VOICES:
A NATIONAL RESEARCH ANTHOLOGY ON NORTHEAST INDIAN ENGLISH POETRY

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(Under the aegis of Jawaharlal Nehru College, Arunachal Pradesh and Khatra Adibasi Mahavidyalaya, Bankura, West Bengal)

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CHAPTER-8

MYSTICISM AND MAMANG DAI'S *RIVER POEMS*

-Dr Chandan Kumar Panda

Mysticism is a kind of perception which observes the phenomenal world in a different light. It arrives at a meaning which is not ordinarily noticed. The phenomenal undergoes a subjective transformation. The ordinary reaches the height of epiphany. Mamang Dai in her *River Poems* represents the phenomenal world of Arunachal Pradesh in a mystical manner. This mysticism is not a choice. It happens. The collocation of the natural beauty of Arunachal Pradesh and its deep-rooted connect with the people and the language in which she embodies those takes her poems to a different height. At that height, her poetry seems mystical. Most interestingly, with Dai the narration of the actual assumes a different dimension. In her word pictures there seemingly coexists a sensibility which renews the givenness of things. The given receives a kind of significance which bears the instances and indications of mysticism. Therefore, this paper intends to explore the dimensions of mysticism in her *River Poems*.

In Dai's mystical experience, river essentially is the substratum. Its geographical and cultural significance in the lives of the natives adds substantially to her poetic perception. Dai's aesthetics of river emanates from her deep biological and cultural engagement with the natural environment. Her constant companionship with that environment both as an onlooker and a

participant inspires her art. She writes what she sees and experiences. The empirical and the intuitive connect with nature determines her poetic representation. In that science of representation, her language sometimes crosses the border of mimetic logic and becomes mystical. This act of becoming is driven by spontaneity and the depth of experience. The intuitive intimacy with the phenomenal inspired by the convention seems to have given her the necessary imaginative elevation to reach the borderline between the metaphorical and the mystical. In "The Missing Link" Dai refers to the Siang River which topographically acts as a connecting link between the Tsangpo river of Tibet and the Brahmaputra of Assam. In her poetic narration, the river which glides curvatuously from the ancient land of red-robed men suggesting Tibet and Buddhism seems to have mystically been glistened by the "fire of the first sun". The light of dawn graces the river with the beauty of illumination,

... the great river that turned turning
with the fire of the first sun,
away from the old land of red robbed men... (2004, 11)

In Dai's romantic perception of nature, there persists a poetic proposition of immanence of divinity. She makes this proposition amply verifiable in her "River Poems":

The sun brands the eastern mountains.
The flash summer revealed/intricate nature,
divinity in trees... (2004,13)

The intuitive perception of divine pervasiveness in nature is itself a romantic and mystical. Mysticism does not necessarily mean the foregrounding of the divine essence. Mysticism also pertains to a kind of iridescence that prevails in nature. The observation of that iridescence is not a common perception. It requires a degree of deep involvement with nature to notice that dimension. The rhetorical question she presents in her poem "Ties" concerning the breath and sweetness of nature suggests her oneness with nature:

Who brought me back/ to taste the mountains,
the breath of these hills, at sunrise to sip
the sweetness of this light? (2004, 14)

The Cartesian scientific logic of human-nature dualism and the Enlightenment project of radical divisionism which prevail until today in the domain of critical humanities get the befitting critique from Dai. In her humanist and ecosophical thinking nature-human cohesion or conciliation finds the finest expression. This acceptance of cohesion is extended to the point of acknowledging the presence of universal being and of time in nature,

In these hills,
the centre of being,
one by one
voices are extinguished. (Dai 2004, 14-15)

The beginning and end of human time is encoded in the being of nature. The voices that receive amplification and the

voices which whimper anchor their destiny in nature. The fragility of human existence - from 'is' to 'is not'-and human contingency are etched in the primordial being of nature. The lack of self- realization and modern human commitment to artificial advancement seems to have widened the human-nature divide. In the existential philosophy of Dostoevsky, one notices the increasing human alienation from that oneness of universal being,

> ...the isolation that prevails everywhere... has not fully developed, not reached its limit yet. For everyone strives to keep his individuality as apart as possible, wishes to secure the greatest possible fullness of life for himself; but meantime all his efforts result not in attaining fullness of life but self-destruction, for instead of self-realisation he ends by arriving gat complete solitude. (1950, 363)

The mysterious envelope of nature housing spirits is presented in the poem "Rain":

> In the sound of rain
> is contained
> all the spirit of the jungle. Living, breathing
> crushed, regenerative
> dark, always watchful. (2004, 25)

Human civilization at the edge of nature remains unaware of its depth. In the same poem, she rejoices the therapeutics of

nature. Nature heals. Nature-human binary is unnatural. There is no such borderline between the nature and civilization. Human civilization is nature and in nature. The categorical dualism is a scientific construct. In Dai's poetic vision nature unburdens. It heals by its beauty. The assortment of beauty and healing smell and sound relieves the senses dulled by worries and anxieties. This curative dimension of nature is not an accidental one. It is a design. On the curative dimension of nature, Rousseau writes in *Emile*,

> For want of knowing how to cure himself, let the child know how to be sick. This art takes the place of the other and is often much more successful. It is nature's art. When an animal is sick, it suffers in silence and keeps quiet. Now one does not see more sickly animals than men. How many people whose disease would have spared them and whom time by itself would have cured have been killed by impatience, fear, anxiety, and, above all, remedies? I will be told that animals, living in a way that conforms more to nature, ought to be subject to fewer ills than we are. (1979, 55)

Nature is never a victim of chance. Chance is an itinerary in the human catalogue. It dominates the human world as the latter is characterized by ambitions and aspirations. Where there is ambition there is pain. Pain is the consequence of the non-

fulfilment of ambition. The world of nature does not inhere ambition. The matrix of fulfilment and non-fulfilment and their intersecting conflicts hardly disturb the design of nature. The nature of nature is to reveal. It reveals its beauty. The beauty that nature so gracefully manifests is to heal humanity from the anxieties of existence. Teleology and causality govern nature. The graceful manifestation of nature's beauty bears teleology of enhancing human happiness. The beautiful nature serves the purpose of producing an ecosystem which aims at providing happiness at every step of human development. But conversely, such a unique design of nature is overlooked by the humanity that sets its goal on achieving something other than happiness. Happiness which should have preceded every human endeavour seems to have become an outcome. There is enough happiness by sheer looking into the grace of nature. It seems that such a vision of happiness is absent in modern human perception. The joy that nature ensures is never found elsewhere. The calm and assertive beauty of nature finds no comparable. The poet feels herself filled in nature:

In the rain the camellias bloom.
The incense of pine
fills the sense again.
Again, the scales are balanced
between joy and pain. (2004, 25)

The immediacy of nature's grace is an urgent requirement for the safety of human civilization. The latter seems to be

corrupted by untameable greed. The same urgency is equally felt by Arne Naess who describes the indispensability of nature for human peace in *Ecology, Community and Lifestyle: Outline of an Ecosophy*, "When we go into nature, we often hear that there 'one can be oneself. This seems to imply that one isn't pressured by nature, one is left in peace'." (1898, 62)

In a mystical experience, the apparently contraries complement each other. The poet perceives the fragrance of light that captures the horizon. It is not an ordinary perception. This perception is constituted by the beauty of difference. The fragrance is never a property of light. But in the eyes of a mystic, the alogical becomes the logic. Science does not determine a mystic's vision. Dai may not be a mystic in the conventional sense of the term. However, she does not need the formalism of mysticism to testify her art as mystical. The language of her poetry, primarily of her narration of nature, expresses a certain depth of feeling which borders on mysticism,

There is a fragrance of light
that travels the horizon,
a ghost of tenderness that glids the sky.
Like a secret inhalation,
when I remember,
the sky covers the world
in a stealth of longing. (Dai 2004, 28)

The depth of longing changes the perception of the poet. In that height of ecstasy, the environment undergoes an

epiphanic makeover. The tenderness of longing extends to the tenderness of the external world that envelops the poet. The stitched boundaries are torn apart. A sameness of experience both within and without forms a totality. The sense of a totality is mystical. Dai's poetry does not suffer from obscurity or abstraction because she does not deliberately try to be a mystic. Mysticism in her poetry is a product of her deep emotional engagement with nature. Nabina Das contextualizing Mamang Dai's poetry in the article entitled "The Body is the Sum of Its Parts" published in *Economic and Political Weekly* writes, "The direction NE poetry take are, therefore, those of a shaman in search of the elemental."(2014, 85) Friedrich Holderlin, the German poet, in his poem, "The Archipelago" shares similar perception of nature and for him nature is that vital force which connects the phenomenal world in a string of unity,

> Life, all of life, has filled with the sense of God
> And everywhere nature returns to her children,
> the old
> Fulfilment returns and as if from a hill of springs
> Blessings water the seedling soul of the people. (1990, 34)

In the poem "Small Towns and the River" Dai speaks up the inherence of soul in river. River, being a phenomenon of nature, inheres a soul. It is not just a water body governed by gravity. For every human civilization a river holds a decisive cultural significance. For the animistic traditions, river is not only a life-line but also a physical incarnation of the universal

soul. The school of pantheism believes in the immanence of divinity in the various phenomena of nature. Dai seems here more of a pantheist as she perceives the presence of spirit in nature. The beauty of nature signifies the inherence of the subtle reality of soul. The mist that clings to the mountaintops and the water that flows in the river share the same soul, "The river has a soul." (2004, 29) In the same poem, the poet discusses the destiny of the human soul while describing the death rites. In the animistic traditions, the sun is not only the centre of the heliocentric universe but also the god from which the universe sprang from and to which it goes. Following the same argument in the context of the people who follow the animistic culture, the human soul comes from the sun and returns to it after the completion of its duration. In some of the tribal death, rites is placed pointing to the west. The logic apparently is that the western horizon symbolizes in the geocentric conception the setting of the sun and the closure of the day. In the western horizon the sun sinks in order to rise in the east. The setting coincides with rising. The sun sets to rise so does the human soul. The implication of placing the dead in the direction of the west is to help the soul to complete its circle by rising again. The soul walks into the house of the sun which is in the east. This seems to be the animistic belief in the trajectory of the human soul and its teleology of mingling with the sun in the eastern horizon. The sun being the house of the souls explains the religious importance of nature:

The dead are placed pointing west,
When the soul rises
it will walk into the golden east,
into the house of the sun. (2004, 30)

In the animistic traditions, nature is believed to be sacred. Therefore, it is worshipped. The rivers, the sky, the mountains, the stars and the trees and animals are taken to be sacred. The fact of their sacredness makes the ecological balance intact. The daily interaction with the phenomena of nature with fear and reverence strengthens the native bonding with nature. Revering nature as a cultural imperative is one of the beauties of animism. The cultural regulatory against human violence upon nature pacifies the human instinctual urge for domination. Dai's cultural experience of the sacredness of nature seems to have impacted her mystical vision. Mamang Dai in her essay "On Creation Myths and Oral Narratives" discusses what constitutes the aesthetic essence of the North-East:

> The North-east region of the country is known for its scenic beauty, and most the stories here focus on its myths of creation: the birth of mountains, stars, good and evil, and the birth of man; and those stories convey a sense of grandeur in concept and feeling. (2005, 4)

In the poet's mystical experience, the mountain seems to be an earth woman rising in her attempted height to reach her sky-lover, "The mountain is a disguise/of earth woman rising to

meet her sky lover." (Dai 2004,31) The earth swells in love to meet its blue lover. In the tradition of nature mysticism there has been recurrent efforts to establish this equation between the earth and the sky. They have been humanized in terms of adding the love motif into it. The mountain and the sky form a love-unity in mystic literature. Their proximity and distance entail the variability of love.

The poem "Sleepwalking" seems more of a modern poem. However, it has a line that seems to be one of the fascinating lines she writes, "The wind is a gesture of love." (44) In the lovers' discourse wind bears a gesture of love. Relation gets murkier as habit brings casual indifference. Love turns sour when the lover expects it to exist beyond its duration. But in nature there exists neither duration nor expectation. Therefore, love remains. Nature holds enough suggestions of love. Only a mystic can witness the inherence of love in nature. The music of love that nature untiringly presents needs the ear to relish. The ears of a mystic capture them. Pain is the effect of the pursuit of permanence in the contingent. Seeking in human love the permanence of a feeling is a painful choice. A mystic does because she feels every nerve of nature. The experience of a presence in nature that is felt by Dai and her attempt to humanize it bear certain similarity with William Wordsworth. Wordsworth in his perception of nature finds a presence. He discusses that in his poem "Lines written a few Miles above Tintern Abbey":

And I have felt
A presence that disturbs me with the joy
Of elevated thoughts; a sense sublime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns,
And the round ocean, and the living air,
And the blue sky, and in the mind of man,
A motion and a spirit, that impels
All thinking things, all objects of all thought,
And rolls through all things. (2010, 51)

Quite similarly and with characteristic philosophical complexity Spinoza in "Short Treaties on God, Man and his Well-being" defines nature:

UNDERSTANDING: I for my part consider Nature only in its totality as infinite, and supremely perfect, but you, if you have any doubts about it, ask Reason, she will tell you.

REASON: To me the truth of the matter is indubitable, for if we would limit Nature then we should, absurdly enough, have to limit it with a mere Nothing; we avoid this absurdity by stating that it is One Eternal Unity, infinite, omnipotent, etc., that is, that Nature is infinite and that all is contained therein; and the negative of this we call Nothing. (2002, 46)

Dai's perception of divine inherence of nature and her leanings towards mysticism share similar thought process. Wordsworth, Spinoza and Dai though belonged to different time and geography shared a thinking that placed nature at a high

ground of divinity and sacredness. May it be Spinoza's rational perception of nature or Wordsworth's and Dai's imaginative; there prevails a commonality of understanding which recognizes the supreme importance of nature in the human-nature continuum.

In "Enigma" Dai narrates the beauty of nature that inspires madness. The golden beams of the slanting sun on its westward journey transform the earth by the magic of light and offer the impression of the earth as a vast mustard field. The entire horizon looks so mystical by the paint of yellow. The maturing sun tilts to sink spreading mildly its yellowed elegance. The maturing beauty of the sun towards the closure of the day suggests not the onceness of this beautiful expression. It tempts the earth for an unalterable repetition. In nature beauty is not contingent. It remains. But on the contrary the human beauty is time's gift. It is in a state of transit. It comes to go permanently. It neither remains nor gets stuck. In nature beauty is not a gift. It is the essence. In nature beauty is not an attribute or a quality. The poet leaps with joy at the sight of that splendid view and nurtures the delight of participation. The joy that maddens the heart of the poet seeks union with that beautiful phenomenon. This is mysticism. A mystic joins that melody of light by the sheer delight of her vision. A mystic is not just an onlooker. She participates in that ecstasy of light by the power of her imagination:

The yellow mustard is a field of gold.

The slanting sun promises to return
tilting the day like a temptation.
Facing this splendor
the heart that is madness
chooses to return to its enclosure.(2004, 56)

In "The Balm of Time" the poet presents her faith in animism and pantheism. She declares her faith in the presence of spirit in nature. The world of nature is not governed by accident or chance. There is immanence of a spiritual principle which inspires its physical manifestation. The animistic tradition divinizes the phenomena of nature. It is a cultural ecosystem which houses many gods. The elements of nature are animated presences. The forest faith that believes in the cultural binaries of good and evil and the presence of the spirit in nature and the beautiful dawn first to show its face giving the impression of a dream world is the faith that the poet ascertains her faith in. Dai's mysticism springs from her profound faith in nature. This profundity of faith transforms her vision of nature:

Yes, I believe in gods.
In the forest faith of good and evil,
spirits of the river,
and the dream world of the dawn. (2004,57)

She feels in the wind voices and hears the whisperings of spirits.

In "Days" Dai refers to a village that freezes in deep winter. Winter fills it with snow. It makes the landscape look

shiny and vibrant with cold. The scattered presence of snow among the trees offers the illusion of laughter:

Sparkling clear cold.
Laughter among the trees.
In the snow frozen villages
there were those days. (2004, 74)

The poet here seems recollecting those days spent in some village which got petrified at night with the bitterness of cold. Those ash cold mornings seem to have brought to the poet some sad but indispensable memories. However, her nature narration seems quite animated. But the smiles of those old women in that same petrified village speak to the poet their deep intimacy with the land. Revering nature may look pagan to the eyes of the Abrahamic religions but in the words of the poet the hills and the rocks and the rivers are full of life. There is eternity in them. People may change and may also change their culture. The rivers and hills once worshiped may later be called pagan but nothing changes the beauty and divinity of nature. The nomenclature may go on shifting with the change of culture but nature does not change with culture. In Dai's words nature continues to exude the radiance of eternity. The life and spirit in nature continue to pulsate even with the change of culture. The transition in culture does not coincide with the transition in nature. Human civilization undergoes change with the introduction or imposition of different variables of culture but nature hardly follows these variables. Nature does not pursue the cultural logic of a people or

a civilization. It follows the logic of unchanged continuity. Culture by its nature is subject to change but nothing can inflict change in nature. Its change is its continuity. Seasons change but they change to continue. Therefore, Dai in her undying reverence for nature observes the cultural transition in terms of dislocating the human faith in nature but the attitudinal change cannot alter the divine inherence in nature:

And now
the smiles of old women
tell me,
in these pagan hills
full of God's/living rock
and the eternal river, ... (2004, 74)

A mystic humanizes nature. The artificial and rational subject-object divide loses its clinical nature in the mystic's love for union. A deep bonding is arrived at. The mystic feels herself integrated with the cosmic oneness. The oneness of everything is the primal cosmic design. A mystic fulfils that design. Dai's humanist and pantheistic approach to nature embodies enough suggestions of her role as a mystic. The dark hills appear impenetrable and mysterious. Clouds flirting with moon and brooding of nature over the creation and the moon spreading silvery whiteness giving the illusion of winter in summer, the arms of summer and the voices of dawn are some of the experiences which are apparently mystical. These are not commonplace experiences. They suggest the poet's mystic

vision. In the alchemy of mysticism nature does not remain just an objective exterior. It develops a perception that unites the phenomenal world with one thread of interdependence and mutuality. The inner coherence of things gets articulated in that perception. The vision that borders on mysticism includes every aspect of the universal being. In that vision of coherence, the oneness of universal ego is realized. In Dai's poetry nature is not just an ocular perception. It involves her complete being. Therefore, nature seems so animated in her poetry.

Human-nature integration seems more vital and apparent in tribal communities. Their constant companionship with nature and the genuine awe and reverence that they cultivate for nature suggest a kind of strong ecological bonding. That bonding is not just superficially and ostensibly orchestrated in the tribal rigid and elaborate rites and rituals. Nature is the most primary and primal presence in the tribal ritual. Such ritual ostentation may sound a kind of strong ecological correctness that those communities maintain. Ecological correctness is not a theory for them. It is part of their culture. Therefore, Dai calls the people who live in close contact with nature as children of rain, "We are the children of the rain/ the cloud woman..." (Dai 2004, 79) In the tribal consciousness nature is the source. Nature has always occupied the role of a mother. Nature is the giver.

To conclude, it seems that in Dai's poetry there is a strong poetic urge towards mysticism. In her narration of nature there persists a will to intimacy with nature. Her narration does not

seem to be objective. Her deep subjective engagement with nature expresses her profound emotional bonding. The language that she uses often makes attempt to humanize and divinize nature. The intimate language that she uses to depict nature bears indications of her approach to mysticism. In her ecological vision nature is not just a protective membrane for the human existence. Nature is a presence. It inspires and guides humanity towards a sustainable environment of unity. With nature she constantly seeks an interaction. That urge for interaction seems quite compelling in her poetry.

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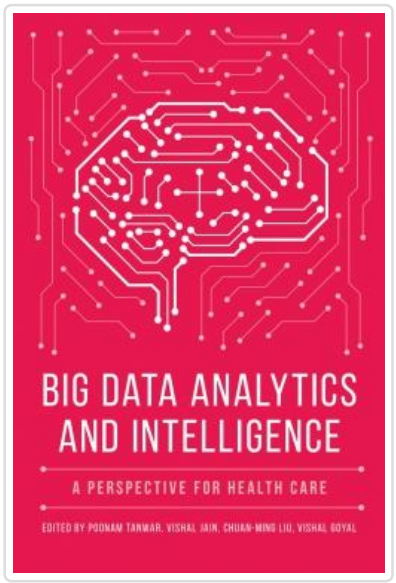

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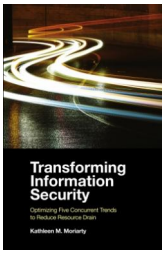

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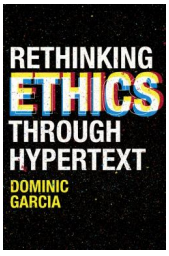

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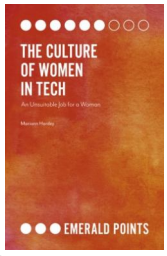

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Dynamics of Knowledge Management in 4IR Through HR Interventions: Conceptual Framework

Arindam Chakrabarty and Uday Sankar Das

Abstract The world economy has been remaining captive to the exponential growth of knowledge. The concept of knowledge is diversified and multidimensional which essentially includes theoretical constructs, experiential learning, incepts of laboratory results, models and of course its ability to adapt changes. In fact, knowledge economy should be ideally the fusion of indigenous belief and practice and transformation of scientific know-how. The world has witnessed rapid transformation both in society knowledge system and industrial revolution. The twenty-first century has emerged as the torchbearer for fourth industrial revolution which can manifested in designing machines, gadgets that can be embraced with auto-guided instructions, artificially par excellence with human intelligence. The aspiration of fourth industrial revolution (4IR) demands higher order of knowledge, big data analytics and continuous improvement in R&D outcomes. So, it has become emergent to concentrate on the threshold level of knowledge management practices in the transforming economy. This paper has focused on how the interrelations among the level of industrial revolution, knowledge management and transformational HRM practices include KASH protocol using conceptual modelling.

Keywords Knowledge management · 4IR · Human intelligence · Transformational HRM practices

1 Introduction

The progression of knowledge management has been carried away through a long journey. The organization began to understand that human being cannot be compared with machine as a part of neoclassical theory of management. In the beginning of

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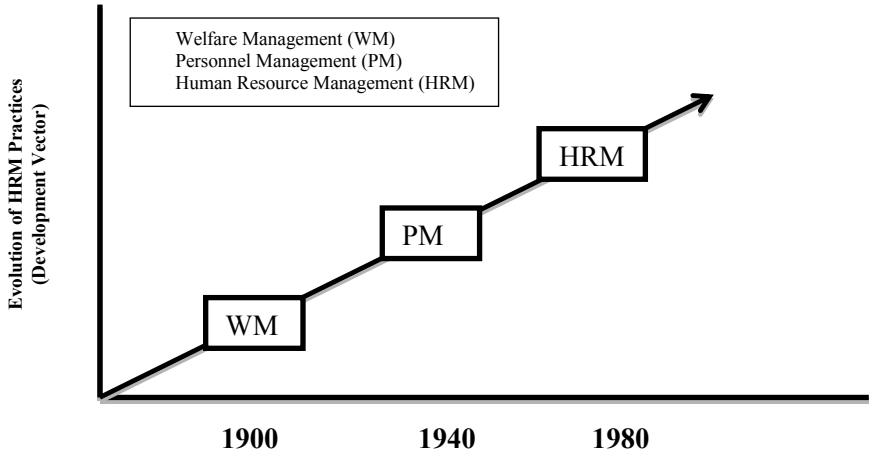
twentieth century, the concept of welfare management had been practised by few organizations which paid a special attention on the welfare measures of workers in the factory, but the experience of welfare management practices had not been complacent as it was desired. Prior to the Second World War, the idea of personal management emerged roughly in 1940s which concentrated on measuring performance of labour on various scales, even though this school of thought never recognized the labour as human resource. The importance of training development OD interventions organizational culture climate had not been given due weightage. From 1980, the organization started to implement human resource management over throwing the erstwhile mechanistic and dogmatic view of management. HRM has been evolved as an organic orientation that recognizes and respects labour force as a dynamic resource that can be appreciated over the period of time with the augmentation of knowledge, skill and experiences. The twenty-first century has revolutionized with the advent of superior level of technological advancement. The knowledge-driven economy has been witnessing with a new paradigm, i.e. generation of new idea, product, process, with the succession of high rate of obsolescence. It becomes faster as we proceed towards the present time.



Adapted & Modified from [1, 11, 13]

With the advent, progression and popularity of 4IR, the organizations have explored to recognize the imperative of knowledge management practices at the beginning of twenty-first century. This brings the accumulation of vivid information robust technology and big data compounded with the application of AI, ML and block chain technology, etc. Today, the construct of knowledge management is not confined in accumulating functional super specializations rather it has extended to endless interactions among various dataset from various domains in a multi-varied assortment of knowledge basket with multi-criteria decision-making (MCDM) protocol [14]. This envisages numerous innovative opportunities and new directions that lead to explore knowledge-led dynamic problem-solving mechanism.

1.1 Evolution and Understanding of Knowledge Management

Contemporary business writings have extensively focused on knowledge management and have curated it as a contemporary theoretical discipline and shifted the focus of organizations from tangible products and goods to intangible assets focused on performance and profitability in this competitive environment. Knowledge management has opened up the opportunity to add renewed strategic growth in any business organization [2]. A study 'Emerging Practices in Knowledge Management' conducted by the American Productivity and Quality Center of the USA points out six key strategies of a firm for practice of knowledge management (KM). From a business strategy point of view

1. As a tool to transfer best practices.
2. As a customer-oriented tool.
3. As discipline for personal development.
4. As a tool for intellectual assets management.
5. As a tool for knowledge creation and innovation.

Prominent fortune 500 companies like 'Dow Chemicals' and 'Texas Instruments' were also a part of this survey [6]. KM focuses on gathering of useful knowledge or for the business process so that the employees can readily access knowledge. It also helps to secure specified well-defined set of knowledge practice by preventing from use of inappropriate knowledge. KM is research intensive and involves application of organizational learning capacity over competitive advantage in the long run. Evolution of KM intervention can be categorized into six broad stages which can be further rationalized as depicted below.

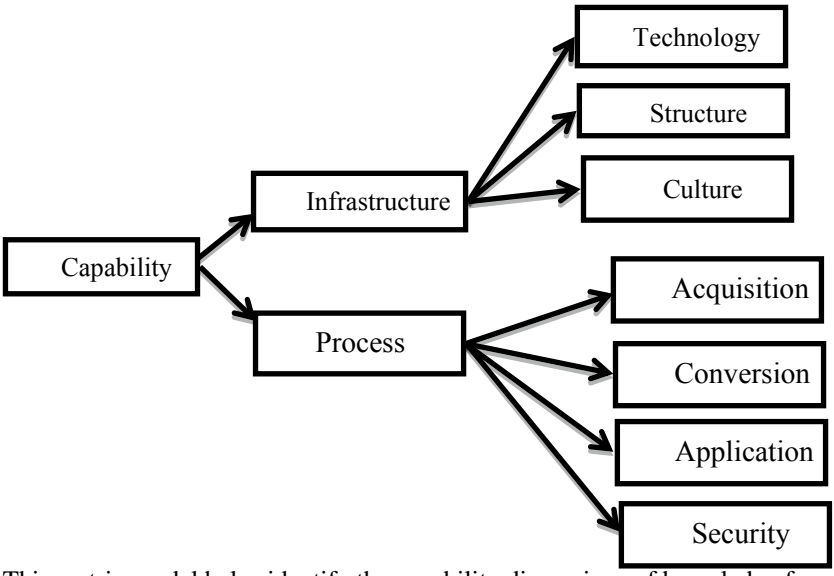
Six broad stages	Rationalization of stages
Initiation	KM initiation
Adoption	
Pilot implementation	
Organic growth	KM development
Organizational implementation	
Diffusion	KM maturity

The factors determining the evolution of KM are classified into knowledge self-efficiency, open communication and mutual benefits [4]. The example of companies like Dow Chemicals which is a treasure trove of unorganized intellectual property, whose main business is to earn royalty through licensing of technology and information highlights the importance and needs of knowledge management in order to organize this other wile piled up disorganized knowledge for profit maximization [6].

1.2 Dimensions of Knowledge Management

The knowledge management can be referred in two perspectives, i.e. in terms of capability dimensions and quality ontology. The capability dimension can be broadly categorized into two sub-dimensions, i.e. infrastructure and process. The attributes of infrastructure may include technological led ecosystem, other resources and support facilities structure, culture. The process matrix may comprise acquisition, conversion, application and security. This has been illustrated in the figure mentioned below:

Capability dimensions	Attributes	Meaning
Infrastructure	Technology Structure Culture	Organize fragmented knowledge in an organization Leverage of technological architecture Encouragement of employee interaction
Process	Acquisition Conversion Application Security	KM process of knowledge acquisition Utilization of the existing knowledge Application of knowledge Knowledge protection



This matrix model helps identify the capability dimensions of knowledge framework and its subsequent branch entities [3]. A conceptual frame work is proposed to manage the quality dimensions of KMS based on the environmental factors and its effects on the same. The resultant framework consists of 36 items grouped into the eight dimensions of KM namely Functionality, Completeness, Reliability, Usability, Access, Serviceability, Flexibility, Security [7, 9].

1.3 Knowledge Management Is an Extension to HRM?

The spectrum of innovation has immensely expanded the ambit of HRM capabilities. The incidence of continuous innovation in every filed of HRM like selection, performance management, training & development etc. has made phenomenal changes to bringforth new directions and domain of thought processes as outcomes that are assimilated in the organizational ecosystem and practiced by the successful mediations and interventions of KM by means of development, dissemination and application of knowledge [8]. Collaborative and holistic practices of KM-induced HRM essentially enhance the uniqueness of organizational competency preferably the knowledge protocol, which positively signifies the association with the extent of innovations not the other way around, i.e. knowledge HRM (KHRM) has no impact on innovation excepting to mediate between collaborative HRM as transformational change agent [5].

1.4 Knowledge Management in the 4IR

There is symbiotic relationship between knowledge management and the progression of 4IR. The fourth industrial revolution has been continuously expanding the knowledge sharing platform so that it can move forward endlessly in consonance with the rapid research and development outcomes. From the beginning of twenty-first century, the world of technological research largely dominated by splendours of electronic gadgets, IoT, machine learning, block chain technology which facilitates to generate record process and interpret the large volume of data which is popularly known as big data analytics which primarily solve the problem by means of various modes of descriptive, predictive and prescriptive data analysis. All these development vectors in the technological framework and high yield application mechanism to solve complex problems have essentially deserved the transformative knowledge management initiatives in the organizational set-up.

2 Objectives of the Study

1. To propose a logical model to understand the interrelationship between progression of industrial revolutions ab initio and individual firms' aspirations for bridging knowledge gaps.
2. To develop a conceptual framework for understanding interrelations and interactions among industrial progression (4IR), knowledge management and transformational HRM practices using HRM competency model.
3. To devise the knowledge-dominated KASH protocol in HR interventions in congruence with the progression of industrial revolution.

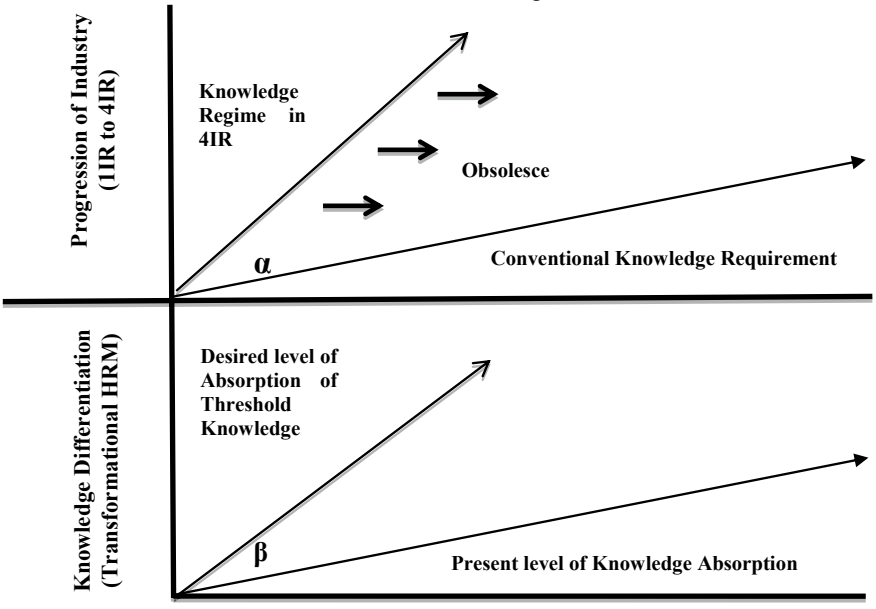
3 Research Methodology

This is an exploratory study through which it is attempted to understand the premises and fitness of knowledge management in the emerging 4IR ecosystem. The paper has been designed referring various research papers, reports and suitable application of strategic evaluative protocols widely practised in the academia and the research world.

4 Analysis and Interpretation

4.1 Analysis & Interpretation—I

According to Watson [12] knowledge is regarded as an ability to utilize information in order to add value and influence the decision-making process. It is imperative that the organization should adapt the terminal level of knowledge in a useable form so that there should not be much deviation of standards between industry and firms in terms of creation, transfer and utilization of knowledge [10].



$\alpha \propto \beta$

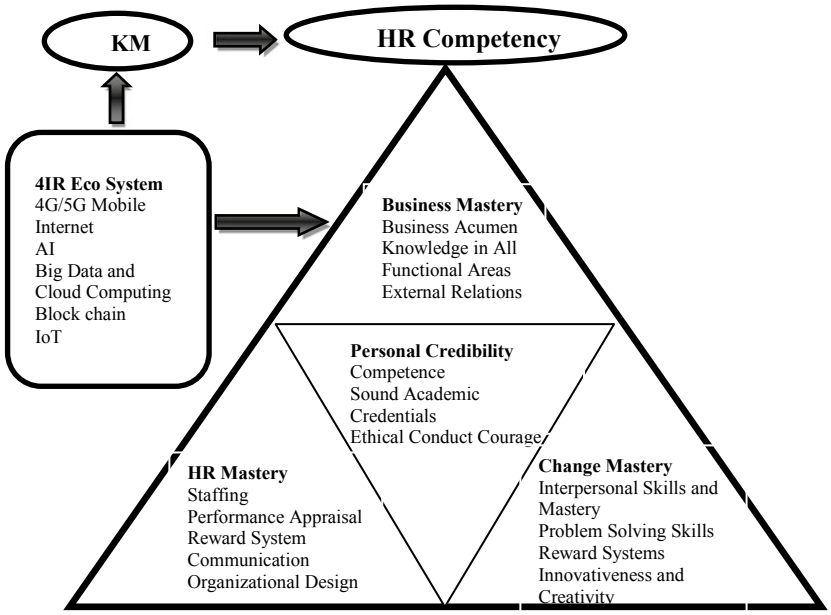
Model developed by the Authors

The journey of industrial revolution has been largely manifested by the voracity of knowledge which has emerged thorough the continuous process of innovation. In the comparative two-dimensional matrix, the angle (α) between conventional knowledge requirement and knowledge regime in 4IR increases with the fact that

'knowledge regime in 4IR' would tend to incline to Y-axis with the passage of time. Similarly, the angle (β) between the 'present level of knowledge absorption' and the 'desired level of absorption of threshold knowledge' must escalate in proportionate with the time spend and experience gathered. For every organization to survive in the dynamic environment and technological development, the angle α and β must be proportional and highly correlated in order to signify that the organization would remain competitive as it enjoys competency in the incremental knowledge-dominated industrial revolution. If the organization fails to achieve this synergy, it would literary cease to exist. The upsurge of 'knowledge regime in 4IR' tends to incline towards *Y*-axis which makes the curve stiffer enhancing the value of angle α. As a result of that, it forces to dissociate the previous knowledge set to become obsolete as depicted in the model.

4.2 Analysis & Interpretation—II

The progression of knowledge intends to augment the process of industrial revolution (IR). The set of ongoing innovations essentially land up with a new age and phase of IR; thus, human society moves forward from the primitive era of 1IR to the most advanced knowledge-driven industrial revolution popularly known as Industry 4.0. The industrial environment essentially influences the appropriate inducement of knowledge that can generate higher order of competency uniqueness for the firm. In order to explore these opportunities, the firm needs to invest on high-end resources as well as procurement of superior human resources that can augment and transform the change management initiative at possible encounter. The new era of knowledge management imbibes the HR policies to encourage and promote the best talents to acquire so that the culture of learning organization can perpetuate with higher acceleration as in tune with the expectations of the relevant industry.

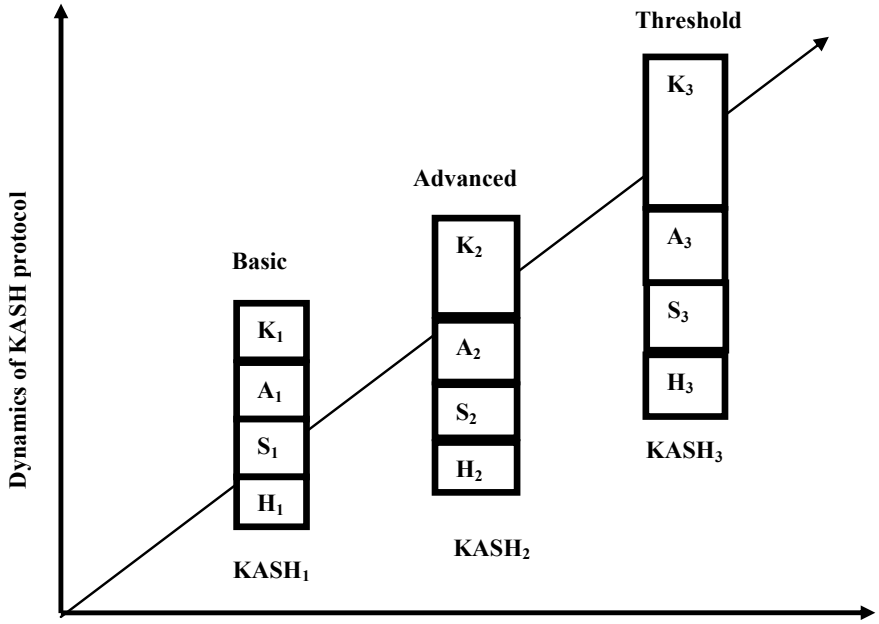


Model developed by the Authors in corporation HR Competency Model adapted from Human Resource management by Christopher Maybe, et. al., Blackwell Business, p.31

The model has been developed to project how the industry environmental factors reign enforces the firm to prioritize knowledge management which can be trickled down even at the bottom of the pyramid in the organizational hierarchy. This holistic development vector has to be inundated by the dynamic HRM practices as depicted above.

4.3 Analysis & Interpretation—III

The basic function of HRM revolves on its effective strategies human resource planning, performance management and human resource development which also interacts and correlates each other. One of the important approaches to address the HRM functions may be the successful manifestations of Knowledge, Attitude, Skills, Habits (KASH) protocol.



Model developed by the Authors

KASH denotes the assortment of four components: Knowledge (K), Attitude (A), Skill (S) and Habits (H) which are primarily required for a certain position of an organization in a mutually exclusive manner. KASH differential matrix examines the differentials of each component with respect to the deviations from the actual level of performance from its desired/expectancy module.

The firm always looks at the KASH differential matrix as illustrated below.

KASH components	Desired KASH set	Actual KASH set	KASH differentials (D~A)
Knowledge (K)	K_D	K_A	K_D~K_A
Attitude (A)	A_D	A_A	A_D~A_A
Skills (S)	S_D	S_A	S_D~S_A
Habits (H)	H_D	H_A	H_D~H_A

~ Sign of difference

If ($K_D < K_A$) or ($K_D = K_A$), i.e. the knowledge set desired is either lesser or equal to the knowledge possessed by the existing professional, no training need is identified / required. In general cases, K_D happens to be greater than K_A that means, the desired knowledge is greater than the actual knowledge possessed by the concerned employee that symbolizes the specific requirement of knowledge, i.e. identification of training need on specific knowledge domain. The firm would attempt to minimize the $[K_D - K_A]$ by means of appropriate HR interventions. Similarly, other **KASH** components can also be described. The most feasible 'K', 'A', 'S', 'H' combinations are generally encouraged for achieving desired HR objectives. With the growing influx

of knowledge management, the appropriate '**KASH differential matrix**' needs to be formulated, giving increasing weightage on knowledge components as per the dynamic demands of 4IR and so on.

5 Conclusion

Experiential learning and Research & development generate new idea product process for the welfare of mankind. The benefits of such illustrious development can reach to the people if it is implemented effectively and efficiently. It is a turn for the industry in general and the firm in particular to adapt such changes by augmenting advanced knowledge management protocol. The transformation process needs appropriate HR interventions that can only ensure this transition in an accelerated change management initiative. This paper has presented conceptual framework to understand the interrelations and interventions of KM and transformational HRM through along the progression of industrial revolutions more precisely 4IR ecosystem.

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E-learning in Higher Education in India: Experiences and Challenges—An Exploratory Study

Kiri Taso and Arindam Chakrabarty

Abstract The world community is committed to achieve 17 goals popularly known as United Nation Sustainable Development Goals (UNSDGs) of which education has been given major thrust that has been earmarked in Goal 4. As a member country, India has also attempted to address the issues of education with highest priority that is envisaged by the responses of the government for drafting New Education Policy in 2019. The government is committed to achieve inclusive education that needs the manifestation of e-Learning platform. Since it is difficult to bring the elephantine population under the ambit of conventional education system, this paper has attempted to explore the experiences and challenges of e-Learning mechanism in the higher education system of India.

Keywords E-Learning · UNSDGs · New Education Policy · Inclusive education · Conventional education

1 Introduction

E-Learning can be defined as an online educational learning process. It can simply be understood as 'Internet-Based Learning'. It is an online learning service through which teaching–learning process is carried out. In other words, e-Learning refers to 'the mode of teaching and learning via Internet and website'. E-Learning is adopted by an institution to let the students learn from home and far distance through online mode which would make the teaching–learning process more approachable and convenient to some extent. E-Learning is primarily the network-enabled practices of skills and information transfer between the online learners and resource providers.

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E-Learning refers to the using of electronic application and processes to learn. 'E-Learning can be in other words understood by means of learning through electronic way by adopting modern means of technological learning. E-Learning can be understood as the network-enabled transfer of skills and knowledge to individual as well as masses. It is opposite to offline and non-electronic means of teaching and learning practices (www.economictimes.indiatimes.com/definition/e-learning). Henceforth, the use of computer–desktop and laptop, mobile and tab and other means to deliver teaching–learning process through the use of Internet source can be simply known as e-Learning. To some extent, we can say online learning (e-Learning) is gradually doing away the traditional learning methods.

Concept of ICT:

Information and Communication Technology (ICT) in the field of education is a significant concept to understand. The various curricular developmental projects have been carried out under the assistance of IITs and NITs. The National Mission on Education initiative by the Government of India is expected to boost the Gross Enrolment Ratio (GER) in Higher Education by 5 percentage (%) points during the Eleven Five Year Plan (2007–12). This Mission has two major components which are (i) Content Generation and (ii) Connectivity—along with a provision to provide devices to institution and learner. Besides that the Mission also seeks to provide computer infrastructure and connectivity to over 18,000 colleges and nearly 400 Departments at Universities and Deemed Universities and Institutions in India for a greater national cause. It also provides interactivity and problem-solving approach which will be addressed through the program called 'Talk to a Teacher' Segment.

2 Electronic Learning or Usage of e-Resources Learning

Massive Open Online Course (MOOC):

MOOC is an online course which committed to provide 'Massive' and 'Open' online learning platform via the web. The MOOCs system of learning begins in the year 2001 at the USA. And it became a trendy approach of learning since 2012 onwards (The New York Times, 18 April 2014).

And the below table shows the students admitted in Coursera enrollees:

Sl. No.	Country/region	Percentage (%) Approx
1.	Russia	2.3
2.	Australia	2.4
3.	Canada	3.5
4.	UK	4.5

(continued)

(continued)

Sl. No.	Country/region	Percentage (%) Approx
5.	Spain	4
6.	India	8.7
7.	Brazil	5.2
8.	USA	27.6
9.	Contribution of the different part of the world	42

Source Coursera Enrolees

SWAYAM

The main goal of the SWAYAM is to deliver quality and reachable educational learning prospect to every needed person specially the underprivileged and unreachable section of society. The SWAYAM actually strives to acts as link for those students who are digitally divided and untouched by e-Learning or Digital Revolution process. The indigenously developed IT platform enables the SWAYAM to propagate all the courses that are being thought by the best teacher in the country and are being made universal access to anyone and at anytime at free of cost.

The programmes and features that offered in SWAYAM are giving education from class 9th to postgraduate n which they offer courses like Science, Engineering, Management, Humanities, Mathematics, Arts and Recreation, Commerce, Language, Education and Library courses, etc., given below:

How to access SWAYAM?

SWAYAM can be accessed through two major ways as follows:

Sl.No.	SWAYAM can be accessed through
1	One can access the SWAYAM portal on the web through https://swayam.gov.in
2	One can also access the SWAYAM mobile apps for—***Android and iOS version***

Source SWAYAM, GOI and Swayam learning portal

Review of Literature

Cox [4], (pp. 85–105) explains the necessity of e-Learning which enhanced our understanding on learning and Information Technology (IT) in teaching and learning process in order to have a clarity and consistency of subject and further highlights that although the young generation has wider access to Information Technology (IT) little is known about this impact on their learning process. There is also a need to balance between the formal and informal uses of e-Learning.

Dewan's [5] study reveals that 80% have computer, 80–67% and 20–33% have no computer. Thus, a better infrastructure is required in institution to provide e-Learning curriculum to the e-Learner.

Rana and Lal [7] highlight that there is need of conventional and holistic approach in educational system which will meet the demands of e-Learners at schools, colleges and universities level. The e-Learning institution with the help of World Wide Web (WWW) via Internet tried its best possibilities to promote distance education, virtual and e-Learning approach by delivering and sharing resources, promoting active e-Learning technologies.

Rosenberg [8] says that e-Learning enables us to understand and deals with different web-based contents for teaching–learning process.

Longmire [6] emphasised that 'an e-Learning approach includes a wide range of digital and computer-based learning mechanism'. He further states that e-Learning content is mainly conveyed via Internet, satellite communication, audiotape and videotape, DVD, CD-ROM and TV and still emerging so-called wireless application protocols (WAP).

Agarwal and Nisa [1] focus on the knowledge process outsourcing sector of India. Authors highlight the scenario which had witnessed the rapid change from 'industrial to knowledge-based economy'. Both also highlight the Skyrme [9] and Stiglitz [10] views on 'how the highly skilled labour force is the key to achieved success in the knowledge-based economy and industry'.

According to Tripathi and Jeevan [11], the paradigm shift in teaching–learning process (traditional to e-Learning) is perhaps due to rapid evolvement made in the field of Information and Communication Technology (ICT).

Ali [2] states that the exponential advent in the field of ICT and Internet has greatly influenced and revolutionised the way the knowledge is broadcasted.

3 Objective of the Study

The paper contains the following objectives:

1. To explore various e-Learning portals operating in India.
2. To explain challenges in implementing e-Learning mechanism for effective teaching dissemination process.

4 Analysis I

Due to the emergence of many well-financed institutions which later link with some of the top universities like Udacity, Coursea and edx, etc., at this period, the year 2012 was regarded as the 'The year of MOOCs' as per The New York Times (2 November 2012).

5 Popular e-Learning Firms/Platforms in India: Indicative List

The emergence of cloud computing technology has highly impacted the Online Education Market in India. The cloud technology with its potential capabilities provides a significant amount of data, information and content at single platforms to e-Learning Companies in India. Due to data saving scope, it is easier for the users and providers to procure, manage access and process the information from anywhere and anytime. Another important reason behind the growth of e-Learning markets trends in India is the rising popularity of big data and learning analytics. The technology enables the companies and institutions to provide online courses to the learners. The e-Learning markets due to its significance potentiality and effective results attract many learners to be aware and opt e-Learning courses. This rising awareness on online learning scope has pushed the growth of online education markets in India. The involvement of Information Communications Technology (ICT) in the field of teaching–learning process has led to the increasing demands of alternative educational approach of learning, which provides significant opportunities for growth of the e-Learning companies in India via digital platform. Thus, it is forecasted that Indian e-Learning markets potentiality will be expanded up to US$18 billion by 2022.

E-Learning Institution in India in 2019:

The emergence of cloud computing technology has highly impacted the Online Education Market in India. Due to data saving scope, it is more easier for the users and providers to procure, manage, access and process the information from anywhere and anytime. Another important reason behind the growth of e-Learning markets trends in India is the rising popularity of big data and learning analytics. The technology enables the companies and institutions to provide online courses to the learners. However, it is forecasted that Indian e-Learning markets potentiality will be expanded up to US$18 billion by 2022 (www.technavio.com).

1. **BYJU'S**: BYJU'S is a learning app founded by Byju Raveendran. In 2019, it has a total net worth of $5.4 billion (Rs. 37,000 crore). This firm has efficiently created a K12 learning smartphone app which offers highly effective, adaptive and active engaging learning programmes. This Edetech app not only provides effective tutoring programme at school level but also efficiently delivers a e-Tutoring to various other competitive exams like IIT-JE, UPSC, CAT and GRE, etc.
2. **IGNOU**: IGNOU stands for *Indira Gandhi National Open University* a Central University which is located at Maiden Garhi, New Delhi. It was established in the year 1985. It has a total enrolment of over 4 million students with 67 centres across the country, the reason why it is regarded as world's largest university. The university serves under the motto of—*The People's University*. IGNOU was founded to serve universal and accessible quality higher educational opportunities in India through the means of *Distance and Open Education*. IGNOU offers 226 academic programs like Diploma, Degree and Certificate courses such as

School of Social Science, Sciences, Education, Engineering and Technology, Management Studies, Computer and Information Sciences, Health Sciences, Law, Journalism and New Media Studies, Vocational Education and Training, Foreign Languages and Performing and Visual Arts, etc.

3. **Dexler Education** (2001): It is located in Bangalore (India). The Dexler Education primarily deals with digital education and consultative services in educational sector. The company provides industry-based e-Learning education solution for corporate learning, talent and faculty management and enhances easier mode on e-Learning. Along with its inventive and skilled e-Learning tactics in delivering quality education to the needy students and organisation, the Dexler Education acquired certain position among the highest e-Learning institution in country.
4. **The Educomp Solution (1994)**: It is in Gurgaon and an Indian-based company. Its aims to replace the traditional way of learning with more advance and smarter way of teaching and learning. Educomp Solutions is ranked among the best e-Learning companies in India. As there is saying—*the numbers speaks*, there are 30 million learners across and 65,000 schools in Educomp Solutions in two decades.
5. National Institute of Information Technology (NIIT-1981): It is situated in Gurugram (India). NIIT provides various kinds of e-Learning courses such as managing, self-learning and instruction training, etc. NIIT is specialised in providing knowledge to certain domains such as corporate, skills and career and schools learning groups. NIIT also offers necessary e-Learning facilities to the deserving and socially challenged and deprived students to certain extent.
6. **Edukart** (2017): It is also listed among the top online educational learning companies in India. Edukart is one of Indian higher education enrolment platform for e-Learner. It is an e-Learning entrance coaching site that provides online learning services to the educational seekers. Edukart also offers admission to certain curriculum such as Diploma and Degree Courses along with Entrance and Certificate, etc. Edukart has linked with some well-recognised educational institution in India like Indian School of Business, National Narsee Monjee Institute of Management Studies-School, etc.
7. **Simplilearn**: It is also one of the top e-Learning platform in San Francisco, California (USA) and Bangalore (India). The Simplilearn also delivered various e-Learning programmes such as cloud computing, digital markets and cyber security course, etc., to the online learner. This institution today achieved successful position among the successful online educational institution in India.
8. **Zeus Learning (ZL)**: It *is* also an online learning institution whose headquarters is at Mumbai (India). It occupies top ninth position among the top online learning institution in India. Zeus Learning offers various programmes to the online learner such as software and apps designing, training and solution for mobile and other technological system, etc.
9. **Meritnation**: It provides live online interactive and tutorial classes to the e-Learning seekers. It is an Edu tech start-up, which is a part or division of Applect Learning Systems based in Delhi (India). **Meritnation** is an online learning

providing institution that delivered various types of e-Learning approach to its e-Learner, so that there could be effective online teaching–learning practices.

10. **Excelsoft**: Excelsoft was founded in the year 2000. Excelsoft provides value courses, product and to cater to the needs and demands of all the key educational sectors like K12 learning system, higher education level, corporate learning, etc.

6 Analysis: II

The e-Learning system is vital for rapid teaching, learning and dissemination process but there are inherent challenges as well. A few key indicative challenges are mentioned below.

(a) Lack of uninterrupted power supply is one of the major issues in the online learning process. Since e-Learning system wholly depends on electricity, there has been frequent interruption in power supply that creates disruption in e-Learning process.
(b) Lack of Internet coverage across the country is another key issue to be addressed in order to provide better and quality digital learning capability of the learner of the country.
(c) Technical issues are yet another matter of concern since the entire process of e-Learning revolves around technology, and if there is technical issue that exists in the learning process, it will definitely hamper the e-Learning process.
(d) Lack of professional skills is another issue need to be redressed, as it requires a well-qualified and skilful professional person in the online education system. If the knowledge providers lack the professional skills, then it will again create problems in such teaching–learning process.
(e) Smooth e-Learning process is hindered by the inherent struggle for adaptability of computer skills. In this type of learning pattern, both the teacher and students need to have well versed in the field of computer technology.
(f) Lack of motivation, i.e. self-motivation is another important matter. Since it lacks face-to-face interactive methods, sometimes students remain unmotivated in their learning process.
(g) Reliability of e-Materials is another important concern, as we do not know the reliable source of materials that are being provided to the students.
(h) Most of the e-Platform is unidirectional. In other words, the learning process in the e-Learning process is one-way learning platform to most often. The learner most often did not get time to have face-to-face contact with the resource person [3].
(i) The e-Learning system also suffers from lack of personal or humanistic touch or human factor in the fields of teaching–learning pedagogy. E-Platforms suffer from real-time interactions, since classes are online in nature with time-specific guidance which makes difficult for the learner to attend the exact schedule classes which is another matter of concern for e-Learner.

(j) Lack of adequate e-Materials is another important issue where the learner may face certain problems. The e-Materials are developed as generic not specific to field of inquiry which lacks the flexibility learning capability or interdisciplinary knowledge of the learner.
(k) Huge initial investment for production, preparation and access of materials at the beginning.

7 Limitation of Study

The paper is developed to explore e-Learning practices in the higher education system of India. Since the e-Learning pattern is in the nascent and formative stage in the country, it is difficult to retrieve longitudinal database in terms of number of users, period of usage, qualitative aspect of e-Learning process, etc. So, this paper essentially suffers from adequate relevant information at this moment. However, the paper has attempted to outline the overview of e-Learning process in Indian higher education system.

8 Conclusion

This study can be regarded as a very foundation work in the domain of e-Learning intervention in Indian higher education system. The study indicates that the e-Learning process has gained momentum over a period of time, and it signifies that both the public and private sectors are contributing to this segment that can achieve the inclusive education model up to the extent of higher education level in India.

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Emotional Intelligence of Mid-Level Service Manager on Career Success: An Exploratory Study

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Abstract:
Career success has been visualized as an outcome of multifaceted variables that operate both intrinsic and extrinsic domain of organizational ecosystem. Emotional intelligence is the state of mind how a person behaves rationally and logically in variety of emotional setup. The impact of emotional intelligence varies with profile and level of jobs. The study shows that the higher EI is highly related to greater accomplishment of jobs as we proceed to superior job responsibility. In the organizational hierarchy, the mid-level professionals are in between and focal layer of both the top-down and bottom-up approach. The rapid changes of roles as a mediating agent between top management, lower management and at the same time to play the role of transforming agent of the instructions from higher-ups to the lower ends are the testimony of high emotional intelligence behavioural components.
The paper has attempted to unearth how the emotional intelligence are related to the career success particularly for the mid-level executives in the north-eastern region. This paper is empirical in nature based on primary as well as secondary information. The study result reflects that emotional intelligence has significant impact on achieving subjective career success among the respondents in the study region. However, the intensity of the impact (R^2 value) may vary with the changing prospective of organizational climate and other temporal factors.

Keywords: *Career success, Emotional Intelligence, Mid-level service manager, north-eastern region.*

1. Introduction

Career is a complex term, and different authors define it in different ways. In the past, people did not consider complex and important as now, and it was considered that when a person had a job, it was for a life long term (Bosionoles, 2004).

Career success has been defined as "the positive psychological or work-related outcomes or achievements one accumulates as a result of work experiences" (Seibert, Crant and Kraimer, 1999: 417). Mirvis and Hall (1994, p. 366) define career success as "the experience of achieving goals that are personally meaningful to the individual, rather than those set by parents, peers, an organization, or society". Dany (2003) provides an alternative theory, that people's definitions of career success are fashioned on an on-going basis throughout their lives, and subsequently change whenever changes in their personal lives have an impact on their priorities.

Career success is a result of a person's career experiences and involves the individual's evaluation of desirable work-related outcomes at any point during these experiences (Arthur et al., 2005; Gattiker and Larwood, 1990; Hennequin, 2007; Judge and Bretz, 1994;Poon, 2004).

Career success is of importance to individuals because of the positive outcomes (e.g., promotion, salary level, job satisfaction, and career satisfaction) associated with it (Judge, Higgins, Thorensen, & Barrick, 1999). It is also important to organizations because successful employees have the capacity to add value that influences organizational performance (Delaney &Huselid, 1996). For this reason, its prediction has attracted considerable research interest.

Mirvis and Hall (1994) define career success as "the experience of achieving goals that are personally meaningful to the individual, rather than those set by parents, peers, an organization, or society". Bozionelos (2008) defined career success expectation as the expected future achievements of employees in their work lives.

Boudreau, Boswell, and Judge (2001) define career success as 'the accomplishment of desirable work-related outcomes at any point in a person's work experiences over time.' Empirical studies on the assessment of careers based on the concept of career success all agree that it is difficult to define and measure career success. The reason is that career success cannot be objectively determined and cannot be measured solely using external criteria such as hierarchical position and salary level because several subjective factors also intervene. As a result, there is no consensus on what constitutes career success. Arthur, Khapova, and Wilderom (2005), in a comparative study of 80 papers, divide the existing literature into three groups: in the first group it is argued that objective career success affects subjective career success; the second attributes a predominant role to subjective career success over objective career success; and a third group of papers holds that the subjective and objective aspects of career success are interdependent. More recently, Dries (2011) provides a detailed review of the concepts of career success, which appear in the most relevant research studies on this subject, revealing a wide variety of definitions, measurement methods and determining variables.

1.1. Objectives of the Study

i. To identify the set of variables that can influence career success of professionals belonging to that segment using existing literatures.

ii. To study the effect of emotional intelligence on career success among the middle level managers in the study region.

2. Literature Review

Emotional intelligence can actually be more influential upon an individual's success in life (personally and professionally) than cognitive intelligence (Stewart, 2008). People with high levels of emotional intelligence abilities are more likely than who have less emotional intelligence to achieve high levels of success in their workplace. Specially, scholars have stated that social skills are necessary for executive level leaders; as individuals ascend the organizational hierarchy; social intelligence becomes a relevant determinant increasingly of who will and will not be successful (Carmeli, 2003). Emotional intelligence is also an important of personal relationships success, family functioning, and success in the workplace (Salovey, Mayer & Causo, 2002). It's found that the emotionally intelligence people have enjoyed more career success, feel less job insecurity, lead more effectively, are more adaptable to stressful events, possess better coping strategies and indicate greater sales success than those who have low emotional intelligence (Yousuf & Ahmad, 2007). Goleman focuses on the importance of emotional intelligence in general work success of people and achievement in their life. Other researchers since Goleman have claimed that emotional intelligence can predict important occupational and educational variables (Fisher & Ashkanasy, 2000). The importance of emotional intelligence to individual and career success can be explained by how important relationships have become in evaluating personal and organizational success (Robbins, 2005). Emotionally intelligence people are able to be effective in pursing the right career that is a career that matches the values, goals, and vision of the individual. Furthermore, it is believed that individuals who have high levels of emotional intelligence will have higher levels of job

satisfaction and organizational commitment, that will make both the individuals and organizations more successful (Stewart, 2008).

3. Research Methodology

The study was undertaken to understand the effect of emotional intelligence on career success among the mid-level managers from the service sector working in Arunachal Pradesh. The study was exploratory in nature with empirical arguments. The study was carried out using both primary as well as secondary information. For primary information a structured questionnaires were used to collect the data from the sample population. For secondary information appropriate domain literatures, various reports were used. Total sample size was 100 mid-level service managers, which have been collected from various sectors of service industries as per the convenience of the researcher.

The collected data were tabulated in the SPSS version 21 for the processing and analyzing of data. Descriptive statistics, parametric and non-parametric test were done to achieve the objectives of the study.

4. Analysis and Interpretation

4.1. Analysis-1

Table 1- Other set of variables influencing career success

`Sl. No.	Variables	Key Findings	Citations
1	Personality (5-factor personality trait)	Positive relationship between conscientiousness and career success.	*Judge et al., (1999);*
		Extroversion and its facets appear to be positively related to extrinsic career success.	*Rawls and Rawls (1968)*
2	Political Skill	The study was to investigate the relations between political skill (the overall construct and the four dimensions) and five career-related outcomes. It was found that the overall political skill variable was a powerful predictor, but that the predictive power of this variable was primarily driven by the networking ability dimension.	*Todd, S. Y. et. al. (2001);*
		Study outcome shows that stronger works councillors' political skill, the more successful they were in their career.	*Blickle et al., (2010).*
3	Gender	Gender has influenced on career success. Gender moderated the predictive influence of international experience on compensation, ascendancy, and perceived success. The findings also illustrate that career development models should be situated by (private versus public) sector and specify systemic gender differences in career success outcomes.	*Orser & Leck, J. (2010).*
4	Self-	Our results, based	*Kammeyer - Muell*

	esteem	on a cross-lagged regression design, suggest that self-esteem increases occupational prestige and income.	*er, J. D. et. al (2008)*
5	Mentoring	Mentoring includes coaching, support, and sponsorship, which provide the protégés the technical and interpersonal skills, and visibility opportunities that enable them to succeed in their careers.	*Whitely, Dougherty & Dreher, 1991*
6	Human capital	It is suggested that person- environment fit and organizational support are important antecedents of career success. Knowledge of career changes and these antecedents help individuals and organizations manage career success.	*Ballout, H. I. (2007)*
7	Networking	Networking is related to concurrent salary and that it is related to the growth rate of salary over time. Networking is also related to concurrent career satisfaction. As satisfaction remained stable over time, no effects of networking on the growth of career satisfaction were found.	*Wolff & Moser (2009)*

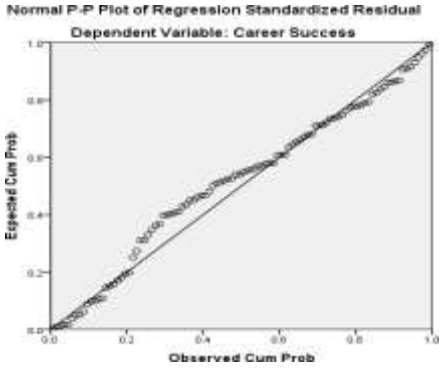
Analysis – 2

Table 2 - Correlations

		Emotional Intelligence	Career Success
Emotional Intelligence	Pearson Correlation	1	.328**
	Sig. (1-tailed)		.000
	N	100	100
Career Success	Pearson Correlation	.328**	1
	Sig. (1-tailed)	.000	
	N	100	100

**. Correlation is significant at the 0.01 level (1-tailed).

Analyzing the data set it is found that, there is a positive relationship between career success with emotional intelligence. However the correlation coefficient 'r' is 0.328 which is somehow lesser than the expected in consonance with established theoretical framework. This may be interpreted that study area is in the formative stage and number of middle level managers and number of firms belongs to organized sector are quite less even among the northeastern states so impact of emotional intelligence towards career success has not been adequately translated. However if similar studies can be conducted after 3 – 4 years it is expected that the value of 'r' would be more significant.



In the P.P Plot diagram, it is evidence that there is inherent consistency among the dataset. The outlier are not significant in the dataset.

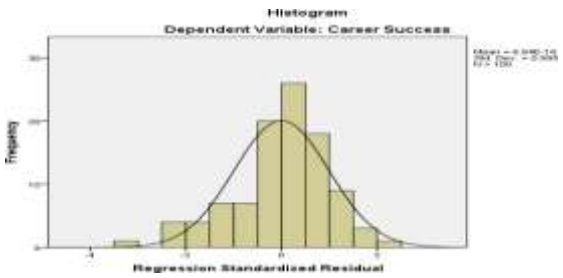


Table 3 - Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.348	.393		5.972	.000
	Emotional Intelligence	.346	.101	.328	3.443	

a. Dependent Variable: Career Success

Y = a + bX
Y = 2.348 + 0.346 X
Where,
Y = Career Success
X = Emotional Intelligence
a = Constant
b = Intercept

This shows the present dataset evidences that there is positive relationship between career success and emotional intelligence of the target respondents. Where, 'a' is 2.348 and the gradient is 0.346. This clearly indicates higher the emotional intelligence (Independent variable) that results higher career success which proves the assumptions.

Scope for further study

The present study can be extended in various dimensions to understand and integrate how emotional intelligence is closely related to career success. The study has been conceived based on the information collected from mid-level managers, which can be experimented with senior level or even entry-level officers. The study region was concentrated to within the state of Arunachal Pradesh. However, it can be extended to neighboring states or entire north-east India in order to widen the catchment area for data collection. In that case, the outcome of the sampling would be more representative and can comprise of mixed set of variations representing various sectors or industries.

Limitations of the study

The sample size in the present study is 100 mid-level service managers from Arunachal Pradesh. The higher the sample size shall ensure greater precision of the study outcome. The study suffers from the samples belonging to managers from manufacturing unit since the state does not have significant manufacturing establishment.

Conclusion

The present research work has demonstrated that there is positive relationship between emotional intelligence and career success among the mid-level service managers working in the North-Eastern state of Arunachal Pradesh. Emotional intelligence.. The results obtained are inconsonance with other previous studies. This shows that emotional intelligence is still the driving force that can manifest higher career growth even in a small nascent state like Arunachal Pradesh. The outcome of the study may be helpful for the organizations that they may consider and influence the importance of emotional intelligence among the top management for mentoring the subordinate managers for their respective career success.

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Fourth Industrial Revolution: Progression, Scope and Preparedness in India—Intervention of MSMEs

Arindam Chakrabarty, Tenzing Norbu and Manmohan Mall

Abstract MSME (Micro, Small and Medium Enterprise) sector constitutes more than 99% of private firms operating in India which generate crores of jobs across the country. In fact, the MSME firms aim to support the large companies either in the form of outsourcing partners for supplying raw materials, W-I-P or adding value to one or few processes as ancillary to the big establishments. However, in the growing competition and the market complexity, the MSMEs have to compete with the large firms. The world is emerging toward Fourth Industrial Revolution (4IR) which not only prescribes for automation, speed, and prompt delivery mechanism but also it attempts to duplicate Human Intelligence in the form of Machine Learning or Artificial Intelligence (AI). In the dynamics of rapid changes across the Industrial Ecosystem, it is emergent for the MSMEs to re-module its business directions. The threshold level technology needs to be transferred, absorbed, and adopted by the MSME firms so that the can play a meaningful role in today's knowledge economies. This paper has explored the Scope and Preparedness for the sector and has prescribed desired Policy Reforms to make the transition smooth, value-adding and resourceful.

Keywords 4IR · MSMEs · Artificial intelligence · Threshold level technology · India

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1 Introduction

1.1 MSMEs in the World

The contribution of MSMEs across the globe has been found highly significant particularly as a change agent for rapid socio-economic development [1, 2]. Research indicates that the MSME sector has a positive association with the economic growth and developmental indicators equitably both in developing and developed nations of the world [3, 4]. The sector has been instrumental to absorb a large pool of manpower directly or indirectly worldwide.

1.2 Indian MSMEs: Status, Scope, and Achievements

Indian MSMEs have the capacity of absorbing around 40% of the total workforce that contributes almost 45% of manufacturing outputs worth of around 6% of manufacturing GDP and reserves the share of 40% of total exports of the country. It is observed that around 94% of the firms belonging to the MSME sector are not registered even though the growth of this sector has been recorded at around 11% per annum which is more than the average GDP of the country in recent years [5, 6]. However, with the implementation of Goods and Service Tax (GST) in India, the unregistered MSMEs are compelled to enroll as a part of legal bindings. The MSME firms have been largely facing a series of problems and inadequacy which are mostly in terms of lack of availability of resources and opportunities leading to high-end inefficiencies. However, India witnesses a minuscule of MSME firms that are performing at par with the big corporates while the larger section of Indian MSMEs acutely suffer from Industrial Sickness or pro-sickness. The financial package extended to such sick firms would not be able to address the root causes rather offering some other set of benefits which might result in a favorable outcome [7, 8]. Most importantly, the industrial development is a function of the ease, access, and successful use of technological development. The MSME sector essentially needs the constant support for skilling of its manpower and technology led transformational business practice. Barring a few Medium and high performing firms, it is difficult for Micro or Small firms to afford continuous investment for technological upgradation. It is indeed a great challenge for the policymakers and the promoters these firms to have a full-proof solution for its survival, growth and sustainability.

2 Review of Literature

MSMEs are deemed to be an accelerator of economic growth across the world [1, 2, 9]. There is a positive relationship between the growth of MSMEs and the growth of the economy in many developed and developing countries [3, 4, 10].

MSMEs are the backbone of the Indian economy as they play a pivotal role by making a substantial contribution to the economy. They contribute around 40% of gross industrial value, 45% of the export and are considered to be the second largest employment generator in the country [9, 11]. Therefore, MSMEs are a necessity for the nation as they ensure innovation, revenue generation, and employment generation, etc. [12]. MSMEs, notwithstanding, face several challenges in India such as lack of tangible resources [13], HRM related issues [14], issues related to power, raw material procurement [15], lack of adequate financial assistance from Banks, absence of sophisticated technologies, scarcity of resources, and lack of skilled manpower leading to ineffective marketing [16].

3 Objectives of the Study

The present study endeavors to:

i. Study and understand the progression of the Industrial Revolution with a special focus on the Fourth Industrial Revolution (4IR).
ii. Explore the scope and emergence of 4IR in India with special reference to MSME sector.

4 Research Methodology

The paper has been conceptualized responding to the call of the hour about the emergence of the 4IR in the world and specifically in the Indian subcontinent. The paper has attempted to understand how the 4IR has progressed over a period of time which has been presented with the use of relevant and reliable secondary information. Since the country has been growing as one of the fastest economies of the world and also aspiring to optimize its demographic dividend, it has become imperative to understand the scope and emergence of 4IR and how the Indian MSMEs can play a responsible role as it caters to almost the entire Indian industries barring a few hundreds of larger firms.

5 Analysis and Interpretation

Analysis I

The Industrial Revolution (IR) began with a view to meet the demands of growing population in terms of supply of products. The primary sector has its limitation and highly concentrated on agricultural produces, handlooms, and handicrafts products. With the landmark invention of Steam based Power and Low Productive Machines and other tools, the First IR took place in the mid of the eighteenth century which continued up to the first half of nineteenth Century. With the pace of technological development in consonance with the growing demand for higher productivity, the Second IR started from the second half of the nineteenth century to the mid of the twentieth century where the sector emphasized on assembly line and mass production techniques to cater to the need of the population. In the later part of twentieth century, the industry was dominated by growing advent of electronics, instrumentation, and computational devices, IT and automation, it introduced a new age of Industrial Revolution popularly known as Third IR. This period of IR focused on higher volume of production with superior quality, precision, and Quality Function Deployment (QFD). In fact, Total Quality Management (TQM) appears to be the prime focus among most of the learning and large firms. The emphasis of Product Development has been shifted to achieving excellence in Process Development since the outcome of the lead processes essentially improvise creating higher quality of product. We are now in the era of 4IR where not only the Production Operation Systems are being modified through continuous improvement process as prescribed by Deming's P-D-C-A Cycle but the sector intends to replicate Human Intelligence par excellence into the devised mechanism in practice. The flowchart of the progression of IR consistent with the timeline has been enveloped in Fig. 1.

Analysis II

The new regime of IR has been propelled by outstanding advancement of satellite and wireless technology and its successful adaption among the population like Mobile Telephony, access to Mobile led Internet, use of high configuration platform like androids, etc. The wave of such advancement was highly appreciated and absorbed by the Indians particularly the Youth population of the country.

The tremendous growth of mobile and internet services have revolutionized the economic growth trajectory of the world and, of course, this is going to impact the Indian economy in the coming decades. The vivid penetration of Smartphone tremendously enhances the use of Mobile Internet as compared to Fixed Line Portals. This has made a growing propensity and user friendly internet access platform for the Indian users that resulted in greater participation in mobile led e-commerce activities across the country. This has motivated the Indian users to prefer new business model [17]. Internet economy of India is projected to double from the existing (April, 2017) 125 billion USD to 250 billion USD by 2020 at the behest of phenomenal growth in e-commerce/m-commerce of which the value of transactions would reach around 100 billion USD through digital platform. The ambitious project of Digital India

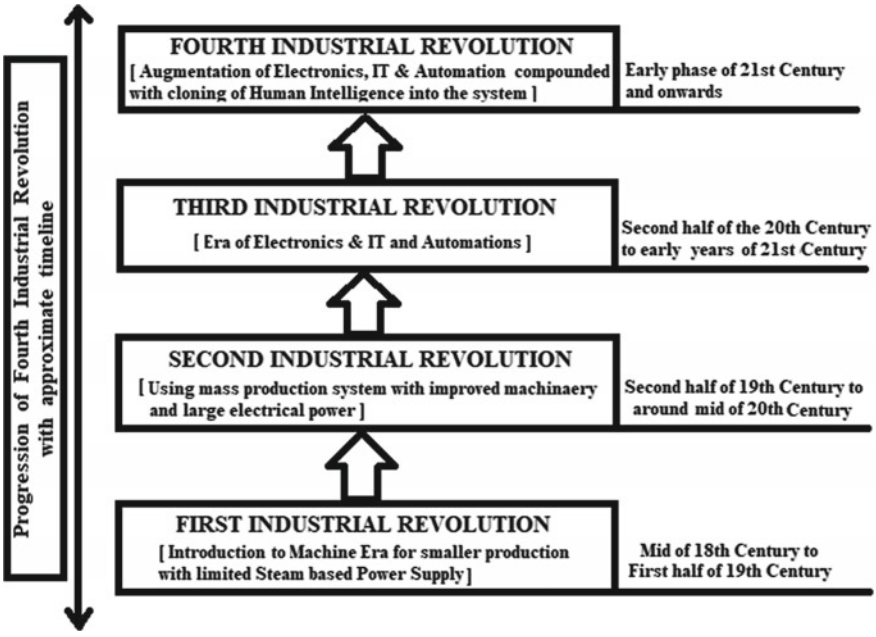

Fig. 1 Industrial revolution: journey ahead

Campaign intends to create online economy worth trillion USD by the year 2025 [18].

According to Worldometers—real-time world statistics, the present global population is around 7.6 billion of which it is estimated that almost half of the population are Internet users and surprisingly, around 50% of global internet users reside in Asia. Around 24% Internet users from Asia belong to India [19]. It is projected that the market potential for IoT devices in India would reach up to 9 billion USD by 2020 [20] as the country is poised to execute large scale IoT intervention projects to cater to its diversified reform policy [21]. All these above figures and observations signify that there is a growing market opportunity in creating, manufacturing and servicing IoT led devices in India which can be shouldered by the Indian MSMEs either as a support hub of large scale enterprises or the independent providers in the segment. This would depend based on the Competency Mapping of the MSMEs firms in terms of firm's core expertise, experiences, conformity of other value chain and the extent of absorbing and adopting new age technology within the least possible transition of time.

6 Recommendations

Based on the present study, it is imperative to understand the development of IoT led and other forms of digital ecosystem in the era of 4IR has been emerging as mammoth business opportunities where the MSMEs can play a leading role along with the larger firms. This transition needs certain policy reforms from the state as well as higher commitments by the enterprises operating in India since India is emerging as the fifth largest economy in the world and the second largest continent using part excellence technology. The sector can achieve enormous export opportunities in various countries of Asia, Africa and Latin America even a small segment of gulf nations since India enjoys a competitive edge over others in terms of its positioning as IT superpower, superior quality of human skill, competitive labor cost, and sustainable competitive advantage on the related domain trade. To achieve these agendas, the following recommendations may be incorporated:

1. The government should sponsor and organize massive skill development programs highlighting the necessary augmentations for creating devices related to IoT and other forms of digital and interactive ecosystem.
2. To reinforce the confidence among the smaller firms, the state may formulate time-bound financial incentives either in the form of tax exemption or extending case-specific subsidy so that financial aspect can be considerably supported.
3. The bank or Financial Institutions may be directed to promote firms for venturing into 4IR by allocating targeted budgetary provisions that should be disbursed in a time-bound manner.
4. The state must encourage Higher Educational Institutions like Universities, Colleges, and Research Institutes to take up innovative and need-based projects and applied research in the broader domain of IoT enabled devices so that the outcome of the research can move from lab to market. The present research has identified that people of India are keen to get IoT augmented high quality healthcare sector which can be prioritized along with other emerging areas.
5. Massive investment in the sector is essential in order to strengthen the infrastructure for delivering public utility services like health, education, Public Health Engineering (PHE), environmental protection etc., both in rural and urban areas of India in order to expedite rapid socio-economic transformation as prescribed by the United Nations' Sustainable Development Goals (SDGs).

7 Conclusion

The present paper is exploratory in nature which has been grounded by the latest dataset and information collated from most recent and reliable sources. The paper has attempted to showcase how 4IR has arrived and is knocking at the door. If we miss or delay to welcome, perhaps we would be compelled to invite ourselves to the

catastrophic consequence and would fail to get into the growth trajectory in the new millennium. India is about to encash its growing demographic dividends where it is inevitable to imbibe the youth with this new generation business model otherwise it would be detrimental to achieve the goals as doctrines by UN SDGs.

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Green Products in India as the Commitment towards SDGs: Initiatives, Prospects and Challenges

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Abstract

The global population is ignited to achieve the seventeen-goal agenda as mutually agreed at Paris Climate Conference (COP21). All the member countries have committed to achieve UN-SDGs by 2030. The global communities are now at the cross roads where they are expected to develop and deliver high configuration products to solve the complex problems and at the same time the global fraternity is very much concerned on the environmental issues. It is difficult to undermine any of this conflicting criteria green services, green manufacturing etc. have become the ultimate resultant solution. In fact green product is indeed a philosophy where we aim to minimize the adverse effect on environment without compromising the aspirations towards development vector. It is alarming that the natural resources are decreasing day by day and the human societies and other living organization are on the verge of extension if we do not stop massive exploitation of virgin resources. The global community is thriving towards renewable and reversible resources. The concept of circular economy has been emerging across the globe. It is high time to study and understand the status and preparedness of developing nations like India towards adapting green culture in the production and consumption pattern. The spirit of sustainability has been given top priority in all facets of developmental model. This paper has studied the scope of green products its initiatives and inherent challenges in Indian context. The study is based on secondary information retrieved from various reliable sources. This study has also enlightened how the global leadership has been excelling to promote green product within the state and beyond. This research work has suggested the state could boost momentum to the green product movements in India using positive reinforcement model instead of confining to negative reinforcement connotations.

Keywords: Green Products, UN-SDGs, Renewable and reversible resources, Circular economy, Green Culture, Positive and Negative Reinforcement, India.

Introduction

The world has been creating new products generating new ideas and services to transform quality of life. We are thriving after higher orders of comfort, convenience and contentment. Rapid technological advancement and commitments to research and development activities have been boosting to manifest our inherent gratifications. New ideas are being generated which ignite to develop innovative products. There are various stages and phases of production where there is need of extensive utilization of resources like raw materials water fuel, energy and so on. As a result the success of each production system consumes various forms of virgin resources and unintentionally it has impacts on environment. Most of the resources which are exploited and used for the production process are irreversible in nature. If we can imagine a set of production system that can minimize the negative impacts on environment and the outcome of system can be partially regarded as green product. However, the ambit of green product is not confined within the production process, rather it is extended throughout its life span i.e. how the product has value added to the society and finally its disposal once it cease to function. During the entire process it generates and releases pollutants and other hazardous elements, heat, which essentially diminishes the ecological balance which stands in contrast with the 'Brundtland Commission Report' on sustainability which defines sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." (Chakrabarty, A. 2019)

1.1 Concept of Green product

The term green product is ambiguous and it came into existence with the acknowledgement of business towards their commitment to sustainability, environmental aspects and use of renewable resources. This phenomenon gave rise to the labeling of corporate terminologies to include green in the nomenclature and formulate green strategies, green management, green innovation and green products

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etc. in the industry as well as academia. However there is no single dictionary definition of these terms and it can be loosely used for any products that was created using green technology, with minimum carbon foot print or used recycled material and renewable resources, and somehow contributes towards circular economy. In case of single use products it must be biodegradable and must not leech any harmful chemical into the surrounding nature.

1.2 Global Commitments to SDGs

Ever since its inceptions in October 24, 1945; the United Nations has been constantly focused on the development and living standards of the global community. This intention led to the formulation of MDGs or Millennium Development Goals in the year 2000 after the UN Millennium summit. MDGs had eight primary goals which focused mostly on Human rights, provision of basic infrastructure and create on of Human capital. The goals were manifested by earmarking the following agenda as follows: *Goal 1: Eradication extreme poverty and hunger; Goal 2: Achieving universal primary education; Goal 3: Promoting gender equality and empower women; Goal 4: Reducing child mortality; Goal 5: Improvement of maternal health; Goal 6: Addressing HIV/AIDS, malaria, and other diseases; Goal 7: Ensuring environmental sustainability; Goal 8: Exploring a global partnership for development.* The successor to Millennium Development Goals is Sustainable Development Goals (SDGs) which was adopted in the year 2015 by the United Nations General Assembly. The SDGs have a 17 point development goal focusing on both human capital improvement, contribution towards sustainable practices and adoption and propagation of green technologies that need to be achieved by the year 2030. The 17 SDGs are outlined below: *Goal 1: No Poverty; Goal 2: Zero Hunger; Goal 3: Good Health and Well-being; Goal 4: Quality Education; Goal 5: Gender Equality; Goal 6: Clean Water and Sanitation; Goal 7: Affordable and Clean Energy; Goal 8: Decent Work and Economic Growth; Goal 9: Industry, Innovation, and Infrastructure; Goal 10: Reducing Inequality; Goal 11: Sustainable Cities and Communities; Goal 12: Responsible Consumption and Production; Goal 13: Climate Action; Goal 14: Life below Water; Goal 15: Life on Land; Goal 16: Peace, Justice, and Strong Institutions; Goal 17: Partnerships for the Goals.* These goals also focus on environmental justice and propagation of peace and equality, amongst the participant nations.

1.3 Emergence of Green Products as a corollary to SDG

Five of the Seventeen goals of SDG focus on environmental sustainability as the means of collective commitments of the global fraternity. These are *Goal 6: Clean water and sanitation; Goal 7: Affordable and clean energy; Goal 11: Sustainable cities and communities; Goal 12: Responsible consumption and production; Goal 13: Climate action*; While one *Goal 3: Good health and well-being* is indirectly linked for improvement of good health and wellbeing. Water till date remains the core need of agriculture production; 70% of available surface water is consumed via agriculture and irrigation globally and 40 % of this is consumed by the OECD countries (World Bank, July 2019). As climate change is becoming prominent in major cities across the globe that experiences severe drought and acute water crisis. A news report published by the British Broadcast Company (BBC) in 2018 highlighted that 11 major cities across the globe face drought and is nearing to zero-day. Two more cities i.e. Chennai in India and Johannesburg in South Africa have joined this list in 2019 where the local municipal governments have declared water emergency and restricted all non-essential water usage. With the rapid expansion of cities and human migration from rural to urban areas, cities are constantly burdened with the need to create sustainable and healthy living spaces that runs on clean energy produced from renewable resources. The 'United Nations Food and Agriculture Organization' points alarming problem of food loss which is due to unplanned food production, inefficient transportation and irresponsible consumption.

Region	**Food loss data from Production to retailing (KG/Year)**	**Food loss data at Consumer end (KG/Year)**
Latin America	198	24
Europe	187	94
North America and Oceania	181	115
North Africa, West and Central Asia	181	31
Industrialized Asia	165	70
Sub-Saharan Africa	159	7
South and Southeast Asia	115	13

Figure: Adapted from United Nations Food and Agriculture Organization

Forests are store house of bio diversity and cages deadly and infectious diseases away from urban masses. A report published by the Food and Agriculture Organization points out that deforestation is the major contributor towards emerging disease like 'Ebola' as similar pattern was also shown by the study done on microbiology by the seminal work of Afelt et.al 2018.
All these indicative facts and trends essentially converge to concentrate on creating and consuming green product / services. The world is passing through a vulnerable and deplorable condition as it is sacrificing the set of virgin resources in order to fulfill the greed of human comforts. The concept of circular economy is gaining momentum so that the people of today can gratify its present needs without causing much threat to the ecological balance. The UNSDGs have categorically pointed out the aspirations and commitments towards sustainable consumption and production. This has explored the essence and emergence of green product / service in our living kingdom.

2. Literature Review

Environmental issues took to the Centre stage as economic activities and industrialization gave rise to growth of highly populated cities in the emerging nations. A large number of organizations are willing to participate in what is called green manufacturing despite the hurdles, challenges and barriers to achieve the same. There is an attempt to understand and help formulate strategic decisions at both national and globally for propagation of green technology. **(Mittal et al. 2013).**

In attempt towards adoption of green technology, green supply chain management plays an important role. It not just helps the company differentiate itself from its competitors and contribute towards it environmental commitments but also stay ahead of the curve by improving its distribution performance and successfully improve its business. India will significantly improve its EPI ratings once the rest of the organizations move towards these green technology and reduce its carbon foot print. **(Dheeraj, N., & Vishal, N. 1992)**

Calculation of carbon foot print or using input-output analysis, it is assumed if India can be regarded as a pollution haven due to the increase of export activities. Despite the presumed and prevalent norms of pollution haven hypothesis regarding developing countries India has moved far beyond this indicated assumption. **(Dietzenbacher, E., & Mukhopadhyay, K. 2007).**

The formation of NGT or National Green Tribunal which became operational in the year 2011 has played a significant role in pollution reduction and disposal of the cases related to environmental offense. The body has also helped preserve flora fauna and forests as they directly came under its jurisdictions. Environmental justice became a norm after the formation of NGT. **(Shrotria, S. 2015)**

NGT is a body constituting of technical as well as judicial experts who are equipped with the necessary expertise in deciding the course of cases given the vested power. There is a wider impact of the possessed scientific knowledge and it contribution to the decision making process by the five benches of the green tribunal. **(Gill, G. N. 2016).**

National Green Tribunal Act 2010 in India not only played a significant role in the creation of the NGT as a specialized body and silenced the debate by exploring the composition of judicial process. **(Nain Gill, G. 2010).**

A study among 204 Indian youth consumers proposed the conceptual model of eco designed packaging material based on the framework of theory of reasoned action. The study also showed the intentions, purchase decisions and willingness to pay for a ecofriendly product based on the financial capacity of the consumer which in turn will reduce the adverse effects of packaging. **(Prakash, G., & Pathak, P. 2017).**

Raising pollution and increasing fuel prices are the main focus for governments across the globe. The use of fossil fuel for the production of electricity is the prime source of pollution. These are an urgent need for the hybridization of power grids and use of mix source of energy like solar, wind and other non-conventional sources. **(Jamel, M. S., et al. 2013).**

Green marketing is a modern phenomenon where most companies have rebranded their products and started to remarket them as green products or environmental friendly. There is an increase of business due to the such targeted approach as the concerned consumers are focused on directing their purchase decisions based on the environmental concern. **(Mishra, P., & Sharma, P. 2010).**

Renewable energy sources are the long-term solution provider to the long facing energy needs of the mankind and developing nations. Use to non-conventional sources has the potential to reduce the energy crisis of India. There will be a need to increase 3 to 4 times of the total energy needs consumed today. 33 % of India primary energy consumptions come from renewable sources. In the last decade India has aggressively focused on switching over to non-conventional sources**.**
(Kumar, et al. 2010).

Use of non-conventional sources also comes with a risk when calculated using the whole value chain of the energy cycle. The material used in production, labour used, and the procedures implemented in the energy storage accounts to this whole chain. This is a relatively new discipline and therefore careful evaluation is needed. **(Inhaber, H. 1979)**

The consequence of the Bhopal tragedy led to the strict implementation of environmental regulations and stringent measures for environmental cases, and environmental justice. Corruption, multilayered enforcement, political interference and lack of public participation has wreaked the whole process. **(Gill, G. (2013).**

PIL is welcomed by the victim class people who don't have the strength to bear the financial burdens of the judiciary. NGT has played a tremendous role in fulfilling the alternate need to environmental justice via the PIL procedure. **(Khandare, J. (2015).**

The NGT act 2010 states the polluters pay the price in track with the international environmental policy and sustainable development goals. The NGT plays an important role towards achieving these international roles. The Indian context with special reference to international standards and commitments are explored. **(Gill, G. N. (2014).**

The role of non-conventional oil is explored using the USA oil production data as a validation method. The study showed more than 10 % sustainable growth of non-conventional oil production is needed for the decline of conventional oil within the next decade. **(De Castro, et al. 2009)**

With the strategic shift from cleaner process to greener products, firms have the opportunity to gain strategic advantage through innovation allowing them to differentiate using green manufacturing. Products face an environmental burden through its entire life cycle. There is a lack of comprehensive study when it comes to the study of impact of environmental foot print of a product. **(Sdrolia, E., & Zarotiadis, G. 2019)**

3. Research Objectives

1. To study the scope and emergence of Green Products across the world with special reference to India.
2. To explore the initiatives, prospects and challenges for promoting Green Products in the country.

4. Research Methodology

The present study has been conceptualized reviewing various literatures, secondary information like policy reports, dissertation, project work, etc. The research papers were extensively collected from reliable sources. The policy documents like UN-SDGs were also consulted. The study has attempted to understand how India is poised to actively participate in the Green Product Market. To the commitments of building sustainable world, it is an endeavor of the researcher to enquire the prospective roles of India Incorporation so that, it could achieve the rapid socio economic transformation with the commitment and compliance to global green movement.

5. Analysis and Interpretations

5.1 Analysis – I

5.1.1 In the era of global commitments towards sustainable developments, the firms are gradually inclining towards offering green products. The focus of the community has been shifting towards responsible use of resources in the spirit of sustainable consumption and production so that we should preserve the resources for the future generations without compromising the needs of the present. The concept of circular economy has been emerged both in letters and spirit. The 9R framework for circular economy and over all sustainability propound by Potting, J., et al 2017 are canvased below

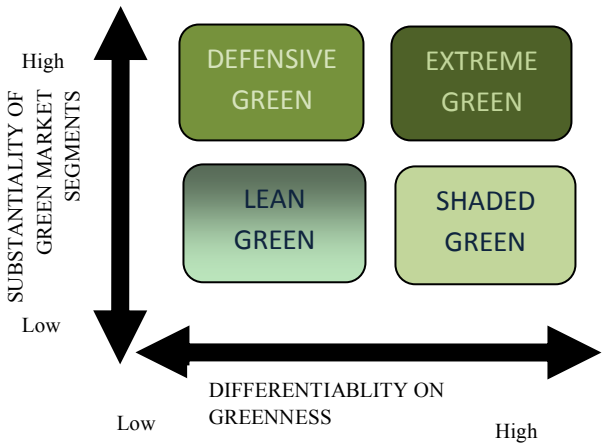
Smarter Product Use and Manufacturing	R0 Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1 Rethink	Make product use more intense
	R2 Reduce	Increase efficiency in product manufacturing or use by consuming fewer natural resources and material
Extended life span of product and its parts	R3 Re-Use	Reuse by another consumer or discarded product which is still in good condition and fulfills its original function
	R4 Repair	Repair and maintenance of defective product so it can be used with its original function
	R5 Refurbish	Restore an old product and bring it up to date
	R6 Remanufacture	Use parts of discarded product in a new product with the same function
	R7 Repurpose	Use discarded product or its parts in a new product with a different function
Useful application of materials	R8 Recycle	Process material to obtain the same (high grade) or lower (low grade) quality
	R9 Recover	Incineration of material with energy recovery

Adapted from Potting, J., et al 2017

5.1.2 With the growing popularity of sustainability issues and the 9R framework, it is important to know what has been promoting the organizations to adopt Green Marketing Policy. From various literatures the following indications are observed namely

- The prospective organization seems to incorporate green marketing policy in order to capture an emerging opportunities for achieving three corporate objectives [Keller, 1987; Shearer, 1990]
- The intending firms feels they have moral responsibility and social obligations in order to adapt green items in the product basket [Davis, 1992; Freeman and Liedtka,1991; Keller,1987; McIntosh, 1990; Shearer, 1990]
- There are growing compliances to adhere to government legislations as far as the promotion of green product for ensuring the practice of sustainable production and consumption; on the contrary intra rivalry within the Industry compels the firm to take up Green projects in their product marketing policies [NAAG, 1990]
- The intending firms find it difficult and costlier to dispose the wastages of non-green products. The prohibiting dimension to ensure regular and abandoned supply of resource material for producing non green items. All these inhibiting propositions force the firms for thinking and absorbing greenness concept in their product portfolio management. [Azzone and Manzini, 1994;].

5.1.3 According to Green Marketing Mix Strategy (Ginsberg, J. M., & Bloom, P. N., 2004), four strategic orientations have been earmarked based on the commitments and compliance at various elements of marketing mix i.e. product, price, promotion, place popularly known as 4PS of marketing (Kotler, P. 1980). in terms of substantiality of green market segments (Y-axis) and corresponding differentiability on greenness (X-axis) compounded with high and low intensity level in both the matrix, green marketing strategy can be categorized into four entities 1.Lean Green Strategy 2.Shaded Green Strategy 3.Defensive Green Strategy 4.Extreme Green Strategy



Adapted from: Ginsberg, J. M., & Bloom, P. N. 2004

In 'Lean Green Strategy', the firm achieves the commitment towards greenness in their product development, design and manufacturing while in case of 'Defensive Green Strategy' the firm is posed to achieve desired level of competency by incorporating eco-friendly and greenness construct in their promotion along with the commitment towards product design and manufacturing. In 'Shaded Green Strategy' the firm is expected to augment green pricing along with their ecofriendly orientation towards product and promotion. The 'Extreme Green' is the ideal form of marketing strategy where the holistic commitments towards achieving green ness and sustainability among all the four elements of marketing mix i.e. product price promotion and distribution. The 4PS of marketing are to be adequately incorporated and coveted with the broad spectrum of green culture philosophy and practices.

Green Marketing Strategy				
4P's of Marketing	**Lean Green**	**Defensive Green**	**Shaded Green**	**Extreme Green**
Product	■	■	■	■
Promotion		■	■	■
Price			■	■
Place				■

5.1.4 The National Geographic Society and GlobeScan, a research consultancy major, jointly conduct a worldwide Tracking Survey on Consumer Choice and the Environment every year. The survey essentially identifies the extent of consumer awareness affinity, commitments and practices eco-friendly culture in the line of sustainable production and consumption. The survey attempts to rank consumers in the selected countries, how the consumer form the respective nations respond to the call of sustainable development.

A comparative analysis to understand how the consumers at the selected countries are behaving towards sustainable consumerism has been depicted below based on GREENDEX overall score.

Comparison of GREENDEX OVERALL SCORES: Consumers with Respective Countries – 2008 & 2014

GREENDEX 2008		Overall Rankings	GREENDEX 2014	
Country	Score		Country	Score
Brazil	58.6	1	India	61.4
India	58.0	2	China	57.5
China	55.2	3	South Korea	55.7
Mexico	52.7	4	Brazil	55.5
Hungary	51.7	5	Argentina	55.4
Russia	51.7	6	Mexico	55
Britain	48.2	7	Hungary	54.8
Germany	48.1	8	Russia	53.3
Spain	48.0	9	South Africa	52.2
Australia	47.8	10	Germany	51.3
Japan	47.4	11	Spain	51.3
France	46.5	12	Sweden	50.9
Canada	46.3	13	Australia	50.4
USA	42.4	14	Britain	49.5
		15	France	49
		16	Japan	48.4
		17	Canada	47.2
		18	USA	44.6

From this above figure, it is observed that the both the emerging economies in the Asian block grab the top positions in the GREENDEX overall score (2008 & 2014) i.e. India and China and South Korea where India and china had been consistent both in 2008 and 2014 ranking. It is surprising to see developed nations like USA, Canada and France has consistent low scores among the selected countries studied in the survey.

The superior score of India in this Index signifies that Indian consumers are more responsible and responsive to the call of sustainable environment. The study pointed out that the growing number of Indian consumers are showing their commitment in the Housing Sub-index where they are practicing responsible usage of freshwater and energy conservation by using normal water for washing clothes. The growing propensity for switching over to solar energy is another dimension of Indian consumers towards saving conventional energy.

According to GREENDEX 2012 report Indian consumers reportedly prefer to choose green products among the list of 17 countries under studies, however it is also observed that they are still in ambiguity and confusion about the core value proposition of the green product.

5.1.5 According to Dupont Green Living Survey: India 2014 on 'Consumer Awareness and Adoption of Bio based Products in India', the study was conducted among 1270 respondents spread over in 12 major Indian cities.

The study found that around 67% Indian consumers are well familiar with green products out of which around 69% belong to younger generation. The consumers prefer to purchase range of product category like garments, household, hygiene & personal care that ideally should be made of bio-based raw materials as it essentially enhances the desirability of green Products.

The survey also revealed that there are differentials in terms of green product familiarity at the four regions of India. The consumers form Southern India have represented the highest order of familiarity with the green products (83%) followed by the sampled consumers bellowing to Eastern India (68 %), northern India (53 %) and western India (42%) as evidenced in the survey. The study further noted that around 95% selected South Indian Consumers perceive that the green products are beneficial to protect the environment.

Familiarity of green product in India according: To Dupont Green Living Survey: India 2014 by TNS Global [add number]

Northern India • Around 53 % respondents acknowledged the familiarity of Green Product.	**Eastern India** • Around 68 % respondents acknowledged the familiarity of Green Product.
Western India • Around 42 % respondents acknowledged the familiarity of Green Product.	**Southern India** • Around 83 % respondents acknowledged the familiarity of Green Product. • Around 95 % respondents are confident that green products are better for the environment.

Figure: Familiarity of green products across various regions in India

However, the similar perception was recorded among 85 % consumers across the country which is more significant as compared to evidences indicated

amongst other developed nations like China (70 %), Canada (65%) USA (60%) recorded in recent previous studies.

All these arguments facts and figures essentially signify India has been emerging country of the world i.e. adopting green policy as far as Industrial development and societal participations are concerned. The affinity of Indians towards Green Products has been growing that has been penetrated even among the tribal population of Arunachal Pradesh which represents the least population density state in India (Chakrabarty & Tagiya, 2018). In fact, the environment issues are mostly dominated by governmental agencies but it is getting recognized, holistic support and desirable responses from all the stake holders that include state and non-state actors.

5.2 Analysis – II

5.2.1 Commitments towards environmental issues were largely driven by governmental regulations. Various laws and acts were passed by the government at different time phases of time as per the needs and commitments of the state. The indicative list of various acts and provisions are mentioned below.

Comprehensive Environmental Policy Laws	
A. Pollution related	• The Water (Protection and Control of Pollution) Act, 1974 • The Water (Prevention and Control of Pollution) CESS Act, 1972 • The Water CESS Act 1977 • The Air (Prevention and Control of Pollution) Act of 1981 • Environmental Protection Act 1986 • Noise Pollution (Regulation and Control) Rules 2000
B. Conservation Oriented Legislation	• Wild life Protection Act 1972 • Forest Act 1980 • The Schedule Tribes and other Traditional Forest Rights (Recognition & Forest Rights) Act, 2006 • Prevention of Cruelty to Animals Act 1960 and National Zoo Policy 1998 • Biodiversity Act, 2002
C. Waste Management Rules	• The Chemical Accidents (Emergency Planning Preparedness, and Response) Rules, 1996 • Hazardous Wastes (Management and Handling) Rules, 1989 (as amended up to 2010) • The Bio-Medical Waste (Management and Handling) Rules, 1998 (as amended in 2003) • Municipal Solid Waste (MSW) Management Rules, 2000 • Draft E Waste (Management & Handling) Rules, 2010
D. Other Environment Specific Legislation	• The National Green Tribunal (NGT) Act, 2010 • The Civil Liability for Nuclear Damage Bill 2010 Version
E. Laws Relating to Industry and Economy	• The Factories Act 1948 • Special Economic Zone (SEZ), Act 2005 • Environmental Impact assessment and Environmental Clearance Act • The Mines and Minerals (Regulations and Development) Act of 1957 • The Atomic Energy Act 1962 • The Manufacture, Storage and Import of Hazardous Chemicals Rules 1989 • Batteries (Management and Handling) Rules, 2001 (amended in 2010) • Boiler Act, 1923 • The Bureau of Indian Standard Act, 1986 • The Coal Mines (Conservation and Development) Act, 1974 • The Electricity (Supply) Act, 1948 • The Industries (Development and Regulation) Act, 1951 • Energy Conservation Act, 2001

In fact, there is no specific legal provision / approach developed for promotion of green products in India. However some miniscule attempts were noticed from the part of government to prioritize eco-friendly initiatives in India for instance in 1991 government of India under the aegis of BIS coined the initiatives 'Eco-Mark' scheme through which by virtue of which if it is awarded to a product that essentially signify the product has followed appropriate ecofriendly norms. The Eco-Labels extensively share the information in terms of environmental performance indicators of the products. The firms

follow eco-friendly norms to receive financial incentives in the form of tax reduction or cost cutting by reusing remanufacturing, recycling, reducing etc. in the line of 9R framework. The broad spectrums of product category were covered under the ambit of eco-mark/ eco labels are depicted below:

- Soaps and Detergents;
- Paints
- Paper
- Plastics
- Cosmetics
- Textiles
- Batteries
- Wood Substitutes
- Propellants and Aerosols
- Food Items (edible oils – including Vanaspati, Tea and Coffee)
- Electrical and Electronics Goods
- Packing/Packaging Materials
- Lubricating/Specialty Oils
- Drugs
- Foods Preservatives and Additives
- Pesticides
- Leather

In India the environmental related issues are mostly reinforced by governmental agencies by means of well-defined regulatory framework. The focus is on controlling emissions and waste management. In fact India is in the nascent state in terms of defining, devising and implementing eco-friendly standards for product design and manufacturing. International Organization for Standardization (ISO) took a step in 1989 and formulized the ISO 14020 series to Eco label products. The three broad types are:-

ISO 14024 – Third Eco- labeling party certification

ISO 14021 – Self declared Eco-labeling

ISO 14025 – Quantitative data measuring environmental impact

Bureau of Indian Standards HAS identified and defined a set of standards for product service and process to be adopted by Indian Firms where the importance and emphasis on environment and ecology has been specially earmarked.

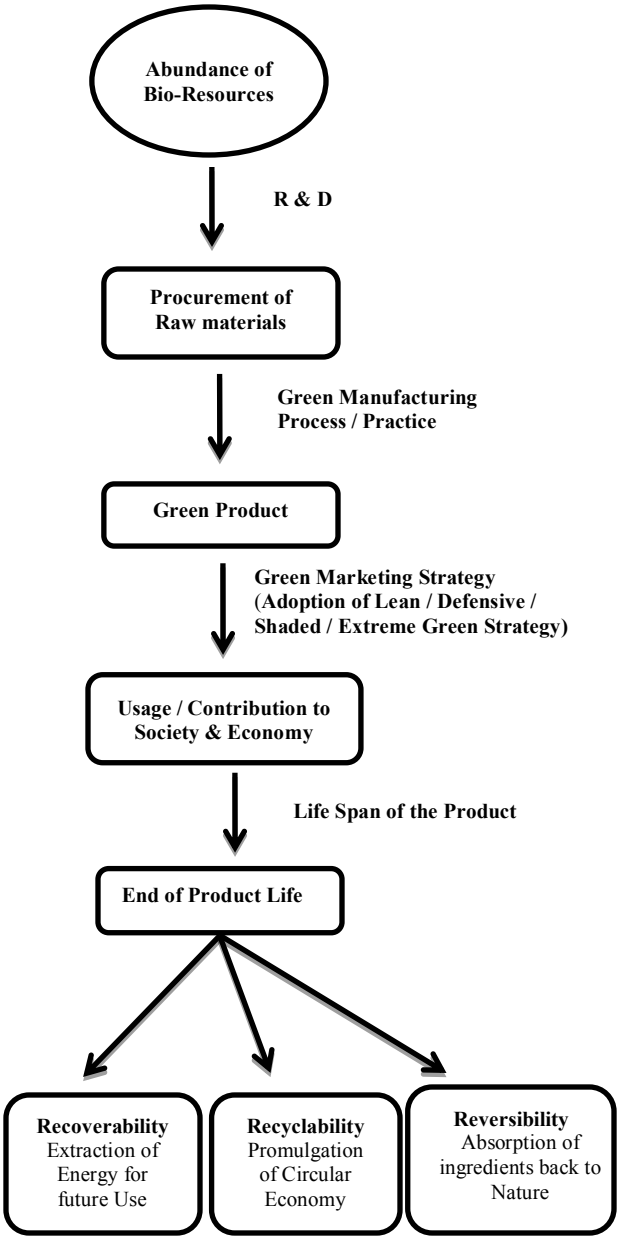
An indicative list of BIS standards have been mentioned below that ensure desired specifications towards environmental sustainability.

BIS Standards related to Ecology and Environmental Sustainability	**IS / IOS Nomenclature**
Occupational Health and Safety Management System	IS 18001
Food retail management - Basic requirements	IS 16019
Food Safety Management - Requirements for Good Hygiene Practices	IS 16020
Good manufacturing practices (GMP) – Requirements for organizations in the Food Processing Sector	IS 16021
Requirements for Good Agricultural Practices – India GAP - Part 1	IS 15930 Part 1
Social Accountability at the Work Place - Requirements as per	IS 16001
Environmental Mgt System (EMS) Certification	IS/ISO 14001
Energy Management System Certification (EnMS)	IS/ISO 50001
Food Safety Management System (FSMS) Certification as per	IS/ISO 22000
Hazard Analysis & Critical Control point (HACCP) Certification as per	IS 15000
Managing environment, occupational health and safety legal compliance-Requirements of good practices (OHSAS)	IS 15793
Occupational Health and Safety Management System (OHSMS)	IS 18001
Quality Management Systems - Requirements for service quality by public service organizations (SQMS)	IS 15700

Figure: Indicative list of IS standards related environments and sustainability

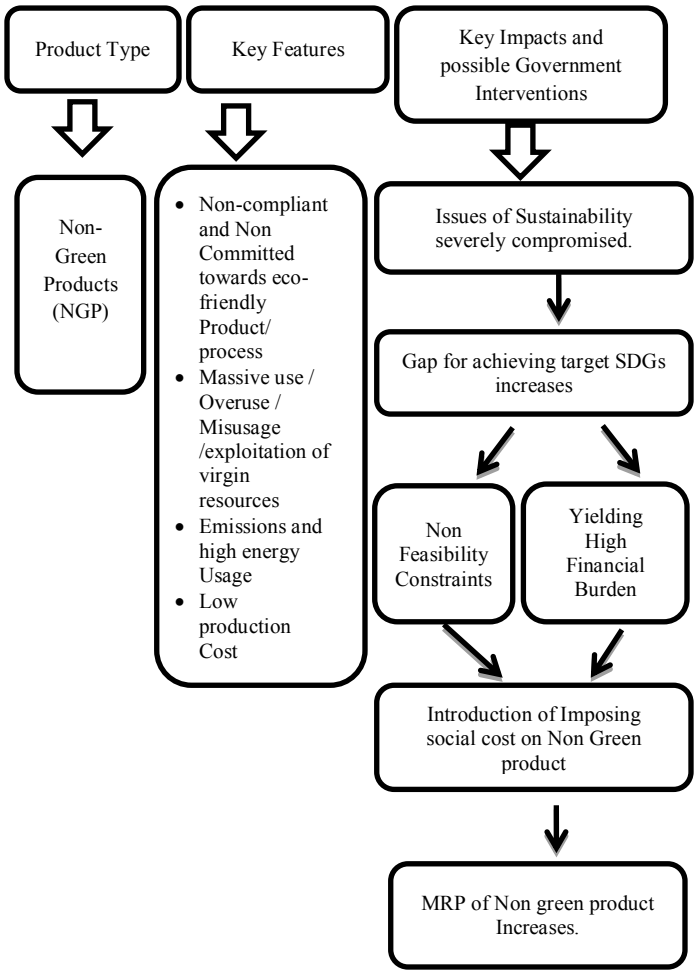
5.2.2 The model 'Prospects of Green Product: A Strategic Audit' clearly showcases the sustainable impacts of green products on socio economic and ecological life of all living creatures on this planet as mentioned below

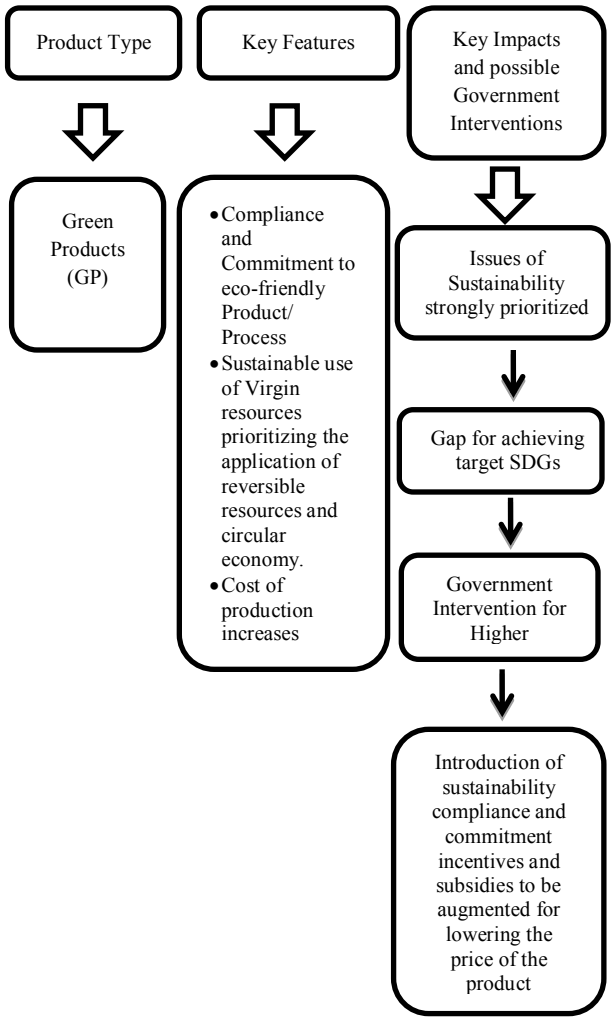
Prospects of Green Product: A Strategic Audit



Model Developed by the Authors

5.2.3 Comparisons between Green and Non Green product: Key features, Impacts and Government Interventions.





The construct of both positive and negative reinforcement theory may be augmented in green and non green products respectively. If effective Government Interventions are adopted, MRP of a particular product category would become at par and competitive for both green and non-green product. As discussed earlier, majority of Indians perceives that green products are more beneficial for the environment. The switching over from non-green items to green products by the majority Indian consumers essentially shall be smooth and sustainable that would result permanent buying behavioral changes. This would ensure that India shall essentially achieve SDGs by 2030 and would vouch for consumer's solidarity towards green and sustainability movement.

5.2.4 There are inherent challenges for the promotion of green products that can address all the problems in life. In fact, all the products or benefits we desperately require cannot be mitigated by a hand full of minuscule ranges of green products. There are debates and deliberations for understanding the possible impacts of the products on environment at every stage of its product life span. For instance, it is difficult that all the green products would have equitable impacts at every stage of its span of life i.e. procurement, processing, product usage and its final discontinuation. It is also difficult to provide incentives or subsidies to all the green products so that these could be competitive in the market with their rival non green products.

6. Conclusions

The world has been transforming and shifting its priorities in consonance with the classical and contingency variables. The erstwhile Millennium Development Goals (MDGs) have been succeeded to multi-dimensional agenda popularly known as Sustainable Development Goals (SDGs). The spectrum of goals have been enhanced, canvassed and become larger priorities that are defined more holistically. But the core issues remain unresolved. This is simply because the human races are fonder of comfort &conveniences rather to solve the key issues through pragmatic, natural and achievable course of actions. The success and failure of any strategic interventions depends to the extent that an individual adapts the change dimensions and culture in the course of his activities, rather expecting the changes to come arbitrarily in the world as opined by the great philosopher Leo Tolstoy. The individual, group and the state should develop the culture for understanding the spirit of collective and peaceful coexistence for long term perspective.

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Vijender Kumar Solanki
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Intelligent Computing in Engineering

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Preface

The 4th International Conference on Research in Intelligent and Computing in Engineering, popularly known as RICE 2019, was held on August 08–09, 2019 in Hanoi University of Industry (HaUI), Hanoi, Vietnam.

The Fourth edition of RICE 2019, organized by the Electronic Engineering Faculty of the HaUI, provides an international forum which brings together the researchers as well as the industry practitioners, who are actively involved in the research in fields of intelligent computing, data science, or any other emerging trends related to the theme covered by this conference. RICE 2019 provided an opportunity to account state-of-the-art works, to exchange ideas with other researchers, and to gather knowledge on advancements in informatics and intelligent systems, technologies, and applications.

This conference has technical paper sessions, invited talks, and panels organized around the relevant theme. RICE 2019 was the event where the author had the opportunity to meet some leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science and Technology.

RICE 2019 received a huge response in terms of submission of papers across the countries. RICE 2019 received papers from various countries outside Vietnam such as India, China, Russia, Australia, New Zealand, and many more. The Organizing Committee of RICE 2019 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and 118 papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published as one volume in Advances in Intelligent Systems and Computing, Springer, indexed by ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar, and Springerlink.

We convey our sincere gratitude to the authority of Springer for providing the opportunity to publish the proceedings of RICE 2019.

To realize this conference in 2019, we really appreciate Hanoi University of Industry to host the conference and to be continuously supporting the organization team during the preparation as well as 2 days of the conference. In addition, we

would like to give a special thanks to Vintech City, a member of Vingroup, that has supported the conference as a diamond sponsor. We would also like to thank the financial support of ASIC Technologies to RICE 2019. Without their support, this conference would have not been successful as the first time being held in Vietnam.

Our sincere gratitude to all keynote address presenters, invited speakers, session chairs, and high officials in India and Vietnam for their gracious presence in the campus on the occasion.

We would like to thank the keynote speaker as Prof. Vijender Kumar Solanki, CMR Institute of Technology, Hyderabad, TS, India; Dr. Le Hoang Son, VNU, Hanoi Vietnam; Dr. Kumbesan, Australia; Dr. P K Pttanaik, KIIT Bhubaneswar, Odisha, India; Dr. Rashmi Agarwal, MRIIS, Haryana, India for giving their excellent knowledge in the conference.

We would like to thank the reviewers for completing a big reviewing task in a short span of time.

We would also like submit our sincere thanks to the program committee members such as Dr. Le Van Thai, Dr. Hoang Manh Kha, Dr. Nguyen Thi Dieu Linh, Dr. Phan Thi Thu Hang, Dr. Tong Van Luyen—Electronic Engineering Faculty of the HaUI; Prof. Tran Duc Tan—Phenikaa University, Vietnam; and Dr. Raghvendra Kumar, GIET University, Gunupur, Odisha, India for their efforts to make congress success.

Moreover, we would like to thank all the authors who submitted papers to RICE 2019 and made a high-quality technical program possible. Finally, we acknowledge the support received from the faculty members, scholars of Electronic Engineering Faculty of the HaUI, officers, staffs, and the authority of Hanoi University of Industry.

We hope that the articles will be useful for the researchers who are pursuing research in the field of computer science, information technology, and related areas. Practicing technologists would also find this volume to be a good source of reference.

Hyderabad, India — Vijender Kumar Solanki
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Contents

Health-Care Paradigm and Classification in IoT Ecosystem Using Big Data Analytics: An Analytical Survey

Riya Biswas, Souvik Pal, Bikramjit Sarkar and Arindam Chakrabarty

Abstract The Indian healthcare system is in a dilapidated state. Healthcare is important to society because people get ill. Healthcare is defined as the diagnosis, treatment, prevention and management of disease, illness and preservation of physical and mental well-being in humans. In our paper we have done healthcare surveys to analyze the aspects. In this paper some aspects of IoT healthcare and big data analytics are discussed Big data can be used for better health planning. It's methodology can be used for healthcare data analytics which helps in better decision making. IoT is the fast developing wireless and web technologies sensors are used to predict the disease supported on IoT are used to develop the healthcare sector. Hence it is assertive that we do, various classifications in IOT are discussed. Hence it is assertive that we do initial surveys on the concept of Big Data, on Healthcare aspects and IoT ecosystem as how we can manage to handle large data files.

Keywords Big data · IoT · Healthcare device · IoT ecosystems

1 Introduction

Cumbrous amount of structured and unstructured data it is used to describe by Big data which is a buzzword. Some characteristics of Big data [1, 2]. As healthcare sector is expanding extremely. The volume of produced data is rapidly expanding every year

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due to existence of unique technologies, appliance and transmission [3]. In the current analysis of smart phones and wearable devices, endless figure of health data folder of patient from various challenges continue featured by healthcare industry [4]. Mostly complication arise where system proceed through divergent data sets [5, 6]. Various aspects of IoT is being discussed in this paper i.e Cancer which is a unchecked expansion unusual unit in any place in a body. Heart disease which is a dominating to conditions to that action area that influenced our heart and affect diminish or clog blood vessels. HIV/AIDS is a germ that mark and alter exempt system. Asthma is one of the most common chronic diseases that has a intelligent impact on people's well-being and in our society. Diabetes is a scheme of metabolic diseases consist of high blood sugar levels concluded lengthy season. For tracking the disease IoT are implemented. IOT basically a model for interconnecting sensor which track, sensing, process and diagnosis [7]. IOT basically composite of physical objects and domain where enclosed device content across the internet [8, 9]. IoT assist self management of disease. Over internet areas like health, Logistics, industry, security, agriculture and environment etc are basically empowered by the IOT appliances [10].

In this paper, we are going to discuss literature survey and classification in the Sect. 2. Section 3 deals with the analytical survey, table and policy design

1.1 Motivation

Big data is not only data it has turn into a entire subject, which involves different device, approach and scheme. Big data is transformative attempt in day-day-life. As in present day there is immense bulk of data, examining these acceptable sets which encompass of structure and unstructured data of various type and size; big data analytics grant the user to evaluate the impractical data to generate a faster and superior judgment. It is establish that big data is calculated to expanding rapidly in healthcare than in other sectors like manufacturing, financial services or media. Big Data and Analytics as with the Internet of Things (IoT). The term big data is one of burning technology. The big data analytics in healthcare covers assimilation and investigation of huge amount of data of complicated heterogeneous data. since Big Data can be advantage to consider user data and the prescribed assistance. It will trying to design program that will allow health care to reach those area where access to hospital was somewhat limited. IoT refers to the computerized intelligent curb and direction of connected associated devices over boundless regions via sensors and other computing capacity.

2 Classification and Analytical Survey

In this section, we will discuss the IoT-based healthcare paradigm and its classification. We have also discussed the analytical survey in this related field.

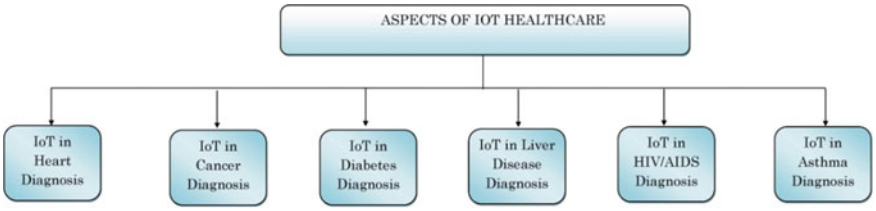

Fig. 1 Classification of IoT aspects

Figure 1 describes the different aspects of IoT-based healthcare. Chavan et al. [9] discussed for creating, acquiring, comparing some technologies like Hadoop, HDFS, Map Reduce, Pig, Hive, HBase are used here. Khan et al. [11] It describes proposed data life cycle which utilize the technologies and nomenclature of Big data management, investigating and scarceness. Nizam et al. [12] discussed that Big data is a type of dataset which is very massive and complicated that get difficultly to computing them exploiting traditional data processing applications. Chen et al. [13] discussed Big data then study about the connected technologies i.e. cloud computing, Internet Of Things, data centers and Hadoop. Archenaa et al. [14] deliver about the perception of how we expose newly expose surplus. Prasad et al. [15] author discussed that diabetes is one of the leading non-communicable disease. This system will prophesy exploring algorithm in Hadoop/Map Reduce environment. Huzooree et al. [16] author explains that Diabetes Mellitus (DM) is one of the starring health hindrance about the world initiating national economical concern. King et al. [17] author discussed that the asthma is characterized by hyper-responsiveness and can be avert by convenient benefit of remedial assistant to conduct asthma charge. Alpert et al. [18] author discussed that the heart failure is an developing public health complication with huge morbidity and probity. Stewart et al. [19] author describes the cardiovascular disease is a compelling and constantly-developing complication. Simon et al. [20] author describes that the HIV-1 pandemic is a complex blend of distinct contiguous. This paper brings on epidemiology. Bhatti et al. [21] author describes that the exploration of the human immunodeficiency virus (HIV) as the original organism of captured immunodeficiency disorder (AIDS). Constatine et al. [10] the author described that breast cancer is one of the biggest fatal disease of world. This paper proposed machine learning algorithm that for Big data analysis leading of an map reduce and mahout. Priya et al. [22] author describes that in first phase, min max normalization algorithm is enforced. Second phase by need of pso character choice. In fourth phase the efficiency will be determined accepting root men square value. Nahar et al. [23] initial forecast of liver disease is very crucial to deliver life and holding appropriate step to curb the disease. Shandilya et al. [24] in the current age automation medical field has develop into one of the favored affair of researcher and cancer. This paper generate survey of such current research study that cause usage of online and offline data for cancer classification. Alharam et al. [25] author describes. The main aim of this paper is for conserving healthcare industry from attack of cyber. Kumar et al. [26] author describes that traditional health center based

approach healthcare is identified with the arrival of large precision sensors and IOT. Kumbi et al. [27] author describes that the IOT is the leading network infrastructure of shipment of connectivity, transportation Technology which is proposed healthcare by the IOT.

3 Analysis of IoT Devices for Healthcare

See Table 1.

4 Policy Design and Constraints in Implementing in India

India seriously needs for reforms in their policy mix particularly in the field of health sector. The world is preparing them to welcome and grab the opportunity matrix that is emerging through the incorporation of 4th Industrial revolution. This is the high time to prepare for optimal participation of Indian firms. The following policy interventions may be exercised.

(i) The 4th Industrial revolution has brought gigantic opportunities in the field of IoT, RFID led ecosystem primarily in the domain of health care sector. The larger enterprises should concentrate in the new business domain as the potential market opportunities are increasing day by day. The big firms or the consortium of large firms may invest on R & D in collaboration with the premier research organizations of the country. The govt. should encourage this mission by offering some lucrative package like tax holiday or relief for the firm for next three years. The firms may be incentivized by promoting SEZ or providing subsidy.

(ii) The Indian MSMEs must initiate to this call of the hour. The firms may introduce their activities in the healthcare domain. As of now, there are various attempts are made to develop innovative branch of research augmenting various forms of technology with the healthcare domain. The branch of biomedical engineering, nano technology and electronic devices is being frequently used in the modern health services. The MSMEs can identify a niche market specializing any of the innovative techno-oriented direction and cutting-edge research which can be converged in modern medical system.

(iii) The IoT based infrastructure can be conjugated with creating healthcare alarming devices. The psycho social behavioral pattern of a set of patients may be studied and the common patterns may be digitally incepted in the IoT led instruments in the line of censory device like e-nose, RFID censors for detecting aroma or pigments and even the unnatural body movements to detect the cases that comes under broader domain of ergonomics.

Table 1 Features and benefits of IoT devices For healthcare

Sl. No.	Disease	IoT devices	Features of IoT device	Benefits
1	Cancer	1. Electronic-nose 2. Biosensor	1. Smart device, authentic, flexibility, quality control 2. Quick, authenticate detection, decent, observing of angiogenesis, cancer metastasis	1. The give off breath of patients with lung cancer characteristics that can be with a computerized nose 2. Biosensors can catch whether a tumor is exist, whether it is favorable or cancerous
2	Heart disease	1. Smartphone 2. Heart beat sensor	1. Rapid analysis, flat cost, familiar 2. Low-cost	1. The sensor associate to a module in the smart phone over the audio jack 2. Heart attack disclosure using Heart Beat Sensor effort on Photoplethysmography (PPG) art.
3	Diabetes	1. Insulin pump 2. Gluco track	1. Flexibility, predictable, reducing wide fluctuations in blood glucose 2. Pain free, Reading history data, user friendly, easy to read data	1. It is a small, automated device that device that bear insulin continuously all over the day 2. A glucose monitoring home device sensor is used to measure the concentration blood.
4	Liver disease	1. MRI 2. e-nose	1. Images come, approach organ morphology, physiology, functions contrast 2. Alluring, ancient and marginally faucal aroma of the emit breath	1. MRI evaluate liver function, usually expressed via the Child-Pugh score 2. e-nose could be a authentic non-invasive apparatus for characterizing CLD

(continued)

(iv) In the era of big data analytics, the predictive analogy in the healthcare sector is emergent to prevent it mammoth outcome on human civilization. The growing concerns of environmental pollution have been challenging the very existence of our civilization. The IoT based ecosystem may be applied in a less expensive manner to identify whether the region are crossing the vulnerable and critical

Table 1 (continued)

Sl. No.	Disease	IoT devices	Features of IoT device	Benefits
5	HIV	1. Photonic crystal (PC) biosensors 2. Novel BioNanoSensor	1. Rapid, sensitive, 100% efficiency, label-free, 2. Inexpensive, portable, simple, sense gases	1. Biosensors optical detection method for bimolecular, cells, and viruses 2. BNS device that employ automation to identify the existence of the HIV
6	Asthma	1. Bracelet 2. HET wristband	1. Authentic measuring and measure 2. Controlling volatile organic compounds, circulatory humidity and temperature	1. It benefit wearers anticipate a looming asthma attack 2. It is a wearable system that could record framework to forecast asthma attacks

level of pollutants so that appropriate measures can be prescribed. The device may also identify the root causes or epicenter of such pollutants so that the multiple stakeholders can intervene and address the issue.

To implement all such modern techniques, India should progress and contribute in the age of Fourth Industrial Revolution. There are several inherent constraints for its implementation particularly in Indian context.

1. The achievement in this new era of technology needs holistic, inclusive and comprehensive growth in the field of technology, its availability, ease of accessibility, technical knowhow for its use, capacity of investment and overall dynamics of its adaptability in real life practice.
2. The IoT technology is the platform to facilitate the healthcare support but the country desperately requires a basic infrastructural facility for healthcare services. The issues of malnutrition, vaccination, basic sanitation and the most importantly the awareness of people in general etc have been creating the stumbling block to achieve success in the cause of humanity.

5 Conclusion

In this literature survey, big data and its various concepts are included. The words big data has been coined to depict this newness. This paper also defines the characteristics of big data. With the advance of big data, we could answer questions that were beyond research in the past, extract knowledge and insight from data. it is understood that

every big data platform has its individual focus. Big data analytics in healthcare is germinating into a promising field for affording acumen from very large data sets and enhancing conclusion while compressing amount. Big Data today carry a lot of promise for the healthcare sector. So, implementing healthcare analytics with expeditious organization, and evolution of big data will make rapid and exact diagnosis which will decrease blunder and bring convenient treatment. using. IoT devices to handle their health requirements. To afford relevant cure to the patient, symptoms are determined from the excessive number of data. Aspects of IoT have been presented.

IoT can detect, determine, and accessed by devices like actuators, sensors or other smart devices. In this paper a review on big data, healthcare, IoT usage in healthcare has been presented.

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Intelligent Computing in Engineering

Select Proceedings of RICE 2019

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Preface

The 4th International Conference on Research in Intelligent and Computing in Engineering, popularly known as RICE 2019, was held on August 08–09, 2019 in Hanoi University of Industry (HaUI), Hanoi, Vietnam.

The Fourth edition of RICE 2019, organized by the Electronic Engineering Faculty of the HaUI, provides an international forum which brings together the researchers as well as the industry practitioners, who are actively involved in the research in fields of intelligent computing, data science, or any other emerging trends related to the theme covered by this conference. RICE 2019 provided an opportunity to account state-of-the-art works, to exchange ideas with other researchers, and to gather knowledge on advancements in informatics and intelligent systems, technologies, and applications.

This conference has technical paper sessions, invited talks, and panels organized around the relevant theme. RICE 2019 was the event where the author had the opportunity to meet some leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science and Technology.

RICE 2019 received a huge response in terms of submission of papers across the countries. RICE 2019 received papers from various countries outside Vietnam such as India, China, Russia, Australia, New Zealand, and many more. The Organizing Committee of RICE 2019 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and 118 papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published as one volume in Advances in Intelligent Systems and Computing, Springer, indexed by ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar, and Springerlink.

We convey our sincere gratitude to the authority of Springer for providing the opportunity to publish the proceedings of RICE 2019.

To realize this conference in 2019, we really appreciate Hanoi University of Industry to host the conference and to be continuously supporting the organization team during the preparation as well as 2 days of the conference. In addition, we

would like to give a special thanks to Vintech City, a member of Vingroup, that has supported the conference as a diamond sponsor. We would also like to thank the financial support of ASIC Technologies to RICE 2019. Without their support, this conference would have not been successful as the first time being held in Vietnam.

Our sincere gratitude to all keynote address presenters, invited speakers, session chairs, and high officials in India and Vietnam for their gracious presence in the campus on the occasion.

We would like to thank the keynote speaker as Prof. Vijender Kumar Solanki, CMR Institute of Technology, Hyderabad, TS, India; Dr. Le Hoang Son, VNU, Hanoi Vietnam; Dr. Kumbesan, Australia; Dr. P K Pttanaik, KIIT Bhubaneswar, Odisha, India; Dr. Rashmi Agarwal, MRIIS, Haryana, India for giving their excellent knowledge in the conference.

We would like to thank the reviewers for completing a big reviewing task in a short span of time.

We would also like submit our sincere thanks to the program committee members such as Dr. Le Van Thai, Dr. Hoang Manh Kha, Dr. Nguyen Thi Dieu Linh, Dr. Phan Thi Thu Hang, Dr. Tong Van Luyen—Electronic Engineering Faculty of the HaUI; Prof. Tran Duc Tan—Phenikaa University, Vietnam; and Dr. Raghvendra Kumar, GIET University, Gunupur, Odisha, India for their efforts to make congress success.

Moreover, we would like to thank all the authors who submitted papers to RICE 2019 and made a high-quality technical program possible. Finally, we acknowledge the support received from the faculty members, scholars of Electronic Engineering Faculty of the HaUI, officers, staffs, and the authority of Hanoi University of Industry.

We hope that the articles will be useful for the researchers who are pursuing research in the field of computer science, information technology, and related areas. Practicing technologists would also find this volume to be a good source of reference.

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Ha Noi, Vietnam — Manh Kha Hoang
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Contents

Intervention of Smart Ecosystem in Indian Higher Education System: Inclusiveness, Quality and Accountability

Arindam Chakrabarty, Mudang Tagiya and Shyamalee Sinha

Abstract In the knowledge age, the human society largely depends on both inclusive growth and superior quality of higher education system. The world is transforming very fast and it tends to celebrate the fourth industrial revolution that extends from the information processing and automation to the extent of replication of human intelligence. The emerging protocol of artificial intelligence, RFID, cloud computing, block chain and machine learning are the gamut of resources which essentially would embody the teaching–learning process more effective and result-oriented. In India, the use of e-resources like MOOC, e-learning, Swyam have been experimented and they enjoy popularity and success among the users. However, the higher education system of the country is severely compromised by regular flow of information and databases. It is affecting the quality of teaching–learning process and research. It is high time to have a centralized database reservoir which would contribute to every learning organization, irrespective of government, private or NGO. The database would be collected and preserved by a national e-resource portal which could be accessed by any individual or institution with or without any processing fees; otherwise the direction and continuum of academia and research would have to be severely affected. The present study has attempted to showcase how the various e-resources are integrated into Indian education system. The paper would also approach and present a prototype model on how a comprehensive e-resource portal can be developed and optimized to ensure collection, preservation and access of data set.

Keywords Higher education · Smart ecosystem · e-resource portal · Inclusive growth · Accountability

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1 Introduction

1.1 India and Higher Education

During the ancient era, the scenario of Indian education consists of '*Gurukul System*' which mainly concentrated on education to developed knowledge. The *Guru* (referred to the teacher) will train their '*Sishya*' (referred to the students) through yoga, meditations and various standards. The early education system in India eventually got unnoticed due to series of invasions and dispute in the country. In the beginning of modern age, the Islamic influences improved the outdated education centers and brought in the broad domains, like geography, administration, law, arabic, mathematics and so on, into India. Colonial rulers who ruled India brought a significant transformation in the higher education system. It was the British who set up the formal system of higher education dedicated to the disciplines, like *languages, literature, history* and *philosophy*. In India, the higher education system started to grow rapidly after independence. The study shows that during the year 1980, there were 132 universities and 4738 colleges, enrolling around 5% of the eligible age group in higher education. The total number of educational institutions in India was four times higher than the overall number of institutions present in both United States as well as Europe. Today, India is advancing toward modernization, technology, communication, education and economic growth. It is giving a tough competition to other developed nations in the field of high-tech industries, such as agriculture, medical, information technology, energy and power, and biotechnology to drive the nation to opulence. In the present day, Indian higher education system holds an important place in the global education industry. India has one of the largest networks of higher education institutions in the world and is the third largest in the world. The UGC—an apex body established in the year 1949—essentially deals with the setting up and maintenance of standards in higher education throughout the nation on a uniform basis. The Central Government has been playing a key role in providing overall policy directions and thus acts as a vital link between the policy-making bodies of the government and institutions of higher education. With the introduction of various policies on higher education and subsequent programs undertaken to operationalize the policy has significantly impacted the growth and development of higher education in India. The important landmarks in the evolution of policy in higher education are as under:

Evaluation of Higher Education Policy in India	Year
University Education Commission	1948–49
Education Commission	1964–66
National Policy on Education	1968
Policy on Education (Draft)	1978

(continued)

(continued)

Evaluation of Higher Education Policy in India	Year
National Commission on Teachers-II	1984
Challenge of Education: A Policy Perspective	1985
National Policy on Education	1986
National Policy on Education: A Program of Action	1986
National Policy on Education: A Program of Action	1992

Source IGNOU study material for PGDHE (MES-101, Block-2, Unit-6, pp. 23

1.2 Emphasis on ICT in the Higher Education Policy

In the year 1984–1985, the need of '*Information and Communication Technology*' (ICT) in education sector has been recognized in India. It was realized when the program called *Computer Literacy and Studies in Schools* (CLASS) was introduced on experimental basis, and the project was later on adopted as a centrally sponsored scheme during the seventh Five-Year Plan (1993–1998). Eventually, the scheme was extended in eighth plan to provide financial grants to institutions covered earlier and to include new government-aided secondary and senior secondary schools. The financial assistance included annual maintenance grant and purchasing equipments for new school. During this period 2598 schools were covered. In the mid-1998, the information technology and software development (IT taskforce) came into the picture for the purpose of recommendations on introduction of IT in education sector including school. The report recommended the provision of computer system to all educational institutions up to higher secondary schools by appropriate investments (about 2–3%) of total budget during the next five years. During the year 2001–2002, a revised class scheme was introduced by making the provision of Rs. 845 million on recommendation. The applications of ICT for quality improvement were also included in Government of India flagship program on education, viz., Sarva Shiksha Abhiyaan (SSA).

2 Literature Review

[1] ICT in Indian University and colleges shows the revolution of higher education in the nation, in terms of access, equity and quality with the application of ICT in education. The various prospects and challenges posed by amalgamation of ICTs in various aspects of higher education in the present scenario are discussed and factors regarding future development in ICT in education sector are also highlighted.

Information and communication technology (ICT) plays a major role in supporting powerful, efficient management and administration in education sector. It is stated that ICT may use right from student management to various resource management in an education institution [2].

The e-learning and pedagogical innovation framework at Leicester provided a proper stage for the number of formal and informal discussions required to develop an e-learning strategy for the university [3].

ICT evolves as an instrument toward advanced knowledge. As learning tool, that is, ICT, it enhances the human intellectuals and capabilities in solving problems, helping and benefiting the students in gaining and increasing knowledge, and promoting the faculties, teachers, trainers and administrators in improving teaching and learning. This technology has also incorporated the knowledge and skills required to effectively use ICT as a tool [4].

Even though the application of ICT is not the answer for all the challenges faced by higher education systems in the region, it does leverage and extend conventional teaching and learning activities, and has the potential to positively influence on learning [5].

The application of information and communication technology (ICT) in higher education system has resulted in shifting from teacher-centered delivery and transmissive learning to student-centered learning. ICT acts as a channel of information, and intellectual tools have been supporting and serving the students to be mature enough and become responsible toward learning [6].

3 Objectives of the Study

I. To explore the application of smart eco-system in Indian higher education system.
II. To formulate integrated and smart strategy framework for sharing information through the man–machine interfaces across the country.

4 Research Methodologies

This study conceptual in nature is based on information collected from secondary sources like reports, journals and so on. The paper attempts to understand the present scenario of smart eco-system used in higher education system in India and attempts to

formulate a schematic model where the advance smart eco-system would be deployed the available resources to enhance quality of the higher education.

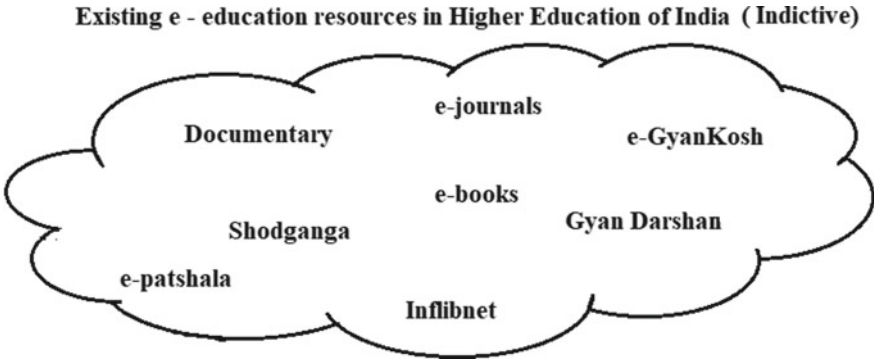
5 Analysis and Interpretation

5.1 Analysis—I

Various e-resources on education	
E-resources from MHRD supported programs	Other learning resources
NPTEL (https://nptel.ac.in/)	Digital Teaching and Learning Resources for PwDs (http://www.ayjnihh.nic.in/Digital_teach_resources.asp)
Virtual Labs (http://www.vlab.co.in/)	LILA Hindi Pravah
Spoken Tutorial (https://spoken-tutorial.org/)	Physics—Mysterious Magnetism (http://www.youtube.com/watch?v=wKdqCqTzSnI&list=PLdm-2_AHi21QoOEbiVEMty8vy6yS3UWF3&index=4)
The Consortium for Educational Communication (http://cec.nic.in/Pages/Home.aspx)	Astronomy—Eclipse (http://www.youtube.com/watch?v=Q1yq2LpQ-Qc&list=PLdm-2_AHi21QoOEbiVEMty8vy6yS3UWF3&index=28)
e-Yantra (https://www.e-yantra.org/)	Astronomy—Day and Night
e-ShodhSindhu (www.inflibnet.ac.in/ess/)	Khan Academy
FOSSEE (Free and Open Software in Education) (https://fossee.in/)	CS Unplugged
	Coursera
	Udemy (http://www.youtube.com/watch?v=Q1yq2LpQ-Qc&list=PLdm-2_AHi21QoOEbiVEMty8vy6yS3UWF3&index=28)
	MITOCW (https://www.edx.org/)
	LEARNING SPACE:THE OPEN UNIVERSITY (https://www.open.edu/openlearn/)
	Vidya Online (http://www.vidyaonline.net/index.php)

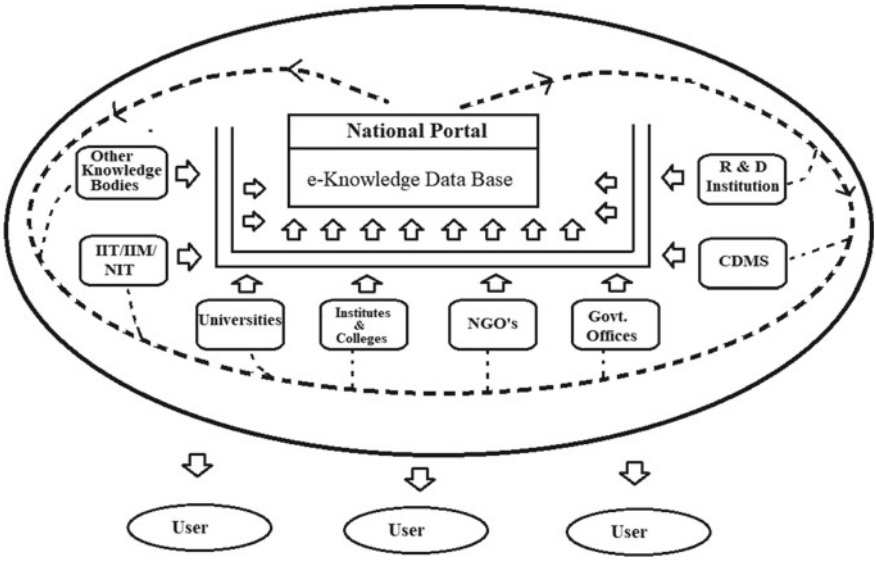
Source http://vikaspedia.in

India has been using e-education resources since early twenty-first century. The application of ICT has been pioneered in a few open and distance learning program and online courses offered by both govt. and private enterprises with the pace of phenomenal growth in satellite technology, access to the internet and even high-configuration mobile usage. The importance of e-resources has been well thought and adopted. The indicative list of popular e-education resources in India is mentioned below:



5.2 Analysis—II

The growth of higher education system largely depends on creation of new knowledge, development of contents, smart dissemination process and application-based research. In India, various sectors and agencies are working in their respective domains but observations, outcome and experiences are not adequately shared among all its partner, stakeholders and users. These create massive hindrance for the learners, researchers and the implementing agencies to achieve success in their respective intellectual pursuits. The lack of data support or exchange leads the society toward policy paralysis. India is in the alarming position where all the knowledge-generating, policy-making and research organization need to interact freely with their databases, sharing of experiences and critical observations. The paper has coined this urgency and has attempted to device an integrated e-resource portal which would perform the task of continuous data collection, preservation, its uninterrupted flow of processing across the entire stakeholders.



Modus Operandi of the Proposed Model

Step—1: Creation of a dedicated e-knowledge national portal/database. It can be created by appropriate enactment of law and with the consortium public–private partnership (PPP).
Step—II: All the knowledge bodies, institutes, private enterprises, non-government organization, govt.–pvt. establishments and so on compulsorily need to share their database, particularly R&D, process outcomes, achievements experiences or observations to the said national portal on regular interval. All the contributing institutional entities may be connected through appropriate network topology or modern gateway. It could also use the flowchart of electronic data interchange (EDI).
Step—III: All the data set/information would be collated, correlated and preserved so that the user's community across the nation can benefit from this system. However, access to the database may be free of cost or partially chargeable as the case may be depending on the rigor and cost implication of data procurement and its preservation. However, this national portal may exclude the information pertaining to security issues of the country, as well as the product/process secrecy, and others forms. In fact, the national portal would collate and preserve all the published information or documents in an integrated, coherent and synergic orientation.
Step—IV: The user may have to either subscribe with the portal or have to purchase the database if it is chargeable.

In the present context of Indian higher education system, it is difficult to access panel data or cross-sectional data, due to lack of integration of data across the stakeholders on a particular field of inquiry. The standard deviation and variation in data collected from different sources on a particular set of measurable attributes and entities sometimes appear to be very high. Few organizations that generate and

preserve database hardly share with the common users whether it is inaccessible, limitedly accessible or very costly for use. There are issues in generating particular set of database on regular intervals. The question of real-time data management is insignificantly exercised. In the corporate sector, the transparency and disclosure of information are limited and highly concentrated among few big players. All these catastrophic features of data generation, preservation and excess mechanism have largely affected the quality of higher education, teaching–learning and dissemination process. The research activities are severely compromised because of lack of availability or access to relevant data set. This paper has devised a comprehensive and nationwide data management ecosystem which would collate, collaborate and integrate all the relevant stakeholders for generating, preserving and sharing the platform for the users. The proposed national e-portal would ensure the authenticity, reliability of dataset and avoid data redundancy. This would ensure incremental access to such dynamic database platform which would trigger for achieving higher inclusive education. The projected model would perform the task of validating and integrating the database with higher precision and reliability which would ensure superior quality of knowledge exchange. As the system is reinforced by all the stakeholders of the country representing various segments of economy and intellectual acumen, the system is committed toward creating high-end value in the process of creating of knowledge and its dissemination, which shall reaffirm the spirit of accountability.

6 Conclusion

Information is the most decisive factor for success, particularly in the era of knowledge economy. Even in the ancient time the battle was fought among kings and the winning party did not conquer not only because of its marshal but of its strength in information search. This paper has shown the growing trend of using e-resources in the process of teaching–learning dissemination and research, particularly in the Indian context. However, there is lack of integrated approach to collate, preserve and share all the pertaining data sets among its users and stakeholders. This paper portraits a model solution by integrating all contributory institution with the national portal and in return the propagation of data flow from the portals to individual and institutional users with free access, limited access or paid access mechanism so that without compromising the sovereignty, security issues of the nation and without affecting the patent, copyright and commitments the country can foster high-end academic environment and experience the frontiers of research outcome.

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Mission SDGs Through Food Waste Management: Nature and Approaches

Arindam Chakrabarty and Uday Sankar Das

Abstract The global fraternity has been embarrassed to understand how to feed the elephantine population of this planet. The greed of comfort, convenience, and technology ecosystem has mesmerized our life in such a fashion that the human society has been up-rooted from the nature. The wave of infrastructure development results in heavy encroachment of fertile land as well as yielding to regressive fertility of land. On the contrary, the society has not learned to optimize the utilization of resources whatever forms it may be. These compel the United Nations to formulate specific target-oriented Sustainable Development Goals that need to be achieved by 2030. Food waste is still a menace of mankind. It may be of many forms and dimensions. Food waste exists in every phase of supply chain. Most surprisingly, the stigma of this menace reaches to our household also. The irony of life is that, on one hand, we are habituated to accept that wastage in foodstuff as part of our livelihood, and on the other hand, the United Nations reveals its concern for poverty, hunger, and many other unaccomplished goals. The world is now on the verge of Fourth Industrial Revolution. The IoT-based ecosystem has been emerged as an inseparable entity of the modern societies. This paper has attempted to assess and account the loss of economy for wastage of food items from global canvas to national perspective. This study has also focused on how to use IoT platform so that the food wastage can be reduced up to a considerable amount both in the supply chain and even in household practices. This research work is based on secondary information like research papers, reports, and results of other relevant studies. The paper has attempted to develop and devise a conceptual and strategic model where the IoT ecosystem can be incorporated to ensure real-time solutions and to curb on massive food wastage practices. If the model is implemented and practiced with appropriate case specific modifications

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and customizations, it would make the economy more efficient and address different perspectives and dimensions of UN Sustainable Development Goals (UNSDGs) to a larger extent primarily in Indian Context.

Keywords Food waste management · Supply chain · Fourth Industrial Revolution IoT ecosystem · UNSDGs · India

1 Introduction

The journey of human civilization started with the ignition of fire, invention of wheels, and creations of indigenous tools and techniques through the passage of various ages. Today, we are in the age of information automation and moving toward Fourth Industrial Revolution. The success of our human civilization is based on key primary needs, i.e., food, clothing, and shelter. However, this is the irony of life that in spite of achieving various developmental indicators, the human society is still unable to fulfill the basic needs like food which is reflected in various literatures, research outcomes and from the experiences of reality. To cater the critical issues, the United Nations move ahead from achieving Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs) where poverty and hunger were given primary thrust.

1.1 Food Waste Across the Globe

Around 1.3 billion tonnes of food produced gets wasted globally which account to around one third of the food produced. A whopping US$680 billion and US$310 billion are lost in the industrialized countries and developing countries, respectively. A 670 and 630 million tonnes of food are wasted for industrialized countries and developing countries. Perishable items like fruits and vegetables account for the highest losses post-harvest. Food loss and food waste per year are roughly account to 20% of oilseeds, 35% for combined for meat, dairy and fish, 30% for cereals, and 40–50% for root crops. Per capita food lost or wasted every year is between 95 and 115 kg/year in Europe and North America. While 6–11 kg a year is wasted in countries of South-Eastern Asia and sub-Saharan Africa. A 40% loss of food items occur at post-harvest or at processing level in developing nations, and same amount is lost at retail and consumer levels in industrialized nations (Table 1; Fig. 1).

Table 1 Per capita food losses and waste (kg/per year), at consumption and pre-consumptions stages, in different regions [1]

Region	Production to retailing	Consumer
Europe	187	94
North America and Oceania	181	115
Industrialized Asia	165	70
Sub-Saharan Africa	159	7
North Africa, West and Central Asia	181	31
South and Southeast Asia	115	13
Latin America	198	24

Adapted from key finding of Food and Agriculture Organization of the United Nations

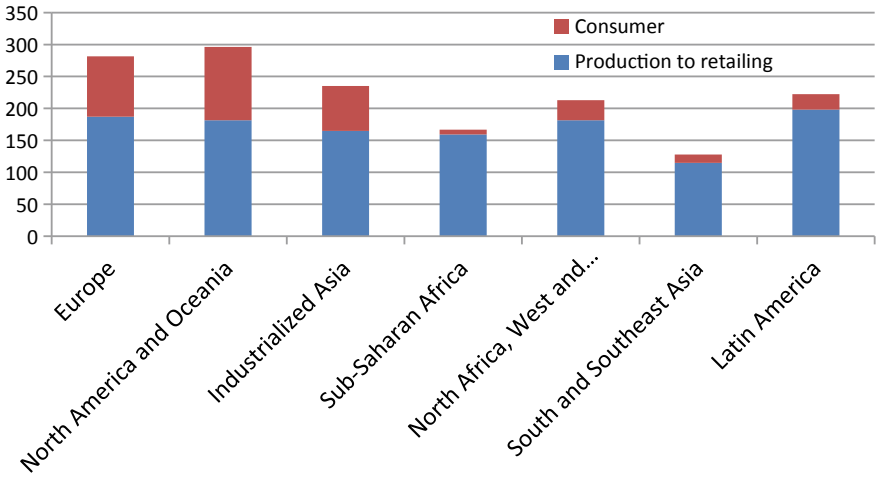

Fig. 1 Per capita food losses and waste (kg/per year), at consumption and pre-consumptions stages, in different regions (adapted from key finding of Food and Agriculture Organization of the United Nations) [2]

1.2 Food Waste in India

India has adorned the developing nation tag since the dawn of independence and is at the frontiers of food loss and food waste. India is ranked at 103 in the latest Global Hunger Index [3] report published in 2018 while a large section of the population still live below poverty line (21.92% of the total population as per RBI data published on Sep 16, 2015) [4] bureaucratic loopholes and intentional ignorance towards the issue has kept the problem alive till date. FCI, a premier food distribution corporation and a state owned utility is yet to fix the grain drain problem. It is reflected in numerous news reports that the food loss by FCI was in the tune of 1.94 lakh MT food grain that had been wasted between 2005–2013 [5]. Apart from this, India still lacks organized

cold storage facilities or processing plants within proximity of farmers producing perishable food items like fruits and vegetables.

1.3 Socio-economic Impact of Food Waste in the Context of Sustainable Development Goal

The Global Hunger Index [3] of 2018 point a staggering 124 million people across the globe suffer from acute hunger due to malnutrition, internal displacement, refugee status and poverty. Four of the total 17 goals prescribed by the United Nations SDGs focus on Poverty, Hunger, Good health and wellbeing, and responsible consumption and production (Goal 1: No poverty; Goal 2: Zero hunger; Goal 3: Good health and well-being; Goal 12: Responsible consumption and production). Food loss [6] is the primary reasons why most of the developing world still suffers from malnutrition and hunger which is caused by poor storage and processing in the post production phase and developed nations are highest contributor towards food waste [6] due to fast pace life, irresponsible and ignorant behavior towards the issue. While the former can be solved by application of technology and infrastructure management the later can be solved by improving upon the social physiological behaviors of the masses.

1.4 Introduction to Fourth Industrial Revolution

The term Fourth Industrial Revolution or 4IR [7] was coined by Professor Klaus Schwab, founder and executive chairman of the World Economic Forum in his book "The Fourth Industrial Revolution" based on the technologies of the artificial intelligence, machine learning, quantum computing, 3D printing, and the IoT. Around the year 1760, First Industrial Revolution started in Great Britain, which was powered by the invention of steam engines. Almost a century later, Second Industrial revolution started which was characterized by mass production (from craft-oriented production to mass production) in various industries like steel, oil, and electric. Some of the greatest inventions like internal combustion engine and light bulb came through in the same period. The Third Industrial Revolution or "The Digital Revolution" started somewhere around 1960s powered by the greatest inventions of the century, semiconductor chips, which gave rise to personal computing and eventuality made the Internet a real possibility. Now, 4IR is knocking on the doorsteps of humanity which will eventually change the way we eat, live, think, or nearly everything we do to sustain our life.

2 Literature Review

The unprecedented developments in the fields of digital, physical, biological technology are the three major drivers of the Fourth Industrial Revolution. There is an attempt to understand the impact of these technologies on various global, industrial, economic, and social developments [8].

One quarter of the food supplied for human consumption is wasted across the food supply chain. High-income countries generate food waste at all levels including household which is the highest. The study gathers data from 1062 Danish respondent measuring the intention and attitude not to waste food. Food waste can be controlled by making perceived behavioral control [9].

Sustainable Development Goals (SDGs) are successor of Millennium Development Goals (MDGs). It proposes 17 goals with 169 targets with numerous indicators [10].

Large-scale food waste in the global food supply chain has attracted attention due to its environmental, social, and economic impacts. There has been an attempt to understand the difference between food surplus, avoidable and unavoidable food waste by various specialist, to manage the waste, and to identify the most appropriate mechanism to create a sustainable supply chain management. There is also an attempt to understand and distribute the food surplus to poor people or to convert it as an animal feed [11].

The UN organization, Food and Agriculture Organization estimates a 32 percent loss of food produce in 2009 based on weight while a 24 percent in terms of calorie. Food wastage has negative impact on economy, and it represents a wasted investment, consumer expenses, and farmers' income loss. While food loss refers to losses incurred due to spills and spoils, food waste refers to losses due to infrastructure limitations or post-consumer waste which is generally fit for consumption. Food waste is generally a conscious decision to throw away the food [12].

Wireless sensor network (WSN) surrounds all living beings in the modern era and influences day to day living. A communication between all these wireless-enabled network creates the Internet of Things (IoT) to form a seamless environment to create a common operating picture (COP). The IoT has evolved from the static web2 (social networking web) to web3 (ubiquitous computing web) increasing the data demand [13].

Continuous population growth will keep a continuous demand for food supply for another 40 years approximately, while there will be a decrease in the capacity to produce food due to overexploitation of land and other natural resources including a threat from climate change. However, a more efficient ways of food production can be explored [14].

In order to feed the nine billion human populations by 2050, a review of food waste in the global supply chain is discussed. Data of post-harvest losses of grains are outdated, and current global losses are unknown. The impacts of food waste in the development of BRIC economies are also unknown while developing nations face food wastage post-harvest due to its perishability developed countries contribute to

high post-consumer food wastage which suggest a scope for behavioral change to reduce wastage in affluent population [15].

There is an attempt to understand the link between inflation in food prices and riots or food riots. Demonstrators of the riot pointed political repression injustice and inequality which mobilized and bought together various political coalitions to promote human dignity [16].

Electronic nose has been a trending technology for the last two decades largely due to numerous applications built around the sensors. Recent changes in the computing power have given the electronic nose a new possibility of various applications. It has provided a numerous benefits in the fields of biomedical, agricultural, environmental, food, cosmetics, manufacturing, military, pharmaceutical, and various scientific researches. Now, electronic noses can monitor all phases of industrial manufacturing [17].

An introduction to radio frequency identification systems and their strength, weaknesses along with deployment challenges is discussed along with various extensions that offer read/write memory and environmental sensing along with social issues [18].

Electronic noses (e-noses) are sensors that can detect various volatile organic compounds. A wide range of applications can be designed based on pattern recognition with the help of artificial intelligence or neural network. The future trend of the sensors is also explored [19].

3 Objectives of the Study

1. To explore varied forms of agriculture food loss at different stages up to the phase of consumption.
2. To provide an IoT-based solution for reducing food waste to a considerable amount primarily in closed system or household condition.

4 Research Methodology

This paper has attempted to understand, study food waste and its impact in the global context, provide solution through existing technological framework (IoT and electronic nose), and achieve related SDGs. This paper has been developed using secondary information collected from various relevant sources and documents. The paper has focused on how a technological solution would help achieve sustainable development goals of the United Nations by 2030.

5 Analysis and Interpretation

Analysis I

The various forms of agricultural food loss can be expressed by using the flow chart diagram as mentioned below.

Loss of Agricultural Produce at Farming Stage

- Agriculture food loss starts at the very beginning when farmers produce crop without adequate planning and sharing information among the producer's community and other stakeholders, and as a result of that, food loss occurs with overproduction of crops [20].
- Farmers harvest their crop prematurely for his personal consumption or to earn money. This accounts both the economic and nutritional loss of food grains [20].
- Massive use of pesticides and fertilizers diminishes the nutritional value of the food grains, and at times, it could be deterrent to human life.

Loss of Agricultural Produce at Transportation/Supply Chain

- During the movement of crops or food grains from field to warehouse or market, there are several supply chain/transportations loopholes like lack of refrigeration system, using FIFO technique or VED analysis (Valuable, Essential, and Desirable) (Fig. 2).

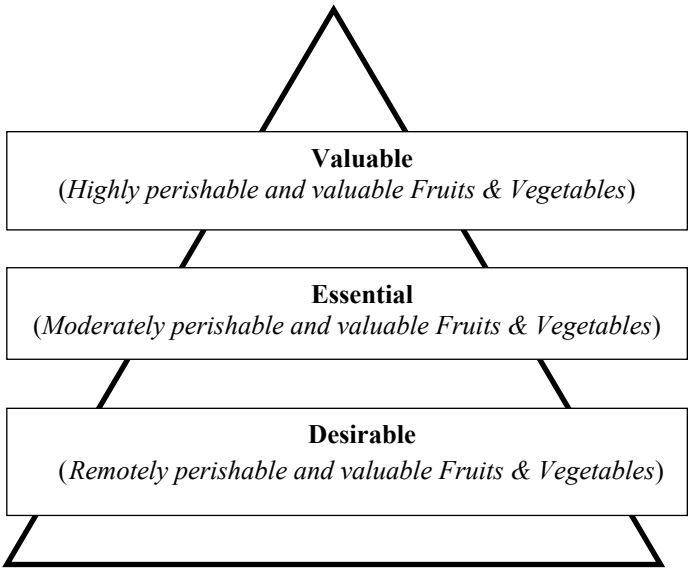

Fig. 2 Schematic diagram of application of VED analysis

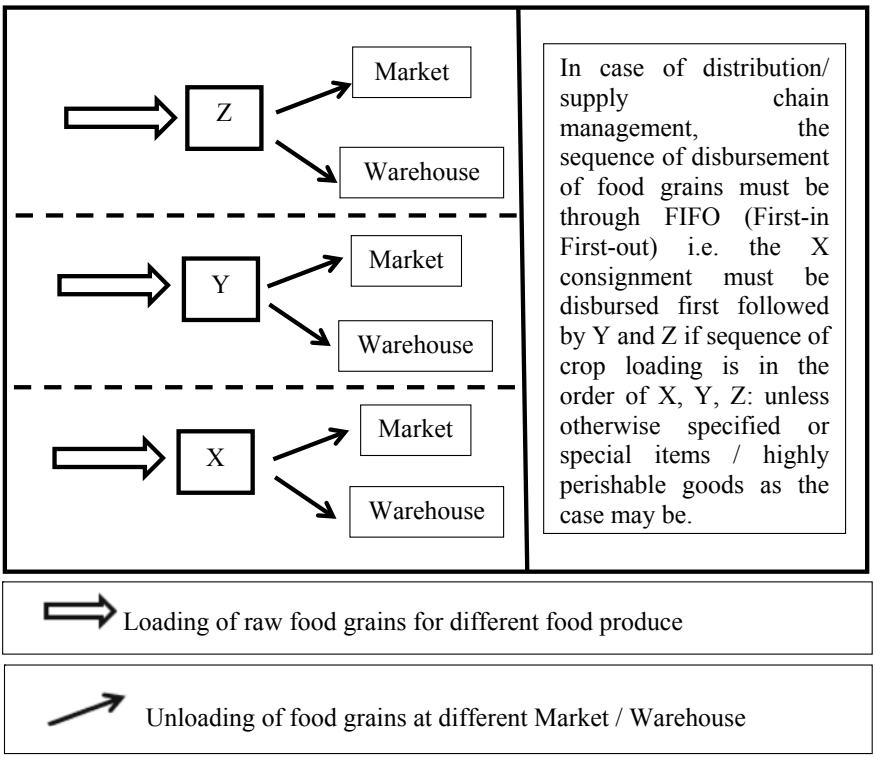

Fig. 3 Schematic diagram: application of FIFO method

Loss of Agricultural Produce at Warehouse/Cold Storage

See Fig. 3.

Loss of Agricultural Produce at Market Place

- In course of selling of food grains in the market, it is difficult to predict actual demand for each variety of food grains or crops. As a result of that, there is substantial loss of food grains in the market places which could not be sold at all or may be sold at a tendered expiry mode.
- In fact, accurate demand forecasting for every set of crops is next to impossible due to uncertainty of market dynamics and impulse purchasing behavior of the consumer.
- Lack of adequate refrigeration and cold storage system.
- Lack of Warehouse facilities.
- Due to excessive overproduction of crops, it results in higher storing cost and stagnation of crops which yield loss of food value, nutrition, and economy (Fig. 4).

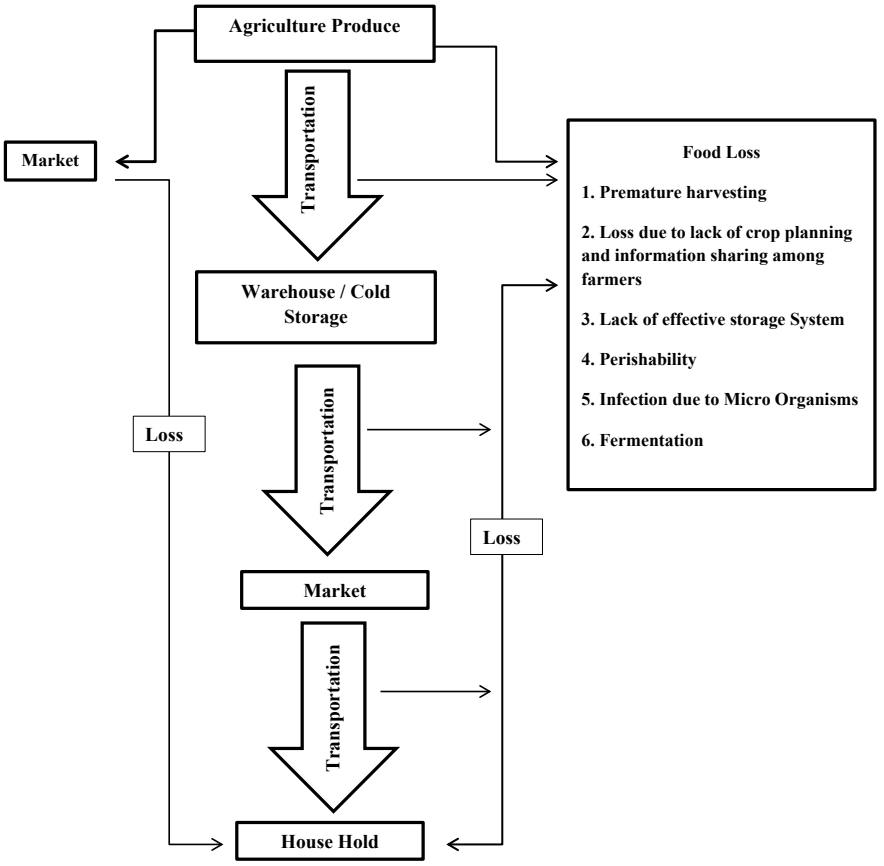

Fig. 4 Schematic diagram of food wastes at various stages

Loss of Agricultural Produce at Household

- Various ways of food waste take place at the household level both in uncooked and cooked format.
- The loss of uncooked produce is primarily because of oversupply of vegetables or food grains due to lack of ready information about the food reserves in the household. From lower middle class and above category, the family depends on household refrigerators for the purpose of preservation of food grains, vegetables, etc.
- The loss of cooked food occurs due to overestimation of perceived demand of food for day to day domestic consumption. This loss can be managed by experiential learning of the household and commitment of the members toward sustainable use of resources.

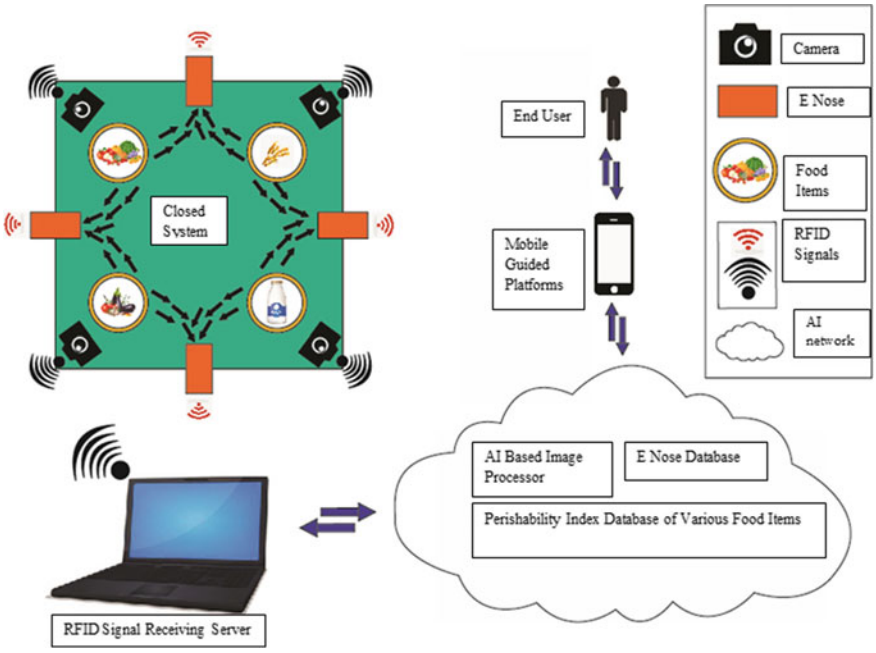

Fig. 5 IOT-based solution for reducing food waste primarily in closed system or household condition

- In fact, the loss of uncooked produce at the household level may be solved with appropriate smart in-house storage system and economic usage mechanism led by IoT intervention.

Analysis II

See Fig. 5.

Indicative algorithm for the model

1. The confined storage system (e.g., household refrigerator) needs to be augmented by multiple IoT devices that would act as E-Nose and E-iris as a means of sensory devices.
2. The IoT, E-nose and E-Iris would be provide adequate database for image processing for with pigment support (e-iris) and aromatic database (e-nose) on each specific food grains and vegetables generally stored in the system.
3. The sensory device will receive appropriate stimuli both aromatic and pigment and that would process using IoT, intelligence system (AI) by matching the preset database and finally the system would generate its predictive analytics about the nature of food produce stored in the system.
4. The processed results would be transferred at all the connected portals with the IoT ecosystem on real-time basis so that the user can be aware of the quantity and quality of each of the variants food products.

5. Based on this input, the user can take most appropriate purchase decision for further procurement of food grains, i.e., the set of variants to procure or not to procure and at what quantity. This real-time information would enable the household to prioritize which vegetables to cook immediately on priority basis in order to minimize both the nutritional and economic losses.

6 Conclusion

Food waste management has multiple implications on society as well as its economy. The world is highly apprehensive on the issues of food security, fertility of land, and nutritional benefits for upbringing off the human civilization. The sustainable development goals firmly advocate that poverty, hunger, and responsible production and consumption are the few integral dimensions which need to be improved if the world would like to achieve the essence of sustainability. Whatever the policy is formulated at macro level, finally the success depends on what extent it has been implemented and practiced at the very micro household level. This paper has emphasized on developing a sustainable solution to address the food loss issues at the household level with the intervention of IoT led smart technology.

Limitation of the Study

This paper has designed and developed a strategic solution in order to combat household syndrome. However, if the model is efficiently implemented, the degree of minimization of food loss could be explored so that the impact of the model could be studied, and necessary improvement on the structural morphology could be incorporated.

Working definition:

e-nose: An electronic nose is used to identify odors by detecting the "fingerprint" of a chemical compound using pattern recognition software [21].

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Advances in Intelligent Systems and Computing 1125

Vijender Kumar Solanki
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Intelligent Computing in Engineering

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The series "Advances in Intelligent Systems and Computing" contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing such as: computational intelligence, soft computing including neural networks, fuzzy systems, evolutionary computing and the fusion of these paradigms, social intelligence, ambient intelligence, computational neuroscience, artificial life, virtual worlds and society, cognitive science and systems, Perception and Vision, DNA and immune based systems, self-organizing and adaptive systems, e-Learning and teaching, human-centered and human-centric computing, recommender systems, intelligent control, robotics and mechatronics including human-machine teaming, knowledge-based paradigms, learning paradigms, machine ethics, intelligent data analysis, knowledge management, intelligent agents, intelligent decision making and support, intelligent network security, trust management, interactive entertainment, Web intelligence and multimedia.

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Preface

The 4th International Conference on Research in Intelligent and Computing in Engineering, popularly known as RICE 2019, was held on August 08–09, 2019 in Hanoi University of Industry (HaUI), Hanoi, Vietnam.

The Fourth edition of RICE 2019, organized by the Electronic Engineering Faculty of the HaUI, provides an international forum which brings together the researchers as well as the industry practitioners, who are actively involved in the research in fields of intelligent computing, data science, or any other emerging trends related to the theme covered by this conference. RICE 2019 provided an opportunity to account state-of-the-art works, to exchange ideas with other researchers, and to gather knowledge on advancements in informatics and intelligent systems, technologies, and applications.

This conference has technical paper sessions, invited talks, and panels organized around the relevant theme. RICE 2019 was the event where the author had the opportunity to meet some leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science and Technology.

RICE 2019 received a huge response in terms of submission of papers across the countries. RICE 2019 received papers from various countries outside Vietnam such as India, China, Russia, Australia, New Zealand, and many more. The Organizing Committee of RICE 2019 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and 118 papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published as one volume in Advances in Intelligent Systems and Computing, Springer, indexed by ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar, and Springerlink.

We convey our sincere gratitude to the authority of Springer for providing the opportunity to publish the proceedings of RICE 2019.

To realize this conference in 2019, we really appreciate Hanoi University of Industry to host the conference and to be continuously supporting the organization team during the preparation as well as 2 days of the conference. In addition, we

would like to give a special thanks to Vintech City, a member of Vingroup, that has supported the conference as a diamond sponsor. We would also like to thank the financial support of ASIC Technologies to RICE 2019. Without their support, this conference would have not been successful as the first time being held in Vietnam.

Our sincere gratitude to all keynote address presenters, invited speakers, session chairs, and high officials in India and Vietnam for their gracious presence in the campus on the occasion.

We would like to thank the keynote speaker as Prof. Vijender Kumar Solanki, CMR Institute of Technology, Hyderabad, TS, India; Dr. Le Hoang Son, VNU, Hanoi Vietnam; Dr. Kumbesan, Australia; Dr. P K Pttanaik, KIIT Bhubaneswar, Odisha, India; Dr. Rashmi Agarwal, MRIIS, Haryana, India for giving their excellent knowledge in the conference.

We would like to thank the reviewers for completing a big reviewing task in a short span of time.

We would also like submit our sincere thanks to the program committee members such as Dr. Le Van Thai, Dr. Hoang Manh Kha, Dr. Nguyen Thi Dieu Linh, Dr. Phan Thi Thu Hang, Dr. Tong Van Luyen—Electronic Engineering Faculty of the HaUI; Prof. Tran Duc Tan—Phenikaa University, Vietnam; and Dr. Raghvendra Kumar, GIET University, Gunupur, Odisha, India for their efforts to make congress success.

Moreover, we would like to thank all the authors who submitted papers to RICE 2019 and made a high-quality technical program possible. Finally, we acknowledge the support received from the faculty members, scholars of Electronic Engineering Faculty of the HaUI, officers, staffs, and the authority of Hanoi University of Industry.

We hope that the articles will be useful for the researchers who are pursuing research in the field of computer science, information technology, and related areas. Practicing technologists would also find this volume to be a good source of reference.

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Contents

Promoting Green Products Through E-Governance Ecosystem: An Exploratory Study

Arindam Chakrabarty, Mudang Tagiya and Shyamalee Sinha

Abstract Green product is the future of global sustainability. The e-governance has been emerged as a form of effective and efficient strategy of the state to optimize its resources and delivery mechanism. The green product needs serious attention, encouragement, investment, and effective promotional strategies so that it gathers the desired momentum in the market. This paper has attempted to understand the basic concept of green products and its various illustrations across diversified product segments. The paper has proposed a conceptual model which is simple but effective to encourage the consumers by appropriately exercising reward-incentive mechanism. This research paper is exploratory in nature, which has been developed using various secondary information and research outcomes.

Keywords Green products · Sustainability · Green technology · E-governance · Ecosystem

1 Introduction

1.1 Green Product and Commitment Toward Environment

There are products having the feature of less impact on the environment or are less detrimental to human health than traditional equivalents. Such products fall under the category of green products. These may be developed or partly developed from recycled components, manufactured in a more energy-conservative way, supplied to the market with less packaging, or manufactured from local materials to reduce the need for transportation and also reduce carbon footprints. In today's world, the

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planet needs to be protected. Human greed and selfish ambition has exploited the resources and put the planet in a critical predicament. By using and promoting the green products, one may contribute to the safety and preservation of the resources provided from the planet, such as metals, plastics, and even water. Today, more number of people needs to be aware about green products and its application so that it would benefit all living beings in the planet earth. The term development has been perhaps wrongly or narrowly manifested within the locus of massive infrastructure, construction, and building of engineering structures to jump from natural green to jungles of concrete. The north-eastern states are still alive with its flora and fauna. If the adoption of green products has not been incorporated by upcoming generations, the flood of indiscriminate and irresponsible consumerism would sweep the core values of sustainability for the region and for the entire nation [1].

1.2 Emerging Green Management Practices

1.2.1 Green Marketing

Green marketing incorporates a broad range of activities, including product modification, changes to the production process, packaging changes, as well as modifying advertising. Yet defining green marketing is not a simple task. Indeed, the terminology used in this area has varied; it includes: green marketing, environmental marketing, and ecological marketing. While green marketing came into prominence in the late 1980s and early 1990s, it was first discussed much earlier. The American Marketing Association (AMA) held the first workshop on "Ecological Marketing" in 1975 [2]. Green or environmental marketing consists of all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment [3].

1.2.2 Green HRM

Nowadays, green HRM has become a significant thrust area for management which can have an enormous impact on people issues in an organization.

It is the application of HRM policies in the way to encourage sustainable use of resources in an organization by increasing awareness and commitments among the employees toward the issues of sustainability to protect and preserve natural resources. It consists of two important elements, that is, environment-friendly HRM practices and the protection of knowledge capital. Green HRM consists of process and practices, like acquisition, induction, training, performance management, and reward system, which have a bearing on the whole carbon footprint of an organization. Green practices under green HRM that are followed by the company are power saving, internal environment and energy audit, eco-friendly or green surveys, going paperless

by using software and apps and so on, recycle waste, water saving, alternative energy sources and so on.

1.2.3 Green Finance

Green finance refers to financial investments flowing into sustainable development projects and initiatives, environmental products, and policies that encourage the development of a more sustainable economy. Green finance includes climate finance but is not limited to it. It also refers to a wider range of other environmental objectives, for example industrial pollution control, water sanitation, or biodiversity protection. Mitigation and adaptation finance is specifically related to climate change related activities: mitigation financial flows refer to investments in projects and programs that contribute to reducing or avoiding greenhouse gas emissions (GHGs) whereas adaptation financial flows refer to investments that contribute to reducing the vulnerability of goods and persons to the effects of climate change [4].

1.2.4 Green Technology, Green Manufacturing, and Green Services

Green technology is considered as environment-friendly based on its production process or supply chain. It also may refer to a means of energy production that is less harmful to the environment than more traditional ways of generating energy, such as burning fossil fuels. This technology is considered as young market comparatively, but investor's interest runs very high in response to global warming fears and the increasing scarcity of many natural resources (*Investopedia*). It aims to conserve nature and mitigate the impact of human activities. This technology provides the benefits not only to nature but also for a clean and greener human lifestyle. This technology ensures that the earth remains well for all generations and exist. On the other hand, the "green" manufacturing is known for the renewal of production processes and the establishment of environment-friendly operations within the manufacturing field. In the process the workers use minimal natural resources, reduce pollution and waste, recycle and reuse materials, and moderate emissions in their processes.

2 Theoretical Background

There was a time where many practicing managers regarded a preoccupation with green management almost exclusively as a threat. Nowadays, it is more widely accepted that green management can be profitable [5–7]. Green management can act as a vital role in the optimization of production processes and new-product development, not only in pollution-sensitive industries, such as petrochemicals and electric power and manufacturing, but also in high-tech industries [8]. The need for

green management springs from a variety of sources, including societal mandates incorporated into laws, treaties, and regulations [9].

Since green management is a type of public good, whose full value a firm cannot entirely appropriate [10], government's role in the acquisition of green capabilities is obviously important [11]. Management or managers should pre-define green goals, targets, and responsibilities for their strategic business unit, and corporates should assess number of green incidents, use of environment responsibility, and successful communication of environmental policy within their scope of their operations for improving the performance [12, 13].

3 Objectives of the Study

I. To study the concept of green product and its representation across various product segment.
II. To formulate comprehensive model and flowchart to increase and optimize green movement in India through efficient e-governance.

4 Research Methodology

This paper is designed on the basis of various reports, articles, research papers, and information collected from varied secondary sources. The conceptual model has been proposed in order to motivate the users toward green products by establishing real-time network with the market players. The e-governance framework may retrieve adequate information about the green product and its purchase indents so that it could establish a structured reward-incentive mechanism for promoting green marketing.

5 Analysis

5.1 Analysis—I

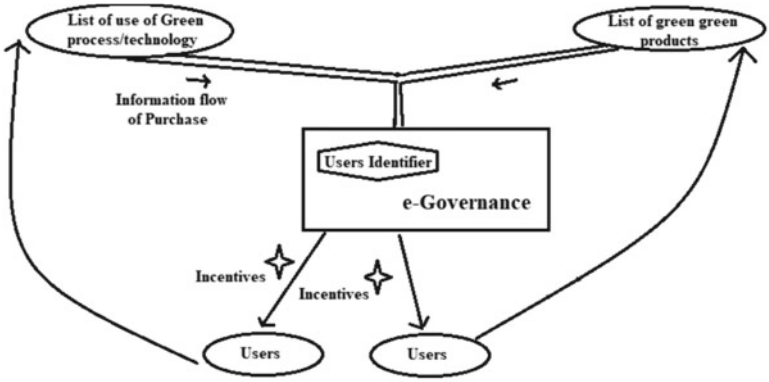
The wave of sustainable development has drawn the attention of the manufacturers, service providers, users, policy makers, and so on across the globe. It has been trickle down from the developed economies to the developing nations of the world. The affinity of the people of India has been increasing to the extent that it has found that the propensity of using green products has been significantly observed among the indigenous community of Arunachal Pradesh, the least population density state in India [1]. The study conducted by Chakrabarty and Tagiya [1] has emphasized that the attitude of the consumer toward environment and green products has combined

effect on favorable purchase intention behavior. However, price sensitivity, quality enhancement, brand familiarity, ease of access, and convenient to use are the decisive factors that influence the attitude of consumer toward green product. The availability, ease of access, and awareness of green product predominantly encourage the buyers for purchasing or availing green product or green technology. The green products are gaining popularity day-by-day and it became available in various sectors, for example, FMCG, consumer durability, health care, white goods, packaging material, and transportation. The indicative list of green products is illustrated below:

FMCG Sector: Biodegradable detergents, soaps, green tea, eco-friendly disinfectants, all types of papers (writing papers, tissues, toilet).
Consumer Durable Segment: Recyclable batteries, LED light bulbs and tubes, solar panels, clay-based cutlery, and crockery.
Health Care Sector: Biodegradable fittings and fixtures, cotton-based consumables for dressing or bandit materials, cotton bed sheet, eco-friendly disinfectants, biodegradable gloves.
White Goods Segment: Water heater tank (electric), dish washer, high-efficiency washing machine and clothes dryer, induction top cooker, energy star refrigerators, vacuum cleaner, dual-blade twin window fan.
Packaging Industry: Edible package material, paper bags, tetra-pack package.
Transportation sector: Bio fuel, low-carbon emission gas (CNG), recyclable tires.

5.2 Analysis—II

The popularity and penetration of green product may essentially be enhanced by the collective efforts of all the stake holders, including the dominant role of the government. The strategic and interactive roles among the stake holders are the prerequisite for enabling the green products in the demand baskets of its users. The strong network needs to be established that would yield desired result for effective promotion strategy of green products. A conceptual model has been proposed where the e-governance can facilitate to promote green consumerism.



Positive Reinforcement Model for Green Product through e-Governance

5.3 Modus Operandi of Proposed Model

Step 1*: The Government should identify the lists of green products, green technology, and green processes. Appropriate awareness campaign may be initiated to create customer pool for this segment.*
Step 2*: The market players may be identified and are established with the real-time network through which any transaction made at their end may send the overview of purchased details.*
Step 3*: Based on the purchase details, the customer profile would be identified and tracked. The incentive package or any form of subsidy may be extended to the identified customer through electronic transfer in the form of "Direct Benefit Transfer" (DBT).*
Step 4*: The real-time reward-incentive mechanism would reinforce and promote the green product among the target segments.*

6 Conclusion

In the dynamics of fourth industrial revolution, to apply threshold level of technology emerged, particularly in the domain of IoT ecosystem. This is high time to create appropriate interface and network between public–private interactions through new generation devices. The e-governance is quite popular and useful in augmenting the efficient delivery system across the world even in India. The success of smart card in Andhra Pradesh is the testimony of India's success story where the system minimizes its leakage [14]. The paper has showcased how the appropriate reward-incentive mechanism can be offered to the green product users using augmented electronic governance. This model may be implemented that would essentially increase green

consumerism in the market, which in turn would fulfill the commitment of sustainable development as expressed in Brundtland Commission 1987.

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Chapter 14
QFD Approach for Integrated Information and Data Management Ecosystem: Umbrella Modelling Through Internet of Things

Arindam Chakrabarty and Tenzing Norbu

Abstract The journey of human civilization has been phenomenal and indeed multi-dimensional. It started with the struggle for existence, survival, growth, transformation and enrichment for gratifying physical as well as intellectual aspirations. Experiential knowledge system and scientific acumen had been the propeller of the engine of development which essentially began with the ignition of fire followed by the inventions of wheels and so on. With the growing complexities of life and multifaceted ambitions, the problems are becoming compounded which need to be solved by the interface of cognitive skills and technology. Triumph of human societies has crossed many milestones at different ages i.e., Stone Age, Bronze Age and Iron Age through evolutionary historical episodes like Paleolithic, Mesolithic and Neolithic era. The dynamics of contemporary human civilization solely depends on knowledge economy at the behest of the present information age. The impetus of information has been widely accepted and practiced across the horizontally and vertically integrated economic orientations worldwide. The degree of intensity and commitment might differ among various societies throughout the globe. The concept of Internet of Things (IoTs) has become popular among practitioners, academia and researchers as it acts as the idea of umbrella value proposition with the synergy of related multipliers. The growth trajectory for the advancement and welfare of human races primarily depends on the availability, accessibility and usability of data on multi-dimensional variables. In fact, efficient data management system has become the backbone of all the developmental models. The government agencies even the corporate sectors are also reciprocating to this call of the hour and collect data in accordance with their sectoral limitation. This is

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welcoming but not exhaustive since it suffers from inconsistencies manifolds. Now, the priority and thrust have been convoluted on the real time data rather being confined into mere collection and use of unintegrated raw data. This chapter would attempt to develop a model based on 'Quality Function Deployment (QFD)' approach using IoT platform to augment the real-life data management system which would interact and share between all the stakeholders conforming the spirit of selective data privacy and confidentiality. This would also strive to bring reforms in the existing process of planning, strategy formulation and project implementations.

Keywords QFD approach · Integrated information · Data Management Ecosystem · Umbrella Modelling · Internet of Things (IoTs) · Real-life data management system

14.1 Introduction

14.1.1 Genesis and Practice of IoT

The term Internet of Things dates back to the year 1999. Most of the sources believe that Kevin Ashton (Co-founder of MIT's Auto-ID Centre) is the one who coined the phrase "Internet of Things". However, the acronym IoT is deemed to be the later innovation. IoT is one of the burning topics in the IT world now. It is a network of physicals things embedded with software, microchip, sensor etc. which enables immediate access to information about the physical world thereby leads to improvement in efficiency and productivity. In a span of two decades, it has got widespread acceptance across the world.

14.1.2 Opportunities for IoT

The opportunities of IoT are enormous and ever increasing. The Business Insider projects around 24 billion IoT devices shall be installed by the end of 2020 [1]. However, the forecast of other researchers exceeds far ahead. Gartner projected around 25 billion devices by the same timeframe [2].

The IoT led ecosystem has been widely practiced in today economy and it is emerging with higher volumes in various sectors like Aerospace and Aviation, Automotive, Telecommunications, Medical and Healthcare Pharmaceutical, Retail, Logistics and Supply Chain Management, Manufacturing, Process, Transportation, Agriculture and Breeding, Media, Entertainment, Insurance, Mining etc. The Return on Investment (ROI) in IoT segment is projected to touch 13 trillion USD by 2025 [3].

It is predicted that more than half of spending on IoT sector may primarily focus on dedicated and customized manufacturing, transportation, logistics and utility services by 2020 which essentially portray that the future industry would be dominated by high-end transformative technologies [4].

14.1.3 Application of IoT

Over a period of time, IoT has emerged as an indispensable component for the development of every nation worldwide. It is being applied in diverse areas such as Smart Home, Wearable, Connected Cars, Industrial Internet, Smart Cities, Agriculture, Smart Retail, Energy Engagement, Healthcare, Poultry and Farming etc. Many industries like Healthcare, Transportation, Agriculture and Breeding, Media and Entertainment, Insurance, Recycling, to name a few, are increasingly using IoT [5]. Therefore, IoT intervention is inevitable in today's era to foster the growth of economy.

14.1.4 Information and Data Management Ecosystems: Experiences from India

The development of economy essentially relates to its resources, knowledge system, rate of creation of new knowledge and optimal sharing of knowledge and resources for making its dynamic and meaningful application. So, the focal point of supremacy in economic model depends on the sharing of information and knowledge system across the stakeholders to a large extent. In India, the state sponsored institutions including academia and research organizations have been creating high quality knowledge and various forms of information and databases regularly. But it suffers from comprehensive integration of all the knowledge and databases in a harmonious manner. As a result of that the India loses its quality and meaningful application. According to Global Entrepreneurship Index (GEI), 2018, India ranked 68th position out of 137 countries across the globe where India scored least in Technology Absorption (5%) followed by Networking (14%) and Cultural Support (14%) in order to understand the propensity of entrepreneurship in India from global standards [6]. This signifies that in general, India lacks in sharing knowledge and information that essentially has created least performance in absorbing technology from lab to market followed by its culture of creating integrated network or platform for sharing information.

Of late, the State Agencies are concentrating to create nationwide database network for example Shodh Ganga in India for Higher Education, INFLIBNET, various reports of Sample survey or Rounds of NSSO Working Groups etc. However, these attempts are miniscule in comparison to its overall demand.

The availability of integrated knowledge set, the ease of access and its effective use are the pre-requisites for scientific and economic development of the state. The transparency and disclosure of Private Sectors in India are not encouraging in general barring a few large firms. There are instances of dubious information and over-estimations of information revealed by the organizations. The concept of creating integrates and shareable Corporate Database is almost absent in India except miniscule attempts by a few agencies purely for commercial purposes.

14.1.5 Exploring Problems in Information and Data Management Ecosystems

The economy of developing nations is quite different from the developed ones. The firms in India are, in fact, sandwiched by various compelling forces and inhibiting factors. The dynamics of rapid technological advancement, bottlenecks like resource crunch, global competitions and turbulence in policy directions are the indicative examples of such antecedents. All the firms in India do not function on excelling their core competency for fetching higher growth. Many of them suffer from threat perception for their existence, survival and perpetuity. Under these circumstances; it may be suicidal for the firms to share all its information in the name of transparency or disclosure. So, India has become the victim of its inherent inconsistencies and challenges for creating integrated and shareable database system as compared to western world.

14.1.6 Concept of 'Quality Function Deployment' (QFD)

QFD can be referred as a system that attempts to translate the quality parameters of Product, Process and Services as a part of TQM initiative for achieving desired customer satisfaction.

14.1.7 Development of QFD Approach

The works of Akao describes that the QFD approach originated in Japan during late 60s of 20th Century [7]. The QFD initiative was first observed when the Oil Tanker was designed at the Kobe Shipyards of Japan in 1972. Mizuno also used this model to design customer satisfaction framework into a service offering encounter. In the mid of 80s of 20th Century, Don Clausing of MIT introduced this QFD as a design tool to the United States [8]. In fact, QFD is a strategic intervention to unify all the key areas so that the outcome of the process could be excelled and optimized.

14.1.8 QFD's Areas of Application

QFD is applied in diversified fields of application like Production, Product Design, Manufacturing, Information Technology (IT), Engineering, Research and Development (R&D) etc. [9] and other facets of life. It is well sought instrument that may be deployed in the organizational functions that are necessary to assure customer satisfaction which may include business, data management enabler/ ecosystem etc. It is also deployed to achieve quality improvement, its management and to foster 4IR (Fourth Industrial Revolution).

14.2 Review of Literature

14.2.1 QFD

Since 1966, QFD has been extensively practiced by the leading companies across the world [10]. In fact, it is expected that QFD will be considered as effective tool for quality assurance in the information age [10, 11]. In QFD process, it is important to know weights for the customer requirements so as to initiate actions accordingly [12]. For this, a fuzzy Analytic Hierarchy Process (AHP) using extent analysis was proposed to determine the same. Besides, Wasserman also introduced a Decision Model for the prioritization of design requirement during the QFD planning process [13].

14.2.2 Integrated Information and Data Management Ecosystem

Integrated Information System (IIS) can play a crucial role for effective management of agriculture and ecosystem [14]. It is a tool for trouble-shooting, decision making and knowledge management [15]. Also for issues like Climate Change and Environmental Monitoring and Management, IIS is highly essential [16]. Integrated approach can serve as a model for Resource and Environment Management in the coming days.

Lari proposed a model which he believes that the model can serve as a framework for Quality Information Management within organizations [17].

Hua and Herstein iterated that IIS is necessary for successful policy making for the development of education system as it ensures open communication, information sharing and information use [18].

Carlson et al. proposed a system called Integrated Business Environmental Information Management (IBEIM) which efficiently supports and integrates environmental information management for Environmental Management Systems

(EMS) tools, LCA and other environmental process modelling tools, and Design for Environment tools. Through this system, Information and reports can be handled efficiently by organizations regardless of size [19].

14.2.3 Internet of Things (IoT) and Its Application

IoT can be considered as a global network infrastructure composed of numerous connected devices that rely on sensory, communication, networking, and information processing technologies [20]. A foundational technology for IoT is the RFID technology, which allows microchips to transmit the identification information to a reader through wireless communication. By using RFID readers, people can identify, track, and monitor any objects attached with RFID tags automatically [21]. RFID has been widely used in logistics, pharmaceutical production, retailing, and supply chain management, since 1980s [22, 23]. Another foundational technology for IoT is the Wireless Sensor Networks (WSNs), which mainly use interconnected intelligent sensors to sense and monitoring. Its applications include environmental monitoring, healthcare monitoring, industrial monitoring, traffic monitoring, and so on [24, 25].

14.3 Objectives of the Study

(i) To study the importance of Integrated Information and Data Management Ecosystems.
(ii) To propose QFD enabled Umbrella Modelling for Integrated Information and Data Management process through IoT intervention.
(iii) To explore opportunities and challenges for implementing the model in Indian context.

14.4 Research Methodology

This paper is exploratory. The study is based on secondary information. It has been developed reviewing various research papers, reports and using relevant information.

14.5 Analysis and Interpretation

14.5.1 Analysis—I

The importance of Integrated Information and Data Management Ecosystems is enormous. Glimpses of indicative importance are noted below:

- There is lack cross-sectional data on various indicators catering to diversified domains. Even the data are not reliable and regularly published. This leads to inconsistencies in generating panel data.
- In India, there is need of real-time observations in most of the dimensions of economy. Another dimension is the available data set are not generated or published on same reference period. Now-a-days, high precision of real-life data is available that helps to make strategies projections/forecasting of weather conditions which can be shared for agriculture, fishermen working in the river and seas, agriculture practices etc. This minimises both loss of resources and loss of human and domesticated animals through strategic displacement or precautionary measures.
- Academicians, researchers and policy makers can formulate appropriate strategies for the emerging issues in terms of priorities of economy.
- Both the cross-sectional and panel data are helpful for designing both short-term and long-term policy planning in the form of e-governance, investment or implementation strategies. Cross-sectional data is for evaluating certain policy implementation activities.

From various studies, it is found that in spite of having positive relationship between the rate of corporate disclosure and transparency with the firms' net worth and profitability [26, 27] miniscule of firms and mostly the large firms have evidenced their efforts and commitments for corporate disclosure and transparency. The MSMEs are least interested in this area that results lesser confidence among all the stakeholders. On the contrary, the firms practicing higher order of Corporate Disclosure are sometimes questioned in terms of credibility and reliability of such information. The instance of Satyam, Enron, Lehman Brothers etc. are the testimony of such arguments where the firms desperately elevated and over projected the firm's net worth by creating fictitious assets. So, the quality, reliability and credibility of information disclosed by the firms are of paramount importance if the society is committed to have ethical practice and good governance (Fig. 14.1).

It is also important how fast the information has been collected by the firm. If the firm has to devise policies or strategies based on past data, it would be merely the 'System Approach' to management which can solve the problem on 'Reactive Mode'. In contrast to that if the firm is enabled with real-time data management system, the business entities may be strengthened with the ability to have 'Contingency Approach' to management that can 'stop the bleeding' instantly by divulging prospective and proactive mechanism. If the experiences and knowledge system (excepting the critical business secrecy) are shared and exchanged, the society would traverse with greater accomplishment and exposure to progress in the journey of excellence collectively with differentiated individual success story.

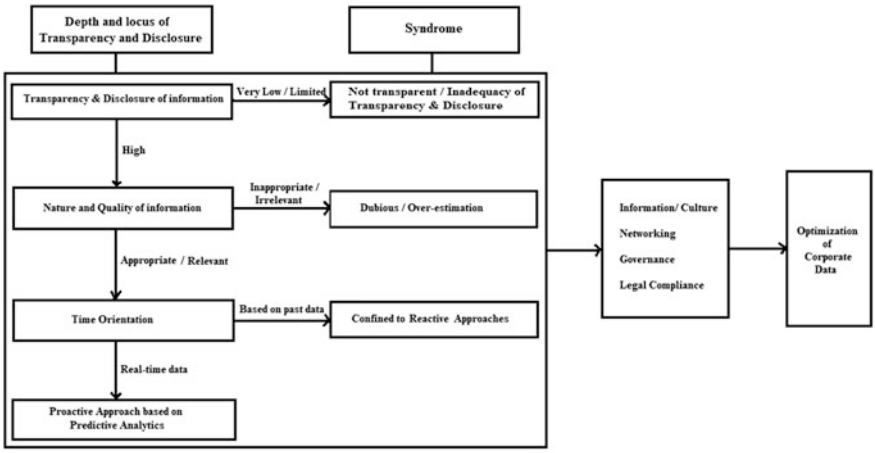
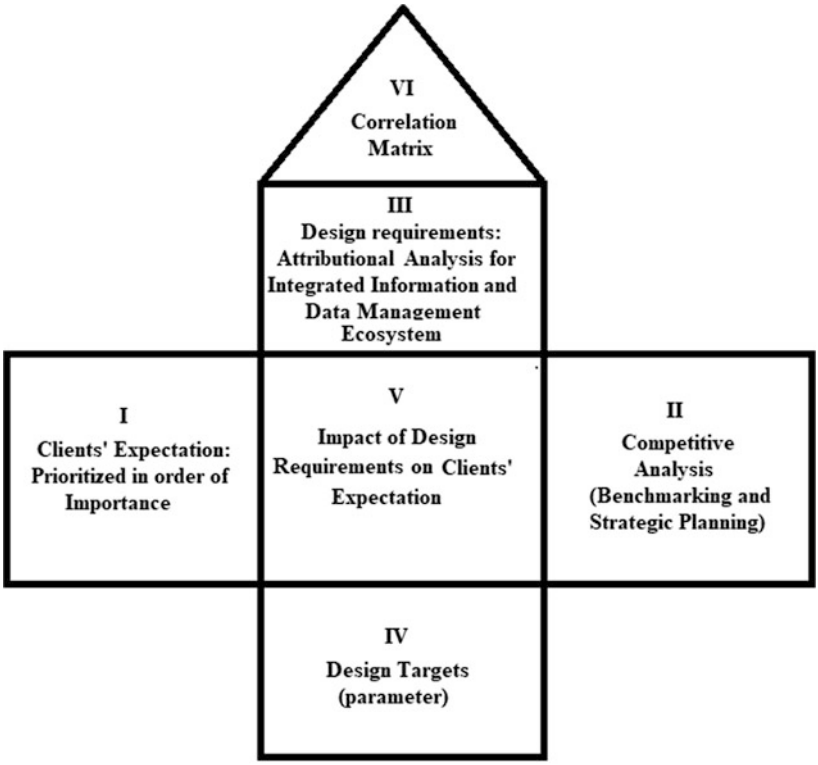


Fig. 14.1 Schematic diagram for rationalizing Integrated Information and Data Management Ecosystem. Developed by the Authors

The holistic development in the process of collectivism without diluting individual identity would have been the ultimate goal of effective and efficient Data Management Ecosystem. The degree of optimization of such process would determine the growth rate of Human Development Indicators. The 'Schematic Decision Box' has been depicted above to understand the depth and locus of Transparency and Disclosure that essentially prescribes for effective and efficient Integrated Information and Data Management Ecosystem.

14.5.2 Analysis—II

Abundance reserve of information and its on-time accessibility may be deemed as the most precious resource in the knowledge economy. The 4IR has empowered the society with the application of IoT that can be guided by developing Non-Human Intelligence through continuous Machine Learning (ML) protocol. The 4IR era enables the system that can interact with each other and analyse big quantum of data which may be collected on real-time basis. It is the high time to integrate and incorporate all the functional KRAs (Key Result Areas) that need to be blended to form a comprehensive ecosystem with the intervention of IoT infrastructure. The functional KRAs are to be embodied in the spirit of Quality Function Deployment (QFD).



House of Quality

The basic structure of QFD as explained in above figure essentially depicts how the QFD system operates in consonance with the voice of customer and the voice of organization divulging the spirit of Competitive Analysis. The relationship matrix helps to identify the designed targets.

The proposed model indicatively may comprise of the following functional KRAs (Fig. 14.2):

- **Real-time Information Recording System**: The devised framework would be able to collect record and retrieve all sort of valued information including research outcomes in the form of formula, copyright or patent etc., on real-time basis with the exposure of IoT led ecosystem.
- **Information Security Protocol and Client-Server Architecture:** The proposed model would instil appropriate Information Security Protocol so that the database would not corrupt or lose due to any malware attack. The system should have high precision 'Client-Server Architecture' so that it ensures free flow of data without any redundancy unless strategically entangled with limited access.
- **Interactive Protocol to develop Artificial Intelligence (AI) and Machine Learning (ML)**: The designed framework would conceptually be reinforced in

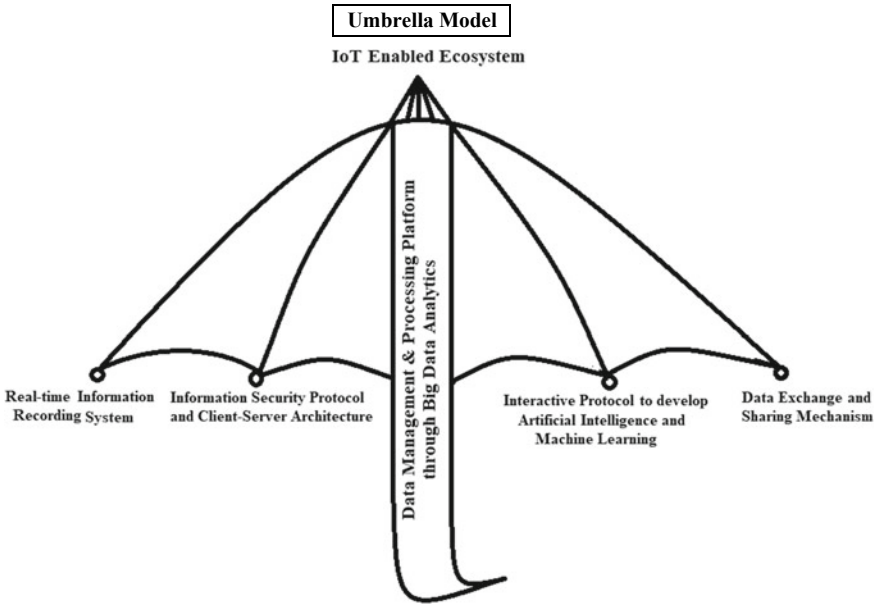


Fig. 14.2 QFD approach for Integrated Information and Data Management Ecosystem: Umbrella Model. Developed by the Authors

such a fashion that the various entities interact with each other at the fullest synergy of permutations and combinations to retrieve meaningful indications/ predictions. The system may be allowed to expose with AI augmented with continuous ML exercises.

- **Data Exchange and Sharing Mechanism**: The purpose of this model is to ensure that all the clients should be able to access, share and exchange the information at the fullest of capacity. This functional KRA would enable to optimise the essence of coordination, consolidation and collaboration among all the stakeholders with the optimum utilization of effective and efficient Data Management System.
- **Data Management and Processing Platform through Big-Data Analytics**: All these KRAs would converge to experience real-time and meaningful interpretation so that the broader dimension of Big-Data Analytics i.e., Descriptive, Predictive and Prescriptive could be achieved holistically for the dynamic problems emerged into the real-life situation. All these competing priorities could be manifested as a fusion of Umbrella Modelling as presented below.

In fact, the QFD approach is of paramount importance in designing an Integrated Information and Data Management Ecosystem. The Quality Functions or the KRAs are to be identified, strengthened and the dynamic form of interactions among the KRAs would create Non-human Intelligence.

14.5.3 Analysis—III

14.5.3.1 Opportunities

The Integrated Information and Data Management Ecosystem has enormous demand for transforming India in terms of economic development, R& D and all other Value Chain functions. The state has concentrated to excel its data infrastructure particularly at the pretext of 4IR. The Union Ministry of Company Affairs, India recently announced to incorporate AI into MCA21 e-Governance service which will make compliance and registration procedures easier. Moreover, it can play a vital role in resolving conflicts as well [28]. The indicative Opportunity Matrix for this Data Revolution System may be identified as follows:

i. Mobile penetration and internet access have been increasing in an incremental rate in India and Mobile Internet has become the pioneer in the access of internet service across the nation. The popularity of Direct Benefit Transfer (DBT) through Aadhar-based Biometric Smart Card has proved successful in Andhra Pradesh [29]. The Integrated Information and Data Management Ecosystem may lead to a massive transformation in the lives and economy of the regions which are remote and away from the central developmental trajectory.
ii. There is a growing trend for emphasizing on Corporate Disclosure in the country which may create gigantic opportunities for comprehensive Data Management System.
iii. In government system, RTI Act 2005 has opened and introduced the process of compulsory information flow on demand of every citizen of the nation. Thus, the Act enforces the government departments to collect, preserve and disseminates the information. However, there is no such Act for Corporate Bodies. The Integrated Information and Data Management Ecosystem would enable to synthesize all sorts of data that necessarily include the basic information of the corporate without intervening the key issues like Patent, Copyright, Business/Trade Secrets etc.
iv. The growing popularity, adaptability and application of IoT have mesmerized the academician researchers and even the users of young generations which essentially creates a platform for sharing multiple and high magnitude of dataset in the public domain or open access forum. If the valuable information is integrated, this could lead the society with fascinating experience and illuminating features.
v. Cutting-edge research depends on the voracity, quality and reliability of dataset and its continuum of data flow. This Pull Strategy would promote the culture and capacity for creating such high-end data infrastructure in the India and across the globe.

14.5.3.2 Challenges

In any study or research, the Opportunity Matrix determines the ease and expectancy mode of any model. But the future expectancy constructs must be complemented and supported by continuous form of tangible and intangible resources. One of the most vibrant factors may be the role of users and the commoners to make it successful. In Indian context, there are few indicative challenges or rather constraints that need to overcome. A subset of challenges are highlighted below:

i. The country suffers from the lack of infrastructure facilities. As 68% of Indians rest in villages [30], it is difficult to bring them in the ambit of the sophisticated and high-end Data Management Ecosystem unless equitable infrastructural development takes place. However, it requires huge investment of financial resources. It is up to the nation to decide on the competitive priorities, that is, what extent the government is committed to value the essence and aspirations of developing Integrated Information and Data Management Ecosystem. Even if all the state and non-actors are unanimous to achieve such landmark, it is practically impossible to develop equitable infrastructure across Pan India within a smaller time frame. The government has been taking initiative consistently. The hallmark of 'Bharat Nirman (2005–09)' initiatives were witnessed to develop the rural infrastructure primarily in irrigation, roads, housing, water supply, electrification and rural telephony [29]. The trend has been fuelled and continued by subsequent governments through their various policy interventions.
ii. India still suffers from adequate competency on a single language platform as it is difficult for the multi-lingual society to learn and practice on English language. The proposed Data Management System may be useful if majority of Indians can read and understand in English language.
iii. The initial investment of such prototype or framework is associated with high cost implementation and that needs to be absorbed by the state and non-state multi-stakeholders.

14.6 Recommendations

The paper has demonstrated how the historical data as well as real-life information and knowledge system can be recorded, preserved, accessed and optimized so that every stakeholder of economy may excel in a mutually benefitting and collaborative manner. The development of 4IR has created enormous opportunity and genuine demand for creating dynamic database infrastructure which would be expected to interact arbitrarily as a form of AI. The implication of this paper may be conceived with the notion how the various forms and facets of data platform can be conjugated, integrated and inter-linked to create an Umbrella-shaped morphology.

14.7 Limitation of the Study

The study intends to formulate a dedicated model for integrating Information and Data Management Infrastructure based on available research inputs and existing frameworks. The model needs to be implemented in a test region i.e., a small district or sub-division where the robustness of the model may be verified. The emerging attributes or concerns during this experimentation process may be explored, identified and incorporated with the existing model framework. Thus, the information ecosystem can be strengthened through continuous development process. However, the model has not been trialled as its present form.

14.8 Conclusion

The world has been progressing through information age where big data analytics has become prolific leader of the millennium. The synergy and synthesis of Artificial Intelligence (AI) based on both panel data and real-life information is the future of our society. The transition and transformation of new generation technology and scientific application essentially depends on the momentum, magnitude and the quality of data storing, preservation, analysis and interaction process through experiential learning and QFD of all the attributes and entities. The fusion of such heterogeneous modalities in a most coherent framework for achieving Integrated Information and Data Management Ecosystem has become the call of the day which needs to be augmented both for developing and developed nations.

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1st Edition

Soft Computing Applications and Techniques in Healthcare

By Ashish Mishra, G. Suseendran, Trung-Nghia Phung

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Book Description

This book provides insights into contemporary issues and challenges in soft computing applications and techniques in healthcare. It will be a useful guide to identify, categorise and assess the role of different soft computing techniques for disease, diagnosis and prediction due to technological advancements.

The book explores applications in soft computing and covers empirical properties of artificial neural network (ANN), evolutionary computing, fuzzy logic and statistical techniques. It presents basic and advanced concepts to help beginners and industry professionals get up to speed on the latest developments in soft computing and healthcare systems. It incorporates the latest methodologies and challenges facing soft computing, examines descriptive, predictive and social network techniques and discusses analytics tools and their role in providing effective solutions for science and technology.

The primary users for the book include researchers, academicians, postgraduate students, specialists and practitioners.

Dr. Ashish Mishra is a professor in the Department of Computer Science and Engineering, Gyan Ganga Institute of Technology and Sciences, Jabalpur, Madhya Pradesh, India. He has contributed in organising the INSPIRE Science Internship Camp. He is a member of the Institute of Electrical and Electronics Engineers and is a life member of the Computer Society of India. His research interests include the Internet of Things, data mining, cloud computing, image processing and knowledge-based systems. He holds nine patents in Intellectual Property, India. He has authored four books in the areas of data mining, image processing and LaTex.

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Prof. Trung-Nghia Phung is an associate professor and Head of Academic Affairs, Thai Nguyen University of Information and Communication Technology (ICTU). He has published more than 60 research papers. His main research interest lies in the field of speech, audio, and biomedical signal processing. He serves as a technical committee program member, track chair, session chair, and reviewer of many international conferences and journals. He was a co-Chair of the International Conference on Advances in Information and Communication Technology 2016 (ICTA 2016) and a Session Chair of the 4th International Conference on Information System Design and Intelligent Applications (INDIA 2017).

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Editor(s)

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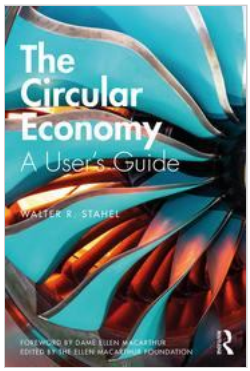

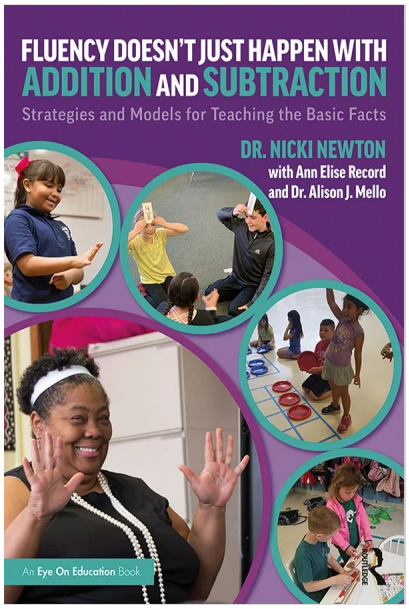
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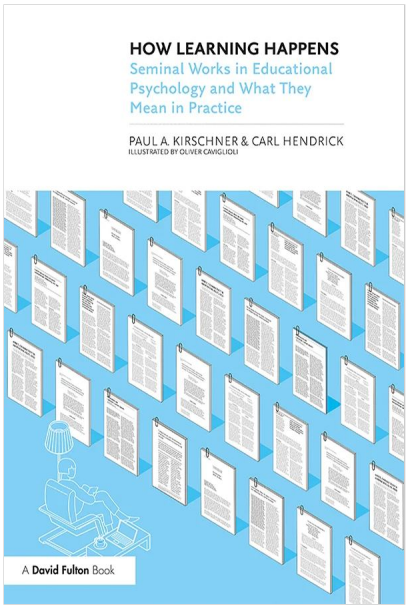
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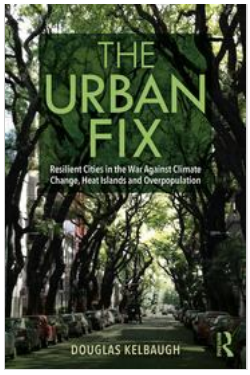
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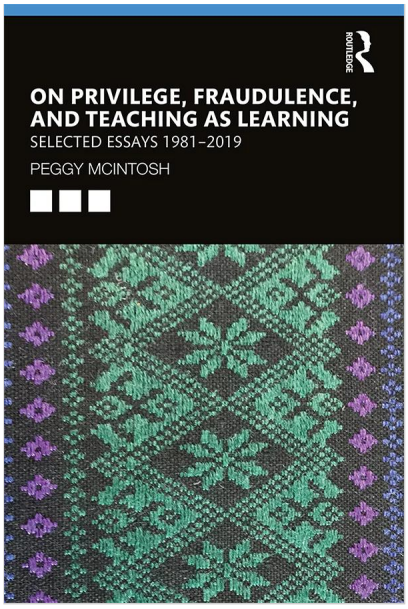
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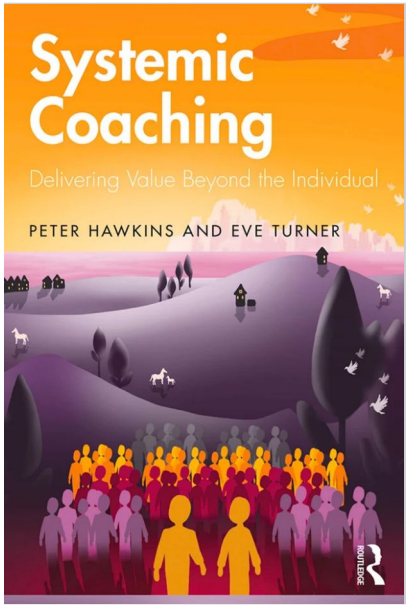
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A Novel IoT-Based Approach Towards Diabetes Prediction Using Big Data

Riya Biswas, Souvik Pal, Nguyen Ha Huy Cuong and Arindam Chakrabarty

Abstract Big data is a modern teamster of today's economical world. Data are being digitalized in today's world as imperative judgment is taken by Big data analytics. In our manuscript, we have discussed about Big data analytics in IoT ecosystems and its implications in healthcare. Healthcare is concerned now a days and big data is holding all the supportive hands in IoT-based healthcare systems. In healthcare, we have discussed about Diabetes Mellitus which is a non-communicable disease. This paper deals with the proposed system of diagnosis of diabetes. Hence it is assertive that we do some surveys on how we can manage to handle large data files, technologies are defined and also predictions of diabetes through IOT sensor and management have been discussed.

Keywords Big data · Hadoop · Map reduce · HDFS · Pig · HIVE · HBase · IoT

1 Introduction

In current surroundings data is generating from multiple origin. These data is of multiple diversity. This bulk of enormous data is considered as Big Data. Big data and IoT are the buzz words now days. It is used to express cumbrous bulk of structured and unstructured data. Some characteristics of Big data being discussed [1, 2].

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The amount of data can be blunder, malleable and scalable data which are processed through technologies used called Hadoop, Map Reduce, HIVE, Pig. The production of volume of data is rapidly enlarging every year due to occurrence of newly technologies, accessory and communication [3]. In the modern milestone of smart phones and wearable devices, endless sum of health data folder of patient from different challenges continue featured by healthcare industry [4]. Mostly confusion begin where system process through heterogeneous data sets [5, 6]. In healthcare sector a leading non-communicable disease (NCD) is Diabetes Mellitus. There are basically three stages of type 1 diabetes, type 2 Diabetes, Gestational diabetes. Diabetes is a scheme of metabolic diseases consist of high blood sugar levels concluded lengthy season a numerous operation supported on Internet Of Things been developed for management of diabetes and it composite of physical objects [7, 8]. IOT is mostly a model for interconnecting sensor which does tracking, sensing, processing and diagnosing, coming up with a enclosed device and detector which can link up and also exchange content beyond the internet [9, 10].

In this paper, we are going to discuss literature survey of the related work in the Sect. 2. Section 3 deals with the architecture of the proposed diabetes diagnosis system, proposed algorithm, and sequence diagram of the algorithm.

2 Literature Survey

In this section, we have discussed on literature survey of the background study. Chavan et al. [9] have discussed about Big data is a word which defines massive and convoluted set of data. Some technologies like Hadoop, HDFS, Map Reduce, Pig, Hive, HBase being used. Khan et al. [11] have expressed a proposed data life cycle which utilize employ the technologies and nomenclature of Big data management, investigating and scarceness. Nizam and Hassan [12] have discussed that it is tough to operate with Big data resolving management traditional dataset. Chen et al. [13] have discussed that Initially generic background of Big data is inform then study about the connected technologies i.e. cloud computing, Internet Of Things, data centers and Hadoop. Archenaa and Mary Anita [14] have deliberate about the approach of how we expose newly expose surplus value from the data autogenic by healthcare and government. Prasad et al. [15] have discussed that diabetes is one of the leading non-communicable disease Mellitus. This system will prophesy searching algorithm in Hadoop/Map Reduce. Huzooree et al. [16] has explains that Diabetes Mellitus (DM). The goal of this paper is to ecumenical review centering on recent glucose projection model is declared depending on the rating to performing data analytics in wireless body area in network system. Kumar and Pranavi [17] has discussed that the important function is providing dilution healthcare by modern application such as Big data and cloud. A ecumenical survey is made on diabetes dataset with random forest (RF), SVM, k-NN, CART and LDA algorithms. Joaheer and Nagowah [18] have explained Telemedicine, Electronic Health Records (EHR) and social media. This paper also describes the repung of Big data and also it proposed architecture for

diabetes Mellitus to predict patient with chronic disease in maturius. Saravana kumar et al. [19] have discussed that the unstructured nature of lifecycle from healthcare of Big data This paper analyzing algorithm in Hadoop/Map Reduce is used for prediction of diabetes type, hindrance. Al-Taee et al. [20] has discussed that the self-management of diabetes by IOT based podium. A completely practical model system is created, achieved, point-to-point function is approved successful.

3 Architecture of Proposed Diabetes Diagnosis System

This section describes the architecture of diabetes diagnosis system that analyzes the various Data and initially it accumulated data from numerous devices and it is initially stored in an unstructured or semi-structured format. Initially data should be digitized to stem EHR as well as data are smart devices, research and development SNM data repository which is begin captured by existent technologies and used to redirect those data to centralized database for anatomy. The data are gathered for processing in Hadoop data system then data will be accumulated by apache flume. Apache flume is used here which is a item of hadoop ecosystem. Then the data will be pushed to Hbase by agents for further processing (Fig. 1).

The outputted data moves to HIVE it is a business application running in SQL queries against a hadoop cluster. It uses then map reduce. Map reduce has two tasks

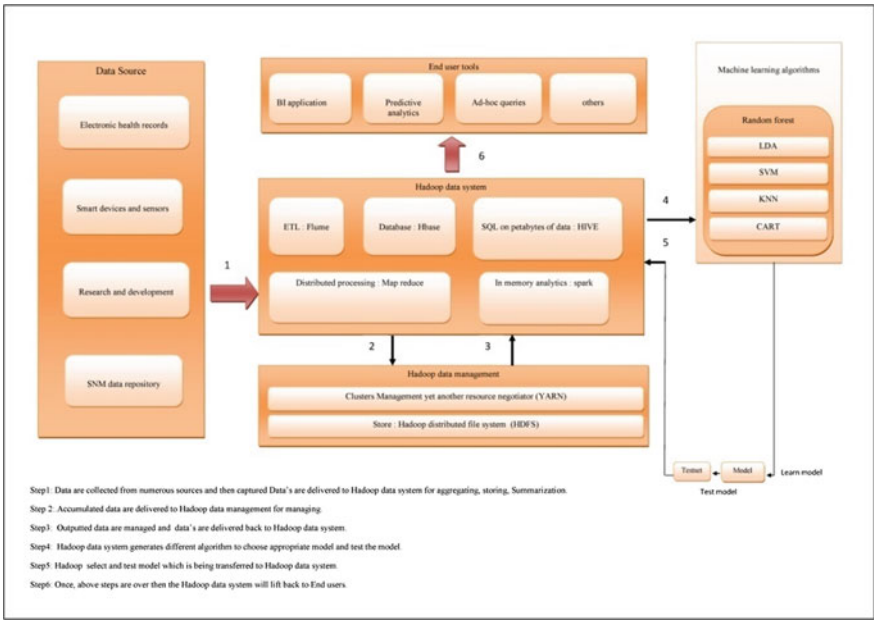

Fig. 1 Architecture for our algorithm

data is splitted and passed into mapping function for produce output values. Next data can use spark which is a frame work that is same as hadoop which provides open-source platforms and can be used by anyone. Then the outputted data are aggregated in hadoop data manager where YARN is used i.e. it is a centralized platform. Then implementing various machine learning algorithms such as RF, LDA, CART and K-NN for prediction it also learn specific data and the test absolute model which will be back to hadoop and hadoop data system will completely send it back to end user tool.

Here it initially identify the course of people tolerate from diabetes registry by working healthcare analytics to big data technology for identifying the diabetes.

3.1 Proposed Algorithm

This section deals with the proposed algorithm of the diabetes diagnosis system.

Step 1: *Initially data assembles from various sources like EHR, smart device and sensors devices and research and development and SNM data respitory.*

Step 2: *Hadoop is a framework which permits for distributed processing of enormous data set. It is a framework which has a capability for stocking and considering data which are prevailing in various machines. It also service map reduce which permits for diving the query into limited chunk and achieve them in co-ordinately.*

Step 3: *Initialized data's from various sources need to be delivered to hadoop data system to process the data where the data's are accumulated by using apache flume, then data moves to HIVE which run SQL queries then data's are place down to map Reduce for summarization. After that spark is used which furnish a open-source platform.*

Step 4: *The processed data's aggregated from hadoop data system need to be managed, so to manage the data are implemented in hadoop data manager where YRAN is used to add new features to the hadoop. It is a centralized platform used for Resource Management.*

Step 5: *The outputted values of managed data are a switched back to hadoop data system.*

Step 6: *The outputted data should be evaluated so Hadoop data system will generate machine learning algorithm.*

Step 7: *Hadoop ensures the appropriate algorithm for the data does evaluated according to their category, from the set of algorithm to determine the appropriate data pattern and lining the data for earning prediction.*

Step 8: *Outputted data tested by Hadoop and draws one specialized model of algorithm and learned the specific model.*

Step 9: *Outputted data are for specific algorithm switch back to hadoop data system.*

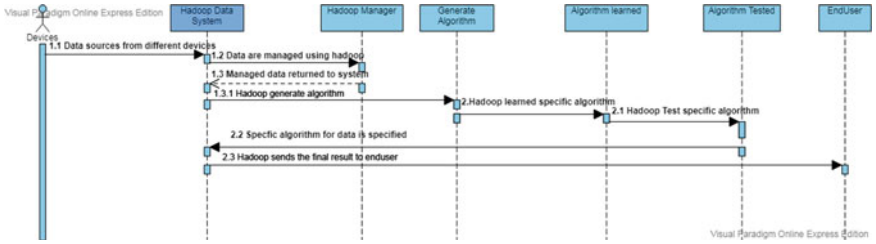

Fig. 2 Sequence diagram for our proposed algorithm

Step 10: Once, the above steps are done hadoop data system will switch over to end user tools.

3.2 Sequence Diagram

Initially data are accumulated from multiple sources. Data are being processed by hadoop data system and managed by hadoop data manager and outputted managed data are swapped back to hadoop data system. The hadoop data system will generate machine learning algorithm. According to the kind of data it will choose specific model and the outputted model will reversed back to hadoop data system. After completion of above steps hadoop will swap back to end user tools. In this section, Fig. 2 is expressing that the data sources which are being assembled from various devices are processed and managed. It also analyzes various algorithm and choose appropriate algorithm to learned specific model to predict diabetes.

4 Analysis

In our work, we have built the need of predicting techniques to measures the diabetes unlike the traditional models which doesn't provide enough efficiency, accuracy and fastest delivery. This technique possesses several data from EHR, R&D and other sources like smart devices.

By using existing technologies, it is possible to capture and send to a centralized database for analysis. Also, unlike most of the other proposed works, we used to gathered data from various devices and processed the data in hadoop data system and then processed data are being managed by hadoop data management and additionally it also applied machine learning algorithm such as RF, LDA, CART and K-NN provoked by hadoop. The machine learning algorithm has main benefits over the most other techniques as it provides more accurate throughput to user and it gains the performance rate of the model.

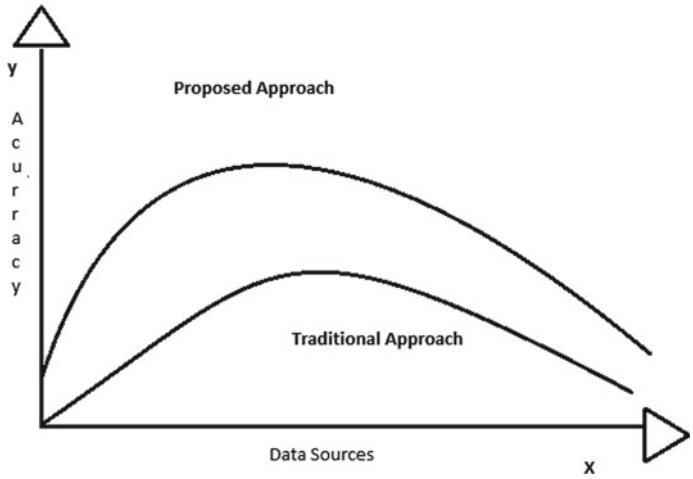

Fig. 3 Compares the traditional approach with the proposed approach shows accuracy will increase as data sources with increase

In our proposed work, considering all factors, we can say that the efficiency, accuracy and fastest delivery medical care at lower cost. This can be compared with the traditional approach by depicting them in the form of graphs for both the traditional approach and our proposed approach. It is depicted that data that we are getting from multiple sources are used to predict the diabetes. So, here accuracy perform a efficient role. Figure 3 compares the data sources with the accuracy as the data sources will increase accuracy throughput will also increase in proposed approach and decrease in traditional approach. Figure 4 is expressing the comparison of cost of traditional approach as compared to proposed approach the cost will decline in proposed approach.

5 Conclusion

Peoples are engaged in today's world in the feverish slots and not pickings any care of their own health, starring to difficulties of continuing disease such as diabetes. In this paper, a recent framework is suggested that utilize. This framework will analyze and predict diabetes Mellitus and providing way to improve healthcare complexity and delivering earliest potential working. As well as this framework is operate for self-treatment and also in future providing faster medical care within a chip costs. In this paper, it also provides many various machine learning algorithms such as RF, SVM, CART, LDA and K-NN to predicting data patterns. The frame work is working currently under development.

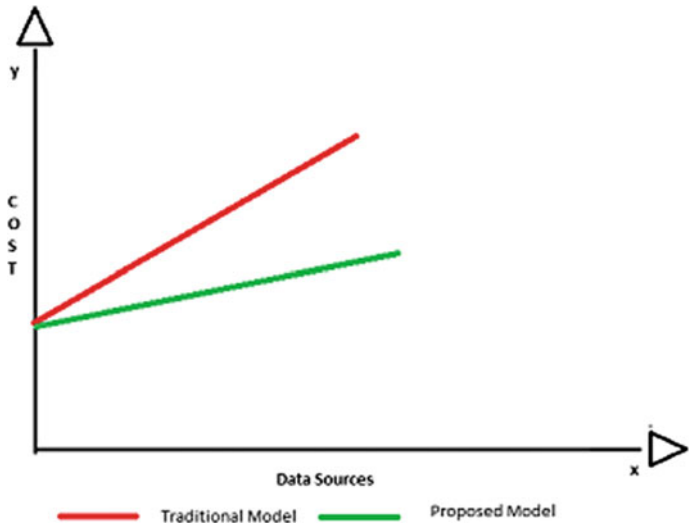

Fig. 4 Compares the traditional approach cost with the proposed approach and display the increase in cost in traditional approach and decrease in proposed approach

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A MITTAL PUBLICATION

NON FARM SECTOR AND LIVELIHOOD DIVERSITY IN RURAL ASSAM

DETERMINANTS AND POLICY OPTIONS

DEBAJIT BHUYAN • AMITAVA MITRA

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– Determinants and Policy Options

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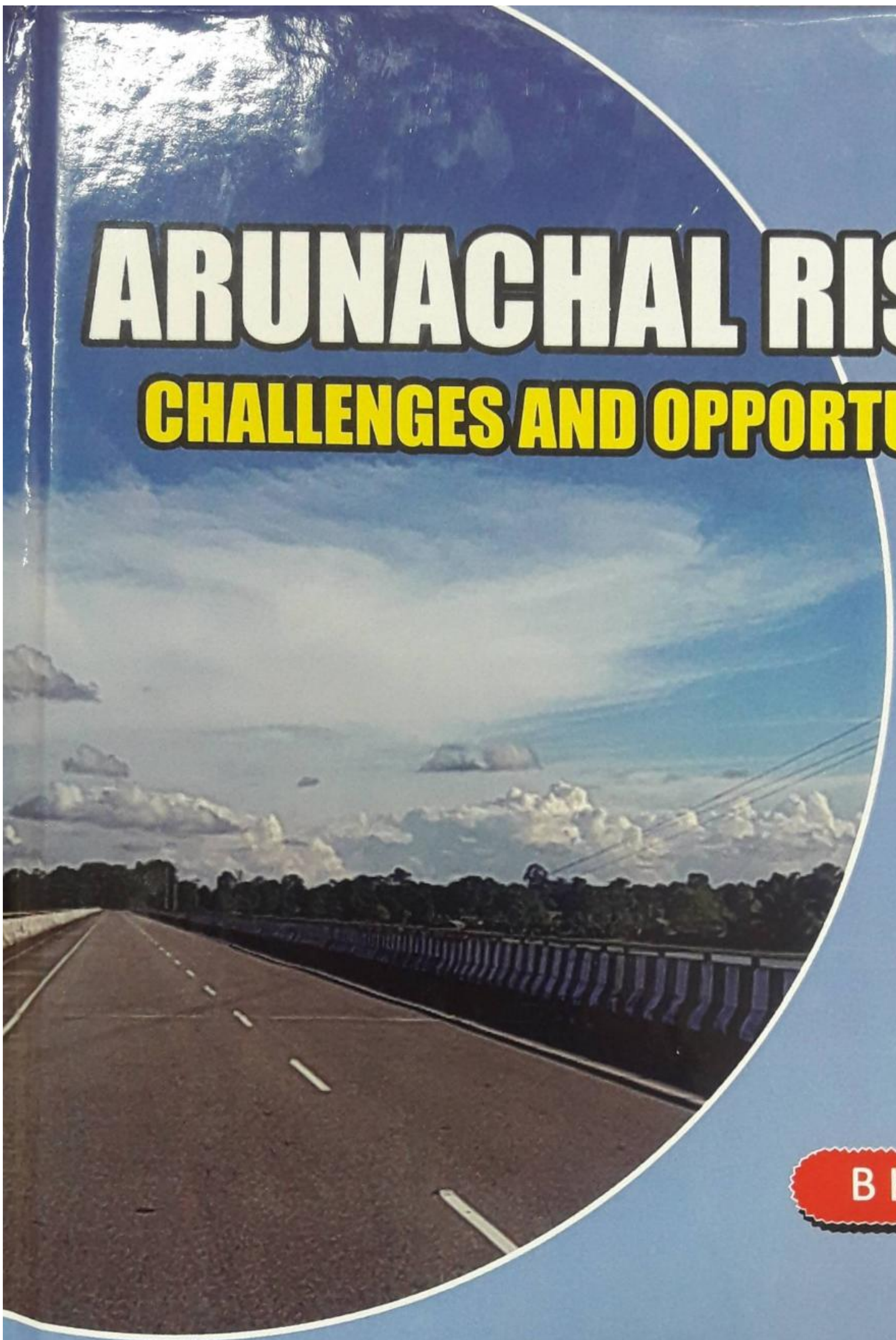

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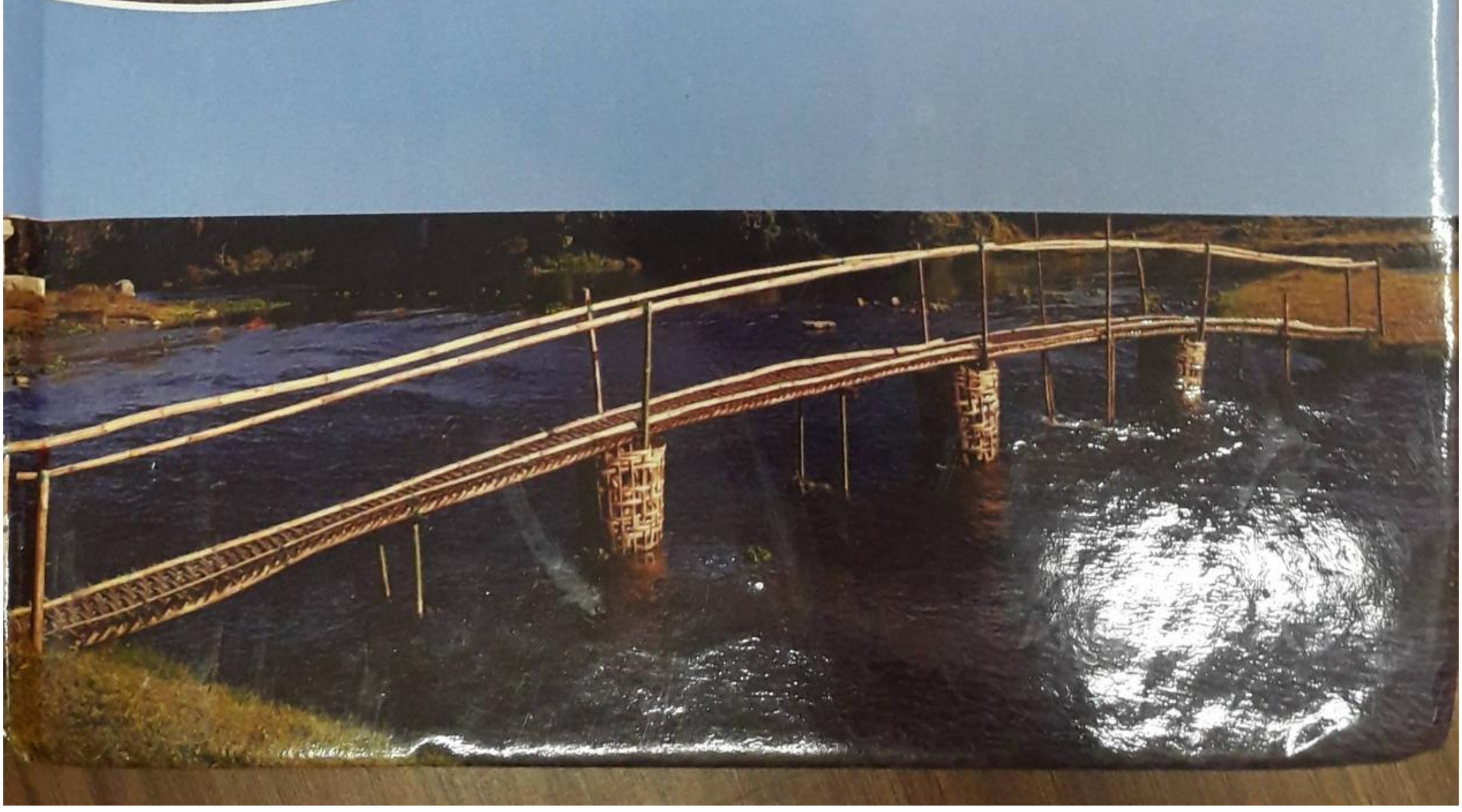

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Content

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A Study of Spiritual Intelligence among the Postgraduate Students of Arunachal Pradesh

Damini Tali
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Department of Psychology
Rajiv Gandhi University
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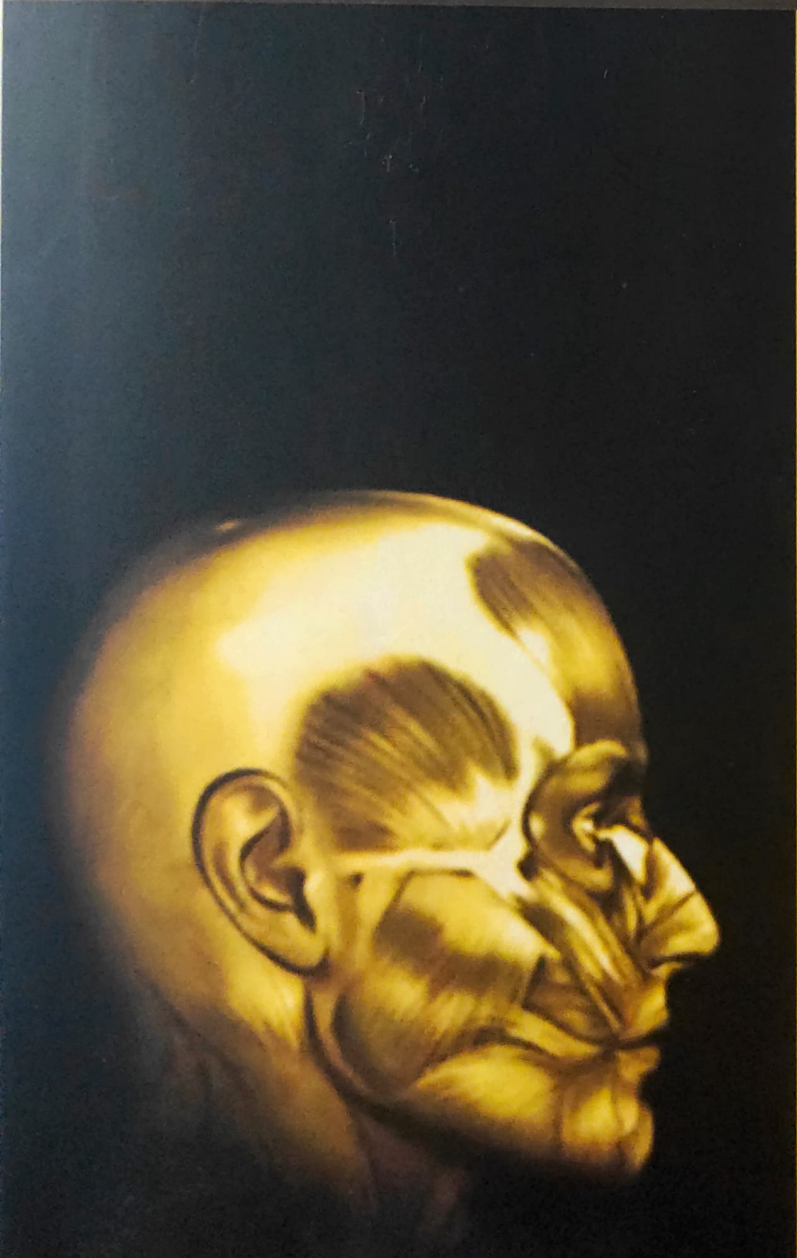
Dharmeshwari Lourembam
Assistant Professor
Department of Psychology
Rajiv Gandhi University
Arunachal Pradesh

Spirituality and its various aspects have become one of the most interesting topics in today's psychological researches. It open up wide horizons that give profound information about the impact of spiritual forces on human body and mind which in turn clarifies the importance of spirituality in one's life. Studies on spiritual aspects have contributed enormous information about its relationship to mental health and overall health of an individual. Spirituality is considered to be a capacity to know the essence of the existence. Many theorists have considered spirituality as a source of all individual thoughts, feelings, behaviour

INTO THE REALM OF MEDICAL ANTHROPOLOGY

Editors
Dhritiman Sharma
Milonjyoti Borgohain



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INDIGENOUS HYGIENE SYSTEM OF THE INDIAN CULTURE AND ITS APPLICATION AT THE TIME OF COVID PANDEMIC

Dhritiman Sarma

Introduction

Covid pandemic has paralyzed the world since December 2019, and India is also suffering a lot. It has been seen that the disease is spreading very fast, and in this time, we are taught by the Government and Medical officials to follow some rules of hygiene, which were practiced by our grandparent generation nearly 50 years ago. This paper is finding out the relevance of the indigenous hygiene system of the Oriental countries like India, and trying to find out the similarities within all. Although the paper highlights on the indigenous hygiene system of the Hindus, yet a brief description of other religions similar practices have also been discussed here, from a humanistic and hollistic perspetives, rather than going through a totally single religious perspectives.

In ancient time, till the 1950s, there were some rigid rules of hygiene in our society. Among the higher caste people, these were very much rigid, especially among the Brahmins and Kshtriyas, and due to such rigidity, these two castes were often subject to ridicule too. It was seen that in order to enter the temple, people has to wash their hands and feet, and similarly while entering a person's house too, it was mandatory to wash the hands and feet. Today, at the time of covid 19 pandemic, we are also compelled to sanitize our hands everywhere. All these issues make us think whether the rituals of washing hands and feet in the ancient times was based on sci-

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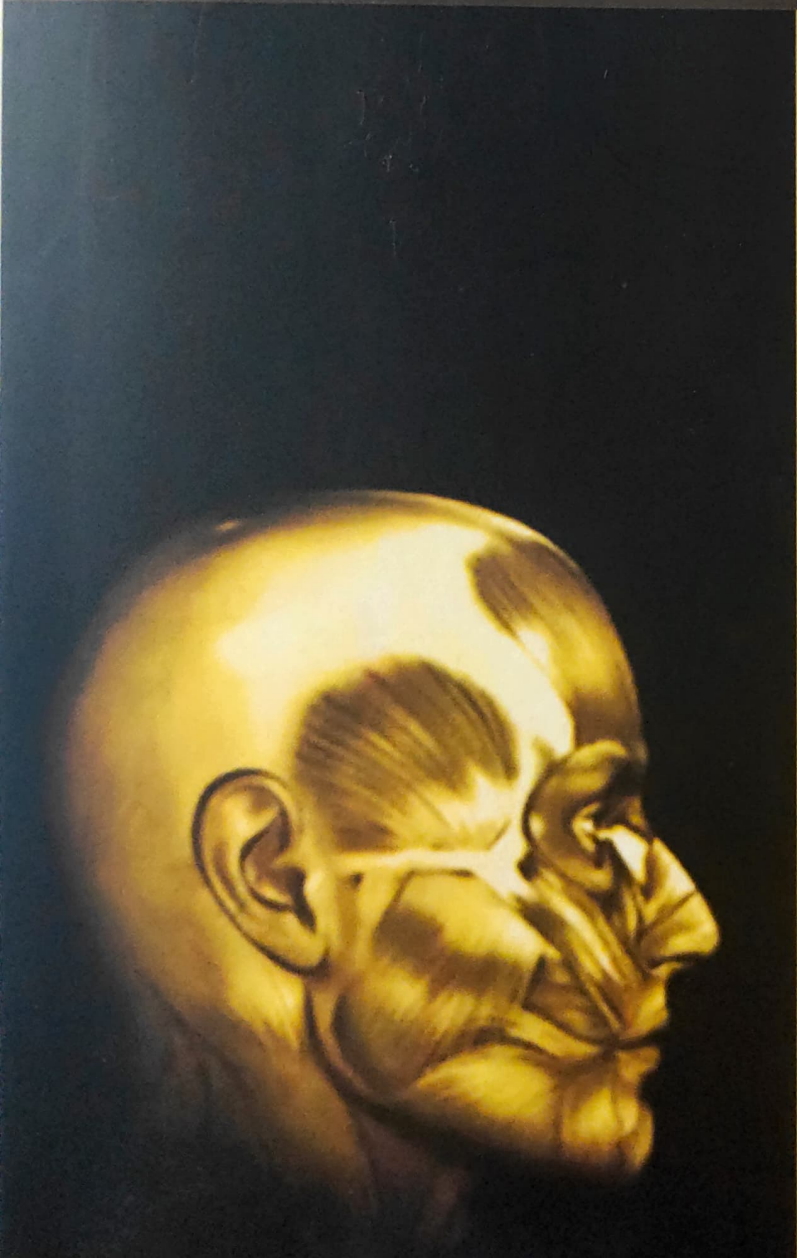

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GENDER AND WORK BURDEN IN RURAL ARUNACHAL PRADESH OF INDIA: A TIME USE SURVEY IN SELECTED DISTRICTS

Dil Bahadur Gurung[a] and Biman Kumar Nath[b]

[a]*Department of Economics, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh, India, gurung_dil@yahoo.co.in*

[b]*Department of Economics, Mahapurusha Srimanta Sankaradeva Viswavidyalaya, Nagaon, Assam, India, nathbiman2012@gmail.com*

Abstract - Increased burden of household activities, care work and other Non-SNA (non-system of national accounts) work for women can be well understood from the fact that women engaged in domestic duties has increased from 51.8 percent in 2005 to 59.7 percent in 2012 in India as per NSSO data. An OECD study conducted in 2012 also indicates that women in India spend 351.9 minutes per day on unpaid work while men spend only 51.8 minutes whereas this difference in work burden is very less in the countries like Norway, Denmark, US, Belgium and Finland (of course with high HDI ranking). In the tribal people dominated states of North East India, women are engaged in agriculture, cooking, housekeeping, child care, fetching fuel wood and water, care of livestock, storing grains, etc. Arunachal Pradesh is not an exception to it. Women's work is not visible or partially accounted for in the data on workforce participation or any other official statistics. Therefore, time use statistics is the only way to understand their work burden. The proposed study will be conducted in four districts, namely, Lohit, East Siang, Lower Subansiri and West Kameng. The data on food gathering and food producing activities, income generating activities, asset holding patterns, collection of forest produce, agricultural operations etc. have been collected at the household level. Individual members of the households have been interviewed about their time allocation pattern, on the basis of a separate questionnaire. In the time-use survey, both yesterday approach and activity approaches has been used. However, information on the time spent on different activities on a normal day in the agricultural and lean period has been collected through the recall method. The study has found significant burdens of women's work do exist in the study area as far as Non SNA and Extended SNA works are concerned. These two groups of activities have been found to be very high among the respondents as per the time pattern is concerned.

Keywords: SNA, Non SNA, Extended SNA, Time use, Gender, Work burden

उईमोक

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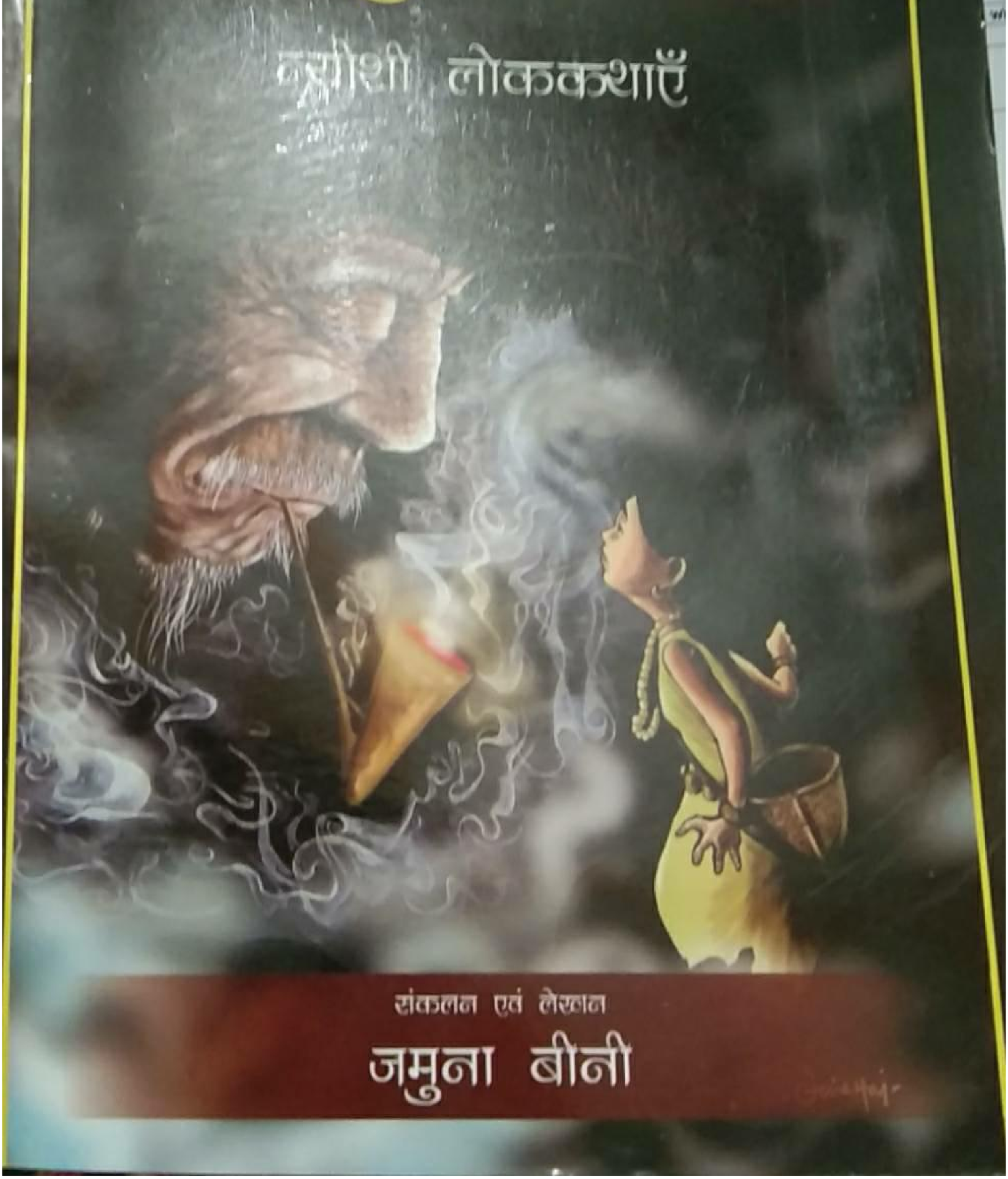

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जमुना बीनी की यह पुस्तक न केवल अरुणाचल अथवा पूर्वोत्तर के साहित्यिक परिदृश्य में वरन् हिंदी साहित्य के विस्तारित फलक पर भी महत्वपूर्ण सिद्ध होगी। इस बहुमूल्य रचनात्मक कृति का विचार उस समय पनपा जब जमुना बीनी 'जनजातीय साहित्य महोत्सव 2018' में सक्रियता से भागीदारी कर रही थी। पूर्वोत्तर के वाचिक साहित्य में अभिरुचि रखने वाले पाठक एवं विद्वानों को तो यह ज्ञात होगा ही कि पहली बार सन् 1958 में अंग्रेजी भाषा में वेरियर एल्विन की 'मिथस् ऑफ नेफा' पुस्तक प्रकाशित हुई थी। अरुणाचल प्रदेश की विभिन्न जनजातियों के मौखिक साहित्यिक परम्परा के गहन अध्ययन तथा मनन के लिए आज भी कई विद्वान उक्त पुस्तक का संदर्भ एवं उल्लेख देते हैं।

'उईमोक' अरुणाचल प्रदेश की न्यीशी जनजाति विशेष पर केंद्रित चित्रांकनों से सुसज्जित हिंदी में पहला और ऐतिहासिक प्रयास है। अरुणाचल के जनजातीय साहित्य की अपार संभावनाओं की खोज करते हुए इसे हिंदी के वृहद पाठकवर्ग के सम्मुख लाने के लिए नि:संदेह जमुना बीनी साधुवाद की पात्र है (उनकी निष्ठा, समर्पण एवं सुंदर प्रयास की जितनी भी भूरि-भूरि प्रशंसा की जाये कम है। हम सभी जानते है कि अकादमिक जगत में ईटानगर स्थित राजीव गाँधी विश्वविद्यालय के हिंदी विभाग की वह एक समर्पित टीचर है और सबसे मुख्य बात यह है कि वह हिंदी साहित्य में महत्वपूर्ण दखल रखने वाली पूर्वोत्तर की बहुचर्चित लेखिका भी है।

जेने हाई से मेरी प्रथम भेंट 2018 के अरुणाचल आर्ट एण्ड लिट्रेचर फेस्टिवल के दौरान हुई थी। मैं उनके सृजनात्मक ऊर्जा की खुले मन से प्रशंसा करता हूँ। उनके चित्र प्रत्येक लोककथा की मूल संवेदना के बखूबी चित्रण में सफल रहे है। मुझे विश्वास है कि यह सचित्र पुस्तक पाठकों के लिए रुचिकारक तथा वर्तमान में पूर्वोत्तर आधारित लोकसाहित्य की अन्य पुस्तकों से भिन्न एवं विशेष होगी। यह पुस्तक भारतीय साहित्य की व्यापक परिधि पर स्थापित सीमांत राज्य अरुणाचल प्रदेश की युवा पीढ़ी की सृजनात्मक शक्ति का परिचायक है। इंदिरा गाँधी राष्ट्रीय मानव संग्रहालय,

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Premature Ventricular Contractions Classification using Machine Learning Approach

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***Abstract*--In this paper, Premature Ventricular Contractions [PVCs] beat classification is proposed for detecting the ventricular arrhythmia. ECG arrhythmia records are considered from MIT-BIH AD and denoised by using the discrete wavelet transform (DWT). Thereafter, two stage median filter is used to eliminate the baseline wander to obtain the clean and smooth ECG signal. Proposed method has calculated the statistical features of extracted QRS complex of both PVCs and normal beats. KNN and SVM algorithms are used for performance evaluation of the proposed method. Overall SVM algorithm using Gaussian function with kernel scale =0.56 achieved the S_p = 99.71 %, S_e =99.80 %, $+P$ =99.71 % and Acc = 99.75 %. The results obtained have shown that the PVCs classification method is more accurate and reliable, and can be used for automatic classification of arrhythmia.**

Keywords--PVCs; classification; KNN; SVN; machine learning

I. INTRODUCTION

ECG reflects the electrical conduction analogous to the electromechanical activity of the heart. ECG signal consists of a sequence of P, QRS and T-wave, which comprises one cardiac cycle. Each wave's morphology in the cardiac cycle represents its own functionality [1]. Any change in the shape, amplitude and duration of a particular wave is identified as an abnormal ECG. P-wave represents the atrial depolarisation, QRS complex shows the depolarization of the ventricles, and T-wave determines the process of repolarization of the ventricles. QRS complex amplitude is the highest among the P and T-waves peaks [2]. In addition to this, QRS complex features make most widely studied components in the ECG signal analysis. The correct interpretation of the ECG signal can determine the status of the heart. Any abnormalities and arrhythmia present in the heart can be diagnosed with help of the ECG signal analysis [3].

In the cardiovascular system, heart is the main organ, which is responsible for pumping the blood throughout the body, where it is divided into two parts left and right. Each part consist the two chambers atrium and ventricle; atrium collects the blood and ventricle pump the blood throughout the body. An autonomous and centrally controlled nervous system node is situated at the wall of atrium is known as sino-atrial (SA) node, which is responsible for exciting the electrical impulse in the heart. The atrio ventricular (AV) node is situated near to the tricuspid wall between the atrium and ventricles chambers. The AV node collects the electrical impulse generated by the SA node, and propagates it to the bundle of his. From excitation to the propagation of electrical impulse from SA node to bundle of his via AV node generates the ECG signal. Any interruption in this electrical condition creates the abnormalities, and can be seen in the form of change in the morphology of the ECG signal. Such changes in the ECG signal are called as arrhythmias or cardiac arrhythmias [4-5].

Cardiac arrhythmia can be easily detected through the ECG signal analysis. Study on various features of the ECG signal can determine the presence of arrhythmia such as tachycardia, bradycardia, ventricular arrhythmia, and atrial fibrillation. When heart rate crosses the 100 beats per minute is known as tachycardia. Similarly when heart rate below the 60 beats per minute is said bradycardia. Moreover, when arrhythmia arises because of the interruption in the electrical conduction, that developed the abnormal rapid heart rate and prevent the filling of blood in the chambers is called ventricular arrhythmia. The ventricular arrhythmias are classified as ventricular tachycardia, ventricular fibrillation, premature ventricular contraction (PVC), and super ventricular arrhythmia. Whereas atrial fibrillations are also classified as Wolff-Parkinson-White (WPW), atrial flutter, premature atrial contractions (PACs), and heart block. In premature ventricular contraction (PVCs), the electrical impulse starts from the SA node and passing through the AV node. But, it does not propagate to the lower portion to activate the depolarization of the ventricles. PVC beat occurs when ventricles are activated by an ectopic site firing instead of the AV node. Most of the PVCs do not contains P-waves, although it was not activated by the atria. PVC complex is wider, taller, and deeper than the normal. Since, it is propagated through the myocytes of the heart [6-7].

Many methods using machine learning approach have been proposed by the researchers. ECG beat classification using statistical parameter was proposed in [8]. In [9] three level fusion technique was used for feature description and classification. CNN was used for automatic classification of arrhythmia in [10]. QRS complex statistical features are used for classification of Bundle branch block by using the KNN algorithm [11]. In [12], a method of PVCs classification was proposed using the entropy as a feature of the signal. In this

work, an automatic classification of premature ventricular contractions beat in the ECG signal is proposed by using the machine learning approach. Two machine learning approach, k-Nearest Neighbors (KNN) and support-vector machine (SVM) are used for PVCs beat classification from the normal beats. This technique is applied on the MIT-BIH arrhythmia database (MIT-BIH-AD) for validation. The process flow of the methodology is shown in figure 1.

II. MATERIALS

ECG records used in this study are taken from the MIT-BIH AD. This database consist the total 48, where each records is of 30minutes duration. All records are samples at the rate of 360 samples per seconds and having the 11 bit resolution over the 10mV range. Records 100m, 105m, 106, 108m, 109m, 111m, 114m, 116m, 118m, 119m, 121m, 123, 124m, 200m, 201m, 202m, 203m, 205m, 207m, 208m, 209m, 210m, 213m, 214m, 215m, 217m, 219m, 221m, 223m, 228m, 230m, 231m, 233m, and 334m consisting the premature ventricular contractions beats have been used in this study.

III. METHODOLOGY

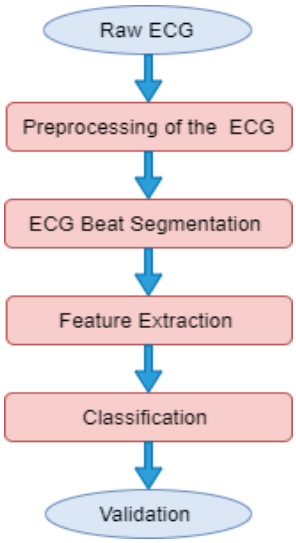

Fig.1 Process flow diagram

A. Pre-processing of the ECG

Pre-processing of the ECG signal is required at the initial stage due to presence of various types of noises in the raw ECG signal. The predominant noises which are present in the raw ECG signal can change the main characteristics of the ECG signal. In this work Discrete Wavelet Transform (DWT) is used to remove the high frequency noises such as motion artefacts and powerline interference. Wavelet transform is generally used in variety of compression and prepossessing applications. Wavelet is a mathematical tool, which cut down the signal into different frequency range and analyse the signal in its matching resolution scale [13].

After denoising, two stage median filters are used for baseline drift removal. Two median filters are connected in the cascade nature, where first stage median filter output is connected to the second stage median filter input. Finally output of the two stage median filter is subtracted from the initial input of the median filter. After that, the pre-processed ECG signal is obtained for further analysis [14].

B. ECG Beat Segmentation

The main component in the ECG signal is QRS complex, which carries lots of information about the heart status. The shape, duration, and amplitude of the QRS complex is used for determining the PVCs beat. Many methods are available for QRS detection in the literature work [15], [16], [17], and [18]. Since the QRC complex is most studied topic in the ECG signal analysis. The proposed study has detected and located the R-peaks by using the method proposed in [15]. PVCs beats are having the different morphology as compared to the normal QRS complex. The QRS complex detected as PVCs beats are wider, tall, and less pointer. But some aberrant PVCs beats are downward (Inverted), and wider in shape. Normal QRS complex is peaked, narrow shaped, and its duration is almost 100ms, where abnormal QRS complex having the duration is more than the 100ms. A window of 125ms is considered to capture the QRS complex in the ECG signal. The extracted QRS complex from the window in the ECG is marked and shown in the figure 2.

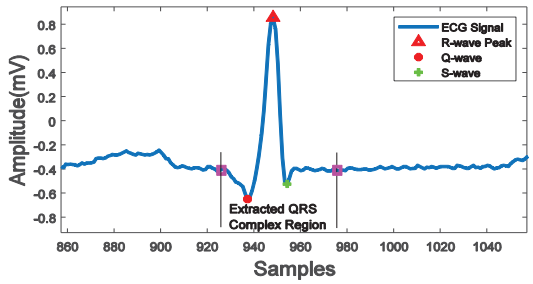

Fig.2. An example of showing extracted QRS complex region

C. Feature Extraction

When Premature Ventricular Contractions (PVCs) beat occurs that results change in the morphology of QRS complex. In PVC, electrical conduction through the AV node does not pass to the ventricles for the depolarization that time an ectopic site in the ventricles excite the impulse. In that situation, impulse is propagated through the myocytes of the ventricles. Thus it's widened the QRS complex due to the introduced delay, and increase the depolarisation time of the ventricles. The occurrence of PVCs in the ECG affects the shape of the QRS complex; also change the statistical features such as mean, variance, standard deviation, skewness, and kurtosis. These statistical features are used in the classification of the PVCs beats. The extracted QRS complex from the ECG signal is represented by the y[n]. The statistical features are calculated by using equations from (1) to (5), and are shown below.

$$\mu_y = E[X] = \frac{1}{N}\sum_{1}^{n} y[n] \quad (1)$$

$$\sigma_y^2 = E\left[\left(X - \mu_y\right)^2\right] \quad (2)$$

$$\sigma_y = \sqrt{E\left[\left(X - \mu_y\right)^2\right]} \quad (3)$$

$$s = E\left[\left(\frac{X - \mu_y}{\sigma_y}\right)^3\right] \quad (4)$$

$$k = \frac{E[\left(X - \mu_y\right)^4]}{\left(E\left[\left(X - \mu_y\right)^2\right]\right)^2} \quad (5)$$

Where, μ_y , σ_y , σ_y^2 , s ,and k represent the mean, standard deviation, variance, skewness, and kurtosis of the extracted QRS complex respectively.

The above statistical features are estimated from the selected QRS complex of the ECG signal. These features are applied in to the classifier along with label for further classification purpose.

D. Classifications

Classification is a process which categorizes the data in to class label. In this work classification is performed using the k-nearest neighbors (KNN) algorithm and support vector machine (SVM) to categorize the normal beat and PVCs beat. The KNN is a simple, slow learning, and non-parametric algorithm used for classification. But SVM is flexible and powerful supervised machine learning and can be used for classification. Aim of SVM to classify the data in to the classes to get maximum marginal hyper plane. The KNN has utilized the four different matric to evaluate the performance of the proposed method. But four different kernel functions are used in the SVM classifier to evaluate the performance of the technique. The 10-fold cross validation is used in training and validation for the classifier.

IV. RESULTS AND DISCUSSION

The proposed method for PVCs classification is evaluated using the two machine learning approaches. First the k-nearest neighbors (kNN) algorithm with four different distance metrics namely Cosine, City block, Euclidean, and Mahalnobis are used. Secondly the support vector machine (SVM) algorithm with different kernel functions namely Gaussian, Linear, Quadratic, and Cubic has been used in this classification method for the performance evaluation. The performance of the technique is evaluated using the parameters Specificity (S_p), Sensitivity (S_e), Positive predictivity ($+P$) and Accuracy (Acc). S_e % and S_p % are evaluated using the equation (6) and (7).

$$S_p = \frac{TN}{TN + FP} \times 100 \quad (6)$$

$$S_e = \frac{TP}{TP + FN} \times 100 \quad (7)$$

Where, TP, TN, FP, and FN are the true positive, true negative, false positive and false negative numbers respectively. These numbers are obtained from the classifier confusion matrices. Positive predictivity ($+P$) % and Accuracy (Acc) % are calculated using the equation (8) and (9).

$$+P = \frac{TP}{TP + FP} \times 100 \quad (8)$$

$$Acc = \frac{TP + TN}{TP + TN + FN + FP} \times 100 \quad (9)$$

Total 6114 PVCs effected QRS complex are extracted from the different arrhythmia records and similar number of 6114 normal QRS complex are extracted from the records of the MIT-BIH AD. Total 12228 instances with their statistical features are applied to the selected classifier.

TABLE 1 PROPOSED METHOD PERFORMANCE ON PVCS CLASSIFICATION

Classifier	Matric/kernel function	Category	Normal	PVC	S_e %	S_p %	$+P$ %	Acc %
k-NN	Euclidean	Normal	6097	17	99.72	99.54	99.54	99.63
		PVC	28	6086				
	Mahalnobis	Normal	6099	15	99.75	99.54	99.54	99.65
		PVC	28	6086				
	City block	Normal	6098	16	99.74	99.49	99.49	99.62
		PVC	31	6083				
	Cosine	Normal	6096	18	99.71	99.54	99.54	99.62
		PVC	28	6086				
SVM	Gaussian	Normal	6102	12	99.80	99.71	99.71	99.75
		PVC	18	6096				
	Linear	Normal	6106	8	99.87	99.04	99.04	99.45
		PVC	59	6055				
	Quadratic	Normal	6097	17	99.72	99.53	99.53	99.62
		PVC	29	6085				
	Cubic	Normal	6105	9	99.85	99.62	99.62	99.74
		PVC	23	6091				

Table 1 presents the performance of the proposed method using the KNN and SVM algorithms for classification of the PVCs beat from the normal beat. KNN algorithm utilised the value of k=1 and different distance functions to obtain the better results. SVM algorithm has used the different kernel function depends on the fitting of the available data. The KNN algorithm using Mahalnobis fitting distance function with k=1 has achieved the better results compared to the other distance function in the same algorithm. Whereas SVM obtained the better results using Gaussian function with kernel scale=0.56 compared to the other function in the same algorithm. Overall SVM algorithm using Gaussian function with kernel scale =0.56 achieved the specificity (S_p) = 99.71 %, Sensitivity (S_e) =99.80 % , Positive predictivity ($+P$) =99.71 % and Accuracy (Acc) = 99.75 %.

TABLE 2 PROPOSED METHOD PERFORMANCE COMPARISONS WITH OTHER EXISTING METHODS

Referenc	S_e %	S_p %	Acc %
[19]	91.4	97.7	98.6
[20]	98.8	99.7	99.5
[21]	81	84	86
This wor	99.8	99.7	99.75

Proposed method performance is compared with the other state of art existing methods is presented in the table 2. In [19], proposed a method based on the DNN and utilised the INCART database to obtain the results. The DWT for pre-processing and SVM with ANN were used in [20] to achieve these results. KNN and SVM algorithm are used in [21] to obtain the results. In overall comparison our proposed method for PVCs classification shows the significant improvement over the other existing methods.

V. CONCLUSION

This work presents a method for classification of the PVCs beat from the normal beat. The ECG signal is pre-processed using the DWT and median filter to get better accuracy. QRS complex of the both normal and PVCs beats are extracted from the MIT-BIH AD for feature extraction. Five different features are estimated from the selected QRS complex region. Two machine learning algorithm, namely KNN and SVM are used with different functions for performance evaluation. Overall SVM algorithm using Gaussian function with kernel scale =0.56 achieved the better results compared with the KNN algorithm. Obtained results have shown that PVCs classification method remains more accurate and reliable, and can be used for automatic arrhythmia classification.

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Health Care Challenges in India

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SECTION - IV: HEALTH DETERMINING BEHAVIOR

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16 Mental Health Stigma and Help Seeking Behavior Among Youth of Tribal Community of Arunachal Pradesh

Kakali Goswami and Leeyir Ete***

The present study was carried out to explore relationship between mental health stigmas and help seeking behavior. Because a person's attitude and belief regarding mental health can contribute to his/her help seeking behavior and self-care initiatives. The study was carried out among young people of various tribal community of Arunachal studying at university level to understand the level of awareness among people regarding mental health and help seeking behavior. A total sample of 50 was collected through survey. Two standardized questionnaire was distributed among the participants. The result of the study will interpret the percentage and belief and attitude of people toward mental health and also initiative towards taking help to deal with mental health and general health issues.

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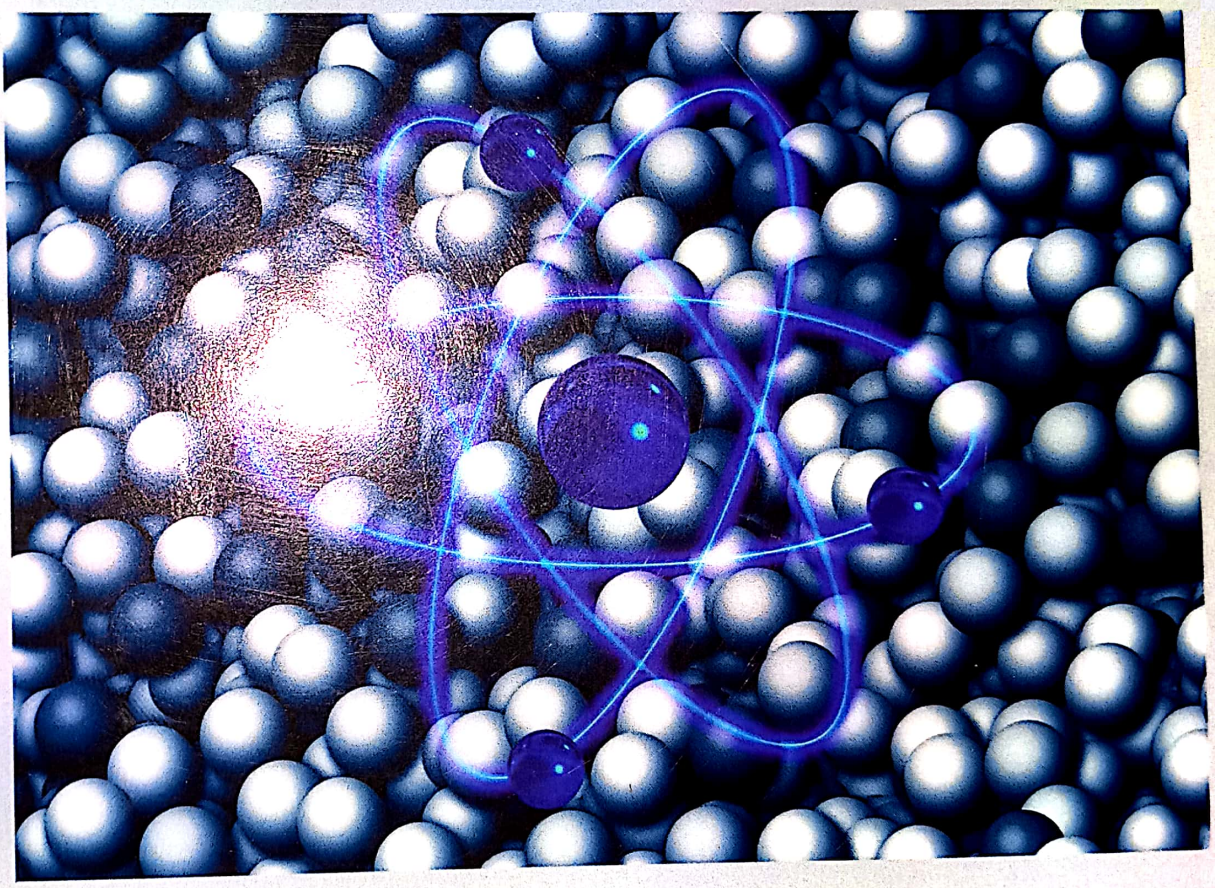

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Synthesis and Characterization of CdS/PbS Core-shell Nanocomposites for Photovoltaic Application

K. C. Handique
B.Barman
Y. Nanung
D. Siboh
P. K. Kalita

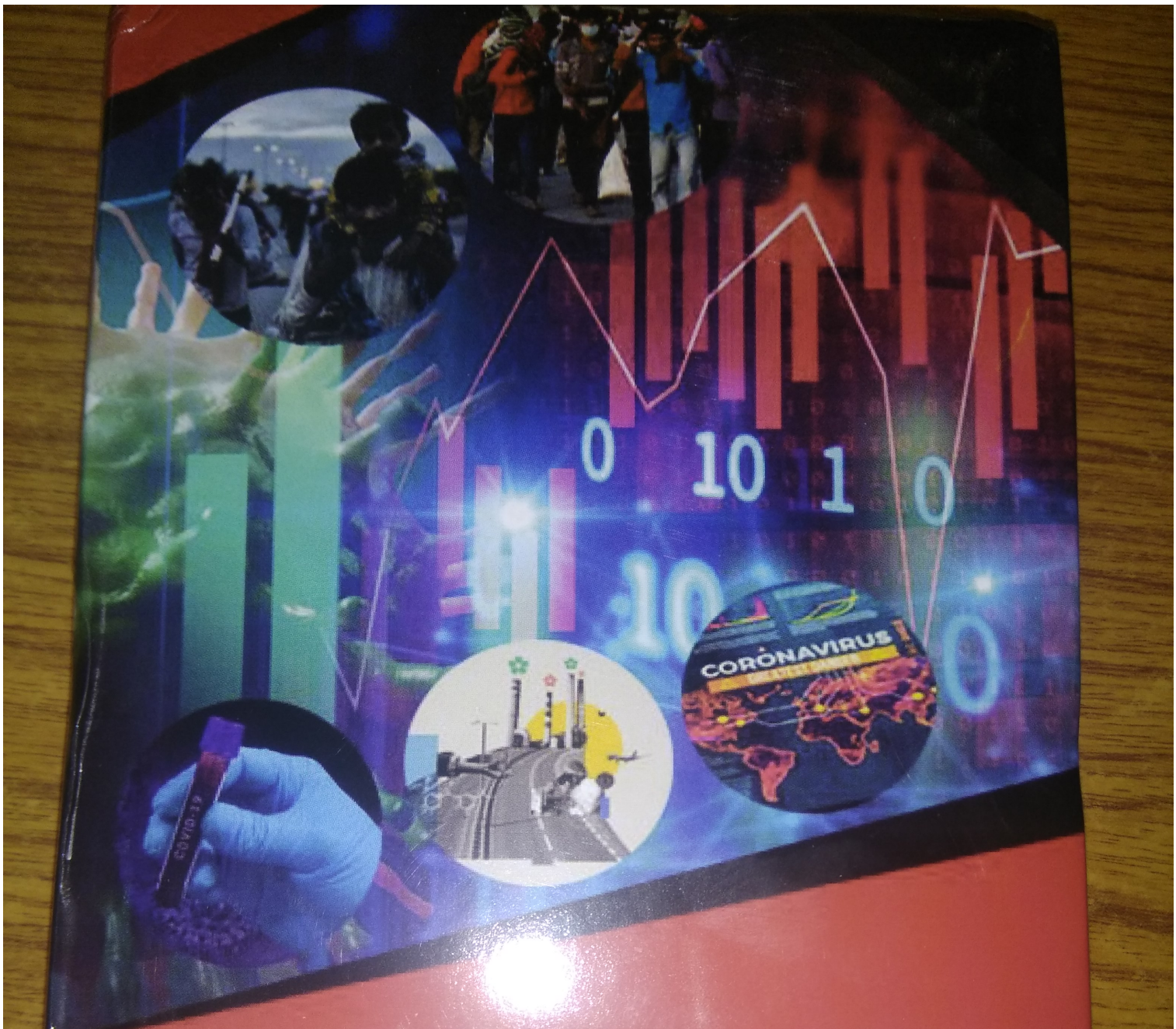
Abstract

CdS/PbS core shell has been synthesized through chemical route.CdS shows hexagonal whereas PbS shows cubic structure. The absorption and photoluminescence studies show a red shift of absorption edge and near band gap emission of core CdS when coated with shell PbS. CdS shows bandgap 2.7 eV and PbS 2.2 eV whereas the CdS/PbS nanocomposites show a bandgap of 2.3 eV. The optical properties clearly signify the formation of quasi type II CdS/PbS core shell nanocomposites that can be used for photovoltaic devices.

Keywords: *CdS/PbS core shell, exciton, blue shift, photoluminescence.*

Introduction

Semiconductor nanostructures especially the core-shell nanocomposites have been attracting a tremendous interest owing to their huge possible application in optoelectronic and photovoltaic devices due to their outstanding optical and electrical properties[1-9]. With this motive one cannot ruled out the role of II-VI semiconductors as the mentioned properties of these materials are strongly dependent on their size and structural morphology which are easily tunable at



COVID-19

ITS GLOBAL IMPACT

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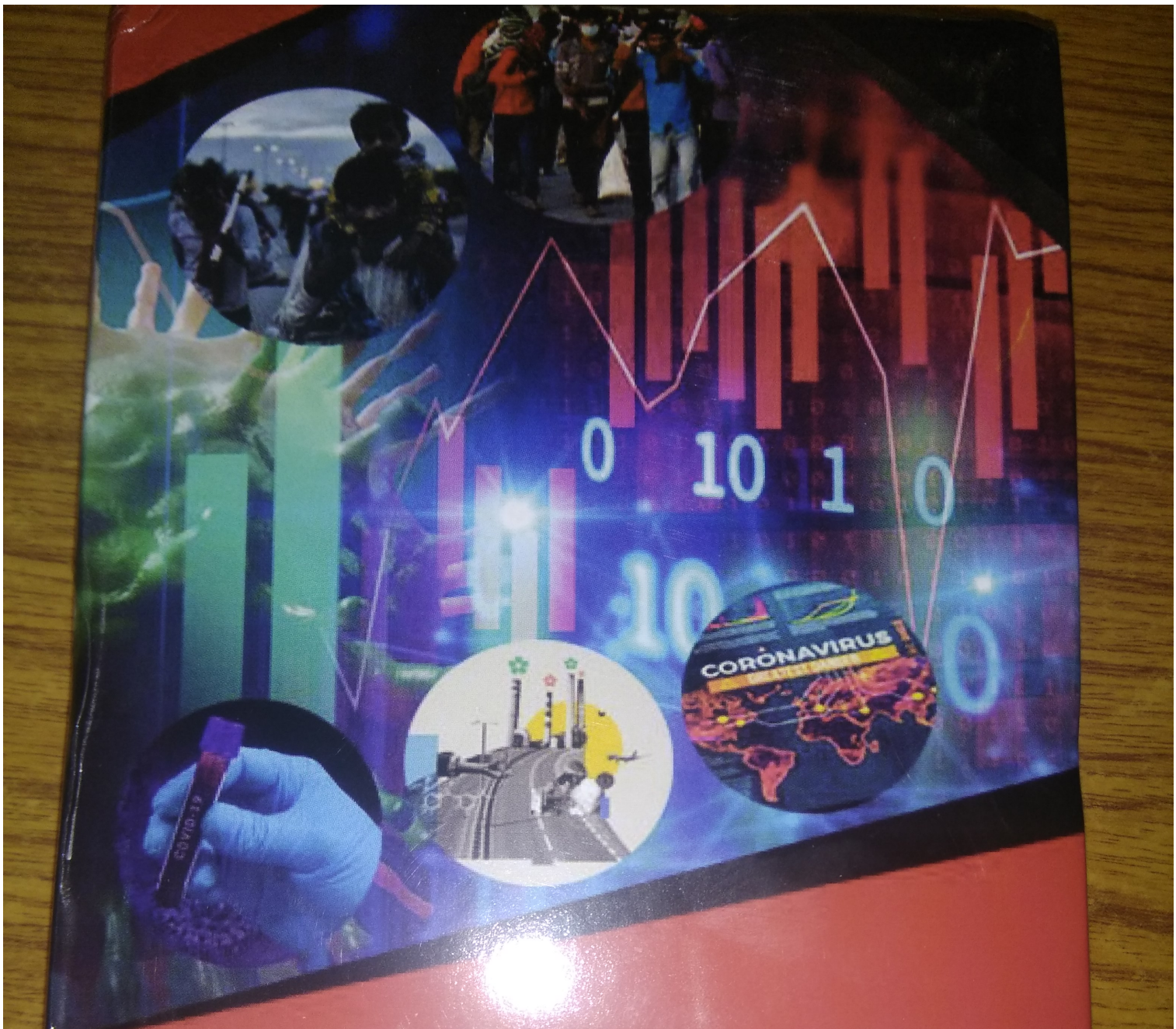

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A REVIEW ON CHALLENGES OF ONLINE TEACHING IN HIGHER EDUCATION DURING COVID 19 PANDEMIC

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ABSTRACT

The world is witnessing the wide effect of covid19 pandemic, which has led to the emergency lockdown of various sectors of development, affecting immensely the higher education. With this, the entire existence of teaching- learning process in higher education has shifted from real teaching to virtual mode of teaching. The sudden transformation in the way of teaching learning process has more popularized the importance of digital education that brought forward the trend of using online teaching among the teachers of higher education to facilitate continued learning despite the emergence of this unprecedented occurrence. The present paper focuses on the basic challenges in executing online teaching effectively in higher education during Covid19 pandemic in the areas concerning: online teaching experiences; connectivity and access to technology among the teacher and the learners. The study concludes with some suggestive measures along with the highlights for the future investigation.

Keywords: Online Teaching, Higher Education and Covid19 pandemic

INTRODUCTION

In the history of human race the world has always bounced back no matter whatever unprecedented consequences they have been through and this time it's COVID- 19 which "stand corona virus disease or novel corona virus or "2019- nCoV" *(Bender, 2020)*, said to be originated the Wuhan city of China in 2019 although various speculations are still prevailed. A Corona vi linked to Severe Acute Respiratory Syndrome Corona virus 2 (SARS-CoV) as similarly found to b fatal *(Meng, Hua, & Bian, 2020)*. Because of its susceptibility, the World Health Organization (W on March 11, 2020, has declared the outbreak a global pandemic in news brief by WHO, Di General. This deadly virus has affected the entire aspects of human existence worldwide, milli

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lives have lost and the various sectors of development hampered causing the world leaders to announce lockdown, which has affected the higher institutions immensely and in order to cope with the set back around 188 countries ***(Toquero, 2020)***underwent adapting online education, with the idea of "Let COVID-19 not stops you from learning which emphasized in developing Open Educational Resources (OER)" ***[MHRD and UGC, 2020, Govt. of India]***same has initiated worldwide that transformed more the very perspective of digitalization in educational arena by altering the trend of face- to- face teaching to virtual mode of teaching in higher education. This paper is concerned with the sudden challenges of online teaching in higher education for effective disbursement of web- based learning during global COVID- 19 pandemic.

THE CONCEPT AND BACKGROUND OF ONLINE TEACHING

The concept of online teaching is nothing but teaching that take place-using internet, which is actually a virtual mode of teaching. The history of online teaching date back its first correspondence courses in 1800s said to be using parcel post to reach students who could not be on a university campus ***(Kentor, 2015).*** Gradually, the communication technologies emerged, modified and the use of radio waves, television, caught the track toward educating the masses. Though online learning was emerged in 1982 yet, in 1998, the first fully online programs were founded in New York University Online, Western Governor's University, the California Virtual University ***(Miller et al., 2004)*** and Trident University (www.bbb.org).

By the time online teaching in India somehow had the hold, the program of audio broadcasting began in 1992 through Doordarshan network but it was only one-way communication in its recorded form. On September 20, 2004, a geostationary satellite named EDUSAT provided the virtual two ways video- conferencing ***(Aggarwal, 2014)*** and the rest, we are already witnessing today. "Right from 2005 and present the focus is on mobile learning and social networking the educational characteristics emphasizes interactive distance courseware distributed online through learning management systems with social networking component; learning that is facilitated via a wireless device; learning with portable technologies where the focus is on the mobility of the learner.***"(Herrington, Reeves et al., 2005; Mortera-Gutiérrez, 2006; Nicholson & McDougall, 2005; Pilla, Nakayama, Nicholson, 2006).*** This indicates the masses have now mature enough to receive digital education. This is 21st century and we can assume almost as the advent of 5th industrial revolution were the importance of virtual being has emerged because of prevailing Covid19 pandemic, as it has transformed the ways of teaching and learning and set the promising ideas more in favour of shifting from real to virtual mode of teaching. However, at the same time additional challenges paved a gap between the effective transaction of learning and the learners. Teachers especially in higher education were expected to meet the end of the students in broader perspective as learners are in their reflective state of thinking. However, unfortunately, despite the flourishing digitalization globally, there are certain basic challenges faced by the teachers of higher education in executing effectively the online teaching- learning process.

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CHALLENGES OF ONLINE TEACHING IN HIGHER EDUCATION

The investigators have tried to pinpoint the basic challenges faced by the teachers of higher education based on the present context.

Online teaching experiences

The outbreak of COVID- 19 pandemic has disrupted the normal classroom teaching and made to think the alternate ways to continue teaching- learning process. Before the outbreak, though the various educational stakeholders emphasized the online education practices yet, it was never an entire shift of online teaching in the mainstream of higher education, which resulted into the beginning of new challenges as well as opportunities simultaneously. The increased demand of online learning, the demand of online teaching is natural. It has found that only 9% of respondents to the education survey indicated that prefer to teach online *(Pomerantz & Brooks, 2017, p. 4, 25)*. As those who are familiar with teacher- centred methods may experience challenges transitioning to online instruction that emphasize implementation of student- centred pedagogies *(Alexiou- Ray & Bentley, 2015; Gregory & Salmon, 2013)* as because, "some instructors find it challenging to adjust to a new pedagogical form" *(Barr & Miller, 2013, p.12)*. As found also that even if they engaged there is, a love- hate relationship with online teaching and learning: they don't want to do it but think they would be better instructors if they did *(Pomerantz & Brooks, 2017, p7)*.

Additionally, *Schmidt et al. (2016)* highlighted that since college instructors often teach as they were taught, they may lack an example of what effective online teaching entails, especially if they never took an online course themselves as students. As in recent times according to *Duffin, 2020* reported that 73% of the students worldwide are not aware of massive online open courses (MOOC) as of in April 2015, the share of students that took a MOOC in the past was still 9% only.

Again, we know that it takes a lot many efforts to design a lesson plan, teaching materials and to create the entire learning toolbox for the learner as said "Developing and teaching online course requires specific sets of skills that faculty must acquire in order to be successful in this new paradigm of learning and teaching *(Howell, Saba, Lindsay, & Williams, 2004)*.They have been persistent since the traditional method of teaching, now as because of outbreak the importance of technological skill acquisition and the use of interactive learning resources under the ICT initiatives has emerged more actively that obligated the teachers to attend the online workshops and webinar. With the inadequacy of technical learning and training among the teachers of higher education the questions of providing relevant and rigorous deliver of content, meeting the learning outcome and its reliability will be on rise.

Connectivity

In this paper the connectivity is all about the connection between network and online teaching i.e., about the technical connectivity. The ABSTRACT noun 'connectivity' represents the notion of serving to connect, while the everyday verb 'to connect' means to bind or fasten together, to join or unite, to link, or to establish and maintain communication between *(Delbridge et al., 1997)*. Network issue has already been the major challenge for the smooth functioning of teaching- learning process in higher education ever since the digitalization of education was introduced, which later become seemed

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itable barrier in pandemic era 2020 and even worst where network connectivity become the to enable the online teaching. Technology issue at present speaks about such connectivity he Covid-19 situation where institutions are mandate to lockdown poor network connection d the online teaching. The feasibility of interactive smart tool is more apparent and effective in a good network connection. In many of the higher institutions especially among the d community, both teachers and students suffer despite knowing the importance of online As stated, in spite of online learning seeming to be the best ways of learning during the eriod, the innovation is hampered by the unavailability of connectivity in some rural context 0). Therefore, even if the teachers are willing to be trained in online instructional tools or up any learning initiatives for their students would face difficulty in delivering online mode because of connectivity problem, which would ultimately limit the benefit of online

echnology among the learners

ther challenge for fair and credible functioning of online teaching is the access to technology learners. In the world of virtual interaction if a person lacks the resources or lacks in the of use of the digital functioning then the motive of spreading online education will never be er, it is also not a denying fact that "though students seems to be using different gadgets and mselves digitally literate yet both teachers and students may not be tech-savvy."***(Kaup, S et***

accessibility of technology has always been the issue among the learners as many of the ong to different socio- economic background which is not equal, the cost of any gadgets, chasing of antivirus, internet pack, repairing charges etc are so expensive in today's era ***(also ube, 2020).*** Additionally, because of COVID-19 "...most of the parents have lost their jobs down..." ***(Dube, 2020)***which has worsen the situation even more that taking online classes, orientation for learner about any relevant information are out of question. The poor has also become a challenge among the learner to fight against COVID- 19 to get informed test news and benefits for example; in countries like India, govt. has issued a public notice to gya Setu' for COVID- 19 contract tracing, syndromic mapping and self-assessment digital nched on April 2020 (www.aarogyasetu.gov.in). Moreover, the problem of using online ps and new upgraded gadgets were also found to be difficult to use among the teachers in cation, which made them challenging to help the learner as, cited the same in ***Dube, 2020.***

ain, these issues have become more elaborative ever since the rise of COVID-19, which has rriers in the way to effective online teaching. Moreover, teachers are already seeking to meet of the learner and to make unlearn learn this additional crises pave a huge hole in the virtual world. As mentioned inadequate hardware and software, slow internet connections, learners' cation, lack of technical expertise among the instructors, insufficient orientation for learners, of release time for instructors to develop and design their online courses have been cited as faculty participation in developing and teaching online courses ***(Nkonge & Gueldenzoph,***

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DISCUSSION AND SUGGESTIONS

Challenges and opportunities have never scooped out of easy cake as long as the human struggle to accomplish a noble cause is concerned, so is the condition in the implementation of digital education and introducing upgraded pedagogic version applies considering that investigators have highlighted above some of the challenges of online teaching during COVID- 19 pandemic. After the analysis the investigators have found that despite many issues it is teacher's readiness, time, intrinsic motivation to seek novelty, zeal to be responsible and looking at the positive aspects of teaching online can make them adapt to the virtual way of teaching and additionally if supported by the concerned govt. and the higher institutions seriously for the effective execution of online teaching giving them the incentives and the freedom to explore for self- reflection as also supported by in the findings of *Shea et al., 2001; Skibba, 2011; Shea, 2007; Sibley & Whitaker, 2015.*

Besides, the investigator finds that it is time to focus more in implementing new pedagogic instructional strategies emphasizing student's self- determined learning called 'Heutagogy,' "because learning online is best done as a self- determined learner, creating personal learning networks that work for you" *(Fred Garnett, 2013)* which is the transitioning from pedagogy to heutagogy *(Boon Hou Tay, 2013)*so that in near future if students find a way to become a teacher then they themselves would be the best example in providing digital learning to guide their future 'ought to be' students. Students in higher education are adult learner and so *Campbell (2004)* argues that the emphasis of online learning in higher education settings is on the development of Metacognitive as well as reflective and collaborative learning. Further, online learning goes beyond planned subject learning to recognize the value of the unplanned and the self-directedness of the learner to maximize incidental learning and improve performance.

So far the connectivity and access to technology for the learner is concerned the use of hybrid or blended learning can be availed by both students and teachers in higher education. The concept of hybrid and blended learning refers to the combination of an online learning environment by gaining the flexibility of distance or outside of classroom learning and face- to- face (F2F) classroom instruction *(Hentea, Shea, & Pennington, 2003)*, indicated also in the findings of *(Al-Husban & Shorman, 2020)*. In this concern govt. or any other private authorized organization are of concern for a good installation of network connectivity, also a kind of cooperation from educational stakeholder is important moreover, teacher can be more sensitive in making the learner learn in their pace using both synchronous and asynchronous channel effectively emphasizing constant feedback in filling up the gap of learning among the learner. As a teacher, during pandemic or post pandemic these techniques with instant or frequent feedback can use as assistance for both frontier and interior section of learner as supported by *(Kaup, Jain, Shivalli, Pandey, & Kaup, 2020)*.

CONCLUSION, LIMITATIONS AND IMPLICATIONS

In lieu of the present study, the investigators have come forward with various, challenges and discussion providing suggestive measures to boost the learning in higher education at the time of pandemic era. The investigator while analysing highlighted some of the new terms like self- determined learning called Heutagogy which is actually a digital learning and blended learning, in days to come one

can initiate more detail study of the said terminologies and its relationship to higher education post-pandemic as because COVID- 19 has initiated the new paradigm of learning, these concepts are concerned with the transformation of the role of teacher from mere instructor to a guide and facilitator and insisting the teaching fraternity to equip themselves with many technical skills and enforcing to adapt virtual engagement. Additionally, one can go forward to study the student's readiness toward self-determined learning and blended form of learning. There was a time teachers in higher education were helpless assisting the learners worldwide as the sudden lockdown of institution brought chaos in the routine functioning of various educational institutions, but as now even though the pandemic and lockdown is prevailed yet many educational stakeholders worldwide has realized the importance of digital education and has emphasized open educational resources, web- based learning,

Again, the investigators show some limitations, as the analysis of the study is based on subjective viewpoint because of the nature of the paper. More strength could have been given by including varied primary data. In conducting online teaching the challenges investigators mentioned is not sufficient, as administrative role, social role etc could have been included.

Therefore, it is concluded, time has come to move ahead by introducing new paradigm of pedagogy besides, "the use of information and communication technology has transformed student expectations" ***(Wegmann, & McCauley, 2008)*** and so of the world as well. Online teaching has the potential to include in the mainstream of higher education despite challenges if cooperation and suggestive measures are taken into consideration by the concerned govt., educational stakeholders, students, scholars along with community seriously with positive note.

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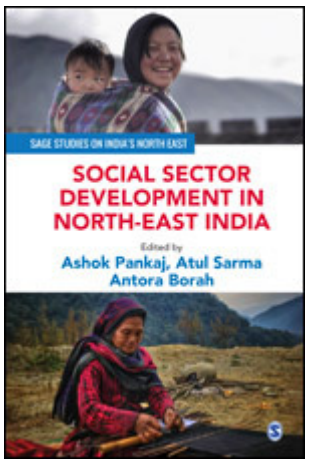

Social Sector Development in North-East India

Edited by:

Ashok Pankaj - Professor and former Director at the Council for Social Development, New Delhi
Atul Sarma - Chairman of the OKD Institute for Social Change and Development, Guwahati
Antora Borah - Research Associate at the Council for Social Development, New Delhi

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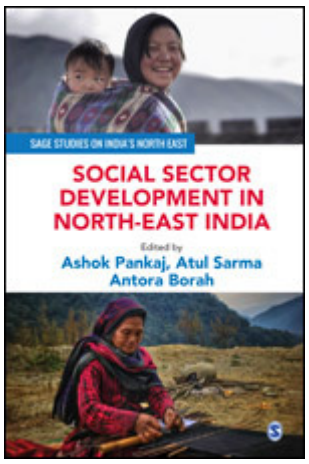

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An Analysis of Phase-Based Speech Features for Tonal Speech Recognition

Jyoti Mannala, Bomken Kamdak, and Utpal Bhattacharjee

Abstract Automatic speech recognition (ASR) technologies and systems have made remarkable progress in the last decade. Now-a-days ASR based systems have been successfully integrated in many commercial applications and they are giving highly satisfactory results. However, speech recognition technologies as well as the systems are still highly dependent on the language family for which it is developed and optimized. The language dependency is a major hurdle in the development of universal speech recognition system that can operate at any language conditions. The language dependencies basically come from the parameterization of the speech signal itself. Tonal languages are different category of language where the pitch information distinguishes one morpheme from the others. However, most of the feature extraction techniques for ASR are optimized for English language where tone related information is completely suppressed. In this paper we have investigated short-time phase-based Modified Group Delay (MGD) features for parameterization of the speech signal for recognition of the tonal vowels. The tonal vowels comprises of two categories of vowels—vowels without any lexical tone and vowels with lexical tone. Therefore, a feature vector which can recognize the tonal vowels can be considered as a speech parameterization technique for both tonal as well as non-tonal language recognizer.

Keywords Feature analysis · MGD feature · Phase-based features · Speech recognition · Tonal language

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1 Introduction

Natural languages are broadly classified into two categories—tonal and non-tonal based on their dependency on lexical tone. In tonal language, the lexical tone plays an important role in distinguishing the syllables otherwise similar whereas in non-tonal language the lexical tone has no significant role in distinguishing the syllables. English, Hindi, Assamese are the example of non-tonal language whereas Chinese, Japanese, language of South East Asia, Sweden, Norway and Sub-Sahara Africa are tonal languages [1]. Modern speech recognition research has a half century long legacy. The technology and the systems developed speech recognition have already registered significant progress and many systems are already commercialized. However, those systems are optimized with non-tonal languages, particularly for English language. As a result, when these systems are used for tonal speech recognition their performance degrades considerably. Since the large sections of the world population are speaker of tonal language, for the global acceptability of the speech recognition technology and system, it must be efficient in recognizing in tonal as well as non-tonal language.

One of the major reasons for the system developed for non-tonal language fail to deliver consistent performance in tonal language is due to the non-consideration of the lexical tone related information. Lexical tones are produced as a result of excursion of the fundamental frequency and these informations are discarded in non-tonal speech recognition system as a measure of performance optimization and due to robustness issues as it contains very little useful information for non-tonal speech recognition system.

In the recent years many attempts have been made for developing tonal speech recognition system [2–4]. Such systems are developed considering the fact that a tonal syllable has two components—phonetic and tone. The phonetic component gives information about the base phonetic unit which is similar with non-tonal speech and a tonal unit which gives information about the tone associated with that phonetic unit. As a result, the tonal speech recognition system relies on two sets of features—Spectral features like MFCC for base phonetic unit recognition and prosodic features for associated lexical tone recognition. The scores obtained from both are combined together to arrive at a decision on underlying syllabic unit. However, the prosodic features are highly sensitive to ambient conditions. As a result, the tonal speech recognition systems based on prosodic features are highly susceptible to ambient conditions.

The speech recognition system relies on short-term spectral property of the speech signal in order to exploit the short-term stationary property of the speech signal. To extract the short-term property, Short Term Fourier Transform (STFT) is used. STFT returns the short-term magnitude and phase spectral of the speech signal. However, in most of the cases magnitude spectra is retain to extract spectral features like Mel Frequency Cepstral Coefficient (MFCC) and phase spectral is completely discarded due to the practical difficulty in phase wrapping [5, 6]. However, the recent research has established the importance of phase spectra in speech processing

applications like speech recognition, speaker recognition, emotion recognition and speech enhancement [7].

In this paper we have analyzed the tonal phoneme discrimination capability of phase-based features. The performances of phase-based features have been evaluated for tonal phoneme discrimination.

2 Feature Vector for the Representation of Tonal Phonemes

The Fourier transform of a discrete time speech signal $x(n)$ is given by.

$$X(\omega) = |X(\omega)|e^{j\phi(\omega)} \tag{1}$$

where $|X(\omega)|$ is the magnitude spectra and $\phi(\omega)$ is the phase spectra of the speech signal. There are number of speech processing difficulties in using the phase spectra directly in Automatic Speech Recognition (ASR). Two most critical problems are—firstly a phase spectrum is highly sensitive to the exact positioning of the short-time analysis window. It has been observed that for a small shift in analysis window, the phase spectrum changes dramatically [8]. Secondly, the phase spectrum values are only computable within the range $\pm\pi$, called principal phase spectrum. The value changes abruptly due to the wrapping effect beyond this range. However, for better representation of the phase spectra for automatic speech recognition, the spectra must be unwrapped. The major problem with this unwrapping is that any multiple of 2π is added to the phase spectra without changing the value of $X(\omega)$. Recent studies have shown that phase spectrum can be used for speech applications and gives promising results [9, 10]. Among the phase based features extraction techniques, Group Delay Function (GDF) and All-pole Group Delay Function (APGD) are widely used. In the present study we have used a modified version of GDF called Modified Group Delay (MGD) function for extracting the phase based features due to their promising performance in speech recognition [11].

The Group Delay Function is derived by taking the negative derivation of the Fourier phase spectrum $\phi(\omega)$, written as [12, 13]:

$$\begin{aligned}\tau(\omega) &= -\frac{d(\phi(\omega))}{d(\omega)} \\ &= \frac{X_R(\omega)Y_R(\omega) + X_I(\omega)Y_I(\omega)}{|X(\omega)|^2}\end{aligned} \tag{2}$$

the angular frequency ω is limited to $(0,2\pi)$, $Y(\omega)$ is the magnitude of the Fourier transform of the time-weighted version of the speech signal given by $y(n) = nx(n)$. The subscript R and I denotes the real and imaginary parts of the signals. The features derived from GDF often leads to an erroneous representation near the point of discontinuity. It is due to the denominator $|X(\omega)|^2$ which tends to 0 near the point of

discontinuities. Therefore, the group delay function is modified, which is given as [14]

$$\tau(\omega) = \frac{\tau_p(\omega)}{\left|\tau_p(\omega)\right|}\left|\tau_p(\omega)\right|^{\alpha} \tag{3}$$

where

$$\tau_p(\omega) = \frac{X_R(\omega)Y_R(\omega) + X_I(\omega)Y_I(\omega)}{|S(\omega)|^{2\gamma}} \tag{4}$$

where $S(\omega)$ is the cepstrally smoothed form of $|X(\omega)|$. α and γ controls the range dynamics of the modified group delay function. Here,

$$P(\omega) = X_R(\omega)Y_R(\omega) + X_I(\omega)Y_I(\omega) \tag{5}$$

is called the product spectra of the speech signal which includes both magnitude and phase information [15].

3 Speech Database

In the present study, we have created a speech database of Apatani Language of Arunachal Pradesh of North East India to analyze the performance of phase-based features for tonal speech recognition in mismatched environmental conditions. The Apatani language belongs to the Tani group of language. Tani languages constitute a distinct subgroup within Tibeto-Burman group of languages [16]. The Tani languages are found basically in the contiguous areas of Arunachal Pradesh. A small number of Tani speakers are found in the contiguous area of Tibet and only the speakers of Missing language are found in Assam [17]. The Apatani language has 06(six) vowels and 17 (seventeen) consonants [18]. To record the database, 24 phonetically rich isolated tonal words have been selected. The words are spoken by 20 different speakers (13 males and 7 females). The recording has been done in a controlled acoustical environment at 16 kHz sampling frequency and 16 bit mono format. A headphone microphone has been used for recoding the database. The words are selected in such a way that each tonal instance of the vowel has at least 5 instances among the words. Since the tone associated with the vowel is sufficient to identify the tone associated with the entire syllable [3, 19], therefore, in the present study we have evaluated the phone discrimination capability and robustness issue of the phase-based features with reference to their tonal vowel discrimination capability. Each tonal instance of a vowel has been considered as different tonal vowel. For example, the vowel [a:] have three associated tones—rising, falling and level. Thus vowel [a:] gives raise to the tonal vowels [á:] ([a:] rising), [à:] ([a:] falling) and [ā:] (([a :] level). Considering the tonal instances as a separate vowel, we get sixteen

Table 1 Apatani vowels and their tonal instances

Vowel	Tonal instances		
	Rising	Level	Falling
ɪ	[ɪ́]	[$\overline{\text{ɪ}}$]	[ɪ̀]
ʊ	[ʊ́]	[$\overline{\text{ʊ}}$]	[ʊ̀]
ɑː	[ɑ́ː]	[$\overline{\text{ɑ}}$ː]	[ɑ̀ː]
ɛ	[ɛ́]	[$\overline{\text{ɛ}}$]	[ɛ̀]
ɔ	[ɔ́]	[$\overline{\text{ɔ}}$]	[ɔ̀]
ə	-	[$\overline{\text{ə}}$]	-

tonal vowels in Apatani language. The vowels and their tonal instances are given in Table 1. Since the vowel [ə] has only one tone, it is not taken into consideration while evaluating the performance of the feature vectors.

All the experiments are carried out using this database. The vowels are segmented from the isolated words for all its tonal instances. The segmentation has been done using PRAAT software which is followed by subjective verification.

4 Experiment and Results

To evaluate the performance of the features for tonal phoneme discrimination capability, both statistical methods and Hidden Markov Model based recognizer have been used.

Euclidean distances between the feature values extracted from each pair of tonal phoneme have been computed. The Euclidean distance gives an indication of the linear separation among the tonal vowels with reference to phase-based features. Higher the value of Euclidean distance indicates better discrimination capability for the feature vector.

Fisher's Discrimination ration (F-ratio) [20] has been used as a quantitative measure for the tonal phoneme discrimination capability of the phonemes. F-ratio is defined as:

$$F = \frac{\text{Variance of the tonal phoneme mean}}{\text{Average intra} - \text{phoneme variance for all phonemes}}$$

The above ratio can be computed as:

$$F = \frac{\frac{1}{P}\sum_{i\in P}\sqrt{(\mu_i - \overline{\mu})^2}}{\frac{1}{P}\sum_{i\in P}\left(\frac{1}{T}\sum_{\beta\in T}\sqrt{\left(\left|x_\beta^{(i)} - \mu_{\beta,i}\right|^2\right)}\right)} \tag{7}$$

where $\overline{\mu}$ is the average mean for all the tonal phonemes, μ_i is the average mean for the base phoneme i, $\mu_{\beta,i}$ is the average mean for phoneme i for tone β, $x_\beta^{(i)}$ indicates an instance of the phoneme i for tone β. Higher the value of F-ratio indicates that the feature is capable of discriminating among the tonal phonemes.

To evaluate the performance of the phase-based feature set in recognizing the tonal phonemes, a Left-to-Right Hidden Markov Model (LRHMM) has been used. The LRHMM is suitable for speech recognition due to its capability to model the time varying property of the speech signal. The number of HMM states is determined experimentally. In the present model, 6 (six) states have been used. Each state is represented by a single Gaussian distribution function given by [21].

$$P\left(x|\mu,\sigma^2\right) = \frac{1}{\sqrt{2\pi\sigma^2}}\exp\left(\frac{-(x-\mu)^2}{2\sigma^2}\right) \tag{8}$$

where x is the observation vector, μ is the Gaussian mean vector and σ^2 is the variance. The forward–backward algorithm has been used for training the HMM model. Clean speech signals have been used for training the models.

To extract the short-time MGD features the speech signal is first pre-emphasized with emphasizing factor 0.97 and then framed by a Hamming windows of 30 ms duration and 10 ms frame rate. The phase-based MGD features are extracted from the windowed speech signal using the method described in the Sect. 2.

In the first set of experiments we have evaluated the phoneme discrimination capability of the MGD features in the context of tonal vowel recognition. The feature values are computed from each instance of the tonal vowels. For each tonal vowel, the average value for each dimension of the feature vector has been computed ignoring the outliers. The Euclidean distances have been computed between each tonal vowel with all the other tonal vowels and their average has been taken. Table 2 gives the average Euclidean distances of each tonal vowel from all the other tonal vowels. Table 3 presents the average Euclidean distances among different categories of tonal vowels.

From the above experiments it has been observed that phase-based MGD features are suitable in discriminating the tonal vowels. They possess discrimination ability even when the base phoneme of the tonal vowels is same and distinction among them is due to underlying tone only or vice versa.

To assess the suitability of the MGD features for tonal vowel recognition, we have computed the F-ratio values for the features. Higher the value of F-ratio among different groups indicates better discrimination ability of the feature with respect to that grouping factor. In the present study we have evaluated the computed F-ratio

Table 2 Average euclidean distances of each tonal vowel from all the other vowels

Tonal Vowel	Average euclidean distance from the other tonal vowels	Tonal vowel	Average euclidean distance from the other tonal vowels	Tonal Vowel	Average euclidean distance from the other tonal vowels
[ɪ́]	0.7513	[ʊ̀]	0.9267	[ɛ̄]	1.2091
[ī]	0.7292	[ɑ́ː]	1.4317	[ɛ̀]	1.1002
[ɪ̀]	0.5993	[ɑ̄ː]	1.9577	[ɔ́]	1.6260
[ʊ́]	0.9437	[ɑ̀ː]	2.7468	[ɔ̄]	1.3167
[ʊ̄]	1.0653	[ɛ́]	1.1449	[ɔ̀]	2.0015

Table 3 Average Euclidean distance among different categories of tonal vowels

Average Euclidean distance among the vowels with same base phoneme but different tone	1.1496
Average Euclidean distance among the vowels with different base phoneme but same tone	0.9698
Average distance from the vowels with different base phoneme and tone	1.3589

value with grouping factors—same base-phoneme, same tone and different base phoneme and tone. The F-ratio values are listed in Table 4.

From the above experiments, it has been established that short-time phase based feature MGD has the capability to identify the tonal vowels even when they are distinct from each other only by tone or only by base-phoneme. This observation assets the fact that short-time phase based MGD feature is a better alternative than the combination of MFCC and Prosodic based features for tonal vowel recognition which have been evaluated in our earlier works [22].

In the next set of experiments, we have evaluated the performance of MGD feature for their tonal vowel recognition in terms of recognition accuracy of the HMM based recognizer. The model has been trained using clean speech database. 60% of the tonal

Table 4 F-ratio values under different grouping factors

Average Euclidean distance among the vowels with same base phoneme but different tone	3.5463
Average Euclidean distance among the vowels with different base phoneme but same tone	3.8222
Average distance from the vowels with different base phoneme and tone	4.6514

Table 5 Evaluation metric for the HMM based recognizer

Correctly recognized the tonal vowel	89.23%
Incorrectly recognized as a tonal vowel with same base phoneme but different tone	6.46%
Incorrectly recognized as a tonal vowel with same tone but different base phoneme	2.91%
Incorrectly recognized as a tonal vowel with different tone and different base phoneme	1.40%

instances of each vowel have been used for training and the remaining 40% for testing the system. The performance of the MGD features have been evaluated in terms of recognition accuracy, which is the percentage of times the recognizer has been able to recognize the tonal vowel correctly. The error cases have been further in-depth investigated to get an insight into the confusion created at modeling level. Table 5 presents an analysis of the performance of HMM based tonal vowel recognition.

From the experiments it has been observed that the short-term phase based MGD feature vector is efficient in representing both tone variation as well as base-phoneme variation in case of tonal vowels. Only in the case of 6.46% cases the recognizer has been unable to recognize the tone variation of the same base-phone whereas in 2.91% cases tone takes more dominants over base-phone for tonal vowel recognition. This facts reassures the suitability of MGD feature for tonal vowel recognition in particular and language recognition in general.

5 Conclusion

It this paper we have investigated the performance of MGD features for their tonal vowels discrimination capability. It has been observed that phase-based MGD feature extracted from different tonal vowels is statistically separate from each other in the feature space even when they are different from each other only by tone or base-phone. This fact has been established by statistical measures Euclidean distance and F-ratio test. The performances of the features have been evaluated with a HMM based recognizer in terms of recognition accuracy. In 89.23% cases, the tonal vowels are recognized correctly by the HMM based recognizer trained and tested with MGD features. In the present investigation, it has been observed that MGD features are equally efficient in representing vowels with lexical tone (rising and falling) and vowels without any lexical tone (level tone). This observation appeals more in-depth investigation of the MGD feature for using it as a parameterization technique for language independent ASR system.

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This book discusses important developments emerging around the land questions in India in the context of India's neoliberal economic development and its changing political economy. It covers many issues that have been impinging the political economy in Land and livelihoods in India since the 1990s, examining the land question from diverse methodological standpoints. Most of the chapters rely on evidence generated through primary surveys in different parts of the country. The book, via its diversity of approaches and methodologies, brings out new and hitherto unexplored and/or less researched issues on the emerging land question in India. The range of issues addressed in the volume encompasses the contemporary developments in the political economy of land, land dispossession, SEZs, agrarian changes, urbanisation and the drive for the commodification of land across India. The authors also examine role of the state in promoting the capitalist transformation in India and continuities and changes emerging in the context of land liberalisation and market-friendly economic reforms.

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'land' as a resource and as a commodity, the institutional histories of land management have also created specific challenges for developing an equitable and efficient land policy. Land is also a source of power and wealth in many rural, agrarian contexts. The legacies of unequal access to and control over land are being renewed under the new circumstances, often leading to adverse consequences for traditionally marginalised groups. With the consolidation of neoliberal ideas, the power relations that govern and mediate access to land, mainly through the state institutions, have undergone significant changes. As governments compete with each other to attract domestic and internal capital, the ability to provide land cheaply, with reduced transaction costs, and without much delay has emerged as a critical aspect of being attractive to capital. The challenge of meeting the expectations of capital in an electoral democracy, where those who are involuntarily displaced from their land or livelihoods also have a voice, is formidable. The studies included in this book attempt to explore the unravelling of these questions in India in specific regional contexts.

Most of these studies were initially presented and discussed at a seminar in 2017 at the Indian Institute of Advanced Studies, Shimla. We express our gratitude to the authorities and the staff of the institute for providing us with all the necessary support. The conversations around the theme of land and livelihood continued in the following months, and the chapters have been revised and updated for the volume. We are immensely thankful to the authors who have contributed to the edited volume for their patience and support throughout the process of developing this volume. We are grateful to Prof. Raju Das, York University, Toronto, and the anonymous referees of Palgrave Macmillan whose insightful comments on previous drafts have been helpful to revise the chapters. We appreciate the editorial and academic support of Mr. Krishna Surjya Das, a research scholar at the Centre for the Study of Regional Development, JNU.

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New Delhi, India
Bhubaneswar, Odisha, India

Deepak K. Mishra
Pradeep Nayak

Contents

CHAPTER 15

The Gendered Transformation of Land Rights and Feminisation of Hill Agriculture in Arunachal Pradesh: Insights from Field Survey

Vandana Upadhyay

1 Introduction

The land tenure system in the hill areas of India's north eastern region, inhabited mostly by the tribal population, is significantly different from the system that is prevalent in the plain areas of the region. Like most other parts of India, in the plains of north east region too individual rights over land holdings are transferable and buying and selling of rights is normally not restricted. However, this is not the case in the hill areas where individual rights over land have not taken the form of full property rights in the sense that there are certain restrictions imposed on the transfer of these rights, if not practically possible (Bezbaruah 2007; Mishra 2015b; Mishra and Upadhyay 2017). The non-transferability of holding rights makes the land unsuitable as collateral for the purpose of securing institutional credit to land holders, which in turn acts as a constraint on the

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