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**Dr. Charru Malhotra**
Associate Professor, E-Governance and ICT
Email: charrumalhotra@gmail

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An Audit Aid - Risk management in e-Governance/ ICT based Projects. *PursuIT (Bi-Annual Journal on IT Audit)*, International Centre for Information Systems and Audit (iCISA), New Delhi. November 2019

https://icisa.cag.gov.in/resource_files/d0a40295f7f771bbc19946a5ad78a742.pdf

Risks are situations that pose threat of damage, liability, loss, injury or other negative vulnerabilities (external or internal in nature) and are to be avoided by preventive action. Since they have the ability to deviate organisations from their intended objectives, it is necessary that a proper identification, evaluation and prioritization of risks is undertaken to properly manage the risks. These steps though sound simple requires detailed understanding, cooperation, coordination and collaboration of all stakeholders. This is even more required when the size and scope of the project expands to include the entire community or citizenry, such as in e-governance projects. This coordination is easier to attain with projects having small Work Breakdown Structure (WBS) and Organisation Breakdown Structure (OBS). However, in a country like India, vast scope, critical nature of public services and the intricate nature of citizens' data associated with e-governance projects could further aggravate the risk-scenarios. Hence, proper risk management becomes necessary to ensure that objectives are met to in timely, effective, and efficient manner. The objective of this study is to formulate risk management strategies and this is done by first explaining the risk management of e-Governance projects and detailing the steps (Section-2) involved in risk management. This is followed by a case study (Section-3) explaining how risk management procedure has to be applied for evading risk in an efficient manner. The study then concludes with the triangulations of the learning outcomes (Section-4) of the risk management processes and the case study.

Cyber Security: An Enabler of Smart Cities and Industrial Revolution 4.0, "*Souvenir of International Conference on Edge Computing, Process Automation Through Robotics, Industry 4.0 & Cognitive Technology*", 2020, Vishakhapatnam, India

The maturity level of emerging technologies has reached a point where the conjunction of a smart city with Industrial 4.0 is inevitable in the next few decades. Urban governance has already started employing trends in emerging technologies including Artificial Intelligence (AI) andInternet of Things (IoT) to address urban concerns related to transportation, waste-disposal,education, healthcare, social facilities and utilities and so on. Such cities are referred to as 'SmartCities'. A smart city primarily utilizes sensor based smart (IoT) devices, at various public places including parks, streets, water bodies, transport or waste-bins and so on. These IoT devices keepcapturing, sharing, collating, analyzing and archiving ( in cloud/ remote data centres) millions ofzettabytes (10 21 bytes ), which is made available to urban planners for real-time decision making through state-of-art control centres. A smart city therefore, provides real-time intelligence through interconnected public places, smart homes, connected transport, connected logistics and so on.

These 'smart' digital technologies including AI, IoT, Cloud computing, Big Data Analytics etc. have also led to a paradigm shift in the manufacturing sector, ushering in, what is popularly referred as 'Industry Revolution 4.0' (IR4.0 ). Like smart cities, Industry 4.0 too completely relies on real time data exchange and digital interconnectivity enabled by cyber-

physical systems and emerging technologies [1]. In IR 4.0, the physical world of manufacturing is connected with digital world using cyber-physical systems (CPS), internet of things (IoT), and industrial internet of things (IIOT), cloud computing, and artificial intelligence for better collaboration across departments, partners, vendors, product, and people. IR 4.0 has now been accepted as a more comprehensive, interlinked, and holistic approach to manufacturing than the prevailing one. A symbiotic relationship of interdependence between smart cities and IR 4.0 is inevitable. Smart and intelligent cities would be possible only if aided by agile intelligent manufacturing mechanisms with minimum human interactions, made possible only by IR4.0.

The underlying commonality of smart cities and IR 4.0 is "interconnectivity using emerging technologies", which could be perceived as strength and also Achilles heels of both.

"More interconnected (these) devices and services are, more vulnerable they might become" [2].It is due to the proliferation of IoT devices that many entry points/ vulnerable spots exist through which hackers can access city systems. Each new IoT device connected to the system increases the chances of a malicious attack. Further, the coexistence and frequent interaction between old and new systems and platforms could also result in hidden security vulnerabilities such as inconsistent security policies, lack in updates etc. Thus, on similar lines, Industry Revolution 4.0too brings in new operational risks in the digital supply networks comprising the integrated and interconnected cyber-physical, IIOT based devices. Unexpected newer vulnerabilities might arise from the common digital 'links' of the digitalised supply chain; malfunctioning might proliferate through the most vulnerable information system and then the disturbance in one part of the cyber-physical system might incite unexpected threats in others. Therefore, there is a dire need to mitigate these cyber

risks more than ever before. Cyber criminals have been exploiting the vulnerabilities of digital technologies to perpetrate the destructive activities leading to mushrooming of different cybercrime techniques and categories – some of which have been elaborated in the subsequent section.

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Malhotra, Charru *et al.*

Designing National Health Stack for Public Health: Role of ICT based Knowledge Management System in 'Proceedings of ITU, Kaleidoscope-2019: ICT for Health: Network, Standards and Innovation', Atlanta 2019.

(//www.itu.int/en/publications/Documents/tsb/2019-ITU-Kaleidoscope/index.html#p= 115)

Public health (PH) domain requires astute amalgamation of different disciplines as its eventual aim is to 'prevent' and not just 'cure' the health concerns of the entire community/ population under consideration. Public health goals can be achieved more meaningfully by application of ICT that can relieve healthcare bottlenecks of brick-and-mortar model. Online consultations, cloud-based health management solutions, smart service-supported diagnoses are some such examples. However, the present study goes beyond this paradigm and attempts to explore the design and implementation of an ICT based Knowledge Management Systems (KMS) to address public health concerns at national level. At any point in time different MIS are being used by various public authorities that directly or indirectly impact PH. However, the data being generated by these MIS is "stove piped" into stand-alone, heterogeneous databases. Non-standardized data formats, incompatible IT systems, an aggravated sense of ownership by the agency that collects the data are some of the factors that further worsen the problem. To overcome these issues, based on the study of best practices and literature review, the review paper proposes a conceptual model, referred as National Health Stack. NHS is a multilayered KMS designed to support evidence based decisions of public health and would pave the way towards "Good Health and well being" (UN SDG 3) for All.

**Keywords** – Public Health (PH), National Health Stack (NHS), Quality of Life (QoL),Emerging technologies (AI, IoT, ML, Blockchain, wearable /immersive technologies), Open Application Programme Interface (API), Knowledge Management Systems (KMS), Digital Service Standard (DSS).

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Malhotra, Charru

De-mystifying IndEA for Easier Implementation in India.In, Background Papers for 22nd National Conference of e-Governance, 'Theme – Digital India – Success to Excellence', DARPG and MeitY, Publication, Government of India: New Delhi. pp 4 – 22.

https://nceg.gov.in/sites/default/files/nceg_2019/Background_papers.pdf

Enterprise Architecture is the eGovernance flagship initiative being implemented across the world to not only make a lucrative mark on the EGDI but also to achieve the United Nation‘s assigned Sustainable Development Goals (SDGs). (United Nations, 2016) The aim is to achieve One Government platform which is transparent, accountable and collaborative with Information and Communication Technology (ICT) as a catalyst. While the world follows an already set framework model proposed by The Open Group Architecture Framework (TOGAF). India has taken a step forward to make its own set of eight-layer reference model called the India Enterprise Architecture (IndEA). The initiative aims to create One Nation, One Platform – for a cashless, paperless and faceless services for the citizens. With the vision, the basic structure and framework in place the government has now envisioned to implement the whole framework at the national level. (Saha, 2017) However, before putting forward with any new initiative, the need of the hour is to keep in check the readiness of the nation state and its citizen adaptability. Along with it, a major shift in focus also needs to be taken in regards of the functioning of the country‘s current policies and initiatives and how well it aligns with the vision of IndEA.

**Keywords** - eGovernance Development Index (EGDI), Enterprise Architecture, Sustainable Development Goals (SDGs), Information and Communication Technology (ICT), The Open Government Architecture Framework (TOGAF), India Enterprise Architecture (IndEA).

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Malhotra, Charru..

Emerging Perspectives of Government With Advent of Frontier Technology: Indian Context. *AIMA Journal of Management & Research*,13(2/4), 2019.

https://apps.aima.in/ejournal_new/ArticleDetails.aspx?curr=463

The technological advancements happening in the twenty-first century are transforming many aspects of human lives. However, one aspect that is still taking considerable time to transform is how people are governed. The pace at which these technologies are developing, disrupting, transforming and converging to create even more complex technologies has left governance structures with problems like policy decay, maintaining trust etc. Governance hence needs to be agile which can be achieved only by incorporating these technologies in the governance structures. Through various case studies the methods and tools essential for implementing agility through the frontier technologies are elaborated. The paper then attempts describing how data-driven approach can be helpful in achieving agility through various examples around the world. Lastly the concerns associated and tools to resolve concerns are discussed.

*Keywords*: Agility, Data-Driven Governance, Frontier Technology, Data Analytics, System Thinking, Design Thinking, Policy Labs, Regulatory Sandbox, Center for Excellence

6

Malhotra, Charru *et al*

Holistic Healthcare Delivery using Emerging Technologies: A Conceptual Framework for National Health Stack of India, National Conference on e-Governance- NCeG 2020( DARPG, GoI)

Maintaining and improving human health has always been of utmost importance and public health systems,through their focus on prevention and treatment of diseases and with the aim of improving the quality of life (QoL), play a significant role in ensuring this. UN Sustainable Development Goal (SDG) 3 aims to promote the wellbeing and ensure healthy lives for all ages by the year 2030. However, developing countries face several challenges that impede the successful implementation of efficient public health systems. With special reference to India, the present study attempts to identify the roadblocks to public health care delivery systems and then based on basic principles of 'agile systems', proposes a conceptual framework of creating a national health stack that serves as an integrated Knowledge Management System (KMS) for public health management. The design of the proposed KMS is based on the principles of agile systems and rule-based extraction (using AI/ML) on heterogeneous multidisciplinary data collected over the entire value chain of health. The creation of such a holistic and integrated health stack would ensure timely retrieval of desired information to address public health concerns. The willingness and harmonious partnership of all stakeholders is mandatory to ensure successful implementation of the proposed model. The unique offering of the present study is a detailed conceptual model for designing an agile e-health care system that would successfully address the multidisciplinary needs of public health. This framework is an outcome of the review of literature on related subjects, including health, technology and the convergence of the two with special reference to tools offered by emerging technologies including Artificial Intelligence (AI) and Big Data

KEYWORDS

"Public Health", "e-Health", "Knowledge Management System (KMS)", "Emerging technologies", "Artificial Intelligence(AI)", "Machine Learning (ML)", "Big Data", "Value chain", "Agility", "Sustainable Development Goal - SDG 3".

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Malhotra, Charru *et al*.

The Online Citizen Engagement Platform of Government of India (GoI) - MyGov: A Case Study. in 'Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance', ICEGOV 2019, ACM Press (ISBN: 978-1-4503-6644-/19/04)

https://storage.egov.uminho.pt/index.php/s/oYvZJtZF9898o3V ) ( Nishtha , BHU)

The advent of ICT has compelled governments all over the world to incorporate citizens into their functioning. It can be observed in the growth of online service delivery platforms, open data

portals, complaint redressal etc. Another form of ICT usage that involves citizens is Digital Citizen Engagement (DCE) platforms which are the use of new media/digital ICTs to create or enhance the communication channels. Though developed countries have been forerunners in this, developing countries are not far behind.

India, too, has a DCE called MyGov-a one-stop and dedicated indigenous social media platform of GoI. However, its functioning in context of developing country may plague its impact. Based on dedicated study of the platform, the following paper attempts to delineate upon these challenges from political, social and technical perspective and attempts to formulate some suggestions that can help MyGov to counter the challenges.

CCS CONCEPTS

Applied computing → Computers in other domains →Computing in government → *E-government* Permission

KEYWORDS: ICT, Digital Citizen Engagement, MyGov, Political, Social, Technical

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Malhotra, Charru.

Restraining Risks in e-governance/ICT Based Projects: The Role of Auditors. *PursuIT (Bi-Annual Journal on IT Audit), International Centre for Information Systems and Audit (iCISA),* New Delhi,*2019* .

https://icisa.cag.gov.in/resources/125-journal-pursuit)

Risks are situations that may have a negative effect on the goals and objectives of the project. The vast scope, criticality of public services and the delicate nature of citizens' data associated with e-governance projects could further aggravate the risk-scenarios. Therefore, risks associated with e-Governance / ICT based projects need to be assessed and managed well to ensure timely, effective, and efficient deliverables. The proposed review paper is a systematic attempt to profile the risk management landscape of e-governance projects so that the auditors associated with such projects are more empowered in dealing with the same. The review of literature for the paper has been undertaken on the three key aspects of the study *viz.* 'types of risks', 'risk management and the 'role of auditors'. This helped to categorise the risks that digital projects are more specifically likely to face followed by systematic elaboration of the process of risk management that is typically valid for an e-governance / ICT based project. These theoretical ruminations are validated by presenting a case study of an e-government health project of a Health Information System of Central Asia that replaces completely the manual systems. This case study delineates the design-reality gap approach to risk

management by applying ITPOSMO model (Krasnikova and Heeks, 2003). The role of auditors in effective risk management of digital projects has been also implicitly exemplified in the case study. Based on the learnings, the study specifically lists the active role that the contemporary auditors are expected to discharge to ensure the success of ICT based projects. The study concludes by asserting that in present digital times, the auditors cannot afford to stay only as reticent actors who are restricted to only 'control audits'; rather they must prepare themselves to be the 'active partners of growth' and 'agents-of-digital-change' in their organizations by imbuing ever evolving risk management strategies related to digital projects.

Keywords : e-Governance, Types of Risks, Risk Management, Auditors, Health Information Study

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Malhotra, Charru *et al*

SmartCities and CyberSecurity - Establishing The Need for Capacity Building, CyberNomics, 2019

The citizen-centric paradigm of governance insists on public service delivery system to be 'intelligent' and 'smart' enough to adapt itself to the ever-burgeoning needs and aspirations of its citizens. Therefore, through the umbrella concept of Smart Cities, urban governance employs 'smart' technologies such as Artificial Intelligence (AI) and Internet of Things (IoT), for resolving concerns related to various aspects of urban public services including public transportation, waste-disposal in cities, and streetlightening and so on. The Government of India (2015) has adopted an urban renewal and retrofitting program, with the mission to develop 100 smart cities across the country making them citizen friendly and sustainable. However, such a redefined 'Smart' urban scenario has a hidden cost attached to it. The recent unexpected breakdowns, such as the one that happened in cyber controls of smart city of Atlanta in March 2018, emphasis that cyber-security is a concern that cannot be wished away. Therefore, the preparedness of the urban citizenry to handle such situations is an equally important concern that too should be addressed simultaneously. Respecting this need of capacity building, the present study attempts to gauge the awareness level of urban citizenry. To address this, the study first attempts to demystify the emerging trends of Artificial Intelligence (AI) and Internet of Things (IoT), then moves on to understand the basic techniques of cyber risks that are popularly prevalent, followed by the influence of these emerging technologies on the cyber security scenario. After this basic conceptual foundation has been built, it moves on to unravel the level of cyber security awareness amongst urban citizens by conducting a primary survey with 152 valid responses. The sample that was considered for the purpose was limited to only tech savvy urban citizens viz. the technocrats and the technical students only. The basic idea of such of choice had been - "if technical genre of citizens were not aware of negative repercussions of emerging technologies in their present daily lives, then the possibility of the same would be almost negligible amongst the rest". The findings emanating from secondary sources as well as the primary survey have been weaved in the present paper through well-defined five modules including Introduction, Review of Literature, Findings and Observations of the primary survey, followed by Discussions and Concluding Remarks. Once the need for the study has been established, general comparative study regarding awareness of different factions of society about

this issue is done with the help of a survey.

Key words: Citizen-centricity, public service delivery, urban governance, Artificial Intelligence (AI), Internet of Things (IoT), Smart Cities, Cyber Security, urban citizens

Dr. V.N. Alok
Associate Professor, Urban Finance
Email: vnalok@gmail.com

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Alok, V.N.
Covid-19 and Multi-order Federalism in India. *Nagarlok- A Quarterly Journal on Urban Affairs,*52(1) January-March 2020.

In India, the pandemic due to novel corona-virus has been attempted to control in its initial stage through centralized institutional arrangements with synergistic relationships of all state governments. Public servants and security forces are responsible to enforce lockdown. These arrangements, in the exit plan, need to gradually give way to the decentralized responsibilities of local governments including *panchayats and* municipalities. The contagion can only be prevented by changing human attitudes and behaviours. Local governments and community, closest to the residents, are best placed to bring this change and inculcate social distancing on

sustainable basis. Hence, the role of local governments must be prominent, at least, in the Disaster Management Act, 2005.

Key words: Covid-19, Corona-virus, Federalism, India, Local Government

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Gupta, Moniks and Alok, V.N.

Is it Time to Impose Carbon Tax? *Financial Times*, July 25, 2019.

https://www.financialexpress.com/opinion/is-it-time-to-impose-a-carbon-tax/1655398/

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Tripathi, S.N. and Alok, V.N.

Right to Public Service Delivery in Indian States: Legislations and Assessment. *Nagarlok- A Quarterly Journal on Urban Affairs 51(2)* April-June 2019.

Like in most federations, local governments in India, both Municipalities and Panchayats, are responsible for providing local public services in urban and rural areas respectively. Local governments are also expected to play a significant role in providing grievance redressal mechanism with respect to satisfaction of citizens. Though the 73rd and the 74th Constitutional Amendment Act have brought Panchayats and Municipalities in the statute book but even after 25 years of their enactments these local governments have failed to fulfill the expectation levels of their respective residents.

On December 20, 2011, the Union government introduced 'the Right of Citizens for Time Bound Delivery of Goods and Services and Redressal of their Grievances Bill 2011' in *Lok Sabha* (Lower House). The Bill was referred to the Parliamentary Standing Committee for examination. It was lapsed due to dissolution of the 15th *Lok Sabha*. However, 19 States and National Capital Territory of Delhi have passed such Acts to make their governments more accountable and citizen-friendly. The main objective of the article is to make an assessment of current status of Right to Public Service Delivery Acts in Indian States and Union Territories (UTs) on the services rendered by local governments. It attempts to present an analysis of services that people prefer the most at local level. The paper uses secondary data in its analysis.

Keywords: Citizen Grievances, India, Local Governments, Municipalities, Service Delivery.

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Alok, V.N.

Union Budget 2020-21- Macroeconomic Aspects of Indian Economy. *The Chartered Accountant*. 68(9) 2020.

The Union Finance Minister presented the budget, 2020-21 against the backdrop of difficult economic environment of slowdown in the economy due low growth of global output partly emanated from the trade tension between the USA and China, the two giants. Internally, the consumption expenditure particularly the rural consumption is decreasing significantly. The stakeholders were expecting an expansionary policy to boost consumption and revive investment climate. However, due to constraints on the revenue targets, there has been a slippage in the fiscal deficit. For which, the government is depending critically on disinvestment.

**Prof. C. Sheela Reddy**
Chair Professor – Dr. Ambedkar
Chair in Social Justice
Email: sheelachavva@gmail.com

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Reddy, C. Sheela
Good Governance and United Nations Sustainable Development Goals: Theme paper. Member Annual Conference, 2019. Indian Institute of Public Administration, New Delhi, 2019

https://iipa.org.in/wp-content/uploads/2020/06/Theme_Paper_19.pdf

The Sustainable Development Goals (SDGs) building upon the Millennium Development Goals (MDGs), are universal call to action towards reorienting the world on to a more sustainable path. They express a bold commitment and reflect an approach that perceives the environment, economy and society as embedded systems. The goals, being universal and country driven, are aspirational and interconnected. The success of one goal involves tackling related issues more commonly associated with others. They are key to Leaving No One Behind (LNOB), encompassing comprehensiveness, inclusiveness and equity, making the quality of governance crucial. This resonates with the spirit of India's national development goals and agenda of,

*'Sabka Saath, Sabka Vikas'* or 'Collective efforts, Inclusive growth,'. The path towards SDGs requires dynamic channels of Good Governance constituting effective linkages. It is imperative to initiate actions towards key governance issues like rule based governance, quality administration and management, transparency, accountability, anti- corruption mechanisms, etc. This entails integration, participation and reflexivity at multiple levels in governance. The coordination between different policy levels and sectors by integrating horizontal and vertical integration mechanisms; participatory arrangements incorporating stakeholders into decision-making processes and the role of effective quantitative and qualitative monitoring mechanisms to constantly review and revise the strategies assume significance. The SDG agenda being transformative necessitates the effective use of public resources, fostering inclusive and accountable processes and ensuring robustness of data for good governance.

Against this backdrop, the paper 'Good Governance and United Nations Sustainable Development Goals' is an attempt to validate the inter-linkage of SDGs and the varied facets of good governance advanced through schemes and policy rubrics endorsed by the present Government of India. Additionally, it will also accentuate the interventions of different ministries both at the state and local level, civil societies, democratic institutions in this direction facilitating a paradigm shift in nurturing and bringing out a positive and desired impact nationally. The paper dwells on aspects that need strengthening for improved governance to leverage full potential and further partnerships for accomplishing the SDGs. It endeavours to make suggestions and recommendations which could serve as a catalyst for coordinated efforts in the realization of SDGs.

***Keywords:*** *SDGs, Good Governance, Integration, Participation, Reflexivity*

Link: https://iipa.org.in/wp-content/uploads/2020/06/Theme_Paper_19.pdf

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Reddy, C. Sheela.

Interlinking Social Inclusion and Social Justice: Dr. Ambedkar's Perspective. *Samajik Nyaya Sandesh*, 10, January 2020, pp 35 – 40

In each society, certain practices of social inclusion and exclusion can be seen. These have to be seen as contrary processes. While social inclusion is the process in which individuals engage in various social, economic and political systems, social exclusion is a condition where certain individuals or groups in the society are marginalized. It is important to understand the processes through which individuals or groups are excluded, as promotion of inclusion can only be possible by tackling exclusion. Social exclusion is understood as the barriers and processes that

impede social inclusion. It may mean the lack of voice, lack of recognition, or lack of capacity for active participation. It may also mean exclusion from decent work, assets, land, opportunities, access to social services and political representation. Social inclusion is a process through which the dignity of each individual is recognized, needs and concerns of all people are reflected, rights of all people are not only guaranteed in legislation, but also respected, and people are able to participate actively in life activities. The process of social inclusion needs to take place simultaneously at multiple levels, from the individual, community and local levels, to the regional and national levels, as social inclusion concerns all stakeholders in society. Social inclusion involves formal i.e. societal level engagements. However, ensuring that institutions in society reflect, uphold, respect, and activate the inclusive processes within society, it also requires the informal i.e. individual level of engagements, such as perceptions and experiences of individuals, the way they think and feel, need to be taken into account. Social inclusion reflects not only individual's experience of and possibilities for self-actualization but also societal capacities to eliminate causes of exclusion and ensure equal opportunities for all.

Social justice is the comprehensive form to remove social imbalances by law, harmonizing the rival claims or the interests of different groups and sections in the social structure. Understanding of social justice accordingly demands having interaction with social purpose, which further requires interpretation of the eternal principles of human freedom to meet the challenges of changing times. Conscientiously, Indian Constitution is the culmination of social justice through the Fundamental Rights and the Directive principles of the State Policy, which are directed to achieve means as well as ends of social justice.

Dr. Ambedkar's ideas of social justice with social inclusion stood for removing social divisions, injustices and inequalities in human society. He strongly believed that political power must aim at protecting social justice for the marginalized sections of the society on more impartial and moral terms. He considered socio-economic justice as a precondition for abiding political justice. His idea of social justice is based on providing equal rights and human dignity to everyone through legal framework. Social inclusion is both an outcome and a process of improving the terms on which people take part in society. Dr. Ambedkar was of the opinion that in a free social order worth and dignity of an individual becomes the means and end of all social purposes. 'Justice' to him is simply another name for liberty, equality and fraternity. Social democracy through social inclusion is an essential ingredient for attaining social justice.

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Reddy, C. Sheela
The Philosophy of Dr. Ambedkar in the Making of Constitution. In *Legacy of Ambedkar: Analysis and Appraisal,* Rawat Publications, New Delhi , 2019. pp: 121 - 134

A country's Constitution is not merely an inert document. It is not only what is written in the text of the Constitution but also a living organism of functioning institutions. Dr Ambedkar's

constitutional vision was for a just society and a united India. He did not portray an image of a sectional leader. He was a modern, progressive, liberal thinker and an enlightened intellectual with a scientific temper and a forward looking secular approach. Dr. Ambedkar while speaking at the Constituent Assembly in 1946 underlined the need to build a cohesive society. He said that "Our difficulty is how to make the heterogeneous mass that we have today take a decision in common and march on the way which leads us to unity. Our difficulty is not with regard to the ultimate; our difficulty is with regard to the beginning". He aspired for a homogeneous India on the basis of liberty, equality and fraternity.

Dr. Ambedkar's contribution to the evolution of free India lies in striving for ensuring justice– social, economic and political to every individual. Conscientiously, Indian Constitution is the culmination of social justice through the Fundamental Rights and the Directive Principles of the State Policy, which are directed to achieve means as well as ends of social justice. Dr. Ambedkar emphasized on the ethical dimension of democracy, or what he referred to as constitutional morality, i.e., abiding by the spirit of the Constitution and not just its legal provisions. Democracy should not be just an enshrined static entity, but a dynamic and energizing force. Political democracy ensures one man - one vote but social democracy can alone guarantee one man - one value.

Dr. Ambedkar performed the role of the Chairman of the Drafting Committee with great aplomb and efficiency. Dr. B.R. Ambedkar's contribution to the making of Indian Constitution is phenomenal. Every page of the Constitution has his imprint and reflects the hopes and aspirations of the people of India. The very fact that the basic philosophy and ideals enshrined in the Constitution of India have withstood the test of time and helped in preserving the unity, integrity and democratic fabric of the country is indeed a tribute to his sagacity, wisdom and legal acumen. He laid profound emphasis on providing liberty, equality and fraternity to all. But, his aim of the creation of egalitarian society still remains an unfulfilled agenda. India may not have moved in the direction that Dr.Ambedkar thought to be optimal. However, the provisions he made in the constitution are the greatest integrating force today.

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Reddy, C. Sheela

Strengthening Panchayati Raj Institutions (PRIs) for Good Governance. *Bihar Journal of Public Administration*, 16(1), January – June, 2019, pp: 5 -13.

The Panchayati Raj Institutions (PRIs) in India are recognized as institutional expression of democratic decentralization. The thought process behind PRIs was to make democracy functional at the local level driven by citizens' needs and participation. It was therefore introduced as a three-tier system that decentralised governance, decision making, and local development. In 73$^{rd}$ and 74$^{th}$ Constitution Amendment Acts (CAAs), there was new-found

enthusiasm for inclusion as they were hailed as key to good governance and were considered as the most significant systemic transformation in the governance of the Indian polity. The expectation indeed was that they could address many ills of governance like bureaucratic oppression, technocratic tyranny, gross inefficiency, bribery, nepotism and corruption. Mostly, Panchayats across the country lack the basic infrastructure, funds and training necessary to carry out their roles effectively. Panchayat Officials and elected representatives lack the basic skills necessary to organise and supervise local government activities. In this scenario, governments need to work towards strengthening the capacity of Panchayati Raj Institutions and elected representatives to better deliver services and benefits at the local level

It is important to bring the issue of PRI performance into prominence and focus the attention of policy makers. The state governments need to be encouraged to develop their systems of assessment. The Ministry of Panchayati Raj has been incentivizing the best performing Panchayats recommended by the State Governments/ Union Territories since 2011-12. The recommendations of the respective State Finance Commissions relating to sharing of taxes, levies and fees, etc. to improve the fiscal position of PRIs should be honestly accepted. Subsequently, an appropriate and timely action should be assured to make these bodies self-reliant.

Good governance is an essential ingredient for socioeconomic development of the country. This necessitates a sound, responsive and competent administration; respect to basic human rights and values; and strengthening democratic, institutional as well as structural frame work to ensure accountability and transparency. In a democratic set-up, accountability is inevitable at all levels. Control over administration at the grass-root level is essential prerequisite for its success. A strong local government system is the best way to include the aspirations of all people to guide collective destiny. Inclusive growth can be achieved only through inclusive governance and the key to this is an effective and well-functioning system of Panchayats. Empowerment, enablement and accountability of PRIs alone can make them function as institutions of self - governance.

Budget 2019: Indian agriculture will fly if Modi brings these reforms in agri-policy. Financial Express. June 26, 2019

India's farm sector can surely move to a higher trajectory of growth if certain measures are implemented as a package as an atomic whole.

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https://www.financialexpress.com/economy/dbt-of-fertilizers-subsidy-the-last-mile-to-walk/1662938/

Fully implementing DBT in case of fertilizers subsidy will save enormous domestic resource costs (DRCs)

21

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Doubling farmers' income by 2022 a tough task, but not an impossible one. Policy Circle, Feb 6, 2020

https://www.policycircle.org/opinion/doubling-farmers-income-by-2022-a-tough-task-but-not-an-impossible-one

*An idea of generating solar power in the farms has the potential to achieve a quantum jump in farmers' income and can be a game changer.*

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Pandey, K.K.

Circular Economy from Urban Waste in India. *Nirman Sarika*, 8(3), July -September 2019.

http://bmtpc.org/DataFiles/CMS/file/New%20Letter%20BMTPC/Nirman_Sarika_WHD_2019.pdf

This paper flags the issues pertaining to hidden wealth in the waste and its conversion into a circular economy. It is noted that circular economy from waste is also essential for sustainable development and preserving scarce resources for future generations. The circular economy is also directly linked with income, employment and environment .Circular economy is particularly important for India which is fifth largest producer and third largest importer of scrap in the world. Accordingly, we have to tap the vast potential of material recovery from urban waste.

Resource consumption in India in past following the liberalisation of economy and upward shift in the pace of economic growth reported 2.30 times increase in 2010 as compared to 1990 whereas resources productivity (output per unit of resource input) has increased around 1.5 time. Thus, there is a need to enhance resource efficiency or there is substantial scope to improve resource use in India. In this regard, urban waste which is rich in material has vast potential for recycling to develop circular economy in the larger context of productivity and equity. The paper covers a pointed analysis of resource treatment in India covering a typology of waste such as garbage, electronic waste, End of Life Vehicles etc.

Paper also gives a pointed presentation of ten innovations applied in the field of circular economy in the country in the field of using output for input for another product. Finally, the paper suggest a roadmap for wider discussion and elaboration by concerned stakeholders. The paper suggests: Need to plan plan suitable incentives and concessions and technology transfer accordingly, Include recycling in the national urban missions namely Swachh Bharat Mission, Deeen Dayal Antyodaya Yojana-National Urban Livelihood Mission (DAY-NULM), Smart City Mission and Atal Mission on Rejuvenation of Urban Areas etc, establish circular economy at different levels such as Urban Mining, Two-way processing of garbage (kitchen and dry waste), scientific processing of automobile sector scrap, e-waste and plastic waste and a separate

treatment of hazardous waste,Indian scrap should lead to import substitution and also export promotion and formalise the informal sector involved in the process of recycling.

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Pandey, K.K.

Intra-City Models for Decentralised Waste Management. *Shelter*, 20(2) October, 2019.

This paper presents a typology of intra-city models and user friendly technology for waste management in the overall context of safe environment, quality of life, poverty alleviation and sustainability. It is noted that decentralized management is emerging as a successful tool to minimize quantum of waste and achieve the status of 4R (reduce, recycle, reuse and make it a resource) and resource efficiency.

Solid Waste Management (SWM) in a decentralized manner assumes special significance in the context of UN Sustainable Development Goals (UNSDG) . Accordingly, the theme for 2019 for Habitat Day is devoted to Frontier Technologies as an innovative tool to Transform Waste to Wealth. Despite remarkable success on clean India Mission during last five years, the scope for improvement is fairly wide. Ninety two percent wards have achieved D2D (Door to Door) Collection, yet, only 56 percent garbage is treated. All the garbage treated is not scientifically done and leads to contamination of land or pollution of rivers and lakes. This also leads to piling up of garbage sites and issues of NIMBY (Not in My Backyard). Further, compost prepared from unsegregated garbage has relatively lower demand from market. It is also noted that as against the installed capacity of 15 lakh tons, the waste to compost generation is only 5 lakh tons per annum. Further, the quantity of compost sold is stated to be only 2 lakh tons. Waste management, therefore, has issues of collection, segregation, composting and other appropriate treatment. It is widely believed that such a large amount of gap in the solid waste management cannot be attended by a city-wide centralized high cost-high tech approach. It can be attended through a wider application of decentralisation to use full potential of 4R.

This paper presents different models applied in Bengaluru to treat solid waste and sewage .It is note that city government has played a proactive role to bring together stakeholders for convergence and synergy. At the same time civil society and court intervention have also created

structures at grass roots level resulting into treatment of kitchen waste at household, neighbourhood and ward level. Similarly sewage is also treated for beatification of locality and plantation using the water treated under the process.These models such as local treatment of kitchen waste in (Dollor Colony ,Cubbon Park,Purva Venezia ,KorMangla etc.) ,Segregation of garbage at ward level using corporate social responsibility from ITC ,Green leaf/temple waste composing ay street level , and preparation of micro plan at neighbourhood level (1000-1500 population) will make a big impact to reduce quantum of waste substantially.

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Pandey, K.K.

Urbanisation : Minimising Farmers' Distress. Financial Express, April 15, 2019

https://www.financialexpress.com/opinion/why-policy-on-farm-distress-must-include-urbanisation-oriented-actions/1547929/

**25**

**Debnath, Roma Mitra**

Enhancing customer satisfaction using Kaizen: a case study of Imperial Tobacco Company (ITC), *Journal of Advances in Management Research*, 16(3), 2019 pp. 277-293

https://doi.org/10.1108/ JAMR-01-2018-0009

Purpose – With rising income and changing lifestyle, increased disposable income along with rapid urbanization is boosting the country’s biscuit market. The purpose of this paper is to represent the implementation of Kaizen in a biscuit-manufacturing unit of Imperial Tobacco Company (ITC). Although the concept of Kaizen is not a standard practice in India, the company chosen for the case study has a prominence in the Indian market.

Design/methodology/approach – The methodologies that have been applied to implement Kaizen in the ITC are discussed. Why-Why techniques, fishbone diagram, failure modes and effects analysis, ABC analysis have been used to study cause and effects. Findings – It was found that the yield was increased from 88.3 to 92.2 percent, which was a significant change, as far as the product line is concerned. The product complaints were reduced to zero with an added increased product quality rating system to 98.2 from the existing rating of 96.7. The product consistency was also improved as an application of Lean in the manufacturing process. Research limitations/implications – This case study is restricted to the manufacturing sector, especially in the field of biscuit company.

Practical implications – The paper should assist those practitioners and consultants who have the desire to find a better way of Kaizen implementation in small-scale industries of India. The academia can also use this case study for a better understanding of the difference between the theoretical and application aspects of the concept.

Originality/value – This paper is an original contribution in the existing body of literature. It shows the application of Kaizen in the manufacturing sector in India.

Keywords India, Kaizen, ITC, Productivity, Customer satisfaction, PQRS

Impact of knowledge management on organizational performance, Impact of knowledge management on organizational performance. *VINE Journal of Information and Knowledge Management Systems*, 49(4), 2019, pp: 510-530.

https://doi.org/10.1108/VJIKMS-07-2018-0063

Purpose – The purpose of this paper is to explore the dynamic relationships among the essential knowledge management (KM) constructs, i.e. strategy, enablers and processes, and to establish their links to organizational performance using a holistic integrated model.

Design/methodology/approach – The structural equation modeling approach was used in the research study. The primary data were collected from IT managers in Indian software firms.

Findings – The study successfully tested an integrated KM model in an Indian scenario. The study found that the KM strategy, enablers and processes had a significant positive relationship with the organizational performance. An appropriately designed KM strategy significantly influenced the KM enablers and KM process. KM enablers nurtured in an organization positively impacted the KM process. Furthermore, the KM process partially mediated the relationship between the KM strategy and organizational performance, and partially mediated the relationship between KM enablers and organizational performance.

Originality/value – This study is one of the few to empirically establish how the essential KM constructs of strategy, enablers and processes together impact organizational performance.

Keywords Knowledge, Knowledge management, Organizational performance, Knowledge management strategy, Knowledge management enablers, Knowledge management process.

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Jain, Neetu and Shauran, Bharti.

Impact of career and psycho-social functions of mentoring on role efficacy of employees, *Journal of Organization Behavior and Education*, 12, 2019. pp: 97-120

This study examines the impact of career and psychosocial functions of mentoring on the role efficacy of the employees in Indian organizations by taking into account the employees who were mentored and those who were not mentored. The study assesses the impact of nine functions of career and psychosocial mentoring on three major aspects of role efficacy i.e. role making, role centering and role linking of employees. For the survey, 350 questionnaires were distributed to the managerial level employees. The findings indicate that the career and psychosocial the mentoring have a significant impact on all the aspects of role efficacy. The mentored employees have a higher role efficacy index value than those who were not mentored. Out of the nine sub-functions of mentoring, a few of them such as counselling, friendship, exposure/visibility, and role modelling are highly and positively correlated with the role efficacy. It is worth noting that friendship, exposure/visibility, and counseling play an important role in improving the role efficacy index of the mentees.

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Jain, Neetu and Shauran, Bharti.

Making of a healthy and Great place to work, *Management Research, Journal of Iberoamerican Academy of Management*, July 2019

This paper is an endeavor to understand what it takes for an organization to transform itself into a great and healthy place to work. This paper makes use of a comprehensive five fold framework developed by the author to study employees' practices in the organizations on five dimensions. This framework focuses on five aspects of a human being where he / she may like to satisfy his needs at i.e. Physical, Intellectual, Social, Emotional and Spiritual level. Organizations need to design various programmes to address employees' needs at these five dimensions in order to get their best and for making an organization a healthy and desired place to work. For collecting data for this study, a triangular approach peculiar to a survey research was adopted i.e. the use of

questionnaires, interviews and documented evidence. SPSS was used to analyse the data. Results from survey were supplemented with gaps identified through desk study. Confirmatory Factor analysis was carried out to check the validity of the instrument.

It is proposed to develop a 'CONDUCIVE' culture , a model developed by the author with a number of activities. This model will enhance the employee engagement in organization which eventually will make an organization a healthy place to work for. A wider role of HR department is being envisaged by proposing to set up a separate "People Management Office" (PMO) which will be responsible for Project People Management (PPM). As suggested organisations can set up People Management Office in order to harness people power. Further, Innovative recommendations are proposed, for making an organization a great place to work.

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Banerjee, Arpita, Mahavir, and Kusum Lata,

A Geo-Spatial Information Model for Rurban Planning**.** 24th International Conference on Urban Planning, Regional Development and Information Society: Proceedings. 2-4 April 2019, International Society of City and Regional Planners (ISOCARP). 2019

The Indian context of planning primarily focuses on urban settlements comprising approximately 30% of our land area. The rest two-thirds are composed of spatially isolated rural communities which lack access to adequate infrastructure, services and connectivity for which the absence of a standardized planning methodology is a pertinent reason. Since a spatial entity is never disconnected from its context, planning is most effective when undertaken in the context of a region, joining settlements in need of physical, economic and social connectivity. Within a region, the availability of a multi-hierarchical geo-spatial database is fundamental to spatial planning, and research identifies that it requires conspicuous attention in our rural planning strategy.

The proposed paper addresses this lacuna of data infrastructure at the micro-regional level. An example of micro-region is the rurban cluster, comprising several village settlements around a central town, displaying potential for spatially integrated development. The rurban cluster is in compliance with the Shyama Prasad Mukherji National Rurban Mission (SPMNRM), a flagship programme initiated by the Ministry of Rural Development (Government of India) in 2016. The planning, implementation and execution of this scheme also suffers due to the lack of geo-spatial database management. Borrowing from past experiences in the country and abroad, this paper constructs a model for geo-spatial planning of rurban clusters. The model takes care of all the stages of rurban cluster planning such as delineation of the micro-region, database design

and management, analysis, evolution of alternative scenarios and finally implementation and monitoring through geo-spatial information systems. Once developed and applied, it objectively evaluates the corresponding stages of the SPMNRM (non-spatial) and the new model (geo-spatial), to demonstrate how the latter adds value to the planning process and produces superior results on ground.

Keywords: Khunti, India, Geospatial Information, Rurban Clusters, Planning

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**Banejee, Arpita and Kusum Lata**

Spatial Strategies for Rurban Clusters : Case Study of Kurukshetra. Urban Planning Theme of the Three-Day International Conference on “Future Cities - 2019”, 11-13 December 2019. Deptt. Of Architecture and Planning, Indian Institute of Technology, Roorkee and Institute of Spatial Planning and Environmental Research (ISPER) Panchkula, India.

In a country where almost 70% of the population is rural, spreading over 90% of our areal extent, top -down strategies for rural development have always met with incomplete success due to their lack of integration and a regional focus on spatial development. In 2015, the Government of India launched the Shyama Prasad Mukherji National Rurban Mission (SPMNRM) in an attempt to create clusters of settlements that could be developed as a single "rurban" unit. The initiative in itself signifies a much-awaited transformation in the approach to rural development, yet suffers significantly due to the absence of well-defined delineation criteria, adequate analyses, and Spatio-temporal vision. The paper represents a detour from the Integrated Cluster Action Plan Guidelines (ICAP) of the SPMNRM, to create a new methodology for the development of rurban clusters by taking cognizance of its most prominent lacunae. It exemplifies a number of spatial strategies for rurban cluster development, from its delineation to implementation of proposals and revision of development plans, through the Kurukshetra District in Haryana. While doing so, it borrows inputs from geo-spatial information systems and modern data-handling tools to create a rurban cluster development plan which preserves the logic of the National Rurban Mission and simultaneously improvises upon it.

Keywords: Rurban cluster; Shyama Prasad Mukherji National Rurban Mission (SPMNRM); spatial planning; Kurukshetra(Haryana); Pehowa

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Mohapatra, Dr. Gadadhara

Impact Evaluation of the Scheme of Development of PVTGs of the MoTA, IIPA Digest 2(1), January-March, 2020 pp.20-21

Particularly Vulnerable Tribal Groups (PVTGs) erstwhile known as 'Primitive Tribal Groups'(PTGs) are distinguished from other tribal communities with regard to their pre agricultural technology, stagnant or declining population, extremely low level of literacy and a subsistence economy. In order to ensure conservation and promote development among these poorest ST communities, certain groups were identified by Government of India for the first time in 1975-6 and thereafter in 1993, and called '*Primitive Tribal Groups' (PTGs).* 75 groups among the STs of India were identified in 18 states and 1 Union Territory who initially were called PTGs and later renamed as "Particularly Vulnerable Tribal Groups(PVTGs)" precisely due to the disagreement of the cultural relativists on using the term "primitive".

Ministry of Tribal Affairs (MoTA), Government of India had entrusted the task to conduct an impact evaluation of the scheme, "Development of Particularly Vulnerable Tribal Groups (PVTGs)" to the Indian Institute of Public Administration (IIPA), New Delhi. I coordinated this national level evaluation as Principal Investigator along with a team of co-investigator and surveyors to identify the bottlenecks in the implementation of the scheme and suggest changes required for improving the service delivery mechanism. The national level impact evaluation of the PVTG Scheme was carried out in 2018-2019 among 16 States falling under 6 geographical regions/zones (North, South, West, East, North East and Central) as classified by NSSO. The study covers 1388 PVTG Households and 55 communities in the country. The methodology adopted for the study is a judicious mix of both qualitative and quantitative research methods. Primary data has been collected by using various tools of Participatory Rural Appraisal (PRA) such as FGDs, observations, in-depth interviews and case studies. Further, 'before and after approach' has been adopted to capture the impact of the project both in financial and physical terms under the PVTG scheme. The study has been carried out through the 'Survey CTO – real time data generation software'.

The study reveals that major emphasis under CCD plan in the respective states are primarily on development of infrastructure(housing, construction of CC roads etc.); however, equal emphasis should be given in conservation and enhancement of traditional skills of the PVTGs, further skill development activities among the PVTGs needs to be imparted to generate alternative employment opportunities. Overall assessment of development among PVTGs as the vulnerability index computed in the selective indicators (family income, household size, literacy rate, land holding, and average livestock) shows that the PVTGs in the Indian state of Tamil Nadu, Telangana, Karnataka, Chhattisgarh, Maharashtra and Manipur are highly vulnerable; whereas the PVTGs in Andhra Pradesh, Odisha, Uttarakhand, Madhya Pradesh, Kerala, and Rajasthan are moderately vulnerable. The vulnerability status of PVTGs in Jharkhand, Gujarat and Tripura is low. The study reveals that except Jharkhand, Gujarat and Tripura, other 13 states are witnessing at least moderate or higher than moderate vulnerability in the above indicators which need serious attention of the policy makers to improve their livelihood.

Mohapatra, Gadadhara.

Projected Behavioural Change in Swachh Bharat Mission: A Public Policy Perspective", *Indian Journalof Public Administration* . 65 (2) April-June, 2019.

https://journals.sagepub.com/doi/full/10.1177/0019556119863856

The Swachh Bharat Mission (SBM) is the largest behavioural change programme in the world. The mission has shifted its focus from production outputs (i.e. toilet construction) to behavioural outcomes (open-defecation-free [ODF] India). The SBM's emphasis on behavioural change in rural sanitation at the grassroots level also leads to rigorous verification and sustainability of the benefits accrued to rural communities. The SBM targets to achieve an ODF India by 2019, on the eve of the 150th birth anniversary of Mahatma Gandhi. In addition to this, the mission will also contribute to India reaching the UN Sustainable Development Goal 6, which calls for ensuring availability and sustainable management of water and sanitation for all. It is in this context that the article critically analyses the sanitation services in general and with special reference to SBM in India from a public policy perspective. It seeks to establish the linkages between public health and sanitation and problemetises the issue of open-defecation and its health implications. It provides an analysis of behavioural change techniques in community-led total sanitation (CLTS) and its application in achieving Swachh Bharat (clean India). The article presents a historical account of sanitation situation in colonial and post-independence India, followed by an in-depth analysis of the formulation of the SBM. Lastly, the article examines the current status of implementation of SBM and it also discusses the emerging issues and concerns that could be addressed in achieving ODF India.

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Taneja, S., Taneja, P.K., Rao, U.

Sahaj: A Sustainable Development PPP Model for Empowering Rural Lives. *Case Centre UK*, Case Reference No. 719-0039-1, 2019,

https://www.thecasecentre.org/educators/products/view?id=163419

In the year 2006, to bridge the urban-rural digital divide, Government of India launched an ambitious Public Private Partnership (PPP) scheme naming Common Service Centres (CSCs)

Scheme. In the scheme digital platforms i.e. CSC will be set at village level to deliver Government to Citizen (G2C) and Business to Customer (B2C) services to rural citizens. The private partner in scheme naming SREI Infrastructure Finance Limited (SIFL) perceived it a big opportunity. They joined hand with Government in 2007 to act as a facilitator to Village Level Entrepreneur (VLE) for setting up and running CSCs. From the year 2007 to 2011, the company had opened 28000 CSCs and invested Rs. 500 million in CAPEX and had an annual OPEX of Rs. 600 million. But, most CSCs were not able to make any profit due to the negligible customer base. None of the government department was able to offer any G2C service, which was expected to be the primary crowd (customer) puller to CSCs. Further, there was no sign for the offering of such services by the government departments in the near future. It became nearly impossible for SIFL to maintain and sustain such loss piling proposition.

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Stran, B.J. van and Tiwary, Nupur

Circular Instrument Management as Corporate Social Responsibility Initiative for Sustainable Healthcare. *Journal of Politics & Governance*, 8(3) March 2020.

This paper analyzes the relationship between Corporate Sustainable Responsibility (CSR) and the Circular Economy (CE). A combination of literature review with an experiment carried out by means of refurbishing and recycling of stainless steel medical instruments. It is stressed that circularity can be achieved through maintenance, repair, reuse, remanufacturing, refurbishing and recycling of materials. Creating a make-use-reuse model which is in contrast to a linear economy which is based on a 'take, make, dispose' model. Metal-ore extraction and metal production increased three-fold from 1970 to 2010 with a the largest increase from 2000 to 2010. A CSR program is evaluated named ‘Circular Instrument Management’ having the objective to reduce carbon footprints on the one hand and protecting our scarce natural resources on the other hand.

**Methods**

A literature review in combination with an analysis of the outcome of an existing business case of instrument repair and circular reprocessing of surgical instruments. Extending the product life cycle of surgical instruments by means of certified repair and refurbishment instead of replacing it with new instruments. Additionally, preventing waste by collecting used disposable instruments, rejected/scrapped instruments and other waste which were melted and reprocessed into sheet metal for re-use in the manufacturing of new medical components and products. The combination of the outcome was reflected with the definition of corporate social responsibility.

**Results**

Surgical instruments were collected, repaired and refurbished into new manufacturing's condition. More than one ton of rejected instruments were collected from four different hospitals during a period of six months. One container of 100 Kg with disposable and contaminated instruments were collected and, after disinfection in a thermo washing machine, melted and recycled to new raw material. This raw material was used on a water jet cutting machine to make new components for surgical instrument mesh baskets. The outcome indicates that circular models such as the reprocessing of surgical waste is feasible, leading to prevention of waste and reduction of costs associated with waste management.

**Conclusion**

The circular program -named circular instrument management- was regarded as a Corporate Social Responsibility program. The results of the circular program demonstrate that circular reprocessing of surgical instruments and stainless steel waste into new raw material can be used for the manufacturing of new medical products. It may not only contribute to waste prevention but also to saving costs on conventional waste management. Although further research is required, it seems that CSR through

Circular Instrument Management contributes to reducing CO2 emissions when compared to the traditional throw-away and replace principle.