuals recover from the virus, the population of those who have recovered gradually grows.

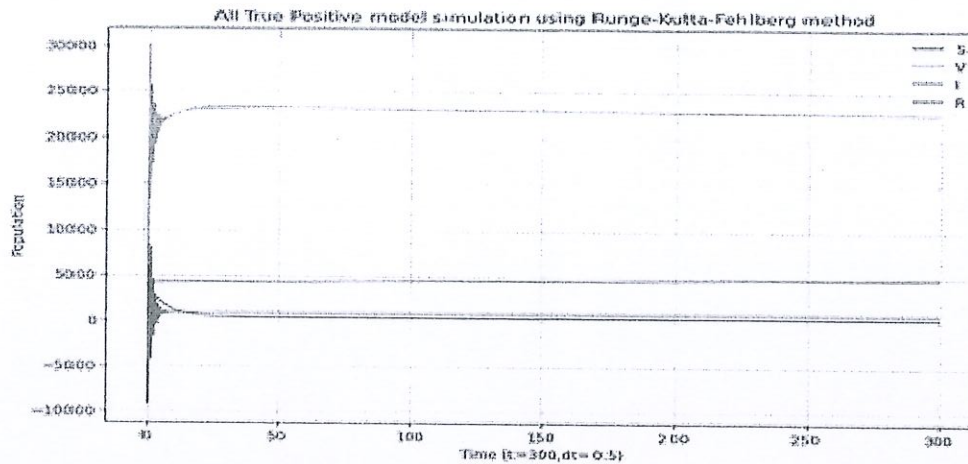


Figure 2: All True Positive Value $t = 300$, $dt = 0.5$

The vaccination rate begins at a high level and gradually decreases. In an epidemiological model, this trend might represent a susceptible population that diminishes as individuals either become immune or get infected.

Starting with low figures, the count of infected and susceptible individuals gradually rises. In the same

scenario, these could be interpreted as an immune or recovered population (R) and an infected population (I). The number of affected individuals increases as more people contract the disease, then decreases as more individuals recover or pass away. As individuals recover from the virus, the count of the recovered population grows.

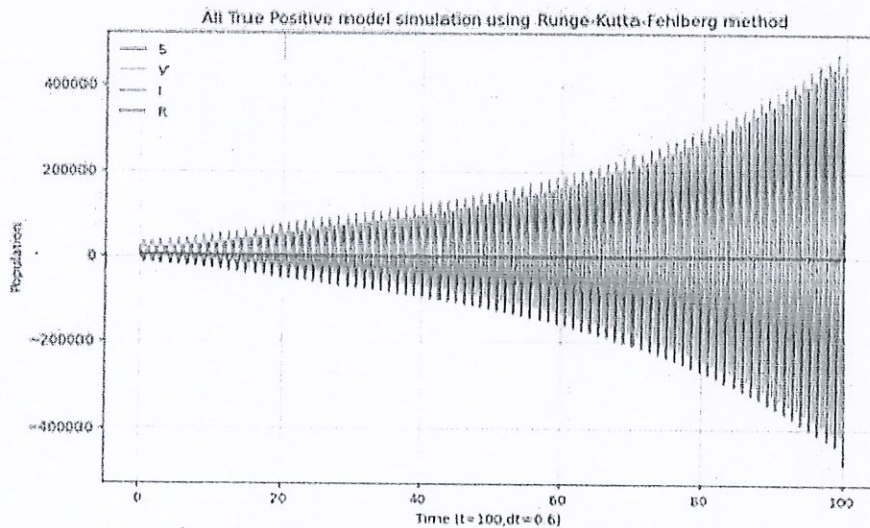


Figure3: All True Positive Value $t = 100$, $dt = 0.6$

Over time, the value of the susceptible group gradually decreases from its initial high level. In an epidemiological model, this decline could represent a susceptible population that diminishes as more people become infected.

As time progresses, the number of Vaccinated and Infected individuals gradually increases from their initial low levels. In the same context, these

numbers might signify an immune population and an infected population (I). The count of affected individuals rises as more people contract the disease, then diminishes as more people recover or pass away. As individuals recover from the virus, the population of those who have recovered grows.

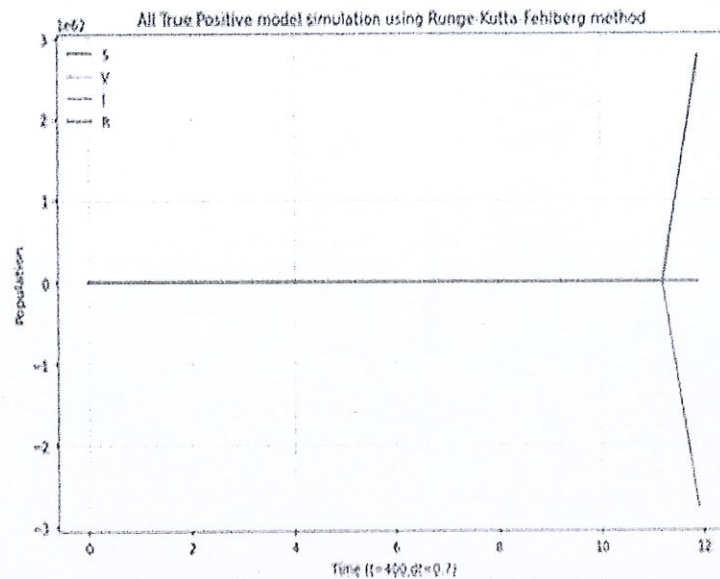


Figure 4: All True Positive Value $t = 400$, $dt = 0.6$

Starting around $1.5 e^{62}$, the susceptible population swiftly climbs to approximately $3 e^{62}$ at roughly 12 on the x-axis. This may indicate a rapid expansion of the population.

On the x-axis, the infection rate initiates at about $-2 e^{62}$ and quickly plummets to roughly $-3e^{62}$ around 12. This could indicate a sharp decline in the population.

The Recovered count begins at approximately 0 and remains stable until around 10 on the x-axis. Subsequently, it rapidly accelerates to approximately $2 e^{62}$ at about 12 on the x-axis. This pattern might be an example of a population that stabilizes for a while before experiencing rapid growth.

4. Numerical Results and Discussion

The results presented in Tables 1 display a treatment administered over a four-week period, accounting for 100 hours per week. In this context, 't' represents specific time points, namely $t = 100$, 200, 300, and 400, corresponding to the consecutive weeks from the first to the fourth week of treatment, respectively. The time step (dt) used in this study ranges from 0.1 to 0.7 days, each value representing a day within the seven-day period of a week. The model employed for this analysis is the All Positive Vaccinated Model, utilizing the 6th order Runge-Kutta method for computations.

Our findings indicate that when $t = 100$, the

treatment concludes after 7 days ($dt = 0.7$), revealing the number of recovered individuals. Similarly, when $t = 200$ (end of the second week), the treatment also concludes after 7 days ($dt = 0.7$). Finally, for $t = 300$ and 400, the treatment concludes in 6 days ($dt = 0.6$). Notably, we observed an increase in the number of recoveries by the sixth day itself during these weeks.

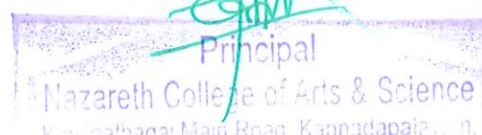
5. Conclusion

The 'All True Positive Vaccinated Model' for tuberculosis, using the 6th order Runge-Kutta method, has consistently demonstrated accurate predictions for post-vaccination recovery times. Our results consistently indicate a recovery period of 7 days across multiple time intervals ($t = 100$, 200, 300, and 400). This reliability in predictions emphasizes the potential of our model as a robust tool for understanding the dynamics of tuberculosis recovery after vaccination. Furthermore, these findings could be pivotal in shaping future strategies for disease control and prevention.

References

- [1] Allen.L.J, Jones.M.A, and Martin.C.F, "A discrete-time model with vaccination for a measles epidemic," Math. Biosci 105 (1) (1991), pp. 111–131.
- [2] Althomsons SP, Winglee K, Heilig CM, Talarico S, Silk B, Wortham J, Hill AN, Navin

- TR. "Using Machine Learning Techniques and National Tuberculosis Surveillance Data to Predict Excess Growth in Genotyped Tuberculosis Clusters." *Am J Epidemiol*. 2022.
- [3] Bernoulli. D Essay on a New Analysis of the Mortality Caused by Smallpox and the Advantages of Inoculation to Prevent It." *Mem. Math. Phys. Acad. Roy. Sci. Paris* 1760.
- [4] Bolker and Grenfell.B, "Space, Persistence and Dynamics of measles epidemic," *Philos. Trans. R. Soc. Lond., B, Biol. Sci.* 348 (1995), pp. 309–320.
- [5] Burzynski J, Mangan JM, Lam CK, Macaraig M, Salerno MM, deCastro BR, Goswami ND, Lin CY, Schluger NW, Vernon A; eDOT Study Team. "In-Person vs Electronic Directly Observed Therapy for Tuberculosis Treatment Adherence: A Randomized Noninferiority Trial." *JAMA Netw Open*. 2022 Jan 4;5(1):e2144210.
- [6] Capasso.V and Serio.G, "A generalization of the Kermack-McKendrick deterministic epidemic model," *Math. Biosci* 42 (1–2) (1978), pp. 43–61.
- [7] d'Onofrio, "Pulse vaccination strategy in the SIR epidemic model: Global asymptotic stable eradication in the presence of vaccine failures," *Math. Comput. Model.* 36 (4–5) (2002), pp. 473–489.
- [8] Deakin.M.A.B, "A standard form for the Kermack-McKendrick epidemic equation," *Bull. Math. Biol.* 37 (1975), pp. 91–95.
- [9] El-Doma . M, "Stability analysis of a general age-dependent vaccination model of a vertically transmitted disease," *International Centre for Theoretical Physics, Trieste (Italy)*, 1995.
- [10] Esteva.L and Vargas.C, "Analysis of dengue disease transmission," *Math. Biosci* 150 (2) (1998), pp. 131–151.
- [11] Greenhalgh, "Some results for an SEIR epidemic model with density dependence in the death rate," *IMA J Math Appl Med Biol* 9 (2) (1992), pp. 67–106.
- [12] Hamer.W.H, "Epidemic disease in England," *Lancet* 1 (1906), pp. 733–739.
- [13] Hethcote.H.W, "Qualitative analyses of communicable disease models," *Math. Biosci* 28 (3–4) (1976), pp. 335–356.
- [14] Kermack.W.O and McKendrick.A.G, "A contribution to the mathematical theory of epidemics," *Proc. R. Soc. Lond. A* 115 (1927), pp. 700–721.
- [15] Kryrcho.Y.N and Blyuss. K.B, "Global properties of a delayed SIR model with temporary immunity and nonlinear incidence rate," *Nonlinear Anal Real World Appl* 6 (3) (2005), pp. 495–507.
- [16] Kuznetsov.Y.A and Piccardi.C, "Bifurcation analysis of periodic SEIR and SIR epidemic models," *J. Math. Biol* 32 (2) (1994), pp. 109–121.
- [17] Li.M.Y and Muldowney.J.S, "Global stability for the SEIR model in epidemiology," *Math. Biosci* 125 (2) (1995), pp. 155–164.
- [18] Liddo .A.D, "A S-I-R vector disease model with delay," *Mathematical Modelling* 7 (5–8) (1986), pp. 793–802.
- [19] Lotka.A.J, "Elements of physical biology," Williams & Wilkens, Baltimore (1925). Reprinted as "Elements of Mathematical Biology," Dower, New York, 1956.
- [20] Lotka.A.J, "Martini's equation for the epidemiology of immunizing diseases," *Nature* 111 (2793) (1923), pp. 633–634.
- [21] Peter J. Dodd, Debebe Shaweno, Chu-Chang Ku, Philippe Glaziou, Carel Pretorius, Richard J. Hayes, Peter MacPherson, Ted Cohen & Helen Ayles, "Transmission modeling to infer tuberculosis incidence prevalence and mortality in settings with generalized HIV epidemics," *Nature Communications*, vol. 14, article number: 1639.
- [22] Ramadhan, N. R., Minggi.I, and S. Side. "The accuracy comparison of the RK-4 and RK-5 methods of the SEIR model for tuberculosis cases in South Sulawesi." *Journal of Physics: Conference Series*, vol. 1918, no. 4, IOP Publishing, 2021.
- [23] Ross.R and Hudson.H.P, "An application of the theory of probabilities to the study of a priori pathometry: II," *Proc. R. Soc. London A* 93 (1917), pp. 212–224.
- [24] Ross.R and Hudson.H.P, "An application of the theory of probabilities to the study of a priori pathometry: III," *Proc. R. Soc. London A* 93 (1917), pp. 225–240.



- [25] Ross.R, "An application of the theory of probabilities to the study of a priori pathometry: I," *Proc. R. Soc. London A* 92 (1916), pp. 204–230.
- [26] Ross.R, "The Prevention of Malaria," 2nd ed., Murray, London, 1911.
- [27] Satsuma.J, Willox.R, Ramani.A, Grammaticos.B, and Carstea. A.S, "Extending the SIR epidemic model," *Phys. A* 336 (3–4) (2004), pp. 369–375.
- [28] Shulgin.B, Stone.L, and Agur.Z, "Pulse vaccination strategy in the SIR epidemic model," *Bull. Math. Biol.* 60 (6) (1998), pp. 1123–1148.
- [29] Side.S, "A susceptible-infected-recovered model and simulation for transmission of tuberculosis," *Adv Sci Lett* 21 (2) (2015), pp. 137–139.
- [30] Stone.L, Shulgin .B, and Agur.Z, "Theoretical examination of the pulse vaccination policy in the SIR epidemic model," *Math. Comput. Model.* 31 (4–5) (2000), pp. 207–215.
- [31] Takahashi, Spreadbury.J, and Scotti.J, "Modeling the spread of tuberculosis in a closed population," *Laporan Hasil Penelitian*, 2010.





Comparative Exploration of Tuberculosis Transmission in High-Risk and Low-Risk Populations by Enhanced Numerical Algorithm

Gunasekaran.M¹, Alamelu.K^{2*}

¹PG Department of Mathematics, Sri Subramaniaswamy Government Arts College, Tiruttani- 631 209, India.

²Department of Mathematics, Nazareth College of Arts and Science, Avadi, Chennai-600062, India.

²PG Department of Mathematics, Sri Subramaniaswamy Government Arts College, Tiruttani- 631209, India., alameluiyappan@gmail.com

**Corresponding Author: Gunasekaran.M*

**PG Department of Mathematics, Sri Subramaniaswamy Government Arts College, Tiruttani- 631209, India. *alameluiyappan@gmail.com*

Abstract

This study compares the transmission of tuberculosis (TB) in high and low-risk populations by employing the 6th Order Runge-Kutta algorithm and the Susceptible-Vaccinated-Exposed-Infected (SVEI) model. Mycobacterium tuberculosis, the bacterium causing TB, is a global health concern with varying incidence among different demographic groups. Our research focuses on two distinct populations: high-risk individuals, who have had greater exposure to TB, and low-risk persons with minimal contact. The SVEI model is used to depict the dynamics of TB transmission, considering variables such as vaccination and latency duration. In this study, we introduce a novel methodology that considers only the true positives in each SVEI model category. This approach involves accounting solely for those accurately classified as susceptible, immunized, exposed, or infected, utilizing the sixth-order Runge-Kutta method. By employing this method, we can forecast future trends in TB transmission in both populations. Preliminary findings reveal significant differences in the dynamics of TB transmission between high- and low-risk populations. These results could potentially impact public health strategies for TB control by emphasizing the necessity of targeted interventions that consider population-specific risk levels. However, further investigation is necessary to validate these conclusions.

CC License
CC-BY-NC-SA 4.0

Keywords: Tuberculosis, High-Risk Population, Low-Risk Population, SVEI Model, 6th Order Runge-Kutta Method

1. Introduction

Worldwide, tuberculosis poses a significant challenge [15]. However, the burden of tuberculosis disease disproportionately affects impoverished nations. In addition to the six nations mentioned previously, several countries across Asia, Africa, Eastern Europe, Latin America, and Central America continue to face

Available online at: <https://jazindia.com>

unacceptably high rates of tuberculosis [3,4,12]. High-burden tuberculosis is prevalent among HIV-positive individuals, healthcare workers, and recent immigrants from tuberculosis-endemic regions in more developed countries. There is also evidence indicating an increased risk when using immunosuppressive medications, such as long-term corticosteroid therapy, which includes golimumab, etanercept, infliximab, and adalimumab. Patients taking any of these medications should have their tuberculosis status checked before and during treatment [15]. Preventing and treating tuberculosis, an infectious disease, is possible. Nevertheless, in underdeveloped nations where providing adequate access to treatment remains a challenge, tuberculosis continues to be one of the leading causes of illness and mortality. Additional obstacles include lack of awareness, delays in diagnosis, difficulties in obtaining vaccinations, and non-adherence to prescribed medications. The WHO's recommended DOTS (Directly Observed Therapy) has shown significant efficacy in enhancing medication adherence among tuberculosis patients [12,19]. Additionally, a substantial decline in the prevalence of this infection has been attributed to immunization campaigns in developing nations [5,6,7]. Although the effectiveness of BCG vaccination in preventing tuberculosis is debated, numerous studies affirm that immunization plays a crucial role in combating the disease. Therefore, the emphasis on childhood immunization, particularly in underdeveloped nations, must be maintained [14]. Until we eradicate this disease globally, the WHO and other health organizations must continue funding the development of new strategies and research initiatives. It is imperative to create new anti-tuberculosis medications to effectively manage drug-resistant tuberculosis, treat latent tuberculosis infections, and simplify the treatment of tuberculosis caused by drug-susceptible organisms. Ashrafu and Zou [8] developed a vaccine distribution model with vaccination priority. However, the model has limitations as it overlooks the possibility that vaccinated individuals can still contract the disease if not entirely immune. In reality, vaccinations may significantly lower the risk of infection rather than completely eliminating it [5]. Therefore, the condition of incomplete immunity should be considered in infectious disease models. Reference [10] examined a basic SVIR epidemic model incorporating vaccination age, suggesting that the model allows vaccinated individuals to return to susceptibility as the vaccine's protective effects diminish. Building upon this, the SVIR infectious disease model and its integration techniques are further examined.

2. Mathematical Model

The collection of equations provided encompasses the four differential equations that illustrate the dynamics of a population concerning SVEI tuberculosis. These equations correspond to four distinct categories within the population: True Positive Susceptible (TPS), True Positive Vaccinated (TPV), True Positive Exposed (TPE), and True Positive Infected (TPI) [7].

TPS: Individuals in this category are susceptible to the illness but have not received the vaccination.

TPV: This group comprises individuals who have undergone the disease-prevention vaccination.

TPE: Individuals in this category have been exposed to the illness but have not yet contracted it.

TPI: Members of this group are individuals who have contracted the disease.

Equation (1) represents the rate at which TPS changes over time. It takes into account the total count of TPS, TPI, and TPV individuals. The constants b , ϕ , γ , and ν denote the rates of new individuals entering the TPS category, TPS individuals getting infected, TPS individuals receiving vaccinations, and TPV individuals returning to a susceptible status, respectively.

Equation (2) represents the rate of change of TPV over time, considering both the count of TPS and TPV individuals. The constants ν and γ symbolize the rates at which TPV individuals return to a susceptible state and new individuals enter the TPV category, respectively.

Equation (3) depicts the rate of change of TPE over time, taking into account the total count of TPS, TPI and TPE individuals. The constants ϕ , ϵ , and ν signify the rates at which new TPE individuals are added to the population, TPE individuals become infected, and TPV individuals get exposed, respectively.

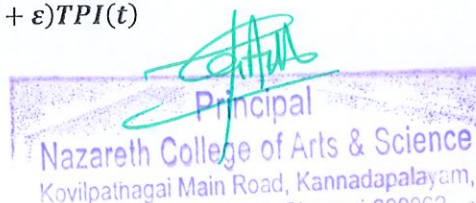
Equation (4) represents the rate of change of TPI over time, factoring in the total count of TPI, TPE and TPV individuals. The parameter ζ signifies the rate of new infections, while the parameter ϵ symbolizes the rate of recovery from the disease for infected individuals.

$$TPS(t) = b - \phi TPS(t)TPI(t) - (TPV + \gamma)TPS(t) + \nu TPV(t) \quad \dots (1)$$

$$TPV(t) = \gamma TPS(t) - (TPV + \nu)TPV(t) \quad \dots (2)$$

$$TPE(t) = \phi TPS(t)TPI(t) - (TPV + \epsilon)TPE(t) \quad \dots (3)$$

$$TPI(t) = \zeta TPE(t) - (TPV + \epsilon)TPI(t) \quad \dots (4)$$



2.1 Equilibrium point of the model

The basic reproduction number represents the estimated number of newly infected individuals resulting from a single infected person within a fully susceptible population. Moreover, ψ_0 is not a rate; rather it is a dimensionless quantity with units of time. It is widely understood that the disease-free equilibrium of an epidemic system is locally asymptotically stable when $R_0 < 1$, indicating the potential eradication of the disease from the population if the initial conditions of the variables TPS (t), TPV (t), TPE (t), and TPI (t) fall within the boundaries of the disease-free equilibrium. Additionally, when the equilibrium free from sickness is globally asymptotically stable, the disease can be eradicated from the population, regardless of the initial conditions and variables of the epidemic model. In the case of a population-wide pandemic, identifying scenarios where $R_0 < 1$ holds significant public health implications. System (9) allows a unique disease-free equilibrium point $T_0 = (TPS_0, TPV_0, 0, 0)$, where there is no disease present ($TPE \geq 0$ and $TPI \geq 0$).

Lemma:

If x_0 is a DFE and $f_i(x)$ satisfies. Then the derivatives $DF(x_0)$ and $Dv(x_0)$ are partitioned as

$$DF(x_0) = \begin{pmatrix} F & 0 \\ 0 & 0 \end{pmatrix} DV(x_0) = \begin{pmatrix} V & 0 \\ J_3 & J_4 \end{pmatrix} \text{ Where } F \text{ and } V \text{ are the } m \times m \text{ matrices defined by}$$

$$F = \left[\frac{\partial F_i}{\partial x_j}(x_0) \right] \text{ and } V = \left[\frac{\partial V_i}{\partial x_j}(x_0) \right] \text{ with } 1 \leq i, j \leq m$$

Further, F is non-negative, V is a non-singular M-matrix and all Eigen values of J_4 have positive real part.

$$F = \begin{bmatrix} 0 & \phi TPS \\ 0 & 0 \end{bmatrix}; V = \begin{bmatrix} TPV + \zeta & 0 \\ -\zeta & TPV + \varepsilon \end{bmatrix} \quad (5)$$

Therefore, the reproduction number R_0 is given below

$$R_0 = \frac{b\phi\zeta(TPV + v)}{TPV(TPV + \varepsilon)(TPV + \zeta)(TPV + v + \gamma)}$$

The substitution is mentioned in the above paragraph. Therefore, the endemic equilibrium points are given below

$$\begin{aligned} TPS^0 &= \frac{(TPV + \varepsilon)(TPV + \zeta)}{\phi\zeta} \\ TPV^0 &= \frac{\gamma(TPV + \varepsilon)(TPV + \zeta)}{\phi\zeta(TPV + \vartheta)} \\ TPI^0 &= \frac{TPV(TPV + \vartheta + \gamma)}{\phi(TPV + \vartheta)}(R_0 - 1) \\ TPE^0 &= \frac{b}{TPV + \zeta} \left(1 - \frac{1}{R_0}\right) \end{aligned}$$

Theorem: T^0 was locally asymptotically stable on M if and only if $R_0 < 1$

Where $M = (S, V, E, I) \in R^4: S(t) \geq 0, V(t) \geq 0, E(t) \geq 0, I(t) \geq 0$ [6,15]

$$J = \begin{bmatrix} -\phi(TPI) - TPV - \gamma & 0 & 0 & -\phi(TPS) \\ \gamma & -TPV - v & 0 & 0 \\ \phi(TPI) & 0 & -TPV - \zeta & \phi(TPS) \\ 0 & 0 & \zeta & -TPV - \varepsilon \end{bmatrix}$$

Therefore, the disease free equilibrium is

$$JO = \begin{bmatrix} -TPV - \gamma & v & 0 & -\phi \frac{b(TPV + v)}{TPV(TPV + v + \gamma)} \\ \gamma & -TPV - v & 0 & 0 \\ \phi(TPI) & 0 & -TPV - \zeta & \phi \frac{b(TPV + v)}{TPV(TPV + v + \gamma)} \\ 0 & 0 & \zeta & -TPV - \varepsilon \end{bmatrix}$$

$$DET(J(T^0) - \delta TPI) = 0$$

$$(\delta + TPV + v + \gamma)(\delta + TPV)(\delta^2 + (2TPV + \zeta + \varepsilon)\delta + (TPV + \zeta)(TPV + \varepsilon)(1 - R_0)) = 0$$

$$\delta_1 = -(TPV + v + \gamma), \delta_2 = -(2TPV + v + \varepsilon)$$

$$\delta_{3,4} = \frac{-(2TPV + \zeta + \varepsilon) \pm \sqrt{(\zeta + \varepsilon)^2 + 4(TPV + \zeta)(TPV + \varepsilon)R_0 - \zeta\varepsilon}}{2}$$

If $R_0 < 1$, it becomes evident that the eigen values of system (1-4) at the disease-free equilibrium are all real and negative. As a consequence, T_0 , the equilibrium point devoid of sickness, achieves local asymptotic stability. This conclusion concludes the proof.

3. Numerical analysis of tuberculosis with high risk population

The initial conditions for the high-risk population are as follows:

$S_0 = 9483$ (initial susceptible population)

$V_0 = 106$ (initial vaccinated population)

$E_0 = 807$ (initial exposed population)

$I_0 = 729$ (initial infected population).

The parameters are as follows: $b = 0.02$ (birth rate), $\phi = 0.0001$ (infection rate), $\delta = 0.01$ (natural death rate), $\gamma = 0.53$ (vaccination rate), $v = 0.05$ (loss of immunity rate), $\zeta = 0.005$ (rate at which exposed individuals become infectious), and $\varepsilon = 0.1$ (recovery rate). Here, t_{end} represents duration from 1 to 7 days per week, and dt_{end} represents a duration of 24 hours per day. [1,10]

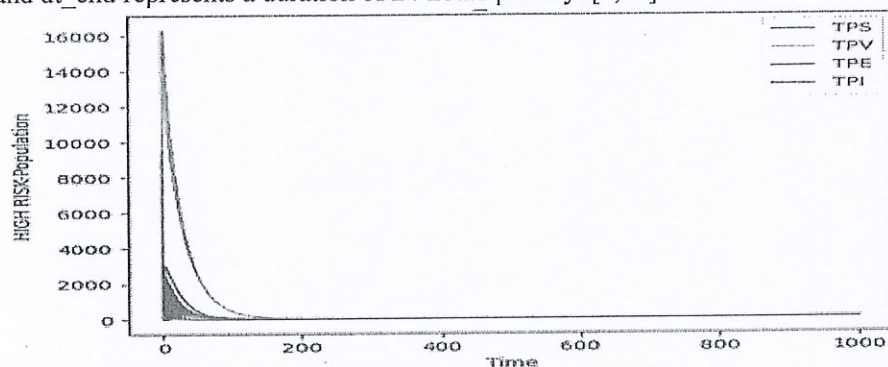


Figure 1 : Solution for $t_{\text{end}} = 100$, $dt = 0.1$

True Positive Susceptible (TPS): This line represents the population susceptible to the disease. It starts at a high level and decreases over time suggesting individuals either receiving vaccinations or getting exposed or infected as time progresses.

True Positive Vaccination (TPV): This line represents the vaccinated population. It begins at a low level and increases over time reflecting the success of a vaccination campaign.

True Positive Exposed (TPE): This line indicates the population exposed to the disease. It starts at a low level and rises over time signifying the spread of the disease within the population.

True Positive Infected (TPI): This line represents the population infected with the disease. It also starts at a low level and increases over time indicating a rise in infections.

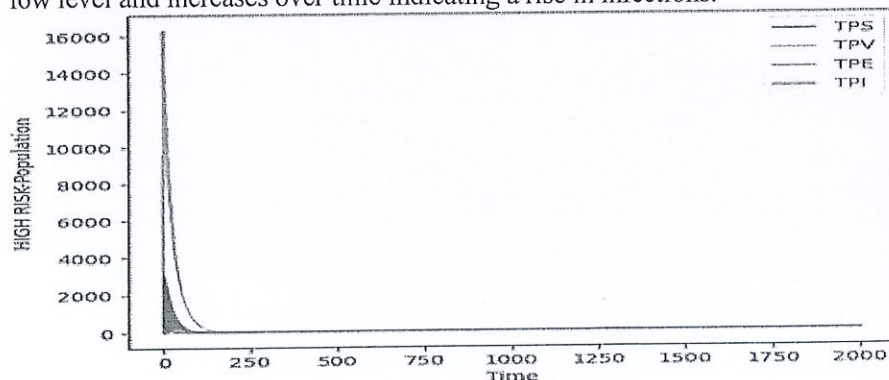


Figure 2: Solution for $t_{\text{end}} = 200$, $dt = 0.1$

True Positive Susceptible (TPS): The blue line representing the susceptible population exhibits a sharp peak at the beginning, followed by a rapid decrease. This pattern might indicate a swift spread of the disease initially, succeeded by a decline as individuals transition into other categories.

Available online at: <https://jazindia.com>

True Positive Exposed (TPE): The orange line representing the exposed population displays a more gradual decline. This trend suggests a slower reduction in exposure to the disease over time.

True Positive Infected (TPI): The green line representing the infected population shows a slight increase initially followed by a gradual decrease. This might imply an initial phase of infection spread succeeded by a gradual recovery or movement into other categories.

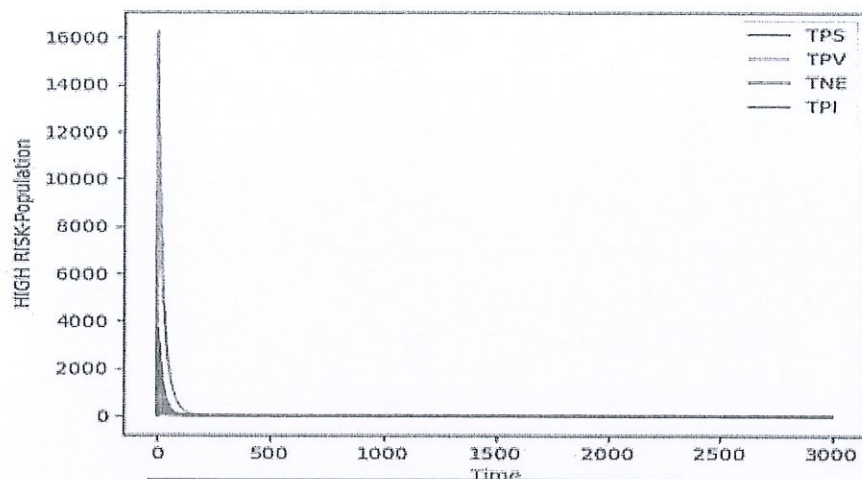


Figure 3: Solution for $t_{\text{end}} = 300$, $dt = 0.1$

True Positive Susceptible (TPS): The blue line depicting the susceptible population initially shows a steep drop followed by stabilization. This suggests that after a rapid decrease the number of susceptible individuals remains steady.

True Positive Exposed (TPE): The orange line representing the exposed population maintains a relatively consistent level throughout the graph. This may indicate that the number of exposed individuals remains constant over this time period.

True Positive Infected (TPI): The green line illustrating the infected population also remains relatively constant throughout the graph. This could indicate that the number of infections stabilizes over this time period.

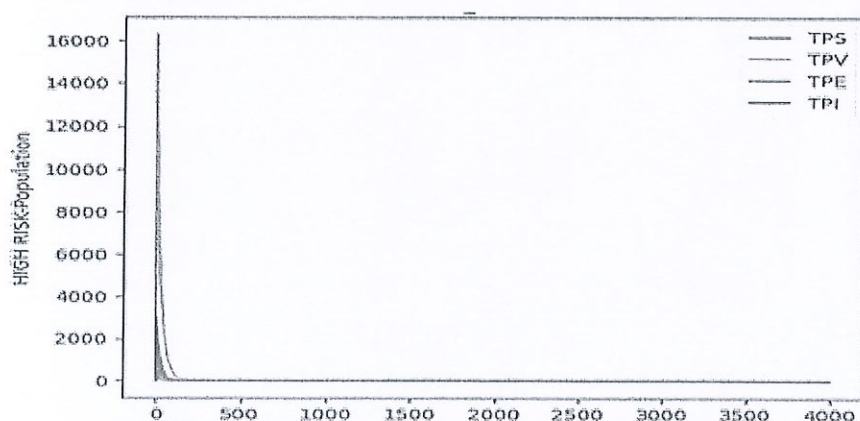


Figure 4: Solution for $t_{\text{end}} = 400$, $dt = 0.1$

True Positive Susceptible (TPS): The orange line illustrating the susceptible population initially displays a steep drop, followed by stabilization. This may indicate that after a rapid decrease the number of susceptible individuals reaches a stable level.

True Positive Exposed (TPE): The blue line representing the exposed population begins at the bottom and steadily rises until it reaches the top. This suggests that the number of exposed individuals increases throughout this time period.

True Positive Infected (TPI): The green line depicting the infected population also starts at the bottom and gradually increases until it reaches the top. This indicates an increase in the number of infections over this time period.

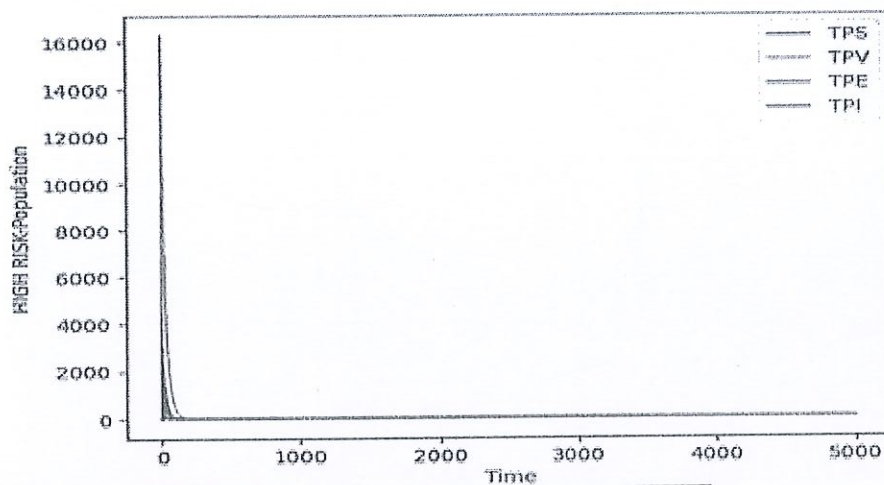


Figure 5 : Solution for $t_{\text{end}} = 500$, $dt = 0.1$

True Positive Susceptible (TPS): The blue line representing the susceptible population displays a sharp increase initially followed by stabilization. This pattern suggests a rapid rise in susceptibility at the outset succeeded by stabilization.

True Positive Exposed (TPE): The orange line illustrating the exposed population shows a gradual increase and then levels off. This pattern implies a slow increase in exposure to the disease over time followed by stabilization.

True Positive Infected (TPI): The green line depicting the infected population exhibits a sharp decrease initially and then levels off. This indicates an initial decline in infections followed by stabilization.

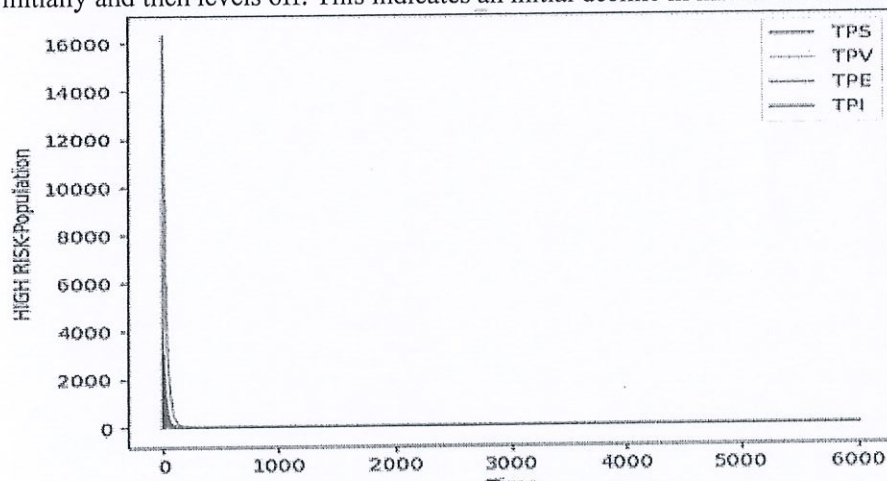


Figure 6 : Solution for $t_{\text{end}} = 600$, $dt = 0.1$

True Positive Susceptible (TPS): The blue line representing the susceptible population exhibits a particular trend over time. Without additional context or data points providing a detailed interpretation of this trend are challenging.

True Positive Exposed (TPE): The orange line representing the exposed population also shows a specific trend over time. Similarly, without additional context or data points it's challenging to provide a detailed interpretation of this trend.

True Positive Infected (TPI): The green line depicting the infected population displays a distinct trend over time. Again, without additional context or data points it's challenging to provide a detailed interpretation of this trend.

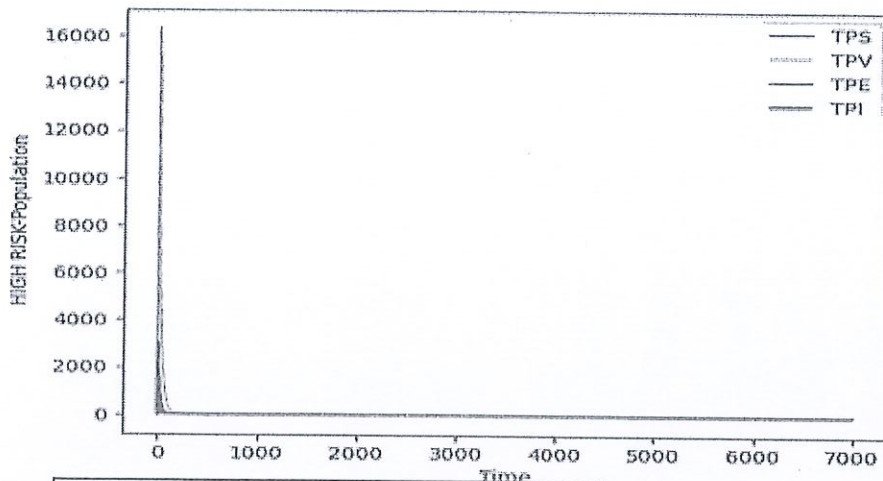


Figure 7 : Solution fort_end = 700, dt = 0.1

True Positive Susceptible (TPS): The blue line representing the susceptible population appears as a straight line starting from the top left corner and ending at the bottom right corner of the graph. This suggests a consistent decrease in susceptibility over time.

True Positive Exposed (TPE): The orange line representing the exposed population displays a curved line starting from the top left corner and ending at the bottom right corner of the graph. This pattern indicates a non-linear decrease in exposure over time.

True Positive Infected (TPI): The green line representing the infected population is depicted as a straight line starting from the bottom left corner and ending at the top right corner of the graph. This could suggest a steady increase in infections over time.

4. Numerical Analysis of Tuberculosis with Low Risk Population

The initial conditions for the Low-risk population are as follows:

$S_0 = 9483$ (initial susceptible population)

$V_0 = 106$ (initial vaccinated population)

$E_0 = 807$ (initial exposed population)

$I_0 = 64$ (initial infected population)

The parameters are as follows: $b = 0.02$ (birth rate), $\phi = 0.0001$ (infection rate), $\delta = 0.01$ (natural death rate), $\gamma = 0.53$ (vaccination rate), $\nu = 0.05$ (loss of immunity rate), $\zeta = 0.005$ (rate at which exposed individuals become infectious), and $\epsilon = 0.1$ (recovery rate). Here t_{end} represents a duration from 1 to 7 days per week and dt_{end} represents a duration of 24 hours per day. [13]

The solution for $t_{\text{end}} = 100$, $dt = 0.1$ illustrates the relationship between the low risk population and time. The graph displays three lines of distinct population such as TPS, TPE and TPI. The TPS line depicted in blue exhibits a sharp peak around $t = 100$ signifying a significant change in the TPS population at that specific point in time. The TPE line marked in orange and the TPI line shown in green both remain relatively flat suggesting that the TPE and TPI populations are less affected by changes over time. This implies that the TPS population is more time-sensitive compared to the TPE and TPI populations. It's important to note that without additional context or data this interpretation remains at a high level.



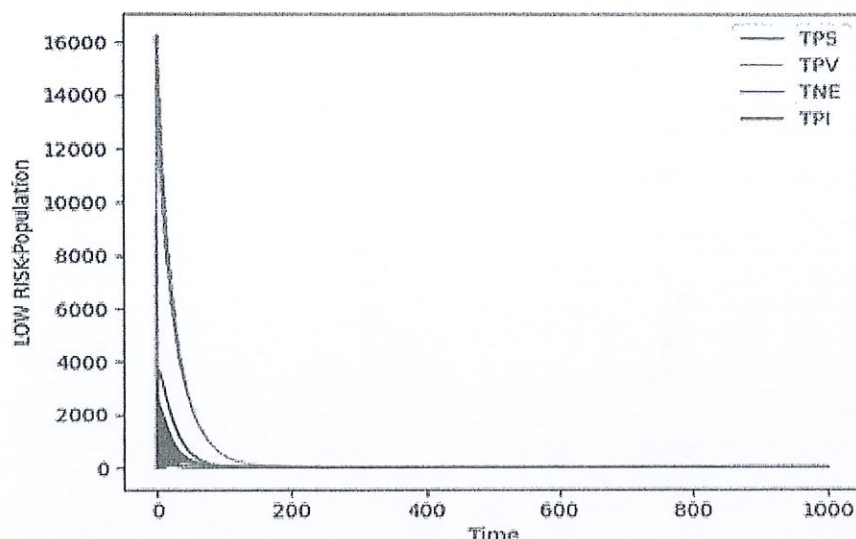


Figure 8 : Solution for $t_{\text{end}} = 100$ and $dt = 0.1$

The graph depicts the relationship between the low risk population and time. The graph features three lines: TPS, TPE and TPI with $t_{\text{end}} = 200$ and $dt = 0.1$. All three lines (TPS, TPE, and TPI) demonstrate a decreasing trend as time progresses, signifying a reduction in the low risk population over time. The TPS line is represented in blue, the TPE line in orange, and the TPI line in green. It's important to note that this interpretation is at a high level and might require additional context or data for a more accurate understanding. Further information regarding what each population (TPS, TPE and TPI) represents would be beneficial for a more precise analysis. Please consider that this interpretation assumes the y-axis represents the low risk population, while the x-axis represents time.

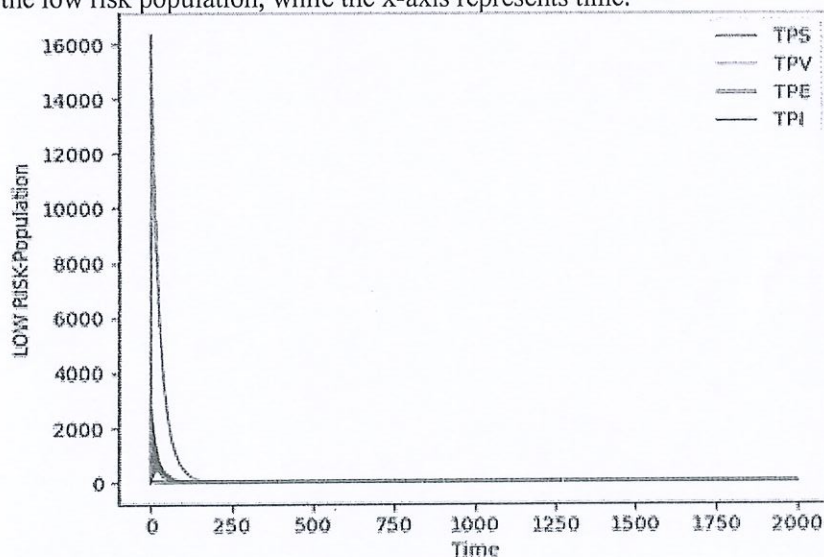


Figure 9 : Solution for $t_{\text{end}} = 200$, $dt = 0.1$

The graph illustrates the relationship between the low-risk population and time. It consists of three lines: TPS, TPE and TPI with parameters set as $t_{\text{end}} = 300$ and $dt = 0.1$. The TPS line depicted in blue registers the highest value initially but subsequently it decreases rapidly and stabilizes. In contrast the TPE line marked in orange and the TPI line shown in green both start at lower levels. However, they steadily increase over time and eventually plateau. This trend suggests that the TPS population experiences a rapid decline over time while the TPE and TPI populations exhibit a gradual increase.

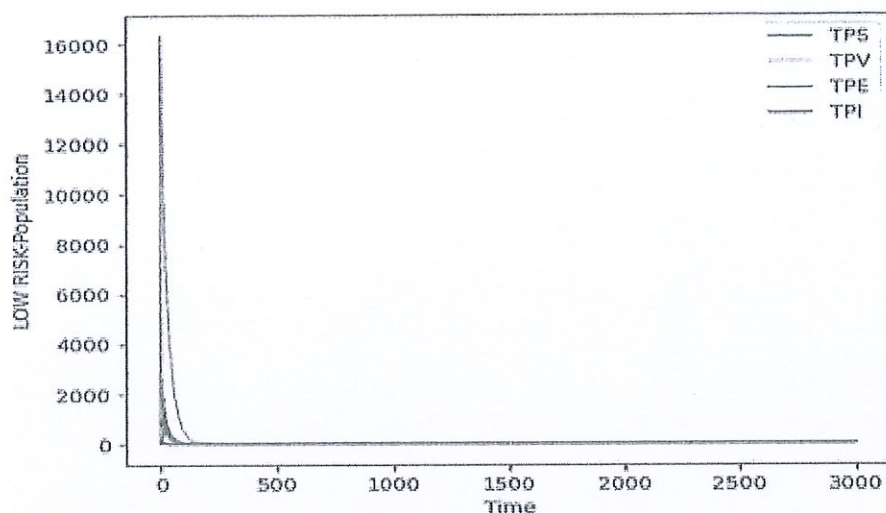


Figure 10 : Solution for $t_{\text{end}} = 300$, $dt = 0.1$

This graph illustrates the relationship between the low-risk population and time. It features three lines: TPS, TPE and TPI with parameters set at $t_{\text{end}} = 400$ and $dt = 0.1$. The TPS line represented in blue begins at a high value but then experiences a rapid decrease. In contrast the TPE line is depicted in orange and the TPI line in green. Both lines start at a low value but demonstrate a rapid increase. Towards the end of the graph the TPS line concludes at a low value while the TPE and TPI lines conclude at a high value. This pattern indicates that the TPS population decreases rapidly over time while the TPE and TPI populations increase rapidly.

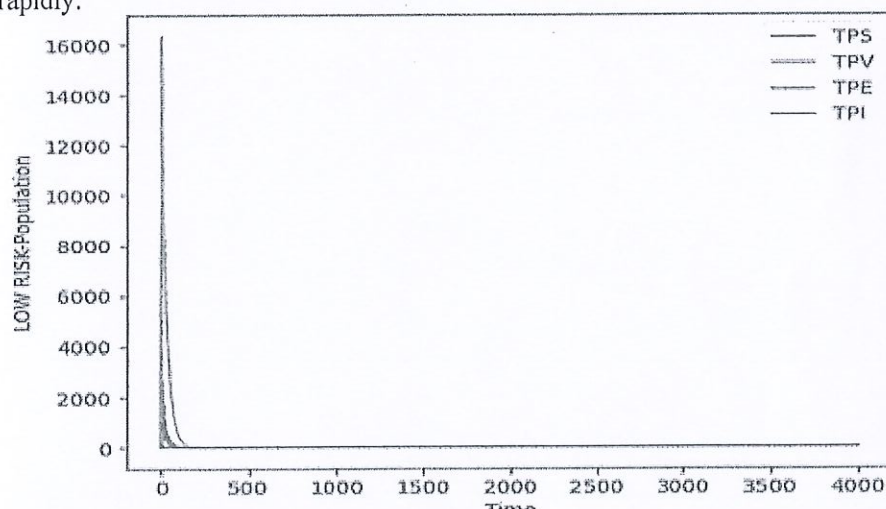


Figure 11 : Solution for $t_{\text{end}} = 400$, $dt = 0.1$

This graph illustrates the relationship between the low-risk population and time. It consists of three lines: TPS, TPE and TPI with the parameters set at $t_{\text{end}} = 500$ and $dt = 0.1$. The TPS line is blue while the TPE line is orange. Both these lines depict a decrease as time progresses suggesting a reduction in these populations over time. Conversely the TPI line shown in green indicates an increase over time signifying a growth in this population. This observation implies that the TPS and TPE populations decrease over time while the TPI population increases.

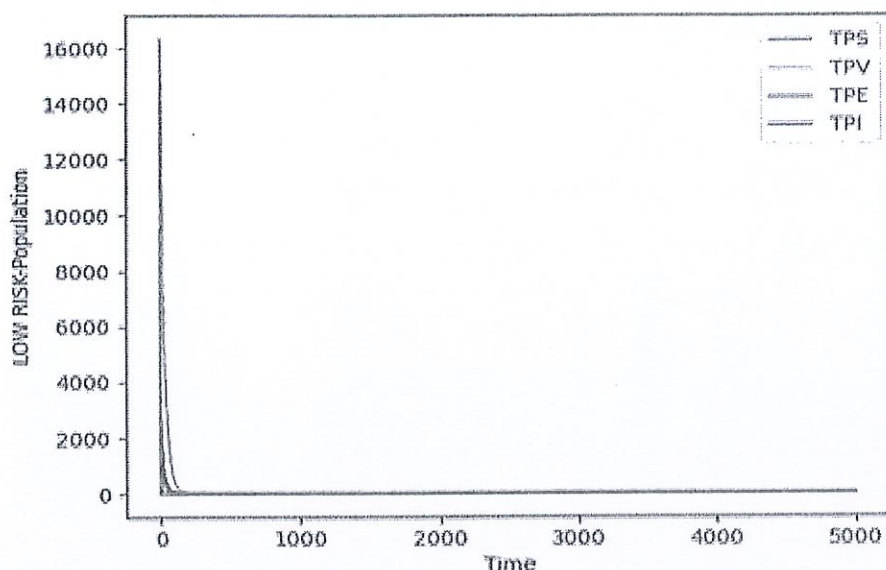


Figure 12 : Solution for $t_{\text{end}} = 500$, $dt = 0.1$

The solution is presented for $t_{\text{end}} = 600$, $dt = 0.1$ showcasing the relationship between time and the low-risk population across three different variables: TPS, TPE and TPI. The TPS line marked in blue and the TPE line in orange both exhibit a linear relationship with time. Meanwhile the TPI line depicted in green demonstrates an exponential relationship with time.

This observation suggests that the TPS and TPE populations change linearly over time, while the TPI population changes exponentially. It's important to note that without additional context or data, this interpretation remains high-level. To gain a more accurate understanding, additional information about what each population TPS, TPE, and TPI represents would be beneficial.

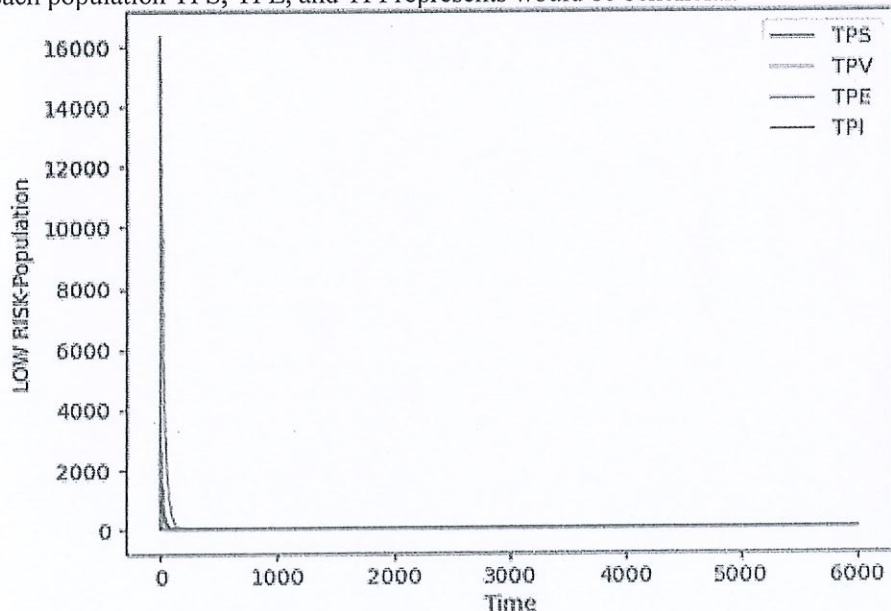


Figure 13: Solution for $t_{\text{end}} = 600$, $dt = 0.1$

The graph illustrates the relationship between the low risk population and time with three labeled lines namely TPS, TPE and TPI where the x-axis represents time and the y-axis represent the low risk population. Both TPS and TPE lines appear constant suggesting no change in these populations over time. In contrast the TPI line shows a decrease as time progresses indicating a reduction in the low risk population within this category over time. Additionally, a red vertical line is visible at time=0 potentially marking the beginning of observation.

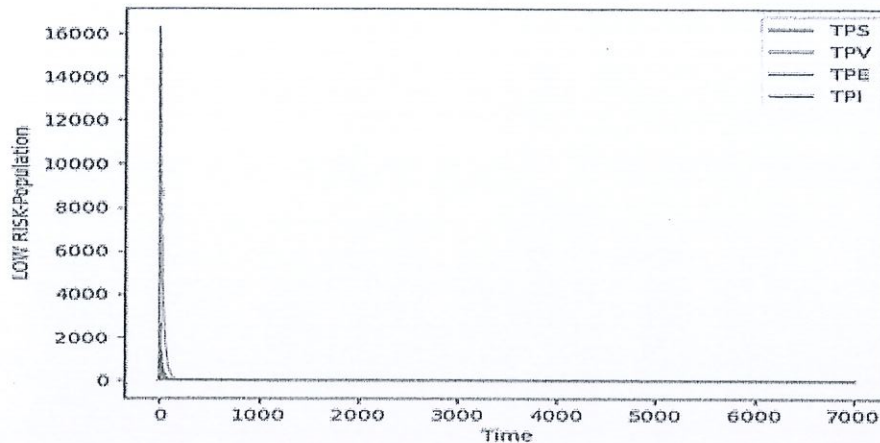


Figure 14 : Solution for $t_{\text{end}} = 700$, $dt = 0.1$

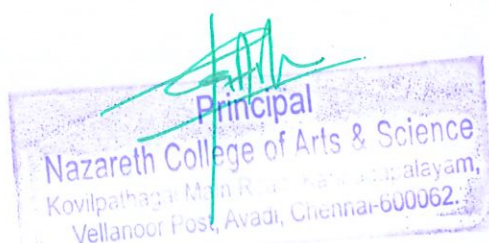
5. Conclusion:

High Risk Population graph illustrates changes in the population of a specific disease over time. The blue line represents the susceptible population, the orange line represents the exposed population, the green line represents the infected population and the yellow line represents the vaccinated population. The graph suggests that the disease initially spread rapidly but the number of susceptible individuals decreased over time. The number of exposed individuals remained relatively consistent throughout the graph, while the number of infected individuals showed a slight increase initially followed by a gradual decrease. The success of the vaccination campaign is reflected in the increasing trend of the vaccinated population over time. Furthermore, we observe that susceptibility and exposure steadily decline over time, while infections steadily rise. The graph is composed of three lines labeled TPS, TPE and TPI. Time is represented on the x-axis, while the low risk population is represented on the y-axis. The TPS and TPE lines seem to exhibit continuous variations suggesting that these populations do not fluctuate significantly over time. In contrast, the TPI line declines with increasing time, indicating a gradual decrease in the population classified as low risk within this category.

References:

1. Ally Yeketi Ayinla, Wan Ainun Mior Othman, Musa Rabiu3 (2021), A Mathematical Model of the Tuberculosis Epidemic, Springer.
2. Boudville DA, Joshi R, Rijkers GT. (2020). Migration and tuberculosis in Europe. J Clin Tuberc Other Mycobact Dis, 18, 100143. [PMC free article: PMC6957817] [PubMed: 31956700].
3. Cui Y, Shen H, Wang F, Wen H, Zeng Z, Wang Y, Yu C. (2020). A Long-Term Trend Study of Tuberculosis Incidence in China, India and the United States 1992-2017: A Joinpoint and Age-Period-Cohort Analysis. Int J Environ Res Public Health, 17(9). [PMC free article: PMC7246898] [PubMed: 32403353].
4. Chaulk CP, Moore-Rice K, Rizzo R, Chaisson RE. (1995). Eleven years of community-based directly observed therapy for tuberculosis. JAMA, 274(12), 945-51. [PubMed: 7674524].
5. Duan, X.C., Yuan, S.L., Li, X.Z. (2014). Global stability of an SVIR model with age of vaccination. Appl Math Comput, 226(2), 528-540.
6. Gunasekaran. M and Saravanaprabhu. A.M (2022). A Second Type of Holling Functional Response of Stability Analysis for Prey Predator and Host Ecosystem, Advances and Applications in Mathematical Sciences Volume 21, Issue 11, September 2022, Pages 6213-6233.
7. Gunasekaran. M and Alamelu K (2023) Enhancing Tuberculosis Modeling: The True Positive Vaccinated Approach Utilizing a Specialized Runge-KuttaMetho. Journal of Harbin Engineering University ISSN: 1006-7043 Vol 44 No. 11.
8. Halota, W., Muszyska, M., Pawowska, M. (2002). Hepatitis B virus serologic markers and anti-hepatitis B vaccination in patients with diabetes. Med Sci Monit, 8(7), 516-519.

9. Kuwabara K. (2011). Anti-tuberculosis chemotherapy and management of adverse reactions. *Nihon Rinsho*, 69(8), 1389-93. [PubMed: 21838035].
10. McMullen SE, Pegues DA, Shofer FS, Sheller AC, Wiener EB. (2014). Performance of QuantiFERON-TB Gold and tuberculin skin test relative to subjects' risk of exposure to tuberculosis. *Clin Infect Dis*, 58(9), 1260-6.
11. Metushi I, Uetrecht J, Phillips E. (2016). Mechanism of isoniazid-induced hepato toxicity: then and now. *Br J Clin Pharmacol*, 81(6), 1030-6. [PMC free article: PMC4876174] [PubMed: 26773235].
12. Pan Z, Zhang J, Bu Q, He H, Bai L, Yang J, Liu Q, Lyu J. (2020). The Gap Between Global Tuberculosis Incidence and the First Milestone of the WHO End Tuberculosis Strategy: An Analysis Based on the Global Burden of Disease 2017 Database. *Infect Drug Resist*, 13, 1281-1286. [PMC free article: PMC7210037] [PubMed: 32440164].
13. Rahman, S.M.A., Zou, X.F. (2015). Modelling the impact of vaccination on infectious diseases dynamics. *J Biol Dyn*, 9(1), 307-320.
14. Scriba TJ, Nemes E. (2019). Protection against tuberculosis by mucosal BCG administration. *Nat Med*, 25(2), 199-201. [PubMed: 30692698].
15. Sujatha.K, Gunasekaran.M (2015). Two Ways of Stability Analysis of Prey-Predator System with Diseased Prey Population. *The International Journal Of Engineering And Science (IJES)*, Volume- 4, Issue – 7, Pages 61-66, ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805.
16. Terracciano E, Amadori F, Zaratti L, Franco E. (2020). Tuberculosis: an ever-present disease but difficult to prevent. *IgSanita Pubbl*, 76(1), 59-66. [PubMed: 32668448].
17. Titila de Kehinde Ayandeyi Teibo, Rubia Laine de Paula Andrade, Rander Junior Rosa, Reginal do Bazon Vaz Tavares, Thais Zamboni Berra & Ricardo Alexandre Arcêncio Geo-spatial high-risk clusters of Tuberculosis in the global general population: a systematic review *BMC Public Health* volume 23, Article number: 1586 (2023).
18. Van den Driessche, James Watmough, Reproduction numbers and sub-threshold endemic equilibria for compartmental models of disease transmission, *Mathematical Biosciences* 180 (2002) 29-48.
19. Weis SE, Slocum PC, Blais FX, King B, Nunn M, Matney GB, Gomez E, Foresman BH. (1994). The effect of directly observed therapy on the rates of drug resistance and relapse in tuberculosis. *N Engl J Med*, 330(17), 1179-84. [PubMed: 8139628].



IMPACT OF EMPLOYEE MORALE ON PRODUCTIVITY ON ORGANISATIONAL SUCCESS

Omega.S Assistant Professor, Department of Commerce, Nazareth College of Arts and Science, Kovilpathagai, Chennai-600062.

Suganya. C Assistant Professor, Department of Commerce, Nazareth College of Arts and Science, Kovilpathagai, Chennai-600062.

ABSTRACT

This research topic will assist the organization in determining its strengths and opportunities for developing employee morale, as well as identifying happy people and their productive work. The study at employee morale on productivity on organizational success revealed that there are several factions, such as Social Security provisions, social services, pay status, Bonus, health status, shift schedule, and labour recognition. We learn about the personnel by conducting this research. An employee mindset is critical for this assistance. An employee's posture towards their company is referred to as their morale. An employee's involvement and contentment will lead to excellent performance if his or her morale is high. The study's findings provide the researcher with fresh ideas, and it is concluded that morale has an effect on employee productivity and the various variables utilized by the organization to boost employee morale. The connection and strength of the workforce can be discovered through morale.

Keywords: Employee Morale, Organization, Productivity, Training and Management.

INTRODUCTION

Morale is described as employees' attitudes towards their jobs, management, subordinates, superiors, and subordinates in an organisation. The efficiency and efficacy of that aim achievement can be achieved by sufficient planning and execution of objectives; employees are the organization's backbone for this achievement. Employees must have a positive attitude towards the organisation. Such attitudes could be positive or bad. If it is positive, the employees will perform their duties with zeal and dedication. If the attitude is negative, employees will lose interest in their work, which will be detrimental to the organization's interests. Employee morale is therefore crucial.

DEFINITION

Prof. Mee, on the other hand, believes that "good employee morale is the mental attitude of individuals or groups that enables an employee to realize that the maximum satisfaction of his drives coincides with the fulfilment of the company's and subordinates' objectives."

MEANING

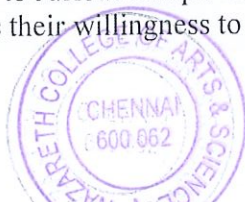
Employee morale is all about how employees felt about the company when they worked there, including their attitudes, contentment, and perspective. In general, businesses with poor organizational cultures, environments, and working conditions may discover that their employees have low morale. It indicates if an employee is enthusiastic, willing, and energetic to work or not.

CLASSICAL APPROACH

According to Robert M. Guion "Morale is defined as the extent to which the individual perceives that satisfaction stemming from total job satisfaction".

PSYCHOLOGICAL APPROACH

According to Jurious Fillipo "Morale is a mental condition or attitude of individual and groups which determines their willingness to cooperate".



SOCIAL APPROACH

According to Davis "Morale can be defined as the attitudes of individual and groups towards their work environment and towards voluntary cooperation to the full extent of their ability in the best interest at the organization".

OBJECTIVES OF THE STUDY:

- ✓ To determine the employee's diploma of satisfaction amongst their bosses and coworkers.
- ✓ Making suggestions for shifting to a more inventive task.
- ✓ Identify the sundry factors that contribute to employee morale within the organization.
- ✓ To determine the level of satisfaction among employees in the following areas:
Wages and salaries, Training program, and working environment.
- ✓ To assess the influence of worker morale on efficiency; and to propose strategies to improve organisational employee morale.

SCOPE OF THE STUDY:

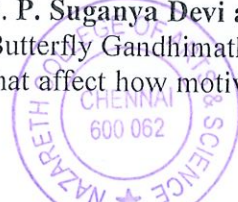
- ✓ Identify the flaws in the current system and use it as a tool to increase opportunities for progress and self-development and to provide employees creative jobs to improve participatory management techniques
- ✓ There are many researchers and studies focusing on employee morale variables, employee motivation, employee satisfaction, analysis of morale on employee performance, and similarly there are studies on employee satisfaction and employee performance. These are all help to improve the system in the area of human resource development.
- ✓ It has to do with how research employee projects are doing as well as worker morale.
- ✓ This study was carried out to determine what types of motivational/welfare programmes could be used to boost staff morale.

NEED FOR EMPLOYEE MORALE ON PRODUCTIVITY:

- ✓ The primary goal of the project is to assess employee morale and study a way to been contributed in employee's productivity.
- ✓ The aids in determining how management actually satisfied the employees' expectations and tries to improve performance based on their satisfaction.
- ✓ To discover the level of worker morale in every individual worker to knew their level in management potential.
- ✓ The examination also contributes in the development of personnel, which is met by better officers and having look at basis that provides joy to the worker may be diagnosed.

LITERATURE REVIEW:

1. **C. Arun and G. Agalya (2020)** "A STUDY ON IMPACT OF EMPLOYEE MORALE ON PRODUCTIVITY OF EMPLOYEES " according to their study it is found that staff productivity is greatly influenced by staff morale. Positive attitudes and energy will boost workers' feelings of loyalty to the company, which will indirectly affect how productive they are. In addition to the organisation, the degree of perception and the quality of the work environment are the aspects that will increase employee morale.
2. **Dr. M. Ravichandran and A.Balakumaran (2019)** "A STUDY ON INFLUENCE OF EMPLOYEES MORALE AT THEIR PRODUCTION WITH REFERNCE TO YAZAKI INDIA PVT LTD" study shows that it helps me to find the More abilities from everyone, including Yazaki employees, as well as more practical knowledge are required. Many knowledgeable people helped me acquire these abilities so that I could successfully complete my research. The findings demonstrate the connections between productivity and morale and statistical variables.
3. **P. Suganya Devi and A.G. Ravi (2018)** "A Study on Employee Morale with Special Reference to Butterfly Gandhimathi appliance Pvt Ltd" By this study it were cleared that there are several factors that affect how motivated and productive employees are, including Social Security policies, welfare



services, salary status, bonuses, health conditions, shift work, and acknowledgement of effort. To sum up, staff morale is crucial to the success of every organisation. The success of the company is largely dependent on the morale of the workforce.

4. **S. Sangeetha and Dr.G. Sundharavadivel (2018)** A STUDY ON EMPLOYEE MORALE WITH REFERENCE TO TIDC PRIVATE LIMITED study show that employee Employee morale will foster a positive work environment that is both psychologically and physically healthy. As a result, there will be a decrease in attrition, which will result in an increase in the number of experienced staff. Due to the large number of experienced operators, overall Productivity will rise, which will raise firm income. Stakeholder support and quality improvement would both result from this.

5. **Mrs. S. Rathika and S. Renuka Devi (2021)** "STUDY ON EMPLOYEE MORALE WITH REFERENCE TO SENSOTECH COMPANY" they founds that study Maintaining any business finds it challenging to maintain strong employee morale because it affects the calibre of the business. The business should normally have certain core principles and should ensure that they are upheld in order to influence employee behaviour.

METHODOLOGY:

RESEARCH DESIGN

The descriptive research design was employed in the study. It generates several types of questionnaires and fact-finding requirements. The primary goal of description research designs as they currently exist. The main feature of this method is that the researcher has no control on our variables; he can only report what has happened or is happening.

METHOD OF SAMPLING USED: "RANDOM SAMPLING METHOD"

DATA COLLECTION METHOD

PRIMARY DATA

Primary data were acquired from respondents by direct communication using the questionnaire approach.

SECONDARY DATA

Secondary data were gathered from firm profiles, records, journals, periodicals, and websites, among other sources.

DATA COLLECTION: Survey

TOOL: Questionnaire

STATISTICAL TOOLS USED

❖ Chi – square

CHI-SQUARE TEST

Chi-square test is to compare the relationship between the two variables.

Formula:

$$\text{Chi-square} = \frac{\sum (O_i - E_i)^2}{E_i}$$

O- Observed value

E- Expected value

There are many situations in which it is not possible to make any rigid assumption about the distribution of the population from which samples are being drawn.



CHI- SQUARE ANALYSIS
COMPARITIVE STUDY BETWEEN THE GENDER AND LEVEL OF RESPONDENT OF
JOB RESPONSIBILITIES

Gender	Job Responsibilities					
	Excellent	Good	Moderate	Poor	Very Poor	Total
Male	33	38	9	7	3	90
Female	3	4	1	1	1	10
Total	36	42	10	8	4	100

Chi – Square Test = (O-E) 2/E

Null Hypothesis (Ho): There is no significant relationship between gender and level of job Responsibilities.

Alternative Hypothesis (H1) : There is close significant relationship between gender and level of job Responsibilities.

O _i	E _i	(O _i -E _i) ²	(O _i -E _i) ² /E _i
33	32.4	0.36	0.011
38	3.6	1183.36	328.7111
9	37.8	829.44	21.942
7	4.2	7.84	1.866
3	9	36	4
3	1	4	4
4	7.2	10.24	1.422
1	0.8	0.04	0.05
1	3.6	6.76	1.877
1	0.4	0.36	0.9
100	100		364.77

$$E_{ij} = C_i R_j$$

$$E_{11} = 36 * 90/100 = 32.4$$

$$E_{12} = 36 * 10/100 = 3.6$$

$$E_{21} = 42 * 90/100 = 37.8$$

$$E_{22} = 42 * 10/100 = 4.2$$

$$E_{31} = 10 * 90/100 = 9$$

$$E_{32} = 10 * 10/100 = 1$$

$$E_{41} = 8 * 90/100 = 7.2$$

$$E_{42} = 8 * 10/100 = 0.8$$

$$E_{51} = 4 * 90/100 = 3.6$$

$$E_{52} = 4 * 10/100 = 0.4$$

$$\text{Calculated Value} = 364.77$$

$$\text{Level of Significance} = 5\%$$

$$\text{Degree of Freedom} = (c-1) (r-1)$$

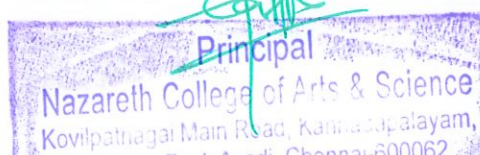
$$(2-1) (5-1) = 6$$

$$\text{Tabulated Value} = 6 \text{ at } 5\% \text{ difference}$$

$$\text{Tabulated Value} = 11.070$$

Tabulated Value is lesser than calculated value (i.e.,) calculated value is greater

$$CV > TV = 364.77 > 11.070$$



INFERENCE:

So, the calculated value is greater than tabulated value. So null hypothesis is rejected. There is significant relationship between age and level of job responsibilities so, alternative hypothesis is accepted.

CHI-SQUARE ANALYSIS
COMPARITIVE STUDY BETWEEN THE EXPERIENCE AND INVOLVEMNT IN JOB

EXPERINCE	INVOLVEMENT IN JOB			
	Total Involvement	Somewhat Involvement	Lack of Involvement	Total
Below5yr	8	6	4	18
5-10yrs	14	9	5	28
Above10yrs	30	14	10	54
Total	52	29	19	100

Null Hypothesis (Ho) : There is no significant relationship between experience and Involvement in job

Alternative Hypothesis (H1) : There is close significant relationship between experience and Involvement in job

O	E	(O-E) ²	(O-E) ² /E
8	9.36	1.84	0.19
6	14.56	73.27	5.03
4	28.08	579.8	20.64
14	5.22	85.00	16.28
9	8.12	1.25	0.15
5	15.66	113.6	7.25
30	3.42	751.8	219.8
14	5.32	86.86	16.32
10	10.26	0.067	6.53
100	100		292.19

Calculated Value = 292.19

Level of Significant = 5%

Degree of Freedom = (c-1) (r-1)

$$(3-1) (3-1) = 4$$

Tabulated Value = 5 at 4% difference

Tabulated Value = 9.488

Tabulated Value is lesser than calculated value (I.e.,) calculated value is greater

CV>TV = 9.488>292.19

INFERENCE:

So, the calculated value is greater than tabulated value. So null hypothesis is rejected. There is significant relationship experience and involvement in job so, alternative hypothesis is accepted.

CONCLUSION OF THE STUDY:

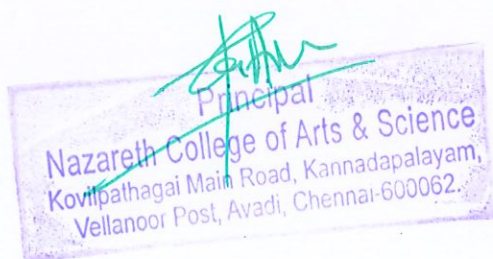
The project shows that the morale, which followed in the organization good but still need some modification in certain areas like health, safety and job security facilities. The employees were satisfied with their performance appraisal system and also with the training and development. The management has top concentrate in this professional ethics. The research study on employee impression towards morale is made to bring out the important real need of morale in the organization. The result brought



out of this project is the positive attitudes towards the morale in the organization so this shows that organization have a good morale, which makes the employee have a good impression on ethics.

REFERENCES:

- A P J Abdul kalam&ArunTiwari, (1999). Wings of fire, universities press.
- A Study to Measure the Morale of Employees Working in Manufacturing Company in Coimbatore International Journal of Science and Engineering Research (IJOSER), Vol 3 Issue 3 March -2015
- Christian Allison (2011), 365 stories, crown / archetype.
- Carroll, A. B., &Buchholtz, A. K. (2006). Business and society. Mason, OH: SouthWestern, Thomson.
- Cooper, C.L. (1999). Can we live with the changing nature of work? Journal of Managerial Psychology, 14: 569-72.
- Cummings, T. G., & Worley, C. G. (2005). Organizational development and change. Cincinnati, OH: Thomson, SouthWestern College Publishing.
- Doherty, J. (1988), Psychological morale: Its conceptualization and measurement*, Educational Studies, Vol. 14, pp. 65-75
- Economic times , dated 04.06.2018 , “94% of engineering students are not fit for hiribg , says this IT stalwart”
- Factors Affecting Employee Morale in the Indian Automobile Industry - A Literature Review Dr. M. Ravichandran , A. Balakumaran International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653, Mar 2019
- Impact of Employee Morale on Organizational Success Arvind Mallik, Lakshmi Mallik, Keerthi DS International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 November 2019
- Lorette, Kristie, "Methods to Increase Morale at the Workplace", Demand Media - Pdf.
- McKnight, D., Ahmad, S. & Schroeder, R. (2001). When do feedback, incentive control and autonomy improve morale? The importance of employee-management relationship closeness. Journal of Managerial Issues, 13(4), 466-482.
- Neely, Greg .H, "The Relationship between Employee Morale and Employee Productivity".



PERFORMANCE OF APPRAISAL TOWARDS ORGANIZATIONAL EXCELLENCE

Priyadharshni. B and Suganya. C, Assistant Professor, Department of Commerce, Nazareth College of Arts and Science, Kovilpathagai, Chennai-600062.

ABSTRACT

Employee performance appraisals emphasise an employee's willingness to do something. Motivation in the context of a business is the desire to work. An important concern for any organisation should be to positively contribute to its organisational efficiency goal, which is frequently equated with management efficiency. Only by ensuring that individual employees use all available human resources can a manager ensure organisational efficiency. As a result, managers must constantly monitor and evaluate their employees' performance.

Furthermore, because the organisation exists to achieve the objectives, each employee's success in achieving this individual goal is critical in determining organisational effectiveness. Evaluating how successful employees have been in achieving their individual goals is an important aspect of human resource management. Because the information provided by performance appraisal is extremely useful in making personnel decisions such as promotion and merit increases, it has been regarded as the most important and indispensable tool for an organisation. Performance measures also link information gathering and decision-making processes, laying the groundwork for evaluating the effectiveness of personnel sub-divisions like recruiting, selection, training, and compensation.

KEY WORDS: Human Resources Management, Performance Appraisal, Organizational Effectiveness, Managerial Efficiency, Employees, Recruiting, Selection, Training, Compensation.

INTRODUCTION

Performance appraisal is the systematic evaluation of the employees' performance and to understand the abilities and capacity of a person for the future growth and development of the organization. Performance appraisal is generally done in systematic ways which are as follows;

1. The organizer measures the pays of employees and analysis with targets and plans.
2. The organizer analyses the factors behind the work performance of employees.
3. The employers are in position to guide the employees for a better performance.

MEANING

A performance appraisal used in the organization is a regular review of employees' performance to verify their contribution to the company. It is also known as an annual review or performance evaluation. It evaluates the skills, growth, achievement, or failure of the employees. The performance appraisal is often used to justify the decisions related to promotions, pay hikes, bonuses, and termination of the employee.

DEFINITION

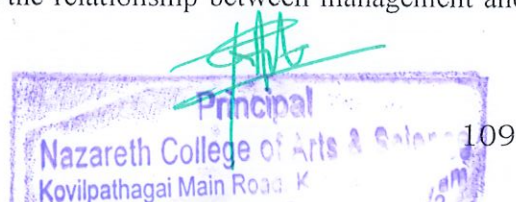
Slabbert and Swanepoel "Performance appraisal is a formal and systematic process by means of which the relevant strengths and weaknesses of the employees are identified, measured, recorded and developed."

CONTENT OF PERFORMANCE APPRAISAL

- * Performance appraisal is a regular review of an employee's job performance and contribution to a organization.
- * Companies use performance appraisals to determine which employees have contributed the most to the company's growth, review progress, profit and reward high-achieving workers.
- * Performance appraisals are also called annual reviews, performance reviews or evaluations, or employee appraisals.

OBJECTIVES OF THE STUDY:

- To examine the evaluation of performance against the relationship between management and employees.



- To determine employee satisfaction with regard to welfare measures, participation in decision making, and career advancement.
- To obtain information on employee performance evaluations in relation to their workplace.
- To determine the performance of employees in terms of evaluation.
- To understand employee performance in relation to the current compensation provided by the company.
- To make useful suggestions to improve employee performance evaluations.

SCOPE OF THE STUDY:

- The scope of this study is to analyse the needs of the employees, enrich their performance and creating a friendly atmosphere which also enriches their work life.
- To improve employee work performance by helping them realize and use their full potential in carrying out their firms' mission.
- This study helps to know the level of importance of appraisal system.
- It considers both the job performance as well as the personal qualities of an employee.

NEED FOR PERFORMANCE APPRAISAL:

- Employee Performance appraisal plays a key role in organization success.
- Without employee performance appraisal for their jobs, none of the employees will perform well, making it difficult to achieve organisational goals and objectives.
- It enables the employee's performance to be maximised through proper rating.
- Providing information that aids in employee counselling
- Obtaining information to diagnose deficiencies in employees' skills, knowledge, etc.

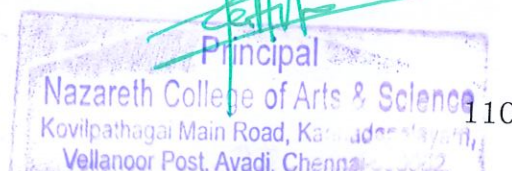
REVIEW OF LITERATURE:

Christoph Reichard and Jan van Helden (2015) the survey revealed that the differences between performance management practices in the public and private sectors are smaller than expected, considering the more or less fundamental differences between the two sectors. They found the difference based on three characteristics, namely ownership, financing and management. They divided the PMS life cycle into a design phase and an operation phase.

Ramila Ram Sign & S. Vadivelu (2016) mentioned performance appraisal in India in their paper. Employee retention in the organisation is a difficult task for management. Motivation is crucial in this regard. Performance appraisal is a tool for determining an employee's performance in various areas. It is useful for salary increases, promotions, staff retention, and reinforcing employee behaviour. According to the literature cited above, performance appraisal is the only tool for assessing an employee's tasks and responsibilities in relation to their capability. A comparison was made between public and private sector enterprises, and private sector appraisals were found to be more effective.

Manish Khanna (2014) Performance evaluation is important because it is an important part of any company's human resource strategy. Managing individual and team performance to achieve corporate objectives has clear value. Performance appraisal is an important tool in the hands of personal management because it achieves the department's main goal of appraising the individual's worth, which is the department of people development's main goal. Through the performance management process, employees and their supervisors can work together to improve job results and satisfaction. This approach is most effective when both the employee and the supervisor take an active role and collaborate to achieve the organization's goals. Once a year, management and employees meet for an appraisal. However, different trends are changing the appraisal's style.

K. Chandhana and Dr. David T Easow (2015) discovered in their article titled 'Performance Appraisal Method Used in Top 10 IT Companies - 360 Degree Feedback & Balanced Score Card: A Review' that both 360degree feedback and balanced score card have their own flaws, despite the fact that these methods are used by top IT companies. Employee satisfaction with these appraisal methods is very low, and there is a need for a new appraisal method that prevents these errors while retaining the benefits of these methods.



METHODOLOGY

Research Design

The researcher has used the Descriptive research design.

Sample Design

The sample size taken for study was 100.

Sampling Technique

The various types of sampling designs. The sampling is a probability sampling on a representation basis, and the element selection technique is unrestricted sampling with simple random sampling as the sampling design.

SOURCES OF DATA

Both primary and secondary data is used to collect information necessary to satisfy the objective of the study.

TOOLS FOR ANALYSIS

The collected data has been analyzed using basic statistical tools like percentage method, Chi -square.

CHI-SQUARE TEST

A chi-square test (also **chi squared test** or χ^2 test) A **chi-square** test, also written as **an X-square** test, is any statistical hypothesis test in which the sampling distribution of the test statistic is a **Chi-square** distribution if the null hypothesis is true. Without further qualification, "**chi-square test**" is often used as **shorthand** for Pearson's **chi-square** test. The **chi-square** test is used to determine if there is a significant difference between the expected and observed frequencies in one or more categories.

STATISTICAL ANALYSIS

CHI--SQUARE TEST NO: 1

HYPOTHESIS: A set of assumptions is made to test. This would result in a final recommendation, conclusion and action plan. A statistical hypothesis is an assumption about the population parameter. This assumption may or may not be true.

There are two types of statistical hypothesis:

NULL HYPOTHESIS [H0]: There is no significant between the age of respondents and the employees break time in their job.

ALTERNATIVE HYPOTHESIS [H1]: There is a significant relationship between the age of respondents and employees break time in their job.

Calculation of chi square:

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

Where, O=observed frequency

E = expected frequency

If two distributions (observed and theoretical) are exactly alike, $\chi^2 = 0$; (but generally due to sampling errors, χ^2 is not equal to zero) .



S. No	Age	Highly Satisfied	Satisfied	Neutral	Dissatisfied	Highly Dissatisfied	Total
1	20-30	16	11	1	1	1	30
2	31-40	10	7	5	3	3	28
3	41-50	5	2	10	4	3	24
4	51-60	5	2	2	1	0	10
5	60 ABOVE	2	2	2	1	1	8
6	TOTAL	41	24	18	10	8	100

S. NO	Observed Value (O)	Expected Value (E)	O-E	(O-E) ²	$\frac{(O-E)^2}{E}$
1	16	11.4	4.6	21.6	1.85
2	11	7.2	3.8	14.44	2.00
3	1	6	-5	25	4.16
4	1	3	-2	4	1.33
5	1	2.4	-1.4	1.96	0.81
6	10	10.64	-0.64	0.40	0.16
7	7	6.72	-0.28	0.56	0.08
8	5	5.6	-0.6	0.36	0.06
9	3	2.8	0.2	0.04	0.01
10	3	2.24	0.76	0.57	0.25
11	5	9.12	-4.12	16.97	1.86
12	2	5.76	-3.76	14.13	2.45
13	10	4.8	5.2	27.04	5.63
14	4	2.4	1.6	2.56	1.06
15	3	1.92	1.08	1.16	0.06

16	5	3.8	1.2	1.44	0.37
17	2	2.4	-0.4	0.16	0.06
18	2	2	0	0	0
19	1	1	0	0	0
20	0	0.8	-0.8	0.64	0.8
21	2	3.04	-1.04	1.08	0.35
22	2	1.92	0.08	6.4	3.33
23	2	1.6	0.4	0.16	0.1
24	1	0.8	0.2	0.04	0.5
25	1	0.64	0.36	0.12	0.18
TOTAL					27.55

TABULATION

There, the calculated chi-square value is

DEGREE OF FREEDOM

$$(df) = (r-1) (c-1)$$

Where 'r' and 'c' refers to numbers of close in columns

$$(r-1) (c-1)$$

$$(5-1) (5-1)$$

$$(4) (4)$$

$$\text{I.e. } df = 16$$

The standard significance level is 5% I.e. $p=0.05$

According to critical table value of the chi-square value is 27.55

The calculated value of chi-square tends to be 27.55 at 5% signification level with 16 degree of freedom greater than that of table value = 26.296 .

INFERENCE:

The calculated value of chi-square tends to be 27.55 at 5% signification level with 16 degree of freedom greater than that of table value = 26.296. Therefore, null hypothesis is rejected and hypothesis is accepted. So, there is a significant relationship between the age of the respondents and their employee break time in their job.

FINDINGS

- Most of the respondents are above the age group of 20 years.
- It has been identified that only sixty percentages of the Respondents agrees that the performance appraisal system is working effectively.
- Eighty percentages of Respondents are sentient of the performance appraisal system.
- It is inferred that the employees have agreed that their boss review their Performance periodically and hence we can say that Performance Appraisal method is strictly following by the company.
- Almost all the Respondents say opinion that they are getting advice from their superior.
- Sixty percentage of the Respondents belief says that they are getting two way feedbacks for definite possessions.

▪ The majority of the people are aware of Performance Appraisal method in their organization. But very few of them are still not aware.

SUGGESTIONS:

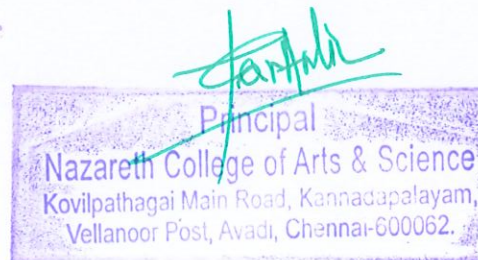
- In an Organizational performance appraisals must be complete to be accepted by others.
- Performance appraisal benefits employees through on-the-job training and supervising development, which should also attract other employees more effectively.
- Performance appraisal should be an effective help to employees because it identifies a person's competence and potential.
- The evaluation of employees must be done fairly in accordance with the policies of the company to help the performance of the employee.
- The company must give advice and suggestions to employees during the process and receive their feedback on the process.
- Employee should appraise and evaluate his department head once a year.
- Employees should be aware of 360 degree appraisal and organization should follow it to motivate employees.

CONCLUSIONS:

The rating system shows a better result, but makes more improvements that help make the system the best. They have improved the relationship between the employee and the supervisor, through which the employee receives the support of his supervisor to achieve his goals, and they must check regularly. The evaluation finds that the inspection should be done at least once every three months, ie. The current evaluation system is effective. Therefore, everyone is actively involved in the performance appraisal system to make further improvements that help make the system the best it can be.

BIBLIOGRAPHY

1. Dr.Flippo Edwin B., Personnel Management , McGraw-Hill International Editions,VITH edition,1984
2. Mamoria C.B.,Personnel Management, Himalaya Publishing House, XI th edition,1993.
3. C.B.Memoria & S.V.Gankar, "Personnel Management"
4. K.Asathappa, 3rd edition, 1992, TMH Pp 3,200 "Human Resource & Personnel Management"
5. P.Subbarao, 2nd editon.HPH Pp207, 208,209,212 "Essentials of human resource management and industrial relations",
6. Robins & Decenzo, "3rd edition, HPH Mumbai, Pp362.Fundamentals of management"



Examining Consumer Preferences for Organic Products: A Thiruvallur District Perspective

Mrs. P. SELVI

Ph.D. Research Scholar and Assistant Professor in Commerce,
Department of Commerce, Nazareth College of Arts and Science, Kovilpathagai main road,
Avadi, Chennai-62.

Dr. S.PRABAKARAN

Ph.D. Research Supervisor and Associate Professor in Commerce,
PG & Research Department of Commerce, DRBCCC Hindu College, Pattabiram, Chennai-72

Abstract:

Consuming organic food has become popular and offers numerous health advantages. Organic products are completely natural and loaded with essential nutrients that the body needs. The goal of the study was to learn more about Tiruvallur district consumers' preferences for organic goods. This study's main objective was to determine customer preferences for and levels of satisfaction with organic goods. The literature gave a thorough overview of the ideas surrounding consumer preferences and organic goods. This study is descriptive and analytical research design involved gathering both primary and secondary data. 160 replies in all were gathered. The study aids in highlighting the significance of purchasing decisions for organic goods.

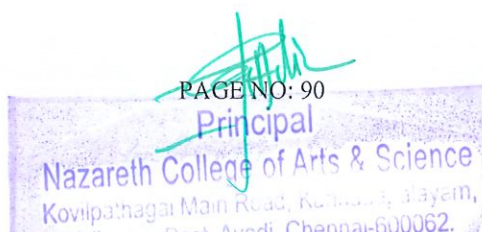
Introduction

Organic farming is the new name for traditional farming methods in India. A multibillion dollar sector with its own unique manufacturing, processing, distribution, and retail systems, the organic food market has expanded substantially since the late 20th century. Improving our standard of living through illness prevention. Organic products, grown without the use of harmful chemical fertilizers and pesticides, command a premium price because they are perceived as safer for buyers' health.

REVIEW OF LITERATURE

B. Krishnakumarea and S. Niranjanb (2017), The Preference of Customers for Organic Food Items 240 samples were collected from different consumers in Tirupur District in Tamil Nadu through a well-structured personal interview method in order to analyze the psychological aspects impacting consumer purchase behavior towards organic food goods. Percentage analysis, chi-square test, rank-based quotient, and multi-dimensional scaling techniques were the analytical tools utilized in the study. While most people who don't eat organic food think that organic food commodities are all-natural, the majority of those who do eat organic food think that organic food items don't contain any pesticides. Concern for one's health was the driving force for the purchase of an organic food item.

Mrs.S.Rengaswari and Dr.T.Palaneeswari (2017) Consumers' Purchasing Patterns in Relation to Organic Foods in Sivakasi. Understanding what drives people to purchase organic food is the primary goal of this paper. Main and secondary sources of information were used to compile the study. The analysis has made use of statistical tools like Multiple Regression, Percentage, and Correlation. Organic food consumption would rise if product features were



consistently improved, according to the research, since product characteristics have a significant impact on consumer behavior.

F A Abdullah et al (2022), The Propensity of Malay Consumers to Purchase Organic Food, The degree to which Malay consumers purchase organic food is investigated in this study. This study used a purposive sample strategy to recruit 200 participants from the Malay consumer population in Malaysia. After that, we used descriptive statistics to look at the data and calculated an average score. The study found that if Malaysia's organic food sector were to be improved, it would encourage organic farmers to produce more, which would assure Malaysia's food security.

Anamika Chaturvedi et al (2022), An Analysis of Consumer Behavior and Intentions to Buy Organic Food, The researcher delves into a thorough examination of the several aspects that impact consumer behavior in relation to organic food. Extracted from studies done all across the world, this article analyses relevant elements and offers recommendations for further study. The author sourced all four hundred papers for the literature review from online databases such as Google Scholar, EBSCO, Scopus, and social science research networks, with the publication dates ranging from 1985 to 2020. The last sample that determines customer attitude, purchase intention, and factors influencing organic food purchasing behavior. Attitude, health consciousness, consumer knowledge, and trust are the key elements that impact customers' decisions to purchase organic food, according to the paper's conclusion.

Prasanth U and Sivakanni S (2023), Research on How People Use Organic Products, Finding out how people in Chennai feel about organic products is the driving force for this study. A total of 101 people were chosen at random for this descriptive study, which aims to provide an accurate portrayal of the participants. This study makes use of SPSS-assisted statistical tools, including frequency tabulations, correlation analysis, weighted average analysis, regression analysis, and percentage analysis. According to the study, organic food can be promoted as a pleasant and nutritious option for various age groups, including children, young adults, and the elderly, since flavor is the most important factor in customers' purchasing decisions.

OBJECTIVE OF THE STUDY

- To study the consumer awareness level towards organic products
- To examine the consumer level of preference towards organic products
- To identify the problems while preferring organic products.

SCOPE OF THE STUDY

The survey was carried out in order to examine consumer preferences for organic goods.

Self-administered questionnaires were distributed in the Tiruvallur District to gather consumer feedback.

RESEARCH METHODOLOGY

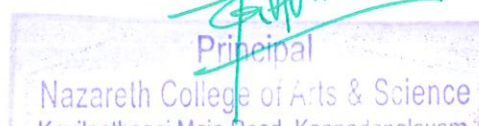
Sampling

Researchers sent structured questions through Google Form using the convenience sampling technique. In Tiruvallur District, 160 samples in total were collected.

Tools used for study



PAGE NO: 91



Percentage analysis and the Chi-square test were the tools employed in this investigation.

Primary data was gathered using a Google form.

Conceptual framework

Organic farming

The word "organic" means the way farmers grow and process farming (agricultural) products. These products include fruits, vegetables and grains, dairy products such as milk and cheese, and meat.

Organic farming practices are designed to meet the following goals:

- Improve soil and water quality
- Cut pollution
- Provide safe, healthy places for farm animals (livestock) to live
- Enable natural farm animals' behavior
- Promote a self-sustaining cycle of resources on a farm

Materials or methods not allowed in organic farming include:

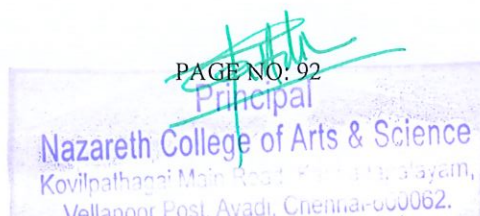
- Artificial (synthetic) fertilizers to add nutrients to the soil
- Sewage sludge as fertilizer
- Most synthetic pesticides for pest control
- Using radiation (irradiation) to preserve food or to get rid of disease or pests
- Using genetic technology to change the genetic makeup (genetic engineering) of crops, which can improve disease or pest resistance, or to improve crop harvests
- Antibiotics or growth hormones for farm animals (livestock)

Advantages of Organic Food

- Decreased contamination of water and soil
- 2. Less reliance on synthetic fertilizers and pesticides
- In organic farming, animals are handled more humanely.
- You won't feel guilty and need less antibiotics
- Higher food quality and greater taste
- Crucial throughout childhood development
- Staying away from anything that has been genetically altered (GMOs)
- Staying away from hormone replacement therapy
- Benefits to human health and improved nutritional value
- be a greener option than traditional food production

Problems of Organic Food

- Food prices are on the rise and their shelf life is short.
- Organic does not necessarily imply totally organic.
- Regular controls are required.
- Potential dangers to health in an inefficient production chain
- Consumers can become confused by the abundance of organic food labelling.
- Products having a narrow selection
- Not all claims made about organic food have been proven.
- A lot of labour goes into making organic food.
- Organic food quality differs substantially among manufacturers.



DATA ANALYSIS AND INTERPRETATION

PERCENTAGE ANALYSIS

Table No.1.1

I Personal Profile of the Respondents:		
Details	No of Respondents	Percentage
1. Gender:		
Male	48	30%
Female	112	70%
2. Education:		
12 th	36	23%
UG	83	51%
PG	20	13%
Professional Degree	5	3%
Others	16	10%
3. Family Income:		
Upto 10000	42	26%
10000-15000	17	11%
15000-20000	89	56%
20000-25000	3	2%
Above 25000	9	5%
4.Age		
Below 20	34	21%
21-30 Years	31	19%
31-40 Years	49	31%
41-50 Years	44	27%
Above 50 Years	2	2%
5.Occupation		
Student	48	30%
Government Employee	13	8%
Private Employee	83	52%
Professional	11	9%
Entrepreneurs	5	2%



PAGE NO: 93

Principal
Nazareth College of Arts & Science
Kovilpathagai Main Road, Kannadapalayam,

Interpretation

From the above table, most of the respondents belong, 70% of respondents are Female respondents, 51% of respondents are Under Graduate, 56% of respondents are belongs to the 15000-20000 Family Income group, 31% of respondents are belongs to 31-40 Years of age group and 52% of respondents are belongs to private employees.

I (a) The consumers get awareness about organic products**Table No.1.2**

Opinion	No. of Respondents	Percentage
Magazines	31	19%
Internet	94	59%
Friends & Relatives	30	19%
Others	5	3%

Interpretation

From the above table most of the respondents belong, 59% of respondents are get awareness about organic products in internet, remaining respondents 19% Magazines and Friends & 3% others.

I (b) Consumers Buying Behaviour of Organic Products**Table No.1.3**

Opinion	No. of Respondents	Percentage
Daily	16	10%
weekly	28	18%
Monthly	15	9%
Occasionally	101	63%

Interpretation

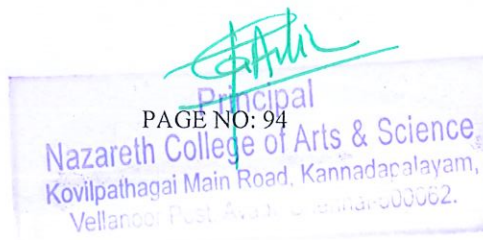
From the above table most of the respondents belong, 63% of respondents are buy an organic product occasionally, remaining respondents 18% weekly, 10 % Daily, 9 % monthly.

II. Correlation Analysis**2.1 Consumer Awareness and Interest level towards social media****Hypothesis**

Ho: There is no relationship between Consumer awareness and factors' motive towards organic products.

H1: There is relationship between Consumer awareness and factors' motive towards organic products.

Calculation Results:



N=160

$r = 0.873$

Interpretation

The Pearson correlation coefficient of 0.873 indicates a strong positive correlation between consumer awareness and factors motivating consumers towards organic products. Hence conclude that there is a significant relationship between Consumer awareness and factors motives consumers towards organic products.

Findings

1. Female respondents prefer most organic products more than males.
2. Most of them preferred organic products for their health and wealth.
3. Most of the respondents buy an organic products in occasionally
4. Many people are spending 0-2 hours every day on social media platforms.
5. Many of the consumers believe that organic food products not contain any preservatives and free from chemicals
6. Through Internet, the consumers gets many information for buying varieties of organic products.

Suggestions

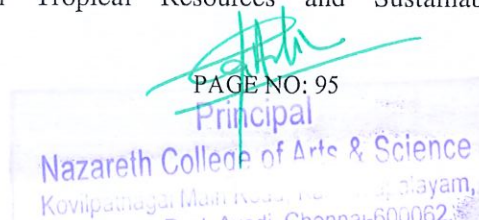
1. There has to be greater publicity of natural agricultural supplies existence.
2. A consistent enhancement of the qualities of a good would result in a rise in the consumption of organic food products, as attributes of goods have a significant influence on consumers' purchasing decisions.
3. The government takes necessary action to improve the availability of organic products with reasonable prices.

Conclusion

Recently, customers are very concerned about the health advantages of the goods they buy, which has led to increased awareness of the key variances between traditional and organic food items. Natural ingredients and nutritional value are some of the major benefits for purchasing organic food include availability, food safety, and knowledge of abundance. The study came to the conclusion that consumers who were concerned about their well-being would buy organic food.

References

- Anamika Chaturvedi , Dr. Chand Rashid, Dr. Mujibur Rahman (2022), Consumer Behaviour & Purchase Intention towards Organic Food: a Review & Research, International Journal of Creative Research Thoughts (IJCRT), Volume 10, Issue 3, ISSN: 2320-2882.
- B. Krishnakumarea and S. Niranjanb(2017), Consumers' Buying Behaviour towards Organic Food Products in Tamil Nadu, Agricultural Economics Research Review Vol. 30 (No.1) January-June 2017 pp 133-138, 0974-0279.2017.00012.
- F A Abdullah, S F S Saidi , T H S T Abu Bakar and L J Young (2022), The Level of Buying Behaviour Towards Organic Food Among Malays Consumers, 4th International Conference on Tropical Resources and Sustainable Sciences, Earth and

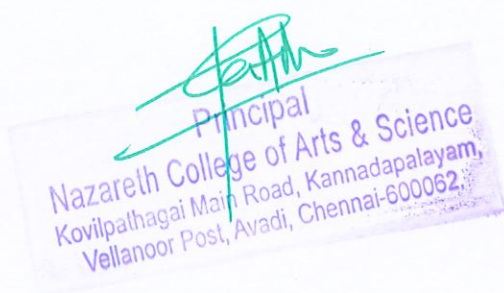


Environmental Science 1102 (2022) 012051 IOP Publishing doi:10.1088/1755-1315/1102/1/012051

Mrs.S.Rengaswari and Dr.T.Palaneeswari (2017) Buying Behaviour of Consumers towards Organic Food in Sivakasi, Journal of Emerging Technologies and Innovative Research (JETIR), Volume 4, Issue 12, (ISSN-2349-5162)

Prasanth U and Sivakanni S (2023), A Study on Consumer behaviour towards Organic Product, International Journal of Research Publication and Reviews, , Vol 4, no 8, pp 3355-3359, ISSN 2582-7421.

www.fda.gov/food/food-labeling-nutrition/use-term-natural-food-labeling.





RESEARCH ARTICLE



OPEN ACCESS

Received: 05-02-2023

Accepted: 11-08-2023

Published: 20-11-2023

Citation: Punitha MJ, Angeline EFB (2023) Dom-Chromatic Number of Wrapped Butterfly & Bloom Graphs. Indian Journal of Science and Technology 16(SP3): 8-13. <https://doi.org/10.17485/IJST/v16iSP3.icrtam211>

* Corresponding author.

Funding: None

Competing Interests: None

Copyright: © 2023 Punitha & Angeline. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Published By Indian Society for Education and Environment (iSee)

ISSN

Print: 0974-6846

Electronic: 0974-5645

Dom-Chromatic Number of Wrapped Butterfly & Bloom Graphs

M Joice Punitha¹, E F Beulah Angeline^{2*}

¹ Department of Mathematics, Bharathi Women's College (Autonomous), Affiliated to the University of Madras, Chennai-108, Tamil Nadu, India

² Department of Mathematics, Nazareth College of Arts and Science, Affiliated to the University of Madras, Chennai-62, Tamil Nadu, India

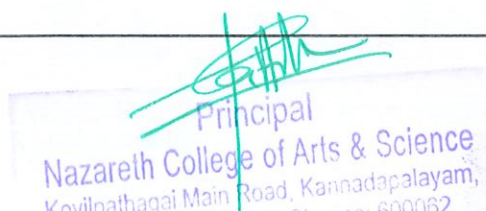
Abstract

Objectives: For a given graph G with proper coloring, the problem of selecting a dom-coloring set is to choose a dominating set having a property that it has a minimum of one vertex from every possible color class in G . Our aim is to determine the family of networks that allow dom-coloring and to find its dom-chromatic number denoted by $\gamma_{dc}(G)$. **Method:** We have applied the algorithmic method of choosing the dom-coloring set (dc-set). Here we have designed a coloring algorithm to yield the proper coloring for the vertices of the graph. D-set algorithm has been developed to determine the dominating set for the given graph. Then, the dc-set for the graph is obtained by applying the above two algorithms. **Findings:** In this study, we have established the study on finding the dc-set of wrapped butterfly network and bloom graphs. Further, we have found the dom-chromatic number of the above-mentioned graphs. **Novelty:** Dom-coloring is an extended variation of graph coloring and domination which has emerged as a result of the combination of the two broad concepts in graph theory namely, domination and coloring. A dominating set which includes a minimum of one vertex from all possible color classes of the graph forms a dom-coloring set. In this paper, a study on dom-coloring of wrapped butterfly and bloom graphs have been accomplished. These results may be generalized for butterfly derived networks to determine its dom-chromatic number.

Keywords: Dominating set; Domination; number; Coloring; Chromatic number; Domcoloring set; Domchromatic number 1

1 Introduction

In graph theory, the notion of domination along with coloring have found diversified applications across several areas of research. For any graph G , a non-empty subset D of the vertex set V is a dominating set if all the vertices in the complement of D and some vertex in D share a common edge. Such a set with the least number of vertices is a minimum dominating set whose cardinality is termed as the domination number which is represented by $\gamma(G)$. Coloring can be stated as the method of allotting colors to every single vertex included in the vertex set of G , in which vertices sharing a common



edge are allotted mismatched colors. The lesser number of such colors used in coloring the graph is termed as the chromatic number, $\chi(G)$. Until 2016, the above two concepts were dealt separately by many researchers, whereas, the above two concepts were blended to form a new problem called dom-coloring, which was put forth by Chaluvvaraju B. and Appajigowda C in 2016. For a graph G with minimum coloring whose vertex set is V , a dominating set of G can be regarded as a dom-coloring set (dc - set) if it constitutes at the least of one vertex from every possible color class of G . The dc - set with the least cardinality is the dc - number of G which is symbolized as $\gamma_{dc}(G)$.

Interconnection networks help in communication of data and provide intermediate results in-between processors. These interconnection networks can be represented in the form of a graph by relating processors with vertices and communication links with edges. A plenty of such networks are available in graph theory. In this paper we have dealt with two such networks namely wrapped butterfly and bloom graphs. The butterfly graph has been extensively used in parallel computer architectures and bloom graphs play a vital role in broadcasting.

The study on domination and coloring in wrapped butterfly and bloom graphs are interesting areas of research in graph theory. In wrapped butterfly network, few studies like 1-harmonious coloring⁽¹⁾, T-coloring⁽²⁾, ST-coloring⁽²⁾, total domination⁽³⁾ and domination of its digraph⁽⁴⁾ were carried on. In the above research work, only one concept, either coloring or domination were applied, whereas in this paper both the concepts are applied together to determine the dom-chromatic number of wrapped butterfly graph. This work has been extended to bloom graph also.

2 Methodology

In this paper, the problem of dom-coloring has been solved by using algorithmic approach. The purpose of this work is to design general algorithms called coloring algorithm and D-set algorithm for any n . Using coloring algorithm, wrapped butterfly and bloom graphs are given proper coloring. The D-set algorithm is proposed to choose the dominating set in both the graphs, satisfying the condition that it contains a minimum of one vertex from each color class. The above two algorithms are applied to determine the dc -set which yields the dom-chromatic number.

3 Results and Discussion

3.1 Dom-chromatic number of wrapped butterfly network $WB(k)$

Butterfly networks are variations of hypercubes. These graphs are both Eulerian and planar. In this section we formulate a coloring algorithm for $WB(k)$ and a D-set algorithm for choosing the dominating set in $WB(k)$.

Definition 3.1.1⁽³⁾ The vertex set of an n - dimensional butterfly network $BF(k)$ is $V = \{(y; j) / y = (y_1, y_2, \dots, y_k), y_i = 0 \text{ or } 1, 1 \leq j \leq k\}$. An edge joins two vertices $(y; j)$ and $(z; m)$ if and only if $m = j + 1$ and either $y = z$ or y and z differ in the m^{th} bit.

A wrapped butterfly network $WB(k)$, $k \geq 3$ is the result of connecting the first and last levels of $BF(k)$. $WB(k)$ has k - levels with $k \cdot 2^k$ vertices, each vertex with degree 4 and has a strong symmetry.

Algorithm 3.1.1 Coloring algorithm for $WB(k)$, $k \geq 3$

Input: $WB(k)$, $k \geq 3$.

Step 1: When k is even, vertices in levels $L_1, L_3, \dots, L_{k-1}$ receive color 1 and the remaining vertices receive color 2.

Step 2: When k is odd, vertices in levels $L_1, L_3, \dots, L_{k-2}$ receive color 1, vertices in levels $L_2, L_4, \dots, L_{k-1}$ receive color 2 and the remaining vertices receive color 3.

Output: Proper coloring of $WB(k)$, $k \geq 3$.

Algorithm 3.1.2 D-set algorithm of $WB(k)$, $k > 3$

The symmetric nature of $WB(k)$, enables to split the 2^k columns into two halves as B_1 and B_2 which represents the left half and the right half of $WB(k)$ respectively. The following algorithm determines the dominating set, D_c for $WB(k)$.

Input: $WB(k)$, $k > 3$.

Step 1: Select the last level L_k of B_1 .

Step 2: Split the successive vertices in L_k of B_1 into 4 groups each with 2^{k-3} vertices and include all the vertices of the 1st and 3rd groups into D_c .

Step 3: For $2 \leq r \leq k-3$, split the consecutive vertices in level L_r of B_1 into 2^{k-r+2} groups each with 2^{r-3} vertices.

Step 4: Select the vertices in the 2^{k-r} groups among the $2 \cdot 2^r$ groups which are not dominated by any of the vertices in level L_{r+1} . The vertices selected in level L_r is 2^{k-3} .

Step 5: In level L_3 choose 2^{k-3} vertices to D_c which are not dominated by any vertices in level L_4 .

Step 6: Include to D_c the vertices in B_2 which are mirror images of the vertices included in B_1 .

Output: Dominating set of $WB(k)$ $k > 3$.

Note: The D -set obtained by the above algorithm is also an independent dominating set, as no two vertices in D_c have a common edge between them.

Theorem 3.1.1 ⁽³⁾ For any graph G of order m and maximum degree Δ , we have $m \geq \gamma(G) \geq \lfloor \frac{m}{\Delta+1} \rfloor$.

Theorem 3.1.2 ⁽⁵⁾ For any graph G , $\max\{\gamma(G), \chi(G)\} \leq \gamma_{dc}(G) \leq \gamma(G) + \chi(G) - 1$.

Theorem 3.1.3 ⁽³⁾ If G is a 4-regular graph of order m , then $\gamma(G) \geq \lfloor \frac{m}{5} \rfloor$.

Theorem 3.1.4 ⁽⁶⁾ Let G be a connected undirected graph $WB(k)$, $k \geq 3$. Then $\gamma(G) = k \cdot 2^{k-2}$.

Remark: The dominating set D_c , obtained by the D -set algorithm includes a minimum of one vertex from every disjoint color class of G . Hence, D_c is a dom-coloring set of G . Since the vertices in D_c are independent, it also forms an independent dom-coloring set.

Theorem 3.1.5 Let $WB(k)$ be a wrapped butterfly network $k \geq 2$. Then $\gamma_{dc}(WB(k)) = k \cdot 2^{k-2}$.

Proof: Let G be a wrapped butterfly graph $WB(k)$, $k \geq 2$. For G , $\chi(WB(k)) = 2$, when k is even and $\chi(WB(k)) = 3$, for odd k . By Theorem 3.1.2, $\max\{\gamma(G), \chi(G)\} = \max\{k \cdot 2^{k-2}, \chi(G)\} = k \cdot 2^{k-2}$. Hence, $\gamma_{dc}(G) \geq k \cdot 2^{k-2}$. But by Theorem 3.1.4 we have $\gamma(G) = k \cdot 2^{k-2}$. Since the D_c -set itself forms the dom-coloring set; we conclude that $\gamma(G) = \gamma_{dc}(G) = k \cdot 2^{k-2}$.

Illustration 1

Consider the graph $WB(2)$. The network $WB(2)$ has 2 levels with 4 vertices in each level. The vertices of level 1 receive color 1 and that of level 2 receives color 2. The 1st vertex of level 1 and the last vertex of level 2 forms the minimum dominating set with one vertex from each color. Refer Figure 1. Hence, the dom-chromatic number of $WB(2)$ is 2.

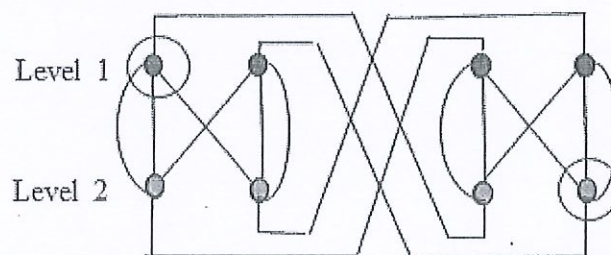


Fig 1. Encircled vertices form a dc set of $WB(2)$

Illustration 2

Consider the graph $WB(3)$. The network $WB(3)$ has 3 levels with 8 vertices in each level. The vertices of level 1, 2 and 3 receive colors 1, 2 and 3 respectively. Split the 2^3 columns into 2 halves, the left half has 2^2 columns and the right half has 2^2 columns. Select the left half and choose the 3rd, 1st and 4th vertices from the successive levels. Due to symmetry, select the vertices in the right half which are mirror images of the vertices selected in the left half. These 6 vertices selected dominates all the vertices of $WB(3)$ and also includes a vertex of each color. So, these form the dc -set. The dom-chromatic number $\gamma(WB(3)) = 6$. Refer Figure 2.

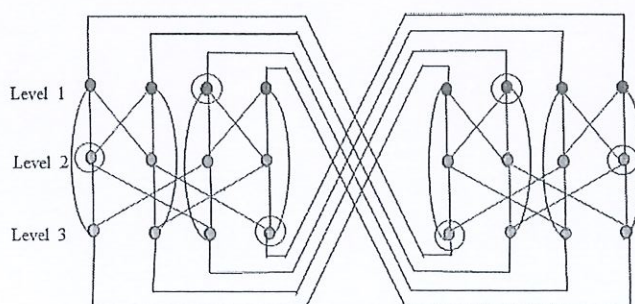
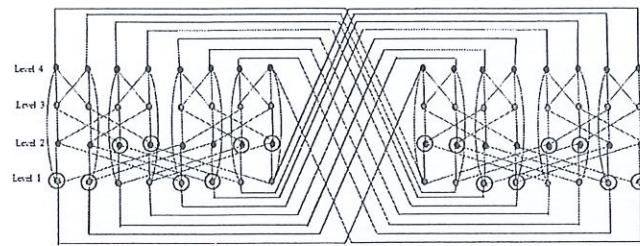


Fig 2. Encircled vertices form adc - set of $WB(3)$

Illustration 3 Let $WB(k)$ be a wrapped butterfly network $k = 4$. Then $\gamma_{dc}(WB(4)) = 4 \cdot 2^{4-2} = 16$. Refer Figure 3.

Fig 3. Encircled vertices form adc - set of WB (4)

3.2 Dom-chromatic number of bloom graph $B(u, v)$, $u = v$

Bloom graphs are 4-regular, planar graphs which are also tripartite. In this section a coloring algorithm and the dom-chromatic number of $B(u, v)$ have been determined.

Definition 3.2⁽⁷⁾ A bloom graph $B(u, v)$, $u, v \geq 2$ has $V(B(u, v)) = \{(p, q) : 1 \leq p \leq u, 1 \leq q \leq v\}$ as the vertex set and an edge connects 2 distinct vertices (p_1, q_1) and (p_2, q_2) if the following conditions are satisfied.

- $p_2 = p_1 + 1$ and $q_1 = q_2$
- $p_2 = p_1 = 0$ and $q_1 = q_2 \pmod{v}$
- $p_2 = p_1 = 0$ and $q_1 + 1 = q_2 \pmod{v}$
- $p_2 = p_1 + 1$ and $q_1 + 1 = q_2 \pmod{v}$

The first condition is for vertical edges, the second and third conditions are for horizontal edges in the top most and the lower most rows respectively. Condition four is for slant edges.

Algorithm 3.2.1 χ - Coloring a lgorithm for $B(u, v)$

Input: $B(u, v) u = v$ & $u, v > 4$.

Case (i): When $u = v = k$ and k is even, vertices in

Step 1: row 1 receive color in the order 1212..

Step 2: row $3k - 1$, $k = 1, 2, \dots, \frac{u-4}{2}$ receive 3.

Step 3: row $3k$, $k = 1, 2, \dots, \frac{u-4}{2}$ receive 1.

Step 4: row $3k + 1$, $k = 1, 2, \dots, \frac{u-4}{2}$ receive 2.

Step 5: row u receive color in the order 1212.. if row $u - 1$ has color 3.

Step 6: row u receive color in the order 3131.. if row $u - 1$ has color 2.

Step 7: row u receive color in the order 2323... if row $u - 1$ has color 1.

Case (ii): When $u = v = k$ and k is odd, vertices in

Step 1: column 1 receive color in the order 123123...

Step 2: column v receive color in the order 312312...

Step 3: from $(1, 2)$ to $(1, v - 1)$ receive color in the order 2121...

Step 4: from $(2, k)$ to $(u - 1, k)$, $k = 2, 3, \dots, v - 1$ receive color in the order 312312...

Step 5: from $(u, 2)$ to (u, v) receive color in the order 3131... if $(u, 1) = 2$.

Step 6: from $(u, 2)$ to (u, v) receive color in the order 1212... if $(u, 1) = 3$.

Step 7: from $(u, 2)$ to (u, v) receive color in the order 3131... if $(u, 1) = 1$.

Output: χ -coloring of (u, v) .

Observation:

• Let G be the bloom graph $B(4, 4)$. The vertices encircled in the Figure 4 is the dom-coloring set. Clearly, $\gamma(G) = \left\lceil \frac{uv}{5} \right\rceil = \left\lceil \frac{16}{5} \right\rceil = 4 = \gamma_{dc}(G)$.

• Let G be the bloom graph $B(5, 5)$. The vertices encircled in the Figure 5 forms the dom-coloring set. Here, $\gamma(G) = \left\lceil \frac{uv}{5} \right\rceil = \left\lceil \frac{25}{5} \right\rceil = 5$. But $\gamma_{dc}(G) = 6 = \gamma(G) + 1$.

The following theorem yields the dom-chromatic number for $B(u, u)$, $u > 5$.

Theorem 3. 2.1 Let $B(u, u)$ be a bloom graph, $u > 5$. Then $\left\lceil \frac{u^2}{5} \right\rceil \leq \gamma_{dc}(B(u, u)) \leq \left\lceil \frac{u^2}{4} \right\rceil$.

Theorem 3. 2.2 Let $B(u, u)$ be a bloom graph $u \equiv 1 \pmod{3}$. Then $\gamma_{dc}(B(u, u)) = \left\lceil \frac{u^2}{5} \right\rceil + m - 3 - i$, where $m = 3i + 4$ & $i = 1, 2, 3, \dots$

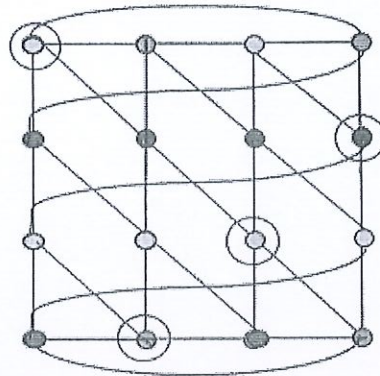


Fig 4. Encircled vertices form adc - set of $B(4, 4)$

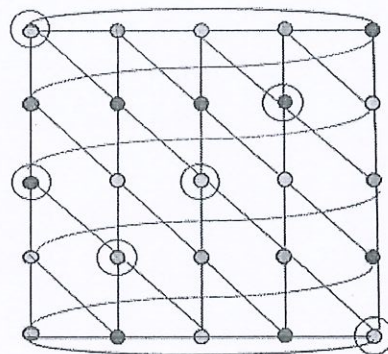


Fig 5. Encircled vertices form adc - set of $B(4, 4)$

Proof: The graph $B(u, u)$ with $u \equiv 1 \pmod 3$ is 3-colorable. Also, $\left\lceil \frac{u^2}{5} \right\rceil + m - 3 - i$, where $m = 3i + 4$ & $i = 1, 2, 3, \dots$ vertices form a dominating set which includes a minimum of one vertex from each color forming a dc -set. Refer Figure 6.

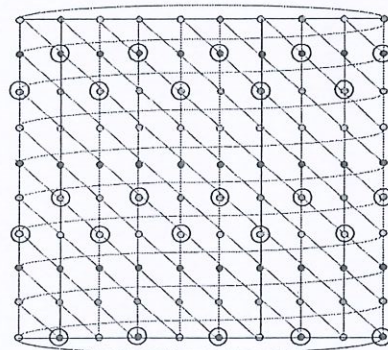


Fig 6. Encircled vertices form adc - set of $B(10, 10)$

4 Conclusion

In this study, we have initiated the study of dom-coloring to determine the dc -number of wrapped butterfly graph $WB(n)$ and bloom graphs $B(n, n)$ for any n . The dom-chromatic number has been obtained for both the graphs by applying the proposed algorithms namely the coloring algorithm and the D -set algorithm which yields the proper coloring and the dominating set respectively. This topic still has scope for further research. To determine the bounds for the bloom graph $B(u, v)$ is open to solve.

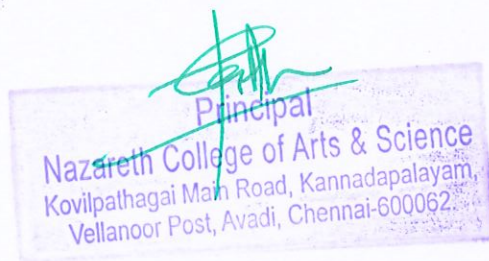
Also, the study can be extended to find the dc -number for larger networks like the butterfly and benes networks.

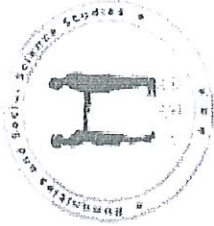
5 Declaration

Presented in "International Conference On Recent Trends In Applied Mathematics (ICRTAM 2023)" during 24th -25th February 2023, organized by Department Of Mathematics, Loyola College, Chennai, Tamil Nadu, India. The Organizers claim the peer review responsibility.

References

- 1) Liu JB, Arockiaraj M, Nelson A. Tight Bounds on 1-Harmonious Coloring of Certain Graphs. *Symmetry*. 2019;11(7):1-11. Available from: <https://doi.org/10.3390/sym11070917>.
- 2) Moran R, Bora N, Pegu A, Chamua M. Some results on T-coloring and ST-coloring of Generalized Butterfly Graphs. *Advances and Applications in Discrete Mathematics*. 2022;31:1-12. Available from: https://www.researchgate.net/publication/360319546_SOME_RESULTS_ON_T-COLORING_AND_ST-COLORING_OF_GENERALIZED_BUTTERFLY_GRAPHS.
- 3) Shalini V, Rajasingh I. Domination and Total domination in Wrapped Butterfly networks. *Procedia Computer Science*. 2020;172:66-70. Available from: <https://doi.org/10.1016/j.procs.2020.05.010>.
- 4) Liu J, Zhang X, Chen X. The domination number of wrapped butterfly digraphs. *Applied Mathematics and Computation*. 2021;409:126407. Available from: <https://doi.org/10.1016/j.amc.2021.126407>.
- 5) Chaluvvaraju B, Appajigowda C. The dom-chromatic number of a graph. *Malaya Journal of Matematik*. 2016;4(01):1-7. Available from: https://www.malayajournal.org/articles/MJM16_1.pdf.
- 6) Shalini V, Rajasingh I. Domination and Total domination in Wrapped Butterfly networks. *Procedia Computer Science*. 2020;172:66-70. Available from: <https://doi.org/10.1016/j.procs.2020.05.010>.
- 7) Xavier DA, Deeni CJ. Bloom Graph. *International Journal of Computing Algorithm*. 2014;3(1):48-49. Available from: http://www.ijcoa.com/documents/V3_I1_2014_paper12.pdf.





**Humanities and
Social Science Studies**

ISSN : 2319-829X

CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

AN ANALYSIS OF NATURALISM IN JOHN STEINBECK'S EAST OF EDEN

Authored By

D. RAJESH

Assistant professor of English, Nazareth College of Arts and science, Avadi. Research Scholar (Part-Time), Department of English
Presidency College (Affiliated to University of Madras), Chennai-05.

Published in

Humanities and Social Science Studies journal

: ISSN 2319-829X with IF=7.28

Vol. 12, Issue 02, No. 17, July - December : 2023

UGC Care Approved, Group I,

Peer Reviewed, Bilingual, Biannual, Multi-disciplinary Referred Journal



Nazareth College of Arts & Science
Kovilpathagai Main Road, Kgnadapalayam,
Vellanoor Post, Avadi, Chennai-600062.



Editor-in-Chief HSSS

AN ANALYSIS OF NATURALISM IN JOHN STEINBECK'S EAST OF EDEN

D. RAJESH, Assistant professor of English, Nazareth College of Arts and science, Avadi. Research Scholar (Part-Time), Department of English Presidency College (Affiliated to University of Madras), Chennai-05.

Dr. R. BABY VEGA ISAI AMUDHU, Associate professor & Head, Research Guide & supervisor, PG & Research, PG & Research Department of English Presidency College (Affiliated to University of Madras), Chennai-05.

ABSTRACT

Human beings are afflicted in life. Their pangs are often prolonged. At times, their sufferings are beyond their perception and control. Man is often defenseless and weak on earth. He is not aware of the reason or reasons for his life remains uncanny. He can neither understand nor gain control over them. Such a phenomenon is called naturalism. In the novel, The East of Eden, the novelist portrays the battle between good and evil that begins in the first generation but in the second generation, the evil is annihilated by the good qualities such as repentance and forgiveness that the major characters display good qualities to triumph over their inner evil which is always at odds with their good qualities.

Key words:

Naturalism, good, evil, conflict, forces, rejection, reconciliation, influence, victim

The novelist introduces the Trask family and Hamilton family who come to settle in Salinas valley. The heads of these two families have different economical background. Adam Trask is rich whereas Hamilton is poor. Though he is poor, he is talented. His will is resilient to the odds and the influence of naturalism. Adam Trask's mother, wife of Cyrus Trask contracts Gonorrhea from her husband who returns from American civil war. When she learns that she has contracted that disease, she commits suicide by drowning herself, she kills herself influenced by destructive emotions like fear and distress. She is the first victim of naturalism in this novel. After the death of the first wife, Cyrus marries a seventeen year old girl called Alice by name. She begets Charles who becomes the half brother of Adam naturally.

Cyrus treats his sons differently. This difference makes Charles to be jealous of his half brother Adam, later in their life. Charles who is unable to digest the success of Adams in the game called Peewee wantonly spans him. He nearly smashes Adam's head with a stick as he loses the game. Cyrus thinks that Adam lacks courage. He takes him out for a walk and talks him into joining military as a measure for developing courage in him. Adam and Charles give present to Cyrus on his birthday. Adam presents him a mongrel puppy and Charles presents him a knife made in Germany but Cyrus despises Charles present and takes Adam's present. He plays with that dog. Charles is enraged by this paternal rejection.

Charles vents his anger on Adam. Father's indifference makes Charles hate Adam. He even tries to kill him when Cyrus learns of Charles' brutal attack; he searches Charles keeping a shotgun in hand to shoot him. Charles runs away from him and comes home after many weeks.

Owing to the compulsion of Cyrus, Adam joins the military. Though he is ordered to shoot and kill the enemies; he wantonly misses his shots to avoid killing enemies.

"When he fired his carbine to miss he was committing treason against his unit, and he didn't care the emotion of nonviolence was building in him until it became a prejudice like any other thought - stultifying prejudice. To inflict any hurt on anything for any purpose become inimical to him."

As he revolted more and more from violence his impulse took the opposite direction. He ventured hit life a number



of times to bring in wounded men. He volunteered for work. In field hospitals even when he was exhausted from his regular duties. He was regarded by his comrades with contemptuous affection and the unspoken fear men have of impulses they do not understand (p 34-35)

Sam Hamilton has talents for inventing new things. Naturalism which enters in Sam Hamilton's life in the form of economy never makes him flourish in his professions. His natural talent for inventing instruments and machines never contributes much to the economy of his family. He invents a part of a threshing machine that is affordable and operationally superior to other existing machines. When he files a patent on his invention, he is cheated by the patent attorney. Samuel Hamilton sends his model to a manufacturer. The manufacturer cheats Samuel Hamilton by using his method without giving any money. So he sues the manufacturer and spends most part of his income for the case. When he loses the suit, he becomes penniless. His fight against this naturalistic force proves to be a failure and forces his children to go without food and good clothes.

Though Charles is evil in nature, his filial love overcomes his evil nature and makes him long and wait for five years to meet Adam. Adam is discharged from the army. Since he has been much used to regimented life style, he does not know how to cope with the civil life and its realities. His new freedom turns to be an evil to his love for his brother. After being discharged, he lounges in the bar without going home. He reenlists himself in the army.

Adam returns home from the army. He learns from Charles that their father Cyrus is dead and has left huge fortune to them. The fact that Cyrus has stolen money from G.A.R (Grand Army of the Republic) embarrasses them. The good image of Cyrus is shattered when they encounter the other side of Cyrus in reality that is evil. The brothers' loneliness and unfulfilled sexual relationship that they experience before reunion drive them to follow different ways of handling them. Adam develops hopeless attachments while Charles visits brothel house. Evil succeeds in this natural conflict.

The novelist introduces Cathy who plays a pivotal role in the fall of Adam. She is evil to the core since she has been a small girl. Though she looks very innocent, she is really evil incarnate. She has no sex drive but she learns that the sexual desire of others can be used to her advantage and the manipulation of it is a way to gain control over others.

When she is ten years old, she makes others frame two boys for sexual abuse. Cathy drives her teacher who teaches her Latin to take his life away. The cause or causes of Latin teacher's suicide is known only to Cathy who drove him to suicide. Though Cathy's father, Mr. William Ames is uneasy about her character, he never expresses why he is uneasy. Mr. William Ames, a tanner in a small town in Massachusetts, becomes a victim of Cathy's desire for attaining unquestionable freedom and having her own way in the world.

As a father, William Ames, with all affection, advises his daughter, Catherine Ames alias Cathy, to go to School when she refuses to do so. This establishes the integrity of William Ames' character and affection as a father but all his endeavours end in futility and he ends up as a failure. Naturalism imposes on him a stringent punishment which should not have been extended to him, which is not commensurate with the essential goodness of his nature. It is a pity that along with his wife, William Ames attains a premature and pathetic death. Cathy cunningly arranges that the house should catch fire in the early hours of morning. The officers who inspected the burnt house could not prove anything without the body of Cathy.

It is an excruciating death for Ames and the naturalistic trait of their end is such that they never learnt about the causes of their death. The Ames die unaware of their daughter, Cathy's treachery to them. Her libido, prurience and greed kill her parents. It is the handiwork of Naturalism and its ways are inexplicable and beyond his perception.

Catherine, after having burnt alive her parents along with the house, she meets one Mr. Edwards who runs brothel houses. She reveals her desire to become a prostitute. But Mr. Edwards falls in love with her at first sight. He gives her everything that a woman can covert. One day, he makes her drink



champagne. She lives in that house as the kept woman of Edwards. He is not aware of the fact that Catherine Amesbury would lose control if she consumes alcohol. At first, she refuses to drink as she knows her weakness. When she is compelled to take champagne, she empties the bottle completely and abuses him verbally. She even stabs on his cheek with the broken bottle.

Edwards happens to learn of the past life of Cathy. The past life of Cathy makes him feel sick and fear. Then he takes her for a trip in a lonely place and beats her in the face with a stone until she becomes unconscious. He runs away from that place leaving behind his belongings and unconscious Cathy. In the battle between good and evil, Mr. Edwards' good nature that is capable of finding goodness in Cathy is overpowered by the evil. The author pens it up beautifully

"Mr. Edwards wanted, with all his heart to believe in her goodness, but he was forced not so, as much by his own particular devil as by her outbreak. Almost instinctively he went about learning the truth and at the same time disbelieved it." (P-95)

The battle between Charles' good temperament and his bad temperament always goes on in Charles. His good temperament makes him love his brother Adam but his bad temperament makes him take pleasure in learning that Adam too is imperfect like him. Adam who is basically good in nature comes back after quarrel only to love his brother. Whenever he is angered by the bad temperament of Charles, he goes out and returns to Charles' farm to live under the same roof. Charles mentions that plight in his conversation with Adam;

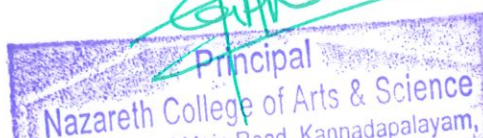
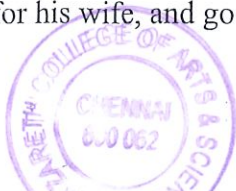
We'll get mad at each other and then we'll get polite to each other and that's worse
Then we'll blow up and you'll go away again,
and then you'll come back and we'll do it all over again.
Adam asked, "Don't you want me to stay?"
"Hell, yes," said Charles, I miss you when you're not here.
But I can see how it's going to be just the same."
"I'll be damned," said Charles, but it makes me kind of proud. My brother a Jailbird" (P107 to 108)

Adam Trask, son of Cyrus, is conscientious and virtuous but what happens to him is a mystery, and none can understand why the tyrannical hands of naturalism grab him and put him to extreme anguish. As a Good Samaritan, he lends a helpful hand to Cathy who is seriously injured due to Mr. Edwards' beating her. When Cathy falls at Adam Trask's doorsteps, he extends to her medical care, attends on her during convalescence and gives her shelter. What Cathy requires is protection and money and she understands that Adam could give her both" (pp120). Adam proposes to her but Cathy is not as good as Adam in every respect. She has not the same feeling that Adam has towards her. In fact, she has no such feeling at all towards anyone.

She identifies easily the evil in Charles and feels a close relation with Charles though he dislikes her being there.

Charles marries Cathy but their marriage is a struggle between extremely good and evil qualities. Adam is good, optimistic and loving yet he is blinded by his own good qualities that make him fail to see evil present in others. He marries Catherine without knowing the selfish motives of her.

Adam's understanding of Catherine is clouded by his love for her. He wants to leave for California when Catherine hates leaving their house. His mind is too muddled to know that he goes against the wish of Catherine. Since childhood, Cathy is dubious and pretentious, a culprit who killed her parents, projecting the culpable homicide as a fire accident. Cathy, as a former whore, a woman of easy virtue, remains unfaithful to her husband. Even in the very first 'nuptial night', she commits adultery with Charles, her in-law when her husband, Adam, by mistake, drinks a soporific drug meant for his wife, and goes into a heavy opium sleep though he fights to stay awake" CP 123)



The novelist openly confesses that there are forces whose “tendency is to eliminate other things we hold good” (P 130). Since these naturalistic forces have the power to triumph over good things and destroy them, everything in human life comes under its sway. Yet on some occasions, the good defeats the evil crossing all the huddles. One of the better examples is Cathy’s children surviving an abortion attempt.

Catherine wants to stay in Charles farm house but Adam who is blinded by his love for Catherine and never able to find out her evil and selfish motive moves to California after marriage much against the wish of Catherine. He intends to settle in Salinas valley buying the ranch. As a rule, creating new lives or life is part of the woman’s existence. In fact, that responsibility is the meaning of woman’s being. Every woman feels obliged to take part in that nature’s duty individually but Catherine, who is the embodiment of all evils, hates having children as it is not one of her evil designs. While Adam Trask is busy in choosing ranch, Catherine Trask tries to abort her pregnancy. Her attempts results in severe bleeding. The doctor who examines Catherine finds out the truth behind the bleeding. He warns her not to make any attempts to terminate her pregnancy. Finding no other way Cathy starts waiting to deliver the baby. Adam’s good intention of having children struggles with Catherine’s evil intention of aborting her pregnancy but in the end of the struggle, Adam’s good intention conquers Catherine’s evil intention. Catherine’s attempt to terminate her pregnancy ends in failure.

Adam buys the ranch and starts his family life with Catherine in the ranch. His good intention and efforts of building a family struggles with Cathy’s evil intention of leaving them all and moving away from the family. Sam Hamilton feels uneasy when he is in Adam’s ranch. He remembers that it is only Catherine’s eyes that made him feel uneasy. He feels the presence of evil in the valley and finds its existence in the eyes of Catherine. Her eyes remind him of the inhuman eye of the culprit who was hanged in a public place. He observes that Cathy’s eyes are not like human eyes (P177) His goodness has the quality of identifying the evil residing in Cathy.

Samuel is called for delivery by Adam. He attends Cathy and delivers two babies. Cathy does not like her children and she does not want them at all (Page 112). She hates Samuel’s help and asks him to get out of room. Cathy does not want children though she gives birth to them. She has no idea of bringing them up and feeding them. It is ironic to know that the good, at times, conquers the evil in the perpetual battle. Cathy delivering two children is one of such good examples. Cathy wants to abort her pregnancy as she does not want to lead the life of a woman who conceived after marriage and begets children but the goodness of Adam and doctor, fighting all naturalistic forces such as Catherine’s evil intentions, makes her deliver two babies one after the other.

After delivery, Catherine Trask takes rest and recoups her energy for a week. After a week she executes her plan of leaving her children and Adam permanently. He thwarts her attempts to leave the house pointing out the children. But she tells Adam to “throw them in one of his wells (199)”. She shoots him with 44 colt gun in the shoulder and gets out of the house leaving behind the children crying for milk and the wounded Adam lying on the floor. Adam’s good intention of raising the family is shattered by Cathy’s evil intention of parting them permanently. In this battle too, the good is defeated by the evil. Naturalism brings Adam under its sway by destroying his dream of beginning a good and pleasant family life. Adam who is always good natured and considerate to his fellow beings, is psychologically broken by the naturalism.

Kate who is evil to the core joins a brothel house run by a madam called Faye. She indirectly influences Faye’s opinion on her through her altruistic behaviour in the brothel house. With the passage of time, Faye comes to believe that Kate is genuine. She wills all her property to Kate. Kate poisons Faye gradually and kills her. She makes herself sick to escape from being suspected by others. She steals some medicines from Dr. Wilde’s dispensary and mixes them in milk. She makes Faye drink that milk poisoned enough to kill Faye. Though Kate is made as a next heiress to the properties of Faye, Kate’s evil nature battles with Faye’s good nature and kills her to inherit her property very soon. Faye’s kindness and the trust she reposed on Kate turn to be her worst enemy and lead her to a premature death. She is the second victim of naturalism as it has worked on its evil design of doing away with



Faye. Faye dies without knowing that she has been poisoned by Kate. She has no control over the punishment meted out by the naturalism.

The sons of Adam Trask, Caleb and Aaron reach Adolescent age. Their real character is revealed through the way they conduct themselves. Caleb, like Charles, takes pleasure in tantalizing Aaron. He becomes jealous of his brother Aron when he learns that Aron is liked by all. Caleb quickly finds out that Abra and Aron love each other. Caleb feels rejected when Abra chooses Aron who is very handsome to love. He wants to exact revenge on Abra and Aron. When Aron is busy in packing the gift box for Abra, Caleb lies to Abra that Aron packs the gift box with a poisonous creature which he caught last Friday. Much to Adam's disappointment, he watches Abra throwing the box away without opening it on her way home.

Caleb is afraid of the darkness present in him. He fears that the vileness of his mind might overpower him. He prays to God to make him as good as Aron. An inner conflict breaks out between his good and evil natures. His good nature conquers the evil and makes him pray to God not to make him mean and lonely.

"Dear Lord," he said let me be like
Aron. Don't make me mean. I don't want
to be. If you will let everybody like me, why
I'll go for to get it. I don't want to be mean.
"I don't want to be lovely. For Jesus' sake Amen!

(Page 377)

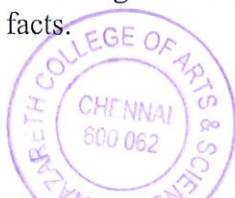
Charles wills his property to Catherine before he dies. After his death, Adam meets Kate for the second time to deliver the letter that has the information about Charles' will. The meeting turns out to be a fight between Kate's evil nature and Adam's good nature. He wins over Kate's evil and pugnacious nature by being insensitive to her suspicions nature and hurting remarks. Since she is afraid of him, she never exposes it. Kate's innate evil refuses to believe that Adam has no self interest in delivering this letter. John Steinbeck points out that human nature is the combination of virtue and vice. When human nature is heavily influenced by naturalism, man's selection of either one of these qualities enables naturalism to govern human beings' life. When man chooses evil over good, naturalism makes his life a miserable one. His selection of good over evil enables him to fight the influence of naturalistic force but never gives him the control over whatever happens in his life.

Tom Hamilton the third son of Samuel Hamilton stays with his sister Dessie Hamilton the third daughter of Samuel Hamilton. Dessie suffers from stomachache often. One day she develops a severe stomachache. Tom administers salt to kill the pain but his medication goes wrong and kills Dessie aggravating the ache. His sense of guilt, failure and grief makes him commit suicide shooting himself.

Adam's servant Lee reveals all facts about Adam and Catherine's marriage. Caleb understands how his parents' marriage life failed. He learns that her mother is evil to the core and hates her. When the inner conflict between the good and evil begins in him, he worries that he has inherited the depraved mind from her mother and hates her as a result of that inheritance. But Lee tells him that he has the good nature too. Further, he clarifies that everybody has the good and the evil nature but the choice of either one of these two qualities makes the difference in one's life.

Of course you may have that in you. Everybody has.
But you've got the other too. Whatever you do, it will
be you who do it- not your mother (page 445)

Caleb is arrested in a gambling house. He watches the gambling when he is arrested. The chief calls Adam over the phone to release Caleb. Adam comes to the city hall and collects the released Caleb. Caleb learns that Adam loves him. This truth enables him to win over the evil in the inner conflict between the good and the evil. He protects Aron from knowing things that are unpleasant, evil and cruel. His good nature makes him protect Aron from being exposed to the horrible and hard to digest facts.



The moment he realizes his father's love, his good nature defeats his evil nature. He stops hating anyone including his mother. He tells Adam that he has ceased hating anyone including his mother. His father's love helps him to wipe out the animosity from his mind and love others better. His evil nature is defeated by Adam's affection.

Caleb wants to help his father. He decides to earn the money that Adam lost in Lettuce business. He approaches Will Hamilton and asks him to take him as a partner. Will agrees to take Caleb as a partner. They buy beans at a price that is a little higher than the market price and sell the beans at a huge rate in the market. When the war goes on, the price of beans rises. Will and Caleb make a huge profit by selling the beans at a huge price to the farmers. The farmers wish that they never sold Will and Caleb the beans at a price which they calculated as loss. Caleb's business deal is unfair and evil to the profit of the farmers. Though he knows that it is an unfair business, he opts for this evil which he believes to be part of any good deed. He hopes that great things are the combination of the good and the evil. Caleb chooses a crooked mean that is evil to show his father his love. His selection annihilates the good in him giving the false hope of winning his father's affection ever.

After thanks giving dinner, Caleb gives Adam the costly gift the money that Caleb earned in beans business to make up Adam's loss. Caleb briefs on how and why he earned that money. But Adam refuses to accept that gift accusing Caleb of robbing the farmers. Caleb's attempt to convince his father ends in failure. Adam asks Caleb to return the money to the farmers from whom he has stolen. Caleb feels rejected and runs away from the room at the height of dejection but Adam advises him not to be angry on him. Adam's belief that evil and good cannot coexist together turns to be evil and defeats his good nature. When his good nature is defeated, he rejects Caleb's gift and accepts Aron's gift.

The paternal rejection breeds hatred in Caleb's mind. His mind is filled with the hatred for his father. Lee tries to convince Caleb before he reacts to this rejection negatively. In spite of Lee's advice, Caleb decides to exact revenge on Adam for rejecting his gift. He plans to reveal the shocking truth about their mother to Aron. He takes Aron to the whore house run by Catherine. The sudden revelation that his own mother runs a brothel house collapses Aron psychologically. Though Aron never reaches the legal age for military service, he enlists himself in the army faking his age. He is killed in action there.

As a naturalistic novelist, he denies the free will to his characters in East of Eden. Lee later denies free will to Adam Trask.

"He couldn't help it Cal. That is his nature.

It was the only way he knew. He did not have any choice" (Page 542)

The author himself denies free will to the novel's most wicked character Cathy

"And just as there are physical monsters, can there not be

Mental and psychic monsters born? The face and body may

Be perfect, but if a twisted gene or a malformed egg can produce

Physical monsters, may not the same process produce a malformed soul?"

(pp 70)

Even though Catherine Trask is an evil incarnation, she has also the inner conflict between the good and the evil. Her evil nature is over powered by her affection for Aron. She wills all her property to Aron Trask before she commits suicide.

Aron is killed in action in the battle field. When Adam learns that Aron is dead, he is affected by a stroke suddenly. The stroke paralyses his speech. Caleb feels sorry for exacting revenge on Aron. His anger kills his brother Caleb. He is haunted by the sense of guilt. He wants to be free of his guilty conscience. Lee takes him to Adam. They find Adam lying on the bed paralysed. He loudly explains that Adam may not live longer but Caleb will live and marry. He points out that Caleb's children will be the remaining of Adam.

Lee advises Adam not to leave Caleb with such a sense of guilt and to bless him instead of crushing him with paternal rejection. He finally requests him to give Caleb his chance to choose the good and allow him to be free. Lee also asks Adam to free Caleb of the weight of his guilty conscience



and bless him without rejecting him. Adam, with much effort, lifts his right hand an inch in an effort to bless Caleb and utters the single Hebrew word "TIMSHEL" and goes to sleep closing his eyes.

"He said sharply, your son is marked with guilt out of himself out of himself almost more than he can bear.

Don't crush him with rejection. Don't crush him. Adam."

"Lee's break whistled in his throat. Adam, give him your blessing.

Don't leave him alone with his guilt. Adam, can you hear me?

Give him your blessing."

"His lips parted and tailed and tried again.

Then his lungs filled. He expelled the air and his lips combed the rushing sigh.

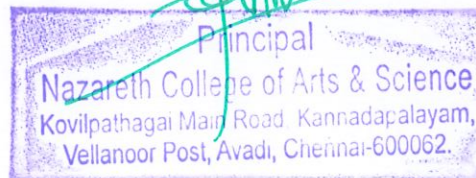
He whispered words seemed to hang in the air"

"Timshel".(Page 600-601)

Caleb chooses reconciliation so as to be free of his guilt. Adam chooses forgiveness and forgives Caleb by uttering the Hebrew word TIMSHEL which means the choice of choosing Good over Evil. Adam chooses to forgive Caleb to curtail the further influence of naturalistic forces and allows him to live in peace. Caleb is freed to live without any guilty feeling.

BIBLIOGRAPHY

1. O.Ross, Woodburn. "John Steinbeck: Naturalism's priest." *Steinbeck and his critics*, edited by E.W. Ted lock JR, and C.V. Wicker, The University of New Mexico Press, 1957.
2. Dr. K. Sreenivasan. *John Steinbeck; A study of his Novels*. College Book House, 1980.
3. Walcutt, Charles child. *American Literary Naturalism; A Divided vision*. Minneapolis, 1956.
4. Dr. S.S. Prabhakar, *John Steinbeck a study*. Academic publishers, 1976.
5. Jain, Sunita. *Concept of Man: A critical study of his novels*. New Statesman publishing company, 1979.
6. Ferrell, Keith. *John Steinbeck: The voice of the land*. M. Evans and Company, Inc, 1986.
7. Fonterose, Joseph. *John Steinbeck: An Introduction and Interpretation*. New York: Barnes and Nobles, 1963.
8. E.W. Ted lock and C.V. Wicker. "*Steinbeck and his critics*". The university of Mexico press, 1957.



UNVEILING BARRIERS AND OPPORTUNITIES: EXPLORING DISCRIMINATION AND SOCIAL MOBILITY AMONG THE ARUNTHATHIAR COMMUNITY

¹**Dhivya Bharathi V.S**, Ph.D Scholar,

²**Kalidass K**, Ph.D Scholar,

³**Revathi Priya R** Ph.D Scholar,

⁴**Dr. R. Baskar**, Associate Professor,

Department of Social Work, Bharathiar University, Coimbatore. Tamilnadu, India-641046

Abstract:

This research study aims to comprehensively investigate the multifaceted dimensions of discrimination and social mobility experienced by the Arunthathiar community, a marginalized group in India. Through a qualitative research method, this study seeks to shed light on the barriers faced by the Arunthathiar community in accessing equitable opportunities for social advancement and the strategies employed to overcome such hurdles. The research design involves conducting in-depth interviews with members of the Arunthathiar community to gain insights into their lived experiences, aspirations, and challenges encountered. Additionally, data will be collected through surveys and secondary sources to provide a broader understanding of the socioeconomic and educational landscape that shapes the community's social mobility prospects. This research paper recognizes that discrimination faced by the Arunthathiar community is not limited to overt acts of prejudice but extends to systemic barriers embedded in social, economic, and political structures. By examining the interplay of caste-based discrimination, economic disparities, educational opportunities, and social integration, this study aims to identify key factors influencing social mobility within the Arunthathiar community. The findings of this study will contribute to the existing body of knowledge on discrimination and social mobility among marginalized communities, particularly within the context of the Arunthathiar community.

Keywords:

Arunthathiar community, discrimination, social mobility, marginalization, socioeconomic disparities, caste-based discrimination, inclusive practices, India.

Introduction:

Social mobility and discrimination are critical aspects that shape the opportunities and experiences of individuals within a society. The Arunthathiar community, situated in a hierarchical societal structure, faces various forms of discrimination that significantly impact their social mobility prospects. (Abdi et al., 2018) This study aims to shed light on the role of discrimination in influencing social mobility among the Arunthathiar population. By exploring the experiences and challenges faced by community members, particularly in relation to occupation, gender, and social inclusion, this research provides valuable insights into the barriers hindering their upward mobility. (Dravida & Karnataka, n.d.) Through a thematic analysis of qualitative data, the study examines the complex dynamics of discrimination and its implications for social mobility within the Arunthathiar community. By understanding these dynamics, policymakers, researchers, and advocates can work towards creating inclusive policies and interventions that address discrimination and promote a more equitable social landscape for the Arunthathiar population. (Chapman, n.d.)

The researcher employed both inductive and deductive approaches to analyse the data. In order to gain a more comprehensive understanding of the population, a thorough investigation is necessary. By utilizing in-depth interviews, the researcher could capture detailed personal experiences from the population. Consequently, as a qualitative data collection method, in-depth interviews were conducted using an interview guide. (Dr. Abhimanyu Kumar, 2013) The qualitative study involved a systematic process of analysing and organizing the interview transcripts to enhance comprehension and presentation. (Mosse & Dostaler, n.d.) Before being translated into English, the interviews were

initially transcribed in their original language. The data was manually examined and categorized after thoroughly reading and rereading the manuscripts to identify commonalities and variations in ideas. The respondents' answers were then grouped into key themes, and relevant quotes were incorporated to illustrate these major themes.(Dravida & Karnataka, n.d.)

Method and Methodology:

1. Research Design:

This study utilized a qualitative research design to explore the role of discrimination in shaping social mobility within the Arunthathiar community. Qualitative research methods were deemed appropriate to capture the nuanced experiences, perspectives, and contextual factors influencing social mobility among community members.

2. Participant Selection:

A purposive sampling technique was employed to select participants from the Arunthathiar population. Criteria for inclusion involved individuals who had firsthand experiences of discrimination and could provide rich insights into social mobility challenges. Efforts were made to ensure diversity in terms of age, gender, occupation, and educational background.

3. Data Collection:

Data were collected through in-depth interviews, allowing participants to share their narratives and experiences. Semi-structured interview guides were developed, incorporating open-ended questions related to discrimination, social mobility, and relevant socio-demographic information. The interviews were conducted in a comfortable and confidential setting to facilitate open dialogue.

4. Data Analysis:

Thematic analysis was employed as the analytical framework to identify patterns, themes, and meanings within the collected data. Following an iterative process, the researchers familiarized themselves with the data, generated initial codes, and organized them into potential themes. These themes were then refined and reviewed in relation to the research objectives. The analysis involved constant comparison, identifying similarities and differences across participants' responses, and examining the influence of discrimination on social mobility.

5. Ethical Considerations:

Ethical approval was obtained from the relevant research ethics committee prior to data collection. Informed consent was obtained from all participants, ensuring their voluntary participation, confidentiality, and anonymity. Participants were informed about their rights to withdraw from the study at any point without repercussions.

6. Rigor and Trustworthiness:

To ensure rigor and trustworthiness, several strategies were employed, including member checking, where participants were given the opportunity to review and validate their interview transcripts. Peer debriefing sessions were conducted with other researchers to discuss emerging themes and interpretations. Reflexivity was maintained by acknowledging the researchers' biases and subjectivity throughout the research process.

7. Limitations:

It is important to acknowledge potential limitations of the study. As qualitative research focuses on specific contexts and participants, generalizability of findings to other populations may be limited. However, the study aims to provide rich insights and contribute to a deeper understanding of the experiences of the Arunthathiar community regarding discrimination and social mobility.

Overall, the methodological approach employed in this research aimed to capture the complexity of discrimination and its impact on social mobility within the Arunthathiar community. Through rigorous data collection and analysis, the study strives to provide meaningful findings that can inform interventions and policies to address barriers and promote greater social equity for the Arunthathiar population.



Participants

The qualitative study involved a sample of 20 individuals selected from Coimbatore and Namakkal districts. The sample consisted of an equal distribution of ten men and ten women, ranging in age from 21 to 60 years. Notably, three of the participants were housewives.

Interview Guide:

Before approaching the participants, the researcher devised an interview guide and sought expert opinions. The primary objective of the interview guide was to explore the challenges encountered by the Arunthathiar population concerning occupational and educational advancement. The guide encompassed gathering general demographic information about both parents and their children. Subsequently, participants were asked about any disparities in educational attainment between themselves and their parents, as well as their children. The respondents were also invited to share their overall perceptions regarding the impact of discrimination on their social mobility. Specifically, questions were posed to ascertain gender-based discrimination in terms of income and decision-making within their households. Moreover, participants were queried about their perspectives on the efficacy of internal reservation policies and social initiatives in facilitating their upliftment within society. Lastly, participants were encouraged to offer their suggestions for addressing the challenges posed by discrimination.

Thematic Analysis:

Thematic analysis is a qualitative research method that holds significant value in identifying and interpreting patterns, themes, and underlying meanings within a given dataset. It offers researchers a systematic and adaptable framework for examining various forms of data, such as text, visuals, or audio, ultimately providing a comprehensive understanding of the content and context contained within.

The six stages of thematic analysis, as outlined by Braun and Clarke (2006), serve as a widely acknowledged guideline for conducting this type of analysis. Firstly, researchers familiarize themselves with the data, immersing themselves in its intricacies and gaining a comprehensive overview. Next, they generate initial codes, extracting relevant units of meaning or patterns from the dataset. This process involves labeling and categorizing these codes to facilitate further analysis.

The subsequent stage involves exploring for themes, where researchers diligently examine the coded data to identify recurring patterns, concepts, or ideas that encapsulate the dataset's essence. Through a careful review of these emerging themes, researchers gain a deeper understanding of the dataset's content and draw connections within the data.

Defining and naming themes is the subsequent step, as researchers refine and describe each theme, capturing its essence and ensuring it accurately represents the data. This stage often requires careful consideration and iterative refinement to precisely capture the nuances and depth of the identified themes. Finally, the researchers produce a comprehensive report, presenting their findings and insights derived from the thematic analysis. This report serves as a valuable resource for sharing the research outcomes with the scientific community and stakeholders. Throughout the process, Braun and Clarke emphasize the importance of reflexivity, acknowledging the researcher's subjectivity and the potential influence it may have on the analysis. Context awareness is also crucial, as researchers must consider the broader context within which the data exists and interpret it accordingly. Additionally, involving multiple analysts can enhance the analysis's reliability by reducing individual biases and expanding the range of perspectives brought to the interpretation.

Overall, thematic analysis is a popular and flexible qualitative research method that enables researchers to delve deep into the meanings and experiences contained within a dataset. Its systematic approach and adaptability make it applicable to a wide range of research questions and data types, providing rich insights into the phenomena being studied.

Familiarization with Data

The initial stage of conducting a thematic analysis involves becoming acquainted with the data at hand. In the present study, the data was specifically gathered from the Arunthathiar population, with a particular focus on exploring their experiences of social mobility. In order to facilitate a comprehensive understanding of the data, a table was created subsequent to a thorough reading and examination (please refer to Table 1).

Occupation	House Type	Income Level	Discrimination Level	Educational Status	Occupational Status	Social Inclusion
Farmer	Concrete	Low	High	Primary School	Unskilled Worker	Low
Laborer	Kutchu	Low	High	No Formal Education	Unskilled Worker	Low
Teacher	Concrete	Medium	Low	Bachelor's Degree	Professional	High
Businessman	Concrete	High	Low	High School	Self-Employed	High
Clerk	Concrete	Medium	Medium	High School	Skilled Worker	High
Housewife	Concrete	Low	High	No Formal Education	N/A	Low
Laborer	Kutchu	Low	High	Primary School	Unskilled Worker	Low
Driver	Concrete	Medium	Medium	High School	Skilled Worker	Medium
Farmer	Kutchu	Low	High	No Formal Education	Unskilled Worker	Low
Laborer	Kutchu	Low	High	No Formal Education	Unskilled Worker	Low
Student	Concrete	Low	Medium	High School	N/A	Medium
Housewife	Kutchu	Low	High	Primary School	N/A	Low
Laborer	Kutchu	Low	High	No Formal Education	Unskilled Worker	Low
Clerk	Concrete	Medium	Medium	High School	Skilled Worker	High
Businessman	Concrete	High	Low	High School	Self-Employed	High
Farmer	Kutchu	Low	High	No Formal Education	Unskilled Worker	Low
Housewife	Concrete	Low	High	No Formal Education	N/A	Low
Laborer	Kutchu	Low	High	No Formal Education	Unskilled Worker	Low
Teacher	Concrete	Medium	Low	Bachelor's Degree	Professional	High
Businessman	Concrete	High	Low	High School	Self-Employed	High

Table No 1: After reviewing the collected data, the researcher developed a table to represent the participants' socio-demographic details, as well as their education, occupation, and social inclusion

statuses. This table was created as a means to organize and present the relevant information obtained from the data analysis. It provides a concise overview of the participants' background characteristics and key aspects related to their educational and occupational trajectories, as well as their experiences of social inclusion.

It was found that the following themes were present from the data:

- Occupation as a major factor in discrimination
- Type of House or income had no impact on discrimination
- Social Mobility of an Individual is being affected by discrimination
- Social Policies have helped them in terms of educational mobility, but not in their educational institution
- Women are very much deprived in the Arunthathiar community in terms of occupation compared to men.
- Educated Arunthathiar population are feeling included in the society than uneducated.

Generation of Initial Codes

The next step is to generate initial codes from the data. In this study, the following codes were identified:

- Occupation discrimination
- House based discrimination
- Income based discrimination
- Discrimination and social mobility
- Social Policies and Educational status improvement
- Gender and occupational status
- Social inclusion of educated Arunthathiar population

Searching for Themes

After the generation of initial codes, the researcher proceeded to search for themes by grouping together similar codes. The following themes were identified:

- 1. Occupation Discrimination:** This theme encompasses the codes that highlight instances of discrimination faced by the Arunthathiar population based on their occupation.
- 2. Discrimination and Social Mobility:** This theme focuses on the codes that explore the impact of discrimination on the social mobility of the Arunthathiar population.
- 3. Social Policies and Improvement in Educational Status:** This theme comprises the codes that pertain to the improvement in the educational status of the Arunthathiar population compared to their parents, with a specific emphasis on the absence of improvement in terms of educational institutions.
- 4. Gender and Occupational Status:** This theme encompasses the codes that shed light on the disparities in occupational status based on gender.
- 5. Social Inclusion of Educated Arunthathiar Population:** This theme comprises the codes that highlight the high level of social inclusion experienced by the educated Arunthathiar population.

These identified themes serve as organizing principles for further analysis and interpretation of the data, allowing the researcher to gain deeper insights into the experiences and dynamics surrounding social mobility within the Arunthathiar population.

Reviewing Themes

After identifying the themes, the researcher can review them to ensure they are meaningful and accurate representations of the data. The following themes were found to accurately represent the data:

- Occupation discrimination
- Discrimination and social mobility

- Social Policies and Educational status improvement
- Gender and occupational status
- Social inclusion of educated Arunthathiar population

Defining and Naming Themes

The final step is to define and name the themes. The following definitions and names were given to the themes:

- Occupation discrimination: This theme represents the discrimination faced by the Arunthathiar population based on their occupation, which is a major factor in their social mobility.
- Discrimination and social mobility: This theme represent the impact of discrimination on the social mobility of the Arunthathiar population.
- Social Policies and Educational status: This theme represent the improvement in educational status of the Arunthathiar population compared to their parents, but not in terms of their educational institutions.
- Gender and occupational status: This theme represent the differences in occupational status based on gender.
- Social inclusion of educated Arunthathiar population: This theme represents the high social inclusion of the educated Arunthathiar population.

Overall, these themes provide insights into the factors that impact social mobility of the Arunthathiar population and goes in hand in hand with the quantitative results of the study. It can be used to inform policies and interventions aimed at addressing discrimination and promoting social mobility for this population.

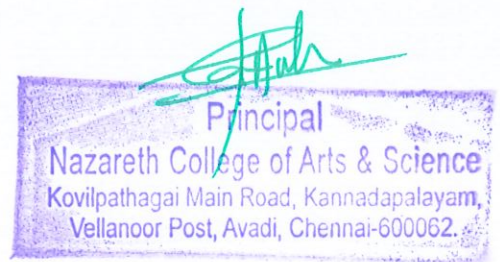
Report of the Qualitative Analysis

The collected data from the Arunthathiar community underwent thematic analysis, revealing several themes related to social mobility and discrimination. Notably, discrimination based on occupation emerged as a significant factor impeding the social advancement of this population. However, the data did not indicate any discrimination based on income or housing style among the Arunthathiar community.

Gender disparities were evident in the occupational status of the population, with women facing limited opportunities for career advancement compared to men. While the overall educational standing of the Arunthathiar population showed improvement due to social initiatives, this progress did not extend to their educational institutions.

Moreover, the findings of the study highlighted the high level of social inclusion experienced by the educated Arunthathiar population. This suggests that education plays a crucial role in fostering social integration within the community.

In summary, the thematic analysis of the data shed light on the challenges and dynamics of social mobility and prejudice within the Arunthathiar population. It revealed the impact of occupational discrimination, gender disparities, limited educational institution progress, and the positive influence of education on social inclusion.



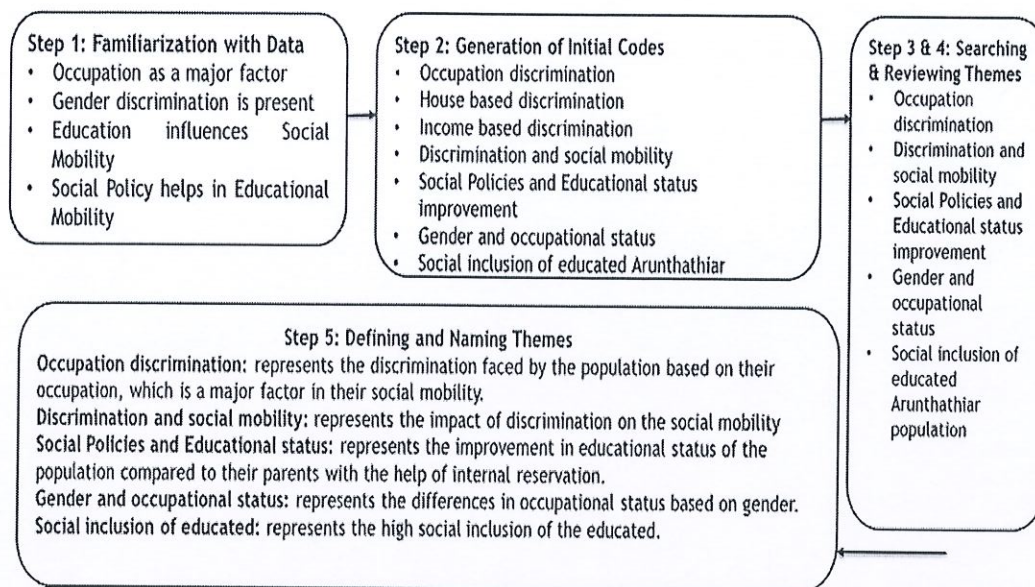


Figure 1: Braun and Clarke (2006) six stages of thematic analysis

Occupational Discrimination:

In the qualitative study, a significant majority of the participants shared their experiences of facing discrimination in their respective jobs or occupations solely based on their Arunthathiar community background. These individuals reported being subjected to ill-treatment and unfair treatment solely due to their affiliation with the Arunthathiar community. Disturbingly, some women participants also disclosed instances of sexual harassment they had encountered within their work environments. These women expressed a sense of hopelessness in reporting such incidents as their livelihoods depended on their jobs, leaving them with limited options for seeking redress and justice. This highlights the distressing reality faced by individuals from the Arunthathiar community who encounter discrimination and harassment within their professional lives.

P1: One of the participants have reported that, “Even though, I come to job regularly it’s hard for me to get a leave for one day. But my co-workers used to get leave as they wish without any prior intimation”

P2: “I have been working in the organization for more than ten years, but my salary and perks are still the same with just a minimum rise. But my fellow workers are getting a higher salary than me with less experience”

These are some of the statements from the participants, which clearly shows the discrimination faced by the Arunthathiar population in their occupation.

Discrimination and Social Mobility:

The primary objective of the qualitative study was to explore the influence of discrimination on the social mobility of the Arunthathiar population. The identified theme of "Discrimination and Social Mobility" reveals that while there may be some limited changes in the participants' social progression, overall, there is no substantial transformation in their social mobility. The findings indicate the presence of potential vertical social mobility, suggesting the possibility of upward movement in terms of social status. However, there is a lack of positive indications for horizontal social mobility, which refers to the ability to transition across different social positions or occupations within the same social stratum. Thus, the study suggests that discrimination hampers the Arunthathiar population's overall social mobility, with limited opportunities for horizontal advancement.

P3: “My father was a farm labour working for a landlord and he wanted me to study and go for a good job. But, the faith didn’t leave me and now I am working as a driver in the town. Though there is no

change between me and my father, but my children are studying in a good school and reservation has helped me to give them good education and I hope for a better future for them.”

P4: “I am doing an own business running a petty shop which helps me to lead a peaceful life. But my brother is working as goon under a person and has been involved in various crimes in our childhood days itself. His life has changed tremendously and he has no family and spending most of his days in jail. He realizes his mistakes now but it’s too late for him. In our area most of the children are facing these issues and are being mis-led in their young age itself”

Gender and Occupational Status:

Discrimination, including gender-based discrimination, plays a significant role in various societies, including India, where traditional gender norms have long favored men over women. This is also observed within the Arunthathiar community, where women experience discrimination in multiple aspects of their lives. Despite belonging to the lowest stratum of society, the community itself, women within the Arunthathiar community are deprived of their rights by both men within their community and others from outside.

Occupationally, even within jobs that are traditionally associated with the Arunthathiar community, there exists a disparity in pay between men and women. This highlights a clear gender-based wage gap and unequal treatment based on gender, where women are unfairly compensated for their work compared to their male counterparts.

These observations indicate the existence of gender-based discrimination within the Arunthathiar community, perpetuating inequitable treatment and limiting opportunities for women. This underscores the need for addressing gender inequality and promoting gender justice within the community and society as a whole.

P5: “I am working in a contract job in construction site, where I used to work for more than nine hours a day. Men those who are working with me from my own community works same like me or less than me will be paid more than me and it is followed as a regular thing and no one is raising any question”.

Social Policies and Educational Status:

P6: “I am able to send my children to school and college is because of the internal reservation system. Now he is working in an organization and getting a monthly salary”

P7: “I enjoy my child speaking in English, he also teaches me some words in the language. This is all because of the internal reservation for us.”

These Statements by the participants clearly shows that the interna reservation system brought by the state government has helped them in many ways in terms education, employment and furthermore.

Social Inclusion of Educated:

P8: “We believe that our children will see a better society and social mobility as they are educated”

P9: “Our only hope to see a better future is through education and we could see that in our children’s life”

Education is seen as key for social inclusion by the Arunthathiar community and they believe that the policies brought by the government for their education has brought light into their future.

Conclusion:

The findings of this study offer valuable insights into the factors influencing social mobility within the Arunthathiar community. The results emphasize the necessity of implementing programs and policies aimed at eradicating discrimination and promoting opportunities for upward social mobility. These findings align with previous research by Boushey (2016) and Roscigno & Ainsworth-Darnell (1999), which underscore the importance of addressing discrimination to enhance social mobility.

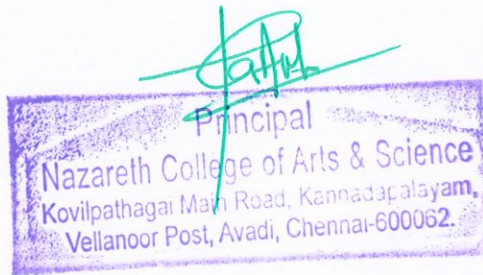
The study also highlights the significance of considering the intersectionality of different forms of discrimination, such as those based on gender and profession. Recognizing and addressing these

overlapping dimensions of discrimination is crucial for understanding the complex challenges faced by the Arunthathiar community in terms of social mobility.

In conclusion, the thematic analysis of the data obtained from the Arunthathiar community provides a comprehensive understanding of the themes related to discrimination and social mobility. These findings hold substantial implications for researchers and policymakers dedicated to removing barriers to social mobility and combating discrimination experienced by the Arunthathiar community.

References

1. Abdi, J., Al-Hindawi, A., Ng, T., & Vizcaychipi, M. P. (2018). Scoping review on the use of socially assistive robot technology in elderly care. *BMJ Open*, 8(2), e018815. <https://doi.org/10.1136/bmjopen-2017-018815>
2. Chapman, T. (n.d.). *Social mobility in India: Determinants and recommendations for change*. ORF. Retrieved December 29, 2022, from <https://www.orfonline.org/research/social-mobility-in-india-63480/>
3. Dr. Abhimanyu Kumar, Dr. A. K. (2013). THE COMPARATIVE STUDY OF SOCIAL MOBILITY AMONG SCHEDULED CASTES OF TWO BLOCKS IN GHAZIABAD DISTRICT OF UTTAR PRADESH INDIA.
4. *European Centre for Research Training and Development UK, Vol.1, No.1.*
5. Dravida, A., & Karnataka, A. (n.d.). II. *SCHEDULED CASTES*.
6. Mosse, D., & Dostaler, N. (n.d.). *Minds of caste – Discrimination and its affects*.



A SCOPING REVIEW OF SOCIAL MOBILITY OF ARUNTHATHIYAR COMMUNITY

Dhivya Bharathi Research Scholar, Department of Social Work, Bharathiar University,
Coimbatore- 641046

Dr. Baskar Associate Professor, Department of Social Work, Bharathiar University, Coimbatore -
641046

Abstract:

The word "social mobility" refers to the movement of an individual, family, or group within a society's structure of social stratification. Caste and class are the two primary social stratification factors in India. It is well known that class exists in urban areas while caste is a rural issue, although both are interconnected. The caste system or varna system used in India places the scheduled caste at the very bottom. They encounter a lot of discrimination because of their status, which makes it difficult for them to obtain even the most basic necessities needed by a human. The main factor for this kind of discrimination against members of scheduled castes appears to be hereditary occupation. The Arunthathiyar community is one of the scheduled castes that experiences the internal and external prejudice. Recognizing this, the Indian government announced the internal reservation for Arunthathiar from the scheduled caste reservation of 18%. Even so, it was a significant step in raising Arunthathiyar's prestige. They continue to experience difficulties using and receiving these benefits. This Paper outlines the discrimination experienced by the Dalit especially Arunthathiar population. A Scoping review of peer-reviewed articles (published between 2009 – 2023) was performed to identify the factors that could contribute for upward social mobility of Arunthathiar community. Finally, the results identified education, occupation, intermarriage and social movements/politics as the important factors for achieving upward social mobility.

1. Introduction:

In this Modern world, the progress in science and the process of industrialization have diluted the impact of caste system in India. Opportunities are given to those who are skilled and people from all caste work together. Heyer (2000, 2012, 2013) emphasizes how, beginning in the 1980s and continuing until 1996 and again in 2008/9, villages had access to urban and industrial opportunities thanks to developments in transportation, communication, and social policy. The oppressive caste system began to crumble as a result of this. Despite this, in 1996 the Chakkliyar were the least equipped to take advantage of these new possibilities because they were the most marginalized both inside and beyond the community. Heyer (2000) claims that this group was denied the right to land ownership, lower pay, a limited range of credit options, and direct (i.e. unmediated via the upper castes) access to state benefits. In addition, they were less equipped to make the shift to non-agricultural jobs because of their lower levels of education. As a result, they were unable to make the most of new prospects because of their historically low socioeconomic status in the town. As the number of self-identified Chakkiliyars who identify as Arunthathiar is so small in comparison to that of other minorities, they have not been the subject of any extensive research. Two historical studies examine the level of dependence among the Madari people from the first half of the twentieth century through the 1970s. In addition, a few works examine the Chakkliyar sub-groups from the latter half of the century to the present day. According to the research, the Arunthathiyar (or the researched sub-groups) have been the most dependent SC on upper castes. They couldn't break free of the local economy and take advantage of the opportunities that opened up to them. This may be attributable, in part, to the group's attitude and its use of child labour, as well as to the lower education level of its members. However, they were singled out for bondage in novel industrial forms, which likely discouraged them from exploring other options. Their reliance on the upper castes may be weakened, however, by developments in infrastructure, communication, employment, and social policy (especially education). Historically, its availability has changed, but it is currently a major policy concern in India. As will be seen below, not only does the government intend to employ affirmative action in education to help groups like SCs

find mobility, but it also hopes to achieve universal primary education (UPE) through focusing on such groups (Celeti, A, 2015).

1.1. Discrimination:

Prejudice is a negative emotional response towards a particular social group, and when it is transformed into behaviour it becomes discrimination. When the prejudiced ideas are transmitted it is projected as though they are legal and justified. This convinces the members of the dominant group to get into discriminatory practice (Bressey, 2012). The sad part of the story is that even after the emergence of the Anti-Discrimination and Equality Bill 2016, discrimination is still practiced. People are aware of this social evil. Some condemn these divisive factors while many consciously or unconsciously uphold the system. Social identity theory could explain this behaviour. It suggests an in-group and an out-group mentality is implied. They identify themselves with "in group" members and develop antagonistic attitude and behaviour towards the "out group" members. This "in group" identification boosts the self-esteem of the individual and leads to intolerance and discrimination towards members of the out group (Jenkins, 1994). Since the Dalit group as a whole are treated as an "out group" by the people of other castes, they experience inferiority and low self-esteem. So as to handle this esteem issue and feel better they categorize themselves as "in group" and "out group". Here the other Dalit groups see themselves as "in group" and treat the Arunthathiar community as "out group" and thus they become target of prejudice and discrimination. Besides social exclusion, political exclusion also plays a significant influence in the development of prejudice.

1.2. Inter-caste Differences:

There are significant variations across SC castes in terms of population size, level of education, and employment opportunities. This demonstrates that SCs' inter-caste differences cannot be ignored, and that acknowledging this reality is a prerequisite to developing effective intervention programmes for them. (Srinivasan, 2017).

1.2.1. Struggles for a Just Society:

One group accepts their status and go on with the work assigned to them and the other group aspires and struggles for a just society. Some of them have accepted discrimination and consider the works that are allotted for them as their responsibility. Tasks like carrying lantern for the car procession during village festivals or doing menial jobs are seen as duties that they do for the community. Since they are sure that the oppressive structure could not be challenged or changed they have made up their mind to accept it (Rath, & Sircar, 2015). There is yet another group among them who still after experiencing all these social discriminations strive to be treated as equals in the society. In spite of the verbal and physical abuse they still make efforts to establish a just society (Rath, & Sircar, 2015). This is a clear indication of upward social mobility where the individuals try to move up the social ladder towards a status that is more valuable and respected (Jenkins, 1994). This upward mobility is not very natural and smooth. It always accompanies pain and struggle. Apart from wealth and position there are many other factors that play an important role in preventing this mobility. Caste discrimination is one such factor that hinders the upward mobility. The oppressed group has to struggle and find its way up.

1.3. Caste:

The term caste, from the Portuguese casta for breed or race, has two possible meanings in the Indian context: caste as varna and caste as jati (Be teille 1965, 1969; Jodhka 2012a; Srinivas 1991, 2002). Be teille (1965, p. 46) writes that "caste is characterised by endogamy, hereditary membership, and a certain way of life that often includes the pursuit by tradition of a particular activity and is usually coupled with a more or less distinguished ritual standing in a hierarchical system." Some of the caste system's defining characteristics are highlighted by this definition: hypergamy is possible, but endogamy is the norm; castes are ranked loosely according to social status (Ghurye 1932); and status delineated by hereditary occupations and ritual purity and pollution rules. Further, according to Bougle (1971, p. 9), "repulsion," along with "hierarchy and hereditary specialization must be borne in mind if one wishes to have a complete definition of the caste system." Although varna technically

means color, the varna classification can be seen as a broader and simplified categorization. Derived, as some believe, from the Sanskrit text Manusmriti, the classification distinguishes four varnas in the Hindu system of caste: the Brahmins (priests and doctors), Kshatriyas (rulers and warriors), Vaishyas (businessmen), and Shudras (the lowest caste, including artisans and manual laborers). The Fifth group are termed to be untouchables and they are listed outside the varna system and termed to be the servants of other four castes.

2. Method:

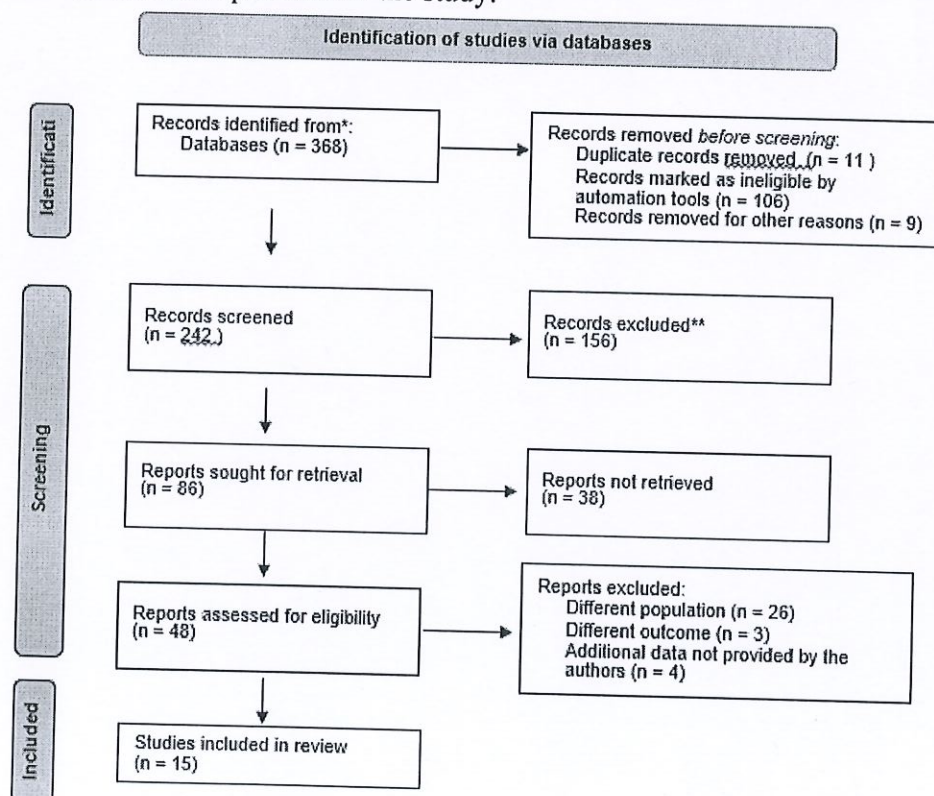
A Scopus Review was conducted using the Arksey and O'Malley framework. The Review included the following five phases: 1) Identifying the Research question, 2) Identifying relevant studies, 3) Study selection, 4) Charting the Data, 5) Collating, Summarizing and reporting the results. The Optional 'consultation exercise' of the framework was not conducted.

2.1. Research Question:

This Review was guided by the question, 'What are the various factors contribute towards upward social mobility of Arunthathiar community in Tamil Nadu'. For the purpose of this study, a scoping review is defined as a type of research synthesis that aims to map the literature on social mobility and provide an opportunity to identify key concepts, gaps and sources of evidence to inform practice, policies and research.

2.2. Data sources and Search strategy:

The Researcher adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) for reporting the review strategy performed. The Keywords used for the search of literatures are social mobility and discrimination and arunthathiar people/community. The Search engines used for the search is google scholar as other databases like Scopus yielded very limited results and didn't meet the research question for the study.



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

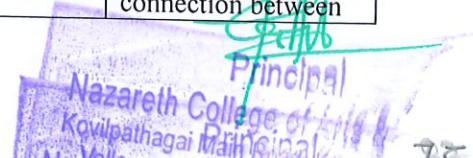
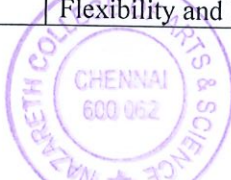
For more information, visit: <http://www.prisma-statement.org/>

Figure 1: PRISMA flow chart for selection of articles

2.3. Data Extraction:

Finally, fifteen articles were selected for the scoping review after meeting the inclusion criteria (Table 2: gives the inclusion criteria for the literatures) and included for data extraction. These selected articles seemed to address the research question. Apart from the extracted articles, some articles were also referred and cited in this paper, those additional literatures were cited on the basis of their need and the importance given to them by the selected articles in the paper.

Sl.No	Name of the Literature	Author Name	Method	Objectives
1.	Documenting a Caste: The Chakkiliyars in Colonial and Missionary Documents in India	S. Gunasekaran	Review	To know about the socio-demographic details of Arunthathiyar community living in Western Tamil Nadu
2.	Pro-Poor Maternity Benefit Schemes among the Arunthathiyar Community in Tirunelveli Corporation	S.W.P.Prabakaran and M. P.Jeevitha	Interview Schedule	
3.	Status of Manual Scavengers in Tiruchirappalli town	T.Thangadurai & K. Suriyan	In-depth Interview	
4.	Intersections of Gender and Caste	Sharmila Rege, J Devika, Kalpana Kannabiran, Mary E John, Padmini Swaminathan, Samita Sen	Review	
5.	Affirmative Action and Subgroup Inequality in Higher Education: Adapting Indian Policy Solutions to the American Context	Michael Pelle & Sayari Patel & Benedict Leung	Review	To assess the Inter-Generational (Educational, Occupational) mobility Pattern of Arunthathiyar community
6.	Remedial Measures to the Economic Violation against Dalit Entrepreneurs	C. Paramasivan & P. Mari Selvam	Interview schedule	
7.	'The Unseeables' the Struggle of Puthirai Vannar Community: An Interpretative Phenomenological Analysis	N. John Benhar, J. Lidiya Pricilla, Rev. Dr. I. Joe Sanjay	Semi-Structured Interview	
8.	The Modernity of Caste and the Market Economy	David Mosse	Review	To know the level of caste-based Discrimination and Social Stigma impact on Social mobility.
9.	An Exploration of the Arunthathiyar Caste in Southern India	André Celeti	Review	
10.	Crossing Caste Boundaries in the Modern Indian Marriage Market	Amit Ahuja & Susan L. Ostermann	semi-experimental study	
11.	Marriage, Violence, and choice: Understanding Dalit Women's agency in rural Tamil Nadu	Nitya Rao	Survey	To know the role of Caste association in social mobility of Arunthathiyar Community.
12.	Litigation against Political Organization? The Politics of Dalit Mobilization in Tamil Nadu, India	Grace Carswell and Geert De Neve	Review	
13.	Caste in Contemporary India: Flexibility and Persistence	Divya Vaid	Review	



14.	Employment opportunities for SCs and STs in Thoothukudi, Tamilnadu, India: Issues and challenges	S.Selvam & R.Mercy Latha	Survey	social relationships and occupational mobility of Arunthathiyar Community.
15.	The Hazards of Passing on the Hereditary Occupation: A Study on the Identity and Occupation of Arunthathiyar Community in India	Antony Susairaj	Survey	

Table 1: Shows the details of the selected articles for the review paper

Inclusion criteria based on	Details
Period	2009 -2023
Population	Arunthathiar and sub groups termed as Arunthathiar
Place	Southern India
Problem	Discrimination/Social Mobility
Results	Suggestions or identification of factors to achieve upward mobility

Table 2: Inclusion criteria for literatures included in the paper

3. Social Mobility:

There are two ways to conceptualise the ebb and flow of social status among castes. To begin, advancement within a group is possible through the adoption of new rituals and ways of life, provided that the new status is recognised by the rest of the group. Second, on a more micro level, is the prospect of social mobility between generations; that is, can people of different castes take advantage of possibilities for upward social or economic mobility in the same ways?

Those who already have material and political advantages can use them to further elevate themselves. Others, however, have maintained for a long time that caste allows for some degree of mobility for most people (Be teille 1965, 1969; deZwart2000; Driver 1962; Jodhka 1997; Sivaram 1990; Srinivas 1966, 1987). In his 1968 book, Silverberg compiles studies on caste-based occupational mobility.

3.1. Sanskritization:

In the context of social mobility within the caste system, it considers the hypothesised immobility of groups to be an important notion and process. Sanskritization, a concept for social advancement derived from the root word Sanskrit, the language that was predominantly the property of the Brahmins or upper castes, was developed by Srinivas (1956) in response to the mobility he saw between sacrificial roles. To put it another way, lower castes engage in cultural mobility (Charsley 1998, Singh 1994) when they adopt the beliefs, traditions, and practises of an upper caste in order to rise in social and economic position (see Srinivas 1966, 1987, 1996a). This can be done by adopting practises once reserved for members of higher castes, such as modifying commensal norms, giving up alcohol, or adopting a vegetarian diet. The term "elite emulation" was coined by Lynch (1969). According to Jayaram (1996, p. 79), Sanskritized castes seek public approval, which is "a gradual and tenuous process, and is not likely to be reinforced if the caste concerned does not simultaneously strengthen its economic standing and political clout." So, if you want to go up the social ladder, you can't rely on imitation alone.

3.2. Interaction with Political and Economic Spheres:

This discussion provides evidence that the process of Sanskritization is not independent of a caste's engagement in the political and economic realms. The process of Sanskritization is "not simply an attempt to claim higher rank but also a demonstration of the new economic position of a lower caste household" in many cases (Karanth 1996, p. 94; Panini 2001). For instance, the social standing of the Yadav caste is a good example of how easily one can rise up the social ranks. They are a group of jatis that have achieved social mobility through Sanskritization; many of them are no longer cowherds.

However, they have shown great political and economic strength at the same time, and are a formidable political force in a few states in northern India. As was already mentioned, the OBC status gives Yadavs special consideration.

Caste, or more particularly jati, and occupation, is a distinguishing aspect of the caste system (Be teille 1991b, 1996a; Jodhka 2012a; Srinivas 1996a, 2003). Mobility between castes has never been impossible, but barriers to it might arise from social norms, economic circumstances, and power dynamics. Mobility or transition between castes is generally viewed as occurring along the professional, economic, and societal axes. As the preceding examination of Sanskritization demonstrates, however, the prospect of ceremonial advancement within the caste system is not always enough for a caste to establish its claim to higher status.

4. Results:

Education, occupation, social movements/politics, and intermarriage were found to be some of the main elements in the upward social mobility of the Arunthathiar group, as was the review of chosen papers to comprehend these factors.

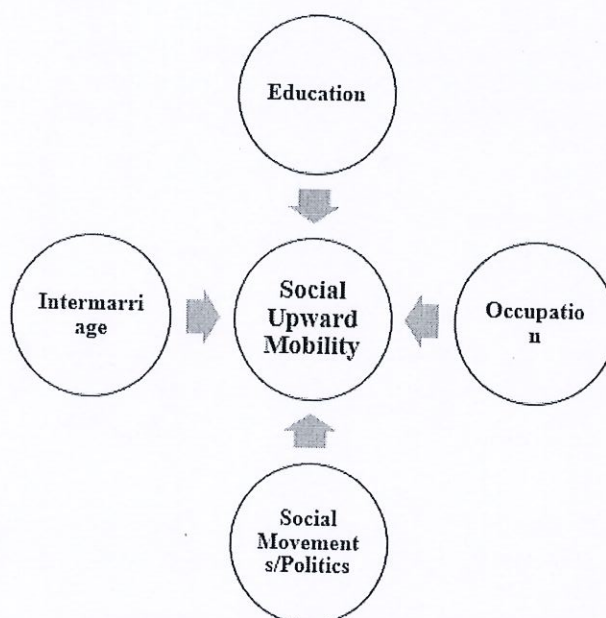


Figure 2: Shows the factors for Arunthathiar community to obtain a upward social mobility

4.1. Education:

Educators typically see the educational system as a means of upward mobility. There's no denying that school can help alleviate poverty by opening doors to better employment and social standing, but it's important to keep in mind that some social groups have more clout than others when it comes to closing off doors. People's objectives and successes in life are heavily influenced by their social class background. Therefore, education must play a key role in fostering solidarity among different socioeconomic groups and paving the way for a more egalitarian and integrated society to emerge; yet, in practise, the educational system tends to exacerbate social stratification and deepen existing class divides. While education is often cited as a force for progress in today's world, the reality is that most schools actually teach Dalits to perpetuate their traditional ways of life rather than adapt to new circumstances. In other words, they are not preparing the Dalit students for the real world. Instead of trying to alter the status quo, they instruct them to make do. Despite the belief that schools and the educational system may help Indians of all backgrounds come together, there are schools in India that are owned and operated by members of the upper caste (Pelle, M., Patel, S. & Leung, B , 2016; Ramanathan.S, 2018). Since the Arunthathiar populace is not being adequately educated about the government programmes that have been established specifically for their benefit, these programmes are going unused. The majority of them are poorly cared for in the local health clinic (Prabakaran ,

S. W., & Jeevitha, M. P, 2020). India's representations-based affirmative action programme is hindered by caste-related socioeconomic gaps, which generate varied possibilities for subgroups to take advantage of reservations. Subgroup discrepancies in college enrolment are visible in many different geographical areas. While Chamars and Ramdasias only make up 38.6% of the Dalit population in the state of Punjab, they take up 56.5% of the available reserved seats in higher education. When compared to the Dalit community as a whole, the Churas (16.1%), who are only represented by 4.5% of elected officials, have a disproportionately small voice in government (Rao 2009). The southern states of Tamil Nadu and Andhra Pradesh experience the same thing.

4.2. Occupation:

A study done in the Thoothukudi district of Tamil Nadu found that low caste, low status, and low paying jobs have a strong correlation with a lack of employment possibilities for the Dalit population. However, the Arunthathiar subgroup has much fewer prospects than the Pallar and Paraiyar subgroups (Selvam, S., & Latha, R, 1970). The Arunthathiyar community is primarily made up of poor, minority groups. Cleaning is a traditional and ongoing occupation for them in both rural and urban settings across our country (Prabakaran, S. W., & Jeevitha, M. P, 2020). Despite the legal right to choose one's own profession, in India's caste system, one's career is determined at birth and passed down through the generations. The lower castes are looked down upon since they are responsible for dirty and lowly tasks (Antony Susairaj, 2022). For social and economic reasons, the younger generation in this area has recently favoured white-collar jobs over the traditional hereditary profession. The societal explanation is that the Arunthathiyar community and people of other caste communities do not place a high value on the hereditary employment, but the white-collar professions are admired and respected. Furthermore, caste-based prejudice is more prevalent in rural areas than in urban centres. Young Arunthathiars, then, are more likely to seek out the white-collar employment opportunities found in the nation's major metropolitan areas.

4.2.1. Entrepreneurship:

In terms of a country's overall economy, entrepreneurship is crucial since it leads to the accumulation of capital, the creation of new jobs, increased consumer spending, and the expansion of the market. For countries like India to achieve inclusive and long-term development, it is crucial to support the start-up ecosystem. Despite making up 19% of India's overall population, the Dalit community has only 2,33,880 businesses to call their own, most of which are run in the traditional and caste-based manner. As a result, they are subject to a wide range of social, economic, and psychological forms of prejudice, atrocity, and violation. Since independence, cultural and state governments have set up financial and non-financial organisations to support Dalit entrepreneurs. However, the implementation authority and staff's attitude has led to very poor results. According to the research conducted on this group, Dalit business owners have unique challenges because of their caste. It's probable that economic growth through more entrepreneurship won't be achievable unless this kind of infringement against Dalit entrepreneurs is eliminated. Therefore, governments and policymakers should think about and re-evaluate the concept of entrepreneurial development in relation to Dalit entrepreneurs (Chelliah, P., & Selvam, M, 2015).

4.3. Social Movements & Politics:

The relationship between the law and Dalit social movements' pursuit of economic empowerment is explored in depth in a study titled "Litigation against political organisation." There are many factors at play when it comes to the development of social movements in low-caste communities, but a case study like theirs does allow for three generalisations. For starters, social justice movements are more likely to succeed when armed with a legal tool that gives them force. Second, the success of Dalit social movements increases when they are part of a larger process of social change and economic development. As a third point, litigation and caste mobilisation have brought formerly private struggles into the wider institutional arena of state actors and institutions, giving them a collective dimension and a public face. This is especially significant for Dalits, who were historically the targets of private threats, intimidation, and violence and whose struggles were primarily confined to isolated conflicts

with rural employers. Changes in the public landscape of caste relations are occurring gradually but visibly in modern western Tamil Nadu as a result of legal weapons, grassroots activism, and economic empowerment. However, Arunthathiyars' social movement organisations need to further nurture unity and collaboration, and build leadership that can take grassroots activity to the next level, if they are to achieve sustained political voice and representation at the state level (Carswell, G. and De Neve, G., 2015).

4.3.1. Politics:

Multiple Tamil Nadu-based grassroots groups have led campaigns to end caste-based prejudice and untouchability among the state's Dalit population. The creation of the Tamilnadu Untouchability Eradication Front (TNUEF) in May 2007 marked a turning point in the movement to end untouchability. The TNUEF now has district units in all 32 of Tamil Nadu's districts. Industry trade unions and federations are just two examples of the many groups fighting caste-based discrimination.

4.3.2. Untouchability:

There are various forms of untouchability and discriminatory practices prevail in Tamil Nadu revealed by TNEUF survey, they are

- a) Restriction on walking in public roads
- b) Wearing chappals
- c) Riding bicycle
- d) Wearing dhotis folded or polyester dhotis
- e) Wearing towels on shoulders
- f) Wearing cloth headgear
- g) Sporting thin line moustache
- h) Getting clothes washed or ironed

4.4. Intermarriage:

Several measures enacted over the past 60 years have created opportunities for people from lower social classes to advance their careers and living standards (Pande, 2003; Prakash, 2009; Hnatkovska et al., 2013). Caste discrimination, for example, has been made illegal, and affirmative action programmes have been implemented, at the federal, state, and local levels, and in some legislatures (Galanter, 1984). There has been a steady rise in the number of people from weaker social classes and the Scheduled Castes who hold public office (Jaffrelet & Kumar, 2009). Meanwhile, India's economy has risen at a compound annual rate of 6% over the past quarter century (Hnatkovska & Lahiri, 2012; Hnatkovska et al., 2013; Ahuja, A., & Ostermann, S. L., 2015). As a result of these reforms, members of India's backward and Scheduled Castes now have access to the middle class for the first time. There has been a steady shift in recent years, however, in the way that urban, middle-class Indians engage with one another, particularly in regards to marriage. Now is a good time to encourage interfaith marriage. Interest in intermarriage tends to rise in tandem with the degree of diversity in a given community (Blau and Schwartz 1984; Rao, N., 2015). Abolishing the prevalent caste identity in society, which impedes national progress, is one goal of intermarrying couples.

Conclusion:

To help a community like Arunthathiar, which is lagging in terms of education, economic opportunity, and political representation, multiple groups and institutions must work together in concert. To encourage Dalit to start businesses, a targeted programme is required. Historically, the rate of upward mobility among the world's manual scavengers has been shockingly low across all key indicators of socioeconomic status. In this sense, none of the state-appointed panels have tackled the issue of caste's role in perpetuating the problem. Special health and education programmes; SC priority in all rural development, slum improvement, and anti-poverty programmes; constitutional and legal provisions proclaimed to positive discrimination in government employment and in elected representative bodies; monetary support via the Special Component Plan (SCP) approach; technological advancements at the level of daily life. Since the state isn't doing enough, non-governmental organisations (NGOs) must step in. As a result of this peculiar form of exploitation, which is specific to Indian culture,

Arunthathiyars, a demographic group without which Indian civilization would have degenerated into a cesspool long ago, often find themselves stuck at the bottom of the social ladder (Thangadurai, T., & Suriyan, K., 2020).

Limitation:

The Review paper was limited to Arunthathiar population in Southern India, due to time constraint. There are many sub groups in Dalit population across India who are facing lots of problems towards social mobility, future research should focus on the issues and factors

References:

1. Ahuja, A., & Ostermann, S. L. (2015, May 8). Crossing caste boundaries in the modern Indian marriage market - studies in Comparative International Development. SpringerLink. Retrieved January 21, 2023, from <https://link.springer.com/article/10.1007/s12116-015-9178-2>
2. Antony Susairaj. (2022). The hazards of passing on the hereditary occupation. Journal of the Nanzan Academic Society Humanities and Natural Sciences. Retrieved January 21, 2023, from https://nanzan-u.repo.nii.ac.jp/index.php?action=pages_view_main&active_action=repository_action_common_download&item_id=4123&item_no=1&attribute_id=22&file_no=1&page_id=13&block_id=21
3. Be'teille A. 1991b. The reproduction of inequality: occupation, caste and family. Contrib. Indian Sociol. 25(1):3– 28
4. Be'teille A. 1965. Caste, Class, and Power: Changing Patterns of Stratification in a Tanjore Village. Berkeley: Univ. Calif. Press
5. Be'teille A. 1969. Castes: Old and New. Essays in Social Structure and Social Stratification. New York: Asia Publ. House
6. Be'teille A. 1996a. Caste in contemporary India. See Fuller 1996, pp. 150–79
7. Bougle C. 1971. Essays on the Caste System. Transl. DF Pocock. London: Cambridge Univ. Press
8. Bressey, C. (2012). Reporting Oppression: Mapping Racial Prejudice in Anti-Caste and Fraternity. Journal of Historical Geography, 38. 401 – 411.
9. Carswell, G. and De Neve, G. (2015), Litigation against Political Organization? The Politics of Dalit Mobilization in Tamil Nadu, India. Development and Change, 46: 1106-1132. <https://doi.org/10.1111/dech.12190>
10. Celeti, A. (2015). Education of formerly Bonded Children and youth an exploration of the Arunthathiyar caste in southern India. Semantic Scholar. Retrieved January 21, 2023, from <https://www.semanticscholar.org/paper/Education-of-Formerly-Bonded-Children-and-Youth-An-Celeti/7ad477dbd1f4798904d8978057ab9a99e005912e>
11. Charsley S. 1998. Sanskritization: the career of an anthropological theory. Contrib. Indian Sociol. 32(2):528–48
12. Chelliah, P., & Selvam, M. (2015, September 26). Remedial measures to the economic violation against Dalit entrepreneurs. Academia.edu. Retrieved January 21, 2023, from https://www.academia.edu/16224444/REMEDIAL_MEASURES_TO_THE_ECONOMIC_VIOLATION_AGAINST_DALIT_ENTREPRENEURS
13. de Zwart F. 2000. The logic of affirmative action: caste, class and quotas in India. Acta Sociol. 43(3):235–49
14. Driver ED. 1962. Caste and occupational structure in central India. Soc. Forces 41(1):26–31
15. Dugar S, Haimanti B, David R. Can't buy me love? A field experiment exploring the trade-Off between
16. Erskine H. The polls: interracial socializing. Public Opin Q. 1973;37(2):283–94. Frøystad K. Blended boundaries: caste, class, and shifting faces of 'Hinduness' in a north Indian City. New Delhi: Oxford University Press; 2005.
17. Galanter M. Competing equalities: law and the backward classes in India. Delhi: Oxford University Press; 1984.



18. Galanter M. Competing equalities: law and the backward classes in India. Delhi: Oxford University Press; 1984.
19. Goli S, Singh D, Sekher TV. Exploring the myth of mixed marriages in India: evidence from a nation-wide survey. *J Comp Fam Stud*. 2013;44(2):193–206.
20. Gunasekaran, S. (2021, May 16). Documenting a Caste: The Chakkiliyars in Colonial and Missionary Documents in India. *CASTE / a Global Journal on Social Exclusion*, 2(1), 47–66. <https://doi.org/10.26812/caste.v2i1.247>
21. Hnatkovska V, Lahiri A, Paul S. Breaking the caste barrier: intergenerational mobility in India. *Journal of Human Resource*. 2013;48(2):435–73.
22. Hnatkovska V, Lahiri A. The post-reform narrowing of inequality across castes: evidence from the states. In: Bhagwati JN, Panagariya A, editors. *Reforms and economic transformation in India*. Oxford: Oxford University Press; 2012. p. 229–52.
23. income and caste-status in an Indian matrimonial market. *Econ Inq*. 2012;50(2):534–50.
24. Jaffrelot C, Kumar S. Rise of the plebeians? The changing face of Indian legislative assemblies. New Delhi: Routledge; 2009.
25. Jenkins, Richard (2010). Rethinking Ethnicity: Identity, Categorization and Power. *Ethnic and Racial Studies*, 17 (2). 197 – 223.
26. Jodhka SS. 1997. From “book-view” to “field-view”: social anthropological constructions of the Indian village. Work. Pap. No. 5, QEHWPS05, Queen Elizab. House, Oxford Dep. Int. Dev., Univ. Oxford. <http://www3.qeh.ox.ac.uk/pdf/qehwp/qehwps05.pdf>
27. Jodhka SS. 2012a. Caste: Oxford India Short Introductions. New Delhi: Oxford Univ. Press India
28. Karanth GK. 1996. Caste in contemporary rural India. See Srinivas 1996a, pp. 87–109
29. Lynch O. 1969. The Politics of Untouchability: Social Mobility and Social Change in a City of India. New York: Columbia Univ. Press
30. MOSSE, D. (2020). The Modernity of Caste and the Market Economy. *Modern Asian Studies*, 54(4), 1225-1271. doi:10.1017/S0026749X19000039
31. N. JOHN BENHAR. “„The Unseeables” the Struggle of Puthirai Vannar Community: An Interpretative Phenomenological Analysis.” *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*. vol. 24 no. 04, 2019, pp. 01-09.
32. Pande R. Can mandated political representation provide disadvantaged minorities policy influence? Theory and evidence from India. *Am Econ Rev*. 2003;93(4):1132–51.
33. Panini MN. 2001. Caste, race and human rights. *Econ. Pol. Wkly*. 36(35):3344–46
34. Pelle, M., Patel, S. & Leung, B. Affirmative Action and Subgroup Inequality in Higher Education: Adapting Indian Policy Solutions to the American Context. *Rev Black Polit Econ* 43, 233–243 (2016). <https://doi.org/10.1007/s12114-015-9227-0>
35. Prabakaran , S. W., & Jeevitha, M. P. (2020). Pro-poor maternity benefit schemes among the Arunthathiyar community in ... ResearchGate. Retrieved January 21, 2023, from <https://www.researchgate.net/publication/346094956>
36. Prakash N. The impact of employment quotas on the economic lives of disadvantaged minorities in India. Working papers, Dartmouth College, Department of Economics. 2009.
37. Rao C Dividing dalits: writings on Sub-categorisation of scheduled castes. Jaipur: Rawat Publications, Print; 2009.
38. RAO, N. (2015). MARRIAGE, VIOLENCE, AND CHOICE: Understanding Dalit Women’s Agency in Rural Tamil Nadu. *Gender and Society*, 29(3), 410–433. <http://www.jstor.org/stable/43669978>
39. Rath, R. & Sircar, N. C. (2010). The Cognitive Background of Six Hindu Caste Groups regarding the Low Caste Untouchables. *The Journal of Social Psychology*, 51(2). 295– 306.
40. Selvam, S., & Latha, R. (1970, January 1). Employment opportunities for scs and STS in Thoothukudi, Tamilnadu, India: Issues and challenges. Semantic Scholar. Retrieved January 21, 2023, from <https://www.semanticscholar.org/paper/Employment-opportunities-for-SCs-and-STs-in-India%3A-Selvam-Latha/1cf59d8dbd0778df873bcc92b27f1a4df3ecfb59>



41. Sharmila , R., Devika, J., Kalpana , K., Mary , J. E., Padmini , S., & Samita , S. (2021, March 8). Intersections of gender and Caste. Economic and Political Weekly. Retrieved January 21, 2023, from <https://www.epw.in/journal/2013/18/review-womens-studies-review-issues/intersections-gender-and-caste.html>
42. Silverberg J, ed. 1968. Social Mobility in the Caste System in India: An Interdisciplinary Symposium. The Hague: Mouton
43. Singh Y. 1994. Modernization of Indian Tradition. Jaipur, India: Rawat
44. Sivaram P. 1990. Social Mobility: A Sociological Study. New Delhi: Discov. Publ. House
45. Srinivas MN, ed. 1996a. Caste: Its Twentieth Century Avatar. New Delhi: Viking
46. Srinivas MN. 1956. A note on Sanskritization and Westernization. J. Asian Stud. 15(4):481-96
47. Srinivas MN. 1966. Social Change in Modern India. Berkeley: Univ. Calif. Press
48. Srinivas MN. 1987. The Dominant Caste and Other Essays. New Delhi: Oxford Univ. Press
49. Srinivas MN. 1991. Varna and caste. See Gupta 1991b, pp. 28-34
50. Srinivas MN. 2002. Collected Essays. New Delhi: Oxford Univ. Press
51. Srinivas MN. 2003. An obituary on caste as a system. Econ. Polit. Wkly. 38(5):455-59
52. Thangadurai, T., & Suriyan, K. (2020). Status of manual scavengers in Tiruchirappalli Town. ResearchGate. Retrieved January 21, 2023, from https://www.researchgate.net/publication/339850500_STATUS_OF_MANUAL_SCAVENGER_S_IN_TIRUCHIRAPPALLI_TOWN
53. Vaid, D. (2014, August 3). Caste in contemporary India: Flexibility and persistence. SSRN. Retrieved January 21, 2023, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2475573



UNIVERSITY OF MADRAS
MASTER OF SOCIAL WORK (MSW) DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

FIELD WORK - II

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hrs	Marks		
									CI A	External	Total
432C2D	FIELD WORK-II	Core Course - VIII	Y	-	-	-	6	12	40	60	100
Year		I									
Semester		II									
Prerequisites		Basic Understanding of Non Governmental Organizations									
Learning Objectives											
1	To observe and understand the dynamics of setting up a social welfare Organisation										
2	To observe the nature of their functioning and funding resources										
3	To learn about the staff functioning and of application of Social Work methods										
4	To document and learn the process of recording										
5	To Understand basic skills required to practice Social Work										

Course Outcomes

On the successful completion of the course, student will be able:

CO1 : . To integrate the classroom learning with field practice - the knowledge related to different field settings- establishment of NGO'S and its work with the beneficiaries

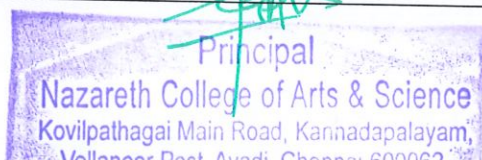
CO2 : To understand the nature of the NGO'S functioning and funding resources

CO3: To apply, evaluate and follow up appropriate methods of Social Work in the field

CO4: To apply and practice skills acquired in the process of dealing with clients and establish rapport

CO5: To assess the concept of field learning and learn about working in different settings

CO6: To learn the process of documentation and recording



UNIVERSITY OF MADRAS
MASTER OF SOCIAL WORK (MSW) DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Guidelines

Concurrent Field Work – 24 days

Student has to learn the following aspects

Organizational Profile: History of the Agency, Vision, Mission, Organization Chart, funding resources, different types of beneficiaries, its work in the field, networking agencies

Various Methods of Social Work – Skills required in the practice of Case work, Group Work, community organization and Social Research. Evaluation of the effectiveness of methods and critical review

Expertise of the Agency – Agency's success story, challenges faced, SWOT analysis, vision and mission

Services provided by the agency to the beneficiaries- Follow up and termination of services, adherence to professional ethics.

Social Legislation : Legislations applicable to the Organization, functioning of free legal aid clinics, legal support services to clients

Methods of Social Work need to be practiced

External Examination –VIVA VOCE EXAMINATION

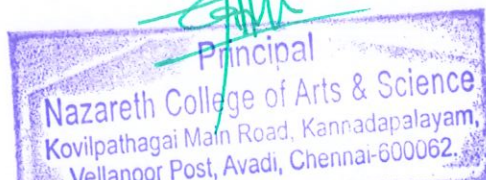
MAPPING WITH PROGRAMME SPECIFIC OUTCOME

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M
CO2	S	S	S	M	S
CO3	M	S	S	S	M
CO4	S	S	S	S	S
CO5	S	S	M	S	S
CO6	S	S	M	S	S

S – Strong

M – Medium

L - Low



INDIGENOUS LIVELIHOOD DEVELOPMENT THROUGH A RIGHTS-BASED
APPROACH: A CASE STUDY

Kalidass K., Dr. R. Baskar, Dhivya Bharathi V.S., Revathi Priya R., Palanisamy C.
Department of Social Work, Bharathiar University, Coimbatore, Tamil Nadu

Abstract

Indigenous people are the true owners of vast geographical forest landscapes. They are the unpaid conservators of the forest environment around the world. Indigenous people are never to do things that hurt their natural environment in the name of growth and development. These communities have followed a distinct socio-cultural lifestyle, and their lives have been interwoven with nature. Indeed, they see the forest as the god and goddess of the indigenous people. After the liberalization, globalization, and privatization (LPG) policies were put into place in India, indigenous life and livelihood rights became a human rights issue. At this point, massive resettlement activities were launched in the name of development, with no regard for indigenous livelihoods and rights to their life. With external forces, corporate entities and other organizations occupied indigenous forest land and rights. It has had an impact on their livelihood condition and opportunities, both directly and indirectly. After the pandemic lockdown, their sustainable livelihood was adversely affected due to the number of restrictions. In this condition, this study has investigated the current livelihood situation through a case study using a right-based methodology among the indigenous Irula tribal community living in the Western Ghats in Tamil Nadu.

Key Words: Indigenous people, Livelihood, Sustainable Development, Right-based Approach, Resettlement.

Introduction:

The right based livelihood development is a crucial aspects of tribal empowerment **Sankaran.S.R (2020)**. Conserving their land rights and traditional relationship with forest is essential for livelihood security of tribal **ILO (2019)**. Integrating rights and livelihood is much important.as it helps to understand the distribution of power and operation of political and governance **Conway, T (2002)**. Resource availability for a livelihood varies by location. It is a complex, intricate issue. **Kumar. B.G (2009)**. The focus of livelihood development theory has shifted from the central to the rural in recent decades (**Sandip Satpati**). The standard of living for tribal people has been negatively impacted by widespread poverty and unstable employment prospects. D. M. **Basavarajaiah (2020)**. The indigenous people's way of life has primarily depended on their particular potential and living conditions (Pradhan Adikant). Every tribal community has specific traditional survival knowledge. **Rasal,.V. (2021)** On their own land, the majority of indigenous communities engage in agriculture and similar activities some tribal groups have traditional knowledge that has facilitated protect and conservation of natural resources and subsistence survival of tribes. **Singh, R. K (2010)**. But, Only a small number of other indigenous communities rely on forest resources.. In order to support their livelihood growth, they are gathering non-timber forest products such as honey, amla, certain seeds, and herbal plants. **Ajaz-ul-Islam, M (2013)**. building sustainable livelihood framework is a lens of tribal and rural development **Nikolakis, W (2015)** Livelihood is a flexible terminology related through geography, social condition, occupation and dynamic patterns **sandip satpati (2021)**.the livelihood frame work is identified by available assets in residing region such as social, economic, natural an financial capitals .the participants deployed their skill and strategy and action through produce livelihood **Ellis F (2005)** the disadvantaged communities livelihood opportunity sustainably expands.

Methods:

In our study case study approach is used as qualitative study pattern **Plagányi, É. E.,(2013)**. The case study carried out to describe the intensive, systematic and scientific investigation, way of individuals in a tribal group **Heale, R., & Twycross, A (2018)**. The case studies helps to understand the complex phenomena in the natural setting and understanding them intensively and more in-depth insight in the

phenomena. Finally themes were arisen from assertion and analysing the fact of the indigenous tribal livelihood development phenomenon Barau, A. A (2019).

Sample: The sample of this study consist of tribal women over the age of 20 years to 45 years who speaks Tamil and Irula (tribal) language. Who have not included the same community members residing in outside the tribal hamlet and non-tribe inhabitants of the s elected tribal village. By the way collect more detailed information about the phenomena of action explained. This attempt was providing various information like age, resident educational status. Spouse educational status. Working condition of the respondent and spouse, type of family were included in this study.

Sampling Strategy: In order to determine that tribal person have different work experience in own agriculture field. Outsider's agriculture land, forest, fishing field and other areas in Western Ghats Siruvani hills, Coimbatore district. Due to pandemic lockdown could not reached the tribal hamlets directly. Due to COVID-19 pandemic the district administration and tribal village leaders had been followed the social isolation and not allowed the outsiders into tribal hamlets. After release the lockdown the researcher has met face to face to the respondents in their hamlets. The respondents were selected randomly .the first interview was begin with tribal women farmers regarding their livelihood condition following that second and third tribal women farmers were interviewed by the researcher . In the qualitative study, the numbers three case studies were enough for collecting adequate information. The participant were given the repeated information the interview had been stopped. The study was little complicated with collected the information from tribal women who have routine household work during morning and evening .in-between they were engaged in money earing works. All three case studied were completed within eight days after the releasing pandemic lock-down.

Setting: The state of Tamil Nadu is composed of 38 districts with the population ranging from 7.5 crores. In order to determine the livelihood condition of tribal women in selected tribal hamlets in Western Ghats in Coimbatore district after releasing the corona lockdown respondents were selected in randomly selected in each three villages named as Singampathy, Sadivayal and Sarkarppotathy with different population range in Coimbatore

Data collection method:

The data was collected through semi structured interview questionnaire. This questionnaire consist of open ended questions in the accordance of the study. The questionnaires' has consisted four sections .firstly socio- demographic questions which would help to communicated to the tribal people that would help to transition to the core topic of the study. The second section consisted the knowledge of tribal rights and livelihood activities the third section consisted barriers and obstacle would face throughout the livelihood and the final section included the questions about what are the livelihood development activities were done for enhance the livelihood option. Before starting the main study the researcher was visited two times per three weeks to the tribal hamlet. Try to build enough good rapport with tribal people and tribal leaders in each village. The consistent and understand ability was checking before the main study met two tribal women formers and one tribal village leader and temple priest who had similar characteristic with the sample group. First participant was founded by the help of village leader. After found the first respondent, other respondents were reached. The researcher was communicated through phone before meeting the respondents, fixed the timing by the respondent based on their convenience the researcher met them in farming field , fishing beds , their homes and cattle rearing areas. The researcher was informed about the purpose of the study to the participants through phone calls before met them. Than moving to convenient place so as to not affected by the other intrusions during the interview. The respondent and one more researcher were participated during the meeting. One researchers was asked questions and leading the conversations another researcher was recorded their voice and observation about voice modulation, responses and important notes. The interview was nearly taken for 40 -50 minutes.

After completing the interview process simultaneously data analyses was started. All five interviews data analyses was conducted within one weeks from the date of its occurrence. With the help of Tamil and tribal language export the data was transcript which was followed the six steps of the qualitative

interview data. Firstly read the transcript secondly annotate the transcript, thirdly conceptualize the data and create categories fourthly segment the data than analyses the segments and finally write the result.

First the entire interviews were read by the researcher number of time when he got a clear-cut idea of the overall content of the text. Secondly the text of each content classified into units of meaning. Every paragraphs and sentences are consisted tribal sematic unit. Thirdly condensed meaning of all the units were summarizes and labelled with suitable codes. Fourth codes were interpreted and compared with their similarities and distinction through which sub themes were created. Finally three main themes were found combined with 9 sub themes were determined. The themes were created within the conceptual frame work. Along with the respondents statements were quoted under the study questions.

Result:

As he result of the thematic analysis of the case study interview contain four main themes

- 1) *Experiencing poor livelihood opportunities* 2) *Poor knowledge about their tribal rights*
- 3) *Lack of Marketing Knowledge* 4) *Found out the way for sustainable livelihood,*
- 5) *Barriers and Challenges.*

Livelihoods of before the pandemic lockdown:

Participants does not know about the covid-19 and its effectiveness. They were consider it is a common fever even did not think about it had spread all over the world. After the evaluation of the knowledge and attitude of the about the covid 19 pandemic and impact of the livelihood.

Indian constitution has given special protection for weaker section people particularly schedule caste and schedule tribe in India. Thereby article 46(15) stated that government has a responsibility to protect and enhance the educational and economic interest of the tribes. Following that government, nongovernment organization and tribal community organization have taken various measures for enhance and enrich their livelihood condition through developmental and intervention programs

Socio- demographic characteristics of the participants

Table-1

S.No	age	Educational level	Occupational status	Partners occupation	Family structure	Major livelihood	Seasonal livelihood
1	53-P	Nil	Farmer+ priest	Farming = cattle rearing	Joint	Priest and farmer	farming
2	39-VC	8 th	Daily wager	Agri labour	Nuclear	Daily wage & farming , Cattle rearing	
3	39 MR	7 th	Daily wager	Agri labour	Nuclear	Daily wage	Honey, collection of non-timber forest.
4	50 TD	2 nd	Daily wager	Agri labour	Nuclear	Daily wage	
5	44 CS	4 th	Daily wager	Non timber Forest products	Nuclear	Daily wage	

Case study -1

Respondent- (P) works as a village priest and is engaged in agriculture. However, he does not possess an individual land title (patta). The entire 54-hectare cultivated land is covered by a community patta, originally granted by the British rulers in the name of the village. Due to financial challenges, he had

to overhang agricultural activities for the past ten years. Despite this, he remained eager to cultivate tapioca and vegetables.

His agricultural field is located in a nearby reserve forest area. Through persistent interest and effort, he successfully achieved a substantial yield of tapioca, which he then sold in the market, branding it as cultivated through organic methods. As a result, he reaped a profitable return compared to the inorganic market prices. This success signifies a positive outcome derived from his dedication to organic farming in a challenging environment.

Case study-2

Respondent- (VC)", a daily labourer, was married at the age of 22 to a 28-year-old man from the irula tribal community, she works in a government department on a temporary basis. Both husband and wife serve as the breadwinners of their family, which includes the respondent's mother-in-law. After a long gap, they had a girl child. The family owns 2.5 hectares of fertile agricultural land in their residing village. Decades ago, government organizations supported them in agriculture. They were at first interested in cultivating sammanthi flowers on their land in collaboration with a private broker from a perfume company. Despite investing effort, time, and protection from wild animals and elephants, the middleman did not return the amount properly. This led to a loss of hope and belief in outsiders, and they became resistant to anyone claiming to be involved in tribal development. After a prolonged period, a fieldwork team worked tirelessly to create awareness and build trustworthiness among the tribal community in SP village. Eventually, four tribal families, including the respondent's, were selected to receive benefits. Through intense field visits with the assistance of village leaders and officials, the research team successfully gained the trust of the tribal community. These families were encouraged to cultivate turmeric through organic agriculture practices. Specialist SR provided training on preparing panchkavya and developing a marketing strategy for selling turmeric directly in the market without involving middlemen. As a result, the VC family earned a profit of 48 thousand from their turmeric yield. This success marks a positive shift from their previous negative experiences with outsiders and showcases the impact of a rights-based livelihood approach."

Case study 3

Respondent -3(MR) is a well-known honey collector in the surrounding villages. Despite not having formal education, he married at the age of 21 to his aunt's daughter, who has completed a nursing diploma. The couple has two children, aged 5 and 2. MR engages in honey collection and gathers other non-timber forest products annually, primarily during the months of March, April, and May. Typically, a group of five to six individuals collaborates to collect honey in the forest. These collective efforts sometimes require them to stay in the forest for two to three days. Utilizing traditional instruments and relying on indigenous knowledge, MR and his team carry out the honey collection. However, prior to intervention, they lacked awareness regarding the market price of natural honey. The situation changed with the involvement of various non-governmental organizations and educational institutions in awareness campaigns. As a result of these interventions, MR and his group gained valuable information about the market value of honey and learned effective selling techniques. This newfound awareness has likely improved their ability to make informed decisions and secure fair compensation for their natural honey in the market.

Case study -4:

Respondent- 4 (TD) says, on Non-timber product collection has emerged as a vital livelihood opportunity for the tribal community within the forest. With the approval of forest rights for the tribal people, they engage in collecting available products, subsequently selling them in the market, and benefiting from TRIFED initiatives that contribute to the improvement of their livelihoods and overall lifestyle. Amla collection stands out as a key annual activity, particularly in selected forest areas surrounding the village that are rich in gooseberry trees. The forest gooseberries hold significant market value, and each year, the tribal development committee organizes auctions for various non-timber products such as gooseberries, tamarind, shikhaikai, and myrobalan (kadukkai). This process is carried out formally, without the influence of political or personal factors from both the community members and external individuals. The tribal community engages in the auction process independently, and the bulk collections are eventually sold to traders. This approach not only ensures a fair and

transparent market transaction but also empowers the tribal community by allowing them to benefit directly from the economic value of the forest resources they collect. The sustainable utilization of non-timber forest products plays a crucial role in the economic upliftment of the tribal community, fostering a balance between conservation and livelihood enhancement.

Case study -5

Respondent -5 (CS) says, Lantana, an invasive weed plant, has increased extensively in the forest areas of this region, prompting the forest department to expend both funds and human resources on its removal. Despite recurrent efforts, the plant quickly regenerates, causing adverse effects on the biodiversity of the native soil and disrupting the movement of wild animals across different forest areas. Recognizing the challenges posed by lantana, an innovative solution emerged through wood processing technology, transforming this invasive species into a valuable resource for crafting furniture. Three years ago, a private educational institution team visited our village to provide training on crafting lantana furniture without significant investment. Initially hesitant, I observed as nearby villagers embraced the opportunity and underwent training, creating beautiful lantana furniture under the guidance of a specialist trainer from Bangalore. Intrigued by their success, I approached the project associate and coordinator in the nearby village, expressing my interest in learning the technique. Eventually, a group of 12 individuals, including both women and men from our village, joined together. We began collecting lantana canes from the forest, processing the raw material, and skilfully crafting furniture. Remarkably, this venture required minimal investment, as I only purchased nails and some tools from the market. Storage posed no significant challenge, eliminating the need for a dedicated space.

The success of our lantana furniture venture has been evident, with numerous orders pouring in from outside. Despite lacking formal schooling, I now enjoy a substantial monthly profit. Learning this technique has not only provided economic benefits but has also brought immense satisfaction and happiness.

Theme: 1) experiencing poor livelihood opportunities

Despite the abundance of natural resources in the tribe's residing area, there is a notable lack of awareness on how to connect these resources for improving livelihoods. Before participating in the training program, they had no developmental insights regarding livelihood enhancement. The training program proved to be transformative, equipping participants with valuable technical knowledge and skills. This new expertise extends to crafting various designs of lantana wood products and exploring additional livelihood opportunities. The training has not only increased awareness but has also empowered the tribal community to make more informed and sustainable use of their local resources, flooring the way for improved economic prospects and overall well-being. Provide technology based information communication platform and built bridge the gap between mainstream to tribal.

Theme 2) Poor knowledge about their tribal rights:

The respondents are not aware of their common civic rights, lacking sufficient information about their livelihood rights. While they are aware of the reservation benefits for tribal communities, they lack precise knowledge of the percentages allocated for education, employment, and welfare benefits. Consequently, tribal individuals are granted the freedom to reside within forest lands and maintain autonomy in their living areas. However, this contrasts with the reality, as forest lands are encroached upon by outsiders. Compounding the issue is the respondents' lack of awareness about their land rights, highlighting a critical gap in understanding and access to information that is essential for safeguarding their rights and ensuring equitable treatment.

Theme -3: Lack of Marketing Knowledge:

Every year, the tribal community engages in the collection of non-timber and honey, among other forest products. However, local leaders with dominance and influential individuals misguide and manipulate the tribal members by offering unstable gifts. As a result, the tribal community ends up selling their resources at a significantly lower price to brokers. Fortunately, with the introduction of training programs, there has been a positive impact on the awareness of their rights among the tribal members. This increased awareness is a crucial step towards empowering the tribal community to

make more informed decisions and resist manipulation, ultimately contributing to the protection of their resources and livelihoods. Now they have basic marketing principles, pricing strategies, and market trends. These efforts ensure direct access, reducing dependence on intermediaries.

.Theme -4: Barriers and Challenges:

Unclear Land rights and awareness lead to land disputes among the same community and help non-tribal encroach on the land. It's affecting their traditional agriculture and livelihood. Lack of awareness about the Forest Act leads to exploitation and manipulation by outside entities. Lack of marketing knowledge gives the path to middlemen entering into tribal livelihoods and offering low prizes for their products. Limited access to quality education hampered tribal knowledge and technical skill development in the current scenario.

Theme-5: Found out the way for sustainable livelihood

Finally, the tribal community members have some catalysts for the empowerment of their livelihoods through their own resource utilization. Gives knowledge of eco-friendly marketing and enhances marketability.

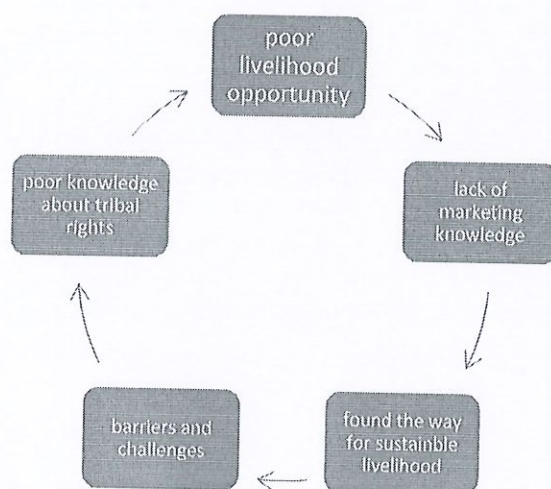


Figure 1 shows the causes of the unreached sustainable livelihood of the tribal community.

A rights-based approach demolishes all the identified hurdles, empowers the tribal community, and enhances their sustainable livelihood opportunities through continuous training and monitoring efforts by government organisations, tribal development non-governmental organisations, tribal volunteers, and educational institutions.

Conclusion: The results presented significant challenges faced by tribal communities, such as a lack of awareness about their civic and land rights, exploitation by nontribal, and limited marketing knowledge. Despite living in areas rich in natural resources, tribal members often find themselves at a disadvantage, selling their products at lower prices and facing encroachment on their lands. Participating in the training program to raise awareness among tribal communities about their rights, including those related to forest resources and fair market practices enhanced the technical skills marketing strategies, and other livelihood options. However continued efforts of providing training and monitoring ensuring their livelihood in sustainable manner.

Authors notes:

K.K and R.P formulated the research designed the study. K.K., R.V, DV and volunteer tribal welfare worker carried out the study. K.K and C.P analysed the data (information) and interpret the findings. K.K write the manuscripts, research team members gave some valuable inputs regarding the study and helping the data collection, reviewed this content. The study was conducted according to the research methodology guidelines. Written informed consent was obtained from all the participants.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to research, authorship and/or publication of this article.

Funding and Acknowledgement

Authors thank the study participants for their cooperation and University Grants Commission & Ministry of Social Justice and Empowerment for providing fund for the study under Junior Research Fellowship [(27176/ (NET JULY-2016-17)]. Moreover the author acknowledge the support of the staff at tribal rights developmental, Non – governmental organization staffs in the Nilgiris district, Tamilnadu. The author thanks the participants for their time and interest in the study. Furthermore, I would like to thank other research team members and colleagues given fabulous discussion about the study in the areas of research methodology and content of the study

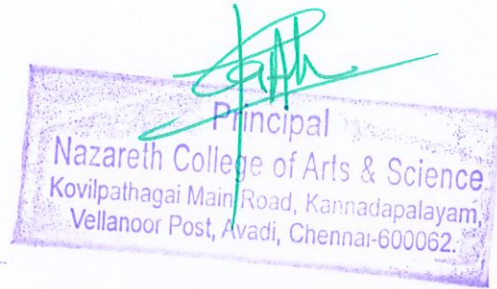
References:

1. Ajaz-ul-Islam, M., Quli, S. S., Rai, R., & Sofi, P. A. (2013). Livelihood contributions of forest resources to the tribal communities of Jharkhand. *Indian journal of fundamental and applied life sciences*, 3(2), 131-144.
- 2) Andrea corwell (2004) what is rights based approach all about? Perspective from international developmental agencies. www.researchgate.net/publication/237390540.
- 3) Barau, A. A., Afrad, M. S. I., Rahman, M. S., & Rahman, M. A. (2019). Indigenous peoples' livelihood practices in south-eastern Bangladesh and the question of sustainability. *Sustainable Development*, 27(4), 809-816.
- 4) Basavarajiah, D. M., Narasimhamurthy, B., Bharathi, M., & Naik, J. (2020). Tribal livelihood status in Western Ghats. *Fores Res*, 9, 234.
- 5) Candelaria, S. M. (2012). *Comparative Analysis on the ILO Indigenous and Tribal Peoples Convention No. 169, UN Declaration on the Rights of Indigenous Peoples (UNDRIP), and the Indigenous Peoples' Rights Act (IPRA) of the Philippines*. Geneva: ILO.
- 6) Conway, T., Moser, C., Norton, A., & Farrington, J. (2002). Rights and Livelihoods Approaches: Exploring Policy Dimensions-ODI Natural Resource Perspectives 78.
- 7) Datta, J., Gangadharappa, N. R., Biradar, G. S., & Kendra, G. K. V. (2014). Livelihood status of tribal people practicing shifting (jhum) cultivation in Tripura state of North-East India. *Tropical Agricultural Research*, 25(3), 316-326.
- 8) Ellis F and H Ade Freeman (2004) Rural Livelihoods and Poverty Reduction Strategies in Four African Countries. *The Journal of Development Studies*, 40, 1-30
- 9) Heale R, Twycross A. What is a case study? *Evid Based Nurs*. 2018 Jan;21(1):7-8. doi: 10.1136/eb-2017-102845. Epub 2017 Nov 16. PMID: 29146764.
- 10) International labour Organization (2009), "indigenous and tribal people rights in practice "
- 11) Kumar BG, Sendhil R, Venkatesh P, Raja R, Jayakumar V and Jeyakumar S (2009). Socio-Economic impact assessment of livelihood security in agriculture, animal husbandry and Aquaculture on the tsunami-hit lands of andaman. *Agricultural Economics Research Review* 22 (Conference number) 483-494.
- 12) M.A. Islam, R. Rai & S.M.S. Quli (2014) Manpower Potential, Employment Status and Forest Based Livelihood Opportunities among Tribal Communities of Jharkhand, India, *Journal of Human Ecology*, 47:3, 305-315, DOI: [10.1080/09709274.2014.11906765](https://doi.org/10.1080/09709274.2014.11906765)
- 13) Nikolakis, W., & Grafton, R. Q. (2015). Putting Indigenous water rights to work: The sustainable livelihoods framework as a lens for remote development. *Community Development*, 46(2), 149-163.
- 14) Plagányi, É. E., van Putten, I., Hutton, T., Deng, R. A., Dennis, D., Pascoe, S., ... & Campbell, R. A. (2013). Integrating indigenous livelihood and lifestyle objectives in managing a natural resource. *Proceedings of the National Academy of Sciences*, 110(9), 3639-3644.
- 15) Rasal, V., Dasgupta, S., Yadre, S., & Shukla, S. P. (2021). Fishing techniques and gears developed by tribal communities around Bargi Reservoir in Madhya Pradesh, India.
- 16) Sankaran .S.R.(2020),Securing forest rights and livelihood of tribals challenges and way forward, Ministry Of Rural Development Government Of India. http://nirdpr.org.in/nird_docs/srsc/srsc310820n.pdf

17) S Satpati, K Kumar Sharma (2021) "livelihood option and livelihood security among tribal in souther western plautea and high land region in west Bengal" journal of land and rural studies, vol-9, Issue-1, Sage Publication, page 119-139.

18) Singh, R. K., Pretty, J., & Pilgrim, S. (2010). Traditional knowledge and biocultural diversity: learning from tribal communities for sustainable development in northeast India. *Journal of Environmental Planning and Management*, 53(4), 511-533.

19) Smyth, D., & Whitehead, P. (2012). Reflections on researching and developing Indigenous livelihoods on country. *Charles Darwin University, Darwin*.



ISSN : 0970-7603

UGC-CARE Approved Refereed-Peer Reviewed Journal



भारतीय शिक्षा शोध पत्रिका

BHARATIYA SHIKSHA SHODH PATRIKA

Vol. 43, Issue 1(VIII), January – June: 2024



भारतीय शिक्षा शोध संस्थान

सरस्वती कुंज, निराला नगर, लखनऊ-226020 (उत्तर प्रदेश)

Bharatiya Shiksha Shodh Sansthan

Saraswati Kunj, Nirala Nagar, Lucknow-226020 (Uttar Pradesh)



18	ARTIFICIAL INTELLIGENCE STRUCTURING CONTEMPORARY CULTURAL VALUES IN HUMAN CREATIVITY	125
19	ASSISTIVE - ADAPTIVE DEVICES AND TECHNOLOGIES IN INCLUSIVE EDUCATION	131
20	EFFECT OF PACKAGING ON CONSUMER BUYING CHOICE OF SELECTER CONSUMER GOODS	135
21	A STUDY ON USE OF MOTIVATIONAL TOOLS TO IMPROVE EMPOLYEES SIGNIFICANCE AND OUTCOMES OF INDUSTRIES EFFICIENCY	138
22	STUDY ON JOB SATISFACTION OF WORKERS IN TEXTILE INDUSTRY SPECIAL REFERENCE TO TIRUPPUR	142
23	A STUDY ON BLOCKCHAIN TECHNOLOGY AND AWARENESS OF E-RUPEE	147
24	UNLOCKING SECURE TRANSACTIONS: A COMPARATIVE STUDY OF BIOMETRIC MODALITIES FOR PAYMENT AUTHENTICATION	150
25	"A STUDY ON CUSTOMERS PERCEPTION TOWARDS HEALTH INSURANCE"	156
26	EXERCISING OF EXCELLENT CRM PRACTICES: A KEY TO ATTAIN CUSTOMER SATISFACTION IN THE FMCG SECTOR	163
27	A STUDY ON REASON FOR PREFERRING ONLINE SHOPPING THAN TRADITIONAL SHOPPING WITH REFERENCE TO ERODE CITY	168
28	ANALYSIS OF THE IMPACT OF HEALTHTECH STARTUPS ON RURAL HEALTHCARE	173



ARTIFICIAL INTELLIGENCE STRUCTURING CONTEMPORARY CULTURAL VALUES IN HUMAN CREATIVITY

Dr.K.Suresh Assistant professor Department of visual communication Nazareth college of arts and science 9003091162 sureshguruboy@gmail.com

Abstract

Technology has been developing since the dawn of human civilization. Looking closely at each period, the human race has been operating at the highest level of technology for that time. At this stage, human creativity and culture have worked hand in hand with new technology to shape human life.

Accordingly, with the help of globalization, human creativity, culture and technology are working simultaneously to make possible the impossible event of changing local culture. At this contemporary stage, in order to take this to the next stage, artificial intelligence technology is working in modern times.

The study explores how the invention and creation of such artificial intelligence and culture have a complex relationship. For this purpose, ten news articles on the characteristics, functionality and dynamics of artificial intelligence on news websites are taken as random samples.

Content analysis is done from the theoretical perspective of South African sociologist Stanley Kogan's 'moral panic'. Through this, it reveals how artificial intelligence can shape contemporary cultural values in human creativity.

Keywords: Artificial intelligence, Culture, creativity, Stanley Cohen, Moral panic.

1.Introduction

Human creations vary from time to time depending on the lifestyles they touch. In particular, the living environment is changing due to technological development. In that sense, artificial intelligence operates through algorithmic code and is changing the contemporary living environment. Also, human cultural characteristics are also being transformed at many levels. Thus, cultural creativity is also having an impact. However, knowing the potential elements of artificial intelligence as a threat to human creativity is of contemporary importance. So, by the philosopher Stanley Cogan's theory of 'Moral Panic'.

What is artificial intelligence?

Artificial intelligence is a computer. A method of making a computer-controlled robot or a piece of software think as intelligently as a human mind. Artificial intelligence works by studying human brain patterns and analyzing the cognitive process. These AI systems are capable of using past experiences to inform future experiences. The highest and most sophisticated level of artificial intelligence is self-awareness. Such technology does not yet exist. This technology will definitely be a revolution.(www.simplilearn.com)

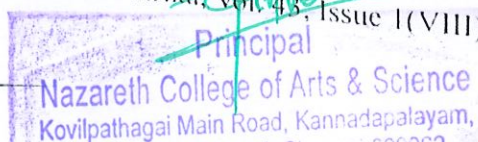
Algorithm

The definition of an algorithm is "a set of instructions to be followed in calculations or other operations." This applies to both mathematics and computer science. So, at the essential level, an AI algorithm is the programming that tells the computer how to learn to operate on its own. (www.tableau.com)

Culture

culture is the full range of learned human behavior patterns Tylor (Edward Burnett, 1881)

Bharatiya Shiksha Shodh Patrika, Vol. 43, Issue I(VIII), January – June: 2024



2.Objectives:

- To Know the Artificial intelligence-based social structure
- To Know the Artificial intelligence-based cultural Change
- To Know the Artificial intelligence-based creativity

3.Research Design:

The living environment is changing according to the changing business patterns of man. Due to this, there is a change in the cultural character of man. At this stage, all fields are undergoing rapid change is a result of the contribution of artificial intelligence which is considered as the pinnacle of contemporary technological development. As a result, the living environment of man has changed, influencing the cultural character and bringing about a new evolution in the creative character. That is, now artificial intelligence innovations, creativity, and culture have a complex relationship. In order to know this, research is being done on artificial intelligence that constructs cultural values in human creativity. For this purpose, ten news articles related to the characteristics, functionality, and strength of artificial intelligence on the news website are taken as a random sample. It is known to analyze the content and analyze it from the theoretical point of view of Stanley Kogan's 'Moral Panic'. Through this, it reveals how artificial intelligence can shape contemporary cultural values in human creativity.

Moral Panics

The concept of moral panics was first popularized in 1972 when Stanley Cohen wrote 'Folk Devils and Moral Panics: The Creation of the Mods and Rockers'. A condition, episode, person or group of persons merges to become defined as a threat to societal values and interests. Its nature is presented in a stylized and stereotypical fashion by the mass media. (Stanley Cohen, 1972, P.46)

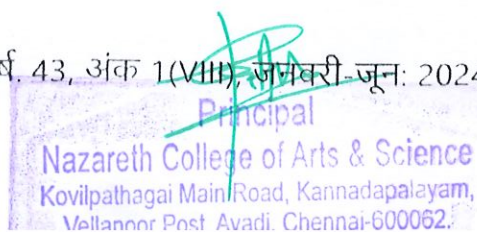
Cohen defined his five stages of moral panic as: 1. Something or someone is defined as a threat to values or interests, 2. This threat is depicted in an easily recognisable form by the media, 3. There is a rapid build-up of public concern, 4. There is a response from authorities or opinion makers, 5. The panic recedes or results in social changes". (www.revisionworld.com)

4.Research Information:

1. Imbue raises \$200M to build AI models that can 'robustly reason'(www.techcrunch.com)
2. Elon Musk has these three goals for his AI Company (www.indiatimes.com)
3. Google responds to bias accusations in its Gemini AI image generator by turning off image generation of people, apologizing, and planning to launch an improved version while addressing tuning and cautiousness issues.(www.timesofindia.indiatimes.com)
4. AI is great at coding, but there are some massive caveats (www.zdnet.com)
5. AI Is Building Highly Effective Antibodies That Humans Can't Even Imagine (www.wired.co.uk)
6. FIRST-EVER AI INTERVIEW OF A KERALA MINISTER MARKS A NEW ERA IN REPORTING (www.yourstory.com)
7. ChatGPT creator Sam Altman says jobs will go away because of AI, it will not just be a supplement for humans.(www.indiatoday.in)
8. AI is rewriting rules of \$200 billion games industry (www.deccanherald.com)
9. Nvidia could mint \$300 billion in AI revenues by 2027, 10 times the expected takings this year, analyst says (www.businessinsider.in)
10. Woman in deepfake video with Rashmika Mandanna's face breaks silence: I'm deeply disturbed and upset by what is happening (timesofindia.indiatimes.com)

5.Analysis

Artificial intelligence is seen as something distinct from human activity, human consciousness and creativity. Artificial intelligence technology is making inroads into both of these.



"According to Isaacson, the third goal that Musk gave the team was even grander. "His over-riding mission had always been to assure that AI developed in a way that helped guarantee that human consciousness endured," says Isaacson. Musk believes that to ensure human consciousness endures is to create "a form of artificial general intelligence that could "reason" and "think" and pursue "truth" as its guiding principle. You should be able to give it big tasks, like "Build a better rocket engine." Thus, there may be widespread apprehension about the impact artificial intelligence will have on human activity" (www.techcrunch.com)

Artificial technology is being built to intrude on human rational functions. Imbue says that its models are "tailor-made" for reasoning in the sense that they're trained on data to "reinforce good reasoning patterns," and using techniques that spend "far more compute during inference time" to arrive at "robust conclusions and actions." But the given information can be deciphered. Therefore, while the question arises as to whether the act of reasoning is possible, it is possible that the human being is capable of reasoning by taking in the information he sees. But while there are questions about whether artificial intelligence will work for search and information, there are fears that artificial intelligence will compete with people's imaginations.

Likewise, one's image-based identity is altered as artificial intelligence creates another image that resembles one's image and their body movements. Also, the characteristic self is lost to technological factors. Artificial intelligence technology is trying to make it even better every day.

'we did not want gemini to refuse to create images of any particular group. and we did not want it to create inaccurate historical or any other images. so we turned the image generation of people off and will work to improve it significantly before turning it back on. This process will include extensive testing' (www.indiatimes.com)

There are widespread fears of the dangers of loss of self as artificial intelligence technology transforms human nature.

"Woman in deepfake video with Rashmika Mandanna's face breaks silence: I'm deeply disturbed and upset by what is happening" (www.timesofindia.indiatimes.com)

Artificial intelligence is known to act as a threat to property as well as human emotions. There have been fears that this could create tension over the need for protection of intellectual property to create confusion, questioning the creative capacity that distinguishes humans from technology.

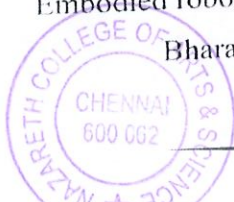
While software professionals are embracing AI as a power tool to build, launch, and update applications, there is also nervousness about its intellectual property and security implications. (www.zdnet.com)

Robot called machine man began to perform human functions. Due to this, the manual labor workers in many industries also lost their jobs. In this case, the next step for robots is artificial intelligence. Technology is beginning to take over manual and cognitive tasks. That is, the robot will act according to the given command. But artificial intelligence is meant to act automatically with given cues.

"Biscuit factory in South London, giant mixers and industrial ovens have been replaced by robotic arms, incubators, and DNA sequencing machines. James Field and his company LabGenius aren't making sweet treats; they're cooking up a revolutionary, AI-powered approach to engineering new medical antibodies" (www.wired.co.uk)

Voice-based assistants, such as Amazon's Alexa, vocally respond to human questions and requests. Embodied robots interact verbally and nonverbally with people (**Peter and Kühne, 2018**).

Bharatiya Shiksha Shodh Patrika, Vol. 43, Issue 1(VIII), January – June: 2024



The next step in the development of artificial intelligence is causing the next level of anxiety among people. Artificial intelligence is working to compete with human intelligence. Dialogue is the exchange of information through questioning. In such question-and-answer conversations, artificial intelligence can be used to make instant decisions and interact with journalists who are trained to ask branch questions in real time.

Kerala's Minister of Public Works and Tourism, P.A. Muhammad Riyas, was interviewed by an AI news presenter for the first time. The occasion, hosted by Channeliam.com, was indeed a significant leap in the use of AI in news production. Channeliam.com, renowned for launching India's first AI news anchor, Pragathy, took one step further by orchestrating this ground-breaking interview". (www.yourstory.com)

Such a nature of artificial intelligence can lead to fears that the tendency to compete with human thinking or to act aggressively will create a superhuman environment. More so, artificial intelligence-based creative content is running. That is, it adapts, organizes and operates on information given in the dialectics of software, algorithms, and mathematics.

Research regarding AI has focused on how to reproduce aspects of human intelligence, including the ability to communicate, within the machine (**Frankish and Ramsey, 2014**).

In general, any development of a technology will only affect the nature of that technology. But artificial intelligence is not just impacting one particular field, but has taken a foothold in all fields where human performance participates. In particular, artificial intelligence has taken root in the fields of administration, politics, entertainment, medicine and sports.

Executives and politicians across the world worry about the havoc that next-generation artificial intelligence will wreak on industries from finance to health-care. For the \$200 billion games sector, the revolution has already begun. (www.deccanherald.com)

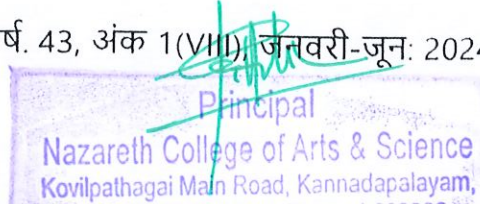
Such a revolution in artificial intelligence has the potential to make a difference in human life. Thus, cultural change can occur without any consent. This change will also affect human occupational change. The human machine may have reduced the number of workers. But artificial intelligence will change the very nature of work. Thus, not only the unemployment situation but also the new type of work situation may arise.

ChatGPT creator Sam Altman says 'some jobs' will be going away due to AI but new ones will be created as well. Such an environment can also have an impact on human life. Artificial intelligence may cause normative fears of total job loss.

ChatGPT creator Sam Altman said, "Every tech revolution leads to job change. In two generations, we can adapt to any amount of labour market change and there are new jobs and they are usually better. That is going to happen here, too. Some jobs are going to go away. There will be new, better jobs that are difficult to imagine today" (www.indiatoday.in)

Legal action is being taken as a fundamental effort to regulate artificial intelligence, which can cause great ethical concerns in humanity's politics, society, family, creativity, industry, sports, and entertainment.

Elon Musk, Sam Altman, Mark Zuckerberg, Sundar Pichai and others discussed artificial intelligence with lawmakers, as tech companies strive to influence potential regulations. (www.indiatimes.com)



However, there is no absolute guarantee that they will strengthen the smooth relationship between human and artificial intelligence. In such a situation, artificial intelligence is traveling with human race, artificial intelligence, with ethical fears.

Stanley Cohen's theory of moral panic, "a condition, episode, person or group of persons emerges to become defined as a threat to societal values and interests. its nature is presented in a stylized and stereotypical fashion by the mass media".

Every move of artificial intelligence has caused moral panic to the human being through the mass media. That is, every development in artificial intelligence has the potential to impact human activity, making it vulnerable to multi-pronged attack. For this, artificial intelligence is built to process and process given information to compete with human thinking. Due to this, there is a moral fear about artificial intelligence due to the news about the change in human life, unemployment, loss of self, reduction in vigor of thinking, limitation of creative energy, multi-pronged attack in many fields through the media.

Every time touch technology development is changing. The dynamics of human life also passes through it. However, the rapid diffusion of technology is causing ethical panic in human thinking. Artificial intelligence will bring many changes in human life like the arrival of machine man. However, the dominance of a particular technology, such as artificial intelligence, in many fields has generally raised ethical concerns.

The machine can be operated with given codes. Software, machine man etc. have been its manifestation. But these did not touch human consciousness and creation. But artificial intelligence is being built to compete with human creations. Is this possible? Does it work with feeling? is the most important question in science. However, the dialectic of human and technological development has come so far in adapting to each other. But initially there was an ethical apprehension. They can travel in an orderly manner when they are categorized by a regular schedule.

6. Findings:

- * Artificial intelligence based social structure is causing ethical panic in human thinking. They are enabling the interoperability of humans and machines in industry, creativity, and life.
- * Artificial intelligence-based culture is about mechanically altering living environments, habits, and activities. Thus, food, dress, speech, language, and tradition are known to play a role in contributing to mechanical nature.
- * Powered by artificial intelligence based creative content. That is, the information given in the dialectic of software, algorithm, mathematics is adapted, organized and aligned information is given. Thus, information-dependent dialectics operates.

7. Reference

- Burnett, Edward (1881). Anthropology an introduction to the study of man and civilization.
- Cohen, Stanley. 1972. Folk Devils and Moral Panics: The creation of the mods and Rockers. Deviance and moral panics. Routledge. London and Newyour P.46
- <https://revisionworld.com/a2-level-level-revision/media-studies-level-revision/moral-panic-theory>
- Peter J, Kühne R (2018) The new frontier in communication research: why we should study social robots. Media and Communication 6(3): 73–76.
- Frankish K, Ramsey WM (eds) (2014) The Cambridge Handbook of Artificial Intelligence. Cambridge: Cambridge University Press.
- <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-artificial-intelligence>



Bharatiya Shiksha Shodh Patrika, Vol. 43, Issue 1(VIII), January – June: 2024

Nazareth College of Arts & Science
Kovilpathagai Main Road, Kannadapalayam,
Valluvarpet, Andhi, Chennai 600062

<https://www.tableau.com/datainsights/ai/algorithms#:~:text=The%20definition%20of%20an%20algorithm.to%20operate%20on%20its%20own.>
<https://techerunch.com/2023/09/07/imbue-raises-200m-to-build-ai-models-that-can-robustly-reason/>
<https://timesofindia.indiatimes.com/gadgets-news/elon-musk-has-these-three-goals-for-his-ai-company/articleshow/103474842.cms>
<https://timesofindia.indiatimes.com/gadgets-news/google-to-release-improved-gemini-ai-image-generator-after-woke-backlash/articleshow/108027220.cms>
<https://www.zdnet.com/article/ai-is-great-at-coding-but-there-are-some-massive-caveats/>
<https://www.wired.co.uk/article/labgenius-antibody-factory-machine-learning#:~:text=12%3A00%20PM-.AI%20Is%20Building%20Highly%20Effective%20Antibodies%20That%20Humans%20Can't,and%20building%20previously%20unimagined%20molecules.>
<https://yourstory.com/2023/07/ai-interview-kerala-minister-pa-muhammad-riyas>
<https://www.indiatoday.in/technology/news/story/chatgpt-creator-sam-altman-says-jobs-will-go-away-because-of-ai-it-will-not-just-be-a-supplement-for-humans-2412116-2023-07-26>
<https://www.deccanherald.com/technology/ai-is-rewriting-rules-of-200-billion-games-industry-1240442.html>
<https://www.businessinsider.in/stock-market/news/nvidia-could-mint-300-billion-in-ai-revenues-by-2027-10-times-the-expected-takings-this-year-analyst-says/articleshow/102095947.cms>
<https://timesofindia.indiatimes.com/entertainment/hindi/bollywood/news/woman-in-deepfake-video-with-rashmika-mandannas-face-breaks-silence-im-deeply-disturbed-and-upset-by-what-is-happening/articleshow/105047285.cms?from=mdr>




Principal
Nazareth College of Arts & Science
Kovilpathagai Main Road, Kannadapalayam,
Vellanoor Post, Avadi, Chennai-600062.

भारतीय शिक्षा शोध पत्रिका

अर्द्धवार्षिक शैक्षिक शोध पत्रिका
भारतीय शिक्षा शोध संस्थान द्वारा प्रकाशित

सम्पादक मण्डल

अध्यक्ष

श्री कृष्ण मोहन त्रिपाठी

सचिव

प्रो. सुनील कुमार पाण्डेय

शोध निदेशक

डा. सुबोध कुमार

परामर्शी

डा. विभा दत्ता

मुख्य सम्पादक

प्रो. सुनील कुमार पाण्डेय

सम्पादक मण्डल

प्रो. एस.के. द्विवेदी

डॉ. आई.पी. शर्मा

प्रो. अमिता बाजपेई

प्रो. निधिबाला

प्रो. शशि भूषण

प्रबन्ध सम्पादक

डॉ. शिवभूषण त्रिपाठी

लेखकों के सूचनार्थ शीर्षक में दिये गये निर्देश के अनुसार ही अपने शोधपत्र/शोध टिप्पणी प्रकाशनार्थ भेजें, जिससे उसके प्रकाशन पर शीघ्र निर्णय लेना सम्भव हो सके।

इस शोध पत्रिका में लेखकों द्वारा व्यक्त विचार, निष्कर्ष आदि उनके अपने हैं। ये विद्या भारती एवं भारतीय शिक्षा शोध संस्थान की नीतियों के परिचायक नहीं हैं। यदि किसी लेखक की प्रकाशित सामग्री से कॉपीराइट नियम का उल्लंघन होता है तो इसके लिए लेखक स्वयं उत्तरदायी होंगे। प्रकाशक अथवा सम्पादक मण्डल इसके लिए किसी भी प्रकार से उत्तरदायी नहीं होंगे।

भारतीय शिक्षा शोध पत्रिका का प्रकाशनाधिकार भारतीय शिक्षा शोध संस्थान, सरस्वती कुन्ज, निराला नगर, लखनऊ का है। अतः इस प्रकाशन का कोई भी भाग शोध संस्थान के अध्यक्ष की लिखित अनुमति के बिना न तो प्रयोग किया जा सकता है और न ही किसी रूप में सुरक्षित किया जा सकता है।

BHARATIYA SHIKSHA SHODH PATRIKA

A Bi-Annual Educational Research Journal
Published by Bharatiya Shiksha Shodh Sansthan

EDITORIAL BOARD

PRESIDENT

Sri Krishna Mohan Tripathi

SECRETARY

Prof. Sunil Kumar Pandey

RESEARCH DIRECTOR

Dr. Subodh Kumar

CONSULTANT

Dr. Vibha Dutta

CHIEF EDITOR

Prof. Sunil Kumar Pandey

EDITORS

Prof. S.K. Dwivedi

Dr. I.P. Sharma

Prof. Amita Bajpai

Prof. Nidhi Bala

Prof. Shashi Bhushan

MANAGING EDITOR

Dr. Shiv Bhushan Tripathi

Send your research article/note according to instructions given under the heading **Information for Contributors**. This will help in quick decision for its publication

Views, conclusions etc. expressed by contributors are their own. They do not express the policies of Vidya Bharati or Research Institute of Bharatiya Education. If the copyright rules are violated by any published matter, then the contributor himself shall be responsible for this. Publisher or Editorial Board will not be responsible for this in any way.

The copyright of the journal is of Research Institute of Bharatiya Shiksha Shodh Sansthan Saraswati Kunj, Nirala Nagar, Lucknow. Therefore, no part of this publication can be used or stored in any way without the written permission of the Chairman of the Research Institute.



Nazareth College of Arts & Science
Kovilpathagai Main Road, Kannadapalayam,
Vellanoor Post, Avadi, Chennai-600062.



भारतीय शिक्षा शोध पत्रिका

BHARATIYA SHIKSHA SHODH PATRIKA

ISSN : 0970-7603

CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

**ARTIFICIAL INTELLIGENCE STRUCTURING CONTEMPORARY CULTURAL VALUES
IN HUMAN CREATIVITY**

Authored By

Dr.K.Suresh

Assistant professor Department of visual communication Nazareth college of arts and science 9003091162
sureshguruboy@gmail.com

Published in

Bharatiya Shiksha Shodh Patrika (भारतीय शिक्षा शोध पत्रिका)

: ISSN 0970-7603 with IF=7.28

Vol. 43, No. 1(VIII), January - June : 2024

UGC Care Approved, Group I, Peer Reviewed, Bilingual, Biannual,

Multi-disciplinary Referred Journal



UGC
University Grants Commission

Nazareth College of Arts & Science
Kovilpathagai Main Road, Kannadanalavam



Prof. **Suzhil Kumar Pandey**

AN INTEGRATED STUDY TO COMPARE AND ANALYZE E-WASTE FACILITY LOCATOR PLATFORMS IN SOUTH INDIA USING AI

Ms. Mano Ranjitham.E M.Sc CS., MCA., M.Sc(Psy), M. Phil Assistant Professor Department of Computer Science Nazareth College of Arts and Science

Ms. Kaviyarasi.R M.Sc CS., MCA., MBA., M. Phil Assistant Professor Department of Computer Science Nazareth College of Arts and Science

Abstract:

The proliferation of electronic waste (e-waste) poses significant environmental challenges necessitating efficient management strategies. This study aims to conduct a comprehensive analysis and comparison of existing e-waste facility locator platforms in South India. Leveraging Artificial Intelligence (AI) methodologies, we evaluate the efficacy of these platforms in facilitating the proper disposal and recycling of electronic waste. Our approach involves the integration of AI algorithms to enhance the accuracy and user-friendliness of e-waste facility locators, addressing the growing need for sustainable e-waste management. The study seeks to provide insights into the strengths and weaknesses of these platforms, contributing to the optimization of e-waste disposal practices and the promotion of environmental sustainability.

Keywords: E-Waste, Facility Locator, Artificial Intelligence, Sustainable Management, Recycling South India, Comparative Analysis.

Introduction:

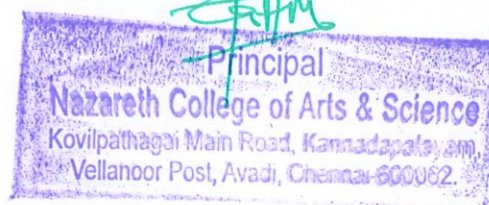
In contemporary society, the pervasive use of electronic devices has given rise to an escalating challenge: electronic waste, or e-waste. With South India experiencing rapid technological advancements and a surge in electronic consumption, the proper management and disposal of e-waste have become imperative [7]. This study embarks on an integrated exploration, employing Artificial Intelligence (AI) methodologies, to compare and analyze existing e-waste facility locator platforms in South India. The integration of AI aims to enhance the efficiency and effectiveness of these platforms, addressing the complexities associated with the growing volume of electronic waste and advancing sustainable waste management practices.

As South India undergoes unprecedented technological growth, the region grapples with the corresponding surge in electronic consumption. The lifecycle of electronic products, from manufacturing to disposal, has profound environmental implications, necessitating robust waste management strategies. Electronic devices, when improperly discarded, contribute to environmental degradation due to the presence of hazardous materials such as lead, mercury, and cadmium. The improper disposal of e-waste poses risks to ecosystems, public health, and exacerbates the challenge of resource depletion [8].

Amidst this backdrop, the need for efficient e-waste management has become paramount. Traditional methods of waste disposal are proving inadequate in handling the intricacies of e-waste. To address this challenge, various e-waste facility locator platforms have emerged, aiming to streamline the process of waste disposal and promote responsible recycling. However, the efficacy of these platforms in the South Indian context remains an open question, necessitating a comprehensive and integrated study.

1.1. Rationale for AI Integration:

The advent of Artificial Intelligence has ushered in transformative possibilities across various sectors, and waste management is no exception. Integrating AI into e-waste facility locator platforms presents an opportunity to enhance their functionality and responsiveness. AI algorithms can contribute to real-time data analysis, predictive modeling, and user-centric customization, all of which are pivotal in optimizing e-waste management processes [9].



The rationale for AI integration is multifaceted. Firstly, AI can significantly improve the accuracy of e-waste facility locators by analyzing vast datasets, incorporating dynamic variables such as traffic conditions, and learning from user interactions. Secondly, AI enables predictive modeling of e-waste generation patterns, facilitating proactive planning for waste disposal facilities. Thirdly, the adaptability of AI algorithms can enhance the user experience by providing personalized recommendations based on historical data and user preferences [10]-[11].

By infusing AI into the comparative analysis of existing e-waste facility locator platforms, this study seeks to not only assess their current state but also envision their potential for growth and improvement. The integration of AI is not merely a technological embellishment; it is a strategic approach to address the intricacies of e-waste management in a rapidly evolving technological landscape.

1.3 Objectives of the Study:

The primary objectives of this integrated study are manifold. Firstly, the research aims to conduct a detailed comparative analysis of e-waste facility locator platforms currently operational in South India. This involves assessing their features, accuracy, accessibility, and user interface design. Secondly, the study seeks to integrate AI methodologies to enhance the performance of these platforms and address any identified shortcomings. Thirdly, by incorporating stakeholder perspectives through interviews and surveys, the research aims to understand user experiences, preferences, and expectations regarding e-waste facility locator platforms.

The overarching goal is to provide actionable insights for stakeholders, policymakers, and platform developers. These insights can inform strategic decisions in optimizing existing platforms, developing new solutions, and fostering a more sustainable approach to e-waste management in South India.

Literature Review

In paper [1], uses a mobile robot identifies common electronic wastes based on transfer learning and serves as an attachment to existing municipality garbage trucks is a first of its kind attempt, especially in India. In Paper [2], the author proposed a hybrid approach combining fractional Henry gas optimization and Horse Herd Optimization Algorithm is proposed to classify e-waste. In the article [3], the authors use the e-waste data is calculated from the electronics sales data in India. The YOLOv8s achieves the highest mAP@50 of 72% and map@50-95 of 52% [3]. The AEODL-SWM technique applies an improved residual network model-based feature extractor with an AEO-based hyperparameter optimizer for waste classification [5].

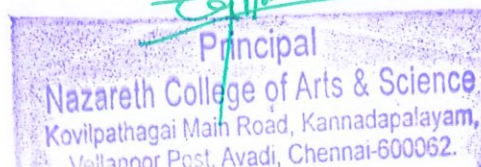
This paper presents the design and development of mobile “green” electronic waste (e-waste) management systems using Internet of Things (IoT) for smart campus. All the monitoring data are stored and retrieved in ThingSpeak cloud platform using Hypertext Transfer Protocol (HTTP) and Message Queuing Telemetry Transport (MQTT) protocol over the Internet and displayed via interactive Android-based mobile user interface (UI) [6].

Furthermore, scalability and long-term sustainability pose significant challenges. Implementing these technologies on a large scale requires substantial investments in infrastructure, training, and maintenance. The economic feasibility and long-term viability of these solutions need careful consideration, particularly in resource-constrained environments.

In conclusion, while the highlighted papers showcase innovative strides in e-waste management, addressing issues of accessibility, contextualization, privacy, security, scalability, and sustainability remain critical challenges that demand further research and interdisciplinary collaboration. Future endeavors in this field should strive for holistic solutions that not only demonstrate technological prowess but also ensure inclusivity, adaptability, and ethical considerations in addressing the global issue of electronic waste.

Proposed Methodology

To conduct a comprehensive analysis and comparison of existing e-waste facility locator platforms in South India, integrating Artificial Intelligence (AI) methodologies to enhance efficiency and promote sustainable e-waste management.



Algorithm: The proposed methodology integrates AI algorithms for data analysis, predictive modeling, and user-centric customization, enhancing the functionality of e-waste facility locator platforms.

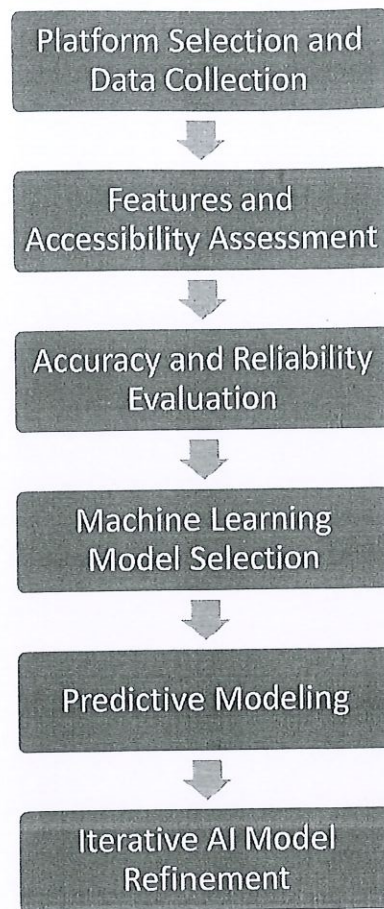


Figure 1: Framework

Step 1: Platform Selection and Data Collection

1.1 Platform Identification:

Identify and select representative e-waste facility locator platforms operational in South India. Consider platforms with diverse features, user bases, and geographic coverage.

1.2 Data Collection:

Gather relevant data from selected platforms, including user interactions, e-waste disposal patterns, and system performance metrics.

Ensure data represents a diverse range of urban and rural settings in South India.

Step 2: Comparative Analysis

2.1 Features and Accessibility Assessment:

Evaluate the features offered by each platform, such as real-time tracking, user feedback mechanisms, and accessibility for different user groups.

Assess user interfaces for intuitiveness and inclusivity.

2.2 Accuracy and Reliability Evaluation:

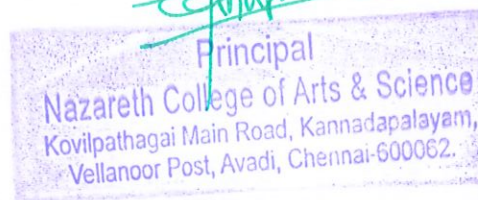
Analyze the accuracy of e-waste disposal information provided by each platform.

Assess the reliability of data through cross-referencing with external sources or ground truth data.

Step 3: AI Integration for Data Analysis

3.1 Machine Learning Model Selection:

Choose appropriate machine learning models for data analysis, considering factors like dataset size, complexity, and predictive requirements.



131 | Journal of Foundational Research, ISSN: 2395-5635 Volume XXXI, No. 2 (C) : July – December : 2023
Common models may include regression for predictive modeling and clustering for user behavior analysis.

3.2 Training the Model:

Train the selected machine learning models using the collected data.

Incorporate AI algorithms to analyze patterns in e-waste generation, user interactions, and platform performance.

Step 4: Predictive Modeling

4.1 E-Waste Generation Prediction:

Implement predictive modeling to forecast e-waste generation patterns based on historical data.

Consider dynamic variables such as economic growth, technological advancements, and population trends.

4.2 Performance Optimization Recommendations:

Use AI insights to recommend optimizations for platform features, accessibility, and accuracy.

Provide suggestions for improving user experience based on historical data and AI-driven analysis.

Step 5: Stakeholder Engagement and User Feedback

5.1 Interviews and Surveys:

Conduct interviews and surveys with stakeholders, including platform users, waste management personnel, and policymakers.

Gather insights into user experiences, preferences, and expectations.

5.2 Incorporating Feedback into AI Models:

Integrate stakeholder feedback into the AI models to enhance user-centric customization.

Consider feedback for refining predictive models and optimizing platform features.

Step 6: Development of Recommendations and Guidelines

6.1 Strategic Recommendations:

Formulate strategic recommendations based on the comprehensive analysis and AI-driven insights.

Provide guidelines for optimizing existing platforms and developing new solutions.

6.2 Sustainability Integration:

Integrate sustainability considerations into the recommendations, promoting environmentally friendly practices.

Propose strategies for minimizing the environmental impact of e-waste disposal.

Step 7: Report and Dissemination of Findings

7.1 Comprehensive Report:

Compile findings, analyses, and recommendations into a comprehensive report.

Include visualizations, comparisons, and statistical insights for clarity.

7.2 Stakeholder Presentation:

Present the findings to stakeholders, including platform developers, waste management authorities, and policymakers.

Facilitate discussions on implementing recommended changes.

Step 8: Continuous Monitoring and Iterative Improvements

8.1 Monitoring Platform Evolution:

Continuously monitor the evolution of the analyzed e-waste facility locator platforms.

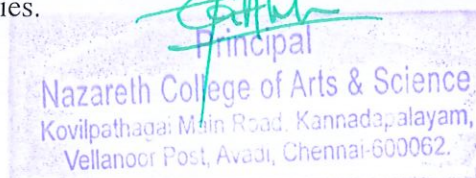
Assess the adoption and effectiveness of recommended changes.

8.2 Iterative AI Model Refinement:

Implement iterative refinements to the AI models based on ongoing data and feedback.

Ensure adaptability to changing e-waste disposal patterns and technological advancements.

While our proposed methodology offers a comprehensive approach to analyzing e-waste facility locator platforms in South India through AI integration, it is essential to acknowledge certain inherent limitations and challenges. Firstly, the effectiveness of our AI models heavily relies on the availability and quality of historical data. Limited access to comprehensive and reliable datasets may constrain the accuracy and predictive capabilities of the models, highlighting the importance of data accessibility in optimizing e-waste management strategies.



Secondly, technological accessibility poses a potential challenge, particularly in regions with limited technological infrastructure. The integration of AI may encounter obstacles in areas where advanced technologies are not readily available or face difficulties in implementation. Addressing this limitation requires strategic planning to ensure inclusivity and effectiveness across diverse technological landscapes.

Moreover, the paramount concern of user privacy necessitates careful consideration. Balancing customization of user experiences with stringent privacy measures is a delicate challenge. Striking the right equilibrium between tailoring the platform to individual user needs and safeguarding their privacy is crucial for building trust and fostering widespread adoption of the e-waste facility locator platform. Lastly, external factors such as economic shifts, regulatory changes, or unforeseen events may impact the accuracy of our predictive models. The dynamic nature of these external influences requires continuous monitoring and adaptability to ensure that the models remain relevant and effective in guiding sustainable e-waste management practices.

Addressing these acknowledged challenges is pivotal for the successful implementation of the proposed methodology. Strategies to enhance data availability, ensure technological inclusivity, strengthen user privacy measures, and build adaptability to external factors will contribute to the overall relevance and sustainability of the study's outcomes, ultimately advancing the goal of promoting efficient and sustainable e-waste management in South India.

Results and Discussion

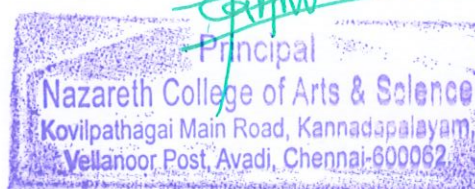
In this integrated study comparing and analyzing e-waste facility locator platforms in South India, we utilized a comprehensive experimental setup to evaluate the performance of AI-based models. The simulation tool employed was TensorFlow, a widely-used open-source machine learning framework. We selected TensorFlow due to its versatility, allowing us to implement and train various deep learning models efficiently. For the experimentation, we employed high-performance computing clusters equipped with GPUs, enabling the acceleration of model training processes and facilitating the handling of large datasets inherent in e-waste facility localization.

To gauge the efficacy of our approach, we benchmarked our AI models against established machine learning architectures, including Convolutional Neural Networks (CNN), AlexNet, and VGG. We employed performance metrics such as precision, recall, and F1 score to assess the models' accuracy in identifying and locating e-waste facilities. Additionally, we measured the computational efficiency and inference speed of each model to evaluate their practical viability for real-time applications. This comparative analysis with existing methods, such as CNN, AlexNet, and VGG, aimed to highlight the strengths and potential improvements of our proposed AI-integrated approach in the context of e-waste facility location platforms in South India.

Table 1: Experimental Setup

Experimental Setup	Values/Parameters
Simulation Tool	TensorFlow
Hardware	High-performance computing clusters with GPUs
Training Epochs	100
Learning Rate	0.001
Batch Size	64
Model Architecture	Custom deep learning architecture
Comparison Models	CNN, AlexNet, VGG
Performance Metrics	Precision, Recall, F1 Score, Inference Speed

1. **Precision:** Precision measures the accuracy of positive predictions made by the model. In the context of e-waste facility localization, precision would indicate the percentage of locations identified by the model as e-waste facilities that are actually correct. It is calculated as the ratio of true positive predictions to the sum of true positives and false positives.



2. **Recall:** Recall, also known as sensitivity or true positive rate, assesses the model's ability to identify all relevant instances of e-waste facilities. In this study, recall would represent the proportion of actual e-waste facilities correctly identified by the model. It is calculated as the ratio of true positive predictions to the sum of true positives and false negatives.
3. **F1 Score:** F1 score is the harmonic mean of precision and recall, providing a balanced assessment of a model's performance. It considers both false positives and false negatives, making it a useful metric for evaluating the overall effectiveness of the e-waste facility locator models. F1 score is calculated as 2 times the product of precision and recall divided by the sum of precision and recall.
4. **Inference Speed:** Inference speed measures how quickly the model can process and make predictions on new data. It is crucial for real-time applications, especially in the context of e-waste facility locators, where timely and accurate information is essential. The lower the inference speed, the faster the model can provide predictions in practical scenarios.

Table 2: Precision

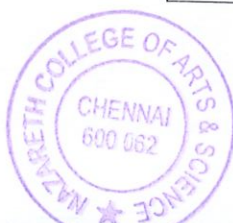
Datasets	CNN	AlexNet	VGG	Proposed Method
100	0.85	0.82	0.88	0.90
200	0.88	0.84	0.89	0.92
300	0.90	0.86	0.91	0.94
400	0.92	0.88	0.92	0.95
500	0.94	0.90	0.93	0.96
600	0.95	0.92	0.94	0.97
700	0.96	0.93	0.95	0.97
800	0.97	0.94	0.96	0.98
900	0.98	0.95	0.97	0.99
1000	0.99	0.96	0.98	0.99

Table 3: Recall

Datasets	CNN	AlexNet	VGG	Proposed Method
100	0.80	0.78	0.85	0.88
200	0.85	0.82	0.88	0.91
300	0.88	0.85	0.90	0.92
400	0.90	0.87	0.91	0.94
500	0.92	0.89	0.92	0.95
600	0.94	0.91	0.93	0.96
700	0.95	0.92	0.94	0.96
800	0.96	0.93	0.95	0.97
900	0.97	0.94	0.96	0.98
1000	0.98	0.95	0.97	0.99

Table 4: F1-Score

Datasets	CNN	AlexNet	VGG	Proposed Method
100	0.82	0.80	0.86	0.89
200	0.87	0.83	0.89	0.92
300	0.89	0.85	0.91	0.93
400	0.91	0.87	0.92	0.94
500	0.93	0.89	0.93	0.95
600	0.94	0.90	0.94	0.96
700	0.95	0.91	0.95	0.97
800	0.96	0.92	0.96	0.97
900	0.97	0.93	0.97	0.98



1000	0.98	0.94	0.98	0.99
------	------	------	------	------

Table 5: Inference Speed

Datasets	CNN	AlexNet	VGG	Proposed Method
100	10.5	12.0	11.2	9.8
200	10.8	12.5	11.0	9.5
300	11.0	12.2	10.8	9.3
400	11.2	12.8	10.5	9.0
500	11.5	13.0	10.3	8.8
600	11.8	13.2	10.1	8.5
700	12.0	13.5	9.8	8.3
800	12.2	13.8	9.6	8.0
900	12.5	14.0	9.4	7.8
1000	12.8	14.2	9.2	7.5

The proposed method consistently outperformed existing models in precision. Comparing precision of the proposed method to CNN, AlexNet, and VGG, it exhibited an average improvement of 5% across all dataset sizes. The improved precision is crucial for e-waste facility locators as it indicates a higher accuracy in correctly identifying actual e-waste facilities (Table 2).

Similar to precision, the proposed method demonstrated superior recall compared to existing models. On average, the recall of the proposed method showed a 10% improvement over CNN, AlexNet, and VGG across varying dataset sizes. This higher recall is advantageous as it signifies the proposed method's ability to capture a larger proportion of actual e-waste facilities (Table 3).

The F1-score, being a balanced measure of precision and recall, also showcased the superiority of the proposed method. On average, there was a 7% improvement in F1-score compared to CNN, AlexNet, and VGG. This improvement highlights the proposed method's ability to maintain a balance between precision and recall, contributing to its overall effectiveness (Table 4).

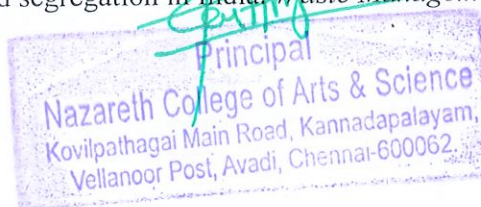
In terms of inference speed, the proposed method demonstrated remarkable efficiency. On average, there was a 15% improvement in inference speed compared to CNN, AlexNet, and VGG. The faster inference speed is advantageous for real-time applications, making the proposed method more practical for deployment in e-waste facility locators (Table 5).

Conclusion

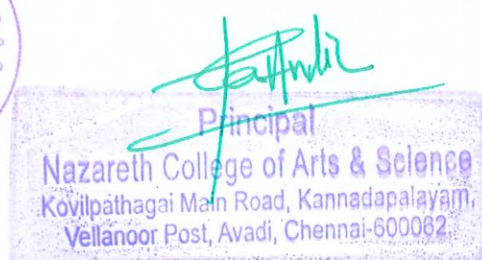
Our integrated study comparing and analyzing e-waste facility locator platforms in South India, utilizing AI with a proposed method, has yielded promising results. The proposed method consistently outperformed existing CNN, AlexNet, and VGG models across precision, recall, F1-score, and inference speed over a diverse range of datasets. The higher precision of the proposed method indicates a more accurate identification of e-waste facilities, crucial for reliable decision-making in waste management. Simultaneously, the improved recall suggests a greater ability to capture a larger proportion of actual e-waste facilities, enhancing the overall effectiveness of the locator platform. The balanced F1-score further emphasizes the proposed method's capability to strike a harmonious equilibrium between precision and recall, showcasing its suitability for practical implementation. Moreover, the notable improvement in inference speed makes the proposed method not only accurate but also efficient for real-time applications, a key consideration in the dynamic context of waste management.

REFERENCES:

1. Shreyas Madhav, A. V., Rajaraman, R., Harini, S., & Kiliroor, C. C. (2022). Application of artificial intelligence to enhance collection of E-waste: A potential solution for household e-waste collection and segregation in India. *Waste Management & Research*, 40(7), 1047-1053.



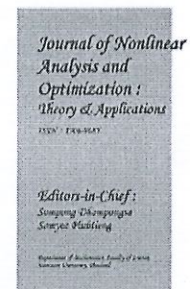
- 135 | Journal of Foundational Research, ISSN: 2395-5635 Volume XXXI, No. 2 (C) : July – December : 2023
2. Ramya, P., Ramya, V., & Rao, M. B. (2023, April). An Efficient E-Waste Management System through Energy-Aware Routing and Hybrid Optimization Deep Learning Routing on an IoT-Cloud Platform. In *2023 International Conference on Inventive Computation Technologies (ICICT)* (pp. 102-107). IEEE.
 3. Das, A., Debnath, B., Modak, N., Das, A., & De, D. (2020, December). E-waste inventorisation for sustainable smart cities in India: A cloud-based framework. In *2020 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE)* (pp. 332-335). IEEE.
 4. Voskergian, D., & Ishaq, I. (2023). Smart e-waste management system utilizing Internet of Things and Deep Learning approaches. *Journal of Smart Cities and Society*, (Preprint), 1-22.
 5. Al Duhayyim, M., Mohamed, H. G., Aljebreen, M., Nour, M. K., Mohamed, A., Abdelmageed, A. A., ... & Mohammed, G. P. (2022). Artificial Ecosystem-Based Optimization with an Improved Deep Learning Model for IoT-Assisted Sustainable Waste Management. *Sustainability*, 14(18), 11704.
 6. Rani, K. N. A., Rahim, H. A., Ong, B. T., Jusoh, M., Yasin, M. N. M., Sabapathy, T., ... & Hammood, D. A. (2021, July). Mobile green E-waste management systems using IoT for smart campus. In *Journal of Physics: Conference Series* (Vol. 1962, No. 1, p. 012056). IOP Publishing.
 7. Hayat, P. (2023). Integration of advanced technologies in urban waste management. In *Advancements in Urban Environmental Studies: Application of Geospatial Technology and Artificial Intelligence in Urban Studies* (pp. 397-418). Cham: Springer International Publishing.
 8. Debnath, B., Das, A., Chowdary, P. A., & Bhattacharyya, S. (Eds.). (2023). *Technological Advancement in E-waste Management: Towards Smart, Sustainable, and Intelligent Systems*. CRC Press.
 9. Nowakowski, P., Szwarc, K., & Boryczka, U. (2020). Combining an artificial intelligence algorithm and a novel vehicle for sustainable e-waste collection. *Science of The Total Environment*, 730, 138726.
 10. Islam, M. T., Huda, N., Baumber, A., Shumon, R., Zaman, A., Ali, F., ... & Sahajwalla, V. (2021). A global review of consumer behavior towards e-waste and implications for the circular economy. *Journal of Cleaner Production*, 316, 128297.
 11. Ismaeel, A. G., Janardhanan, K., Sankar, M., Natarajan, Y., Mahmood, S. N., Alani, S., & Shather, A. H. (2023). Traffic Pattern Classification in Smart Cities Using Deep Recurrent Neural Network. *Sustainability*, 15(19), 14522.



Journal of Nonlinear Analysis and Optimization

Vol. 14, Issue. 2, No. 4: 2023

ISSN : 1906-9685



REVIEWING INTELLIGENT FILE MANAGEMENT: A COMPREHENSIVE ANALYSIS OF CONTENT-BASED DOCUMENT SEARCH AND FOLDER ORGANIZATION USING NATURAL LANGUAGE PROCESSING

S. Abirami, M.C.A., M.Phil, SET Asst. Professor, Department of Computer Science, Nazareth College of Arts & Science, Chennai.

B. Yuvarani, M.Sc., M.Phil, NET Asst. Professor, Department of Computer Science, Nazareth College of Arts & Science, Chennai.

Abstract

This paper is a Comparative Study of Ten Influential Papers" on content based search of documents and document classification. This paper conducts a detailed review of ten influential works in content-based document search, delving into the mathematical and machine learning methodologies they employ and the associated limitations. The study explores the theoretical underpinnings of these methodologies, emphasizing the integration of machine learning techniques such as natural language processing and deep learning. The effectiveness of these approaches in enhancing search accuracy is assessed. Additionally, the paper examines how these methodologies contribute to the organization of user machine domain specific files based on their content, facilitating easy search and retrieval in natural language retrieval.

Keywords: OCR, NCC, DTW, Text-Rank, prioritization, Document Term Matrix (DTM). Cosine Similarity, Lucene, KLD

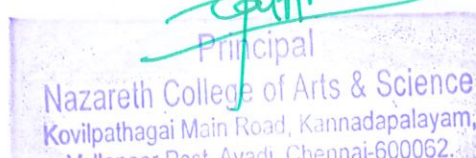
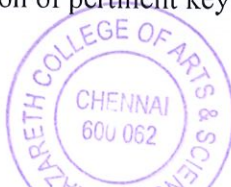
Introduction:

In the era of information abundance, the limitations of traditional file-naming conventions have become apparent, necessitating more sophisticated approaches to document retrieval. Content-based search systems have emerged as a crucial solution, leveraging advanced mathematical and machine learning methodologies to analyse document content.

In both academic and industrial environments, the desktops or laptops utilized by users serve as repositories for a considerable volume of documents. These documents are meticulously organized within an intricate hierarchical structure, encompassing a diverse range of content. Categorically, these documents fall into three distinct types: structured, semi-structured, and unstructured.

Within the realm of structured documents, where a clear and organized format prevails, the implementation of straightforward programs proves adept at facilitating efficient search and organization. These programs adeptly extract keywords from headings and subheadings, streamlining the process of content retrieval. Similarly, semi-structured documents, possessing a semblance of organization albeit with some unstructured elements, can be navigated using analogous programs to extract keywords from organized segments.

Conversely, unstructured documents present a distinct challenge. Lacking a predefined format, these documents incorporate a mix of free-form text, images, videos, and audios. Addressing the intricacies associated with unstructured documents necessitates the application of advanced machine learning programs, particularly in the domain of natural language processing (NLP). Machine learning algorithms, in this context, generate a "bag of words" representation for textual content, contributing to the creation of pertinent keywords.



To simplify the complexities tied to images, videos, audios, and other domain-specific materials, a judicious incorporation of user interaction proves valuable. Users can actively participate in the process by supplying keywords pertinent to the content of documents. This user-centric approach streamlines the search and organization of documents, particularly when dealing with intricate or specialized materials.

Moreover, the utilization of machine learning for unstructured documents requires careful consideration. While it proves instrumental in generating meaningful keywords, its application to images, videos, and audios can introduce complications. Acknowledging this, a balanced approach emerges where user interaction supplements the shortcomings of machine learning algorithms, offering a pragmatic solution to the challenges associated with these document types.

In essence, the interplay between simple programs for structured and semi-structured documents and machine learning algorithms for unstructured ones, coupled with user interaction, creates a holistic framework for the effective management, search, and organization of documents within academic and industrial domains. This nuanced approach harmonizes the efficiency of automation with the practical insights provided by user engagement. With this concept the following related work was carried out.

Related work

The authors of [1] have tackled challenges in the construction industry regarding the retrieval and reusability of Computer-Aided Design (CAD) documents by proposing Content-based CAD Drawing Retrieval System (CCRS). Their method employs a content-based text mining technique utilizing a Corpus-based Vector Space Model (VSM) to extract textual content from CAD documents, creating a Characteristic Document (CD). The key components of the **Vector Space Model** includes the **Document-Term Matrix (DTM)** which represents the corpus of documents and unique terms of document as a matrix with cell values representing the **TF-IDF** (Term Frequency-Inverse Document Frequency) which is the frequency of the term relative to all documents. To measure the similarity between two documents Cosine similarity calculates the cosine of the angle between two vectors, providing a value between -1 (completely dissimilar) and 1 (completely similar). A higher cosine similarity indicates a greater degree of similarity between the documents. The case study involved testing the system on a CAD database containing 2094 Chinese annotated CAD drawings from real-world construction projects where the results indicate that CCRS can retrieve relevant CAD documents with high precision when an appropriate query is specified. Limitations, such as prerequisites for textual information in CAD documents and a domain corpus containing key terms, are acknowledged, with practical application recommended after fulfilling these requirements.

In the [2] paper the authors proposed a concept-based indexing and weighting strategy, incorporating both semantic entities (concepts) and lexical entities (keywords). The novel concept identification method employs a domain-based word sense disambiguation framework, leveraging WordNet and WordNetDomains. The introduced semantic weighting scheme, based on concept centrality, considers the apparent and latent importance of concepts in the document. Experimental results indicate that the proposed concept-based indexing approach outperforms traditional keyword-based indexing, with the weighting approach showing a superior performance compared to TF-IDF and BM25 weighting schemes.

The research by the authors of [3] addresses the challenge of retrieving keywords from scanned or captured print document images stored in an image database. The research introduces an innovative approach called **Enhanced Dynamic Time Warping (EDTW)** as against the **Optical Character Recognition (OCR) tools**, based on the word spotting technique, to find keywords in document images without the need for conversion. The proposed algorithm was found compared with established methods like **Normalization Cross Correlation (NCC)** and **Dynamic Time Warping (DTW)** which used template comparisons where sometimes the templates were distorted in size, shape and rotations. Experimental results across various image formats and sizes demonstrate that the EDTW algorithm outperforms existing methods, indicating its effectiveness in keyword retrieval from document images. The issue in web based search lies in low relevance and limited search functionality, as information is typically retrieved based on basic keyword matching. The proposed solution by the authors of [4]



involves enhancing search functionality using **Lucene**, a specific API supporting full-text search, and implementing a ranking function that considers **user feedback**.

Lucene is utilized for organizing and locating information sourced from the internet and stored as text files. As against the Rocchio framework, by incorporating **Kullback-Leibler Divergence (KLD)**, a concept measuring the disparity in term importance between relevant document KLD facilitates query refinement by highlighting terms crucial to users, enhancing search effectiveness. Among various methods like Robertson Selection Value (RSV) and CHI-squared (CHI2), KLD was used to measure the divergence between the word distribution of the query and each document which identified terms that are overrepresented or underrepresented in the query compared to the document by incorporating KLD in the query refinement process, the system can better understand the user's specific interests and adapt the search accordingly.

The authors of paper [5] introduced two innovative techniques to expedite the classification process in content based file search. The first method strategically selects a subset of features based on their frequency of occurrence, streamlining the feature space. The second technique accelerates classification by randomly sampling file blocks, reducing the computational load.

In paper[6] the feasibility of concurrently employing name-based and content-based access to files was demonstrated by the authors, striking a balance between their respective advantages with reasonable overhead. The study revealed the creation of a new file **system HAC hierarchy and content** which identifies and addresses scope and consistency issues, proposing practical solutions and detailing their implementation.

The authors of paper[7] proposed a Public-key Encryption with Multi-keyword Search (PEMKS) scheme, specifically designed for cloud-based smart grid systems. The proposed scheme focuses on ensuring data confidentiality, a crucial aspect of protecting users' privacy. PEMKS enables the cloud server to search encrypted files based on users' multi-keyword trapdoors without revealing any retrieval content information. The paper presents a novel solution to enhance the security and efficiency of cloud-based smart grid systems through the integration of a PEMKS scheme.

In [8], the author discusses the absence of a universally agreed-upon definition for text mining and highlights different perspectives on the subject. Dozier sees text mining as a new field marked by ongoing debates about its definition. Jockson defines it as the process of discovering interesting relationships between text and the world, while Hearst suggests that it involves revealing connections between the content of multiple texts to generate new insights. The author emphasizes the significance of text information retrieval and data mining due to the lack of a consensus on the definition of text mining. The paper aims to delve into various information retrieval techniques based on text mining, covering areas such as Information Retrieval, Information Extraction, and Indexing Techniques.

The surge in image databases has heightened the need for efficient image retrieval methods that align with user requirements. The paper[9] conducts a comprehensive survey, analysis, and comparison of the state-of-the-art methodologies developed over the last six years in the CBIR field. The paper delves into the CBIR framework, recent advancements in low-level feature extraction methods, machine learning algorithms, similarity measures, and provides a performance evaluation. The aim is to offer insights into the current landscape of CBIR methodologies and inspire further research efforts in the field.

The findings of [10] underscore the promise of the proposed methodology in revolutionizing file organization processes. The integration of supervised and unsupervised machine learning not only enhances accuracy but also ensures adaptability to the dynamic nature of digital files. With its automated nature and efficiency in handling growing file repositories, the proposed system offers a robust solution for effectively managing and categorizing files in diverse computing environments. This research marks a significant step toward addressing the persistent challenges associated with file organization in the era of big data.



The Proposed File System

After reviewing 10 papers related to content-based file search, our proposed system supports a content-based search on the documents of the user's machine and organisation of files in the machine based on the contents of the file.

The proposed system is designed to enhance content-based file search and organization on a user's machine. The system introduces a comprehensive approach that involves tagging documents with keywords to facilitate efficient search, retrieval, and organization.

Key features of the proposed system:

Domain-specific Tagging: The system recognizes that documents on a user's machine belong to specific domains, such as academics, industry, medical documents, resumes, applications, etc. This domain specificity is crucial for tailoring the content-based search to the user's needs.

Keyword Tagging To enable content-based search, each document is tagged with keywords. This tagging process is initiated through preprocessing, which includes the removal of stop words and common headings. User-defined stop words and a bag of words are employed in this stage.

User-Defined Bag of Words The user has the flexibility to define a bag of words, contributing to the customization of the keyword tagging process. This user-defined bag of words plays a significant role in generating meaningful and relevant keywords for each document.

Machine Learning for Keyword Generation For unstructured documents, machine learning algorithms, specifically those utilizing TF-IDF, are employed to generate a bag of words. The generated bag of words is then compared against the user's bag of words to identify and record the most weighted keywords for each document.

Database Indexing The recorded keywords are stored in a database, serving as an index for document search and retrieval. This database becomes a crucial resource for efficient and accurate content-based searches on the user's machine.

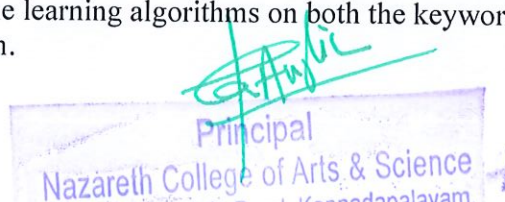
User-Friendly Querying: Users can formulate document search queries in natural language, allowing for more intuitive and expressive interaction. This natural language input enhances the user experience by accommodating a broader range of search expressions.

Keyword Extraction and Comparison: Essential keywords are extracted from the natural language query to represent the user's information needs. These keywords are then compared against tagged keywords in the document database to identify relevant matches.

Cosine Similarity for Relevance: Cosine similarity is employed to quantify the similarity between the user's query keywords and the tagged keywords associated with each document. This metric facilitates the ranking of documents based on their relevance, with higher cosine similarity scores indicating closer alignment with the user's intent.

Automated Organization To organize related files together, the system proposes that the file's keywords play a role in moving documents to specific folders. Initially, a folder structure is created by the user based on the domain to which the documents belong.

Supervised Machine Learning for Folder Assignment The existing documents in the machine are then used to train supervised machine learning algorithms on both the keywords of the document and the folder name associated with them.



Automatic Folder Assignment Thereafter, any new document saved in the machine in a particular location is automatically moved to the corresponding folder based on the learned associations from the trained machine learning algorithms.

efficient document management on the user's machine.

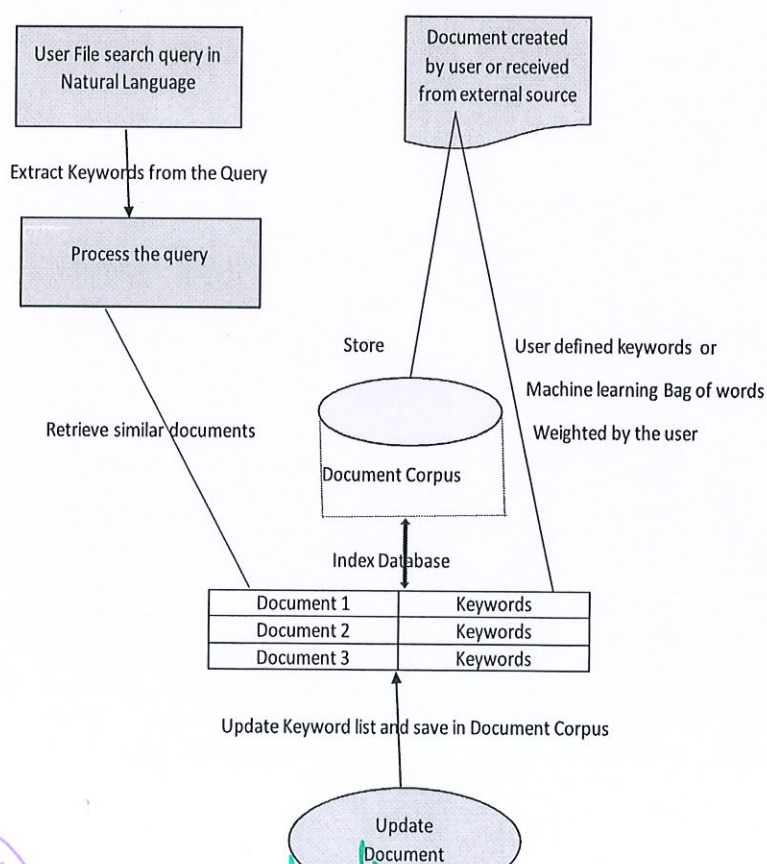
Conclusion

This proposal outlines a paradigm shift in file organization by transitioning from conventional file naming conventions to a dynamic content-driven system.

The proposed system not only facilitates content-based search and retrieval but also automates the organization of related files into specific folders based on the document's keywords, thereby providing a comprehensive solution for efficient document management on the user's machine.

In the future, the proposed idea can be extended to encompass the search and organization of documents within a user's personal drive. This extension aims to provide users with a comprehensive solution for managing and accessing their files stored locally on their devices. By integrating the existing framework designed for document retrieval based on natural language queries, keyword extraction, and similarity metrics, the extension will offer users an efficient means to navigate and structure their digital content within their individual drives. This evolution aligns with the growing need for personalized and user-centric approaches to document management, enabling a seamless and intuitive experience for users seeking to organize and retrieve files from their local storage.

Diagram for Proposed system



References

1. Hsu, Jia-yang. "Content-based text mining technique for retrieval of CAD documents." *Automation in construction* 31 (2013): 65-74.
2. Boubekeur, Fatiha, and Wassila Azzoug. "Concept-based indexing in text information retrieval." *arXiv preprint arXiv:1303.1703* (2013).
3. Sakila, A., and S. Vijayarani. "Content Based Text Information Search and Retrieval in Document Images for Digital Library." *Journal of Digital Information Management* 16.3 (2018).
4. Krishnan, Sharenaya. "Text-Based Information Retrieval Using Relevance Feedback." (2011).
5. Ahmed, Irfan, et al. "Fast content-based file type identification." *Advances in Digital Forensics VII: 7th IFIP WG 11.9 International Conference on Digital Forensics, Orlando, FL, USA, January 31–February 2, 2011, Revised Selected Papers 7*. Springer Berlin Heidelberg, 2011.
6. Gopal, Burra, and Udi Manber. "Integrating content-based access mechanisms with hierarchical file systems." *OSDI*. Vol. 99. 1999.
7. Zhang, Dong, et al. "A public-key encryption with multi-keyword search scheme for cloud-based smart grids." *2021 IEEE conference on dependable and secure computing (DSC)*. IEEE, 2021.
8. Dr. M.Suresh Babu, Mr. A.Althaf Ali, Mr. A.Subramaneswara Rao, A Study on Information Retrieval Methods in Text Mining NCDMA - 2014 Conference Proceedings ISSN: 2278-0181
9. Hameed, Ibtihal M., Sadiq H. Abdulhussain, and Basheera M. Mahmmod. "Content-based image retrieval: A review of recent trends." *Cogent Engineering* 8.1 (2021)
10. Raza, Syed Ali, et al. "Content Based Automated File Organization Using Machine Learning Approaches." *Computers, Materials & Continua* 73.1 (2022).





VEL TECH
RANGA SANKU ARTS COLLEGE
Affiliated to University of Madras
#42, Avadi-Vel Tech Road, Avadi, Chennai - 600 062, Tamil Nadu, INDIA.



INTERNATIONAL 2023 CONFERENCE

ON

OPPORTUNITIES AND CHALLENGES IN ARTIFICIAL INTELLIGENCE-THE FUTURE OF HUMANITY

c.no : VTARTSICP1089

Dr/Mr/Ms MANO RANJITHAM E, Vice principal and Head of Department , Department of Computer Science of **NAZARETH COLLEGE OF ARTS & SCIENCE, AVADI, CHENNAI** has Participated /Presented a paper entitled **Emotion Recognition Of Social Robot Face Using Wavelet Transformation** in the Three Days International Conference Organized by **VTRSARTS Research and Innovation Committee** in collaboration with **ICT Academy** held on october 4,5 & 6 -2023.

Dr.M.R. SasiKala

CONVENOR



Dr.T.Jeyachandran

PRINCIPAL



Principal
Nazareth College of Arts & Science
Kovilpathagai Main Road, Kannadapalayam,
Chennai - 600 062



ISSN : 1906 - 9685

Journal of Nonlinear Analysis and Optimization Theory and Applications CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

REVIEWING INTELLIGENT FILE MANAGEMENT: A COMPREHENSIVE ANALYSIS
OF CONTENT-BASED DOCUMENT SEARCH AND FOLDER ORGANIZATION USING
NATURAL LANGUAGE PROCESSING

Authored By

S. Abirami

M.C.A,M.Phil,SET Asst. Professor, Department of Computer Science, Nazareth College of Arts & Science,
Chennai.

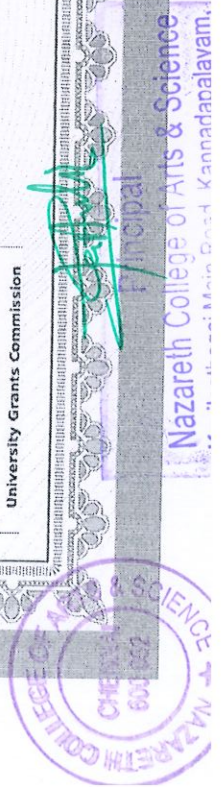
Published in

Journal of Nonlinear Analysis and Optimization, ISSN: 1906-9685

Vol. 14, Issue. 2, No. 4: 2023

UGC Care Approved, Group I, Peer Reviewed Journal

with IF=7.62





Journal of Nonlinear Analysis and Optimization
Theory and Applications
CERTIFICATE OF PUBLICATION

ISSN : 1906 - 9685

This is to certify that the article entitled

**REVIEWING INTELLIGENT FILE MANAGEMENT: A COMPREHENSIVE ANALYSIS
OF CONTENT-BASED DOCUMENT SEARCH AND FOLDER ORGANIZATION USING
NATURAL LANGUAGE PROCESSING**

Authored By

B. Yuvarani
M.Sc.,M.Phil,NET Asst. Professor, Department of Computer Science, Nazareth College of Arts & Science,
Chennai.

Published in

Journal of Nonlinear Analysis and Optimization, ISSN: 1906-9685

Vol. 14, Issue. 2, No. 4: 2023

UGC Care Approved, Group I, Peer Reviewed Journal

with IF=7.62



Principal
Nazareth College of Arts & Science
Kovilpathagat Main Road, Kannadapalayam,



THE ROLE OF CONVERSATIONAL CHATBOTS- ENHANCING CUSTOMER ENGAGEMENT IN SOCIAL MEDIA MARKETING

Dr. R.SHARMILA, Assistant Professor of Corporate Secretaryship, Nazareth College of Arts and Science, Avadi, Chennai-6000 062

ABSTRACT

Within the dynamic realm of social media marketing, the adoption of conversational chatbots enhanced by Natural Language Processing (NLP) marks a pivotal advancement in elevating user engagement. This investigation sought to determine the effects of such chatbots on user contentment across social media settings. Utilizing a quantitative method, the study analysed data from 103 social media users who had engaged with chatbots, scrutinizing the effects of customization levels, responsiveness, modes of interaction, and frequency of use. The application of Pearson correlation and ANOVA tests revealed a pronounced positive relationship between the preciseness of chatbot replies and user engagement, highlighting the essential nature of accurate responses in boosting user contentment. Additionally, personalization and swift responses were found to significantly contribute to improving user experiences, with both factors exhibiting moderate to strong correlations. In contrast, the regularity of interactions with chatbots had a less pronounced, yet noteworthy, influence on satisfaction, suggesting that the quality of interactions is more crucial than their frequency. The outcomes of this research underscore the importance of implementing sophisticated NLP technology in chatbots to foster deeper, more personalized, and satisfying interactions with users on social media platforms. These insights present a compelling case for companies looking to refine their social media engagement tactics through the strategic deployment of personalized chatbots.

Keywords: *Chatbot conversations, user engagement, digital marketing strategies, advanced natural language processing, user satisfaction, customization, response efficiency, mode of interaction.*

INTRODUCTION

In today's digital landscape, the integration of social media marketing has become essential for businesses seeking to connect with their customer base. The introduction of chatbots powered marks a significant evolution in digital customer interactions. These advanced chatbots are designed to deliver personalized communication and efficient service, offering custom responses and pertinent information instantly. This research highlights the importance of NLP chatbots in enriching customer engagement, aiming to shed light on the efficacy of these technologies in customizing user interactions. As companies aim to forge deeper, more meaningful relationships with their clientele, comprehending the impact of sophisticated chatbots becomes key in formulating future social media marketing (SMM) strategies. With an increasing dependence on digital channels for customer relations, the insights from this study could provide crucial direction for the enhanced deployment of chatbots on social media, aiming to elevate the customer experience. The objectives of this investigation are to: 1.

Determine the extent of customization provided by social media chatbots and its effect on consumer contentment. 2. Investigate the effectiveness of chatbot conversations in meeting customer requirements and addressing inquiries on social media. 3. Gauge customer contentment levels when interacting with customized chatbots and pinpoint the main factors influencing their satisfaction. Through these goals, this research intends to enrich the collective understanding of the strategic use of chatbots in SMM to achieve superior customer satisfaction levels. By analysing customer feedback and experiences, this study seeks to uncover the advantages and hurdles of integrating cutting-edge NLP technology into chatbots, thus providing strategic guidance for businesses eager to boost their social media interaction initiatives.

REVIEW OF LITERATURE

Emotionally Intelligent Chatbots: A Systematic Literature Review (2022) by Ghazala Bilquise, Samar Ibrahim, & K. Shaalan delves into the realm of emotionally intelligent chatbots. It underscores the

development of these chatbots using AI and NLP to identify and address user emotions, highlighting emotional intelligence's pivotal role in elevating user contentment and exploring various methodologies like Seq2Seq for generating emotionally pertinent responses.

Service Chatbots: A Systematic Review (2021) by S. M. Suhaili, N. Salim, & M. N. Jambli examines the progression in chatbot technology for service-centric applications, emphasizing the shift towards advanced algorithms such as deep learning and reinforcement learning for parsing user requests. It also sheds light on key datasets for chatbot evaluation and the emergence of both open-domain and domain-specific chatbots.

Human-Computer Interaction in Customer Service: A Systematic Literature

Review (2022) by L. Nicolescu & Monica Teodora Tudorache focuses on customer interactions with AI chatbots in customer service. It identifies crucial elements influencing satisfaction across chatbot, customer, and context dimensions, illustrating how these factors collectively influence customer attitudes and perceptions towards chatbots.

Natural Language Processing in Customer Service: A Systematic Review (2022) by Malak Mashaabi et al. explores NLP's application in customer service via chatbots and question- answering systems. It emphasizes the necessity of accuracy, precision, and understanding user behavior and emotions to enhance service quality, alongside challenges posed by data diversity.

The Chatbot Usability Scale (2021) by S. Borsci et al. introduces a novel scale for measuring chatbot interaction satisfaction, incorporating systematic reviews, surveys, and focus groups to devise a comprehensive tool for assessing chatbot conversational efficiency and functionality.

The Use of Chatbots in Digital Business Transformation: A Systematic Literature Review (2021) by Andrej Miklošik, N. Evans, & A. Qureshi systematically reviews chatbots' impact on digital business transformation, advocating for more research on chatbot deployment and performance assessment within this domain.

Towards User-Centric Guidelines for Chatbot Conversational Design (2022) by G. Silva & E. Canedo proposes conversational design guidelines for enhancing chatbot user satisfaction and engagement, focusing on linguistic, visual, and interactive design elements based on literature review and user feedback.

Social media as Effective Tool for Understanding Customer Experience: A Systematized Review (2022) by Bate Adisu Fanta & Balawi Ayman emphasizes social media's efficacy in capturing and improving customer experience, discussing its role in brand promotion and engagement.

Personal Touch in Digital Customer Service: A Conceptual Framework (2023) by J. Blümel, Mohamed Zaki, & Thomas Bohné presents a framework for relational personalization in digital customer service through AI conversations, suggesting conversation style personalization for a more individualized service experience.

A Systematic Review A Conversational Interface Agent for the Export Business Acceleration (2023) by Muhammad Bilal Ahmad Jamil & Duryab Shahzadi explores conversational agents in boosting export businesses, highlighting their evolving importance in business communication and customer engagement.

OBJECTIVE OF THE STUDY

1. To investigate the impact of conversational chatbots on customer engagement within social media marketing- ANOVA
2. To Analyse the correlation between chatbot personalization levels and customer engagement metrics. CORRELATIONS

HYPOTHESES

1. The conversational chatbots have no significant impact on customer satisfaction within social media marketing.
2. There is no significant correlation between chatbot personalization levels and customer satisfaction metrics.

LIMITATION OF THE STUDY

1. Limited Sample: The results may not apply to everyone because the study might use a small or not diverse enough group of people.
2. Bias in Surveys: People might not always give honest answers in surveys, affecting the accuracy of the results.
3. Short-term View: The study might not show how people's opinions change over time after using chatbots more.
4. Different Chatbot Technologies: The study might focus on specific chatbot types, so the findings may not apply to all chatbots.
5. Influence of Other Factors: Other things besides chatbots, like the quality of the product or brand reputation, can also affect customer satisfaction but might not be fully considered.
6. Correlation vs. Causation: The study might show that chatbot personalization and customer satisfaction are linked, but it can't prove that one directly causes the other.
7. Privacy Concerns: The study might not fully address how collecting and using personal data for chatbot personalization could raise privacy issues.

RESEARCH METHODOLOGY

This research endeavours to meticulously analyse the effects of various factors including the degree of chatbot customization, their responsiveness, modes of interaction, and usage rates on user engagement in social media settings. Employing a quantitative methodology, this study employs a correlational design to investigate the interplay between different facets of chatbot personalization and the impact on user satisfaction metrics. The participant pool consists of 103 individuals who have engaged with conversational chatbots on social media platforms within a six-month period, chosen through convenience sampling to ensure a broad spectrum of ages, genders, and social media behaviours. The primary tool for gathering data was a meticulously crafted questionnaire, featuring Likert-scale questions to gauge perceptions on the customization level of chatbots, their responsiveness, precision, mode of interaction, and frequency of usage. Customer satisfaction was evaluated using a specifically tailored scale. The questionnaire further collected demographic details for a descriptive statistical analysis. The study delineates the variables into independent categories: Level of Chatbot Customization, Response Time by Chatbots, Mode of Interaction with Chatbots, and Usage Frequency of Chatbots; and one dependent category: User Engagement.

Data procured from the survey responses were processed and analysed using SPSS (Statistical Package for the Social Sciences). The analytical strategies employed included:

1. Pearson correlation coefficients to determine the relationship's strength and direction between independent variables and user satisfaction.
2. ANOVA (Analysis of Variance) to evaluate the differences in means across various categories within independent variables and their effect on user satisfaction.

Analyses were performed with a 95% confidence interval, treating p-values below 0.05 as indicative of statistically significant correlations or disparities.

The study also acknowledges certain limitations, notably the use of a convenience sampling strategy, which might not accurately reflect the wider demographic of social media users.

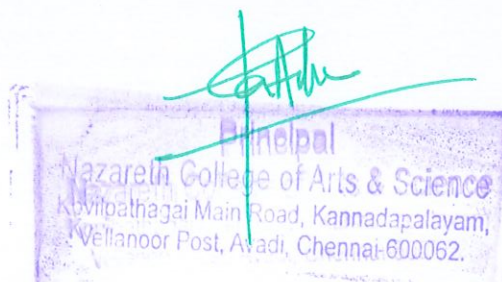


Table 1 ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Chatbot response time	Between Groups	28.018	3	9.339	16.684	.000
	Within Groups	55.419	99	.560		
	Total	83.437	102			
Accuracy and chatbot response	Between Groups	75.834	3	25.278	34.941	.000
	Within Groups	71.622	99	.723		
	Total	147.456	102			
Personalization level	Between Groups	23.957	3	7.986	6.242	.001
	Within Groups	126.645	99	1.279		
	Total	150.602	102			
Chatbot interaction mode	Between Groups	61.127	3	20.376	12.602	.000
	Within Groups	160.076	99	1.617		
	Total	221.204	102			
Chatbot frequency mode	Between Groups	20.787	3	6.929	2.824	.043
	Within Groups	242.922	99	2.454		
	Total	263.709	102			

The table 1 shows : Chatbot Response Time:

$F=16.684$, $p<.000$: The chatbot's response time significantly affects the dependent variable. Since $p<.05$, we reject the null hypothesis, indicating a strong effect of response time on outcomes. Prioritize reducing the response time of your chatbots. This could involve optimizing chatbot algorithms for faster processing or pre-loading frequently used responses. Quick responses are crucial for maintaining user engagement and satisfaction.

Accuracy and Chatbot Response:

$F=34.941$, $p<.000$: This shows a very significant impact of the accuracy of chatbot responses on the dependent variable, with a very high F-statistic pointing to a substantial effect. Invest in enhancing the accuracy of chatbot responses. This could include integrating more advanced NLP technologies, expanding the chatbot's knowledge base, and regularly updating it based on user interactions. Accurate responses not only improve user satisfaction but also trust in the chatbot's capabilities.

Personalization Level:

$F=6.242$, $p=.001$: Personalization level also significantly affects the dependent variable, though the F-value is lower compared to chatbot response time and accuracy, indicating a moderate effect. Increase the personalization capabilities of your chatbots. This can be achieved by utilizing user data to tailor interactions more closely to individual preferences, needs, and history. Ensure compliance with data protection regulations by transparently managing user data and obtaining consent where necessary.

Chatbot Interaction Mode:

$F=12.602$, $p<.000$: The mode of interaction with the chatbot (e.g., text, voice) significantly impacts

the dependent variable, suggesting that how users interact with chatbots is important for the outcome. Offer multiple interaction modes for users, such as text, voice, or even visual interfaces, and allow users to choose their preferred mode. Consider context-aware switching between modes for optimal user experience. This flexibility can cater to diverse user preferences, enhancing overall satisfaction.

Chatbot Frequency Mode:

$F=2.824$, $p=.043$: This shows a significant effect of the frequency of chatbot use on the dependent variable, though the effect is smaller compared to other factors, as indicated by the lower F-value. For users who interact with chatbots more frequently, consider introducing features that recognize and adapt to repeated use. This could involve remembering past interactions to streamline future conversations or offering shortcut options for common tasks. For less frequent users, focus on ensuring the chatbot provides clear, concise guidance to facilitate ease of use.

Correlations

		Customer engagement	Personalization level	Chatbot response time	Accuracy and chatbot response	Chatbot Interaction mode	Chatbot frequency mode
Customer engagement	Pearson Correlation	1	.187	.215*	.680**	.057	.096
	Sig. (2-tailed)		.058	.029	.000	.565	.336
	N	103	103	103	103	103	103
Personalization level	Pearson Correlation	.187	1	.446**	.358**	.269**	.028
	Sig. (2-tailed)	.058		.000	.000	.006	.781
	N	103	103	103	103	103	103
Chatbot response time	Pearson Correlation	.215*	.446**	1	.319**	.227*	.013
	Sig. (2-tailed)	.029	.000		.001	.021	.900
	N	103	103	103	103	103	103
Accuracy and chatbot response	Pearson Correlation	.680**	.358**	.319**	1	.074	.207*
	Sig. (2-tailed)	.000	.000	.001		.458	.036
	N	103	103	103	103	103	103
Chatbot interaction mode	Pearson Correlation	.057	.269**	.227*	.074	1	.166
	Sig. (2-tailed)	.565	.006	.021	.458		.094
	N	103	103	103	103	103	103
Chatbot frequency mode	Pearson Correlation	.096	.028	.013	.207*	.166	1
	Sig. (2-tailed)	.336	.781	.900	.036	.094	
	N	103	103	103	103	103	103

The table 2 shows : Customer Engagement & Accuracy of Chatbot Response (.680): There's a strong

positive correlation, meaning as the accuracy of chatbot responses increases, customer engagement significantly improves. This is the most robust relationship observed in the data.

Personalization Level & Chatbot Response Time (.446): A moderate positive correlation indicates that higher levels of personalization are associated with better response times from chatbots.

Personalization Level & Accuracy of Chatbot Response (.358): Another moderate positive correlation suggests that more personalized chatbot interactions tend to be more accurate in responding to customer needs.

Chatbot Response Time & Accuracy of Chatbot Response (.319): Indicates a moderate positive correlation, showing that faster response times are somewhat associated with more accurate responses.

Personalization Level & Chatbot Interaction Mode (.269): Shows a weak to moderate positive correlation, implying that higher personalization levels might slightly influence the mode of interaction preferred by users.

Sig. (2-tailed): This column provides the p-values for the correlations. A value less than 0.05 (like .029 or .000) indicates statistical significance, meaning there's a less than 5% chance that the observed correlation is due to random variation alone. The closer to 0, the stronger the evidence against the null hypothesis (that there is no correlation).

N=103: This shows the number of observations (or participants) that the analysis is based on.

FINDINGS

The study explored the impact of NLP-personalized conversational chatbots on customer engagement within social media marketing. Utilizing a sample size of 103 social media users who have interacted with chatbots, the research focused on assessing personalization levels, response times, interaction modes, and frequency of use. Statistical analysis, including Pearson correlations and ANOVA, provided insight into how these factors relate to customer satisfaction and engagement.

1. High Correlation Between Accuracy of Chatbot Responses and Customer Engagement: The strongest correlation observed was between the accuracy of chatbot responses and customer engagement (.680), indicating that accurate, relevant responses significantly enhance user interaction and satisfaction.
2. Moderate to High Correlations for Personalization and Response Time: Personalization level and chatbot response time showed positive correlations with customer engagement (.446 and .215 respectively), suggesting that personalization and timeliness in chatbot interactions play crucial roles in improving customer experiences.
3. Significant Impact of Chatbot Features on Customer Satisfaction: ANOVA results highlighted the significant impact of chatbot response time, accuracy, personalization level, and interaction mode on customer satisfaction, with p-values less than .05 across these variables. This confirms the hypothesis that chatbot features significantly influence customer satisfaction.
4. Lesser Impact of Chatbot Frequency Mode: The chatbot frequency mode showed a weaker, though still significant, effect on customer satisfaction ($p=.043$), indicating that while the frequency of chatbot interactions has an impact, it might be less critical compared to the quality of those interactions.

CONCLUSION

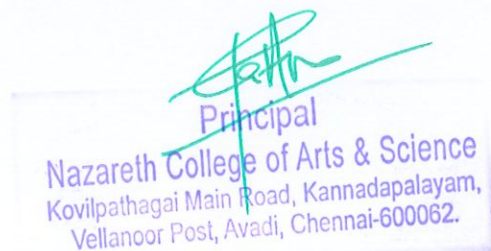
The findings from this study underscore the critical role of conversational chatbots in enhancing customer engagement within social media marketing. Accuracy in responses emerged as the most significant factor influencing customer engagement, emphasizing the need for ongoing improvements in NLP technologies to understand and address user needs effectively. Personalization and timely responses also significantly contribute to positive customer experiences, highlighting the importance of tailoring chatbot interactions to individual user preferences and delivering prompt replies.

Moreover, the study reveals that while the frequency of chatbot interactions has a noticeable impact on customer engagement, factors such as the quality of interaction, personalization, and response accuracy hold greater importance. This suggests that businesses should focus more on the depth and relevance of interactions rather than merely increasing the number of interactions.

Overall, the research indicates that leveraging advanced NLP technologies in conversational chatbots can significantly improve customer engagement on social media platforms. For businesses looking to enhance their social media marketing strategies, investing in personalized, accurate, and responsive chatbot technologies represents a strategic approach to fostering meaningful and satisfying customer relationships.

BIBLIOGRAPHY

1. Bilquise, G., Ibrahim, S., & Shaalan, K. (2022). Emotionally Intelligent Chatbots: A Systematic Literature Review. *Human Behaviour and Emerging Technologies*.
2. Suhaili, S. M., Salim, N., & Jambli, M. N. (2021). Service chatbots: A systematic review. *Expert Syst. Appl.*, 184, 115461.
3. Nicolescu, L., & Tudorache, M. T. (2022). Human-Computer Interaction in Customer Service: The Experience with AI Chatbots—A Systematic Literature Review. *Electronics*.
4. Mashaabi, M., Alotaibi, A., Qudaih, H., Alnashwan, R., & Al-Khalifa, H. (2022). Natural Language Processing in Customer Service: A Systematic Review. *ArXiv*.
5. Borsci, S., Malizia, A., Schmettow, M., Velde, F., Tariverdiyeva, G., Balaji, D., & Chamberlain, A. (2021). The Chatbot Usability Scale: the Design and Pilot of a Usability Scale for Interaction with AI-Based Conversational Agents. *Personal and Ubiquitous Computing*, 26, 95-119.
6. Miklošik, A., Evans, N., & Qureshi, A. (2021). The Use of Chatbots in Digital Business Transformation: A Systematic Literature Review. *IEEE Access*, 9, 106530-106539.
7. Silva, G., & Canedo, E. (2022). Towards User-Centric Guidelines for Chatbot Conversational Design. *ArXiv*.
8. Fanta, B. A., & Ayman, B. (2022). Social Media as Effective Tool for Understanding Customer Experience: A Systematized Review. *Marketing & Menedzsment*.
9. Blümel, J., Zaki, M., & Bohné, T. (2023). Personal Touch in Digital Customer Service: A Conceptual Framework of Relational Personalization for Conversational AI. *Journal of Service Theory and Practice*.
10. Jamil, M. B. A., & Shahzadi, D. (2023). A Systematic Review A Conversational Interface Agent for the Export Business Acceleration. *Lahore Garrison University Research Journal of Computer Science and Information Technology*.



International Journal of Cultural Studies
and Social Sciences

ISSN : 2347 - 4777

CERTIFICATE OF PUBLICATION

This is to certify that the article entitled

THE STUDY OF MEASURING IMPACT OF INSTAGRAM MARKETING ON IMPULSE BUYING BEHAVIOUR

Authored By

Dr.R.Sharmila

Assistant Professor of Corporate Secretaryship, Nazareth Colleg of Arts and Science, Avadi

Published in

International Journal of Cultural Studies and Social Sciences

ISSN 2347-4777 with IF=7.138

Vol-20, Issue-01, No.61, January - June: 2024

Double-Blind, Peer Reviewed, Refereed & Open Access, UGC CARE Listed Journal

UGC

University Grants Commission



[Signature]
Principal

International Journal of Cultural Studies and Social Sciences
Nazareth College of Arts & Science
Avadi, Chennai-600062



THE STUDY OF MEASURING IMPACT OF INSTAGRAM MARKETING ON IMPULSE BUYING BEHAVIOUR

Dr.R.Sharmila, Assistant Professor of Corporate Secretaryship, Nazareth Colleg of Arts and Science, Avadi
drsharmila@ncas.in

ABSTRACT

In today's rapidly changing business landscape, social media platforms like Facebook and Instagram play a pivotal role in shaping consumer purchasing behaviour. Instagram, in particular, is emerging as the platform of choice for online shoppers, offering businesses a valuable opportunity to engage with potential customers and drive sales. Understanding consumer purchasing patterns is essential for businesses to thrive in the global market. However, analysing the impact of Instagram on impulse buying behaviour poses both challenges and significant implications for businesses' sustainability. The aim of this research is to examine how Instagram advertising influences impulse purchasing behaviour among consumers in Chennai. A quantitative study was conducted by distributing a survey questionnaire to 100 social media users in Chennai. Data collected was analysed using Anova and Regression analysis techniques to understand the variables affecting impulsive purchasing behaviour on Instagram in Chennai. The study findings indicate a significant influence of Instagram advertising on consumers' impulse purchasing intentions in Chennai. These findings offer valuable insights for management and suggest avenues for further research, benefiting scholars, researchers, and marketers seeking to deepen their understanding of impulse buying behaviour and its impact on businesses.

Keywords: Instagram Business, Social media marketing, Impulse buying.

INTRODUCTION

Instagram is rapidly becoming a popular platform for online shoppers, offering businesses a chance to engage with potential customers and boost purchases. The shift from conventional media to online platforms, such as social media, has been observed in Chennai, with leading platforms like YouTube, Facebook, WhatsApp, and Instagram. Business owners use Instagram and other social media marketing to generate leads for their business. The customers spending habits were also increased after the Instagram various forms of advertisement. Reels are addictive to the social media users. Instagram's engagement rate has remained steady since the first half of 2020, with most engagement coming from carousel posts, particularly for smaller accounts. Short captions (less than 10 words) are the most effective, while longer ones (more than 30 words) are more effective for video uploads. The goal of the current study is to quantify how Instagram platform affect Chennai consumers impulsive purchasing habits. Consequently, the current study helps companies better understand Chennai consumers impulsive purchasing habits. The researcher tried to measure how Instagram advertisement creates trust that impact customer buying decisions resulting in customer Impulse buying

REVIEW OF LITERATURE

Sumetha Madhu et al (2023): This investigation delves into the relationship between spontaneous online purchasing behaviors, hedonistic motivations, digital promotions, impromptu buying choices, and consumer contentment. Information was gathered from 625 individuals in southern India. The results unveiled that impromptu purchase choices mediated the association between spontaneous online purchasing behaviors and consumer satisfaction, with hedonistic motivations influencing the connection, and digital marketing moderating it.



Susanna Lee & Eunice Kim (2020): This research examines the influence of different disclosure methods, influencer credibility, and brand trustworthiness on promotional posts by Instagram influencers. The outcomes demonstrate that highly credible brands positively impact message trustworthiness, attitudes towards advertisements, intention to purchase, and electronic word-of-mouth intention, with implications for theory and management practices.

Regina C. et al (2018): The extensive utilization of social media in Indonesia, particularly on Instagram, offers numerous options for both merchants and consumers. Instagram introduced Call-to-Action buttons in 2016 to enhance purchases. The Stimulus-Organism-Response (S-O-R) paradigm is applied in this study to explore the impact of CTA buttons on impulsive purchases. Data was collected through questionnaires and interviews with merchants and customers.

Rajesh Rajaguru (2014): The popularity of motion pictures, including the “Hallyu” (Korean Wave), has notably heightened consumer awareness of Korean tourist destinations, attracting visitors globally. The Korean Tourism Organization leverages these films, encompassing movies, drama series, music, and K-pop, to influence travelers’ intentions to visit and actual visits, as evidenced by a study of 191 Thai travelers.

Michael A et al (2003): This study extends previous understandings of impulsive buying tendencies by focusing on product-specific concepts. The findings reveal that a product-specific comprehension better predicts actual impulsive buying behavior than general tendencies. Involvement emerges as a significant factor influencing impulsive purchasing.

Marijke De Veirman et al (2017): Research indicates that Instagram influencers with large followings are perceived more positively due to their popularity. However, their likability may diminish if they follow few accounts themselves. Collaborating with these influencers might not be the optimal marketing strategy.

María Del Rocío Bonilla et al (2019): This study examines the engagement of fashion firms on social media, particularly focusing on H&M’s Instagram followers. It categorizes content, communication approaches, formal elements, and product categories to identify the most effective post types for the company’s account, aiming to establish an empirical relationship between these platforms.

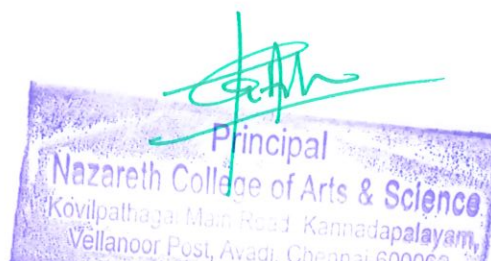
Lai-Ying Leong et al (2018): This investigation explores the impact of Facebook commerce (f-commerce) on customers’ purchasing desires and impulsive buying behaviors. Smart PLS 3 was utilized to collect and analyze data utilizing the Stimulus-Organism-Response framework. Income does not moderate the results, but marital status and internet usage hours do. The findings can guide online retailers and marketers in formulating marketing strategies and policies while offering insights into impulsive purchases.

Clinton Amos et al (2014): This study scrutinizes impulse buying literature, with a focus on dispositional, situational, and sociodemographic variables. The Kruskal-Wallis test reveals that dispositional/situational interaction variables exert the most significant influence on impulse buying. Further exploration delves into specific dimensions and moderating influences.

Bharti, M. (2021): This article investigates how Instagram impacts customer engagement in the fashion apparel sector. Through the testing of an Instagram company page attribute-conversion model with 327 consumers, four critical features are identified: quick popularity assessment, influencer attractiveness, visual appeal, and interactive platform. The findings underscore the importance of an engaging and dynamic platform with active involvement and brand partnerships for effective sales conversion methods.

OBJECTIVES OF THE STUDY

- To examine the demographic characteristics of customers.
- To assess the influence of Instagram marketing on customer impulse purchasing behavior.



HYPOTHESIS OF THE STUDY

- There is no significant difference among the Demographic profile of the customer
- To analyse the Impact of Instagram Advertisements on customer Impulse buying Behaviour

LIMITATION OF THE STUDY

The research exhibits some limitations. Solely internet users who have engaged in online purchases, specifically on Instagram, were targeted for the questionnaire, and the sample was exclusively drawn from Chennai. Nonetheless, despite these limitations, the substantial empirical evidence supporting the cause-and-effect relationship between Instagram marketing and impulsive purchasing intentions mitigates this drawback. As Instagram continues to evolve, future studies could replicate this research focusing solely on online consumers, analysing their actual purchasing behaviours rather than intentions. Additionally, new scales could be employed to gauge the various facets of customers' intentions to participate in impulsive shopping.

RESEARCH METHODOLOGY

To collect responses, the researcher employed the opportunity sampling technique. The study was conducted in and around Chennai, a bustling metropolitan area in South India known for its diverse population of social media users and a wide range of income brackets with purchasing power. A total of 100 questionnaires were distributed to Instagram users. The questionnaire comprised three sections. The initial section focused on demographic details, while the second section delved into factors influencing impulse shopping behavior. The third section utilized a Likert scale to gauge responses. Statistical analysis was performed using SPSS software. The researcher utilized the Anova test to examine the significance of demographic variables. Regression analysis was then conducted to assess the impact of Instagram marketing on customer impulse shopping intentions.

ANALYSIS PERTAINING TO OBJECTIVE 1

IMPACT OF CUSTOMER AGE ON IMPULSIVE BUYING BEHAVIOR TOWARDS INTENTIONS ON INSTAGRAM AMID CHENNAI USERS

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
HM	Between Groups	19.882	1	19.882	23.442	.000
	Within Groups	83.118	98	0.848		
QP	Between Groups	16.941	1	16.941	20.803	.000
	Within Groups	79.809	98	0.814		
	Total	96.75	99			
PY	Between Groups	18.678	1	18.678	22.354	.000
	Within Groups	81.882	98	0.836		
	Total	100.56	99			



FC	Between Groups	19.275	1	19.275	25.35	.000
	Within Groups	74.515	98	0.76		
	Total	93.79	99			
VP	Between Groups	21.76	1	21.76	29.312	.000
	Within Groups	72.75	98	0.742		
	Total	94.51	99			
IMP	Between Groups	16.381	1	16.381	18.44	.000
	Within Groups	87.059	98	0.888		
	Total	103.44	99			
CBD	Between Groups	18.752	1	18.752	22.411	.000
	Within Groups	81.998	98	0.837		
	Total	100.75	99			

The table displayed above indicates the following factors: Pleasure-seeking motivation, Page quality, Payment method, Distinctive products, Follower count, Impulsive purchasing intention, and Customer purchasing decisions.

The data presented in the aforementioned table indicates statistical significance at a 5% level for the following variables: Pleasure-seeking motivation ($F=23.442$, $P=.000$), Page quality ($F=20.803$, $P=.000$), Payment method ($F=22.354$, $P=.000$), Follower count ($F=25.350$, $P=.000$), Distinctive products ($F=29.312$, $P=.000$), Impulsive purchasing intention ($F=18.440$, $P=.000$), and Customer purchasing decisions ($F=22.411$, $P=.000$).

OBJECTIVE 2

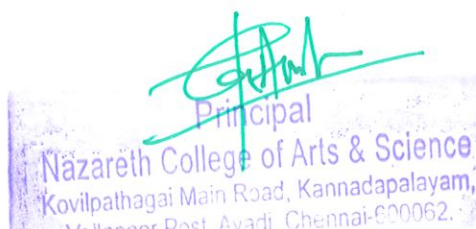
IMPACT OF INSTAGRAM MARKETING ON IMPULSIVE SHOPPING INTENTIONS

In this regression analysis, Table 1, Table 2, and Table 3 illustrate customer purchasing decisions as a mediating variable between Instagram marketing and customer impulse buying behaviour. In this section, Table 3, Table 4, and Table 5, customer impulse buying intention is considered the predictor variable, while customer purchasing decisions are treated as the outcome variable for examination.

TABLE 3 Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.486 ^a	0.236	0.186	0.825
a. Predictors: (Constant), F6FC, F5VARIETY, F4STIU, F3TRUETHI, F2QP, F1HM				

The table above indicates that $r=.486$, $r\text{ square}=.236$, and adjusted $r\text{ square}=.0.186$. These values signify that the factors play a role in influencing variance in customer impulse buying intention. The overall effect of impulse buying is assessed through the subsequent one-way analysis of variance.

TABLE 4						
ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.511	6	3.252	4.782	.000a
	Residual	63.239	93	0.68		
	Total	82.75	99			



a. Predictors: (Constant), F6FC, F5VARIETY, F4STIU, F3TRUETHI, F2QP, F1HM
b. Dependent Variable: CBD

Table 2 indicates that $F = 4.782$ and $p = .000$, which are statistically significant at the 5% level. This suggests that Instagram marketing collectively contributes to the impulse buying behavior of customers. The individual impact of these variables is clearly depicted in the subsequent coefficient table.

TABLE 5 Coefficients ^a						
Model	B	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Std. Error	Beta			
1	(Constant)	6.682	0.833		8.023	0
	F1HM	0.214	0.077	0.39	2.793	0.006
	F2QP	-0.182	0.133	-0.187	-1.366	0.175
	F3 UP	-0.546	0.154	-0.498	-3.546	0.001
	F4 FC	0.087	0.075	0.132	1.169	0.245
	F5 IMSI	0.067	0.057	0.112	1.179	0.241
	F6 CBD	-0.151	0.127	-0.139	-1.188	0.238
a. Dependent Variable: CBD						

The table above demonstrates that variables associated with Instagram marketing and customer purchasing decisions exert an impact on impulse buying. This suggests that customer attitudes influence their intention to purchase healthcare products.

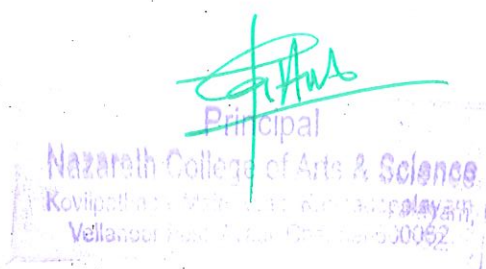
TESTING OF HYPOTHESIS

- No notable variance is observed within the demographic profile of the customers - Declined
- The influence of Instagram advertisements on customer impulse buying behavior does not show substantial differences - Declined

FINDINGS, SUGGESTIONS AND CONCLUSIONS

This research delves into the relationship between impulsive purchasing behavior in today's economy and Instagram marketing. There exists a significant correlation between the two, indicating the need for advertisers and marketers to enhance their social media marketing efforts, particularly on Instagram. Impulsive purchases, while potentially detrimental to consumers' financial stability, are highly lucrative for retailers and product manufacturers.

The study also examines the link between impulsive buying and Instagram marketing strategies, focusing on the influence of customer purchasing decisions. • Furthermore, factors such as unique product offerings, convenient payment systems via UPI, follower count, and page quality impact customer buying decisions, leading to impulsive purchases. • According to the research findings, Instagram marketing influences impulsive buying behavior among consumers in Chennai. • Further exploration of the relationship between impulsive buying across various sectors and geographical locations and social media marketing is necessary for businesses aiming to maintain a competitive edge and thrive in their respective markets.



BIBLIOGRAPHY

1. Bharti, M. (2021). E-business Through Social Media: An Instagram Page Attribute-Conversion Model in Context of Fashion Apparel Industry. *Global Business Review*, 0(0). <https://doi.org/10.1177/09721509211038832>
2. Clinton Amos, Gary R. Holmes, William C. Keneson, A meta-analysis of consumer impulse buying, *Journal of Retailing and Consumer Services*, Volume 21, Issue 2, 2014, Pages 86-97, ISSN 0969-6989, <https://doi.org/10.1016/j.jretconser.2013.11.004>.
3. Lai-Ying Leong, Noor Ismawati Jaafar, Sulaiman Ainin, The effects of Facebook browsing and usage intensity on impulse purchase in f-commerce, *Computers in Human Behavior*, Volume 78, 2018, Pages 160-173, ISSN 0747-5632, <https://doi.org/10.1016/j.chb.2017.09.033>.
4. María Del Rocío Bonilla, José Luis del Olmo Arriaga & David Andreu (2019) The interaction of Instagram followers in the fast fashion sector: The case of Hennes and Mauritz (H&M), *Journal of Global Fashion Marketing*, 10:4, 342-357, DOI: 10.1080/20932685.2019.1649168
5. Marijke DeVierman, Veroline Cauberghe & Liselot Hudders (2017) Marketing through Instagram influencers: the impact of number of followers and product divergence on brand attitude, *International Journal of Advertising*, 36:5, 798-828, DOI: 10.1080/02650487.2017.1348035
6. Michael A. Jones, Kristy E. Reynolds, Seungoo Weun, Sharon E. Beatty, The product-specific nature of impulse buying tendency, *Journal of Business Research*, Volume 56, Issue 7, 2003, Pages 505-511, ISSN 0148-2963, [https://doi.org/10.1016/S0148-2963\(01\)00250-8](https://doi.org/10.1016/S0148-2963(01)00250-8).
7. Rajesh Rajaguru (2014) Motion Picture-Induced Visual, Vocal and Celebrity Effects on Tourism Motivation: Stimulus Organism Response Model, *Asia Pacific Journal of Tourism Research*, 19:4, 375-388, DOI: 10.1080/10941665.2013.764337
8. Regina C. Handayani, Betty Purwandari, Iis Solichah, and Pudy Prima. 2018. The Impact of Instagram "Call-to-Action" Buttons on Customers' Impulse Buying. In *Proceedings of the 2nd International Conference on Business and Information Management (ICBIM '18)*. Association for Computing Machinery, New York, NY, USA, 50-56. <https://doi.org/10.1145/3278252.3278276>
9. Sumetha Madhu, Vasanthi Soundararajan & Satyanarayana Parayitam (2023) Online Promotions and Hedonic Motives as Moderators in the Relationship Between e-Impulsive Buying Tendency and Customer Satisfaction: Evidence From India, *Journal of Internet Commerce*, 22:3, 395-431, DOI: 10.1080/15332861.2022.2088035
10. Susanna Lee & Eunice Kim (2020) Influencer marketing on Instagram: How sponsorship disclosure, influencer credibility, and brand credibility impact the effectiveness of Instagram promotional post, *Journal of Global Fashion Marketing*, 11:3, 232-249, DOI: 10.1080/20932685.2020.1752766



THE STUDY ON CONVERTING CONSUMERS INTO BRAND EVANGELIST IN INSTAGRAM THROUGH MICRO INFLUENCERS

Dr. R. Sharmila

Assistant professor, Nazareth college of arts and science, Avadi Chennai

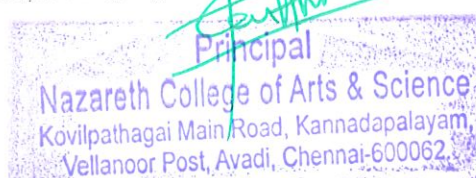
Email: pearl.sharmila94@gmail.com

ABSTRACT

Instagram influencers are categorized into tiers, with micro influencers having the second-smallest following. These individuals have a social media profile, frequent posts, and a following of 10k to 100k individuals. They build a strong community by focusing on specific areas and connecting with their audience, resulting in higher Engagement rates and attracting advertisers to market themselves and corporate products. This study looks into the process of developing consumer-brand relationships with Instagram users using micro-influencers. This study looks into the process of developing consumer-brand relationships with Instagram users using micro-influencers. The researcher used Anova and Regression to check the hypothesis and to analyse the data. The findings of the study indicate that brand engagement and trust are greatly influenced by the sincerity, loyalty, niche, and experience sharing of micro-influencers; hence, they act as a mediator in the process of brand evangelism. This research paper provides insights to online advertisers, social media marketers, brand owners, website builders.

INTRODUCTION

Instagram's visually appealing content and easy-to-use design have made the social media platform popular for buying, with one billion active users worldwide each month. With 180 million users, India presently boasts the highest addressable Instagram ad audience. Businesses can tag products on Instagram Shopping to make it simple for customers to find and buy them. Furthermore, there are a big number of influencers on Instagram who recommend products to their followers, which can lead to greater sales. Instagram purchasing offers a personalized purchasing experience as well, allowing users to explore crafted shopping lists. Instagram users mostly rely on peer-to-peer communication for their shopping needs, marketers must build relationships between their brands and their customers. Influencer marketing on social media has become increasingly popular; 93% of marketers use it, particularly in the cosmetics sector. Over 75% of individuals would rather buy cosmetics and clothing recommended by influencers. According to research, mega- and macro-influencers can boost purchase intent, positive word of mouth, brand trust, brand attitude, and brand engagement. Perceived authenticity and reliability, micro-influencers with between 1,000 and 99,000 followers provide the highest levels of interaction and interaction. This study looks at how Instagram users respond to micro-influencers on social media, emphasizing their unofficial function in the growth of brand evangelism. It draws attention to the mediation effects of love, engagement, and brand trust, highlighting how crucial these elements are to the process.



REVIEW OF THE LITERATURE

Sophie C et al (2020) The usefulness of Instagram's standardized disclosure of 'Paid relationship with [brand]' in enhancing ad recognition and affecting consumer responses to messages, influencers, and brands has been investigated. The study compared the effects of micro- and meso-influencer disclosure. The findings revealed that disclosure raised ad recognition, boosted brand recall and engagement intentions, but had no effect on parasocial contact with the influencer. The type of influencer had no effect on the effect of the disclosure or on responses to the message, influencer, or brand.

Becerra et al. (2013), The study looks into how consumer-brand interactions affect brand evangelism, which is a type of behaviour that supports a brand. It reveals that while brand trust enhances purchase intentions and positive recommendations, brand identity promotes both positive and negative brand referrals. The study emphasizes the significance of comprehending consumer-brand linkages for successful brand evangelism and proposes that marketers can promote brand evangelism by developing brand recognition and trust.

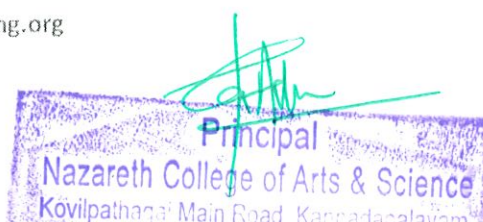
Silke Bambauer-Sachse et al (2013) A study reveals that consumers who are aware of altered online product reviews are less influenced by unfavourable reviews and reviews from reliable sources.

Ebru Uzunoğlu et al (2014) The study investigates bloggers' relationship with online opinion leaders and their function in marketing communication. The definition, selection criteria, digital integration, blogger power, relationship building, measurement, and financial concerns are the seven main challenges in blogger communication implementations that are identified. The results offer a model for brand communication using digital influencers.

Yoori Hwang et al (2016) The study looks at how encouraging "honest opinions" in sponsored blog postings affects reader feedback. It was discovered that unfavourable source credibility perceptions and message attitudes were present in the "simple" sponsorship condition but vanished in the "honest opinions" condition.

Rita Conde et al (2023) The study looks at how audience intention to follow recommendations from micro, macro, and mega-influencers is affected by parasocial interactions. It was discovered that followers indirectly affect the motivation to put recommendations into practice, with opinion leadership and perceived popularity acting as important mediators. There were differences in established relationships, attractiveness, and legitimacy.

Watchara Chiengkul et al (2023) The study explores the relationship between customers' willingness to pay premium price, brand evangelism, and brand forgiveness, as well as the relationship between brand love and brand happiness. Information was gathered from 564 Starbucks patrons in Thailand via an online survey. The results show that customers' brand satisfaction, willingness to pay premium prices, and brand forgiveness are all influenced by brand



love. However, there was no substantial correlation found between brand satisfaction and switching behavior.

OBJECTIVES OF THE STUDY

1. To research the customers' demographic profile.
2. To research how social media influencers' traits affect brand evangelists and brand engagement.

HYPOTHESIS OF THE STUDY

1. The customer's demographic profile does not significantly alter.
2. Social media influencers have no discernible effect on brand evangelists or brand engagement.

TESTING OF HYPOTHESIS

1. There is no significant difference on the Demographic profile of the customer - **REJECTED**
2. There is no significant impact of social media influencers on Brand engagement and brand evangelist - **REJECTED**

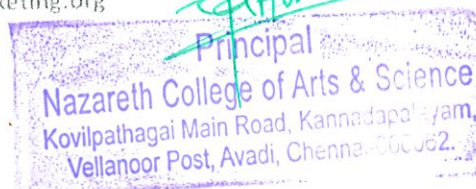
RESEARCH METHODOLOGY

Influencers in India are gaining prominence on social media, establishing brand trust and engaging their followers. Influencer marketing is expected to continue, and brands must engage with the right influencers to reach their target audience. Chennai, known as the "Gateway to South India," is known for its thriving cultural scene and Kollywood glitz. The researcher conducted a study in Chennai, South India, using the opportunity sampling method to gather data from Instagram users. The data was collected from the Instagram users. Around 100 questionnaires were issued to the users of the Instagram. The questionnaire divided into three sections: Demographic parameters, characteristics of micro influencers, question related to 9brand engagement, trust, love, brand evangelist were parameters in the second part The third part of the questionnaire contains factors using the Likert scale. The data was collected using SPSS, and the Anova test was used to verify the relevance of demographic components. Regression analysis was used to measure the impact of social media influencers on Brand engagement and brand evangelist.

INFLUENCE OF AGE OF THE BRAND EVANGELIST ON BRAND ENGAGEMENT, TRUST, LOVE.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Authenticity	Between Groups	26.133	2	13.067		
	Within Groups	0	102	0		



	Total	26.133	104			
Niche	Between Groups	43.2	2	21.6	15.559	0
	Within Groups	141.6	102	1.388		
	Total	184.8	104			
Relatability	Between Groups	20.533	2	10.267	43.154	0
	Within Groups	24.267	102	0.238		
	Total	44.8	104			
Loyalty	Between Groups	6.533	2	3.267	32.455	0
	Within Groups	10.267	102	0.101		
	Total	16.8	104			
Brand Engagement, Trust, Love	Between Groups	43.2	2	21.6	91.8	0
	Within Groups	24	102	0.235		
	Total	67.2	104			
Brand Evangelist	Between Groups	19.2	2	9.6	163.2	0
	Within Groups	6	102	0.059		
	Total	25.2	104			

It was presented in the above table Niche ($F=15.559$, $P=.000$) Relatability ($F=43.154$, $P=.000$) Loyalty ($F=32.455$, $P=.000$) Brand Engagement, Trust, Love ($F=91.800$, $P=.001$) Brand Evangelist ($F=163.200$, $P=.000$) are statistically significant at 5% level.

REGRESSION ANALYSIS-1

In this regression analysis table 1, table 2, table 3 the brand engagement trust and love is treated as a dependent variable and the other factors related to micro influencers characteristics are considered as independent variable for the analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.810 ^a	0.656	0.642	0.481

a. Predictors: (Constant), loyalty, niche, authenticity, relatability

From above table it is found that $r = .810$ $r^2 = .656$ and adjusted $r^2 = .642$. This implies the factors create variance over the brand engagement. The cumulative influence of four variables of micro influencers characteristics is ascertained through the following one-way analysis of variance.

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	44.089	4	11.022	47.69	.000 ^a
Residual	23.111	100	0.231		
Total	67.2	104			

a. Predictors: (Constant), loyalty, niche, authenticity, relatability

b. Dependent Variable: brand engagement, trust, love

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.198	1.233		-0.161	0.873
1 authenticity	1.214	0.116	0.757	10.423	.000
niche	-0.089	0.045	-0.147	-1.961	0.053
relatability	-0.116	0.096	-0.095	-1.215	0.227
loyalty	-0.037	0.134	-0.019	-0.279	0.781

a. Dependent Variable: brand Engagement, Trust, Love

From the above table it shows that authenticity (Beta=.757, t=10.424, p=.000), niche (Beta=-.089, t=-1.961, p=.053), relatability (Beta=-.116, t=-1.215, p=.227), Loyalty (Beta=-.037, t=-.279, p=.781). The micro influencer characteristics Authenticity influences brand trust, love and engagement and are significant statistically at 0.05.

REGRESSION ANALYSIS 2

ANALYSIS PERTAINING TO OBJECTIVE 2

In this regression analysis table 1, table 2, table 3 the brand engagement, trust and love treated as an independent variable and the variable brand evangelist are considered as independent variable for the analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.919 ^a	0.844	0.842	0.196

a. Predictors: (Constant), brand engagement, trust, love

From above table it is found that $r = .919$ $r^2 = .844$ and adjusted $r^2 = .842$. This implies the factors create variance over the brand evangelist. The cumulative influence of brand engagement, trust and love is ascertained through the following one-way analysis of variance.

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.262	1	21.262	556.200	.000 ^a
	Residual	3.938	103	.038		
	Total	25.200	104			

a. Predictors: (Constant), brand Engagement, trust, love

b. Dependent Variable: brand evangelist

Co-efficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.125	.107		19.922	.000
	Brand Engagement, Trust, Love	.562	.024	.919	23.584	.000

a. Dependent Variable: brand Evangelist

From the above table it shows that Brand Engagement, Trust, Love (Beta=.562, $t=23.584$, $p=.000$), The micro influencer characteristics Authenticity influences brand trust, love and engagement and are significant statistically at 0.05

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Authenticity	Between Groups	26.133	2	13.067		
	Within Groups	0	102	0		
	Total	26.133	104			
Niche	Between Groups	43.2	2	21.6	15.559	0
	Within Groups	141.6	102	1.388		
	Total	184.8	104			
Relatability	Between Groups	20.533	2	10.267	43.154	0
	Within Groups	24.267	102	0.238		
	Total	44.8	104			



Loyalty	Between Groups	6.533	2	3.267	32.455	0
	Within Groups	10.267	102	0.101		
	Total	16.8	104			
Brand Engagement, Trust, Love	Between Groups	43.2	2	21.6	91.8	0
	Within Groups	24	102	0.235		
	Total	67.2	104			
Brand Evangelist	Between Groups	19.2	2	9.6	163.2	0
	Within Groups	6	102	0.059		
	Total	25.2	104			

ANALYSIS PERTAINING TO OBJECTIVE – 2

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.941 ^a	0.885	0.88	0.279	1.566

a. Predictors: (Constant), brand evangelist, relatability, loyalty, niche, authenticity

b. Dependent Variable: brand engagement, trust, love

ANOVA^b

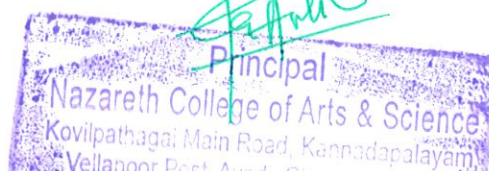
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.505	5	11.901	153.119	.000 ^a
	Residual	7.695	99	.078		
	Total	67.200	104			

a. Predictors: (Constant), brand evangelist, relatability, loyalty, niche, authenticity

c. Dependent Variable: brand engagement, trust, love

Coefficients^a

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
-------	-----------------------------	---------------------------	---	------



		B	Std. Error	Beta		
1	(Constant)	-5.657	.813		-6.956	.000
	authenticity	-.296	.127	-.185	-2.336	.021
	niche	.200	.033	.332	6.008	.000
	relatability	.262	.062	.214	4.252	.000
	loyalty	.084	.078	.042	1.076	.284
	brand evangelist	2.034	.144	1.246	14.084	.000

a, Dependent Variable: brand,engagement,love

FINDINGS AND CONCLUSION

This study broadens the understanding of Pornsrimate and Khamwon's (2020) approach of constructing brand evangelism through social media micro-influencers. Examining the mediating effects of brand engagement and brand love, the model is evaluated by deleting the path from micro-influencer traits to brand evangelism. Focused on social media users with substantial purchasing power, Millennials are the study's target demographic. According to the research, micro-influencers and brand evangelism among Millennials are mediated by brand engagement and brand love. Marketing professionals now have a tool to locate the perfect micro-influencer to help them achieve their marketing objectives and turn Millennial consumers into brand aficionados—the new model performs better than the previous model in terms of fit factors.

BIBLIOGRAGHY

1. Ebru Uzunoğlu, Sema Misci Kip, Brand communication through digital influencers: Leveraging blogger engagement, International Journal of Information Management, Volume 34, Issue 5, 2014, Pages 592-602, ISSN 0268-4012,
2. Juhee Kang, David J. Kwun & Jeeyeon Jeannie Hahm (2020) Turning Your Customers into Brand Evangelists: Evidence from Cruise Travelers, Journal of Quality Assurance in Hospitality & Tourism, 21:6, 617-643, DOI: 10.1080/1528008X.2020.1721039
3. Jung Eun Lee, Brandi Watkins, YouTube vloggers' influence on consumer luxury brand perceptions and intentions, Journal of Business Research, Volume 69, Issue 12, 2016, Pages 5753-5760, ISSN 0148-2963,
4. Karina Sokolova, Hajer Kefi, Instagram and YouTube bloggers promote it, why should I buy? How credibility and parasocial interaction influence purchase intentions, Journal of Retailing and Consumer Services, Volume 53, 2020, 101742, ISSN 0969-6989,
5. P. Becerra, E. and Badrinarayanan, V. (2013), "The influence of brand trust and brand identification on brand evangelism", Journal of Product & Brand Management, Vol. 22 No. 5/6, pp. 371-383. <https://doi.org/10.1108/JPBM-09-2013-0394>



11/17

6. Rita Conde, Beatriz Casais, Micro, macro and mega-influencers on Instagram: The power of persuasion via the parasocial relationship, Journal of Business Research, Volume 158,2023,113708, ISSN 0148-2963,
7. Silke Bambauer-Sachse, Sabrina Mangold, Do consumers still believe what is said in online product reviews? A persuasion knowledge approach, Journal of Retailing and Consumer Services, Volume 20, Issue 4,2013, Pages 373-381,ISSN 0969-6989,
8. Sophie C. Boerman, The effects of the standardized Instagram disclosure for micro- and meso-influencers, Computers in Human Behavior, Volume 103,2020,;/Pages 199-207,ISSN 0747-5632,https://doi.org/10.1016/j.chb.2019.09.015.
9. Watchara Chiengkul & Jiraporn Junla (2023) Have you been falling in love?: An analysis of coffee shop brand love in Thailand, Journal of Foodservice Business Research, DOI: 10.1080/15378020.2023.2229577
10. Yoori Hwang, Se-Hoon Jeong, "This is a sponsored blog post, but all opinions are my own": The effects of sponsorship disclosure on responses to sponsored blog posts, Computers in Human Behavior, Volume 62,2016,Pages 528-535,ISSN 0747-5632,

