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BUSINESS STUDIES**SOFTWARE DEVELOPMENT TEAM CHARACTERISTICS IN
TECHNOPARK, THIRUVANANTHAPURAM**¹S.A. Parvin and ²H.M. Dhas¹Research Scholar^{1&2} Dept. of Business Studies and Centre for Research

Scott Christian College (Autonomous), Nagercoil - 629003, Tamil Nadu

¹Corresponding author: ashadhilip@gmail.com**Abstract**

The study attempted in identifying the team characteristics that commonly prevail among the Software Development Team members. Through the previous research studies 28 team characteristics were identified. The attitude of the Software Development Team members towards the various team characteristics were identified using Questionnaire and attitude measured through Likert's scale. Based on their attitude team themes were identified through factor analysis. Seven themes were identified and they were labelled according to the nature of the team characteristics contained in it. This research could be further carried out by identifying the relation between generated software development team themes and its relation with the team effectiveness. The team effectiveness can be subjectively measured.

Keywords: Characteristics; Software; Themes; Behavioural; Effectiveness

Introduction

An organization creates teams to bring together groups of people with complementary skills and interests to work toward a common goal. Teams are increasingly common and relevant from an organizational perspective, as globalization and technology continue to expand organizational scope and strategy. In organizations, teams can be constructed both vertically (varying levels of management) and horizontally (across functional disciplines). In order to maintain synergy between employees and organize resources, teams are increasingly common across industries and organizational types. Team refers to a small group whose members have complementary skills, have a common purpose, apply performance goals, and who accept mutual accountability (Proehl, 1997: 139). A complex production environment benefits from the work produced by teams.

Forsyth (1990) states that teams utilize individual resources, and team performance should utilize the interpersonal dimensions of the team. Usually, productivity increases when workers see themselves as part of a team, rather than as individuals who work alone. Also, a team approach increases the sense of camaraderie, self-worth, and belonging (Stewart *et al.*, 1999). In spite of the perceived challenges, both academic literature and current trends in the workplace indicate that the use of teams will continue to grow (Elmuti, 1996). As a result, teams are usually highly focused groups of employees, with the role of achieving specific tasks to support organizational success. Work teams come in a variety of types and sizes, cutting across different contexts, functions, internal processes, and external linkages. However, several features provide a foundation for a basic definition.

Unlike the early concept of teams that rose to popularity in the 1970s, modern teamwork is fully integrated into the activities and culture of an organization. The rationale for teams is myriad evidence that shows employees are more productive when they work together than when they work alone.

Related Works

Previous research studies have contributed a lot in the concept development of Team and its characteristics. Researchers who study general team characteristics often examine and reference the models of Gladstein (1984), Hackman (1987) and Campion *et al.* (1996). Gladstein defines inputs as contributions from individual, group, and organization for group effectiveness. Gladstein categorized the inputs into two levels: group and organizational. Gladstein's model defines team effectiveness based on the performance of the team and the satisfaction of the team members. Hackman's model (1987), like Gladstein's model (1984) uses an "input-process-output" framework for analyzing group behavior and performance. Hackman's model consists of six major variables: organizational context, group design, group synergy, process, group task, and group effectiveness. Campion *et al.* (1993) developed a model of team characteristics and team effectiveness. Their model is based on the studies of Gladstein (1984), Hackman (1987) and, Guzzo and Shea (1992). Guzzo and Shea (1992) reviewed previous studies regarding task performance of teams in organizations, according to several schools of thought: socio-technical theory; interaction process; group development; group composition and goals; contextual influences on performance, and inter-group relations. Campion *et al.* (1993) developed five common themes, all of which relate to team effectiveness. The five themes in their model were: job design, interdependence,

composition, context, and process. Each team theme is associated with a unique set of team characteristics. The authors also identified team effectiveness criteria. These criteria are team productivity, employee satisfaction, and manager judgments of effectiveness (Campion *et al.*, 1993). Campion *et al.* (1996) replicated and expanded on their previous study Campion *et al.* (1993). Their 1996 study eliminated two team characteristics (task identity and preference for group work), based on their 1993 study results. The two variables were not highly-related to team effectiveness (Campion *et al.*, 1993) and were not relevant to their second study (Campion *et al.*, 1996). They measured team effectiveness based on manager judgment of team effectiveness, employee satisfaction, and productivity (performance appraisals).

Based on Campion *et al.* (1993) model, Kwak (2004) developed a model which defined the relationship between Apparel Development Team Characteristics and its effectiveness. Kwak (2004) in her research work used both factor analysis and multiple regression analysis and by means of applying factor analysis two themes for team characteristics were identified: team interaction and team interdependence. Based on multiple regression analysis, these two themes predicted team member job satisfaction (TMJS) and team member judgment of effectiveness (TMJE). Among the 11 team Apparel Product Development Team characteristics, potency, workload sharing, communication with teams, and social support displayed the highest correlation (in descending order) with Apparel Product Development team effectiveness. This study found to be a theoretical framework for further research studies among teams who work towards a common purpose.

In another study by Heng (2006), among the relationship of team characteristics and team performance among Malaysian manufacturing and telecommunications work teams from various organisations in the study utilised about 13 behavioural characteristics based on the previous research studies and identified its effect on team performance.

In the present study the researcher has included 28 team characteristics based on the previous literature. The Conceptual background of the included team characteristics are presented below:

Self-management refers to the degree of self-control that an individual exercises over his/her own tasks within the team.

Participation includes variables on how well the teams encourage acceptable level participation of team members in decision making, and how well they work well together.

Task variety one of the characteristics of the job design theme, provides each team member with the opportunity to perform a number of different tasks. When team members share both interesting and mundane tasks, this enhances the motivation of the individual team members.

Task Significance implies how well the task performed by the team is significant to the company and to the team customers.

Managerial Support includes the top management support for the team activities, encouragement of the management in risk taking and participation of team members in decision making.

Communication and co-operation within the team includes how far the team members rely on each other, extent to which they have respect for other team members and how they communicate well with one another.

Training includes questions on the attitude of the team members and leaders towards technical training, training to enhance communication of team members, training to enhance interpersonal skills, and training on customer service.

Potency implies the team spirit that exists among the team members.

Social support includes the opportunities for positive social interaction and helping each other.

Workload sharing includes fair share of work and equal contribution of the team members.

Interdependent feedback and rewards includes how well individual feedback is given and how the contribution of the individual is assessed.

Interdependence refers to the level of team-member interaction required by a work task in order for the team members to complete the task. Interdependence includes Task interdependence, Goal interdependence and Organizational Interdependence.

Cohesiveness refers to the need to belong because of certain attraction or because they like other members. Team cohesiveness is considered a key factor in influencing team performance and a strong predictor of team behaviour.

Liking each other is personal attraction that encourages team members to remain in the team.

Role clarity refers to clear role definition and mutual expectations that offer stable internal coordination.

Goal Agreement refers to sharing team goals which lead to goal clarity and higher team performance in quantity and accuracy of services.

Role Satisfaction implies the fulfillment of social needs which leads to a willingness to stay in a group.

Openness to change indicates that team members who are open to change tend to interact openly with other members as they are more likely to trust.

Openness to Differences indicates that when team members are open to each other's differences, they tend to participate actively in team activities and are open to feedback.

Division of Task into Sub - Teams implies dividing the tasks with clear definition of authority, responsibility and expertise.

Participative Leadership Style implies that the leader is seeking opinions, suggestions and encouraging participation in decision making.

Goal Motivation implies challenging task experienced by team members motivate team members towards higher performance.

Informal Leadership Role occurs when team autonomy such as decision making is given to team members there is a tendency to rely on informal leadership.

Intra Team Conflict is viewed as an important process variable which serves as a mediator between team behaviour and team outcomes.

Cliques tend to form in large teams because of poor communication and clear goals leading to members isolate themselves.

Objectives of the Study

- To know the Socio-Economic profile of Software Professionals in Software Development teams at Techno Park, Thiruvananthapuram.
- To identify the effective Team characteristics among the Software Development

teams at Techno Park, Thiruvananthapuram.

- To generate Software Development Team Themes.

Materials and Methods

Sampling Technique

The sampling technique adopted for the study is Stratified Random Sampling. As the population were stratified into three strata's such as small- sized companies, medium sized companies and large sized companies. They are classified based on the number of employees working in such companies. If there are Less than 50 members in an organisation it is categorised as Small- sized companies, if there are employees between 50 - 200 they are categorised as Medium -sized companies and if there are more than 200 members working they are grouped as Large sized companies.

Sample Size

The Sample size selected for the study includes 400 Software Development Team members at Technopark, Thiruvananthapuram-20 teams from small sized companies, 20 teams from medium sized companies and 40 teams from large sized companies. From each team 5 team members were randomly selected.

Data Collection

Primary Data was collected through Questionnaire. The attitude of software development team members towards these characteristics are collected through Likert 5 point scale ranging from strongly agree to strongly disagree. The Secondary Data was collected through Journals, Books and Websites.

Area of Study

The Software Development Teams were chosen from the Small, Medium and Large sized organisations at Technopark, Thiruvananthapuram. Technopark offers a one-stop solution to all the business needs related to IT. Technopark's Vision is to provide a holistic enabling environment to make Knowledge industry intrinsically competitive and world-class. Be it, robust and failsafe infrastructure, or best in class data communication options, or availability of a talent pool of high quality professionals or India's best prevalent law and order conditions or the highest incentive on offer amongst Indian states.

Tools used

To analyse the data collected the following tools were used:

- 1) Percentage Analysis
- 2) Factor Analysis.

Need for the study

Technological advancements have catalyzed the usage of teams in modern software organizations. Teams are supposed to be better suitable for executing complex tasks because team members share workload, observe behavior of other team members and contribute to the sub tasks of the complex task (Mathieu *et al.*, 2000). Large scale software development is a collaborative activity which requires human resources and coordination among them (Espinosa *et al.*, 2001). This study will enable further research work in identifying the relation between team characteristics and its effect on team effectiveness thereby contributing towards the success of an organisation.

Tables and Figures

Socio - Economic Profile of the Respondents - Gender of the Respondents

Table 1.1. Gender of the Respondents

S. No.	Gender	No. of Respondents	Percentage	Cumulative Percentage
1	Male	199	49.75	49.75
2	Female	201	50.25	100
Total		400	100	

Source: Primary Data

Table 1.1 indicates that the number of female respondents (50.25%) are higher than the number of male respondents (49.75%).

Marital Status of the Respondents

Table 1.2. Marital status of the Respondents

S. No.	Marital Status	No. of Respondents	Percentage	Cumulative Percentage
1	Married	132	33	33
2	Unmarried	268	67	100
Total		400	100	

Source: Primary Data

Table 1.2 indicates that the number of unmarried respondents (67%) are higher than the number of married respondents (33%).

Age-Group of the Respondents

Table 1.3. Age-Group of the Respondents

S. No.	Age-Group	No: of Respondents	Percentage	Cumulative Percentage
1	Less than 30 years	210	52.5	52.5
2	More than 30 years	190	47.5	100
	Total	400	100	

Source: Primary Data

Table 1.3 indicates that the number of respondents less than 30 years (52.5%) are higher than the number of respondents in the age group of more than 30 years (49.75%).

Highest Qualification of the Respondents

Table 1.4. Qualification of the Respondents

S. No.	Qualification	No. of Respondents	Percentage	Cumulative Percentage
1	B.E.	225	56.25	56.25
2	B.Tech	49	12.25	68.5
3	Degree	72	18	86.5
4	Diploma	16	4	90.5
5	P.G	38	9.5	100
	Total	400	100	

Source: Primary Data

Table 1.4 indicates that 56.25 percent of respondents have completed their Engineering Degree and 18 percent of the respondents have completed their Under Graduate degree followed by B.Tech holders (12.25%), Post Graduate Degree holders (9.5%) and Diploma holders (4%).

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NPR ARTS & SCIENCE COLLEGE
NATHAM, DINDIGUL DISTRICT

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Risks in the Space Exploration in Andy Weir's *The Martian*

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Abstract

This paper depicts the risks faced by the astronauts in space exploration in the novel *The Martian* which was written by Andy Weir. Andy Weir is an American novelist who was a son of a particle physicist. He uses his tremendous knowledge in science to write the book to be as scientifically accurate as possible. He has written a number of works including *The Martian* and *Artemis*. The novel *The Martian* is a science fiction novel. The novel speaks about the risks faced by the astronauts in the space travel in an unexpected situation. Andy Weir explores the survival methods by using his scientific background.

Space exploration is an intrinsic risk endeavor. Apart from the massive engineering challenges in launching and returning spaceman's safely to Earth, astronauts living in space experience a range of psychological and physical changes that can affect their ability to perform required mission function, and, in the long term, increased risk of developing various physical illness including tumour, damaged vision, reduced bone strength, and other damages to health and wealth being.

Andy Weir, is the son of the particle physicist, has some background in computer science. He begins writing the novel *The Martian* in the year 2009. He researches related material so that it would be pragmatic as possible and based on existing technology. Andy Weir studied Orbital mechanics, astronomy and the history of manned spaceflight.

The novel opens with a crew traveling on Mars to discover the planet but all of a sudden, a dust storm shows up and the crew of the mission is forced to leave the red planet to survive. Unfortunately, the crew accidentally left Mark Watney, who was on the crew member going on the mission. Now the situation is that Mark Watney is stranded on Martian surface, he has no other way expecting he will have to use his skills in botany and engineering, to survive Mars hazardous environment until the day he rescued.

The writer Andy Weir shows up the character of Mark Watney to be an exceptionally intellectual character who can use his intelligence to easily adopt the dangerous atmosphere of Mars by using his knowledge in both engineering and botany. Mark uses his competence in this subject to study the environment of the Martian surface and try his level best to stay alive in such an atmosphere. Mark Watney, who is a botanist and mechanical engineer, make use of his botanical knowledge in order to grow food to survive and uses his engineering knowledge in order to customize the equipment he uses.

The whole story covers up nearly two years, and the whole time Watney fights for his survival against the harsh Martian atmosphere.

The novel *The Martian* largely speaks about the risks faced by the astronauts in the outer space. When one read the novel *The Martian*, they get a solid idea of just how someone could survive on the Martian surface. Stuck all alone in the surface of Mars for far longer than planned, Mark Watney finds himself completely in a different inhospitable environment which is completely opposite to the atmosphere of Earth. Unlike Earth, his body is not suitable for the situation and atmosphere of Mars.

Unsurprisingly, Mark Watney comes to rely upon technology to keep himself alive, such as the Hab, the rovers and his EVA suits which keep him all alive. Though these technologies keep himself alive, its very strength conceals many dangers. On the one hand, this technology is very much helpful, it is also simple for Mark Watney to underrate how vulnerable the technology is to harm.

Mark Watney faces many challenges when he fails to account for the difference between the atmosphere between Earth and Mars, or when an apparently slight error damages his equipment. It is better illustrated in a situation when Watney's nearby unsuccessful attempt to make water by separating hydrogen gas out from hydrazine fuel. During this process of making water, Watney by accident leaves sufficient hydrogen in the air to risk an explosion. Watney almost suffocates a lot while removing the hydrogen from the air by inhaling too much of nitrogen. He then pulls on an oxygen mask without understanding the situation, but when the moment he exhales, he adds enough oxygen into the air to cause an explosion inside the Hab. Exhaling a combination of oxygen and carbon dioxide and also breathing oxygen is, on Earth is the most natural thing. But in the Hab oxygen is dangerous the very exact thing that Watney needs to survive could kill his life.

The novels start off with dust storm which leads Mark Watney to struggle all alone in the Martian surface. After the dust storm other crewmembers leaves Mark Watney in the red planet consider him as dead but Watney wakes up by the alarm sound from his suit, he is bleeding but that actually turns out to be a good thing. Because the dried blood has pooled and is sealed up the hole in his suit. When he found himself all alone in the Martian Surface, even not had a way to communicate with NASA, Mark says:

For the record ... I didn't die on Sol 6. Certainly, the rest of the crew thought did, and I can't blame them. Maybe there'll be a day of national mourning for me, and my Wikipedia page will say, "Mark Watney is the only human being to have died on Mars. (1)

The novel *The Martian* speaks about the problems faced by the astronauts, especially when Mark was all alone in the Martian surface, his first problem was food. When Mark was calculating the food amount in the Hab, he found it was lost only for three hundred days. Mark has no way to communicate with Earth, so no one knows the truth about Mark Watney, and he has no way live after

300 days. The only hope of Mark was the next mission of NASA namely Ares 4. At first Mark Watney loses his hope, and says:

So that's the situation. I'm stranded on Mars. I have no way to communicate with Hermes or Earth. Everyone thinks I'm dead. I'm in a Hab designed to last thirty-one days. If the Oxygenator breaks down, I'll suffocate. If the Water Reclaimer breaks down, I'll die of thirst. If the Hab breaches, I'll just kind of explode. If none of those things happen, I'll eventually run out of food and starve to death. (7)

In space travel astronauts face many problems, including, "Behavioural Health, and performance, Inadequate Food and Nutrition, Space Radiation, and Vision Impairment and Intracranial Pressure" (National, 15). In the novel *Martian*, Mark Watney faces many health issues from the beginning to the end of the novel. He not only face physical issues, but he also faces mental problems. Even his crewmates and the employs of NASA filled with mental pressure after they lose Watney in the Martian surface, and once they found Mark Watney was still alive, many of them lost their sleep in order to bring him Earth safely.

Even four months after the incident, the grew members remind the loss of Watney, Everyone remembers the day, they left Watney all alone in the Martian Surface, even they were not aware of his survival. "Beck tried not to think about the painful reason he was doing zero-g plant growth experiment" (143). For that experiment, they travel to Mars, but unfortunately loss Watney there. From that passage, one could easily understand the feelings of the astronauts after their crewmate's loss. They were not in good condition after they met with the dust storm. After four months the crew receives a message from Mitch Henderson, The flight director of Ares 3, informing them, "I have some news", Mitch's voice continued, "There's no subtle way to put this: Mark Watney's still alive" (144).

On hearing this first the crew mates get stunned until then they thought Watney was dead, but now the news about him ntake them happy. But Lewis, the commander of Ares 3 was the one who takes the message seriously. After hearing the message, Lewis hastily said she left him behind. Beck tried to convince her by saying that they were altogether left him. But Lewis crosses their conversation and says, "I left him behind. In a barren, unreachable, godforsaken wasteland" (145).

Lewis used to make tough decisions such as the order to evacuate Mars during a dust storm. But she suffers extreme to regret at losing a subordinate. When Lewis learns Watney is alive, she feels guilt at having left him behind. On the other hand, Mark Watney's story, which is told in episodic construction focuses on Mark Watney's labors and innovations as he struggles to stay alive despite lack of food and resources. Once Mark Watney found he was lack of food, he found an alternative idea to grow up potato plants in Martian surface.

Mark Watney, a botanist, and mechanical engineer make extensive use of his knowledge in order to grow potatoes in the Martian surface for his survival and to repair and modify the equipment he uses. At first, everything went efficiently but when the Airlock which he has been using frequently breaks, and is thrown from the HAB. Mark was injured, but at the same time, that explosion brings major drawback to Watney's farm idea. It destroyed the whole crop of potatoes and fundamentally end up his crop growing idea in Mars. After that incident, he has no way to survive and to wait for Ares 4 without food. Food is very much important for survival. According to A. P. J. Abdulkalam:

Food is the sustainer of life. For all living organisms there are four essential aspects of life: to be born, to eat, to reproduce, and to die. Food is what provides energy to living beings, so it is essential for survival and growth. Accordingly, all life form spend a large part of their lives on the acquisition of food. (Kalam 109)

Ares 4 arrive at Mars on Sol 1425 but after the explosion of the airlock, Mark was left with food that long-lasting till sol 600, and Mark Watney has no other way to grow up potato plants in the HAB. Before the accident, Watney grew food that lasts for sol 900 and NASA plans to send the probe to Watney on Sol 856. But after the blast, everything went wrong. So NASA started to work on to send the probe before Watney starve to death. But they only have a very short amount of time to invent the probe. Because the trip of the probe in the space was taken four hundred and fourteen days.

Teddy Sander, the administrator of NASA, hurry up the construction of the probe. They found out that the probe reaches Mars after some days Watney runs out of food but, Teddy asked, Dr.Keller to reduce the intake of Watney's ration in order to last the food for some more days. But Dr. Keller was not satisfied with the idea of Teddy. Because Mark Watney was already at a minimum calorie count and comparing to his physical labor Watney eating far less than he could.

Teddy Sander enquires Dr. Keller out the lifespan of a human without food. For this question the doctor replied:

Presuming an ample water supply, he might last three weeks. Shorter than a typical hunger strike, but remember he'll be malnourished and thin to begin with. Within 4 days of running out of food, he'll barely be able to stand up, let alone control a rover Plus, his mental faculties will rapidly decline. He'd have a hard time even staying awake. (179)

It leads Mark Watney's life to danger. Teddy in most of the time doesn't want to take any risks for the life of the other crew members and the Hermes. But at the same time, he has the authority to decide anything according to the rules of NASA, which says:

The PRR summarizes the Agency's ability to control the risks and concerns based on current understanding and identification and validation of potential countermeasures. NASA updated the PRR in June 2015. According to the 2015 version of the document,

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சேலம்.**

**தமிழ்த்துறை
இணைந்து நடத்தும்**

4

பன்னாட்டுக் கருத்தரங்கம் அக்டோபர்-04-2019

இலக்கண இலக்கியங்களில் வாழ்வியல் கூறுகள்



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குறள் காட்டும் இனிய இல்லறம்

*முனைவர் ஜாக்ஜீவின் ஜானஜெனி, உதயிப் பேராசிரியர், தூய பொன்னு கலை மற்றும் அறிவியல் கல்லூரி, அம்பலமேட்டி-600 035

அறிவுத்திறம் இனிய தம் துரித பொழியல் காண்பித்தாலும் முயில் நல்வழக்கை காண்பித்திருக்கருதுககனாக் கூறும் பழையது இலக்கியங்கள் போன்ற வகுக்கின்றன. அருகிலக்கியங்கள் மண்ணிலும் அவற்றுக்கெல்லாம் மணிமுடியாய் திகழ்வது வள்ளலார் வள்ளலார் வகுத்தாரித்த தெய்வப்பாடலும் திருக்குறள் பொழி, இடம், காலம் என்னும் மூன்று மூலங்களாகத் தான் அமைந்துள்ள இல்லறமுக்கூறும் வரிக்காட்டும் தூய திருக்குறள் மகிமை யாராவும் மறக்க முடியாது.

"அறம் பொருள் இனிய வினா தம் நூற்பாவின்" (குறள் 10) என்ற பன்னாதி முயில் நூறுக்கு இலக்கணம் தருகிறார் தூய என்னும் பொது அது மக்களுக்கு உறுதி யாய்தாய் திகழ வேண்டும். திருக்குறள் அறம், பொருள், இனிய என்னும் மூன்று மூலங்களாகப் பகுக்கப்பட்டிருந்தாலும், விடுபட்டு வெளிப்பாடாகக் கூறாதே சொயினும், இத்தூயின் முடிவான பொருள் விடுவதும் என்பது அமைவதும் அறிந்திதே.

இல்லறம்

*முதலாயத்திற்கும் ஒழுக்கத்திற்கும் ஆகிய முன்னோற்றத்திற்கும் ஆற்றும் இவ்விடமையாத உதயங்களான அறுவகையான எடுத்துக்கூறும்படி அறத்தூயாய் இல்லறத்தில் தன் மனைவி மக்களைக் கூப்பிடுத்து அறம் செய்ய குடுவத்ததை சிறப்பாக நடத்துவதே இல்லறம். இல்லறத்தில் இருப்பவனே பெற்றோர் அருகிலிருந்து உதயி புரிய வல்லவன் ஊரன் பின்னையாகிய மனைவியை நன்னுயிரோடு பொருத்தப் பெண்க் காத்ததும், தன் பின்னையகையை பெண்ப் பாதுகாத்ததும் இல்லறவனின் உதயங்களாகும். இதனை வள்ளலார்,

"இல்லறவன் என்பான் இயல்புடைய முயில்க்கும்

நல்வழியின் தின்று துணை" (குறள் 41)

என்று கூறுகிறார். இல்லறத்தை இயற்கை நடத்தும் தன்மையுடன் தன்மையுடன் இறுதிக்காலம் வரை தன்மத்த அன்புடையவனாக இருக்க வேண்டும். போயினும் துன்பத்திலும் இருந்தும் ஒத்த பங்கு கொள்வனாக வாழ வேண்டும் என்கிறார் வள்ளலார். இதைக் கூறத்ததை குறள்தொனகயும்,

"இம்மை மறி மறுமையாயினும்

நிபாசியர் என் கணவனே

நானாயித் தன் நெஞ்சு நேப்பவனே"

என்று சிறப்பித்துக் கூறுவதை அறிவலாம். பின்னையகையும் பிறகாவது அவ்வளவுதான் தம் வாழ்வில் கையாடுக்கத் தக்க சான்றாக அமைய வேண்டும். இல்லறமுக்கூறும்படி அறநெறி தவறாத பொருளை உடையதாக இருக்க வேண்டும்.

இதனை வள்ளலார்,

"அன்பும் அறமும் உடையத்தாயின் இல்லறமுக்கூறும்

பண்பும் பயனும் அது" (குறள் 45)

என்னும் குறள் மூலம் எடுத்தியம்புகிறார். இல்லறம் அருகத்தில் வள்ளலார் கூறும் பண்பு நன்மைகள் கொண், குடுவத் தன்மையுடன் பண்பு சிறப்பாகத் தம் இல்லறத்தை நடத்தி வருகின்றார்கள். இதிலும் விதிவிலக்காகச் சில குறிப்பத்தனவாகும் ஆண்கு அடிமையாகி யது, மரது போன்ற சிறுபிள்ளைகளில் எடுக்கி தம் குடுவத்ததும் பொண்பும் பிற படித்தது பொருத்தக் காழ்க்கை காழ்கின்றார்கள். இதனால் தன் குடுவப் உறுதியுடையதும் நிபந்த படிச்சொல் வறங்க காண்புகின்றார்கள்.

வாழ்க்கைத்துணை

குடுவப் வாழ்க்கைக்கு துணையாக உயர் மனைவியின் மனைவி 'மனைக்கு விளக்கம் உடைய' என்க. இல்லறத்துக்கு வேண்டிய நூற்பாவை உடையவனாகத் திகழ்த்து தன்மையக் கொண், கணவனது வாழ்க்கை மனம் தூயவனே சிறந்த வாழ்க்கைத் துணையவியாவார்.

"மனைத்தக்க மனைவியை ஆகித்தத் கொண்கன்

வளத்தக்கன் வாழ்க்கைத் துணை" (குறள் 51)

இல்லறவாழ்வில் இருந்து கொண்டு எல்லோரையும் பாதுகாத்து பொருளை முயன்று ஈட்டி பாதுகாத்து வாழ்வதெல்லாம் இல்லம் தேடி வரும் விருந்தினர்களை உபசரித்து உதவி செய்வதற்கே என்பதனை,

“இருந்தோம்பி இல்வாழ்வ தெல்லாம் விருந்தோம்பி
வேளாண்மை செய்தற் பொருட்டு” (குறள்:81)

என்னும் குறளில் சுட்டுகிறார். ‘அகத்தின் அழகு முகத்தில் தெரியும்’ என்பது பழமொழி அகத்தின் வெளிப்பாடே முகம். இனிய முகத்துடன் விருந்தினரை உபசரிப்பவன் இல்லத்தில் செல்வமகளாகிய திருமகள் மனமுவந்து தங்குவாள் என்பதனை,

“அகனமாந்து செய்யாள் உறையும் முகனமாந்து
நல்விருந்து ஓம்புவான் இல்” (குறள்:84)

என்னும் குறள் உணர்த்துகிறது.

விருந்தோம்புதலோடு யாதொரு பலனையும் எதிர்பார்க்காமல் வறுமையால் வாடுபவனுக்கு அவருடைய தேவையறிந்து கொடுக்கும் ஈகைப் பண்புடையவர்களாகவும் நாம் விளங்க வேண்டும். இல்லம் தேடி வந்த விருந்தினரை முறையுடன் பேணி இனி வரப்போகும் விருந்தினருக்காக காத்திருப்பவன் தேவர்களை உபசரிக்கும் நிலையை அடைகிறான் என்பதை,

“செல்விருந்து ஓம்பி வருவிருந்து பார்த்திருப்பான்
நல்விருந்து வானத் தவர்க்கு”

எனும் குறள் மூலம் விளக்கியுள்ளார் வான்புகழ் வள்ளுவனார்.
ஒழுக்கமுடைமை

ஒருவர் வாழ்வில் மேற்கொள்ள வேண்டிய நல்ல நடத்தையே ஒழுக்கம் எனக் கருதப்படுகிறது. தன் சொல்லிலும் செயலிலும் தாய்மை காப்பவனே ஒழுக்கமுடையவனாக இருக்க முடியும். ஒழுக்கம் என்னும் உயர்ந்த குணம் ஒருவனுக்கு மேன்மையைத் தருவதால் அந்த நற்குணத்தை உயிரைவிட மேலாகப் பாதுகாக்க வேண்டும். இதனை,

“ஒழுக்கம் விழுப்பம் தரலான் ஒழுக்கம்
உயிரினும் ஓம்பப் படும்”

என்ற குறள் மூலம் வள்ளுவர் வலியுறுத்துகிறார்

மனிதனுக்கு மேன்மையை ஈட்டுகின்ற ஒழுக்கம், கல்வி செல்வம் என்னும் மூப்பெருங்கூறுகளுள் ஒழுக்கமே எல்லாராலும் உயர்த்திக் கூறப்படுகிறது. இவ்வுண்மையை

“ஆர்கலி உலகத்து மக்கட் கெல்லாம்

ஓதலிற் சிறந்தன்று ஒழுக்கமுடைமை” (முதுமொழி காஞ்சி - 1) எனும் முதுமொழிக்காஞ்சி பாடல் மூலம் உணரலாம்.

பிறன் இல் விழையாமை

பிறன் மனையாளின் தோளில் சாய்தலை விரும்பாதவனே தன் மனையாளிடம் இன்பம் செலுத்தமுடியும். பிறன் மனைவியை நினைக்காத அரிய செயல் சான்றோருக்கு அறம் மட்டுமன்று. சிறந்த ஒழுக்கமும் ஆகும். இதனை

“பிறன்மனை நோக்காத பேராண்மை சான்றோர்

கறனொன்றோ ஆன்ற ஒழுக்கு” (குறள்:148)

என்னும் குறள் மூலம் சுட்டுகிறார் வள்ளுவர். “பிறன்மனைப் பின்னோக்காப் பீடு இனிது” (இனியவை நாற்பது 15) என்பது இனியவை நாற்பது கூறும் உண்மை.

புறங்கூறாமை

ஒருவன் தன் முன்னிலையில் இல்லாதபோது இழிவாகப் பேசுவதும் நேரில் கண்டபோது பொய்யாக சிரித்துப் பேசுவதும் அறத்தை சிதைப்பதைவிடக் கொடுமையானதாகும் என்பதனை

அறனழி அல்லவை செய்தலின் தீதே

புறனழிம் பொய்த்து நகை(குறள்:182)

எனும் குறள் மூலம் வள்ளுவர் உணர்த்துகிறார்.

குடும்ப வாழ்வில் ஏற்படும் பிரச்சினைகளுக்கும் மனமுறிவுகளுக்கும் தீவு காண முயலுபவர்கள் பலர். இல்லறம் என்னும் தேருக்கு அச்சாணியாகவும் வையத்துள் வாழ்வாங்கு வாழ வழிகாட்டும் கலங்கரை விளக்காகவும் இருக்கின்ற திருக்குறளின் கருத்துக்களை நம் வாழ்வில் கடைபிடிப்பதுடன் மறப்பதும் மன்னிப்பதுமே குடும்ப வாழ்வில் ஏற்படும் பிரச்சினைகளுக்கு தீவு என்பதை உணர்ந்து இல்லறத்தை இனிய இல்லறமாக மாற்றுவோம்.

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TOTAL DOMINATOR CHROMATIC NUMBER OF PATHS AND CYCLES THROUGH COMPUTER PROGRAMMING

Mathematics

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ABSTRACT

A total dominator coloring of a graph $G=(V,E)$ without isolated vertices is a proper coloring together with each vertex in G properly dominates a color class. The total dominator chromatic number of G is a minimum number of color classes with additional condition that each vertex in G properly dominates a color class and is denoted by $\chi_{td}(G)$. In this paper we introduce C++ programmes that are able to efficiently determine on approximation to the total dominator chromatic number of Paths and Cycles.]

2010 Mathematics subject classification code : 05C69, 68W25

KEYWORDS

Total dominator coloring, Total dominator chromatic number.

INTRODUCTION

In this paper we only consider Paths and Cycles. Further details in graph theory can be found in F.Harry[4]

Let $G=(V,E)$ be a graph with minimum degree atleast one. The Path and Cycle of order n are denoted by P_n and C_n respectively.

A proper coloring of G is an assignment of colors to the vertices of G , such that adjacent vertices have different colors. The smallest number of colors for which there exists a proper coloring of G is called a chromatic number of G , and is denoted by $\chi(G)$. A total dominator coloring (td-coloring) of G is a proper coloring of G with extra property that every vertex in G properly dominates color class. The total dominator chromatic number is denoted by $\chi_{td}(G)$ and is defined by the minimum number of colors needed in a total dominator coloring of G . This concept was introduced by A. Vijayalekshmi in [1]. This notion is also referred as a smarandachely k -dominator coloring of G , ($k \geq 1$) and was introduced by A. Vijayalekshmi in [2]. For an integer $k \geq 1$, a smarandachely k -dominator coloring of G is a proper coloring of G , such that every vertex in a graph G properly dominates a k color class. The smallest number of colors for which there exists a smarandachely k -dominator coloring of G is called the smarandachely k -dominator chromatic number of G and is denoted by $\chi_{td}(G)$.

In a proper coloring C of a graph G , a color class of C is a set consisting of all those vertices assigned the same color. Let C be a minimum td-coloring of G . We say that a color class is called a non-dominated color class (n -d color class) if it is not dominated by any vertex of G and these color classes are also called repeated color classes.

The total dominator chromatic number of Paths and Cycles were found in [3]. We have the following observation from [3]

Theorem A [3]

Let G be P_n or C_n . Then

$$\chi_{td}(P_n) = \chi_{td}(C_n) = \begin{cases} 2 \left\lceil \frac{n}{4} \right\rceil + 2 & \text{if } n \equiv 0 \pmod{4} \\ 2 \left\lceil \frac{n}{4} \right\rceil + 3 & \text{if } n \equiv 1 \pmod{4} \\ 2 \left\lceil \frac{n+2}{4} \right\rceil + 2 & \text{Otherwise} \end{cases}$$

Main Results

Section 1.1

In this section we have to find the total dominator chromatic number of paths by using C++ programme.

A path of ' n ' vertices, denoted by P_n , is a connected graph where all but two vertices have degree 1. We label the vertices of P_n as v_i for $(1 \leq i \leq n)$. Furthermore let (v_i, v_{i+1}) be an edge of P_n for $i < n$.

Here is the source code of C++ programme to find the total dominator chromatic number of Paths. The C++ programme is successfully compiled and run on C++ platform.

Program as follows

```
#include "stdafx.h"
#include <Windows.h>
#include <conio.h>

#include <iostream> using namespace std; int main() {
    int inpt;

    cout << "Enter the Value" << endl;
    cin >> inpt;
    while (inpt >= 11)

    {
        int n = inpt; // matrix row
        int m = inpt; // matrix column
        // dynamic allocation
    }
    int** ary = new int*[n]; //logic matrix int** mat = new int*[n];
    //adjacency matrix for (int i = 0; i < n; ++i)

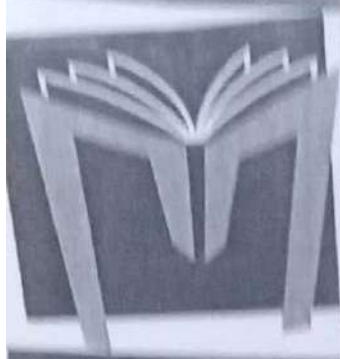
    {
        ary[i] = new int[m];
        mat[i] = new int[m];
    }

    // fill ary

    for (int i = 0; i < n; ++i) for (int j = 0; j < m; ++j) ary[i][j] = i;
    system("pause"); system("cls");
    cout << "\n";

    cout << "The Adjacency Matrix for P" << n << "\n" << "\n";
    for (int i = 0; i < n; ++i)
    {
        for (int j = 0; j < n; ++j)
        {
            if (ary[j][i] == i + 1 | ary[j][i] == i - 1)
            {
                mat[i][j] = 1;
                cout << mat[i][j] << " ";
            }

            else
            {
                mat[i][j] = 0;
                cout << mat[i][j] << " ";
            }
        }
        cout << "\n";
    }
```



LITERARY FINDINGS

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சமீபத்திலே

மாண்புமிகு மா.க.கழகம்

6

பதிமவாணி கல்வியியல் அக்டோபர்-04-2019

இலக்கண இலக்கியங்களில் வாழ்வியல் கற்றுதல்



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புறம் கூறும் நட்பு

*க.பிரபா ஜோஸ்லின், உதவிப்பேராசிரியர், புனித ஜான்ஸ் கலை மற்றும் அறிவியல் கல்லூரி, அம்மாண்டிவிளை.

உலகின் பழமையான மொழிகளுள் ஒன்று தமிழ் பல இலக்கிய ஆதாரங்களும், அகழ்வாராய்ச்சி மற்றும் வரலாற்று நிகழ்வுகளும் இன்னும் பல ஆய்வுகளும் இதற்கு சான்று பகர்கின்றன. தமிழ் இலக்கியங்கள் பிற மொழி இலக்கியங்களை விட தனிச் சிறப்பினைப் பெற்றுள்ளது. அத்தகைய தமிழ் இலக்கியங்கள் பத்துப்பாட்டு, எட்டுத்தொகை, பதினெண்மேற்கணக்கு, பதினெண் கீழ்க்கணக்கு, காப்பியங்கள், பக்தி இலக்கியம், சிற்றிலக்கியம், நாட்டுப்புற இலக்கியம் எனப் பல எண்ணிலடங்கா இலக்கியங்களாகப் பரிணாம வளர்ச்சிப்பெற்றுள்ளது. அவற்றுள் சங்க இலக்கியம் என்பது ஒரு தனிச் சிறப்பிடத்தைப் பெற்றுள்ளது. அவ்விலக்கியத்தில் தமிழர்களின் அகவாழ்க்கை, புற வாழ்க்கை முழுமையாக இடம் பெற்றுள்ளது. குறிப்பாகத் தமிழ் மக்கள் அன்று முதல் இன்று வரையில் கண்ணை எவ்வாறு இமைகாத்து கொள்கிறதோ அதைப் போன்று தம் வாழ்க்கை ஒழுக்கலாறுகள் மற்றும் காதல், வீரம், சகை இன்னும் பல நல்லநெறிகளைக் காத்து வந்துள்ளனர். வீரத்திற்கு இலக்கணமாகத் திகழும் புறநானூறு தமிழன் கடைபிடித்து வந்த சமுதாயத்தைப் போற்றும் நல்லறங்களையும், அரசியல் அமைப்பு முறைகளையும் சிறப்பிடம் எடுத்துரைக்கின்றன. அத்தகைய புறநானூற்றில் நட்பிற்கு இலக்கணமாகத் திகழ்ந்த கோப்பெருஞ்சோழன் பிசிராந்தையார், அதியமான் ஓளையார், பாரி கபிலன், சோழன் கிள்ளிவளவன் பண்ணன் ஆகியோரின் நட்புகளைப் பற்றி ஆய்வதாக இக்கட்டுரை அமைகிறது.

புறநானூற்றின் சிறப்பு 'புறம்' என்ற சொல்லுக்கு 'வெளியே' என்பதாகக் கழகத் தமிழ் அகராதி விளக்கம் தருகிறது. புறம், புறப்பாட்டு, புறநானூறு என இந்நூல் பல வகையான பெயர்களால் வழங்கப்படுகிறது. புறநானூறு என்பது போருக்கு இலக்கணமாகவும் மக்களின் வீரம், கொடை, ஒழுக்கம், கல்வி, நட்பு போன்ற எல்லா பண்புகளுக்கும் இலக்கணமாகவும் விளங்குகிறது. புறம் பற்றிய 400 பாடல்களைக் கொண்டது இந்நூலின் சிறப்பு. நூலின் பெயரிலேயே 400 பாடல்கள் புதைத்திருப்பது இதன் சிறப்பு. எட்டுத்தொகையில் காணப்படும் மற்ற எல்லா நூல்களைக் காட்டிலும் மிகுந்த சிறப்பு மிக்கது இந்நூல். நட்பின் இலக்கணம்

நட்பு என்பது மனிதனுக்குக் கிடைக்கப்பெற்ற பண்புகளுள் தலையாயது. அன்பு, பொறுமை, சகிப்புத்தன்மை, விட்டுக்கொடுத்தல், உதவுதல் எனும் எல்லா நற்பண்புகளையும் உள்ளடக்கியதே நட்பு. இந்நட்பு குறித்து,

'உடுக்கை இழந்தவன் கைப்போல ஆங்கே

இடுக்கண் களைவதாம் நட்பு' (குறள் - 788).

என்ற திருகுறளுக்கு எடுத்துகாட்டாகப் புறநானூறில் கோப்பெருஞ்சோழனும் பிசிராந்தையாரும் சிறப்பிக்கப்பட்டுள்ளனர்.

கோப்பெருஞ்சோழனும் பிசிராந்தையாரும்

சோழ நாடு செல்வ செழிப்புமிக்க நாடாகத் திகழ்கிறது. உழவர்கள் செழிப்புடன் வசிகளும் அந்நாட்டில் உறையூரை தலைநகராகக் கொண்டு உலகம் புகழும் விதமாக அரசாட்சி செய்தவன் கோப்பெருஞ்சோழன்.

"யாமை புழுக்கின் காமம் விட ஆரா

ஆற் கொழுஞ்சூடு அங்கவுள் அடாஅ

வைகுதொழின் மடியும் மடியா விழாவின்

யாணர் நல்நாட்டுள்ளும்.

என்னும் பாடல் எடுத்துரைக்கிறது.

கோப்பெருஞ்சோழன், பிசிராந்தையார் நட்பின் உயர்வு

கோப்பெருஞ்சோழன் துன்புற்ற காலத்தில் உன் தோழன் பிசிராந்தையார் இங்கு வரமாட்டான் என்று சான்றோர்கள் கூறினர். நட்பின் ஆழத்தை உணர்ந்த கோப்பெருஞ்சோழன், பிசிராந்தையார் உள்ளும் ஊரில் வாழ்பவனாகிய என் உயிர் தோழன் எம்மிடத்தில் செல்வம் உள்ளபோது வராமல் நிற்பினும் துன்பத்தில் வராமல் இருக்க மாட்டான் என்று நட்பின் உறுதியை எடுத்துரைக்கிறார். இதனை

"தென்னம் பொருப்பின் நன்னாட்டு உள்ளும்

பிசிரோன் என்ப, என் உயிர் ஓம் புநனே

செல்வக் காலை நிற்பினும்

அல்லற் காலை நில்லவன் மன்னே".

என்னும் பாடல் வரிகள் கட்டுகின்றன. மேலும், பிசிராந்தையார் என்னை தேடி வந்து என்னோடு வசிக்கிறது உயிர் துறப்பது உறுதி என்று கூறுகிறான். சான்றோர் வியக்கும் வகையில்

கோப்பெருஞ்சோழனின் நம்பிக்கையுடைய பிசிராந்தையார் வந்து தன் நண்பனுக்காகக் காவிரிக் கரையில் அவனைச் சேர்ந்து வடக்கிடுத்து உயிர்துறந்தார். இதனை,

“வருவன் என்ற கோனது பெருமையும்
அது பழுதின்றி வந்தவன் அறிவும்

வியத்தொறும் வியத்தொறும் வியப்பிறந் தன்றோ!”

என்ற பாடல் வரிகள் சான்றுரைக்கின்றன. இரப்பினும் இணைபிரியாத நட்பை உலகளாவிய அளவில் வாழ்ந்து காட்டிய பெருமை இவர்களைச் சாருமெனில் அது மிகையாகாது. அதியமானும் ஒளவைபாரும்

தற்போது தருமபுரி என்றழைக்கப்படும் தகடூர் என்ற இடத்தைத் தலைநகரமாகக் கொண்டு ஆட்சி செய்தவன் அதியன் இவன் குறுநில மன்னனாவான். கடையெழு வள்ளல்களுள் ஒருவனாக மதிக்கப்பெற்றவன். அவனது பரிசிலுக்கு வருந்திய புலவன் ஒருநாள், இருநாள், பலநாள் போன்று முகம் காட்டாமல் இன்முகத்தோடு பரிசில் வழங்கினான். இதனை

“ஒருநாள் செல்லலம், இருநாள் செல்லலம்

பன்னாள் பயின்ற; பல-ரொடு செல்லினும்

தலைநாள் போன்று வீரும்பினான்” (புறம் 101:1-3)

என்னும் பாடல் வரிகள் அவன் புலவர்களோடு கொண்டிருந்த நட்பை எடுத்துரைக்கின்றன. அதியமானின் அவைக்களப் புலவர் ஒளவையார் ஆவர் மீது அதியமான் கொண்ட நட்பின் மிகுதியால் பெரிய மலையின் கண் பிளவுப்பட்டிருந்த இடத்தில் பெறுவதற்கு அரிதாக இருந்த சிறிய இலையை உடைய நெல்லிக்கனியை ஒளவைக்குக் கொடுத்தான். அதியமான் நடந்து கொண்ட விதம் நட்பின் உயர்வை அடையாளம் காட்டுவதாகக் கொள்ளலாம். இதனை,

“நீல மணிமிடற்று ஒருவன் போல

மன்னுக பெரும் நியை தொன்னிலைப்

பெருமலை வீடரகத்து அருமிசை கொண்ட

சிறியிலை நெல்லித் திங்கனி குறியாது

ஆதல் நினைகத்து அடக்கிச்

சாதல் நங்க எமக்கு ஈத்தனையே” (பாடல் 91.6-11)

என்னும் பாடல் வரிகள் சான்றுரைக்கின்றன.

பாரியும் கயிலரும்

கடையெழு வள்ளல்களுள் ஒருவனாகவும் முல்லைக்குத் தேர் நல்கியவனாகவும் விளங்குபவன் பாரி இவன் ஒரு குறுநில மன்னன். இவன் பறம்பு மலையைத் தலைமையிடமாகக் கொண்டு ஆண்டு வந்தான். சங்க புலவர்களுள் கயிலர் தவிச்சிறப்பு மிக்கவர். பாரியின் அவையில் கயிலர் புலவர் என்ற போதும் இருவரும் நட்பின் அடிப்படையில் இணைபிரியாமல் இருந்தனர். பறம்பு குளிர்ச்சி பொருந்திய நாடு மற்றும் முந்நாறு ஊர்களைத் தன் அகத்தே கொண்டு விளங்குகிறது. அத்தகைய ஊர்களையும் புலவர்களுக்குப் பரிசாகக் கொடுத்தான். இதனை,

“கடந்து அடு நானே முவிரும் கூடி

உடன்றனர் ஆயினும் பறம்பு கொளற்கு அரிதே

முந்நாறு ஊர்த்தே தன் பறம்பு நலநாடு

முந்நாறு ஊரும் பரிசில் பெற்றனர்” (பாடல் 110.3-6)

என்னும் வரிகள் விளக்குகின்றன.

பாரி தனது பகை மன்னர்களால் கொலை செய்யப்பட்டான் அவன் பிரிவால் கயிலர் வருந்தினார். பாரிக்குப் பெண்மக்கள் இருவர் இருந்தனர். பாரி இறந்த பின்பு தனது உயிர் தோழனாகவும் நட்புக்கு இலக்கணமாகவும் திகழ்ந்த கயிலர் அப்பிள்ளைகளைச் சீரும் சிறப்போடும் வளர்த்து நல்லதொரு வாழ்க்கையை அமைத்துக்கொடுத்தார். கயிலருக்கும், பாரிக்குமான நட்பு கடமை உணர்வுமிக்க நட்பாக இருந்தமை புலனாகிறது. கிள்ளிவளவனும் பண்ணனும்

குளமுற்றத்து துஞ்சிய கிள்ளிவளவன் நட்பைப் போற்றி வளர்த்த சோழ மன்னன். அவனது நாட்டில் வாழ்ந்துவந்த பசிபிணிப்போக்கும் மருத்துவனாக சிறுகுடிக்கிழான் பண்ணன் என்பவன் வாழ்ந்து வந்தான். அவன்மீது கிள்ளிவளவன் கொண்ட நட்பின் வெளிப்பாடாக தான் உயிர்வாழும் ஆயுள் நாட்களையும் பெற்று பண்ணன் நீடுழி வாழ்வானாக என்றுக் கூறினான். இதனை,

“கின்கினி களைந்த கால் தொட்டு,

குடுமி களைந்த நுதல் வேம்பின் ஒண் தளிர்.....

மகிழ்ந்தன்றும் மலிந்தன்றும் அதனினும் இவனே” (புறநானூறு : 77)

இவ்வரிகள் சுட்டுகின்றன. தனது மீதமுள்ள வாழ்நாளைப் பண்ணன் வாழ கொடுக்க துணிந்தான் காரணம், பண்ணன் பசியென்று வருபவர்க்கு அளவின்றி உணவளித்து காப்பவனாகக் காணப்படுகிறான்.

கோப்பெருஞ்சோழனுக்கும் பிசிராந்தாருக்குமிடையே இருந்த காணாது கொண்ட நட்பும், அதியமானிடமும் ஒளவையிடமிருந்த ஈகையின் நட்பும், பாரியும் கயிலரும் கொண்ட கடமை உணர்வுமிக்க நட்பும், சோழ மன்னன் கிள்ளிவளவனும் சிறுகுடி கிழான் பண்ணனும் கொண்ட உயிரோட்டமான நட்பும் புறநானூறு வாயிலாக சுட்டிக்காட்டப்பட்டுள்ளது. ஒவ்வொருவருடைய வாழ்க்கையிலும் நட்புக்கு முதலிடம் கொடுத்து நட்பாகப் பேசிபழகவும் நட்பிற்கு இலக்கணமாகவும் வாழ்தல் வேண்டும் என்பதை இக்கட்டுரை தெளிவாக விளக்குகிறது.

தமிழ் இலக்கியங்களில் பன்முகப் பாசியை



தேசியக் கருத்தரங்கம்

சொகுஷ க்கம்

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23. தமிழர் கலைகளுள் - கட்டிடக்கலை, சிற்பக்கலை, ஓவியக்கலைகள்

திருமதி. க. பிரபா ஜோஸ்லின்,

தமிழ்த் துறை,
புனித ஜான்ஸ் கலை மற்றும் அறிவியல் கல்லூரி,
கன்னியாகுமரி மாவட்டம்.

முன்னுரை

மனிதன் என்றைக்கு பிறப்பெடுத்தானோ அன்றைக்கு அவனிடத்தில் கலைகளும் உருவாகின. மனித வாழ்வில் கலைகள் பலவாறு காணப்பட்டாலும் வரையறுக்கப்பட்ட கலைகள் 64 ஆகும். இக்கலைகள் கலைக்காகவா வாழ்க்கைக்காகவா என்று ஆராயும் போது அவை கலைக்காகவும் வாழ்க்கைக்காகவும் என்று வரலாற்று ஆய்வாளர்கள் கூறி வருகின்றனர். இப்படிப்பட்ட மனித வாழ்வில் பயன் படக்கூடிய கலைகளுள் கட்டிடக்கலை, சிற்பக்கலை, ஓவியக்கலை போன்றவை சிறப்பிடம் பெறுகின்றன. தான் வாழும்பிடம் வளங்குபிடம் ஒரு மகிழ்விடமாக இருக்க வேண்டுமென்று மனிதன் விரும்பியதால் மேற்கட்டிய கலைகள் தனக்கும் வரும் தலைமுறையினருக்கும் ஒரு கலைக்கூடமாகவும் கல்விக் கூடமாகவும் விளங்குகின்றன என்பதில் ஐயமில்லை நம்முன்னோர்கள் நமக்கு விட்டுச்சென்ற கலைகள் மிகப்பெரிய பொக்கிஷங்களாகும் அவற்றை பேணிப் பாதுகாப்பதோடு அக்கலைகள் மென்மேலும் வளர நம் நுண்ணறிவுக் கொண்டு இன்றைய அறிவியல் யுகங்களோடு ஒன்றாக் கலந்து வளர்க்க வேண்டுமென்பதும் நமது அனைவரின் கடமைகளாகும்.

தமிழர் கலைகள்

தமிழகத்தில் காணப்படும் கலைச்செல்வங்களைக் காணும் போது தமிழர்கள் மிகப்பழங்காலம் தொட்டே கலையைப் பேணி பாதுகாத்து வருகின்றனர். என்பது தெரிய வரும். எது கல்வியினால் மலர்கிறதோ எது கற்றவனை பண்படுத்துகிறதோ அது கலையாகும். எந்த நாட்டில் அத்தகைய கலைஞர்கள் வேருன்றி செழித்து நிற்கின்றார்களோ அந்த நாடு பண்பாடு பரந்த நாடு நாகரீகம் மிக்க நாடு என்று உலக வரலாற்றறிஞர்கள் ஒரு நாட்டை

மதிப்பிடுகின்றனர். அந்த வகையில் பார்க்கும் போது நம் பாரத பெருநாடு பல கலைகளின் தாயாகவும் சில கலைகளின் தமக்கையாகவும் கலைபுலகில் இடம் பிடித்து தன்னிகரற்ற சிறந்து நிற்கிறது. ஆயக்கலைகள் என்பதற்கு பதிவாகிய கலைகள் என்பது பொருள். அவற்றுள் கட்டிடக்கலை சிற்பக்கலை ஓவியக்கலை மிக மிகப் பழங்காலம் முதலே தமிழகத்தில் சிறப்பு பெற்று விளங்கி இருக்கின்றன.

கலைகளின் நோக்கம்

கலை என்பது மனதுக்கு விருந்து, கலைகள் என்பது மனிதனின் முதல் கல்வி முயற்சி, கலைகள் என்பவை விலைகூறி விற்கும் வியாபாரம் அல்ல உண்டி, உடை, உறைபுள் எனும் மூன்றும் மனித வாழ்வின் அடிப்படை தேவைகள் மூன்றும் நிறைவெய்தியவுடன் மனித மனம் உடனே திருப்தியடைந்து அமைதியாகி விடுவதில்லை. மீண்டும் சிலவற்றைத்தேடும் தேடலைத் தொடங்குகின்றது. அந்த தேடலில் கிடைப்பவையான் கலைகள்.

மனித மனங்கள் கலைகள் என்னும் தொட்டில்களில்தான் அமைதியாகக் கண்ணுறங்குகின்றன. தன்னை மறந்து இன்பமுற மனிதன் செய்யும் தந்திரம்தான் கலையாகிறது கலை ஒருநாள் பணியால் கைகூடுவது அன்று. பன்னிரெண்டு நாள் முயற்சியால் கனியும் கனி அது. ஓயா உழைப்பால் வரும் உன்னதம் அது. உழைப்பின் சோர்வு, நம் உள்ளத்தைப் போர்த்திக் கொள்ளாமலிருக்கவும், சோர்ந்த உள்ளத்தின் மேல் துக்கம் உட்காந்து கொள்ளாமலிருக்கவும், தீயது நுழையாமல் உள்ள தூயதாக இயங்கவும், கலைகள் அவசியம். கலைகளின் நோக்கம் உடலின் திரட்சிகளை விரட்டுவதற்கு மட்டும் அல்ல உள்ளத்தில் புரட்சிகளை விளைவிப்பதற்கே.

சிற்பக்கலை

கலைகளில் சிறந்தது சிற்பக்கலை வரலாற்றுக்கு முற்பட்ட காலத்திலிருந்து சிற்பக்கலை வளர்ந்து வருகிறது. கோயில்களில் காணப்படும் முதன்மை தெய்வதிருமேனிகளும் சிவ திருமேனிகளும் முழு வடிவ சிற்பங்கள் ஆகும். வைணவ ஆலயங்களில் வகைக்

[illegible]

107 சிற்பக்கலை

மே சிற்பக்கலை கி.பி 16 ஆம் நூற்றாண்டிலிருந்து
கொண்டிருக்கிறது. லோயிஸ்களில் சிற்பகலைகள் அதிகமாக மே
சிற்பங்கள் செய்யும் தொழில் வளர்ச்சி பெற்றுள்ளது. சில
ஆண்டுகளில் லோடி வளர்ச்சி கதாபோலும் சிற்பத் துச்சிற்பக்கலை
களை முடிக்கிறது. பிறகாவதில் செட்டாட்டில் கிழக்கில் வளர்
தலாகளில் மேசிற்பங்கள் செய்து அழகுபடுத்தித்தவறும்
காலமாகும்.

2018年11月10日

১৯৮১ সালের ১৯ই আগস্ট তারিখে, যখন
 ঢাকার গভর্নমেন্ট হাই স্কুলে ১০ম শ্রেণির
 পরীক্ষার প্রস্তুতিতে ছিলাম, তখন আমার
 সিনিয়র বন্ধুগণের সাথে একটি

පාලිපිටකයෙහි සිද්ධාන්තයට අනුකූලව ව්‍යාකරණය

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ஒவ்வொரு நபரின் தந்தை, மாந்தரின்
ஒவ்வொரு பெற்றோர் வாழ்கின்ற மனம் பெரிய மனதின்
அடிமையின் சின்னங்கள். இந்தக் கற்றோர் மனத்தின்
ஒவ்வொரு உயர்வு, உயர்வு, மனதின் உயர்வுகள்
உயர்வுகள் ஆகிய மனம் பெற்றோருக்கு அடிமையின்
மனதின் பெற்றோருக்கு அடிமையின் உயர்வுகள்
ஆ நபரின் ஒவ்வொரு நபர் 'மனம்
பெற்றோர் உயர்வு' ஆ நபரின் 'மனம்
பெற்றோர் மனம் பெற்றோருக்கு உயர்வு' ஆ
மனதின் பெற்றோர் பெற்றோர் பெற்றோர்
பெற்றோருக்கு நான் ஒவ்வொரு மனத்தின் நான்

மன்ன தாம் வளர்த்த ஓவியங்களை அவர்கள் கட்டிய கோயில்களின் நுழைவு வாயிலின் இருபக்கங்களிலும் கருப்பக்கிரக கலர்களிலும் பிரகாரங்களிலும் விதானத்திலும் தீட்டினர். இந்த ஓவியங்களில் அமைந்த வண்ணச் சேறிலும் உணர்ச்சிப் பொலிவும் நம்மை கவரும் விதத்தில் அமைந்துள்ளன. ஓவியக் கலை ஓடி, ஓடும், ஓவியம். சித்திரம் என பல பெயர்களால் அழைக்கப்பட்டது. இலக்கியங்களில் ஓவியங்கள்

தமிழ் இலக்கியத்தில் எழுத்து என்பதற்கு ஓவியம் என்று பொருள் இருந்ததாக குறுந்தொகை செய்யுள் அடிகள் கூறுகிறது. தொல்காப்பியத்தில் நடுகல் வணக்கம் பற்றி கூறப்பட்டுள்ளது. நடுகல்லில் போரில் வீர மரணம் எய்திய வீரனது பெயர் பெருமைக்குரிய செயல் முதலியவற்றை பொறிக்கும் பழக்கம் இருந்தது சிறிப் தான் செதுக்கிய உருவத்தை முதலில் வரைந்து பார்த்த பின்னரே அவ்வோவியத்தை கல்லில் தீட்டினர். இதன்படி ஆராய்ந்து நோக்கினால் செதுக்குவதற்கு ஓவியம் துணை புரிந்ததையும் ஓவியம் முன்னரே வளர்ந்திருந்ததையும் அறியலாம். புறநானூற்றில் 'ஓவத்தனைய இடனுடை வண்பு' என்று அழகை ஓவியத்திற்கு ஒப்பாக வைத்து பொற்றினர்.

சித்தன்னவாசல் என்னுமிடத்தில் உள்ள குடைவரை ஓவியங்கள் புகழ் பெற்றவை. இது தவிர அரிட்டப்படி, திருமலைபுரம், ஆனையலை ஆகிய இடங்களிலும் தமிழ்களின் ஓவியங்கள் காணப்படுகின்றன.

மேலும் இந்தியாவில் புகழ் பெற்ற தஞ்சை பிரகதீஸ்வரர் கோயிலில் பெருமை வாய்ந்த ஓவியங்கள் காணப்படுகின்றன.

மரபன்றிக் குகைகளின் வெளி மண்டபத்திலும், காஞ்சிபுரம், கௌசநாதர் கோயில் பண்பலைக் கோயில் முதலிய இடங்களிலும் சிறப்பு வாய்ந்த ஓவியங்கள் காணப்படுகின்றன. இதில் பண்பலையில் உள்ள மண்டபத்தில் காணப்படும் வழிவந்த ஆடல் மகளின் ஓவியம் மிகச் சிறப்பு வாய்ந்தது.

கோயில் பணியும் கட்டிடக் கலையும்

சோழர்கள் பெரிய கற்கோயில்களை எழுப்பினர். சோழர்கள் செங்கல்லைத் தவிர்த்துக் கற்களை பயன்படுத்தினர். சோழர்கள்

இராட்சத வடிவிலும், பொற்கொல்ல வகைவண்ண நேர்த்தியிலும் சோழர்கள் ஆலயம் எழுப்பினர். இவை நாயக் கோயிலுக்குச் சிறப்பிடமும், கல்களுக்கு விளையாட கலையும், நேர்த்தியான வெற்றிடங்களையும் கொண்டுள்ளன. முதற்காலக்கட்டத்தில் எழுந்தவை வடிவில் சிறியவை அவை கற்றளிகளாலானவை. ஆதித்த சோழன் காலத்துக் கோயில்கள் காவிரிக்கரையில் எழுந்தன, தஞ்சை தூக்கை கோயிலுடன் விசயாலயம் காலத்து ஆலயங்கள் எழுந்தன. தஞ்சைப் பெரிய கோயிலும், கங்கை கொண்ட சோழபுரத்து ஆலயமும் சிறந்த கட்டிடக்கலைக்கு எடுத்துக்காட்டாக திகழ்ந்தன. சோழர்களின் கட்டிடக் கலைக்கு விளக்கம் கூறி நிற்கும் தஞ்சைப் பெரிய கோயிலை இராசராசன் எழுப்பினான். பிரகதீஸ்வரர் ஆலயத்தை ஏழாண்டுகளில் இராசராசன் கட்டி முடித்தான். இது மொத்தத்தில் 500 அடி நீளமும் 200 அடி அகலமுடையது. இங்கு நாய்கோயிலைச் சுற்றி பல கோயில்கள் உள்ளன. இறையறைக்கோபுரம் 14 அடிக்குடையது. கங்கைக் கொண்ட சோழபுரம் கோயில் இராசேந்திர சோழனின் வெற்றி சின்னமாக விளங்குகிறது. இதன் கோபுரம் 190 அடி உயரமுடையது. இதன் 12 ராசிகளையும் நவகிரகங்களையும் விளக்கு பகுதிகள் சிறந்த கலைநிறனுக்கு எடுத்துக் காட்டாகும். தஞ்சைக் கோயில் ஆண்மையப் பொலிவு கொண்டிருக்கும் பொது கங்கை கொண்ட சோழபுரத்தாலயம் பெண்மை அழகுடன் விளங்குகின்றது. என்றார் கலை நிருபர் பெர்சிபிரவுன். முதலாம் குலோத்துங்கனின் சூரியனார் கோயில், இரண்டாம், இராசராசனின் ஜாவதேசுவரர் கோயில் 3-ஆம் குலோத்துங்கனின் கம்பகரேசுவரர் கோயில் சோழர் கட்டிட கலைக்குச் சிறந்த எடுத்துக்காட்டாகும். கட்டிடக்கலையை உறைந்து போன இசைக்கலை என்பர் ஸ்லீசல் மொகஞ்சதரோ ஹப்பா, நாகர்கோம் திராவிட கட்டிடக்கலையின் முன்னோடி என ஜான் மார்குல் பாதிரியார் கூறுகின்றனர். கட்டிடக்கலையை நன்கு ஆராயின் இந்திய பண்பாட்டின் வேற்றாமையில் ஒற்றுமையையும், கட்டிடக்கலையின் வளர்ச்சியையும் அறியலாம்.

On Sequential Graphs

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Abstract

A labeling or valuation of a graph G is an assignment f of labels to the vertices of G that induces for each edge xy a label depending on the vertex labels $f(x)$ and $f(y)$. In this paper we study some classes of graphs which admit sequential labeling.

Keywords: Labeling, Sequential graph, Braid graph, Total graph, Cyclic graph.

1. INTRODUCTION

Unless mentioned a graph in this paper shall mean a simple finite graph without isolated vertices. For all terminology and notations in Graph Theory, we follow Harary [3] and for all terminology regarding Sequential labeling we follow Grace [2].

Let G be a (p, q) graph. Let $V(G)$, $E(G)$ denote respectively the vertex set and edge set of G . Consider an injective function $g: V(G) \rightarrow X$ where $X = \{0, 1, 2, \dots, q\}$ if G is a tree and $X = \{0, 1, 2, \dots, q-1\}$ otherwise. Define the function $g^*: E(G) \rightarrow N$, by $g^*(uv) = g(u) + g(v)$ for all edges uv , where N is the set of all natural numbers. If $g^*(E(G))$ is a sequence of distinct two integers say $\{k, k+d, k+2d, \dots, k+(q-1)d\}$

$(q-1)d$ for some k and d , then the function g is said to be (k, d) -Sequential labeling and the graph which admits such a labeling is called as a Sequential graph.

If $d = 1$, G is called k -sequential graph.

Definition 1.1: A chord of a cycle C_n is called a P_k -chord if it divides the cycle into two cycles C_k and C_{n-k+2} .

Theorem 1.2: Let G be a graph obtained from C_{2t+1} with a P_4 -chord. Then G is a $(t+2, 1)$, $t \geq 1$ Sequential graph.

Proof: Let $C_{2t+1} = (u_1 u_2 \dots u_{2t+1} u_1)$ and let $u_2 u_{2t}$ be a P_4 -chord of C_{2t+1} .

The graph G consists of $2t+1$ vertices and $2t+2$ edges.

Define $f: V(G) \rightarrow \{0, 1, 2, \dots, 2t+1\}$ as follows:

$$f(u_{2i-1}) = i, \quad 1 \leq i \leq t+1$$

$$f(u_{2i}) = (t+1) + i, \quad 1 \leq i \leq t$$

Also $f(u_i) < f(u_j)$ for all $i < j$

Clearly vertex labels are distinct.

Then the induced edge labels are given by $f(u_i v_i) = f(u_i) + f(v_i)$ and are as follows:

$$f(u_i u_{i+1}) = t + i + 2, \quad 1 \leq i \leq 2t$$

$$f(u_1 u_{2t+1}) = t + 2$$

$$f(u_2 u_{2t}) = 3t + 3$$

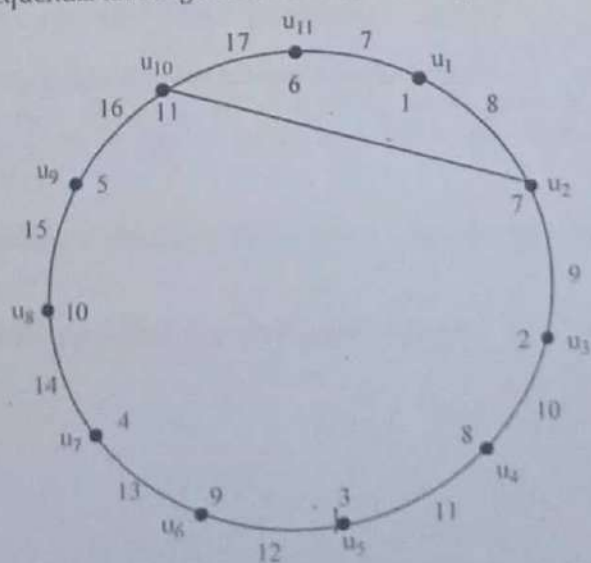
Thus the set of labels of the edges of the cycle $= \{t+2, t+3, \dots, 3t+1, 3t+2\}$ and the label of the chord is $3t+3$.

Clearly edge values are distinct and is of the form $\{t+2, t+3, \dots, 3t+2, 3t+3\}$.

Thus the induced edge labels are given by $f(E(G)) = \{k, k+d, k+2d, \dots, k+(q-1)d\}$ where $k = t+2$ and $d = 1$.

Therefore G is a k -Sequential graph.

Illustration 1.3: $(7, 1)$ -Sequential labeling of C_{11} with P_4 -chord is given below.



Theorem 1.4: The graph $K_{1,n} + K_{1,m}$ is a $(2t + 1, 1)$ -Sequential graph for all m, n and for any non-negative integer t .

Proof: Let $V(K_{1,n}) = \{u_0, u_1, \dots, u_n\}$ where $\deg u_0 = n$ and $V(K_{1,m}) = \{v_0, v_1, \dots, v_m\}$ where $\deg v_0 = m$. Join each vertices of $K_{1,n}$ to every vertices of $K_{1,m}$, then we get the graph $K_{1,n} + K_{1,m}$.

Let $G = K_{1,n} + K_{1,m}$

The edge set of G is $E(G) = \{u_0u_i; 1 \leq i \leq n\} \cup \{v_0v_i; 1 \leq i \leq m\} \cup \{u_iv_j; 1 \leq i \leq n, 1 \leq j \leq m\}$

Note that G has $n + m + 2$ vertices and $n + m + (n + 1)(m + 1)$ edges.

Let t be a non-negative integer. Define $f: V(G) \rightarrow \{0, 1, 2, \dots, (n + m + (n + 1)(m + 1)) - 1\}$ as follows:

$$\begin{aligned} f(u_i) &= i + t, & 0 \leq i \leq n \\ f(v_0) &= n + t + 1 \\ f(v_i) &= i(n + 2) + n + t, & 1 \leq i \leq m \end{aligned}$$

Then the induced edge labels are given by $f'(u_iv_j) = f(u_i) + f(v_j)$ and are as follows:

$$\begin{aligned} f'(u_0u_i) &= 2t + i, & 1 \leq i \leq n \\ f'(v_0v_i) &= 2t + i(n + 2) + 2n + 1, & 1 \leq i \leq n \\ f'(v_0u_i) &= 2t + (n + 1) + i, & 1 \leq i \leq n \\ f'(v_iu_j) &= 2t + (j + 1)(n + 1) + i + (j - 1), & 0 \leq i \leq n, 1 \leq j \leq m \end{aligned}$$

Thus the set of labels of the edges of $K_{1,n} = \{2t + 1, 2t + 2, 2t + 3, \dots, 2t + n\}$

The set of labels of the edges $v_0u_i, 0 \leq i \leq n = \{2t + n + 1, 2t + n + 2, \dots, 2t + 2n + 1\}$

The set of labels of the edges v_0v_i and $v_1u_i, 0 \leq i \leq n$
 $= \{2t + 2(n + 1)\} \cup \{2t + 2(n + 1) + 1, 2t + 2(n + 1) + 2, \dots, 2t + 2(n + 1) + n\}$

The set of labels of the edges v_0v_2 and $v_2u_i, 0 \leq i \leq n$
 $= \{2(n + 1) + n + 1\} \cup \{2t + 3(n + 1) + 2, 2t + 3(n + 1) + 3, \dots, 2t + 3(n + 1) + n\}$

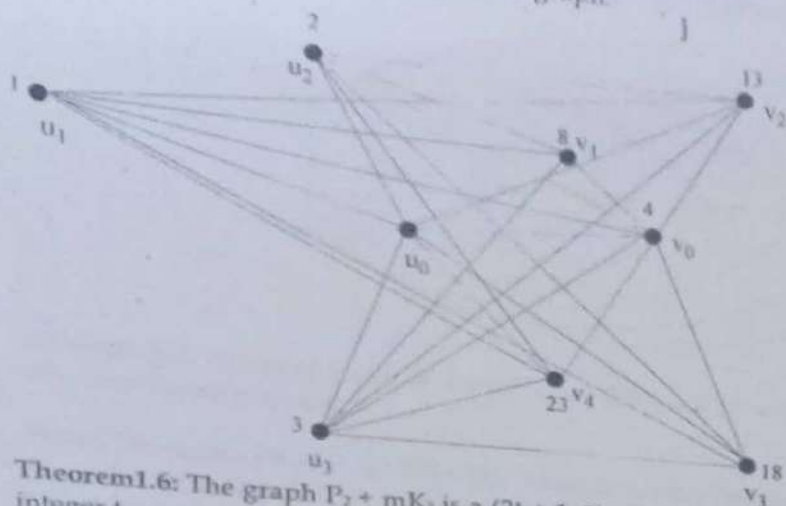
The set of labels of the edges v_0v_m and $v_mu_i, 0 \leq i \leq n$
 $= \{2t + (m + 2)(n + 1) + m - 2\} \cup \{2t + (m + 2)(n + 1) + m - 1, 2t + (m + 2)(n + 1) + m, \dots, 2t + (m + 2)(n + 1) + m + n\}$

Thus the edges values of the graph G is distinct and is of the form
 $2t + 1, 2t + 2, 2t + 3, \dots, 2t + n, 2t + n + 1, 2t + n + 2, \dots, 2t + 2n + 1, \dots,$
 $2t + 2(n + 1) + n, \dots, 2t + 3(n + 1) + n, \dots, 2t + (m + 2)(n + 1) + m - 2, \dots,$
 $2t + (m + 2)(n + 1) + m + n.$

Thus the induced edge labels are given by $f'(E(G)) = \{k, k + 1, \dots, k + (q - 1)\}$ where $k = 2t + 1$ and $d = 1$

Therefore f is a Sequential labeling. Thus G is a k -Sequential graph.

Illustration: 1.5: $K_{1,3} + K_{1,4}$ is a sequential graph.



Theorem 1.6: The graph $P_2 + mK_1$ is a $(2t + 1, 1)$ -Sequential graph for all m and for any non-negative integer t .

Proof: Consider a path P_2 with two vertices v_1, v_2 . Let y_1, y_2, \dots, y_m be the m isolated vertices. Join v_1, v_2 with $y_i, 1 \leq i \leq m$. The graph obtained is $P_2 + mK_1$.

Let $G = P_2 + mK_1$. The vertex set of G is $V(G) = \{v_1, v_2, y_1, y_2, \dots, y_m\}$
 $E(G) = \{(v_1, v_2)\} \cup \{(v_1, y_i), 1 \leq i \leq m\} \cup \{(v_2, y_i), 1 \leq i \leq m\}$

Then $|V(G)| = 2 + m$ and $|E(G)| = 2m + 1$

Let t be an integer such that $t \geq 0$.

Define labeling $f: V(G) \rightarrow \{0, 1, 2, \dots, 2m\}$ as follows:

$$\begin{aligned} f(v_1) &= t \\ f(v_2) &= t + 1 \\ f(y_i) &= t + 2i, \quad 1 \leq i \leq m \end{aligned}$$

Then the induced edge labels are given by $f'(u_i v_i) = f(u_i) + f(v_i)$ and are as follows:

$$\begin{aligned} f'(v_1 v_2) &= 2t + 1 \\ f'(v_1 y_i) &= 2t + 2i, \quad 1 \leq i \leq m \\ f'(v_2 y_i) &= 2t + 2i + 1, \quad 1 \leq i \leq m \end{aligned}$$

Thus the label of the edge $v_1 v_2$ is $2t + 1$.

The set of labels of the edges $v_1 y_i, 1 \leq i \leq m$ are $\{2t + 2, 2t + 4, 2t + 6, \dots, 2t + 2m\}$

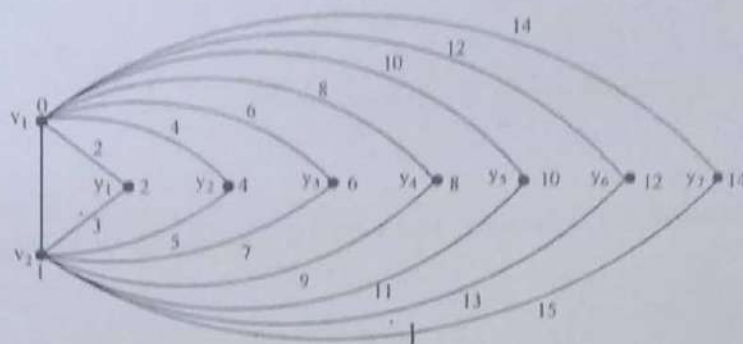
The set of labels of edges $v_2 y_i, 1 \leq i \leq m$ are $\{2t + 3, 2t + 5, \dots, 2t + 2m - 1, 2t + 2m + 1\}$

Therefore the values of the edges form the set $\{2t + 1, 2t + 2, 2t + 3, \dots, 2t + 2m, 2t + 2m + 1\}$

Thus the induced edge labels are given by $f'(E(G)) = \{k, k + d, k + 2d, \dots, k + (q - 1)d\}$ where $k = 2t + 1$ and $d = 1$.

Thus f is a Sequential labeling of G . Hence $P_2 + mK_1$ is a k -Sequential graph.

Illustration 1.7: $(1, 1)$ - Sequential labeling of $P_2 + 7K_1$ is given below.



Theorem 1.8: The total graph of the path $G = T(P_n)$ is a $(2t + 1, 1)$ - Sequential graph for all n and for any non-negative integer t .

Proof: The vertex set of G is $V(G) = \{u_i, 1 \leq i \leq n, v_i, 1 \leq i \leq n-1\}$
 The edge set of G is $E(G) = \{u_i u_{i+1}, 1 \leq i \leq n-1\} \cup \{v_i v_{i+1}, 1 \leq i \leq n-2\} \cup \{v_i u_{i+1}, 1 \leq i \leq n-1\} \cup \{u_i v_i, 1 \leq i \leq n-1\}$

Then $|V(G)| = 2n - 1$ and $E(G) = 4n - 5$

Let t be a non-negative integer such that $t \geq 0$. Define $f: V(G) \rightarrow \{0, 1, 2, \dots, 4n - 6\}$ as follows:

$$\begin{aligned} f(u_i) &= 2i + t - 2, \quad 1 \leq i \leq n \\ f(v_i) &= 2i + t - 1, \quad 1 \leq i \leq n-1 \end{aligned}$$

Then the induced edge labels are given by $f(u_i v_i) = f(u_i) + f(v_i)$ and are as follows:

$$\begin{aligned} f(v_i v_{i+1}) &= 2t + 4i, \quad 1 \leq i \leq n-2 \\ f(u_i u_{i+1}) &= 2t + 4i - 2, \quad 1 \leq i \leq n-1 \\ f(u_i v_i) &= 2t + 4i - 3, \quad 1 \leq i \leq n-1 \\ f(v_i u_{i+1}) &= 2t + 4i - 1, \quad 1 \leq i \leq n-1 \end{aligned}$$

The set of labels of the edges $v_i v_{i+1}, 1 \leq i \leq n-2$
 $= \{2t + 4, 2t + 8, 2t + 12, \dots, 2t + 4n - 12, 2t + 4n - 8\}$

The set of labels of the edge $u_i u_{i+1}, 1 \leq i \leq n-2$
 $= \{2t + 2, 2t + 6, 2t + 10, \dots, 2t + 4n - 10, 2t + 4n - 6\}$

The set of labels of the edges $u_i v_i, 1 \leq i \leq n-1, v_i u_{i+1}, 1 \leq i \leq n-1$
 $= \{2t + 1, 2t + 3, 2t + 5, \dots, 2t + 4n - 7, 2t + 4n - 5\}$

Thus the values of the edges form the set
 $= \{2t + 1, 2t + 3, 2t + 5, \dots, 2t + 4n - 7, 2t + 4n - 6, 2t + 4n - 5\}$

Thus the induced edge labels are given by $f(E(G)) = \{k, k + d, k + 2d, \dots, k + (q - 1)d\}$ where $k = 2t + 1$ & $d = 1$

Hence the above defined labeling pattern f admits Sequential labeling.

Therefore, $T(P_n)$ is a k -Sequential graph.

Illustration: 1.9: $(3,1)$ is a Sequential labeling of $T(P_8)$



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USAGE OF MOBILE BANKING IN KANYAKUMARI DISTRICT

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Abstract

Mobile banking is a recent innovation in the telecommunication has proved to be a boon for the banking sector and its customers where customers interact with the bank through mobile phones and banks provide them the services like short message services, fund transfers, account details and issue of cheque book. At present almost all the banks in the world have started providing their customers "Mobile Banking Services". The main aim of this study is to analysis the major services used in mobile banking and the reasons for using mobile banking. An empirical study was conducted through questionnaire survey method. Data are collected from 135 respondents and the results shows that savings and online buying as these variables got the highest mean score in services generally used in mobile banking.

Keywords: Mobile banking, Telecommunication, Modern Banking.

Introduction of Mobile Banking

Mobile banking (M-banking) has emerged as a popular mode of banking in many developed and developing countries. In India, there are approximately 13 million mobile banking users and this figure is expected to grow rapidly with mobile transactions exceeding credit card transactions by the end of the decade. Mobile banking communication represents that mobile phones are growingly accepted with banks as a device for online payments, account management, risk management, information, marketing and other services offered by it. Mobile banking not only provides banking facilities to customers anytime or anywhere as well as mobile banking importantly decreasing service costs also. The uniqueness of mobile banking in terms of ease of use, fastness in transactions, time spent in query solving and transaction as a whole. Day by day users are continuously increasing and using the mobile banking services for improving financial services like savings, insurance and money deposits without wasting time. The mobile banking is defined as, "the provision of banking services to customers on their mobile devices", specially the operation of bank current and deposit or savings accounts. Mobile banking is an application of mobile computing which provides customers with the support needed to be able to need anywhere,

anytime using a mobile handheld device and a mobile service such as short message service (SMS). Internet banking helps the customers anytime access to their banks. Customer could check out their account details, get their bank statements, and perform transactions like transferring money to other accounts and pay their bills sitting in the comfort of their homes and offices. But the biggest limitation of internet banking is the requirement of a personal computer with an internet connection, but definitely a big barrier in most of the developing countries of Asia like India. Mobile banking addresses this fundamental limitation of internet banking, as it reduces the customer requirements. Mobile usage has seen an explosive growth in most of the Asian economies like India. The main purpose of the mobile banking scores over internet banking is that it enables anywhere, anytime banking is available to the customers need access to a computer terminal to access their bank accounts.

Objectives of the Study

1. To know the services generally used in Mobile banking.
2. To find out the reasons for using Mobile banking.

Methodology of the Study

Required data for the study is collected by primary and secondary sources. Primary data is collected through the questionnaire. The secondary data was collected by referring books, journals, internet etc. The study was conducted by administering the questionnaire among 135 mobile banking users by way of convenient sampling method.

Data Analysis and Interpretation

Facilities used in Mobile banking

The mobile banking users were asked to rank some of the facilities which enable them to use the mobile banking. Facilities used in mobile banking such as transferring Money, transferring tuition fees, receiving salary, booking tickets, payment of insurance premium etc. The percent position of each rank was found using the following formula.

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} = Rank given to i^{th} factor j^{th} individual

N_j = Number of factor ranked by j^{th} individual.

By referring the table given by Garret, the percent position estimated were converted into scores. Then for each factor the scores of various respondents were added and divided by the number of respondents to arrive at the mean score. The mean scores thus obtained for the other factors were arranged in a descending order. The factor with the highest mean score was given the first rank, followed by second and so on. The results are presented in the following table.

Major Services Used in Mobile Banking

S.No	Major Services	Garrett Mean Score	Rank
1	For saving	59.61	I
2	For buying/ online shopping	58.66	II
3	View last few transactions/mini statements	55.35	III
4	Pay your telephone/mobile/utility bills	54.02	IV
5	Transferring money	53.83	V

6	Receiving salary	51.1	VI
7	Booking Tickets	46.2	VII
8	Payment of insurance premium	45.44	VIII
9	Transferring tuition fees	45.2	IX
10	Airtime Recharge	42.14	X
11	International Remittance	40.3	XI

Source: Primary data

From the table given above it can be inferred that 'for saving' (59.61) is the main facility used in mobile banking. The second rank scored is for 'for buying/online shopping' (58.66). Viewing last few transactions/mini statements (55.35) scores the third rank. Paying telephone/mobile/utility bills (54.02) got the fourth rank. Transferring money (53.83) is another important facility used in mobile banking. 'Airtime Recharge' (42.14) and 'International Remittance' (40.3) are the least important facilities used in mobile banking.

Reason for Using Mobile Banking

Factor Analysis

The technique of Factor Analysis is used to reduce the number of variables into a smaller and manageable number by combining related ones into factors. 'Principal Component Analysis' method is used to extract factors with an Eigen Value of 1 or more. In order to assign variables 'Rotated Factor Matrix' is used.

In this study Factor Analysis is applied to know the reasons for using Mobile Banking and the results are given below.

Table 1 KMO and Bartlett's Test

KMO Measure of sampling adequacy	.640
Bartlett's test of Sphericity	1731.897
App. Chi-square value	153
df	.000
Sig	

The KMO value is very high (.640). Similarly the Bartlett's test rejects the approximate chi-square value is 1731.897 at 153 degrees of freedom which is significant at 1% level of significance. Thus factor analysis may be considered as an appropriate technique.

The results of the Principal Component Analysis to extract the number of variables are given below:

Table 2 Principal Component Analysis

Component	Extraction Sums of Squared Loading			Rotated Sums of Squared Loading		
	Total	Percentage of Variables	Cumulative Percentage	Total	Percentage of Variables	Cumulative Percentage
1	6.432	36.846	36.846	4.287	23.818	23.818
2	2.346	13.033	49.879	3.220	18.445	42.263
3	1.925	10.696	60.575	2.385	12.892	55.154
4	1.331	7.392	67.968	1.685	9.359	64.483
5	1.023	5.682	73.650	1.658	9.167	73.650

From the above table 2 shows it is clear that 5 factors can be extracted together which accounts for 73.650 per cent of the total 18 variables. Hence 18 factors are summarized to 5 factors by losing nearly 26 per cent of data.

The table 3 presented below gives the Rotated Component Matrix table found by using Varimax Method which is used to assign factors which have higher loadings.

Table 3 Rotated Component Matrix

S.No	Factors	F1	F2	F3	F4	F5
1	Speedy Transaction	.722				
2	Family using	.839				
3	High interest in newer Technologies	.845				
4	Easy Device	.845				
5	Social Status	.846				
6	Easy access		.893			
7	Easy process		.919			
8	Saves time		.995			
9	Handle free		.983			
10	User friendly		.966			
11	No need to go a bank			.636		
12	Secure Fraud			.615		
13	Physical Security			.596		
14	Service all time				.687	
15	Credibility				.879	
16	Additional Facility					.777
17	Low cost					.618
18	Differ from traditional banking					

The above table 3 shows that in the first column the variables namely, 'speedy Transaction', 'Family using', 'high interest in newer technologies', 'Easy Device', and 'Social Status' have higher loadings of .722, .839, .845, .845 and .846 respectively and it can be suggested that factor 1 is the combination of these five factors and have the variance of 23.818 percent and it can be named as 'Social Influence'.

From the second column it can be seen that the variables of 'Easy access', 'Easy Process', 'Saves time', 'Handle free', 'user friendly' have the higher loadings with a variance of 18.445 and it can be combined and called as 'User Friendly'.

The third column shows that the factor 'No need to go a bank', 'Secure Fraud', 'Physical

Security' and 'service all time' have the higher loadings of .636, .615, .596 respectively and are summarized and named as 'Secured usage'.

The fourth column it can be seen that the variables of 'credibility' and 'Additional Facility' have the higher loading to be named as 'Additional Facility'.

In the last column have two variables i.e. 'Low cost' and 'Differ from traditional banking' have higher loading with a variance of 9.167 and it can be combined and called as, 'Modern Technology'.

Thus 18 factors are reduced to five variables and are given different names by using factor analysis.

banking is an application of mobile which provides customers with the needed to be able to bank anywhere, anytime using a mobile handheld device and a mobile service such as Short Message Service (SMS). Mobile banking facility removes the space and time limitations from banking activities such as checking account balances or transferring money from one account to another and time saving by going to bank and doing some banking activities. This article explains clearly the major services used in Mobile banking and the reasons for using Mobile banking. By applying Henry's Garrett Ranking technique it is found that the major services used in mobile banking are savings and for online buying as these variables got the highest mean scores. International Remittance is the least variable used in mobile banking. Factor analysis is used to find out the reasons for using Mobile banking. The analysis indicate that 5 factors are extracted which account for 73.650 per cent of the total 18 variables. Hence 18 factors are summated to 5 factors named as, 'Social Influence', 'User Friendly', 'Secured usage', 'Additional Facility', 'Modern Technology'.

Suggestions

1. The banks should reduce the cost of mobile banking services and ensure the security of mobile banking services.
2. The bank should make the credibility among the customers about the mobile banking then the customer using mobile banking services than the traditional banking services.

Conclusion

It is well recognized that mobile phones have immense potential of conducting financial transactions thus leading the financial growth with lot of convenience and much reduced cost. Indian banking scenario shows that there is need of m-banking for financial inclusion of poor and urban people. Since last five years mobile telephone service extended tremendously in India and it provides golden opportunities to extend m-banking service in India. However, because of various problems in m-banking system this is not widely accepted by the customers. Hence, there is need to improve m banking service including network coverage and security in m-banking.

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ATTITUDE TOWARDS MOBILE BANKING IN KANNIYAKUMARI DISTRICT

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ABSTRACT The Mobile phone plays a very important role in the development of mobile commerce and mobile banking. Linking banking business to customers through mobile devices such as mobile phones or PDAs (Personal Digital Assistant) is one of these competitive strategies. The main objective of this article is to find out the reason for using mobile banking and to know the factors considered for using mobile banking. This results shows that the factors considered for using mobile banking are 24*7 service and Time saving as these variables got the highest mean scores, trust in M-banking and security are the least important variable considered for using mobile banking. Factor analysis is used to find out the reason for using mobile banking. The analysis indicate that 5 factors are extracted which account for 71.470 per cent of the total 18 variables.

KEYWORDS : Mobile Banking, Mobile Commerce, Reason For Using M-banking.

INTRODUCTION

Recent innovations in the telecommunication have proved to be a boon for the banking sectors and its customers. One of these is Mobile Banking, where customers interact with the bank via mobile phones and banks provide them the services like short message services, funds transfers, account details, issue of cheque books etc. Presently almost all the banks in the world have started providing their customers "Mobile Banking Services".

Mobile banking refers to provision of banking services with the help of mobile telecommunication devices. The offered services may include facilities to conduct bank transactions, to administer accounts and to access customized information. The launch of mobile banking has a long way to go as majority of the customers prefer banking in traditional ways⁴. The problem of the most customers is that they are not well educated and they are unaware of the technological innovations. Internet banking helps to give the customers access anytime to their banks. Customers can check their account details, get their bank statements, perform transactions like transferring money to other accounts and pay their bills sitting in the comfort of their homes and offices. But the biggest limitation of internet banking is the requirement of a personal computer with an internet connection. Mobile banking addresses this fundamental limitation of internet banking, as it reduces the customer requirement to just a mobile phone. Mobile usage has seen an explosive growth in most of the Asian countries like India. The main purpose of mobile banking scores over internet banking by providing 'Anywhere, Anytime Banking availability'. Customers don't need a computer terminal to access their bank accounts.

Mobile banking (M-banking) has emerged as a popular mode of banking in many developed and developing countries. In India, there are approximately 13 million mobile banking users and this figure is expected to grow rapidly with mobile transactions exceeding credit card transactions by the end of the decade. By some measures, there are more mobile phones in India than there are bank accounts. The combination of two factors- a large unbanked population and the ubiquity of cell phones-is a catalyst for high mobile banking adoption. Mobile banking is an application of mobile computing which provides customers with the support needed to be able to need anywhere, anytime using a mobile handheld device and a mobile service such as short message service (SMS). Mobile banking facility removes the space and time limitations from banking activities such as checking account balances or transferring money from one account to another and time saving.

OBJECTIVES OF THE STUDY

1. To know the factors considered for using mobile banking.
2. To analyse the reasons for using mobile banking.

METHODOLOGY OF THE STUDY

The methodological approach in this study is exploratory and descriptive in nature. This study was based on field level data. The total

sample size was fixed as 135 customers. Necessary data were collected from different ages of people and analysed in terms of the objectives set for the study. The data for this study were collected by the survey method. Survey is a research technique in which information is gathered from a sample of people by use of a questionnaire. Both primary and secondary data were used for the study. Secondary data were used for providing the theoretical background. Secondary data collected from journal, books, internet etc. Primary data were collected by the researcher herself through the questionnaire.

DATA ANALYSIS AND INTERPRETATION

Garrett Ranking

Factors considered while using mobile banking

It is well recognized that mobile phones have immense potential of conducting financial transactions thus leading the financial growth with lot of convenience and much reduced cost. For inclusive growth, the benefits of mobile banking should reach to the common man at the remotest locations in the country.

$$\text{Percent Position} = \frac{100(R-0.5)}{N}$$

N

Where, R = Rank given by the respondents
N = Number of factors i.e., 8.

The ranks thus obtained are converted into scores with the help of Garrett's table. For each criterion, the scores of individual respondents are added together and divided by the total number of respondents. The mean scores for all the criteria's are arranged in the ascending order and ranks are given in the order of importance.

TABLE 1
Factors for using Mobile Banking

S.No	Criteria	Garrett Mean Scores	Rank
1	24x7 service	69.72	I
2	Time Saving	63.64	II
3	Convenience	58.92	III
4	Modern Technology	50.36	IV
5	Attractive Facility	46.32	V
6	Economy in Cost	39.48	VI
7	Trust in m-banking	32.47	VII
8	Security	29.81	VIII

The above table 1 explicitly explains the top eight factors that are considered for using mobile banking. The most important criteria to use mobile banking is '24x7 service' since it scores the highest mean score of 69.72. The second important factor is 'Time Saving' which got the mean score of 63.64. The next important factor is 'Convenience' which has the mean score of 58.92. The least important factors are 'Trust in m-banking' and 'Security' as the mean scores for these variables are 32.47 and 29.81 respectively.

Reason for using Mobile Banking

Factor analysis

Factor analysis is a very useful method of reducing the complexity of the data by reducing the number of variables. It is an excellent way in identifying the latent factors by analysing correlation among variables and it explains the variables that influence much to the base or dependent variables.

In this study Factor Analysis is applied for the reason for using mobile banking and the results are given one by one.

In order to find the appropriateness of this analysis Kaiser Meyer Olkin and Bartlett's Test of Sphericity is used and the results are shown below.

In this study eighteen variables relating to the reason for using mobile banking have been analysed with the help of factor analysis.

TABLE 2 Rotated Component Matrix

S. No	Factors	Social Influence	User Friendly	Secured Usage	Additional Benefit	Modern Technology
1	Helps to maintain social status	.894				
2	High Interest in newer technologies	.863				
3	My family and colleagues are also using	.825				
4	Mobile phone is an easy to use device	.787				
5	Easy Process		.918			
6	Easy Access		.897			
7	Saves Time		.650			
8	User Friendly		.558			
9	No need to go bank			.745		
10	Physical Security			.741		
11	24*7 service			.688		
12	Secure from fraud			.616		
13	Speedy transactions				.589	
14	Additional Facility				.913	
15	Credibility				.608	
16	Low Cost					.821
17	Differ from traditional banking					.609
18	Hassle Free					.554
	Eigen Value	6.052	2.496	1.801	1.445	1.070
	Percent of variation explained	33.623	13.864	10.007	8.030	5.946
	KMO measure of sampling Adequacy: 0.721	Bartlett's test of sphericity: Chi-square value: 1484.895 Df:153 Significance Value: .000				

Extraction method: Principal Component analysis

Rotation method: Varimax with Kaiser Normalisation

The KMO measure of sampling adequacy and Bartlett's test of sphericity have been conducted to test of validity of data, since their KMO measure is greater than 0.5 i.e. (.721) and the chi-square value is 1484.895 degrees of freedom which is significant at 1% percent level. The above table indicates the rotated factor loading for the eighteen variables that have been extracted into five factors.

The number of variables in each factor, Eigen value and the percent of variance explained by the factor are presented in the table:

TABLE 3 factor Loading Reason For Using Mobile Banking

S.No	Reason	No. of variables	Eigen Value	Percent of Variance	Cumulative Percent
1	Social Influence	4	6.052	33.623	33.623
2	User Friendly	4	2.496	13.864	47.487
3	Secured Usage	4	1.801	10.007	57.494
4	Additional Benefit	3	1.445	8.030	65.524
5	Modern Technology	3	1.070	5.946	71.470

Source: Computed data

The highly influencing reason is 'Social Influence' since its Eigen value is 6.052 'Social Influence' has the variance of 33.623 percent. 'Helps to maintain social status', 'High Interest in newer technologies', 'My family and colleagues are also using', 'Mobile phone is an easy to use device', have higher loadings of .894, .863, .825, .787 respectively are the variables included in this factor.

The second reason for using mobile banking is 'User Friendly' which has a percentage of variance of 13.864 and its Eigen value is 2.496. 'Easy Process, Easy Access, Saves Time, User Friendly these variables are included in this factor.

The third reason is 'Secured Usage' which has a percentage of variance 10.007 and its Eigen value is 1.801. This factor is combination of variables such as 'No need to go bank', 'Physical Security, 24*7 service, Secure from fraud

The fourth reason is 'Additional Benefit' since its Eigen value is 1.445. This factor explains the variables considered in 'Additional Benefit' to the extent of 8.030 percent. 'Speedy transactions', 'Additional Facility, Credibility are the variables included in this factor.

The last reason for adopting mobile banking is 'Modern Technology' since its Eigen value is 1.070. This factor explains the variables considered in 'Modern Technology' to the extent of 5.946 percent. These factors have the variables 'Low Cost', 'Differ from traditional banking' and 'Hassle Free'.

Thus 18 factors are reduced to five variables and are given different names by using factor analysis.

FINDINGS

Mobile banking is an application of mobile computing which provides customers with the support needed to be able to bank anywhere, anytime using a mobile handheld device and a mobile service such as Short Message Service (SMS). Mobile banking facility removes the space and time limitations from banking activities such as checking account balances or transferring money from one account to another and time saving by going to bank and doing some banking activities. This article explains clearly factors considered for using mobile banking services and reason for using Mobile Banking. By applying Henry's Garrett Ranking technique it is found that the important factors considered for using mobile banking are 24*7 service, Time saving and Convenience as these variables got the highest mean scores, trust in M-banking and security are the least variable in considering the use of mobile banking. Factor analysis is used to find out the reason for using mobile banking. The analysis indicates that 5 factors are extracted which account for 71.470 per cent of the total 18 variables. Hence 18 factors are summarized to 5 factors named as Social Influence, User Friendly, Secured Usage, Additional Benefit and Modern Technology.

SUGGESTION

1. The banks should give awareness about the mobile banking services to their customers and try to remove all the doubts of the customers regarding mobile banking services.
2. The banks should demonstrate to their customers about the advantages of mobile banking services then the customers prefer to use mobile banking over other conservative methods.

CONCLUSION

Mobile Banking allows the user to access any time at anywhere. Customers can check balances, statement of information, transfer funds from one account to another etc. For this purpose the bank set this system and it is accessible to anyone using mobile. So visiting of banks can be avoided. Mobile banking services accessible from anywhere in the globe provides various banking and financial services under single umbrella and gives complete freedom of banking anywhere anytime on 24x7x365 basis. Through mobile banking, you can keep an eye on your transactions and account balance all the time. This facility also keeps your account safe.

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Research Article

MEAN LABELING PATTERN OF $C_m[P_m; C_n]$ and $C_n \otimes P_n$

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ABSTRACT

The concept of mean labeling was introduced by Somasundaram and Ponraj in 2003. Many research papers have published in this topic. In this paper we have established a general format for labelling the cycle, $[P_m, C_n]$, $C_n \otimes P_n$ and $K_{2,n}$ graphs.

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INTRODUCTION

Let $G = (V, E)$ be a graph which is finite, simple and undirected. The graph G has vertex set $V = V(G)$ and edge set $E = E(G)$. The graph labeling is an assignment of numbers to the vertices or edges or both subject to certain condition. If the domain of the mapping is the set of vertices / edges then the labeling is called a vertex / edge labeling. Graph labeling have enormous applications in mathematics as well as to several areas of computer science and communication network.

Definition

A graph G is an ordered pair $(V(G), E(G))$ consisting a non-empty set $V(G)$ of vertices and a set $E(G)$ disjoint from $V(G)$ of edges, together with an incident function π_G that associate with each edge e of G , an unordered pair of vertices of G . If e is an edge u and v are vertices of G such that $\pi_G(e) = \{u, v\}$ then e is said to join u and v and the vertices u and v are called the ends of e .

Definition

A Path is a simple graph whose vertices can be arranged in a linear sequence in such a way that two vertices are adjacent if they are consecutive in the sequence and are non-adjacent.

A closed path is called a Cycle. A Cycle with n vertices is denoted by C_n .

Definition

A graph is bipartite if its vertex set can be partitioned into two subsets, X and Y so that every edge set has one end in X and one end in Y .

A bipartite graph G is said to be complete if every elements of X is adjacent with all elements of Y . A complete bipartite graph with m, n vertices is denoted by $K_{m,n}$.

Definition

The cartesian product of simple graphs G and H is the graph $G \otimes H$ whose vertex set is $V(G) \otimes V(H)$ and whose edge set of all pairs $(u_1, v_1), (u_2, v_2)$ such that either $u_1, u_2 \in E(G)$ and $v_1 = v_2$ or $v_1, v_2 \in E(H)$ and $u_1 = u_2$.

Definition

A labeling or valuation of a graph G is an assignment f of labels to the vertices of G that induced for each edge xy a label depending on the vertex labelled by $f(x)$ and $f(y)$.

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Definition

A function f is called a mean labeling of a graph G if $f: V(G) \rightarrow \{1, 2, \dots, q\}$ is injective and the induced function $f^*: E(G) \rightarrow \{1, 2, 3, \dots, q\}$ defined as,

$$f^*(uv) = \begin{cases} \frac{f(u)+f(v)}{2} & \text{if } f(u) + f(v) \text{ is even} \\ \frac{f(u)+f(v)+1}{2} & \text{if } f(u) + f(v) \text{ is odd} \end{cases}$$

is bijective. A graph that admits mean labeling is called a mean graph.

Definition

Let G be a graph with fixed vertex v and let $[P_m; G]$ be the graph obtained from m copies of G connected the common vertices of $v_i \in G_i$ by path P_m .

Theorem

Any cycle C_n of length $n \geq 3$ is mean graph.

Proof

Let $G = C_n$ be the cycle with n vertices and the vertex set of G is denoted by $V(G) = \{v_i / i = 1, 2, 3, \dots, n\}$ and represented in (Figure: 1) as below we can label the vertices of G as

$$L(v_{n+1}) =$$

$$\begin{cases} n - (i - j) & / i = n - 1 \text{ to } \left\lfloor \frac{n+1}{2} \right\rfloor \text{ and } j = 2 \text{ to } \left\lfloor \frac{n+1}{2} \right\rfloor \\ n - (j - i) & / i = \left\lfloor \frac{n-1}{2} \right\rfloor \text{ to } 0 \text{ and } j = \left\lfloor \frac{n+1}{2} \right\rfloor \text{ to } n \end{cases} \dots (A)$$

Hence, C_n for all $n \geq 3$ is a mean graph.

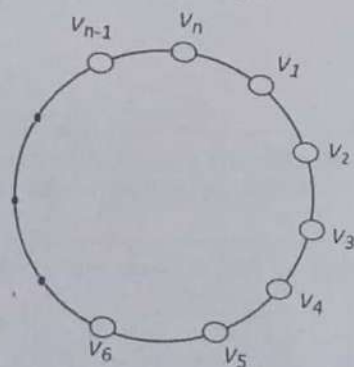


Figure 1

Note

The labeling pattern defined in (A) can be used to label any cycle in both directions.

Example

C_5 is labelled in (Figure: 2) by (A).

$$V = \{v_1, v_2, v_3, v_4, v_5\}$$

$$L(v_{n-i}) = n - (i - j), \text{ where } n = 5, i = \{4, 3\} \text{ and } j = \{2, 3\}.$$

$$L(v_{5-4}) = v_1 = 5 - (4 - 2) = 5 - 2 = 3$$

$$L(v_{5-3}) = v_2 = 5 - (3 - 3) = 5 - 0 = 5$$

$$L(v_{n-i}) = n - (j - i), \text{ where } i = \{2, 1, 0\} \text{ and } j = \{3, 4, 5\}$$

$$L(v_{5-2}) = v_3 = 5 - (3 - 2) = 5 - 1 = 4$$

$$L(v_{5-1}) = v_4 = 5 - (4 - 1) = 5 - 3 = 2$$

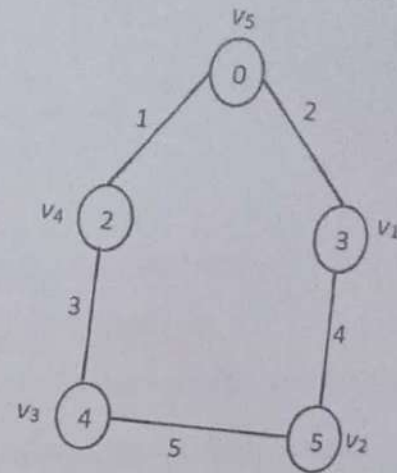


Figure 2

$$L(v_{5-0}) = v_5 = 5 - (5 - 0) = 5 - 5 = 0$$

Example

C_8 is labelled in (Figure: 3) by (A)

$$V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8\}$$

$$L(v_{n-i}) = n - (i - j); \text{ where } n = 8, i = \{7, 6, 5\} \text{ and } j = \{2, 3, 4\}.$$

$$L(v_{8-7}) = v_1 = 8 - (7 - 2) = 8 - 5 = 3$$

$$L(v_{8-6}) = v_2 = 8 - (6 - 3) = 8 - 3 = 5$$

$$L(v_{8-5}) = v_3 = 8 - (5 - 4) = 8 - 1 = 7$$

$$L(v_{n-i}) = n - (j - i); \text{ where } i = \{4, 3, 2, 1, 0\} \text{ and } j = \{4, 5, 6, 7, 8\}$$

$$L(v_{8-4}) = v_4 = 8 - (4 - 4) = 8 - 0 = 8$$

$$L(v_{8-3}) = v_5 = 8 - (5 - 3) = 8 - 2 = 6$$

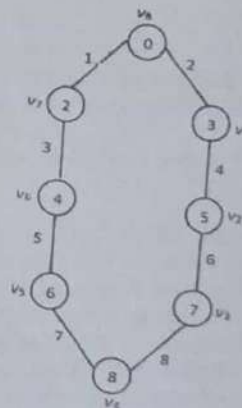


Figure 3

$$L(v_{8-2}) = v_6 = 8 - (6 - 2) = 8 - 4 = 4$$

$$L(v_{8-1}) = v_7 = 8 - (7 - 1) = 8 - 6 = 2$$

$$L(v_{8-0}) = v_8 = 8 - (8 - 0) = 8 - 8 = 0$$

Theorem

Let $G = [P_m; C_n]$ is m copies of C_n which are connected by a unique path P_m is a mean graph.

Proof

The graph G is given in (Figure: 4) as below.



Figure 4

The vertex set of G is denoted by

$$V(G) = \{v_{ij} : i = 1, 2, 3, \dots, m, j = 1, 2, 3, \dots, n\}$$

The vertices of G can be divided into two sets V_1 and V_2 such that

$$V_1(G) = \{v_{ij} : i = 1, 2, 3, \dots, m, j = 1, 2, 3, \dots, n\} \text{ if } i \text{ is odd}$$

$$V_2(G) = \{v_{ij} : i = 1, 2, 3, \dots, m, j = 1, 2, 3, \dots, n\} \text{ if } i \text{ is even}$$

Now, we label the vertices of G as below

$$L(v_{ij}) = 2(n+1) + v_{ij} \text{ where } i = 1, 2, 3, \dots, \lfloor m/2 \rfloor$$

$$L(v_{ij}) = 2(n+1) + v_{ij} \text{ where } i = 1, 2, 3, \dots, \lfloor m/2 \rfloor$$

---(B)

Hence, $G = [P_m, C_n]$ is mean graph.

Example

$G = [P_5, C_4]$ is labelled in (Figure: 5) as below by

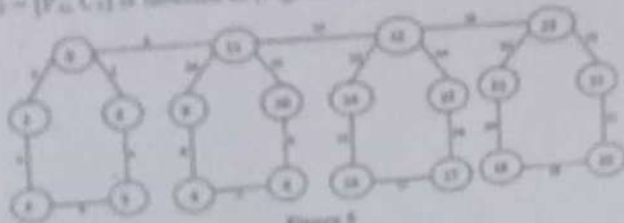


Figure 5

labelled by using (A), $L(v_{11}) = 0$; $L(v_{12}) = 3$; $L(v_{13}) = 5$;
 $L(v_{14}) = 4$; $L(v_{21}) = 2$;
 $L(v_{22}) = 6$; $L(v_{23}) = 9$; $L(v_{24}) = 11$; $L(v_{31}) = 10$; $L(v_{32}) = 8$;

labelled by using (B), $L(v_{11}) = 2(n+1) + v_{11} = 2 \times 1(5+1) + 0 = 12 + 0 = 12$;

$$L(v_{12}) = 2(n+1) + v_{12} = 2 \times 1(5+1) + 3 = 12 + 3 = 15$$

$$L(v_{13}) = 2(n+1) + v_{13} = 2 \times 1(5+1) + 5 = 12 + 5 = 17$$

$$L(v_{14}) = 2(n+1) + v_{14} = 2 \times 1(5+1) + 4 = 12 + 4 = 16$$

$$L(v_{21}) = 2(n+1) + v_{21} = 2 \times 1(5+1) + 2 = 12 + 2 = 14$$

$$L(v_{22}) = 2(n+1) + v_{22} = 2 \times 1(5+1) + 6 = 12 + 6 = 18$$

$$L(v_{23}) = 2(n+1) + v_{23} = 2 \times 1(5+1) + 9 = 12 + 9 = 21$$

$$L(v_{24}) = 2(n+1) + v_{24} = 2 \times 1(5+1) + 11 = 12 + 11 = 23$$

$$L(v_{31}) = 2(n+1) + v_{31} = 2 \times 1(5+1) + 10 = 12 + 10 = 22$$

$$L(v_{32}) = 2(n+1) + v_{32} = 2 \times 1(5+1) + 8 = 12 + 8 = 20$$

Theorem

$K_{n,n}$ is a mean graph for all $n \geq 1$.

Proof

Let $G = K_{n,n}$ and $V(G) = \{v_i : i = 1, 2, 3, \dots, n+1\}$

Now $V(G)$ can be partitioned into two sets V_1 and V_2 such that

$$V_1 = \{v_i : i = 1, 2, 3, \dots, n\}$$

Now, the vertices of $V(G)$ are labelled as

$$L(v_i) = \begin{cases} 2i-1, & (1 \leq i \leq n+1) \\ 2i, & (1 \leq i \leq n+1) \end{cases}$$

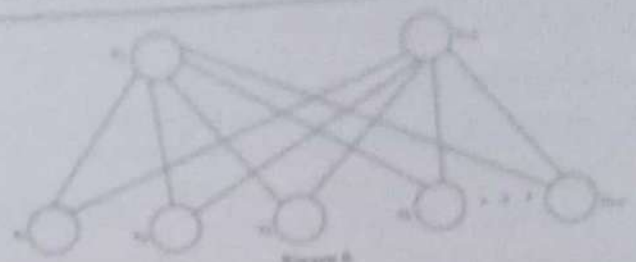


Figure 6

Hence, $K_{n,n}$ is a mean graph.

Example

Let $G = K_{3,3}$ is represented in (Figure: 7) and $L(V(G))$ is labelled by using (C) as below,

$$V = \{v_1, v_2, v_3, v_4, v_5, v_6\}$$

$$L(v_1) = 2i-1 = 2 \times 1-1 = 2-1 = 1$$

$$L(v_2) = 2i-1 = 2 \times 2-1 = 4-1 = 3$$

$$L(v_3) = 2i-1 = 2 \times 3-1 = 6-1 = 5$$

$$L(v_4) = 2i-1 = 2 \times 4-1 = 8-1 = 7$$

$$L(v_5) = 2i-1 = 2 \times 5-1 = 10-1 = 9$$

$$L(v_6) = 2i-1 = 2 \times 6-1 = 12-1 = 11$$

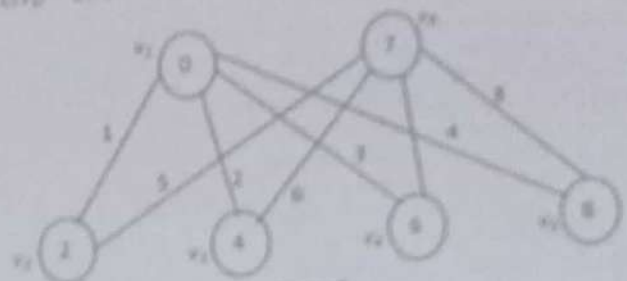


Figure 7

$$L(v_1) = 2i-1 = 2 \times 1-1 = 2-1 = 1$$

Theorem

The graph $G = C_n \otimes P_2$ is a mean graph.

Proof

The graph $G = C_n \otimes P_2$ is given (Figure: 8) as below.

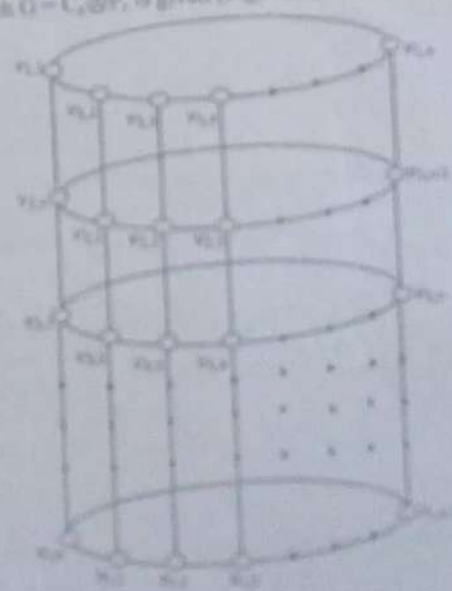


Figure 8

The vertex set of G is denoted by $V(G) = \{v_{i,j} / i=1,2,3,...,m; j=1,2,3,...,n\}$

Now $V(G)$ can be divided in to two sets V_1 and V_2

$V_1(G) = \{v_{i,j} / i=1,2,...,m; j=1,2,3,...,n\}$ where i is odd

$V_2(G) = \{v_{i,j} / i=1,2,3,...,m; j=1,2,3,...,n\}$ where i is even.

$$L(v_{i,j}) = \begin{cases} n-(i-j) / i=n-1 \text{ to } \lfloor \frac{n+1}{2} \rfloor \text{ and } j=2 \text{ to } \lfloor \frac{n+1}{2} \rfloor \\ n-(i-j) / i=\lfloor \frac{n-1}{2} \rfloor \text{ to } 0 \text{ and } j=\lfloor \frac{n+1}{2} \rfloor \text{ to } n \end{cases} \quad \dots(A)$$

$$L(v_{2,j}) = \{2n + v_{1,j} / j=1,2,3,...,n\} \quad \dots(D)$$

$$\left. \begin{aligned} L(v_{1,i}) &= 2n(i-1) + v_{1,i}, \text{ for all } v_{1,i} \in V_1(G) \text{ and} \\ L(v_{2,i}) &= 2n(i-2) + v_{2,i}, \text{ for all } v_{2,i} \in V_2(G) \end{aligned} \right\} \quad \dots(E)$$

Hence, $C_n \otimes P_r$ is a mean graph.

Example

$G = C_4 \otimes P_4$ is labelled using (E) is given in (figure: 9) as below

By using (A) $L(v_{1,1}) = 3$, $L(v_{1,2}) = 4$, $L(v_{1,3}) = 2$, $L(v_{1,4}) = 0$,

Using (D) $L(v_{2,1}) = 11$, $L(v_{2,2}) = 12$, $L(v_{2,3}) = 10$, $L(v_{2,4}) = 8$,

By using (E)

$$L(v_{3,1}) = 2n(i-1) + v_{1,i} = 2 \times 4(3-1) + 3 = 19,$$

$$L(v_{3,2}) = 2n(i-1) + v_{1,i} = 2 \times 4(3-1) + 4 = 20,$$

$$L(v_{3,3}) = 2n(i-1) + v_{1,i} = 2 \times 4(3-1) + 2 = 18,$$

$$L(v_{3,4}) = 2n(i-1) + v_{1,i} = 2 \times 4(3-1) + 0 = 16,$$

$$L(v_{4,1}) = 2n(i-2) + v_{2,i} = 2 \times 4(4-2) + 8 = 26,$$

$$L(v_{4,2}) = 2n(i-2) + v_{2,i} = 2 \times 4(4-2) + 12 = 27,$$

$$L(v_{4,3}) = 2 \times 4(4-2) + 10 = 16 + 10 = 26,$$

$$L(v_{4,4}) = 2 \times 4(5-1) + 12 = 16 + 10 = 26,$$

$$L(v_{5,1}) = 2 \times 4(5-1) + 0 = 32 + 3 = 35,$$

$$L(v_{5,2}) = 2 \times 4(5-1) + 3 = 32 + 4 = 36,$$

$$L(v_{5,3}) = 2 \times 4(5-1) + 2 = 32 + 2 = 34,$$

$$L(v_{5,4}) = 2 \times 4(5-1) + 0 = 32 + 0 = 32.$$

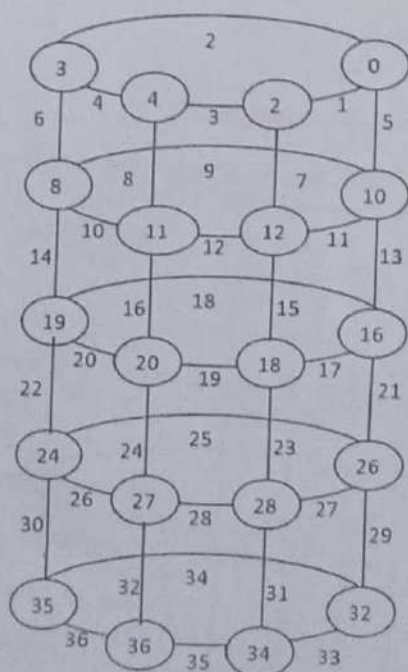


Figure 9

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Hence, Theorem: 2.9 is verified.



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A STUDY ON THE PROBLEMS OF WOMEN ENTREPRENEURS IN ASARIPALLAM AREA

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Abstract:

The status of women has changed from time to time; position of the women in society is the index to the standard of social organization. Women position in the modern Indian Society is equal to that of men socially, economically, politically, legally. New women has the right to review education, own properties, participate in public life of the nation. She can seek employment anywhere and remains not a domestic slave. As Dr. APJ Abdul Kalam rightly remarked "empowerment of women, their thoughts and their value systems leads to the development of a good family, good society and ultimately of good nation". Entrepreneurship is a multi-dimensional task and the entrepreneur should be a good creator, innovator, organizer, risk bearer and leader. And it is same, as in the case of a women entrepreneur. Though development policies and good performance have created a positive impact in women position in the society, still the growth of women entrepreneurial field is haunted by a number of difficulties and problems. The study is conducted in order to understand the problems of women entrepreneurs in Asaripallam area, Kanyakumari district. This Study reveals cooperation, support and motivation from the part of the family members. Most of them acquired a socio economic status through entrepreneurship and ultimately sustainability for a better tomorrow.

Introduction

Women entrepreneurs may be defined as women or the group of women who initiate, organize and operates business enterprise. According to Schumpeter an entrepreneur is an innovating individual who is introducing something new in to the economy. Government of India has given a broader definition of women entrepreneur as "an enterprise owned and controlled by women having a minimum financial interest of 51% of the capital and giving at least 51% of the employment generated in the enterprise to women".

Emergence of women entrepreneurs in the economy is an indicator of women's economic independence and their improved social status. Throughout the world, women's participation in economic activities is increasing. A women as entrepreneur is economically more powerful than a male worker. Women's active participation in economic activities leads to their economic development. Participation of women in entrepreneurship will provide a change to utilize their free time, rather than being employed outside their homes in some other job. Emergence of women entrepreneurs in the economy is an indicator of women's economic independence and their social status. The study is conducted in order to understand the problems of women entrepreneurs in Asaripallam area, Kanyakumari District.

Scope of the study

The key area in the empowerment of women is the economic area. Emergence of women entrepreneurs in the economy is an indicator of women's economic independence. In the present days, women are getting with high credit than men in education and in professional studies. Women entrepreneurship needs to be studied for number of reasons. The main reason is that women entrepreneurship has been recognized during the last decades as an important source of economic growth. They create new jobs for themselves and others and also being different. They also provide the society with different solution to management, organization and exploitation of entrepreneurial opportunities. Study was conducted in Asaripallam area. Moreover that large percentage of women entrepreneurs engaging in the field of textiles, tailoring shop, super markets, herbal parlors, small retail shops in the respective area. These are provided various benefits to themselves. But there are a number of problems which will hinder the growth and expansion of these business units. The objective is to analyze these problems of women entrepreneurs in this area.

Objectives

1. To understand the socio economic background of women entrepreneurs.
2. To study the major benefits enjoyed by women entrepreneurs.
3. To examine the problems faced by the women entrepreneurs.

Methodology

The study was undertaken in Asaripallam Area. Data for the present study have been collected both from the Primary data and secondary data.

Primary Data

The primary data required for the study were collected from the selected sample of women entrepreneurs in Asaripallam area. Samples of 50 respondents were selected by convenience sampling method. The respondents were interviewed with the help of scheduled questionnaires. Additional information was collected from books, journals, articles and reports from newspapers, magazines and websites.

Tools and Techniques

For the analysis of data, percentage method is used. Along with this tables are also used to make the analysis more clear.

Data Analysis and Interpretation

Table 4.1 Socio- Economic Profile of Women Entrepreneurs (Source: Primary data)

Sl. No	Category	Details	Number of Respondents	Percent
1	Age	20- 30	8	16
		30- 40	28	56

From the table 4.2, it is understood that almost 36 per cent of the respondents are engaged in running tailoring units and boutiques and 30 per cent of them are running beauty parlors. 12 & 8 per cent of women entrepreneurs are engaged in manufacturing of candles and food products. 14 per cent are having service units like binding, printing and DTP centers.

Table 4.3 Traditional Restrictions (Traditional restrictions like travelling alone, working after normal hours and interaction with men)

Basis	Number of Respondents	Per cent
Yes	10	20
No	40	80
Total	50	100

Table 4.3 reveals that 80 per cent of the respondents do not face any traditional restriction in their business field and 20 percent complained the indifferent attitude of the society as a problem.

Table 4.4 Support from Family (Source: Primary data)

Basis	Number of Respondents	Percent
Good	36	72
Satisfactory	11	22
Poor	3	6
Total	50	100

The table 4.4 shows the nature of support from family to the women entrepreneurs. 72 per cent get good support and 22 per cent are satisfied with the support from family. 6 per cent of respondents opined that their family support is very poor.

Table 4.5 Reason for Starting the Business (Source: Primary Data)

Basis	Number of Respondents	%
Experience in field	4	8
High level of opportunity	6	12
Profit making	22	44
Daily Income	18	36
Total	50	100

Profit making is the most attractive element that catches the attention of 44 percent of women entrepreneurs. 36 per cent have an aim in attaining daily income by entering in to entrepreneurship ventures. Experience in the field (8%), high level of opportunities (12%) are considered as other reasons for starting business by women.

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Article

Synthesis, X-ray Single Crystal Structure, Molecular Docking and DFT Computations on *N*-[(1*E*)-1-(2*H*-1,3-Benzodioxol-5-yl)-3-(1*H*-imidazol-1-yl)propylidene]-hydroxylamine: A New Potential Antifungal Agent Precursor

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Abstract: Mycoses are serious health problem, especially in immunocompromised individuals. A new imidazole-bearing compound containing an oxime functionality was synthesized and characterized with different spectroscopic techniques to be used for the preparation of new antifungal agents. The stereochemistry of the oxime double bond was unequivocally determined via the single crystal X-ray technique. The title compound **4**, $C_{13}H_{13}N_3O_3 \cdot C_3H_8O$, crystallizes in the monoclinic space group $P2_1$ with $a = 9.0963(3)$ Å, $b = 14.7244(6)$ Å, $c = 10.7035(4)$ Å, $\beta = 94.298(3)^\circ$, $V = 1429.57(9)$ Å³, $Z = 2$. The molecules were packed in the crystal structure by eight intermolecular hydrogen bond interactions. A comprehensive spectral analysis of the title molecule **4** has been performed based on the scaled quantum mechanical (SQM) force field obtained by density-functional theory (DFT) calculations. A molecular docking study illustrated the binding mode of the title compound **4** into its target protein. The preliminary antifungal activity of the title compound **4** was determined using a broth microdilution assay.

Keywords: crystal structure; imidazole; benzodioxole; oxime; DFT

1. Introduction

The incidence of systemic fungal infections (mycoses) has increased drastically in recent years, mainly in immunosuppressed or immunocompromised individuals with AIDS, cancer or undergoing organ transplantation [1,2]. Failure of the available antifungal agents to treat fungal infections is primarily due to dramatic increase in resistance to the conventional antifungal drugs leading to morbidity and mortality in patients facing life-threatening fungal infections. In order to overcome

this serious problem, the development of new alternative antifungal drug therapies with improved efficacy, broader activity and favorable safety profile has attracted a great deal of interest [3,4].

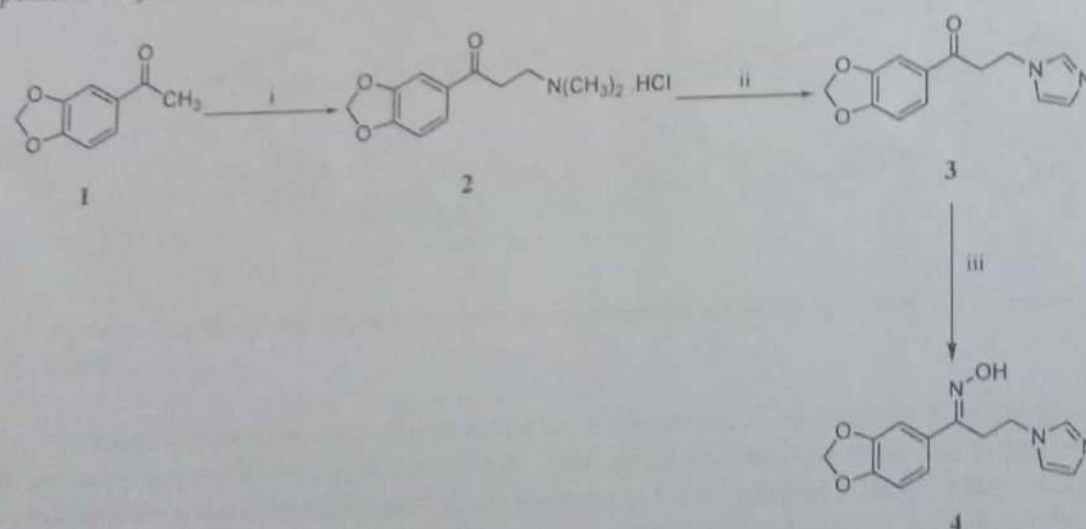
Azole-based compounds having either an imidazole or triazole pharmacophore moiety in their structure, constitute the mainstay of the antifungal chemotherapeutic agents used in the clinic [5,6]. Azoles competitively inhibit cytochrome P450-dependent lanosterol 14 α -demethylase (CYP51) resulting in depletion of ergosterol in fungi making them unable to grow in a normal way [7,8]. A screening the literature revealed that most of the available imidazole-bearing antifungal agents have two carbon spacers between the imidazole moiety and an aromatic residue, while few antifungals have a three carbon spacer between the pharmacophore and the aromatic part [9–11].

On the other hand, the benzodioxole moiety is found in a sizable number of biologically active compounds with a wide range of activities [12–16]. The title molecule features both the 1,3-benzodioxole moiety and the imidazole nucleus connecting to each other through a three carbon bridge. Therefore, the current investigation deals with the synthesis, molecular characterization and single crystal X-ray structure of a new oxime derivative, namely *N*-[(1*E*)-1-(2*H*-1,3-benzodioxol-5-yl)-3-(1*H*-imidazol-1-yl)propylidene]hydroxylamine (4) to be utilized as a potential precursor for imidazole-bearing antifungal agents. The stereochemistry of the imine functionality in the title molecule 4 was certainly determined via the single crystal X-ray crystallography technique. In addition, density-functional theory (DFT) computations were also performed as a useful tool to investigate the electronic structure and molecular geometry of the title molecule 4. Molecular docking studies were conducted in order to predict the biological activity of compound 4.

2. Results and Discussion

2.1. Chemistry

Scheme 1 illustrates the synthetic pathway which was adopted to synthesize the target compound 4. The synthesis commenced with a Mannich reaction under acidic conditions using the commercially available 1-(2*H*-1,3-benzodioxol-5-yl)ethanone (1). Subsequently, the formed Mannich base hydrochloride 2 was smoothly transformed in aqueous solution into the ketone 3 via a nucleophilic substitution reaction using imidazole. The target oxime 4 was ultimately obtained using the standard procedure for oxime formation with hydroxylamine hydrochloride in ethanol in the presence of potassium hydroxide [17].



Scheme 1. Synthesis of the target oxime 4. Reagents and conditions: (i) $\text{HN}(\text{CH}_3)_2 \cdot \text{HCl}$, $(\text{CH}_2\text{O})_n$, conc. HCl, ethanol, reflux, 2 h; (ii) Imidazole, water, reflux, 5 h; (iii) $\text{H}_2\text{NOH} \cdot \text{HCl}$, KOH, ethanol, reflux, 18 h.

2.2. Crystal Structure of the Title Compound 4

The configuration of the target compound 4 was confirmed via X-ray crystallography. A suitable single colorless crystal of dimensions, $0.40 \times 0.23 \times 0.11$ mm, was selected for X-ray diffraction analysis. The labeled displacement ellipsoid plot of this molecule is shown in Figure 1. Figure 2 depicts the packing of the molecules in the crystal structure.

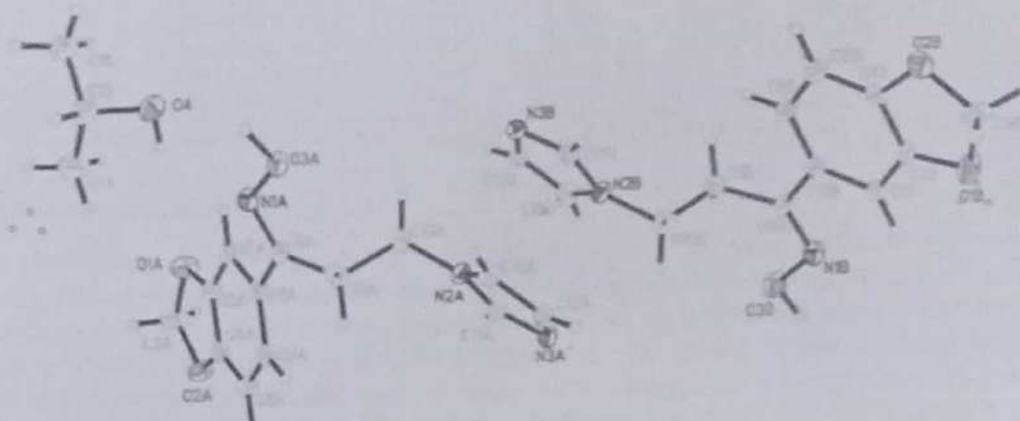


Figure 1. ORTEP diagram of the title compound drawn at 40% ellipsoids for non-hydrogen atoms showing two molecules and one isopropanol molecule as a solvent.

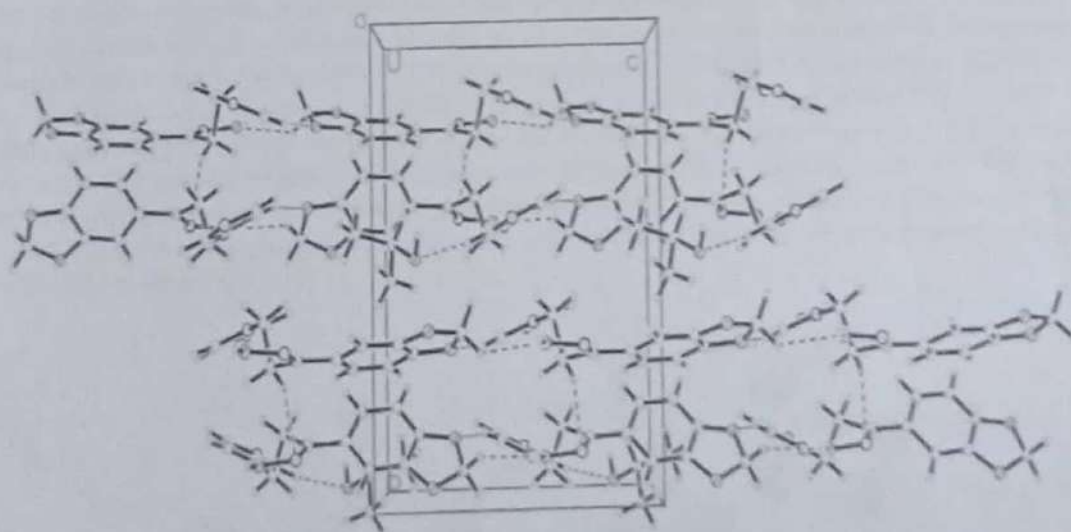


Figure 2. Crystal packing showing intermolecular hydrogen bonds as dashed lines along the *b* and *c* axes.

The single crystal X-ray molecular structure therefore conformed the assigned (*E*)-configuration of the imine group in the target compound. The crystal structure contains two independent molecules with one isopropanol molecule as a solvent in the asymmetric unit. The benzodioxole ring (C1/C2/O1/C3/O2/C4–C7) forms dihedral angles of $44.04(3)^\circ$ and $20.04(2)^\circ$ with the imidazole ring (N2/C11/N3/C12/C13) for molecules A and B, respectively. The crystal structure is stabilized by eight hydrogen bonds along the *b* and *c*-axis (Table 1).

Table 1. Hydrogen-bond geometry (Å, °) of the title molecule 4.

D—H...A	D—H	H...A	D—A	D—H...A
C10—H10A...O2A ⁱⁱ	0.96(5)	1.75(5)	2.722(5)	176(4)
C10—H10B...N2A ⁱⁱ	0.96(5)	1.78(5)	2.672(5)	175(4)
C8—H8A...O1A ⁱⁱ	0.95(7)	1.76(7)	2.717(6)	175(4)
C15A—H15A...O2A ⁱⁱ	0.96(6)	1.80(6)	2.739(6)	172(4)
C16—H16B...O1A ⁱⁱ	0.96(6)	1.76(6)	2.680(6)	176(4)
C15A—H15A...O1A ⁱⁱ	0.95(6)	1.77(6)	2.717(7)	176(4)
C15A—H15A...O2A ⁱⁱ	0.95(6)	1.76(6)	2.679(6)	176(4)
C13B—H13B...O2B ⁱⁱ	0.96(6)	1.72(6)	2.672(6)	169(4)
C13B—H13B...O1A ⁱⁱ	0.96(6)	1.76(6)	2.701(6)	176(4)

Symmetry codes: (i) $x+1, y, z$; (ii) $x, y+1, z$; (iii) $x, y, z+1$; (iv) $x-1, y, z$; (v) $x, y, z-1$; (vi) $x-1, y+1, z$.

2.3. Structural Geometry Analysis

Equilibrium structural geometry of the title molecule 4 has been evaluated by a potential energy surface (PES) scan study. The flexible dihedral angles of $C_{11}-C_{12}-N_{12}-C_{13}$, $C_{11}-C_{12}-C_2-C_4$ and $C_{11}-C_{12}-N_{12}-O_2$ were scanned from 0° to 360° and their optimum energy was studied to identify stable conformations of the title compound 4. The global minimum energy is -883.45 and -893.49 Hartree for the conformers of compound 4 in the gas and solution phases, respectively (various conformers of compound 4 are shown in Figure S1). From this PES analysis, we have identified the minimum energy conformation of this molecule which was chosen for the subsequent studies. The optimized structure of the studied compound 4 with atom numbering is depicted in Figure 3. Optimized bond lengths, bond angles and dihedral angles have been presented in Table 2. The formation of intramolecular hydrogen bonding is expressed by the intramolecular contacts to $H_{12}...N_{12}$ occur with H...O distance of 2.455 Å, which is shorter than the van der Waals separation between the O and H atoms (2.75 Å) [18]. Shortening of the C-N bond lengths $N_{12}-C_{13}$, $N_{12}-C_{11}$, $N_{11}-C_{12}$ and $N_{11}-C_{13}$ is typical for double bonds and it is due to resonance interactions. The linear fitting graphs (Figure S2) are drawn to study the correlation between the average experimental values and computed results. Statistical analysis revealed that the results of the computed vibration model are in a good agreement with the average experimental XRD values. Therefore, this method was considered to compute spectral vibrations, natural bond orbital and Frontier orbital energy analysis for the title molecule 4.

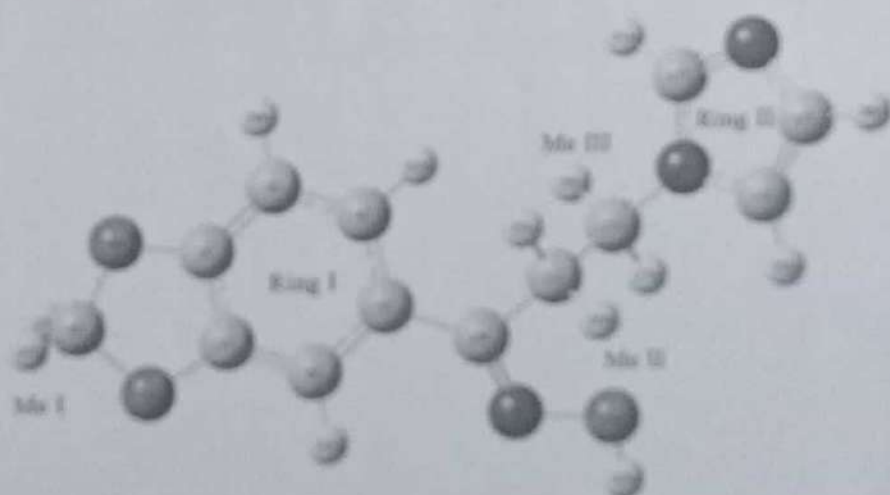


Figure 3. Optimized molecular structure of compound 4.



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**ROLE OF DISTRICT INDUSTRIES CENTRE IN ENTREPRENEURSHIP DEVELOPMENT
IN KANYAKUMARI DISTRICT**

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Abstract

The state government introduced District Industries Centre (DIC) in Kanyakumari District at Konam, Nagercoil from 1st August 1978, the DIC serves as nucleus for providing the support and assistance required by small scale, rural and cottage industries. Powers of the Directorate of Industries and Commerce have been delegated to District Industries Centre, Konam, Nagercoil and the field officers of the Department. In this paper the researcher has made an attempt to study the concept of DIC, Role of District Industries Centre in Entrepreneurship Development in Kanyakumari District and has given some suggestions.

Introduction

The District Industries Centres (DIC) programme was started in 1978 with a view to providing integrated administrative framework at the district level for promotion of small scale industries in rural areas. The DIC are envisaged as a single window interacting agency at the district level providing service and support to small entrepreneurs under a single roof. DIC are the implementing arm of the central and state governments of the various schemes and programmes.

Objectives

The followings are the objectives of this paper

1. To study the concept of DIC.
2. To analyse the Role of DIC in Entrepreneurship Development in Kanyakumari District.
3. To give some suggestions.

Methodology

The present study needed both primary data and secondary data. Primary data means the data collected originally, especially for the study. The researcher collected it through the questionnaire. The secondary data is the data collected by someone else used for the study. Likewise the researcher used secondary data collected from the reports, pamphlets of the DIC, Kanyakumari district and also through different articles, journals, magazines and websites. The list of entrepreneurs along with their basic profile was collected from District Industries centre, Nagercoil and it was classified according to the year and type of organization. The total number of entrepreneurs according to the details obtained from the District Industries centre was 4967. Out of the total population of 4967 entrepreneurs from the year 2010 to 14, 3000 are Industrial/Manufacturing entrepreneurs and 1967 are Trade and Service entrepreneurs. The total of 497 entrepreneurs from Kanyakumari District is selected as a sample for the purpose of this study. 300 respondents who are Industrial/Manufacturing entrepreneur and 197 respondents who are Trade and Service entrepreneur were selected as the total respondent for the purpose of this study. 10 per cent of the total beneficiaries from each sector were selected by applying simple random sampling. This study employed a properly structured questionnaire, which was finalized after a thorough scrutiny of various questions by various experts. The questionnaire used in the

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Role of Credit Cards In Banking

Dr. Padmanaban and Eframe Sophia Selvam

I. INTRODUCTION

A credit card is a card issued by a financial company giving the holder an option to borrow funds, usually at point of sale. Credit cards charge interest and are primarily used for short-term financing. Interest usually begins one month after a purchase is made, and borrowing limits are pre-set according to the individual's credit rating.

Many conceptually innovative products were born setting new trends and high standards in various economic parameters. Civilized man made further progress by drifting ahead from the primitive ages of barter. A Credit card is a thin plastic card that contains information such as signature and sometimes, a photograph for identifying the holder and authorizes the person named on it to charge purchases or services to his/her account. The basic concept of the credit card is 'Buy now. Pay later'. Credit cards can be viewed as a kind of financial instrument that enable the user to buy products and services without having to pay the seller directly. It affords the card holder considerable purchasing power and convenience. In this paper the researcher tried to bring out some new information about the credit cards such as the need of credit cards, the origin, types of credit cards, their benefits, types of frauds tried against them and the measures to overcome them for safety of the card holders.

II. INDUSTRIES RECOGNIZED THE NEED OF CREDIT CARDS

The system of credit took a real turn in 1914, when Western Union, in the interest of good customer service, gave some of their more prominent customers a metal card to be used in deferring payments-interest free - on services used. This system became known as 'metal money'. Then another company realized the value of making goodwill gestures to their customers. In 1924, General Petroleum Corporation issued the first metal money specifically for gasoline and automotive services.

In the late 1930's, American Telephone and Telegraph (AT&T) introduced the 'Bell system credit card'. Other industries followed suit- railroads and airlines introduced similar cards. The system of credit was fast growing in popularity.

III. CREDIT CARD - ORIGIN

A credit card is a payment card issued to users (cardholders) to enable the cardholder to pay a merchant for goods and services, based on the cardholder's promise to the card issuer to pay them for the amounts so paid plus other agreed charges. The card issuer (usually a bank) creates a revolving account and grants a line of credit to the cardholder, from which the cardholder can borrow money for payment to a merchant or as a cash advance. Many conceptually innovative products were born setting new trends and high standards in various economic parameters. He amassed much wealth in various forms such as land, buildings, bank deposits, corporate equity, patents and ownership rights.

Money in the form of different coins and currencies through the years and centuries continued to dominate the commercial era in assimilating and quantifying commercial and business transactions. Printed paper currencies and metal coins were exchanged in place of goods and services traded by various countries. The bankers facilitated these settlements in those countries.

The word credit comes from Latin which means trust. It was in the year 1951, that the Diners club issued the first credit card or a plastic card to some of its 200 customers. These were treated as "Member Cards" catering to a few subscribers or clients. Early on, the members of the club could use these cards at about 27 restaurants in New York.

IV. CREDIT CARD ELIGIBILITY

Any citizen of the country who is eligible to enter into a contract can apply for a Credit card. Yet, banks need to exercise their own discretion while assessing individual records such as their regular income criteria, net -worth etc.

V. CREDIT CARD OPERATION

After swiping the card in the Manual Swiping Machines or EDC s, the identity and authenticity of the credit card and the card holder are verified on the spot. The merchant establishment is in a position to avail reimbursement from the Acquiring Bank or the card issuer, i.e., the bank. The card issuer can authorize the transaction telephonically or electronically to the merchant retailer/ establishment and transmit an Authorization Code that can conclusively seal the transaction. A reference number is used to retrieve a past transaction and dig out details of the same.

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It has become essential for us to choose for ourselves the card or the combination of cards, which best suit our own personal financial needs.

The different basic types of cards and their features.

ATM card. This enables you to draw cash from bank account round the clock throughout the year from specially - designed machines (Automated Teller Machines) which, through some linkages established with the bank branches, instantly debit your account for the amount of cash withdrawn.

Debit card; this enables you to charge purchases or services through instantaneous debits to your bank account at designated shops and merchant establishments. These cards may also double up as ATM-card.

Charge card; with these cards you have to pay in full for the purchases made or services availed on or before a stipulated due date. Credit is, thus, made available to you for a period of about 20-50 days, including the grace period. But unlike credit cards, charge cards do not allow you to carry forward your dues.

Credit card; In case of credit cards, you can choose to pay fully or partially (the minimum amount payable is usually 5% of the total amount outstanding on the date of the periodical billing by the card issuer).

There also some other cards like the following.

Charge cards are financial instruments issued by banks of authorized business establishments. They are plastic cards having magnetic strip, which are used to make payments similar to credit cards. But unlike credit card no due can be carried forward.

Petro cards- are a kind of smart card to pay for fuel. Normally these are issued by petroleum companies. These cards are purchased for a certain value and each time the amount is deducted when used for fuel payment.

Phone cards- are stored value cards which are normally used for long distance and international calls. They can be used to make call from any type of phone say landline, cell phones, or payphones etc.

Forex cards - are bank cards used as a payment tool in different countries. These cards are safe, fast and convenient and can be purchased from banks who are authorized dealers in foreign exchange, while travelling abroad.

Library cards- are a form of magnetic strip card which stores information. They can be used to check the availability of books, reserve books, view account balances and pay fines apart from using it as photo identity cards.

VI. TYPES OF CREDIT CARDS



A. Visa cards

Visa cards are the foremost name in plastic cards with international acceptance and state of art features and subscribed by the people around the world. They provide exceptional convenience and reliability in terms of transaction processing. VISA -are accepted in 150 countries all over the world. VISA stands for 'Visa International Service Association'. Through Visa cards, one can withdraw cash from 840000 ATMs in the Visa Global Network. Most of the banks have tie-ups with VISA International and thus, they can issue Visa cards from any part of the globe.

B. Master Cards

Master Cards International is a leading global payments solutions company. It provides a number of innovative services related to payment settlements. They cover through their global networks; electronic cash deposit access as also business to business settlements. Payments through MasterCard International Payments (MIP). The members or associates of MasterCard International networks are benefited in many ways.

C. Salient features

- Application of Modern Technology
- Minimum risk cost
- Facilitates e-payment
- Security through pass words and pin numbers
- Global acceptance
- Practical and convenient
- Trigger off an overdraft

VII. ADVANTAGES OF CREDIT CARDS.

Plastic money is used for convenience, emergency and transparency in dealings.

Credit cards offer many benefits to the prudent card user. They score a number of advantages over other mode of payments, especially where it involves carrying liquid cash and hard currency changing hands. They can be summarized as follows:

- The risk and inconvenience of carrying cash are eliminated

- Cheques and drafts can be issued through the card over the phone
- Free credit can be availed for 20-50 days
- Bills can be cleared on or before the stipulated due dates
- Cards can be used at petrol pumps
- Card issuers offer their members a comprehensive insurance cover
- One can settle a deal or transaction with the help of a card through the net practically from any part of the world and that too instantly.
- Use of credit cards help in planning one's finances
- Various card- issuers offer zero percent finance through credit card purchases.
- Credit cards help in budgeting short-term or monthly expenses with a personal and independent source of finance
- Credit cards are easy to carry, handle and encash.

VIII. CREDIT CARDS - THE FLIP SIDE

No system is fool-proof, no system is without faults and shortcomings, and there is always scope to evolve and adapt. The followings are the defects, drawbacks and disadvantages.

- First and foremost, it is a credit- tool and hence, shall be utilized with prudence and care. It should be used wisely and productively, otherwise the budget plans may not come under one's control.
- Credit card is not an alternative to a long term credit facility and use of it shall be restricted to regular spends and expenses and not for speculative purposes or luxuries.
- Loss of cards entails a financial charge or penalty. It may also risk misuse by unscrupulous people.
- In a few places and destinations, credit cards are skimmed with the help of a palm- size magnetic stripe-reader that can copy the encoded data in the magnetic stripe of a card in as much time as it takes to swipe a card.
- Credit cards involve higher financial costs especially when one chooses the revolving payment action. The interest is compounded on a monthly basis even though the card user is paying up to 5% of the outstanding balance.
- The fees, penalties and levies are exorbitant when compared to other banking products and services.
- Since it is considered as a kill (target) for the card issuer, the card user becomes the prey. He is

called up to compensate all operational costs of the card issuer.

- The economic condition of the credit card user may be adversely affected when he is not using the credit prudently disregarding his repayment capacity.
- The card user makes his spending on various purchases or other comforts in anticipation of income-flow throughout. However, many times due to any factors, in case income level drops, the consequences will be much.
- Report lost cards immediately

IX. FUTURE OF CREDIT CARDS

In India, the market for payment cards has only recently begun to take off. It is estimated that there are 30 million people eligible for debit cards. Today, there are only 9 million credit cards and less than 15 million debit cards in use in India. Usage of cards is largely confined to about 10-15 major cities. Only about 125000 merchants in India accept payment cards. This is mainly due to the fact that the card acceptance devices including the Electronic Data Capture (EDC) machines are imported and expensive and only large merchant establishments find it worthwhile to make the investment. Sophisticated variations of payment cards are also emerging. There are now cards in market that use greater security measures than in conventional credit cards. These are called smart cards, which have a microprocessor chip built into the card itself. Internationally accepted smart cards will eventually be available to everybody.

X. CONCLUSION

Credit cards afford enormous advantages and convenience, but if used casually and without diligence, can become a highly expensive form of borrowing. It cannot be overemphasized that an intelligent approach to use of cards is required. Thus a credit card is a powerful tool for prudent personal financial planning and management.

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EATHAMOZHY TALL COCONUT WITH GEOGRAPHICAL INDICATION

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ABSTRACT

This paper will give the description about the Eathamozhy Tall Coconut with Geographical Indication in Kanyakumari district of Tamilnadu. The promising and traditional coconut type known as Eathamozhy Tall found in the southern most belt of the peninsular India with its superior Morpho-Genetic traits is registered under geographical indications in the year 2007 in G.I. 110, with the necessary certificate No.72 dt.7.09.2007, class 3 coconut. The coconut trees generally grow in coastal areas. The present study covers the objectives to analyse the method of cultivating coconut in Kanyakumari District. The study concluded that the method of coconut cultivation is based on yielding time duration

Keywords: Coconut, hectares, cultivating, yielding, marketing.

INTRODUCTION

Coconut is grown in more than 86 countries worldwide, with a total production of 54 billion nuts per annum occupies the premier position in the world with an annual production of 13 billion nuts, overtaking Indonesia and the Philippines, the other two prominent coconut growing countries

The coconut having originated in South East Asia appears to have dispersed eastwards towards the Pacific and further in to America, towards the west, it moved to India and Madagascar over the calm tropical waters. Although, it was often considered as an ocean dispersed nut due to its sustenance viability in sea water for over 100 days sea traveller were also responsible for worldwide introduction and propagation of coconut plantation.

The promising and traditional coconut type known as Eathamozhy Tall found in the southern most belt of the peninsular India with its superior Morpho-Genetic traits is registered under geographical indications in the year 2007 in G.I. 110, with the necessary certificate No.72 dt.7.09.2007, class 3 coconut. The world intellectual property organisation has granted protection to the G.I. registered Agricultural products through its orders in 1883, and 2005. The WTO (World trade Organisation) has also granted protection to the G.I. registered Agricultural products from 2005. The Indian parliament has also passed the needed acts in 1993 and 2006.

STATEMENT OF THE PROBLEM

The Eathamozhi tall coconut is in Eathamozhi near Rajakamangalam in Kanyakumari district. This district offers good scope for agricultural as well as for handicraft industries. India is primarily an agricultural country. About 70 percent of its population depends on agriculture. Agriculture is the



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CHALLENGES OF MANAGING HYBRID LIBRARIES BY THE LIBRARY PROFESSIONALS IN THOOTHUKUDI DISTRICT

Dr. R. Arulmathi Librarian St. John's College of Arts and Science, Ammandivilai, Tamilnadu, India.

Abstract

The study has analyzed challenges of managing hybrid libraries by the library professionals in Thoothukudi district. It revealed that the foremost challenges faced arts and science college library professionals are inadequate funds. Identification of resources including funds, convincing the management for automation, copy right issues and motivation and training to the staff. For successful implementations of hybrid library, it is essential that LIS professionals have to be trained and possess requisite knowledge and skills in this regard.

Keywords: Challenges, Hybrid Libraries, Management, Library Professionals

Introduction

Library is a trinity which works together to satisfy goals linking documents for users in effective way through library personnel. The technologies are now more used and caused changes in the practices in libraries. User demands are rapidly changing with the invention of new resources and technologies. Library professionals are trying to provide information services to the users over the desk with the help of limited staff.

Hybrid Library

Hybrid libraries are the mixture of traditional print materials such as books and magazines, as well as electronic based materials such as downloadable audiobooks, electronic journals and e-books. Hybrid libraries are the new norm in most public and academic libraries. Librarians and information professionals in India are now experiencing both excitement and anxiety as a result of the sweeping societal changes. The major challenges faced by librarians of hybrid libraries are:

- ❖ Financial contentment for setting and maintaining technology.
- ❖ Lack of standardization for hardware and software.
- ❖ Complexity in locating and analyzing and linking of information.
- ❖ Overloading redundancy of information.
- ❖ The existing technology may be insufficient to accommodate the tremendous growth of information on Internet.

Review of Related Studies

The hybrid library professionals face many challenges to analyse that the investigator reviewed studies.

Nwosu (2017) analysed a study on "The Future of a 21st Century Libraries is Hybrid". This paper examines the future of libraries against the backdrop that many libraries have moved the process of moving from a traditional print based collection to one where traditional hardcopy and electronic information resources co-exist and are brought together in an integrated information service accessed via electronic gateways available both on site and remotely via the internet or local computer networks.

Shivcharan and Karund (2017) conducted a study on "Skill requirements of LIS professions in the new e-world". In today's competitive environment no one can sustain himself in the market without adequate skill set. Many skills are required from LIS professionals to handle their working environment. Government is also making policies for the skill development at various levels. This study discusses about different skills required for library professionals to equip them for doing their job effectively and to manage the change. This further highlights the policies of government of India on skill development.



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CTTL- 2019

Dr.P.BALASUBRAMANIAN

Current Technology and Trends in Libraries

Editor

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CHALLENGES OF MANAGING HYBRID LIBRARIES BY THE LIBRARIANS

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Abstract :

The study has analysed challenges faced in managing hybrid libraries by the librarians. It revealed that the foremost challenges faced arts and science college librarians are in adequate fund provisions, lack of supporting – staff, identification and collection of resources, copy right, convincing the management for automation, motivation and training to the staff. For successful implementations of hybrid library, it is essential that LIS professionals have to be trained and possess requisite knowledge and skills in this regard.

IndexTerms - Hybrid libraries, Management, Challenges

INTRODUCTION

Libraries are supplementing and replacing print resources with electronic resources at a fast pace and almost all of the electronic resources are now available on the web. One of the advantages of web environment as compared to print environment is that one could link from one document to another logically related document very easily. As more information resources become available electronically on the web, linking becomes even more important to researchers. The libraries all over the world are now responding with adaptability, creativity and flexibility. Indian librarians of today serve in a society which is actually in flux, torn by the technological revolution and rapid political changes. Librarians are now experiencing both excitement and anxiety as a result of the sweeping societal changes.

Hybrid libraries are the mixture of traditional print material such as book and magazines as well as electronic based material such as downloadable audiobooks, electronic journals and e-books, Hybrid libraries are the new norm in most public and academic libraries. Hybrid libraries need staff that are trained in helping patrons navigate the vast amount of information available in the digital age. Libraries working in hybrid libraries have training in electronic media as well as the traditional print forms.

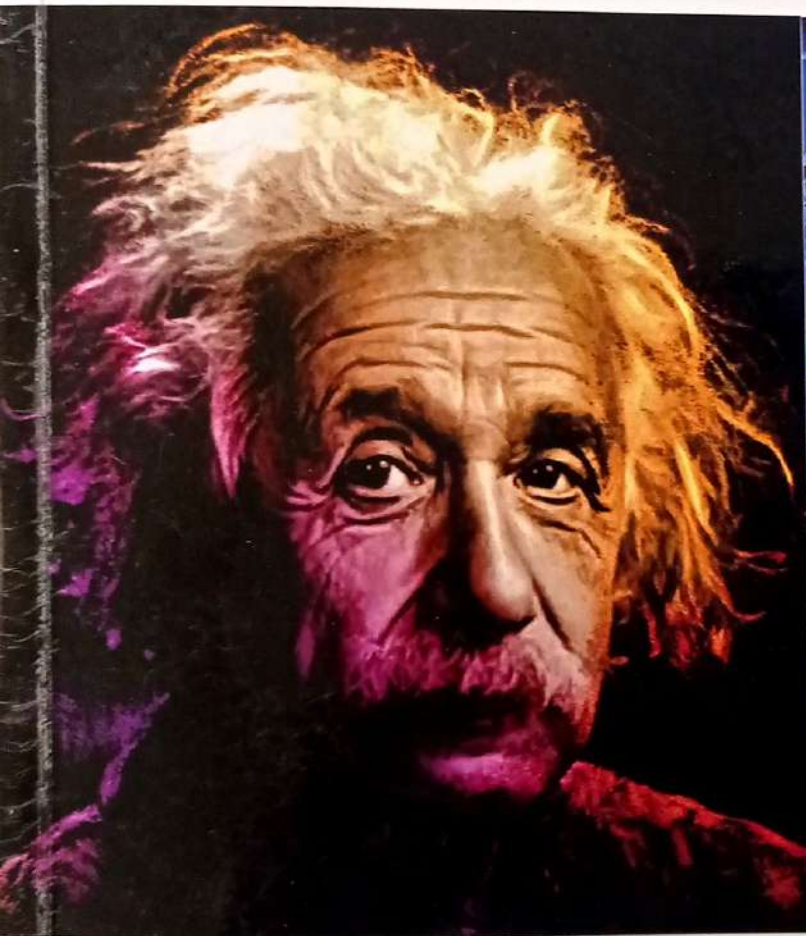
The major challenges faced by librarians of hybrid libraries are:

- Complexity in locating and analyzing and linking of Information;
- Overloading redundancy of information;
- Lack of Standardization of hardware and software;
- Financial investment for setting and maintaining the technology;
- Interpretability of Intermediary and end users;
- The existing technology may be insufficient to accommodate the tremendous growth of information on Internet.

MULTIDISCIPLINARY RESEARCH IN GLOBAL CHALLENGES AND PERSPECTIVES OF SUSTAINABLE DEVELOPMENT

Physics | Biology | Physical Education | Library Science

VOLUME 6



Editors

Dr. J.T. ANANTHI
Dr. A. ANGELIN JEBA
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[PHYSICS, LIBRARY SCIENCE, PHYSICAL EDUCATION AND BIOLOGY]

Edited by

Dr.J.T.Ananthi
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Preface

Sustainable development is the key factor for the realistic of all business. It is a way of achieving present growth without compromising the future availability of existing resources. In currently highly volatile business environment any competitive advantage gained by firms is temporarily. Therefore constant change in their business strategy is mandated for sustainable development.

The organizing committee is delighted to bring out the souvenir of **International Conference on Multidisciplinary Research in Global Challenges and Perspectives of Sustainable Development (ICMRGCPSD – 2019)** organized by Department of Business Administration, St.Jerome's College, Anandhanadarkudy on 21st December 2019. The conference offers a platform for the dissemination of original research results, new ideas and practical development and discovered advances in the field of Arts, Science, Library Science, Physical Education, Computer Science, Physics, Chemistry, Mathematics and Management. This souvenir of the conference provides a glimpse of more than 260 abstracts from India and Other Countries compiled in Different subject areas, which are selected for presentation and discussion by delegates in presence of expert session chairperson. The conference also provided participants an opportunity to learn the latest through keynotes and plenary talk by eminent academicians and field experts. The conference comes to a reality due to the untiring efforts of large number of individuals as well as synergy of participating organizations.

Foremost and utmost gratitude goes to all authors for their thoughtful contribution and their cooperation in the submission and presentation of manuscripts. Special thanks to the key note speakers for their insight on time relevant topics of talk. We place our sincere gratitude to all advisory board members for their support and effort in promoting the conference. We sincerely thank reviewers for timely carrying out the herculean task of critically reviewing each paper. Members of organizing committee, supporting committee, technical committee and other committees have devoted their valuable time and sincere effort in carrying out multiple tasks involved with conference and the same is deeply acknowledged.

Convener

Dr.E.Joseph Rubert

Acknowledgement

The biggest thanks are due to the many academics, authors and research scholar and students who submitted papers. We are inspired by the depth and quality of Multidisciplinary Research that is being undertaken around the world – and are confident that the conference attendees will enjoy hearing your presentations as much as we enjoyed reading your submissions and make the subject **Multidisciplinary Research in Global Challenges and Perspectives of Sustainable Development**. We have received many research papers for the International Conference conducted by the Department of Business Administration, St.Jerome's College, Anandhanadarkudy, Kanyakumari district, Tamilnadu, India on 21st December, 2019. While writing this book.

First of all we express our thanks to God Almighty for giving me strength and vision to write this book.

We also express our sincere gratitude to our correspondent **Rev.Fr.A.Suvakkin**, of St.Jerome's College, Anandhanadarkudy, Tamilnadu, India for his continuous encouragement in publishing this book.

We also wish to express our sincere thanks to **Dr.A.Amal Raj**, Principal and of St.Jerome's College, Anandhanadarkudy, Tamilnadu, India for his support in publishing this book.

We also express our sincere thanks to **Dr.G.M.Joseph Dunston**, Director of St.Jerome's College, Anandhanadarkudy, Tamilnadu. For his help in publishing this book.

We express our gratitude to our department staff **Mrs.S.Jeevitha**, **Mrs.Divya D.Rajan** and all other faculty members of St.Jerome's College, Anandhanadarkudy, Tamilnadu, for their encouragement to publish this book.

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We are also thankful to the contributors whose active interest and participation to ICMRGCPD – 2019 have made the conference a glorious success.

Finally, so many people have extended their helping hands in many ways for organizing the conference successfully. We are especially thankful to them.

Dr.E.Joseph Rubert
Mr.F.Penanston Xavier
Mr.J.Sahaya Shabu

CHALLENGES OF LIBRARY PROFESSIONALS IN MANAGING HYBRID LIBRARIES IN KANYAKUMARI DISTRICT

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Abstract

The basic goal of library professionals is to provide access to information to needy users. The activities realizing this goal have evolved and transformed over the years due to use of ICT. This study focused on the challenges of library professionals in managing hybrid libraries.

Index Terms- Hybrid library, Challenges, Library professionals.

INTRODUCTION

The hybrid library is basically a combination of different types of library systems with different functions and services. Starting from collection to services, everything is of heterogeneous in nature. Hybrid library was designed to bring a range of technologies from different sources together in the context of a working library, and also to begin to explore integrated systems and services in both the electronic and print environments. The hybrid library should integrate access to different kinds of resources, using different technologies from the digital library world, and across different media.

HYBRID LIBRARY

The name hybrid library is intended to reflect the transitional state of the library, which today can be neither fully print nor digital. Besides print collection, there are also the electronic resources in the library. Some housekeeping works are done through Library Management Software (LMS) whereas others are through traditional way; some collections are digitized and rest are printed. It is actually the transitional state between the traditional and automated libraries.



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UNDERSTANDING THE CHANGE MANAGEMENT IN THE INFORMATION TECHNOLOGY (IT) SERVICES INDUSTRY

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Abstract

Change is continuous and often uninvited. Every organisation in the world is affected by change. Organisational change will not happen instantly, it is a process. This study is conducted to understand the change management in the Information Technology (IT) services industry. The research instrument used in this study to collect data was the questionnaire. The questionnaire was based on the six dimensions of the managing change model. The findings indicate that major reasons for IT services employee's short tenure are relocation, family reason, salary, and better career prospect. Resistance to change is very common during the change process. The foremost reasons for resistance to change are new learning, more work, and fear of failure. Resistance can be reduced by involving employees in the change process. Understanding organisational change leads to active participation of employees towards positive change effort.

Keywords: Change Management, Information Technology (IT) Services Industry.

Introduction

The Indian Information Technology (IT) industry has become one of the vibrant sectors of Indian economy. According to the Government of India (GoI), India is the base for most of the Fortune 500 and Global 2000 companies. National Association of Software and Services Companies (NASSCOM) report states that IT industry is the largest private sector in India with 37 lakhs employees. In the financial year 2014-15, IT software and services added about 2,31,000 jobs (consisting of 34 per cent women employees). According to the Software Technology Parks of India (STPI) annual report, the indirect employment in the IT industry accounts to nearly one crore.

In terms of the national Gross Domestic Product (GDP), the IT sector revenue has grown from 1.2 per cent in the financial year 1997-98 to nearly 9.3 per cent in the financial year 2015-16 (GoI). In the financial year 2016, the revenue generated by the Indian IT services sector is Rs. 7,500 crores (NASSCOM). In order to sustain in this competitive world, organisations have to adapt to the business environment and change continuously.

Change is an alteration in existing state of an organisation in terms of people, structure, or technology. It is not only adequate to react to change but anticipate the impact of change and managing change effectively really matters for the success of an organisation. Organisational change may be defined as the implementation of an idea or behaviour which is new to the organisation (Daft, 1982).

Change is inevitable, similarly, resistance to change also inevitable (Baker, 1989). The resistance to change may be due to the individual, organisational, or both. The resistances need to be tackled in order to implement the change process effectively. To successfully manage organisational change, the managers must know what to change, why to change, when to change, and how to change (Gupta, 1998). Study of organisational change and management of change have emerged as most common topics of management (Sturdy and Grey, 2003).



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USAGE OF MOBILE BANKING IN KANYAKUMARI DISTRICT

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Abstract

Mobile banking is a recent innovation in the telecommunication has proved to be a boon for the banking sector and its customers where customers interact with the bank through mobile phones and banks provide them the services like short message services, fund transfers, account details and issue of cheque book. At present almost all the banks in the world have started providing their customers "Mobile Banking Services". The main aim of this study is to analysis the major services used in mobile banking and the reasons for using mobile banking. An empirical study was conducted through questionnaire survey method. Data are collected from 135 respondents and the results shows that savings and online buying as these variables got the highest mean score in services generally used in mobile banking.

Keywords: Mobile banking, Telecommunication, Modern Banking

Introduction of Mobile Banking

Mobile banking (M-banking) has emerged as a popular mode of banking in many developed and developing countries. In India, there are approximately 13 million mobile banking users and this figure is expected to grow rapidly with mobile transactions exceeding credit card transactions by the end of the decade. Mobile banking communication represents that mobile phones are growingly accepted with banks as a device for online payments, account management, risk management, information, marketing and other services offered by it. Mobile banking not only provides banking facilities to customers anytime or anywhere as well as mobile banking importantly decreasing service costs also. The uniqueness of mobile banking in terms of ease of use, fastness in transactions, time spent in query solving and transaction as a whole. Day by day users are continuously increasing and using the mobile banking services for improving financial services like savings, insurance and money deposits without wasting time. The mobile banking is defined as, "the provision of banking services to customers on their mobile devices", specially the operation of bank current and deposit or savings accounts. Mobile banking is an application of mobile computing which provides customers with the support needed to be able to need anywhere,

anytime using a mobile handheld device and a mobile service such as short message service (SMS). Internet banking helps the customers anytime access to their banks. Customer could check out their account details, get their bank statements, and perform transactions like transferring money to other accounts and pay their bills sitting in the comfort of their homes and offices. But the biggest limitation of internet banking is the requirement of a personal computer with an internet connection, but definitely a big barrier in most of the developing countries of Asia like India. Mobile banking addresses this fundamental limitation of internet banking, as it reduces the customer requirements. Mobile usage has seen an explosive growth in most of the Asian economies like India. The main purpose of the mobile banking scores over internet banking is that it enables anywhere, anytime banking is available to the customers need access to a computer terminal to access their bank accounts.

Objectives of the Study

1. To know the services generally used in Mobile banking.
2. To find out the reasons for using Mobile banking.



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DECLARATION

I hereby declare that the details and information given above are complete and true to the best of my knowledge and belief.


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