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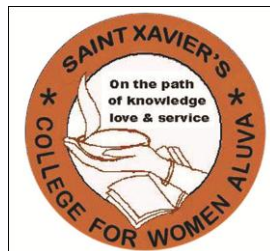
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CUSTOMER SATISFACTION ON 'ONLINE TAXI SYSTEM' - A REGRESSION MODEL

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Abstract

A study about online taxi system is appropriate in the present scenario, where it is the period of consumer shift from traditional to online system of taxis. The purpose of the study is to examine the relationship and effect of service quality on customer satisfaction by applying the modified RECSA model with the introduction of new two variables Driver Behavior and Discount and Promotional activities. The study focused on customer satisfaction towards Uber cabs service in Ernakulam District. In all seven variables: price, comfort, driver behavior, safety, availability, perceived reliability, discount and promotional activities were tested to examine its relationship with customer satisfaction. Regression analysis illustrated that all variables had a positive and significant relationship with customer satisfaction. To examine the effect of these variables on customer satisfaction, seven hypotheses were tested. Regression analysis results proved that the perceived reliability, comfort, driver behavior and safety have more influence on customer satisfaction.

Key words: RESCA model, Uber

Introduction

Customer satisfaction can be defined as “a person’s feelings of pleasure or disappointment, resulting from comparing a product’s perceived performance (or outcome) in relation to his or her expectations” (Kotler, 2000). According to

Hansemark and Albinsson (2004), “satisfaction is an overall customer attitude towards a service provider, or an emotional reaction to the difference between what customers anticipate and what they receive, regarding the fulfillment of some need, goal or desire”. Satisfaction can be associated with feelings of acceptance, happiness, relief, excitement, and delight (Hoyer and MacInnis, 2001). According to Hokanson (1995), customer satisfaction factors include friendly, courteous, knowledgeable and helpful employees, which in turn affects accuracy of billing, billing timeliness, competitive pricing, service quality, good value, billing clarity and quick service.

In order to achieve customer satisfaction, organisations must be able to satisfy their customers’ needs and wants. Customers’ needs state the felt deprivation of a customer (Kotler, 2000), whereas customers’ wants, according to Kotler (2000) refer to ‘the form taken by human needs as they are shaped by culture and individual personality’.

Service quality is defined as a post-consumption assessment of services by customers or consumers (Holdford and Reinders, 2001). Kotler & Keller (2009) defines service as, “any intangible act or performance that one party offers to any other that does not result in the ownership of anything.” In short, we can say that service is an intangible offer by one party to another in exchange of money for pleasure and convenience. However according to Ford et al., (2012) service quality is the difference between the service that the consumer expects to receive and the service that the consumer actually gets. The reason that the perceived quality of the product has become the most important factor for competition in business world; it has been the reason of naming the present business era as “Quality Era” (Peeler, 1996).

As per American Marketing Association (AMA), Service quality is 'an area of study that has developed to define and describe how services can be delivered in such a manner as to satisfy the recipient and high quality service is defined as delivery of service that meets or exceeds customers' expectations'. Based on the assessment of service quality provided to the customers, business operators are able to identify problem quickly, improve their service and better assess client expectation. Parasuraman et al. (1988) have defined service quality as the ability of the organization to meet or exceed customer expectations. It is the difference between customer expectations of service and perceived service (Zeithaml et al., 1990).

Complementing and competing with other forms of traditional transport systems, taxis are an important constituent of the public transport system in an economy and their importance in providing comfortable and flexible service to customer cannot be ruled out. Irrespective of nature of economy of any nation, taxi industry is quite visible, which can be a single passenger taxi market or a shared taxi market, on fixed or flexible routes. Single passenger taxis are more preferred in markets having less demand and mainly established in rural areas having a low population. On the other hand, shared taxis are more popular in urban areas having highly dense population.

The tremendous expansion of internet has fuelled the growth of e-commerce. The internet not only influenced consumer markets, but also brought a huge impact on transport industry too. With the popularity of smart phones, online taxi system has been introduced in the market as a new business stream. By sensing the potential in online taxi market many large companies have now entered into the taxi business and are generating good profits. With the emergence of online taxi system, there is a consumer-shift from traditional taxi system to online taxi system.

A study about online taxi system is appropriate in the present scenario, where it is the period of consumer shift from traditional to online system of taxis. It is intended to provide an understanding to the extent to which online taxis has become successful in getting into the mind set of common man. The study attempts to answer the following research questions:

- Which are the factors influencing customers to choose online taxi system?
- What is the customers' perception about price, quality and promotion activities of online taxi system?
- How is the perception about those service quality factors affect customer satisfaction?

Theoretical framework

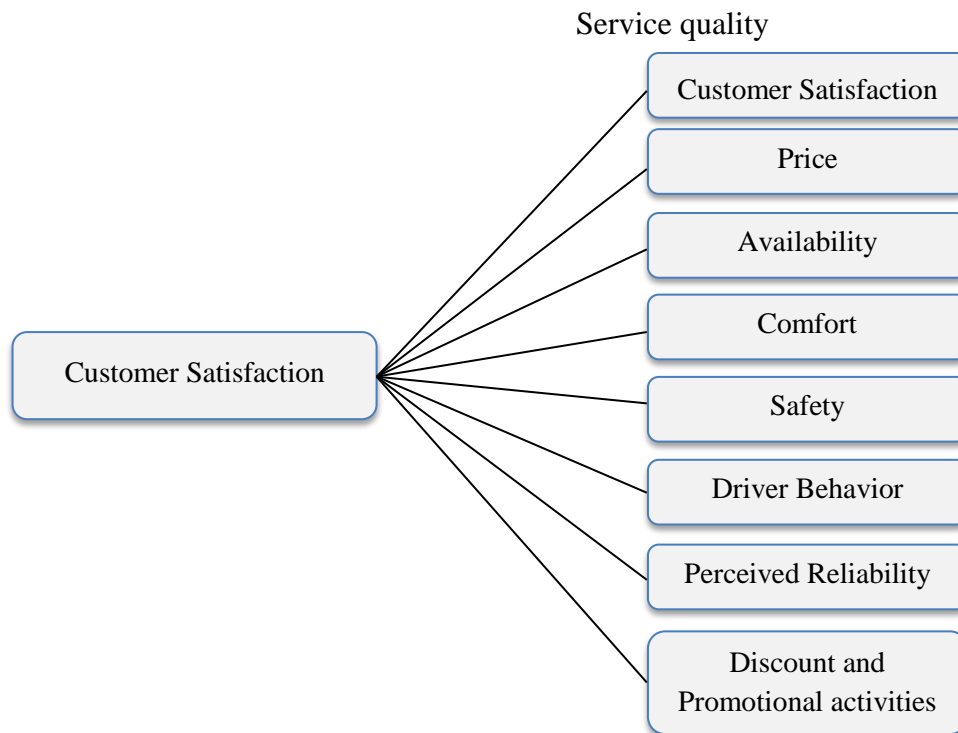
Measuring consumer perception of service quality is a complex process. Several studies have been conducted to measure the service quality. However, the service quality model, SERVQUAL developed by Parasuraman et al., (1985, 1988) has consistently used by marketing practitioners. The model based on measuring the perception gap between the perceived service quality and the expected service quality. Originally 10 dimensions of service quality were proposed (reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding the consumer, and tangibles). Later these were reduced to five (reliability, responsiveness, empathy, assurance and tangibles) (Ravichandran et al., 2010)

While the dimensions of SERVQUAL model are important aspects of service quality, many scholars have doubts about whether they are applicable when it comes to evaluating service quality in other service industries. So,

researchers develop different other models to measure the service quality. McKnight et al., (1986) proposed the RECSA model, an acronym carved from reliability, extend of service, comfort, safety and affordability.

Eventhough the RECSA model is an effective tool of measuring service quality in transport; it ignores the contribution of the driver and crew, ticket service and auxiliary service rendered by service providers. According to Kotler and Armstrong (2007), a major characteristic of service is service inseparability which means that service is produced and consumed at the same time and cannot be separated from their providers. Due to this reason Horsu and Yeboah(2015) in their study of “influence of service quality on customer satisfaction on mini cab taxi service in Cape Coast” use a revised RECSA model. They revised the model by introducing another dimension “driver behavior”

The purpose of this study is to examine the relationship and effect of service quality on customer satisfaction by applying RECSA model with some modification in the model. The new variables are introduced in the model due to the nature of study. They are driver behavior, availability, discount and promotional activities. The study focused on customer satisfaction towards Uber cabs in Ernakulam district. In the study, seven variables; reliability, price, discount & promotional activities, safety, comfort, and driver behavior were used to study the service quality and examine its relationship on customer satisfaction.



Source: RECSA model adapted

Figure 1. Theoretical model

Several studies were conducted in the field of service quality and consumer satisfaction. But only few studies were conducted in service quality and customer satisfaction of transportation industry mainly regarding taxi system. No study was conducted to measure the service quality and customer satisfaction of UBER cabs.

Scope of study

The scope of this study is confined to UBER which is one of the leading online taxi providers in the world. The geographical scope of the study is limited to Ernakulam district, from which primary data is collected. The study covers the customer satisfaction and service quality of UBER taxi.

Methodology

This study is conducted to examine the influence of service quality on customer satisfaction of Uber cabs in Ernakulam using a modified RECSA model.

Primary data was collected by online questionnaire using Google Form from the people who use Uber taxi service. For the analysis a sample size of 150 respondents from Ernakulam city was taken into consideration, by convenient sampling technique. The collected primary data were statistically processed, classified, tabulated and analyzed by using statistical and mathematical tools and techniques like Percentages, Mean and Regression. A Reliability Test was carried out using Cronbach's Alpha, which measures the internal consistency of research constructs. Statistical analysis was done by using SPSS.

Hypotheses

- H₀₁:** There is no significant relationship between Price and Customer Satisfaction
- H₀₂:** There is no significant relationship between Comfort and Customer Satisfaction
- H₀₃:** There is no significant relationship between Availability and Customer Satisfaction
- H₀₄:** There is no significant relationship between Safety and Customer Satisfaction
- H₀₅:** There is no significant relationship between Driver Behavior and Customer Satisfaction
- H₀₆:** There is no significant relationship between Perceived Reliability and Customer Satisfaction
- H₀₇:** There is no significant relationship between Discount and Promotional activities and Customer Satisfaction

Results

Demographic Profile of respondents

Data was analysed in respect of the demographic factors such as gender, age, residence, and occupation. Out of the 150 respondents, 64 (42.7 percent) were male and 86 (57.3 percent) were female. Among the respondents, 42 percent was between the age of 15-25, 32 percent of them were in the age group of 25-35, 15.33 per cent in the age group of 35-45 and 10.67 percent is above the age group 45. 36 (24 percent) respondents are living in rural area while 114 (76 percent) respondents are living in urban area.

Regarding occupation of the respondents, 38 (25.3 percent) were students, 14 (9.3 percent) fall under the category of government employee, 47 (31.3 percent) were private sector employees, 20 (13.3 percent) is in the category of business, 18 (12 percent) are in category of profession and remaining 13 (8.7 percent) belonged to other categories.

Exploratory factor analysis and interpreting the variables through descriptive analysis

The Alpha values for all the seven factors are above 0.70 (table 1), the threshold suggested by Nunnally (1978). Thus, it can be concluded that the scale has internal consistency and reliability. In other words, the items that are used in it measures what are intended to measure.

Table 1. Internal consistency and reliability of the chosen scale valued using Cronbach's Co-efficient

Factors(Constructs)	Number of Items	Cronbach's Alpha
Price	2	.764
Availability	4	.701
Comfort	2	.729
Safety	5	.810
Driver Behavior	4	.926
Perceived Reliability	4	.853
Discount and Promotion activities	1	.785
Customer Satisfaction	6	.927

Source: Author's Calculation

- Construct 1:** Price (P) is the sum or amount of money or its equivalent for which anything is bought, sold or offered for sale. It is value that will purchase a finite quantity, weight or other measures of a good or service, as the consideration given in exchange for transfer of ownership, price forms the essential basis of commercial transactions.
- Construct 2:** Availability (A) means that a service or anything which is readily accessible or obtainable when it is needed.
- Construct 3:** Comfort (C) means something that makes your life easy and pleasant. Here comfort means thing that makes journey easy and pleasant.
- Construct 4:** Safety(S) is relative freedom from danger, risk or threat of harm, injury or loss to personal and /or property, whether caused deliberately or by accident.

Construct 5: Driver Behavior (DB) is a set of action he/ she performs to ensure both the safety of people and compliance to the driving regulations. It involves respecting the regulation, taking care of the life of both the driver and others.

Construct 6: Perceived Reliability (PR) means the ability to perform the promised service dependably and accurately.

Construct 7: Discount and Promotional Activities(DP)means the offers and different activities which generate sales and retain the existing customers and also attract new customers.

Customer Satisfaction (CS) is the degree of satisfaction provided by goods or services of a company to its users.

Regression Analysis and Hypotheses Testing

Regression analysis was conducted to measure the influence of P, C, S, DB and PR on CS. The independent variables are P, C, S, DB and PR and the dependent variable is CS.

Table 2. Regression analysis model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.438 ^a	.192	.152	.36202

a. Predictors: (Constant), P, C, S, DB, PR and DP.

Hence adjusted R square value is used for interpreting the results. Table 2 shows that .36202 percent of the variation in CS is explained by P, C, S, DB, PR and DP.

Table 3. Beta Coefficients of the Regression Model

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1(Constant)	2.272	.318		7.146	.000
P	.021	.057	.030	.374	.034
A	.024	.064	.037	.370	.041
C	.125	.064	.225	1.954	.026
S	.066	.089	.062	.742	.034
DB	.057	.076	.091	.752	.025
PR	.214	.089	.336	2.405	.017
DP	.060	.036	.141	1.665	.098

**denotes significant at 1% level

Table 3 represents the beta values, t values and significant values of independent variable P, A, C, S, DB, PR and DP. The independent variables P (t = 0.374, P = 0.034), A (t = 0.370, P = 0.041), C (t = 1.954, P = 0.026), S (t = 0.742, P = 0.034), DB (t = 0.752, P = 0.025), PR (t = 2.405, P = 0.017) and DP (t = 1.665, P = 0.098) are statistically significant at 1 percent significance level. It means that these seven independent variables have significant positive effect on CS. Hence **H01, H02, H03, H04, H05, H06 and H07 are rejected**. Among the independent variable PR has greater effect followed by C, DB, S, A and P. So, it can be concluded that, Perceived Reliability, Comfort, Driver Behavior, Safety, Availability and Price have significant influence on Customer Satisfaction.

Conclusions

Since the Perceived Reliability has significant impact on Customer Satisfaction, Uber should ensure various dimensions of reliability, especially the overall availability of cabs. It should take necessary step to ensure that cabs

are arrived on time. Company should also take care to provide correct information to the public. Secondly, Comfort has significant role in Customer Satisfaction the company should take necessary step to ensure a smooth ride to its customer. The air condition facility of cabs should be improved. Thirdly, Driver Behavior has an important role. So, company must try to improve the drivers' knowledge about routes. The next important factor as shown by the study is the Safety. Uber should try to improve the safety measures for the passengers. Company can reduce the concentration on Price and Discount and Promotional activities because it has less impact on Customer Satisfaction.

This study was conducted to examine the influence of service quality on customer satisfaction of Uber cabs in Ernakulam using a modified RECSA model. On the basis of study, it was found that Perceived Reliability has high influence over customer satisfaction. The customers have an opinion that Uber cabs are arriving on time. The customers choose Uber because it provides a smooth ride to its customers. The study identified that service quality variables Perceived Reliability, Comfort, Driver Behavior, Safety, Availability, Price and Discount and Promotional activities influence customer satisfaction. The Regression results revealed that customer satisfaction is highly influenced by Perceived Reliability. The passengers' estimation of satisfaction depends upon the readily availability, timely arrival, smooth ride safety factors, driver behavior driver's knowledge about routes, affordable price and discount offers. It also identified that customers believe that Uber cabs are better than other taxi services. Most of the respondents are satisfied with service of Uber and they state that they will recommend it to others.

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ASSESSING THE IMPACT OF AGRICULTURAL PRACTICES AND PESTICIDE USAGE ON THE WATER QUALITY OF KUTTANAD AGROECOSYSTEM

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Abstract

Alappuzha (Kuttanad) referred to as the Venice of the East is a part of Vembanad –Kol wetland system which is also one of the important Ramsar site in India. This novel ecosystem is currently under threat due to various anthropogenic activities including intensive agricultural practices. Considering the ecological and economic significance of Kuttanad, a study was undertaken to analyze the pollution status of the water bodies of this region. Two different sites of Kuttanad wetland system were selected for the study. One was highly influenced by the discharge of water from paddy fields (test site) and another with less intense agricultural activities (control site). The study has revealed that the organophosphorous pesticide chlorpyrifos is present in the test sample at an alarming concentration of 10.18ug/L. The study on different water quality parameters has revealed a considerable increase in the levels of alkalinity, nitrate, phosphate and ammonia in the test sample. Histological studies conducted on *Villorita sp.* were also in support of the heavy pesticide pollution in the water bodies of Kuttanad region. The present study attempts to unveil the pollution status of this significant Ramsar site so that better eco-restoration strategies could be developed for its conservation and sustainable use.

Keywords: Kuttanad, agro ecosystem, pesticides, chlorpyrifos, *Villorita sp.*

Introduction

Kerala is one of the most popular tourist destinations in India named as one of the ten paradises of the world by National Geographic Traveller. It is renowned especially for its ecotourism initiatives and magnificent backwaters. Alappuzha, a district in Kerala popularly known as Venice of the East, is blessed with remarkable natural beauty with the enchanting presence of canals, bridges, backwaters, lagoons, lakes and beaches. It is the epicenter of resorts and backwater cruises. The Kuttanad region of Alappuzha is well known for its vast paddy fields and geographical peculiarities. The region has the lowest altitude in India and is one of the few places in the world where farming is carried around 1.2 to 3.0 meters (4 to 10 feet) below sea level (Krishnadas, 2006). It is the land of agriculture, a unique Ramsar site in Kerala comprising marine, estuarine and fluvial system and is part of the Vembanad-Kol wetland.

Kuttanad is the deltaic formation of four river systems viz., Manimala, Meenachal, Pamba and Achencoil, which drain westwards from Western Ghats into the southern part of Cochin backwaters. The hydrographic features of Kuttanad backwaters are mainly controlled by the discharge from these four river systems, and also by the tidal intrusions of saline waters from Cochin estuarine system (Shiney, 2013) The total area of Kuttanad region is estimated as 1, 10,000 ha which comprises of 28% dry lands, 60% wet lands and 12% of other water bodies such as lakes, rivers, channels etc. Most of the land in this area is paddy field which is subjected to agricultural operations twice or thrice a year (Varghese et al., 2012). The unique agro ecosystem has now become a land of serious ecological concern, mainly due to fierce agricultural practices, unscientific establishment of multifarious developmental projects and the sheer lack of proper sanitary facilities and waste water management (Tang, 2009). The increasing use of pesticides in order to improve the agricultural

productivity to match the population growth rate is a global phenomenon. The use of various classes of insecticides such as organophosphates, organochlorines, carbamates and pyrethroids have been increased many folds in the last ten years and it has posed a long term impact on natural aquatic environments (Costa, 2006).

Pesticides such as organophosphates, carbamates and the organochlorine pesticides directly target nervous tissue as their mechanism of toxicity. Both the central and peripheral nervous systems are involved in the acute toxidromes of many pesticides resulting in acute short-term effects. There is strong human epidemiological evidence for persistent nervous system damage following acute intoxication with several important pesticide groups such as organophosphates (Jamal, 1997, Keifer and Firestone, 2007). The mechanism of organophosphates neurotoxicity in most cases involves overstimulation of postsynaptic cholinergic receptors after inhibition of acetyl choline esterase (Keifer and Mahurin, 1997). Most of the pesticides used in this region are highly toxic and doses of chemicals used to protect crops are much higher than that recommended (Chandy, 2013). Skin, lungs, mouth and eyes are the four routes of pesticide exposure and the symptoms of pesticide pollution can range from mild skin irritation to comma (Chandy, 2013). Organophosphates and organochlorine pesticides are identified as carcinogenic and the relationship between pesticide use and incidence of cancer is well established (Fleming et al., 1999, Waddela et al., 2001).

The black clam *Villorita* species is the most important clam species landed in Alappuzha back water. The species comes under the class bivalvia, which includes marine and fresh water molluscs. This species has been used frequently as bio indicator organisms (Nicholson, 2001). When they live in

polluted waters, bivalve molluscs have a tendency to accumulate substances such as heavy metals and persistent organic pollutants in their tissues. This is because they ingest the chemicals as they feed but their enzyme systems are not capable of metabolizing them and as a result the levels build up (Mane et al., 2004). This may be a health hazard for the molluscs themselves and is one for the humans who devour them. *Villorita* sp. are the cheap source of protein rich food and thousands of coastal families are depending on this species for their living. This species has been found to offer most of the features of a biological indicator such as non migrant, long life, reasonable size, easy sampling, fairly abundant distribution, tolerance to brackish waters and ability to concentrate numerous pollutants (Gundacker, 2000). So, the present study is undertaken with a view to investigate the current status and impact of pesticide pollution in the selected areas of Kuttanad by taking *Villorita* sp. as a bioindicator.

Materials and Methods

Collection of bioindicator organisms and water samples

The present study was conducted in the Kuttanad agroecosystem, part of the Vembanad-Kol Ramsar site in Kerala, India (Figure 1). Water samples and the bio indicator *Villorita* sp. were collected from two sites in Kuttanad. The site which was highly influenced by the discharge of water from paddy fields was taken as the test site and the other with less intense agricultural activities was treated as the control site. The size group of the organisms used was 25-30mm. Depth of clam beds was two to three meters from the surface. The period of study was from April to June 2016. 15 specimens and 3 liters of water were collected from each site.

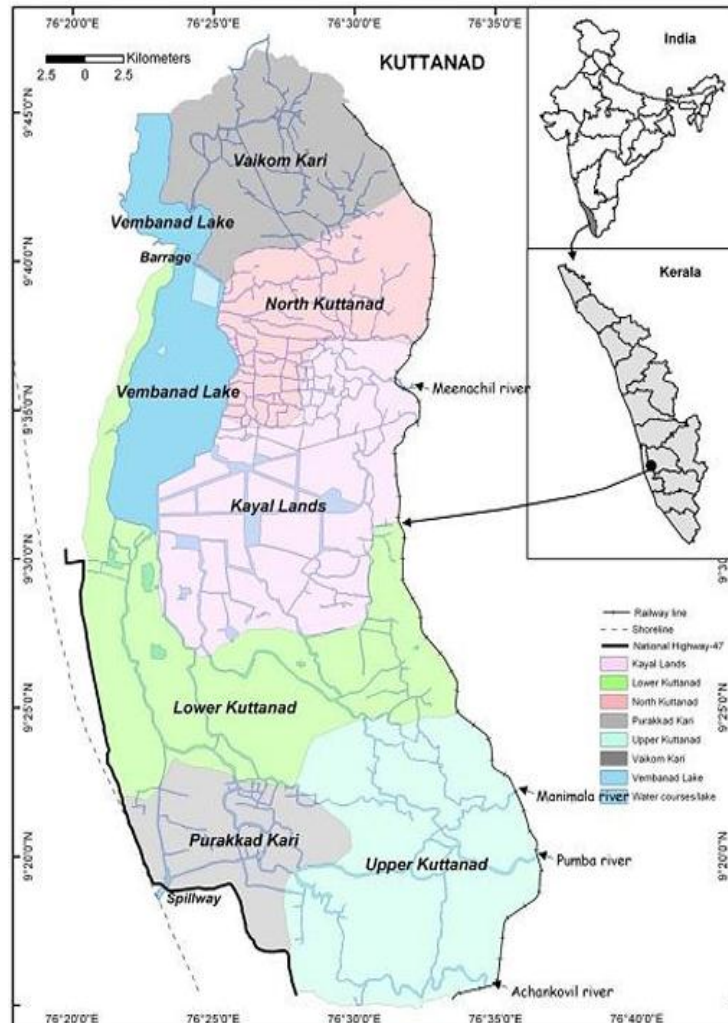


Figure 1. Area of investigation and stations sampled

Water quality testing

Water samples were filtered through a 0.5 µm paper filter and analyzed for various quality parameters such as alkalinity, hardness, nitrate, phosphate and ammonia. All the experiments were performed in triplicates as per the standard procedures.

Tissue preparation

The intestine and gills of the clams were dissected out and fixed in Bouin's fluid for 24 hours. The tissues were then subjected to washing, dehydration, cleaning and embedding. The tissue embedded in wax blocks was cut into thin sections using a microtome and stained using hematoxylin – eosin stains.

Pesticide analysis of water samples

The water samples collected from the test site and control site were analyzed for the presence of organophosphate and organochlorine pesticides. The pesticides analyzed include:

Organochlorines – o,p'-DDT, p,p'- DDT, o,p'- DDE , p,p'- DDE, o,p'-DDD,p,p'-DDD, a- Endosulphan, b- Endosulphan, Endosulphan sulfate ,Aldrin, Dieldrin, Endrin, Heptachlor, trans -Chlordane, cis –chlordane, Endosulphan and DDT.

Organophosphates – Parathion, Malathion, Methyl parathion, Chlorpyrifos and Diazinon

Analysis by GC MS

The pesticide analysis was done using Agilent GC MS/5975 MSD Single Quad with ZB-5MSI Column of length 30 m and film thickness of 0.25 micron meter. Flow rate was maintained at 1.1ml/min

Results and Discussion

Deterioration of water quality can have many negative impacts on aquatic ecosystems, such as loss of species and shifts from pollution-sensitive towards pollution-tolerant organisms. Two-thirds of aquatic life is considered to be an endangered species because of improperly disposed chemicals and other wastes

(Moeller, 2005). Ever since the green revolution started in India in 1966, application of pesticides has increased by more than 100 times (Bhardwaj and Sharma, 2013). It has been reported that about 500 tonnes of pesticides and about 20,000 tonnes of fertilizers are used annually in the Kuttanad region and a portion of this enters the waterways and lakes when water is pumped out of the paddy fields (Shiney, 2012). The excess use of different types of fertilizers has caused a tremendous increase in the nitrate, phosphate and other quality parameters of the water bodies surrounding the paddy fields.

The results of the analysis of water quality parameters from samples of two regions of Kuttanad indicated that the test sample contains an alkalinity of 485mg/L (Figure 2a) which is almost twice the normal range and this could have serious impact on aquatic life. Alkalinity is a measure of the buffering capacity of water or the capacity of bases to neutralize acids. It is important in determining a river's ability to neutralize acidic pollution from rainfall or wastewater. Levels of 20-200mg/L are typical of freshwater and levels below 10mg/L indicate that the system is poorly buffered and are very susceptible to changes in pH from natural and anthropogenic sources. Total hardness is an expression for the total amount of calcium and magnesium cation concentration in a solution. These ions are essential in the biological processes of aquatic animals for example, bone and scale formation in fish (Brunson, 1999). Environmental calcium is crucial for osmoregulation; maintaining precise levels of internal salts for normal muscle and nerve function. It is also important in the molting process of shrimp and other crustaceans and can affect the hardening of the newly formed shell (Brunson, 1999). In the present study, it was observed that the hardness of the test sample was less than the recommended level of 130mg/L and this could result in the impairment of normal physiological functions of bivalves and other aquatic life (Figure 2b).

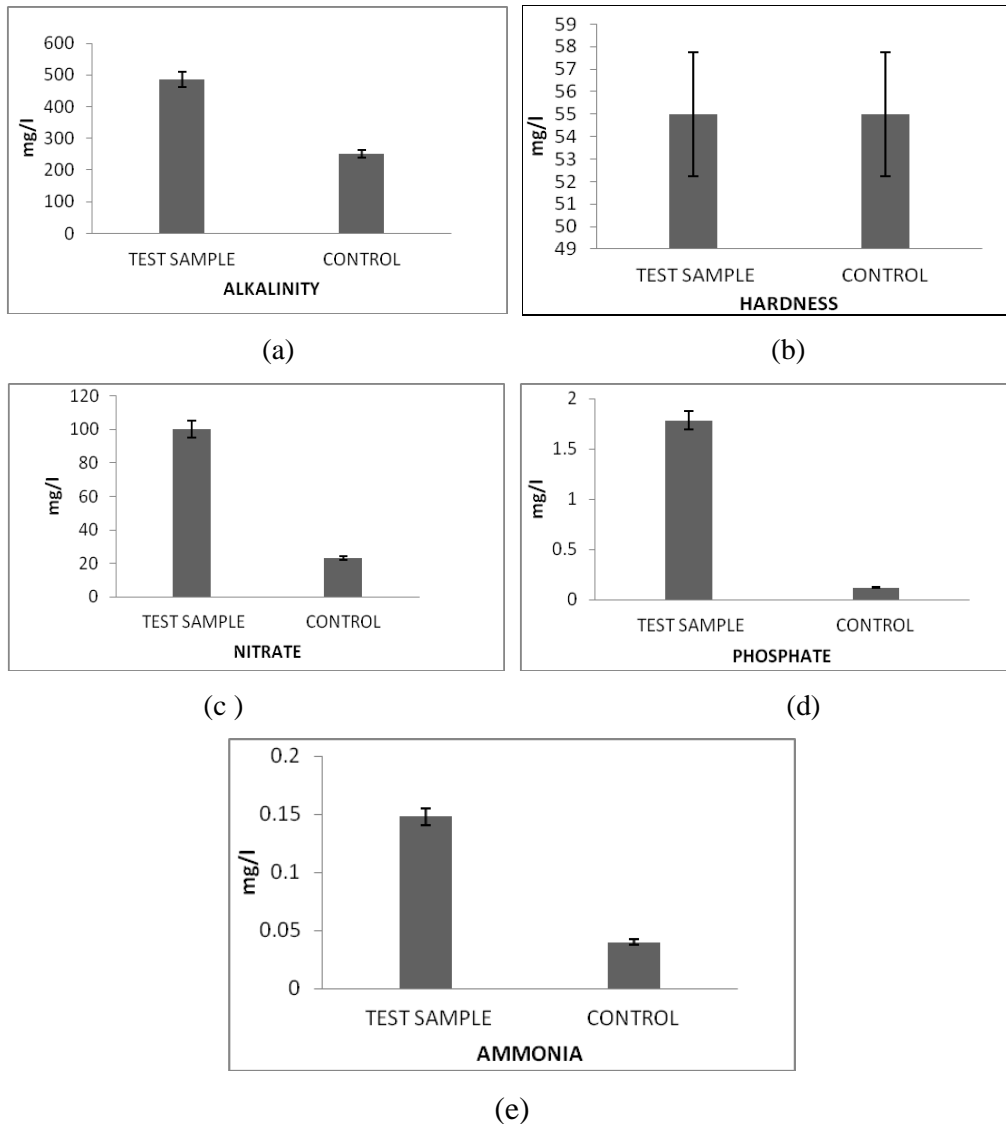


Figure 2. Result of water quality parameters tested for control and test site (a) Alkalinity (b) Hardness (c) nitrate (d) phosphate and (e) ammonia

Nitrate occurs in natural water as the end product in the biological breakdown of organic nitrogen being produced through the oxidation of Ammonia. Excess nitrate in water is often used as an indicator of poor water quality (Volk, 2013). Similarly, phosphate is the nutrient in shortest supply in most fresh waters, with even small amounts causing significant plant growth

and having a large effect on the aquatic ecosystem (Volk, 2013). Result of the present study has indicated that the nitrate and phosphate concentration of the test sample is considerably high as compared to the control (Figure 2c and d). The excess nitrate and phosphate content could be attributed to the fertilizers used in the agricultural fields which find their way in to the nearby canals when the water is flushed out after irrigation. It has been reported that phosphate concentrations greater than 0.1 mg/L will have serious impact on water bodies (Kotoski, 2008) and the current value of 1.78 mg/L is tremendously higher than the recommended levels of phosphate.

The USEPA recommends a limit of 0.02 mg/L ammonia in freshwater and a concentration above this level would be toxic to the aquatic organisms and may cause serious effect on the organisms inhabiting the water. The test sample has showed a tenfold increase in the ammonia content (Figure 2e) which indicates that the aquatic system of Kuttanad region is under the threat of ammonia toxicity. It has been reported that ammonia can block oxygen transfer in the gills of fish, thereby causing immediate and long-term gill damage in fishes (Ogbonna et al., 2010).

The pesticide analysis conducted in the present study has revealed an alarmingly high concentration of the organophosphorous compound chlorpyrifos in the test sample (Table 1). Presence of pesticide residues in the water bodies affects almost all the fauna and flora leading to ultimate health hazards in humans. Fishes and bivalves when exposed to polluted water are known to accumulate and biomagnify the toxicants (Farrington, 1983). These pollutants affect the normal physiology and biochemistry of the aquatic organism. However, quite often the chemical concentration in the environment may not be sufficient enough to kill the organism but change the physiology and biochemistry of the organisms in its sub lethal levels (Rusyniak, 2004).

Table 1. Pesticide analysis of water samples from the sampling sites

Sampling area	Pesticide	Result
Test site	Organochlorines	Not detected
	Chlorpyrifos (OP)	10.18 µg/L
	Other Organophosphorous pesticides	Not detected
Control site	Organochlorines	Not detected
	Organophosphorous pesticides	Not detected

Chlorpyrifos (O,O-diethyl-O-3,5,6-trichloro-2-pyridyl phosphorothioate; CPF) is a broad spectrum organophosphate insecticide (OP) that is used globally as an insecticide to control pests. It is the second largest selling OP pesticide and found to be more toxic to aquatic organisms than organochlorine compounds (Tamse et al., 1995). This OP insecticide is known to inhibit acetyl cholinesterase, which plays an important role in neurotransmission at cholinergic synapses by rapid hydrolysis of neurotransmitter acetylcholine to choline and acetate (Tamse et al., 1995). Chlorpyrifos can have significant effects on aquatic community structure. A single pulse of chlorpyrifos at 1 µg/L has been reported to have caused long lasting effects on the macro-invertebrate community structure of a coastal stream mesocosm system in Australia (Barron, 1995). Chlorpyrifos causes endocrine disruption in molluscs. Studies on marine mussels *Mytilus galloprovincialis* have showed complex interactions between chlorpyrifos and 17β-oestradiol in the digestive gland of mussels (Aldridge et al., 2003). Chlorpyrifos, at a concentration of 0.1 µg/L has been reported to change the composition of the plankton community in seawater, particularly reducing arthropods (Abdel-Halim et al., 2006).

The severity of the pathological changes depends on many factors such as type of pesticides, concentration of dose, time of exposure, type of animal species etc. As per the toxicological study, intensity of the damages depends

mostly on concentration of pesticide and on the rate of metabolism in the target tissues. Histopathological studies are greatly important in evaluating the pollution level of pesticides since their trace amount is capable of inducing considerable damage in the tissues (Darr et al., 1993). Many investigators have reported toxicant induced histopathological abnormalities and degenerative changes in the tissues of various animals (Veeraiah and Tilak, 2005; Waykar and Lomte 2002; Pandit and Mundhe, 2013).

The histological study of *Villorita sp.* conducted in the present investigation has revealed that the highly toxic chlorpyrifos has caused severe damages to the gills and intestine of the clams (Plate 1). Microphotography of the gill tissue of clam collected from the control site revealed normal gill lamellae with stratified epithelial cells, normal water space in between two secondary gill lamellae, normal blood capillary and supporting chitinous rods (Plate 2) whereas microphotography of gill tissues of clams from test site exhibited histological changes like elongation and necrosis of secondary gill filaments, shrinkage of epithelial cells and necrosis of epithelial cells. Vacuoles were formed at the tip of secondary gill lamellae. The detachment of the epithelial cells of secondary gill filaments along with damaged chitinous rods is also evident in Plate 1. Necrosis and vacuolization were very common in secondary gill lamellae and connective tissue. The shrinkage of epithelial cells was prominent and it has caused cavities between epithelial cells. At certain places of secondary gill lamellae, wall of the respiratory epithelium showed dissolution that has made the gill fuzzy. The result of the microscopy shows that epithelial tissue is probably a primary target of the pesticide intoxication and similar results have already been reported by many investigators (Shukla et al., 2004; Devi and Banerjee, 2006; Sathick, 2010).

In bivalves, the gill is the most important organ for respiration and osmoregulation and it is the first organ, which comes into contact with the pollutant first. There is increasing evidence that toxic compounds have a potential to cause the most harm to tissues and organs that contact first (Tilak et al., 2005). The reason is that gills are very important absorption place for the toxic compounds. Histopathological changes caused due to pesticide exposure in the gills of molluscs and fishes have been studied by many workers (Shukla et al., 2004; Seth and Banerjee, 2001). Similar tissue damages such as necrosis of gill epithelium, vacuolization and sloughing of epithelial cells due to organophosphate pesticide intoxication has also been reported in freshwater teleost, *Cyprinus carpio* (Nagaratnamma and Ramamurthy, 1982). Probable cause of epithelial damage in gills was the destruction of basement membrane, which mainly contains collagen. It has been reported that pesticide generate the oxidative stress leading to tissue destructions and marked fibrosis (Dass et al., 2004) and the results of the present study is in congruence with the earlier reports (Waykar and Lomte, 2002; Sathick, 2010).

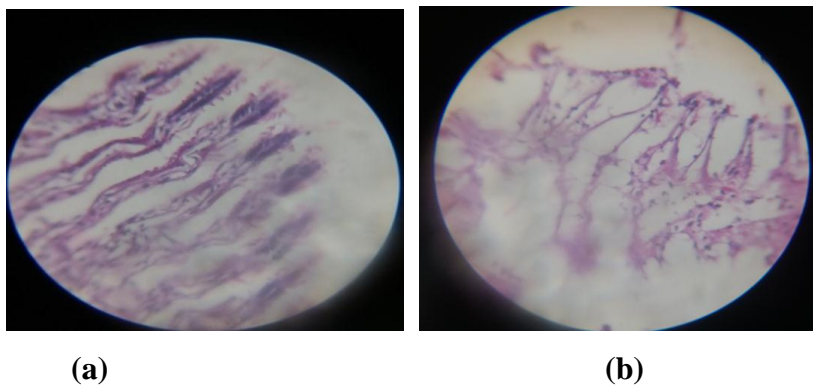


Plate 1. Microphotographs of longitudinal section of gills of *Villorita sp.* collected from (a) test site (b) control site

Conclusion

Kuttanad agro ecosystem and the associated water bodies are getting polluted at a brisker pace mainly because of anthropogenic activities. Not only the aquatic organisms but also the other animals including humans are affected through food chains. The growing demand and supply of new chemicals, including pesticides, in the industrialized society in this century places increasingly higher stress on the environment. The pesticide analysis and histological studies of Villorita sp collected from Kuttanad backwaters have clearly revealed the critical pollution status of the area. The black clams are one of the favorite foods of the local people and tourists. Hence there is very plausibility for the hazardous compounds accumulated in the tissue of clams to enter into the people and cause serious health hazards. According to WHO appraisals, pesticides cause 30,00,000 cases of poisoning and 2,20,000 deaths annually across the globe, the majority of which are reported from developing countries and these numbers, even more alarmingly, show a rising trend in the recent years. Organophosphorous pesticides are found to be responsible for death in more than 70% of the cases of pesticide poisoning in India. Hence it is high time to take stringent measures to mitigate the pollution of Kuttanad agro ecosystem otherwise the unique ecosystem may lose its entire pulchritude and ecological pith.

Acknowledgement

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NEUROSCIENCE AND THE PROBLEM OF SELF: A STUDY BASED ON MIRROR NEURONS

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Abstract

Mirror neuron is one among the most recent discoveries in neuroscience. According to V.S Ramachandran, mirror neurons or empathy neurons are one specific class of brain cells that contribute towards many human specific features such as empathy and representation of self. This paper is a study based on mirror neurons and about neuro-scientific understanding of the problem of self. In order to achieve this aim, following objectives are listed: to examine the western and eastern ideas of self, to generalize the problem of self, to examine the neurobiology of consciousness, to examine the role of mirror neurons in consciousness and to generalize the universality of consciousness on the basis of mirror neurons.

Key words: Neurobiology, Mirror neurons, empathy neurons, consciousness

Introduction

Self is a riddle in philosophy. It stands against all 'others' that are in its experience. Empirically speaking, the constitution of self may include all our experiences from the early childhood till the temporal death along with the inherited contents. In a sense, the self is a bundle of memories, the set of cognitive faculties that are considered to be an immaterial substance, separate and independent of the body. The notion of self is synonymously used with as mind, consciousness, ego etc.

The problem of self is one of the largest outstanding obstacles in our scientific understanding of consciousness. According to John Locke, “Self depends on consciousness, not on substance”. This problem takes its new shapes in the light of scientific and technological advancements as ‘how our objective brain produces a subjective mind’, and how the scientific/objective studies can define the subjective self or consciousness etc. There are several approaches for tackling this problem; Neuroscience, which essentially is a branch of medicine, being one among them.

Neuroscience tried to solve the problems and mysteries of human consciousness and existence. It reveals some of the most important conditions that are necessary for behaviour and awareness. No other sciences, medical or otherwise, that are based on the objective study of material objects in the universe, bears as close connection to our lives as the study of brain, and more generally, the nervous system.

The brain is made up of neurons. Neurons are of different kinds and each neuron makes contact with one another. Mirror neuron is one among the most recent discoveries in neuroscience. According to V.S Ramachandran, mirror neurons or empathy neurons are one specific class of brain cells that contribute towards many human specific features such as empathy and representation of self. This paper is a study based on mirror neurons and about neuroscientific understanding of the representation of self.

The Notion Self

The philosophy of self-defines the essential qualities that make one person distinct from all others. The self is the idea of a unified being which is the source of consciousness. Moreover, this self is the agent responsible for the thoughts and actions of an individual to which they are described. The finite self is a subject, an

ego. It is misleading that it is considered as a substance. Substance always lies behind the qualities and attributes. It is not connected with quality and not expressed in attributes. But self is expressed in its states of consciousness and hence it is not identical with it. So, it is better to say self as a subject or ego.

The self is the unity indifference. But it does mean that the abstract unity beyond the plurality of mental states. Self is the spiritual principle of unity that is expressed in distinct mental states. Various approaches on the notion of the self can be seen in the history of both oriental and occidental philosophers.

The Self in Western Tradition

Plato is one of the most important and influential thinkers in western tradition. According to him soul is a spiritual substance which expresses itself in three fundamental types of experience. That is thinking, feeling and willing. These are base functions of soul.

According to Aristotle soul is an activity of body, it can't be immortal, just like when a knife is destroyed, the cutting stops. More precisely, the soul is 'first activity' of a living body. This is a state, or potential for actual, or 'second activity'. He believed that there were four sections of the soul: the calculative and scientific parts on the rational side used for making decision and the desiderative and vegetative parts on the irrational side responsible for identifying our needs.

On the expectation of Descartes, self is a thinking thing. Which means a thing that thinks: 'doubts, understands, affirms, denies, is willing, is unwilling', also imagines and has sensory perceptions. According to his dualism there is a link between the soul (mind) and body through which sensations are transferred and that this link allows one to identify a body as one's own. "I am not merely

present in my body as a sailor is present in a ship, but that I am very closely joined, and as it were intermingled with it, so that land the body from a unit". But he maintains that "it is certain that I am really distinct from my body and can exist without it". For Descartes, then, 'self' refers to the soul or the wind along, not the body.

Like Descartes, Locke made distinction between mind and the body. He says, that self is a thinking intelligent being, that has reason and reflection and can consider itself thinking the same thing in different times and places and continues to define personal identity simply as 'the sameness of a rational being' so long as one is the same self, the same rational being one has the same personal identity.

David Hume proves the idea of self in his bundle theory of self. We tend to think of ourselves as selves-stable entities that exist over time. But no matter how closely we examine our own experiences. We never observe anything beyond a series of transient feelings sensations and impressions. We cannot observe ourselves or what we are, in a unified way. There is no impression of the 'self' that ties our particular impressions together. In other words, we can never be directly aware of ourselves, only of what we are experiencing at any given moment. Although the relations between our ideas, feelings, and so on, may be traced through time by memory, there is no real evidence of any core that connects them. This argument also applies to the concept of the soul. Hume suggests that the self is just a bundle of perceptions, like links in a chain. To look for a unifying self beyond those perceptions is like looking for a chain apart from the links that constitute it. Hume argues that our concept of the self is a result of our natural habit of attributing unified existence to any collection of associated parts. This belief is natural, but there is no logical support for it.

In his discussions of rational psychology, Immanuel Kant identified the soul as the 'I' in the strictest sense, and that the existence of inner experience can neither be proved nor disproved. "We cannot prove a priori the immateriality of the soul, but rather only so much, that all properties and actions of the soul cannot be recognized from materiality". It is from the 'I', or soul which Kant proposes transcendental rationalization, but cautions that such rationalization can only determine the limits of knowledge if it is too remains practical.

Hegel in its idealistic view of self, states that self is neither an abstract noumenal principle of unity, above and beyond mental phenomena, nor an aggregate of mental states or phenomena but a concrete spiritual principle of unity in plurality. Hegel's idea of self is in a triad process. It is the synthesis between logic and idea of nature. Its subject is the power of consciousness and its various forms and manifestations. He believes that the development of the consciousness passes through three steps. They are thesis, anti-thesis and synthesis. The thesis provided by the idea or self or subjectivity and the two are resolved in the idea of absolute. The triad represents the evolution of the soul or the self and the direction of the evolution of being towards the absolute idea.

According to Hegel, we can't define mind of spirit as a substance which exists by itself, prior to or a part from its relations to other substances, for its very nature and essence is to exist in and through its relations to other substances. They are a part of its being. It discovers or analyses its own nature through natures that are foreign to or outside to itself. Its whole life as spirit consists in taking it to itself that outward world which it at first opposes to itself.

The Self in Indian Tradition

The teaching of Upanishads can be understood under three categories; the self or essence of man (atman), the self or essence of the world (Brahman), the relation between atman and Brahman. In Upanishads atman called the self or soul, but really deepest self. In Hindu philosophy, especially in Vedanta school of Hinduism, Atman is the first principle, true self of an individual beyond identification with phenomena, the essence of an individual. In order to attain liberation, a human being must acquire self-knowledge (*Atmajnana*), which is to realize that one's true self (Atman) is identical with the transcendent self-Brahman.

Brihadaranyaka Upanishad says that atman (self, soul) is indeed Brahman. The Upanishad asserts that this knowledge of "I am Brahman", and that there is no difference between 'I' and 'you', or 'I' and 'him' is a source of liberation, and not even gods can prevail over such a liberated man. Like this there are some other Mahavakyas which shows the relation between I and you that are 'Aham Brahmasmin', 'Ayamatma Brahman', 'Tatvamasi', 'Prajananam Brahman'.

Cārvaka School of philosophy was one of the orthodox school of thought. Because of the unpercieveness they reject the God. So they opine that soul also does not exist as it cannot be perceived. According to them, consciousness is a property of the body which arises due to the mixture of areacnut, lime and betel gives rise to red colour on being chewed, these elements also give rise to consciousness when mixed in the right proportion.

The Buddha teaches that we call ego, self, soul, personality, etc. are merely convenient terms that do not refer to any real independent entity. According to Buddhism there is no reason to believe that there is an eternal soul

that comes from heaven or that is created by itself and that will transmigrate or proceed straight away either to heaven or hell after death.

They can't accept that there is anything either in this world or any other world that is eternal or unchangeable. Searching for something in a dark room. Among all the Buddhist teachings, those on the nature of the self are hardest to understand, yet they are central to the religion. An individual is a combination of five heaps. That is form, sensation, perception, mental formations and consciousness. There are not qualities that an individual possesses, because there is no-self possessing them. This doctrine of no-self is called anatman or anatta which recommended as one of the seven beneficial perceptions, which along with the perception of dukha and impermanence.

Both materialism and Buddhism taught false doctrine concerning the self. According to Nyayavaisesika because the materialist falsely identified the self with the body, while the Buddhist dissolved the permanent self into a series of casually connected "thought moments". In opposition to these schools of thought Nyayavaisesikas held the self to be an immaterial and eternal soul, and they defined the soul as a certain sort of substance, which is an entity in which qualities and actions inherit (Thus, if there are colours there are coloured things, if there are thoughts there are thinking things etc). According to them soul is an immaterial substance in which cognition, desire, aversion, volition etc. are able to inherit. By saying about the theories of self also there are some problems in philosophy which always tries to find the solutions.

The Problem of Self

The Word 'self' is a very common one in ordinary language. Existence of a self is unquestionable. After all there is something unique about us that are the essence of our identity. The problem is pinning down exactly what that

something could be. May be the self is a viewpoint within the inner world, but then what is that viewpoint itself made up of, if it is not a result of our inner world? Nor can the self be easily explained as a straightforward product of operation of brain.

The continuity of the self is no less confusing. The self does not seem to exist continuously, so how do we know that the self that exists after a period of unconsciousness is the same self as the one that existed before. Forgotten memories or amnesia are the problem with the idea of self-have led some to argue that there is no self, that it is an illusion generated by the brain for the convenience of its operation. Psychology and cognitive sciences gives the evidences to support this view. Powers of hypnosis, alien hand syndrome, split brain syndrome etc. are examples for this. These shows that the parts of the mind outside conscious self, have the ability to perform tasks and make decisions almost as capably as the self that we are aware of. This may lead us to wonder if the entire brain functions this way, and if the self is simply an unneeded artefact.

Before we tackle the self and its continuity let us consider the continuity of particles. E.J. Lowe who tells in his ‘An Introduction to the Philosophy of Mind’ about the identity puzzle of the ship of Thesus’. In which Lowe bases his views about this problem in his puzzle of the ship of Thesus. The story goes that the ship was left in the harbor at Athens after the Zeus died and it was preserved for many years. After sometime, the parts began to decay and they were replaced one-by-one by new parts. Eventually, nothing of the original ship was left and the question, of whether this renovated ship is the same one that Thesus sailed in, remains. Lowe’s immediate response to this is that ‘an artefact can undergo replacement of its parts’, if the replacement occurs in a gradual and

piecemeal fashion' and so the renovated ship is still identical with the original ship. It is clear that this change in the ship has occurred over a period of time, but how can a ship that contains none of the original parts actually be that ship as it was when it was made? Lowe returns to this point but first explores what it would mean for us to place a limit on how much of something can be changed before there is a loss of identity. He claims that it would make no sense to argue that the ship could not undergo a change to any of its parts and still be identical with the original. This view also makes confusions like the example.

The Neurobiology of Consciousness

Mind, traditionally, was believed to be situated in heart. The development of medical sciences and technology enabled us to correlate the loss of mental functions with the damages in the brain. This gave a new insight and replaced heart with brain as the seat of mind and mental functions.

The Brain and the Mind

The relationship between brain functions and mental functions can be studied in various ways. There are two major methods for studying this relation. At first, we have the stimulation method in which specific brain areas are stimulated to get corresponding cognitive or motor functions modified. This method brings in the correlation between brain and cognitive/ motor functions. The second method focuses on the loss of cognitive or motor function in patients encountered with brain damage by birth, by accident or otherwise, thus establishing the correlation between them.

The development of imaging techniques such as CT Scan, PET, and fMRI has enhanced the capacity of neuroscientists in getting correlations between the brain and mental functions. Various disciplines of researches in neurobiology,

clinical neuroscience and virtual reality generate new avenues to investigate brain mechanisms underlying the fundamental nature of mind and consciousness. Previous cognitive neuroscience research on the self has focused on high-level aspects such as language, conceptual knowledge and memory. Where as in recent eras new theories evolved as Blanke and Metzinger proposed by concerning much about brain's integration of perceptual information from multiple senses, as for example from vision, touch and information about respective configurations of body in that space.

The Brain and the Self

The developments in neuroscience have tremendously influenced the philosophical issues related to self and consciousness. Recent researches about human subjectivity and self-consciousness has been focused much on cognitive psychology and various neuro-imaging techniques for studying mind-brain relationship. Many results suggest that vision, touch and proprioception are sensory signals that are highly relevant for the brain in order to rapidly update representation of one's self. There have been several other methodologies in neural science with the advent of neuro imaging. Scientists had new methods to address longstanding questions such as whether the self was somehow special as a memory structure. Beginning with studies using positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), numerous subsequent studies have examined brain regions that are involved in processing information about self, compared to those associated others. From a neuroscience perspective, it is likely that the brain has evolved distinct mechanisms for knowing ourselves, knowing how others respond to us, detecting threats from within the social group, and regulating actions in order to avoid being excluded from those groups, thus formulating the notion of self.

Within social psychology, there were many efforts like the ones to understand bodily involvement in social phenomena also have a long history, from the use of skin conductance measures to indicate whether experimental conditions produce various expressions with in self, studies that examine the effects of brain injury on social behaviour and personality, and methods that uses brain imaging techniques for making analysis about the behavioural fluctuations in different scenarios. The advent of imaging has led to an explosion of research on social neuroscience and related fields. Thereby such research in social neuroscience has provided insights into the cognitive bases of self-awareness, theory of mind, threat detection and self-regulation. The methods and theories of social and cognitive neuroscience are likely to continue to grow increasingly sophisticated, furthering our understanding of the social brain.

Whether the brain forms the foundation of self or not is a matter of controversy. How something that is material can be the foundation of something that is spiritual or non-material? The cases of split brain give some clues to this problem. The patients with split brain, in specific cases, can handle two cognitive functions with two hemispheres, independent of each other. Based on some specific conditions the neuroscientist Sperry “concluded that his patients had two conscious entities in one head; each having private sensations and free will” hence, it may be concluded that, in some specific split-brain cases one person can have two *selves* together. If it is so, the foundation of brain as the self may be asserted.

Mirror Neurons and Problems of the Self

The Mirror Neurons

Mirror neurons are specific class of brain cells. Mirror neurons are such a kind of neurons that fires both when an animal acts and when an animal observe the same action performed by another. Thus, the neuron ‘mirrors’ the behaviour

of the other as though the observer were itself acting. Such neurons have been directly observed in primate species. In humans, brain activity consistent with that of mirror neurons has been found in pre-motor cortex, the supplementary motor area, the primary somatosensory cortex and the inferior parietal cortex.

According to cognitive psychology these may be important for understanding of actions of other people, and for learning the new skills by limitations. Neuroscientist Marco Iacoboni has argued that mirror neurons are the neural basis of the human capacity for emotions such as empathy (Blakeslee).

It has also been proposed that problems with the mirror neuron system may underlie cognitive disorders, particularly autism leading to the inability to imitate and learn. However, the connection between neuron dysfunction and autism is tentative and it remains to be seen how Mirror neurons may be related to many of the important characteristics of autism.

These neurons are believed to mediate understanding of other animals' behaviour. For example, a mirror neuron which fires when the monkey sees a person rip paper or hears paper ripping (without visual clues). These properties have led researchers to believe that mirror neurons encode abstract concepts of actions like 'ripping paper', whether the action is performed by the monkey or another animal.

It is not animally possible to study single neurons in the human brain, so most evidence for mirror neurons in human brain is indirect. Functional Magnetic Resonance Imaging has suggested that these brain regions contain mirror neurons, and they have been defined as the human mirror neuron system.

V.S. Ramachandran, the famous neuroscientist, in his essay entitled *Mirror neurons and imitation learning as the driving force behind "the great*

leap forward” in 2006 introduced first time to the edge community, the notion of mirror neurons which were discovered by Ibbacco Rizzolati of the university of Parma in 1995. According to Ramachandran mirror neurons would do for psychology what DNA did for biology by providing details about mental abilities which remained as the mysterious experiments. He further suggested that the emergence of a sophisticated mirror neuron system set the stage for the emergence of early hominids, of a number of uniquely human abilities such as proto-language, empathy, ‘theory of other minds, and ability to ‘adopt another’s point of view’.

Mirror neurons were initially discovered while observing monkeys. When monkey reached for an object, a certain neuron in the pre-motor cortex would fire. (Other types of neurons would fire when the monkey performed different tasks) and when another monkey reached for the object, the same neuron was fired in the observing monkey. Ramachandran argues that the implication of this discovery is that the neuron is capable of adopting other’s perspective. The same neuron is fired when the person is poked with a needle as when they observe someone else being poked with a needle(Ramachandran, *The Tell-Tale Brain: A Neuroscientist's Quest for What Makes Us Human* 300). He calls, these are ‘empathy neurons’ (in his specific reference, the Gandhi neurons) and suggests that the neuron does not know the difference between what happens to itself and what happens to others. When we are reflecting on our own thoughts and feelings, we are looking at ourselves as if you are looking from other respective.

Self-Identity and the Mirror Neurons

It has been proposed that so called mirror neurons have an important role in the development of self-identity and self-awareness. They are also important in our ability to empathize and imitate others. Babies copy facial expressions

and it is very cute when they stick out their tongue in imitation. This behaviour has an important function and the other babies' brain is hardwired to perform them.

Describing the original mirror neuron studies, the monkeys were doing a sort of interval virtual reality simulation of the other monkeys' action in order to figure out what he was 'up to'. As such the mirror neurons for 'looking at myself as if someone else looks at me'. Thus, the mirror neurons that originally evolved to help us in adopting other's point of view was turned inward to look at our own self. Ramachandran does not claim that mirror neurons are sufficient for the development of the self. Rather, he claims they have a very important role in its development. But as Ramachandran notes, we have not solved the problem of the self-identity and its neural underpinnings just by stating that it depends on mirror neurons, rather, the quest is just beginning.

The mirror neuron mechanism-that originally evolved to help us adopt other's point of view was turned inward to look at our own self. Ramachandran suggests that the ability to read the minds of others, the ability to know what the others are thinking developed as a response to social needs, and the ability to self-reflect developed later as a bonus. He acknowledges that mirror neurons may not be of themselves sufficient for the development of self-reflection and that other parts of the brain may also be playing a role.

Universality of Consciousness in Relation to Mirror Neurons

Mirror neurons are located in the frontal lobe of the brain, which include motor neurons, emotion and pain neurons. Certain motor neurons fire when we perform a manual task, such as reaching out to pick an object. A subset of these neurons will fire when we simply observe another person performing that same action as if we are performing the action ourselves.

These neurons are acting as though they are adopting the other person's point of view. Mirror neurons allow us to imitate and emulate another person's actions, and also create empathy when we observe something happening to another person. When one person sees another in pain, mirror neurons allow empathy for the person who is experiencing the pain, creating a condition that allows the brain of the observer to experience the same agony and pain as if it were occurring directly to them. This poses the question on the real distinction between consciousness of oneself and that of other. Mirror neuron is the bridging principle that acts in dissolving the barriers between self and others, leading to the universality of consciousness.

Ramachandran states: "there is no real independent self, aloof from other human beings...you are actually connected quite literally by your neurons... and there is no real distinctiveness between your consciousness and another person's consciousness"(Ramachandran, *The Emerging Mind* 2).

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EXPLORING AND EXPERIENCING KOCHI METRO: AN ANALYSIS OF THE PERSUASIVE DEVELOPMENT STRATEGIES IMPLEMENTED BY KMRL

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Abstract

The Kochi Metro, the new transit system of Cochin City made a tremendous impact on the life and rhythm of the entire Keralites. Since its inception it wooed not only Kochiites but the entire nation and they were curious to know the developmental status of this new mobility pattern. This paper discusses the different development strategies employed by KMRL to make Kochi Metro a prominent transit brand. This is basically an analysis of the Communication, revenue generation, aesthetic and branding strategies developed by the metro authorities to make Kochi metro a unique service. Through this paper you will explore and experience the developmental tactics of Kochi Metro.

Keywords: Kochi metro, revenue generation, product branding

Introduction

Kochi Metro, Kerala's first metro rail service grabbed the attention of many people worldwide for initiating different growth strategies from the beginning. People welcomed the progress of each phase of Kochi metro with great awe and excitement. The Kochi Metro has proved that it is not just an engineering marvel but an architectural splendour by doing ordinary things in an extraordinary manner. It is interesting that the Kochi Metro has organized everything that they did under the five core values: Inspiration, Integration,

Innovation, Communication and Cooperation. The shades of these core values are reflected in the design, strategies and implementation of the Kochi Metro Rail Project.

Kochi metro as a unique brand made Kochiites proud. Kochi Metro Rail Ltd (KMRL) with this initiative was trying to make the beautiful city equip for the future. KMRL used an innovative tone to create this brand. Impassioned commitment, transparency and dedication allowed KMRL to cultivate a strong, optimistic and authentic brand for the Kochi Metro.

Kochi City an Overview

Kochi is the commercial capital of Kerala as well as the largest and most vibrant city in the state, with the highest Human Development Index in India. It hosts a major port, runway and it is composed of several islands and backwaters. The economy of this growing city is predominantly classified as the tertiary sector and the important business sectors include tourism, IT, exports of seafood and spices, chemical industries, health services, banking, construction etc. Being the business hub of the state, Kochi Metro will definitely prove an important ingredient in the progress and prosperity of the business sector.

Experiencing the KMRL

Kochi Metro Rail Limited abbreviated to KMRL, is a Kerala State public sector company which operates the Kochi Metro. The company was incorporated on 02 August 2011. KMRL's Kochi Metro is the newest implemented mass rapid mobility system in the state. Its construction began in June 2013 and a 13.4 km long section on the line between Aluva and Palarivattom was inaugurated on 17th June 2017. A second 5 km stretch between Palarivattom and Maharaja's College commissioned on October 3, 2017.

Each city has its own specific features and flavours which will cherish any project that reaches them. This is very true in the case of Kochi, where the land and culture were a major source of inspiration and were reflected in the design and implementation of Kochi Metro. Metro brought a wind of change that the city deserved. Kochiites are now experiencing the new change in the mobility pattern with great enthusiasm. Kochiites are certain that it will contribute a great deal to the economic and social system of the city. The ideas KMRL brought to this complex urban challenge are appreciable.

Business Strategies

Axis Bank in association with KMRL launched KMRL Axis Bank 'Kochi1' Card, a mobility card to make travel a convenient and hassle free experience for commuters in Kochi. It is a completely personalized transit card which also facilitates shopping experience at merchant outlets, so there is no need to carry multiple cards. This initiative promotes the 'less cash' economy concept and also promotes the use of digital payments which are more efficient, secure and inclusive.

In addition, the bank has also introduced a mobile app which can be used by commuters to manage their transit card and also to get QR tickets on the go for travel in the metro. Commuters using the Kochi1 app can check the current balance on the card, top up their metro card through any debit/credit etc.

Green Strategies

Kerala is highly dependent on hydro electric energy for meeting its power requirements. This led to the requirement of developing a renewable source of energy for Kochi Metro. Kochi Metro Rail Ltd (KMRL) has succeeded in setting up the effective use of renewable energy by installing solar panels atop

the metro stations and at the land available near Muttom yard which are expected to meet half of the power requirements of the stations.

KMRL has invested a lot of time and effort in making Kochi Metro environmental friendly. They started very early with tree saplings being planted across the city. Cochin City is still struggling to find an efficient and lasting solution for waste disposal in the city. The Corporation of Kochi is bogged down by the worsening scenario of waste management. Given these circumstances, the Kochi Metro has nailed it by coming up with the idea of using compost made from municipal waste for growing plants. The metro rail vertical garden adorning every station pillar entails tones of compost generated from municipal waste. It should be looked upon as an exemplary endeavour that could be imbibed by every Kochiite. Also, the stations are beautified with indoor as well as outdoor plants.

KMRL has a public bike sharing system to support environment-friendly transportation. It is not an easy task to guarantee the use of non-motorized transport. However, it could be considered a green approach.

KMRL has installed Plastic Bottle Recycling Machines at few stations. The machines have been designed to dispose and recuperate plastic bottles effectively for recycling. The highlight of the machine is that travelers using the facility will be incentivized by way of discount coupons redeemable at selected commercial outlets.

Communication Strategies

At the very outset of the project, Kochi Metro has extensively used the possibilities of all social media to tease and inform its citizens. A special effort was made on branding. KMRL has worked with a highly-reputed company specialized in the field of communication to establish the brand.

Since its inception KMRL has developed an efficient communication strategy to ensure a progressive ownership by the population and ease people's concern and anxieties regardless of the verbal protests which emerged on account of the traffic congestion created by the metro works. KMRL introduced a promotional campaign Gooseberry Campaign (2014) which used the old maxim related to gooseberries - "Bitter now, Sweet later" - referring to the difficult period of the metro works, which would soon turn "sweet". This campaign was well accepted and was even given an award. The second campaign of KMRL presents children in metro worker's uniform. Here the children remind the public that the troubles faced during metro construction are temporary and will make way for a better tomorrow for the next generation.

Through the next Awareness campaign by KMRL (2015), the team created an interactive platform for Kochiites with the help of Facebook and LinkedIn pages where each comment would be answered and taken into consideration on a daily basis. Moreover, not a single day would go by without news in different media. KMRL's blog and website was another strong communication tactic they used to get more online visibility. The regular entries, comments and descriptions made the blog livelier.

In 2015, KMRL conducted an internal reflection to change their logo and choose one which would better fit with their ambitions. Together with Brash Brands, a Dubai-based branding agency, KMRL designed a logo which represents both the lines of the integrated public transport network and the objective of Kochi Metro, ie., to link people with places and opportunities. The logo was further customized for each mode of public transport like Metro, Water metros, Buses, Cycles and taxis to symbolize the unity of the network.

Catering to a wide variety of all classes, outdoor advertising is the most preferred medium today. Kochi metro's Hoardings across the city attracted people and they used this as a branding technique.

The numbering of the metro pillars has been beneficial and it serves as a mode of advertising. Most of the retail shops in the city use pillar numbers as landmarks.

Non fare Revenue Generation Strategies

In this competitive world, if you simply sit around and hope that your business attracts the customers it requires to stay afloat, you are likely to be disappointed. Instead, you must involve in employing viable strategies to set you apart from the rest. Even though KMRL is a government owned organization, it acted like an outstanding private sector company and implemented exceptional strategies in escalating the revenue and growth of Kochi metro.

It was an outstanding move to give away the advertising rights to professional media firms. One of the prominent Kerala-based Out of Home media firm Zero Degree achieved the rights on the gamut of vast media opportunities on the Kochi Metro Rail network. In the tendering process, Zero Degree outbid competition to bag the rights on the Metro network's pillars, medians and portals for a period of 7 years. Dedicated spaces on Kochi metro pillars, medians and portals have now become the highly sought after advertisement spots in the city. The revenue generated from this is used for metro's operation and maintenance.

The Kochi Metro Rail Limited's plans to raise revenue from non-ticketing sources are commendable. Back side of the tickets printed with different fests

and fiestas definitely will catch the attention of the commuters. Banner Stands are another versatile and cost-effective tool to advertise the products. Physical banner stands in the prominent metro stations also attract people. Small kiosks put up in the stations are also eye-catching advertising vehicles.

The other alternative revenue-generating modes for metro's operation and maintenance include advertisements on the interior and exterior of trains especially video ads on LED screens with great visibility.

The KMRL has also provided space for setting up ATMs in metro stations. Many nationalized banks have already set up their ATMs at busy stations.

The "station-naming rights" is another revenue generation strategy introduced by the KMRL. In this, the name of a firm or institution can be suffixed with that of the metro station's location. Many cities in the world have started selling their stations' names to private companies, as a source of non-fare box revenue. Dubai Metro was the first project in the world to sell station naming rights, but various cities have followed: Chicago, Houston, London, Montreal, Kuala Lumpur, Gurgaon, Mumbai, New York, Philadelphia, etc. have successfully increased their non-fare box revenues. We already have two OPPO stations functioning with the look and feel of OPPO Camera Phone, a prominent mobile brand in India. The stations have been renamed as Edapally OPPO station & MG Road OPPO station.

To make the metro journey a memorable one KMRL has recently introduced metro shopping spaces. People will get a shopping cum metro experience through this. Most of the metro stations have a good area allotted for the same and soon Kochi metro stations will get a facelift to a shopping mall with many international and national brand outlets.

Social Consciousness Strategies

KMRL has selected Medical Trust hospital as the medical partner for Kochi Metro to provide Emergency medical care in all stations for a period of three years. Medical desks and Emergency Medical Care are set up in all stations. The hospital has provided the infrastructure and staff required for operating the facility. Medical Trust Hospital has also deployed ICU ambulance facility at every 5km distance to cover the emergencies along the metro alignment.

KMRL has signed a Memorandum of Understanding with Kudumbasree for the management of its station premises including ticketing, customer relations, housekeeping, parking management and running the canteens of KMRL. Kudumbasree is a community organization of Neighbourhood Groups (NHGs) of women in Kerala. It has been recognised as an effective strategy for the empowerment of women in rural as well as urban areas.

Kochi Metro has taken two landmark initiatives in the country. Keeping social inclusion as agenda, KMRL formally appointed twenty three transgender persons in different job titles. Moreover, Kochi metro is a 'Women run metro' with more number of women employees.

Before the official opening of the metro, a special ride was dedicated to differently abled children, elderly people and migrant workers. Everything was done to ensure a widespread adherence to the project presented as a new milestone in the already rich history of Kochi.

As part of expressing solidarity to the metro workers, Watermark event Solutions LLP on behalf of KMRL provided sumptuous traditional Kerala Sadya for over 500 workers of Kochi metro, who worked relentlessly day and night to make the dream of Kochiites come true.

Aesthetic Strategy

KMRL has succeeded in highlighting the rich and fascinating Kerala's history, art, culture, and literature, through specific themes allotted to the main stations. Trains are also carriers of the state's heritage. The coaches of Kochi Metro are decorated with beautiful design, colour and exotic interiors. It is laudable that the colour, design and interior features are at par with the international standards.

The interiors and exteriors of the 12 Metro stations from Aluva to Maharaja's College reflect the cultural heritage of the state. While the Western Ghats, the mountain ranges that guard the Kerala are common theme for all stations, each station reflects variants of the main theme as per the individual characteristics. While the Palarivattom station has floral interiors, the Kaloor station has monsoon season theme. For Aluva, the theme is Kerala's natural beauty with special focus on Western Ghats. The interiors of the station have Periyar and the other main rivers as the main theme. The flora and fauna of Western Ghats adorn the walls of Pulinchodu station, while Kalamassery has the rare species found in Western Ghats. The Edappally and Changampuzha Park stations showcase the spices of the state and its cultural/artistic heritage, respectively. Kerala's sports heritage is the theme of Jawaharlal Nehru Stadium station. Lissie, the 14th station from Aluva, is decked with the specified theme Dragonflies & butterflies of Western Ghats. MG Road has "Ernakulam and its History" as theme. Maharaja's Ground, the last station, is etched with the theme 'endangered species and mammals of Western Ghats'.

Kochi metro has implemented pedestrian projects keeping the aesthetics in mind. KMRL gave a lot of importance to the development of open spaces, walkways and cycle-tracks, to ensure an equitable sharing of the public

space among the citizens of Kochi. In the case of Kochi metro, aesthetics has become a unique selling point and people love to capture the moments they spend there.

Conclusion

With its green, gender, aesthetic, social and worker-friendly ways of doing things, Kochi metro has become an emblematic model in our state. Kochi Metro is not just an infrastructure project but an agent of metamorphosis. The swanky three-coach trains offer people literally a new perspective of our state. By implementing different development strategies, Kochi Metro has become the pulse of our metropolis.

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ON CENTRALIZERS OF A PERMUTATION IN S_n

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Abstract

The number of elements in centralizer C_α of a permutation α in S_n where α can be written as composition of disjoint cycles such that α has a_1 1-cycles, a_2 2-cycles, an n - cycle is $C = \prod_j (j)^{a_j} (a_j!)$. In this paper we prove the same using a graph theoretic approach.

Key words: Directed graphs, Centralizers.

Introduction

Suppose n is a natural number and λ is an unordered integer partition of n such that λ has a_j parts of size j for each j . In other words, there are a_1 1cycles, a_2 2cycles, a_3 3cycles and so on. Let c be the conjugacy class in the symmetric group of degree n comprising the elements whose cycle type is λ , i.e., those elements whose cycle decomposition has a_j cycles of length j for each j . Then:

$$c = n! / \prod_j (j)^{a_j} (a_j!)$$

Equivalently, if C is the centralizer of any element of c , then:

$$C = \prod_j (j)^{a_j} (a_j!)$$

These are equivalent because size of conjugacy class equals index of centralizer, which follows from the identification of the conjugacy class with the left coset space of the centralizer via the action of the group on itself as

automorphisms by conjugation. Here we study the directed graphs of a transformation and see why the centraliser $C\alpha$ of an element α has the cardinality as $C = \prod_j (j)^{a_j} (a_j!)$.

Directed Graphs

A digraph (directed graph) is a pair $D = (S, \rho)$ where S is a non-empty set of vertices denoted by $V(D)$ and ρ is a binary relation on S . Any pair $(a, b) \in \rho$ is called an arc of D , which we will write as $a \rightarrow b$. A vertex a is called an initial vertex in D if there is no b in ρ such that $b \rightarrow a$; it is called a terminal vertex in D if there is no $b \in S$ such that $a \rightarrow b$.

Definition 1. A digraph D is called a *functional digraph* if there is $\alpha : S \rightarrow S$ such that for all $x, y \in S$, $x \rightarrow y$ is an arc in D if and only if $\alpha(x) = y$. If such an α exists, then it is unique, and we will write $D = D\alpha$ and refer to D as the digraph that represents α .

Let D be a digraph and let $\dots, x_{-1}, x_0, x_1, \dots$ be pairwise distinct vertices of D . Consider the following sub-digraphs of D (if they exist):

- (1) $x_0 \rightarrow x_1 \rightarrow \dots \rightarrow x_{k-1} \rightarrow x_0$
- (2) $x_0 \rightarrow x_1 \rightarrow \dots \rightarrow x_m$
- (3) $x_0 \rightarrow x_1 \rightarrow x_2 \rightarrow \dots$
- (4) $\dots \rightarrow x_2 \rightarrow x_1 \rightarrow x_0$
- (5) $\dots \rightarrow x_{-1} \rightarrow x_0 \rightarrow x_1 \rightarrow \dots$

We call (1) - (5), respectively: a cycle of length k ($k \geq 1$), written $(x_0x_1\dots x_{k-1})$; a chain of length m , written $[x_0x_1\dots x_m]$ ($m \geq 0$); a right ray, written $[x_0x_1x_2\dots >$; a left ray, written $<\dots x_2x_1x_0]$; and a double ray, written $<\dots x_1x_0x_1\dots >$.

Definition 2. Let D_α be a functional digraph, where $\alpha \in T(S)$. A right ray $[x_0x_1x_2\dots]$ in D_α is called a maximal right ray if x_0 is an initial vertex of D_α .

Definition 3. Let D_α be a functional digraph, where $\alpha \in T(S)$

- A left ray $L = [x_0x_1x_2\dots]$ in D_α is called an infinite branch of a cycle C [double ray W] in D_α if x_0 lies on C [double ray W] and x_1 does not lie on C [double ray W]. We will refer to any such L as an infinite branch in D_α .
- A chain $P = [x_0x_1\dots x_m]$ of length $m \geq 1$ in D_α is called a finite branch of a cycle C [double ray W , maximal right ray R , infinite branch L] in D_α if x_0 is an initial vertex of D_α , x_m lies on C [double ray W , maximal right ray R , infinite branch L] and x_{m-1} does not lie on C [double ray W , maximal right ray R , infinite branch L]. If x_m lies on an infinite branch $L = [y_0y_1y_2\dots]$, we also require that $x_m = y_0$.

Definition 4. Let $\alpha \in T(S)$, $x \in S$. The sub-graph of D_α induced by the set $\{y \in S : \alpha^k(y) = \alpha^m(x) \text{ for some integers } k, m \geq 0\}$ is called the component of D_α containing x . The components of D_α correspond to the connected components of the underlying undirected graph of D_α . The following two propositions is due to (Araújo, 2013).

Proposition 1. Let D_α be a functional digraph. Then for every component A of D_α , exactly one of the following three conditions holds:

- (1) A has a unique cycle but not a double ray or right ray;
- (2) A has a double ray but not a cycle; or
- (3) A has a maximal right ray but not a cycle or double ray.

Proposition 2. Let D_α be a functional digraph. Then for every component A of D_α :

- (1) if A has a (unique) cycle C , then A is the join of C and its branches;
- (2) if A has a double ray W , then A is the join of W and its branches;
- (3) if A has a maximal right ray R but not a double ray, then A is the join of R and its (finite) branches (type rro).

Let α be a permutation in S_n . Then we can say that the every component of α has only cycles and not any branches since α is one- one and onto (every element in Z_n (vertices of $D - \alpha$) has exactly one image and exactly one pre-image). In other words we can represent a permutation by join of disjoint cycles of different length (A well known approach)

Example 1. Let n be 9 and $\alpha \in S_9$ be such that

$$\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 2 & 3 & 1 & 5 & 4 & 6 & 8 & 9 & 7 \end{pmatrix}$$

then α can be represented as $(123)(45)(6)(789)$

where (123) and (789) form 3-cycles and (45) form a 2-cycle and (6) is a 1-cycle.

The following definition is due to (Hell, 2004)

Definition 5. Let $D_1 = (X_1, \rho_1)$ and $D_2 = (X_2, \rho_2)$ be digraphs. A mapping $\varphi : X_1 \rightarrow X_2$ is called a homomorphism from D_1 to D_2 if it preserves edges, that is for all $x, y \in X_1$, if $(x, y) \in \rho_1$, then $(x\varphi, y\varphi) \in \rho_2$.

We say that D_1 is homomorphic to D_2 if there exists a homomorphism from D_1 to D_2 . Let α be a permutation in S_n . Then α can be represented by a directed graph $D(\alpha) = (X, \alpha)$ where α is viewed as a binary

relation on Z_n . In other words, for all $x, y \in Z_n$ (x, y) is an arc in $D(\alpha)$ if and only if $x\alpha = y$. Let γ be a connected component of α . By $D(\gamma)$ we will mean the directed sub-graph of $D(\alpha)$ induced by $\text{dom}(\gamma)$. That is, $\text{dom}(\gamma)$ is the set of vertices of $D(\gamma)$ and for all $x, y \in \text{dom}(\gamma)$, (x, y) is an arc in $D(\gamma)$ if and only if (x, y) is an arc in $D(\alpha)$. (The latter is equivalent to $x\gamma = y$.)

The following proposition from (Araújo, 2013) provides a link between centralizers of elements of $T(X)$ the semigroup of all transformations from X to X and digraph homomorphisms.

Proposition 3. *Let $\alpha, \beta \in T(X)$. Then $\beta \in C(\alpha)$ if and only if for every connected component γ of α , there exists a connected component δ of α such that $\beta|_{\text{dom}(\gamma)}$ is a graph homomorphism from $D(\gamma)$ to $D(\delta)$.*

Now since S_n is a subgroup of $T(X)$ we can restate it as

Corollary 1. *Let $\alpha, \beta \in S_n$. Then $\beta \in C(\alpha)$ if and only if for every connected component γ of α , there exists a connected component δ of α such that $\beta|_{\text{dom}(\gamma)}$ is a graph homomorphism from $D(\gamma)$ to $D(\delta)$.*

3. Centralizer of $\alpha \in S_n$

In this section we look at the permutations in $C(\alpha)$. Since α is one-to-one the directed graph of α consist of only cycles of different length and no branches.

Theorem 1. *Let $\alpha, \beta \in S_n$ and $\beta \in C(\alpha)$. Then β maps k -cycles in α to k -cycles.*

Proof. Suppose γ is a k -cycle with vertices a_1, a_2, \dots, a_k in α and β maps γ into δ and suppose that δ is a l -cycle with vertices b_1, b_2, \dots, b_l . Now we have to show that $l = k$. From corollary 1, $\beta|_{\text{dom}(\gamma)}$ has to be a graph homomorphism from $D(\gamma)$ to $D(\delta)$ so $k \leq l$ also since β is one-to-one (being a permutation) we

can say that δ should have at-least k elements that is $1 \leq k$. So we have that $1 = k$ that is β maps k -cycles in α to k -cycles.

Theorem 2. Let $\alpha \in S_n$ where α has a_1 1-cycles, a_2 2-cycles, a_3 3-cycles and so on, then the cardinality of $C(\alpha)$ is given by $C(\alpha) = \prod_j (j)^{a_j} (a_j!)$

Proof. Suppose that $\alpha \in S_n$ where α has a_1 1-cycles, a_2 2-cycles, a_3 3-cycles and so on. Every element in $C(\alpha)$ maps k -cycles to k -cycles by theorem 1. Now the number of ways one can map 1-cycles to 1-cycles of α is $a_1!(1)^{a_1}$. The number of ways one can map 2-cycles to 2-cycles of α is $a_2!(2)^{a_2}$ and so on. And so the cardinality of $C(\alpha)$ is the total number of ways one can map k -cycles in α to k -cycles, hence we have that

$$C(\alpha) = \prod_j (j)^{a_j} (a_j!)$$

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ENTREPRENEURIAL ENVIRONMENT OF RURAL WOMEN ENTREPRENEURS –AN OPINION SURVEY

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Abstract

“To awake the people it is the women who should be awakened first. Once she is on the move the family moves ...the nation moves”.

Jawaharlal Nehru

Entrepreneurship is a core element of growth and development for all nations. Increasing participation of women in entrepreneurship is an important part of human resource development. Women entrepreneurship is extremely low in India, especially in rural areas. Women entrepreneurship has been recognized during the last decade as an important untapped source of economic growth. This study is made to find out the opinion of rural women entrepreneurs on entrepreneurial environment. The study is based on primary data collected from 87 rural women entrepreneurs in Coimbatore. The statistical tools like Simple percentage analysis, Average score analysis and ANOVA have been used to analyze the data. It can be concluded from the results of the study that inspite of the difficulties such as increased cost of business operations faced by the rural women entrepreneurs, entrepreneurship has helped them to enhance their business skills and talents.

Key Words: Entrepreneur, MUDRA, Women Preneur

Introduction

Entrepreneurship is the key component of growth and development for all countries. Women owned business enterprises are increasing rapidly. The hidden entrepreneurial talents of women have gradually been changing with the growing sensitivity to the role and economic status in the society. Women entrepreneurship has been recognized during the last decade as an important untapped source of economic growth.

A case study in the rural areas of Cote d' Ivoire (Vizverberg 1988) among self-employed small-scale entrepreneurs observed that self-employment is a main mode of activity and a significant portion of the labour force in rural areas making their living through self-employment. The study shows that the motive behind starting such enterprises is not due to their passion towards entrepreneurship but because the market wage offered is low or the chance of receiving a wage job is remote. Sujata *et al.*, (2010) in their study on problems faced by rural women entrepreneurs of Rajasthan indicated that lack of supportive network, financial and marketing constraints were the major problems for the women entrepreneurs as well as for other women who were willing to start entrepreneurial activity.

In a study on 50 women entrepreneurs of Kolhapur city, India by Memon (2012) it is seen that majority of the women entrepreneurs do not avail the facilities provided by government, due to lack of awareness and fear of long and complex government procedures.

Steps taken by Government to improve rural women entrepreneurs

The Mudra Yojana Plan enacted by the Government of India attempts its best to improve the status of women by giving loans and encouraging them to

start new business and thereby empowering them by providing a financial safety and security of individual income. Joint ventures by women also receive loans and funds under this scheme, provided they are eligible according to the predefined terms and conditions. The fact that this loan is collateral free is in fact a big boon to them, for it takes off a huge risk from their backs. According to data released by Finance Ministry, up to August 2017, Rs 3,55,590 crores were sanctioned under the scheme to help micro businesses

National Bank for Agriculture and Rural Development (NABARD) was set up in 1982 to promote integrated rural development. Apart from agriculture, it supports small scale industries, cottage and village industries and rural artisans using credit and non-credit approaches.

The Rural Small Business Development Centre (RSBDC) is set up by the World Association for Small and Medium Enterprises and it is sponsored by NABARD. It works for the benefit of socially and economically disadvantaged individuals and groups. It aims at availing management and technical support to current and prospective micro and small entrepreneurs in rural areas. Small industries Development Bank of India (SIDBI) has been set up as an apex bank to provide direct/indirect financial assistance under different plans, to meet credit needs of small business organizations.

The Rural and Women Entrepreneurship Development Programme (RWED) aims at promoting a conducive business environment and at building institutional and human capacities that will encourage and support the entrepreneurial initiatives of rural people and women. Mahila Vikas Nidhi grants loan to rural women to start their business in the fields like spinning, weaving, knitting, embroidery products, block printing, handlooms, handicrafts, bamboo products etc. Training of Rural Youth for Self-Employment

(TRYSEM) is a sub-plan of integrated rural development programme it gives training to young unemployed men and women for self-employment. The trainees get a stipend of Rs.150 per month during training period. In this programme 40% of total seats are reserved for women. Development of Women and Children in Rural areas (DWCRA) is the rural development scheme to support women income generation activities through a group of 15-20 women. The Government of India has launched this women development programme in 1982.

In this dynamic world, women entrepreneurs have an important role in attaining the global quest for sustained economic development and social progress. In India, though women play an important role in the society, their entrepreneurial ability has not been properly used due to the lower status of women in the society. In this study, focusing on women in the district of Coimbatore, Tamil Nadu the researcher tries to study the profile of women entrepreneurs and their opinion about internal and external opportunities in business environment in India.

Objectives of the study

- To Identify the steps taken by government to encourage rural women entrepreneurs
- To analyze the opinion of rural women entrepreneurs about entrepreneurial environment.

Statement of the problem

Entrepreneurship creates self-determination, recognition, self-esteem and career goal among rural women entrepreneurs. Compared to men, women are less motivated to start business concerns. The central and state governments

have initiated a number of specialized institutions and loan schemes to cater to the needs of women entrepreneurs but they still face many problems. This study is conducted to know the opinion of rural women entrepreneurs about the entrepreneurial environment available to them and attempt to give remedial measures.

Materials and Methods

A sample size of 87 rural women entrepreneurs spread over Coimbatore district were selected and interviewed through a pre-structured interview schedule from July to December 2017. The statistical tools like Simple percentage analysis, Average score analysis and ANOVA have been used to analyze the data.

Data Analysis

Simple Percentage Analysis

Percentages were used in making comparison between two or more variables to find the efficiency of each variable and to describe relationships among them. Percentage analysis has also been used to summarise the general profile of the respondents.

Average Score Analysis

The Average score analysis was employed to determine the level of agreeability on the entrepreneurial environment of rural women entrepreneurs by different category of respondents. Women entrepreneurs were asked to express their opinion on the following statements using 5 point scaling, to say whether they strongly agree/ agree/ neutral/ disagree/ strongly disagree/ to the statement for average score analysis. Value 1 has been assigned to strongly agree, 2 to agree, 3 to neutral, 4 to disagree, 5 to strongly disagree (table 1).

Table 1. Statements used for average score analysis

S. No.	Statements	Code
1	The overall environment for women entrepreneur is good	S1
2	Family and Social commitments are growing	S2
3	Government support to women entrepreneurs is increasing	S3
4	Cost of running the business is increasing	S4
5	Easy access to finance & credit for women entrepreneurs	S5
6	Business support network is favorable	S6
7	Market is favorable	S7
8	Business and technical skills of women entrepreneurs have improved	S8

Statistical analysis:

ANOVA was used to check whether there is any significant difference in the opinion of the respondents based on the demographic variables such as age, educational qualification, marital status, number of members in the family, monthly family income and age of entering the business.

Result**Simple Percentage Analysis**

Majority of the respondents (33.3%) belonged to the age group of 20 to 30 years. Most (56.3 %) of the respondents have completed school level education while 4.6 per cent of the respondents have no formal education.

It can be inferred from table 2 that majority (73.6 %) of the respondents are married. Most (41.4 %) of the respondents' monthly family income was between Rs.10,000 and Rs. 20,000, while 3.5 % of the respondents' monthly family income was more than 40, 000.

Majority (89.7 %) of the respondents live in nuclear family and 10.3 per cent in joint family. Most (46.0 %) of the respondents started business when

they were 20 to 30 years of age whereas 12.6 per cent of respondents were above 40 years of age when they started business.

Table 2. Details of the respondents involved in the study

Age	Frequency	Percent
Less than 20 years	15	17.2
20-30 years	29	33.3
31-40 years	22	25.3
Above 40 years	21	24.1
Educational qualification		
No formal education	4	4.6
School level	49	56.3
Graduate	28	32.2
Post graduate	6	6.9
Marital status		
Married	64	73.6
Un married	22	25.3
Separated	1	1.1
Monthly income of the family		
Less than Rs.10,000	18	20.7
Rs.10,000-Rs.20,000	36	41.4
Rs.20,001 – Rs.30000	13	14.9
Rs.30,001 – Rs.40,000	17	19.5
Above Rs.40,000	3	3.4
Kind of Family Structure		
Nuclear	78	89.7
Joint	9	10.3
Number of Members in the Family		
1-3	21	24.1
4-6	62	71.3
Above 6	4	4.6
Age of Entering the Business		
Less than 20 years	18	20.7
20-30 years	40	46
31-40 years	18	20.7
Above 40 years	11	12.6
Total	87	100.0

Source: primary data

Average Score Analysis

From the results, it is evident that the rural women entrepreneurs have strongly agreed that they face difficulty due to the increased cost of running their business. It can also be found that the business and technical skills of entrepreneurs have improved due to the experience they derive as entrepreneurs (table 3).

Table 3. Level of agreeability of the respondents on the statements relating to entrepreneurial environment based on 5 point scaling

		S1	S2	S3	S4	S5	S6	S7	S8
Age	Less than 20 years	1.80	2.00	1.87	1.73	2.53	2.60	2.67	1.60
	21-30 years	1.90	1.79	1.41	1.07	2.24	2.97	3.66	1.34
	31-40 years	1.77	1.82	1.50	1.36	2.95	2.82	3.18	1.27
	Above 40years	1.90	1.57	1.52	1.38	2.57	2.19	2.86	1.33
Educational Qualification	No formal education	1.50	1.00	1.00	1.00	4.00	2.00	3.50	1.50
	School level	1.88	1.88	1.61	1.45	2.12	2.69	3.08	1.33
	Graduate/ Diploma	1.93	1.82	1.36	1.25	2.82	2.82	3.25	1.36
	Post Graduate	1.50	1.33	2.17	1.00	3.83	2.33	3.33	1.67
Marital status	Married	1.94	1.78	1.47	1.27	2.55	2.84	3.41	1.27
	Unmarried	1.59	1.82	1.73	1.55	2.45	2.23	2.55	1.68
	Separated	2.00	1.00	2.00	1.00	5.00	2.00	2.00	1.00
Monthly income of the family	Less than Rs.10, 000	1.83	1.61	1.56	1.44	3.06	2.33	2.94	1.56
	Rs.10, 001 –Rs.20,000	1.83	1.78	1.42	1.25	1.92	2.78	3.33	1.06
	Rs.20,001 –Rs.30,000	2.00	2.08	1.62	1.46	2.54	2.23	2.69	1.46
	Rs.30,001 – Rs.40,000	1.76	1.76	1.76	1.12	3.41	3.12	3.41	1.71
	Above Rs.40,000	2.00	1.67	1.33	2.33	2.33	3.00	3.33	1.67
Number of members in the family	1-3	1.95	1.86	1.62	1.29	2.67	2.67	3.05	1.24
	4-6	1.81	1.74	1.45	1.34	2.45	2.66	3.23	1.40
	Above 6	2.00	2.00	2.50	1.50	3.50	3.00	3.00	1.50
Age of entering the business	Less than 20years	1.67	1.89	1.83	1.61	2.72	2.61	2.78	1.72
	21-30years	1.98	1.90	1.40	1.23	2.42	3.13	3.67	1.27
	31-40 years	1.72	1.61	1.44	1.28	2.89	2.11	2.78	1.33
	Above 40years	1.91	1.45	1.73	1.36	2.18	2.09	2.64	1.18

Source: Computed

Entrepreneurial environment of rural women

There is no significant difference in the opinion of the respondents classified into different groups based on the demographic variables such as age, educational qualification, marital status, number of members in the family, monthly family income, and age of entering the business about entrepreneurial environment (Table 4)

Table 4. ANOVA for Opinion score on entrepreneurial environment of rural women entrepreneurs and personal factors

Personal factors	Sum of squares	DF	Mean square	F	Table value	Significant/ not significant
Age	.417	3	.139	.284	2.635	NS
Educational qualification	.202	3	.067	1.37	2.635	NS
Marital status	.220	2	.110	.226	3.026	NS
Number of Family Members	1.415	4	.54	.731	2.402	NS
Monthly family Income	.502	2	.251	.519	3.026	NS
Age of entering the business	1.276	3	.425	.886	2.365	NS

Source: Computed from primary data,
NS – Not Significant

The ANOVA results have shown that the calculated F-ratio value is less than the table value at 5% level of significance. Hence there is no significant difference in the opinion of the respondents based on the demographic variables such as Age, Educational qualification, Marital status, Number of family members, Monthly family income and Age of entering the business about entrepreneurial environment. Hence the null hypothesis is accepted.

Conclusion

Women entrepreneurship in India has gained sharp momentum in recent years. But still some rural women entrepreneurs are facing social, financial,

personal and marketing problems. In this study on entrepreneurial environment of rural women entrepreneurs the respondents have opined that entrepreneurship activities have a major role to play in improving their skills. In order to overcome these problems women entrepreneurs must be trained properly to meet the multi dimensional challenges in global markets and to be competent enough to sustain and strive for excellence in the entrepreneurial arena.

Government has emerged as a major catalyst by way of providing training incentives and other facilities to women entrepreneurs particularly in rural areas. But this marks only the beginning of an arduous journey ahead for the Indian rural woman entrepreneurs.

On the basis of this study, we could suggest that

- Women should try and upgrade themselves by adapting to the latest technologies and derive maximum benefits.
- Women must be educated and trained constantly to acquire skills and knowledge in all the functional areas of business management. This can facilitate women to excel in decision making process and develop a good business network
- Government and the society should continuously attempt to inspire, encourage and motivate women entrepreneurs

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**EMERGING REGULATORY TRENDS IN MARITIME
JURISDICTION: AN ANALYSIS IN THE LIGHT OF 'PROMPT
RELEASE' CLAUSE UNDER UNCLOS -3**

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Abstract

This paper analyses the matters relating to jurisdiction of coastal states over the ships who indulge in any illegal activity in territorial waters or high seas of the coastal state. Till the adoption of UNCLOS 3 the coastal state had only limited power over foreign vessel and crew. The UNCLOS-3 was able to bring zone uniformity in the practice by prescribing specific rights to these zones and recognizing specific rights and obligations of all countries. Now there are 167 countries and the European Union as members of UNCLOS-3. The special feature of the convention is the creation of a comprehensive system for settlement of disputes that may arise in the interpretation and application of the convention. It contains provisions for compulsory procedure entailing binding decision under part 15 of the convention. The ITLOS established under annexure VI is a special tribunal which can consider any dispute concerning the interpretation or application of the UNCLOS 3. Prompt release obligation is an important jurisdiction contained in Article 292 of the UNCLOS in order to prevent abuse of enforcement process confused on contract states by arresting flag state fishing vessels for breach of fishing regulations. Exercise of sovereign rights by coastal states with freedom and right of navigation, over flight, and laying of submarine cables and pipelines are exempt under this provision.

Keywords: ITLOS, territorial waters, maritime law

Introduction

Maritime law is a developing area with great concerns all over the world especially for maritime nations. It is said to be hot in the present scenario due to the commercial value attached to every aspect of this area. But the regulatory trend which has emerged so far is not adequate enough to meet the issues and challenges arising day by day.

Major Concerns of Admiralty jurisdiction through its development

A ship on voyage enters into numerous contracts and deals. There are copious chances of disputes due to collision, pollution, wages, allowances etc. Admiralty law deals with all these matters. From very early ages special courts namely admiralty courts adjudicated the maritime claims. It means that ordinary courts do not have jurisdiction to deal with maritime claims. This can be traced from the earlier writers like Blackstone and Codes of Hammurabi. The Halsbury's laws of England also ensure this matter.

In India Recorders Court which was established in 1798 had the earliest jurisdiction to deal with maritime matters. Later on, Supreme Court of Judicature which was established in 1823 assumed the jurisdiction. The Colonial Courts of Admiralty Act, 1890 conferred admiralty jurisdiction over High Courts of Bengal, Madras and Bombay.

Even after independence the older scenario continued. In the famous *M.V. Elizabeth Case* (AIR 1993 SC 1014) maritime jurisdiction was extended notionally to all the high courts. Later Law Commission was entrusted with the duty to deal with the situation. In 2005 a new bill was introduced in the parliament. But it was not passed or enforced. There was a cry to meet the urgent need for a modern, efficient, performing and competent legal infrastructure for smoother maritime

commerce and navigation. Ultimately the new Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017 has been passed. This Act, consolidates the laws relating to admiralty jurisdiction, legal proceedings in connection with vessels, their arrest, detention, sale and other matters connected there with or incidental there to.

At this juncture this paper analyses the matters relating to jurisdiction of coastal states over the ships who indulge in any of the criminal activity as well as any illegal activity in territorial waters or high seas which has affected the coastal state.

Jurisdiction over ships

The third UN Convention of the law of the Sea enhanced the enforcement powers of Coastal states over foreign vessels and their crew in the coastal waters. It also extended the breadth of coastal waters tremendously. The enforcement powers include embarking on the vessel inspection of documents, arrest of crew, seizure of vessel and detention of the ship and crew. The detention may extend to considerable length of time. It may be a hardship for the ship owners and seamen in a foreign country and in a foreign jail. The 200 nautical miles (EEZ) and even an extended sovereign rights area of 350 N. miles from the base line in cases of extended continental shelf give the power very vast. In order to reduce the difficulties faced by the ship owners and seamen the convention created provisions for prompt release of vessels and crew members on complying with the posting of security bond or other financial security. It is said that the underlying objectives of this provision (Article 292) is to serve as a compromise between the interest of coastal state and the flag state. In this context it is necessary to examine whether the prompt release provision under UNCLOS 3 is able to maintain the balance of interest

between coastal state and the flag country. It is noted that out of the 24 cases considered by ITLOS since its creation in 1997. Nine related to prompt release of defined vessels. The ITLOS issued six provisional orders which considered illegal detention or confiscating ships and crew members. This includes the 'Entrica Lexie' case in which India was a party and decided in 2015.

Traditional Coastal State Jurisdiction over Maritime Waters

Till the adoption of UNCLOS 3 the coastal state had only limited power over foreign vessel and crew. It was limited to the territorial waters which was only 3 N M for the baseline till UNCLOS and 300 nautical miles under ITLOS. In the contiguous zone which was only another 6 N M from the territorial sea limited powers of enforcement of customs, fiscal, sanitary and immigration laws were allowed. Exclusive fishing right in this area was also recognized by the UNCLOS 1 (in 1958). Since 1960's there had been unilateral expansion of these zones by many maritime countries. By the time of negotiation of UNCLOS-3 (from 1972-1982) most of the countries adopted 12 N M territorial sea. Another 12 N miles contiguous zone on an exclusive economic zone of 200 N M and continental shelf with varying limits. The UNCLOS-3 was able to bring zone uniformity in the practice by prescribing specific rights to these zones and recognizing specific rights and obligations of all countries. A mammoth convention containing 320 articles and 9 appendices gives a comprehensive picture of the rights and obligations of signatory Nations. It is stated that now there are 167 countries and the European Union as members of UNCLOS-3. The special feature of the convention is the creation of a comprehensive system for settlement of disputes that may arise in the interpretation and application of the convention. It contains provisions for compulsory procedure entailing binding decision under part 15 of the convention.

The Novel procedure *viz.* the independent procedure for prompt release of detained foreign vessels and crew has been set up.

Dispute Settlement Mechanism under UNLOS-3

The effort for creating special mechanism to settle the international dispute relating to sea especially fisheries were there even before the UNCLOS-1. The International Law Commission in 1956 received many requests for settlement of law of the sea disputes to compulsory settlement by arbitration commission or I.C.J. But the ILC recommended only a system for settlement of disputes under high sea fisheries. However, the draft articles made provision for the ICJ to have compulsory jurisdiction in relation to continental shelf. But the UNCLOS -1 rejected all such proposals. The 1958 convention on fishing and conservation living resources of the high sea made provisions for a limited number of fisheries disputes to be submitted for settlement by a special commission of five members. The second UN convention on the law of the sea failed to receive ratification by sufficient number of states. So, till the adoption of the UNCLOS 3 the settlement of Law of the sea disputes were done by diplomatic channels and adjudicative bodies.

The Alabama claims arbitration (Us Vs UK 1872) and the Bering Sea Fur Seals between Canada and UK were decided by arbitration tribunal. The “*l am*” alone case dealing with right hot pursuit was also made by arbitration. A few cases like fisheries jurisdiction case 1951 and Continental Shelf case 1966 were decide by the ICJ. The third UN convention on law of the sea part 15 established special institutions for resolution of disputes concerning the law of the sea. Strictly in conformity with the primary objective maintaining peace and public order in the world oceans and to make shared use of the oceans possible. It provided for peaceful settlement of disputes by the parties. The countries can

resolve the disputes through peaceful means of their own choosing. Article 281, provide compulsory disputes settlement mechanisms. If the parties failed to reach a settlement by their own agreed means they can look for compulsory settlement provisions. There are four compulsory disputes settlement methods set out in part IV. Parties can agree to refer the matter to an arbitral tribunal established under annexure VII or to special arbitral tribunal established under annexure VIII. They can also choose ICJ as the settlement body by mutual consent. The ITLOS established under annexure VI is a special tribunal which can consider any dispute concerning the interpretation or application of the UNCLOS 3. It can deal with disputes relating to fisheries, protection and preservation of the marine, scientific research and navigation including pollution from vessels. In relation to disputes concerning the exploitation and exploration of seabed, ocean floor and subsoil the seabed dispute chamber a special chamber of IPLOS can give binding awards.

Provisional Measures and Prompt Release Obligation

Provisional measures under Article 290 and prompt release obligations of vessels and crew under article 292 are very the unique provision of UNCLOS 3. Not only that compulsory jurisdiction is provided, a binding obligation is related through this provision (UNCLOS, 1982).

Provisional measures

The provisional measures envisaged under the convention are important sources of jurisdiction of the ITLOS. Not only ITLOS but the ICJ and arbitral tribunal created under Article 287 also have power to issue provisional orders. Such provisions could not be found in the statute of ICJ or other international dispute settlement tribunals. Articles 290 say that these bodies could “prescribe” provisional measures. This term confirms that the order issued

under this provision is legally binding and obligatory. So far ITLOS has issued such orders on six occasions. The scheme comes into operation to preserve the respective rights of the parties to the dispute and to prevent serious harm to the marine environment pending final decision. According to the court in southern Blue Fin Tuna case (New Zealand Vs Japan, 1999) there is a strong conceptual affinity between precautionary principle and the provisional measures procedure. In *Entrica Lexi* case the court directed that India and Italy should not proceed with the existing domestic proceedings or begin any new proceedings. The only requirement for issuing such provisional orders is that the tribunal should prima facie satisfied that it has jurisdiction to decide the case on merit and there is possibility of violation of important right of the parties. The ICJ, court of justice of EU, the inter-American court of Human rights and the European court of Human rights also have competence to prescribe provisional measures. But the rules governing IPLOS is something different from others. In the fisheries jurisdiction case of 1972 in the ICJ limited that the objective of provisional measures is for preserve the respective right of party pending decision of the court. Hence under Article 290 of the UNCLOS 3 protection of marine environment is an additional objective. Similarly, conservation of straddling stocks of fish and prevent damage to such fish stock can be a ground for provisional measures (Mukherjee, 2002).

The request for prescription of provisional measures should be made by a state party which is affected by the action of coastal state. Any modification or changes should also be requested by the parties. There is no rule in UNCLOS 3 which suggested that the measures can be requested asking if there is a case of urgency as insisted by ICJ. It is often said that the rules concerning provisional measures of the ITLOS are innovative in the sense that the measures can be received later (MARPOL, 2005).

Prompt Release Obligation

Prompt release obligation is an important jurisdiction contained in Article 292 of the UNCLOS in order to prevent abuse of enforcement process confused on contract states by arresting flag state fishing vessels for breach of fishing regulations. These provisions are used Article 73 of the UNCLOS 3 seek to reconcile competing interests of coastal and flag state. It provides that coastal state can exercise sovereign rights to explore, exploit and conserve marine resources in the Exclusive Economic Zone (EEZ). It can also take enforcement actions against vessels necessary to ensure conformity with the fishing regulations. But the same article also states that the arrested vessels and their crew should be promptly released upon posting of reasonable bond or other security. Article 292 establish the procedure to seek resolution of dispute concerning such arrest. This power is exercised as the residuary compulsory jurisdiction on ITLOS. The prompt release cases are the most important category of cases coming before the ITLOS. Since the first case in 1997 nine cases out of total 24 considered by the ITLOS relates to prompt release. The very first case *M V. Sarga* case involved an application by Saint Vincent and Grenadines for prompt release of an oil tanker supplying fuel to fishing vessel offshore Guinea (Chaturvedi,1981).

The requirements for jurisdiction of the tribunal are the following

- 1) One state party defamed a vessel flying the flag of another state party.
- 2) The defamed vessel had not complied in the provisions of the convention for prompt release.
- 3) The vessel or the crews are ready to give reasonable bond or financial security in this to days from the time of detention if the release is not made the ITLOS can issue orders. The application for release should be made on behalf of the flag state.

The tribunal will not look into the merit of the case. The tribunal will usually examine only four factors.

- 1) Parties to the proceedings are state parties to the convention
- 2) The parties did not agree to submit the question of release from detention to another court.
- 3) The applicant state is the flag state of the vessel defined.
- 4) The applicant alleges the defining state has not complied with the provisions of the convention for prompt release.

Initiating the proceedings

Individual ship owners or corporation are not having direct access to ITLOS in prompt release procedure. Only states are the parties. So, the application can be made only by or on behalf of the flag state. The applicant state should be the flag state of the vessel at the time of application as well as at the time when the decision is taken. For example, in the Grand Prince case the vessel was flying the flag of Belgium when it was arrested in the EEZ of France. The master was charged with failure to announce entry to the EEZ of France and fishing without authorization the master admitted the violation. Later Belgium filed an application under article 292 at the ITLOS. The tribunal found that at the time of arrest Belgium had written a letter admitting that it had imposed Deregistration hence it was conducted that Belize was not the flag state (Implications of the United Nations Convention on the Law of the Sea, 1982 for the International Maritime Organization, Study by the Secretariat of IMO, doc.LEG/MISC 1 (1986))

Impact of Domestic Court Proceedings and Delay in Application

It has been suggested that there is no requirement that domestic proceeding should be exhausted. Similarly, it is not a valid objection to admissibility. The delay in prompt release application cannot prevent the state in invoking article 292. In Camouco case Panama waited for more than 3 months to file an application before ITLOS. France argued that there had been delay and tribunal cannot order prompt release.

This argument was rejected by the tribunal. The ITLOS also held that pending proceeding in the domestic court cannot be valid objection admissibility. Exhaustion of local remedy is also not a condition precedent for filing application (Camouco case).

Effect of Decision on Merit by Domestic Court

In Grand Prince case the allegation was illegal fishing by the Belize vessel. But before the conclusion of the case final adjudication was made by the National Court. So the ITLOS refused to hear the case. Similar is the case in Tomi Maru (*Japan Vs. Russia*). Here Japanese vessel was confiscated for illegal fishing with in the Russian EEZ. It was stated that power to arrest and take criminal proceeding was sovereign right and hence the action failed. Similar decision was taken in Juno trader case.

Another difficult problem is the notion of reasonable bond or security given by flag state. The tribunal can determine whether the security given is reasonable and if not, it can determine the amount nature and form of the bond (Sharma, 2009).

In M V Sarga the tribunal marginally addressed reasonableness criteria applied to the amount, nature and form of the bond. In Monte Confurco case

also, the nature and form of financial bond was the crucial question. The court listed the elements for consideration like the gravity of the offence, the penalty imposed, value of defamed vessel and the amount of the bond. Similar case like the Volga case (*Russia Vs. Australia*) was also considered.

Limitations of the Prompt Release Case

There are several limitations to the jurisdiction of ITLOS and other institutions dealing in the prompt release and provisional measures cases. These are set out in article 298. The state may declare that they do not accept compulsory dispute settlement procedures for certain disputes like maritime boundary determination, disputes involving historic bays or title, dispute over military activity and disputes in which U N. Security council is exercising their function. There are other limitation setouts in article 297 (Shukla, 2012).

So, exercise of sovereign rights by coastal states with freedom and right of navigation, over flight, and laying of submarine cables and pipelines are exempt under this provision. There are two optional exceptions to jurisdiction. The coastal state is not obliged to accept a dispute regarding nongranteeing of permission for marine scientific research in the EEZ or continental shelf. But this is subject to compulsory conciliation. Similarly, coastal state is not obliged to submit disputes relating to its sovereign rights relating to living resources in the EEZ like capacity to harvest conservation management of the resources and allocation of surplus.

Conclusion

There are many instances where powerful maritime companies refuse to accept compulsory dispute resolution procedure for eg. on *Philippines Vs.*

Peoples Republic of China. China refused to accept to participate in arbitration proceedings even though the tribunal ruled that it had compulsory jurisdiction and gave a verdict for Philippines. It is not Implemented so far (South China Cases). Similarly, the dispute between Irish republic and UK in the MOH plant case could not be settled due to objection of UK. Even though not directly related to law of the sea the advisory opinion of the ICJ in Military and paramilitary operations in Nicaragua suggests that countries which are powerful righter economically or military power can cause impediments to the functioning of international dispute settlement bodies. Hence it is a question to be debated whether the actual limitations and exceptions incorporated in the UNCLOS 3 are appropriate and reasonable.

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PRELIMINARY INVESTIGATION ON ENDOPARASITES OF NON-OPHIDIAN REPTILES IN ZOOS OF KERALA

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Abstract

This is the preliminary study on gastrointestinal parasites of non-ophidian reptiles of State Museum and Zoo, Thrissur and Thiruvananthapuram Zoo, Kerala. Coprological samples were taken from non-ophidian reptiles viz., *Geochelone elegans*, *Calotes calotes*, *Indotestudo elongate* and *Varanus bengalensis*. Out of the 12 samples, 50 % of the samples were found to be positive for parasites. Ascarids, *Enterobius* sp. and Oxyurids were the identified parasites.

Keywords: Captive reptiles, Endoparasites, Coprological

Introduction

Reptiles kept as captive ones in zoos, are collected from the wild at the point of their origin or are the offspring of wild caught animals (Ras-Norynska and Sokot, 2015). In nature, wild animals surviving in large areas have a low genetic resistance against parasitic infections because of low exposure. When these wild animals are kept in captivity in zoos, the problem of parasitic infections can worsen and cause a serious threat resulting in unexpected declines in abundance (Muoria *et al.*, 2005). Stressful life, concentration of animals in a small living space trigger, multiplication and spreading of parasites. Reptiles may carry diseases, which can be spread to other animals and even to humans (Dovč *et al.*, 2004). This is a preliminary study on the qualitative assessment of gastrointestinal parasites of captive non-ophidian reptiles of State Museum and Zoo Thrissur and Thiruvananthapuram zoo of Kerala.

Methodology

Faecal samples were collected during June to November 2017 from 4 species of non-ophidian reptiles housed at State Museum and Zoo, Thrissur (10°31'N, 76°12'E) and Museums and Zoo, Thiruvananthapuram (8°30'N, 76°57'E). Approximately 3-4 gm of non-desiccated reptile faecal samples were collected from State Museums and Zoos of Thrissur (n =6) and Thiruvananthapuram (n = 6). A total of (n = 12) samples were collected in labelled containers and kept at 4°C till processed.

Direct Smear, Faecal floatation, Shaether's sugar floatation and sedimentation technique was used for faecal examination (Wolf *et al.* 2014; Soulsby 1982). Parasitic elements (eggs, oocysts and larvae) were counted, photographed and identified in accordance with the guidelines published (Schneller and Pantchev 2008).

Results and Discussion

This is the preliminary study on gastrointestinal parasites of non-ophidian reptiles of Thrissur and Thiruvananthapuram zoo. Coprological samples were taken from non-ophidian reptiles *viz.*, *Geochelone elegans*, *Calotes calotes*, *Indotestudo elongate* and *Varanus bengalensis*. Out of the 12 samples, 50 % of the samples were found to be positive for parasites. Ascarids, *Enterobius* sp. and Oxyurids were the identified parasites. (table 1). Earlier studies on endoparasitic infection of snakes of these zoos by Radhakrishnan *et al.*, 2009 revealed that 88% the snakes were infected. Positive measures undertaken by zoo authorities have improved the situation in these zoos. Studies in Zoos of Italy by Papini *et al.*, (2011) showed 57% of captive-bred reptiles were infected with parasites. This could increase to over 90% in the case of animals taken from the wild which are at higher risk of being infected with parasites of

complex life cycle (Milhaca *et al.*, 2007; Adeoye and Ogunbanwo, 2007). Even low-grade infection should not be neglected and conducting epizootiology surveys are necessary to study the prevalence of parasitic infections. There is a need for detail epidemiological investigation on the prevalence of gastro-intestinal parasites in captive wild animals with respect to season, age, climate etc. Based on the prevalence of gastro-intestinal parasites and administration of desired anthelmintic drugs to the captive wild animals periodically coupled with better sanitary measures, we would be able to reduce the parasitic infection in the zoos.

Table 1. Prevalence of various parasites in non-ophidian reptiles of State Museum and Zoo, Thrissur and Thiruvananthapuram zoo.

Host	Total no. of samples analysed	No. of infected samples	Percentage (%)	Parasites identified
State Museum and Zoo, Thrissur				
<i>Geochelone elegans</i>	3	2	66.66	<i>Ascaris sp.</i>
<i>Calotes calotes</i>	3	1	33.33	<i>Enterobius sp.</i>
Thiruvananthapuram Zoo				
<i>Indotestudo elongate</i>	2	1	50	<i>Ascarids</i>
<i>Geochelone elegans</i>	3	2	66.66	<i>Oxyurid</i>
<i>Varanus bengalensis</i>	1	0	0	-

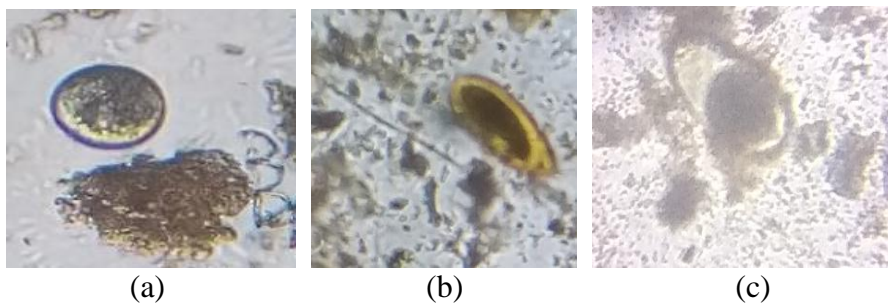


Figure 1. Gastrointestinal parasites identified from non ophidian reptile samples (a) *Ascarid* egg, (b) *Enterobius* oocyst (c) *Oxyurid* egg

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