UNIVERSITY OF ZULULAND

Responsiveness of LIS Education and Research to the Fourth Industrial Revolution. African perspectives

Dennis Ocholla, PhD,
Senior Professor and Deputy Dean Research and Internationalization, FA, UNIZULU

UP Carnegie Capstone Conference, Pretoria 24- 30th March 2019

RESTRUCTURED FOR RELEVANCE

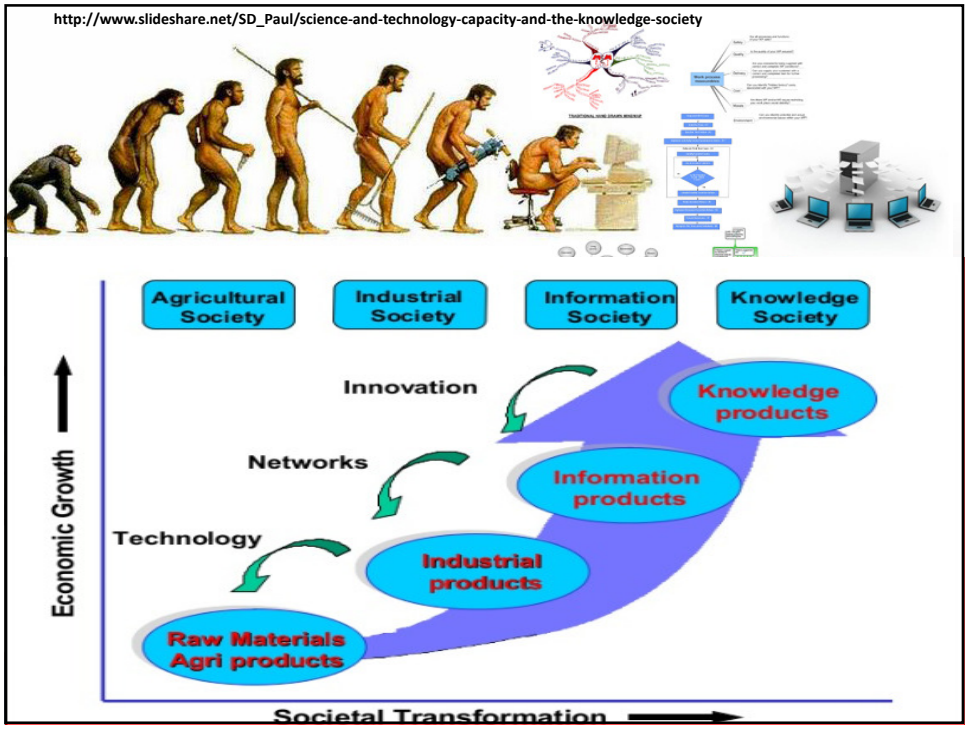
OUTLINE

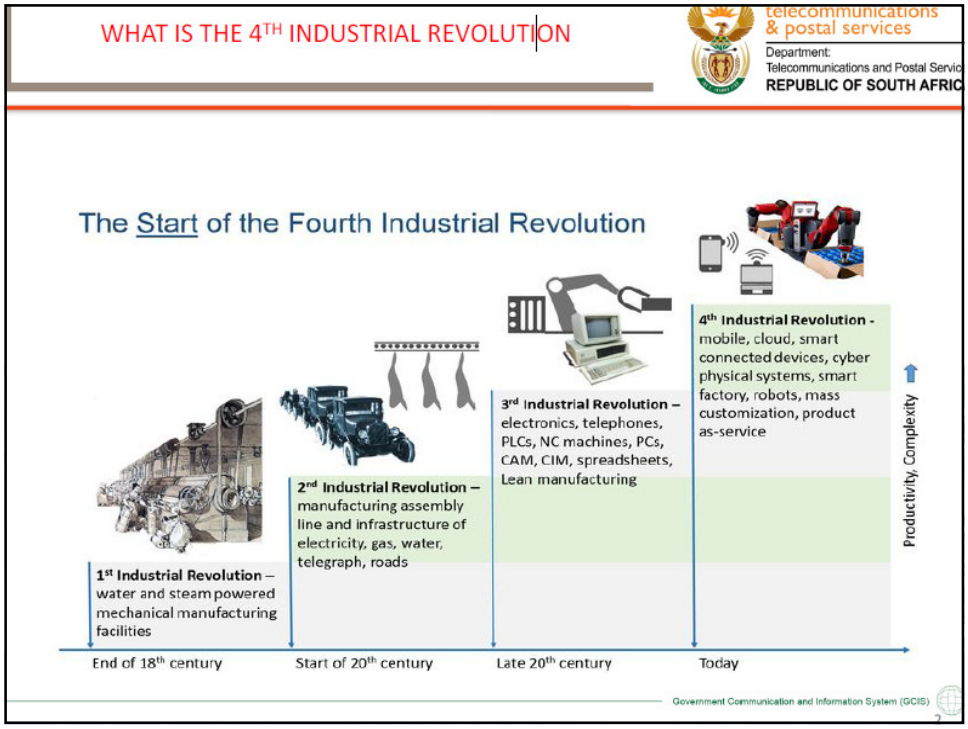
- WHAT IS FOURTH INDUSTRIAL REVOLUTION?
- WHAT ARE THE FRAMEWORKS?
- HOW DO WE GET THERE?
- WHAT CAN WE PROPOSE?
- WHAT IS THE AGENDA?
- WHAT ARE OUR CONCLUSIONS ?

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE

http://www.slideshare.net/SD_Paul/science-and-technology-capacity-and-the-knowledge-society





What is Fourth Industrial Revolution? Origin (Moon & Seol 2017:248)

Table 1 Target items of the High-Tech Strategy Action Plan of 2012

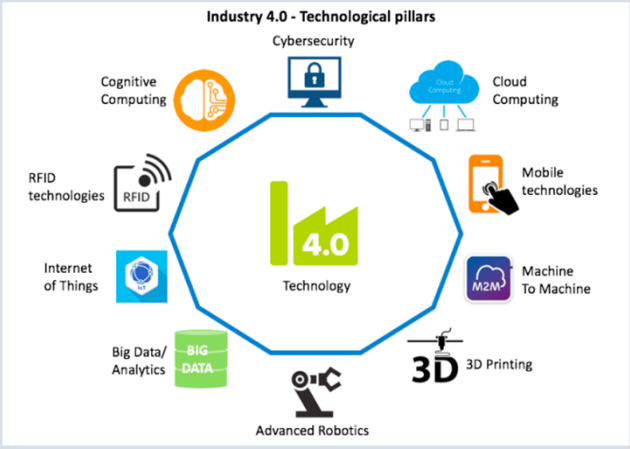
1. CO_2-neutral, energy-efficient and climate-adapted city ("future city")
2. Renewable energy resources as an alternative to oil
3. Intelligent restructuring of energy production
4. Combating illness with individualized medicine
5. Improving health through targeted preventive measures and nutrition
6. Independent living for senior citizens
7. Sustainable mobility
8. Internet-based services for the economy
9. INDUSTRIE 4.0
10. Secure identities

Industry 4.0 is a German project that has amalgamated manufacturing with IT and lead to the development of factories that are "smart," and efficient and adaptable (e.g. by help of CPS) to new technological changes /demands.

What is Fourth Industrial Revolution?

Klaus Schwab, Founder & Executive Chairman, World Economic Forum distinguishes 4IR from other industrial revolutions:

"Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres" *(Schwab 2016).*



https://www.researchgate.net/figure/Technologies-for-industry-40_fig1_319944621

Thus, it includes IoT, Cloud computing ,Robotics, Artificial intelligence, Big data, Biotechnology, 3D printing Nanotechnology, Integration of the technology with the human body. https://www.youtube.com/watch?v=v9rZOa3CUC8

DAVOS 2016

Carl Benedikt Frey and Michael A. Osborne estimated that **"47% of jobs in the US will be in massive distress because Of the introduction Of computers, and other developed countries and emerging ones are in a similar situation"** (Prisecaru 2017:59)

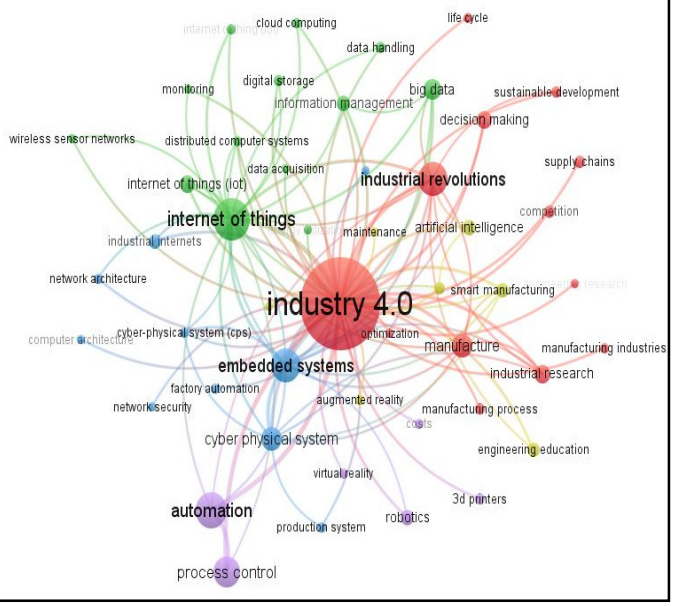
Devesh Raj, SVP and Head of Strategy and Planning at Comcast-NBCU and Dries Buytaert, founder of Drupal and Chief Technology Officer of Acquia concern is that …."**Digitalization will enhance the great inequality existing now in a world where many states and areas have not even passed through the second and third industrial revolution. Robotics and artificial intelligence may drive the "dehumanization" of people lives, affecting unique values as empathy, sensitivity, creativity and inspiration and may also raise moral and ethical challenges"**(Prisecaru 2017:60)

Ian Blinder from Princeton University considers in his paper Education for The Third Industrial Revolution that for "**adapting to the era of information students need to acquire an education which is not quantitative but specialized and qualitative, focusing on the demands of the moment. Therefore it is necessary a personalized education since we talk of much higher and more complex requisites, requiring innovation, inter Disciplinarity, networking"**(Prisecaru 2017:59).

"There is a set of 17 Sustainable Development Goals, also known as the Global Goals, that were adopted by all countries in 2015 to "end poverty, protect the planet and ensure prosperity for all" and they cover poverty, hunger and food security, health, education, energy, water and sanitation, and they are linked to specific targets. Technological advancement may contribute to attaining these Global Goals"(Prisecaru 2017:60).

KEYWORDS	NUMBER OF APPEARANCE IN 5 092 DOCUMENTS
Industry 4.0	2657
Internet of Things	721
Manufacture	680
Embedded Systems	650
Industrial Revolutions	530
Automation	458
Big data	372
Cyber Physical System	366
Process Control	266
Industrial Research	258

DATABASE: SCOPUS (2014-2019)
SEARCH TERM: 4TH INDUSTRAIL REVOLUTION OR INDUSTRY 4.0 OR FOURTH INDUSTRIAL REVOLUTION OR 4IR - ABSRACT SEARCH



Kamble et al 2018:419

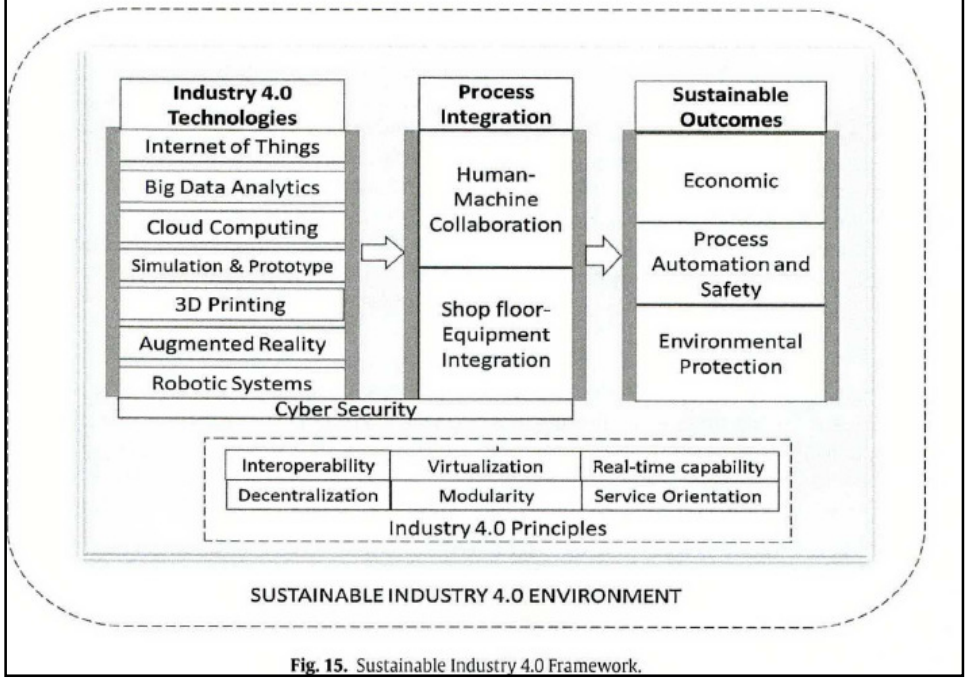


Fig. 15. Sustainable Industry 4.0 Framework.

What are the frameworks?

International response - WEF, Davos, 2016 (see Frasicau 2016), MDG, SDG, WSIS

Government response – government notices, policy and legislations (see http://www.polity.org.za)

Institutional response – What is your university response?

Professional/discipline response – LIASA, IFLA,

Faculty/Department, etc. (e.g. RCSW) – see UNILISA 2019, UJ 2019, IS conf. 2019, UP Capstone Carnegie 2019), Map/Audit Resources

Research, teaching and learning response– WoS, SCOPUS, GS, SABINET-SA-epublications, Technology-eg T+T/Khow+P+C

Employment response – competencies – creativity, critical thinking, problem solving, emotional intelligence

Personal response – self/CPD/learning, adaptability

Indexing – OCLC, Indexing languages, author ID

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE

Faculty of Health Sciences, University of Pretoria

"3D technology is allowing us to do things we never thought we could"

Prof Mashudu Tshifularo

Professor Mashudu Tshifularo
Head of the Department of Otorhinolaryngology

https://www.up.ac.za/media/shared/1/ed-3d-printed-ear-bones-11.zp170070.jpg

How Do We Get There?

PAST

(see Ocholla and Bothma 2007)

Colonial past

***Negative*:** invasion, war, servitude, divestment, racial segregation, colonialism, apartheid, illiteracy, poverty and the denigration of indigenous communities.

***Positive*:** development of some infrastructure exploited by a few today

Language - Africa to the world and the world to Africa-Language-26 Anglophone, 29 Francophone, 5 Lucophone, 7 Arabic speaking and 2 Spanish speaking.

Libraries and Library and information education institutions plays a role.

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE

PAST, cont.

- Growth of LIS Schools from 1938 (SA), 1960s, 1980s-Ghana, Nigeria, Senegal and Uganda)
- LIS Education Outside Africa
- Focus of LIS education and training -librarianship.
- Major growth LIS schools is noted in Anglophone Africa, Francophone and Arabic oriented countries,
- The growth of Library schools in South Africa is shaped by periods of significant quantitative growths from 1938 to 2000, rising from one to eighteen, decline from 2000 to 2006 from eighteen to twelve and now 9).
- A significant growth of LIS schools is noted in Nigeria, Kenya and Tanzania.
- At least one LIS School is found in most African Countries-growth significant
- Information service market is expanding – Libraries still lead, growth minimal, emerging professions growing

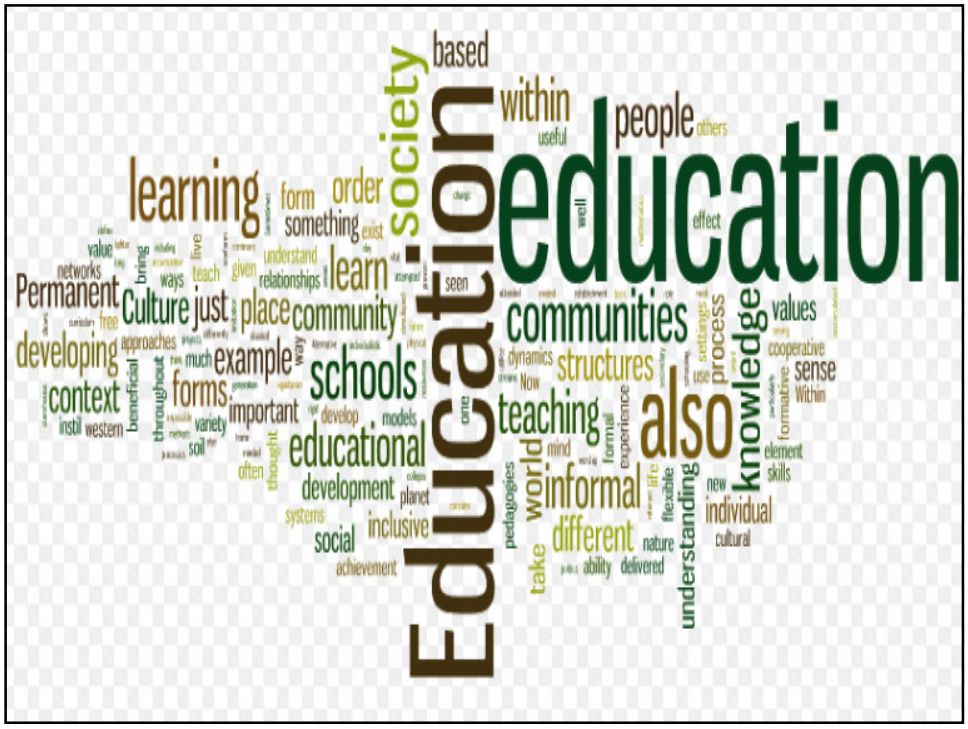
Present

- Number LIS of schools is increasing rapidly -
- Quantity challenges quality as more LIS schools emerge
- Most LIS Schools are located within HEIs or universities - GOOD
- Quality assurance/control in curriculum, staffing and students .
- Minimum number of credit and content requirements for LIS education exist
- ICT integration in research, teaching and learning is largely prevalent. NOT ADEQUATE
- LIS curricula also increasingly diversified –eg core courses or electives/auxiliaries in knowledge management, multimedia, publishing, records management, information and communication technologies , along with librarianship
- Name change of LIS Depts, Programmes and courses- ongoing
- Resource support is unequal/varies
- LIS Job Market – diversification. Generic and personal competencies requirements is cross-cutting. Professional competencies vary with qualification track
- Government involvement prevalent- legislation + Policy+Mngt, eg CHE
- No accreditation of LIS Education by professional associations. Research increasing
- Research – increasing

RESTRUCTURED FOR RELEVANCE

What are the gaps?

- Experiential learning
- Continuing education
- Curriculum response to LIS job market – review and revision
- Graduates response-quality, lifelong learning/self education
- Educators/Faculty response – Scarcity/ lifelong learning/self education
- Employers response – variations – Government/private sector/NGOs/municipalities;
- Institutional response – policies
- Government response – policies + legislation
- Stakeholders/Advisory councils for curriculum development- ESSENTIAL
- Preparedness to 4th industrial revolution- lacking/unequal



PATHS

Paths	Status	Type/remarks
Contact education	Common	growing number of LIS schools compromis quality
Distant/virtual education	Rare	Essential
Undergraduate	Common	Certificate/diploma/bachelor
Postgraduate	Increasing	Common- PhD, PGDLIS, Honours
General/academic/scholastic	Common	better quality control
Professional /Vocational	Decreasing	Data TBC
Four years/ Three yrs	Common	Four yr duration predominant
Formal education	Common	(BA, BLIS, BIS, MLIS,MIT, PHD etc),
Informal education	Growing	auditing required
Continuing education(CPD)	Rare	Require strong focus
Private education	Rare	LISE not always included
Public Education	Common	Public universities
Experiential /service learning	Inadequate	not included in distant education
Institutional affiliation/location	diversifying	*social sciences, humanities, engineering and computing, education, business and commerce, others

What do we offer?

LIS theory	Library history, information sector, information and knowledge society, libraries and information centres, introduction to IS etc
Information Sources/resources	Print, e-resources, databases, search engines
Collection development	Public, academic, school, special, children libraries or all
Information services/User Studies	Information Literacy, Marketing of LIS, Circulation and Reference Services, Bibliometrics, Reference Management Tools, Intellectual Property, publishing, Open Science/Open data, e-resources, Computer Literacy/DL, User Studies
Information and knowledge management(e.g. Kwanya 2017:396)	Management, knowledge management, records management, digital curation, LMS, IKS, artificial intelligence
Research	Proposal, execution, reporting/publishing, Evaluation and measurement, visibility, impact, bibliometrics, peer review, RL
ICT applications	LMS, multimedia, artificial intelligence, programming, MIS, WD +
Information Retrieval/Information seeking	Information literacy, searching and retrieval, indexing and abstracting, information retrieval, bibliometrics, databases, Computer Literacy, Digital Literacy
Organisation of Knowledge/Information (see Ocholla et al 2013)	classification, cataloguing, metadata, Dublin Core, bibliographies, indexing, abstracting, information architecture ,semantic web, internet of things/web 2.0/3.0/ etc.; RDF, ontologies, information literacy; databases

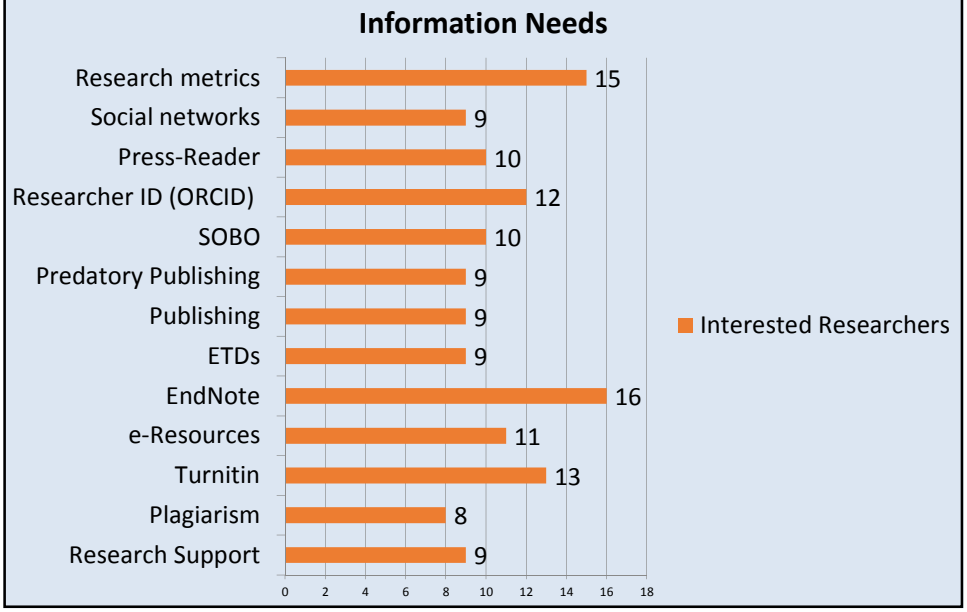
Who are our employers? (see Shongwe and Ocholla 2011, Ocholla and Shongwe 2013, Shongwe 2014)

- Public sector - National and regional government + Municipalities +libraries(academic + public)
- Private sector – minimal/unknown
- *NGOs – limited/not well known*

Table 1 Total number of job adverts and categories advertised in the *M&G* and *The Sunday Times*, 2009-2012.

Year	Job category: Academic		Archives and Records		Information		Library		KM		Total no of jobs	
	M&G	ST	M&G	ST	M&G	ST	M&G	ST	M&G	ST	M&G	ST
2009	0	5	0	6	0	31	9	61	7	14	16	117
2010	0	5	1	11	4	37	10	79	4	16	19	148
2011	1	3	1	31	4	32	9	89	4	16	26	171
2012	1	6	1	21	5	51	11	52	8	15	26	145
Total with duplications	2	19	3	69	13	151	39	281	23	61	80	581
	21		72		164		320		84		661	
No of duplications	2		2		3		5		5		17	
Total without duplications	19		70		161		315		79		644	

What don't we know? (Ocholla, 2019-UNIZULU AWR Training Needs 2019)
SOBO=Selecting and Ordering of Books Online



Jaya Raju, Assoc. Prof.
University of Cape Town

http://www.lisc.uct.ac.za/news/lis-competency-index-first-higher-education-sector-sa

LIS professional competency index for the higher education sector in South Africa

Compiled by **Jaya Raju**
Library and Information Studies Centre, University of Cape Town

RESTRUCTURED FOR RELEVANCE

Competencies

http://www.sacplan.org.za/documents/(Draft%201)%20SACPLAN%20SAQA%20(2015-02).pdf

- **Generic** – "are the essential skills, attributes and behaviours which are considered important for all planners[students/learners], regardless of their function or level"
- **Core [professiona] competencies** – "are the set of specific knowledge, skills, abilities, or experience that a Planner[student] must possess in order to successfully perform the work and activities that are central to professional planning practice" What + How?
- **Functional [personal]** – "are the basic skills and behaviour that are needed to do a job successfully. These are competencies which relate to the "how to do" aspects of planning"

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE

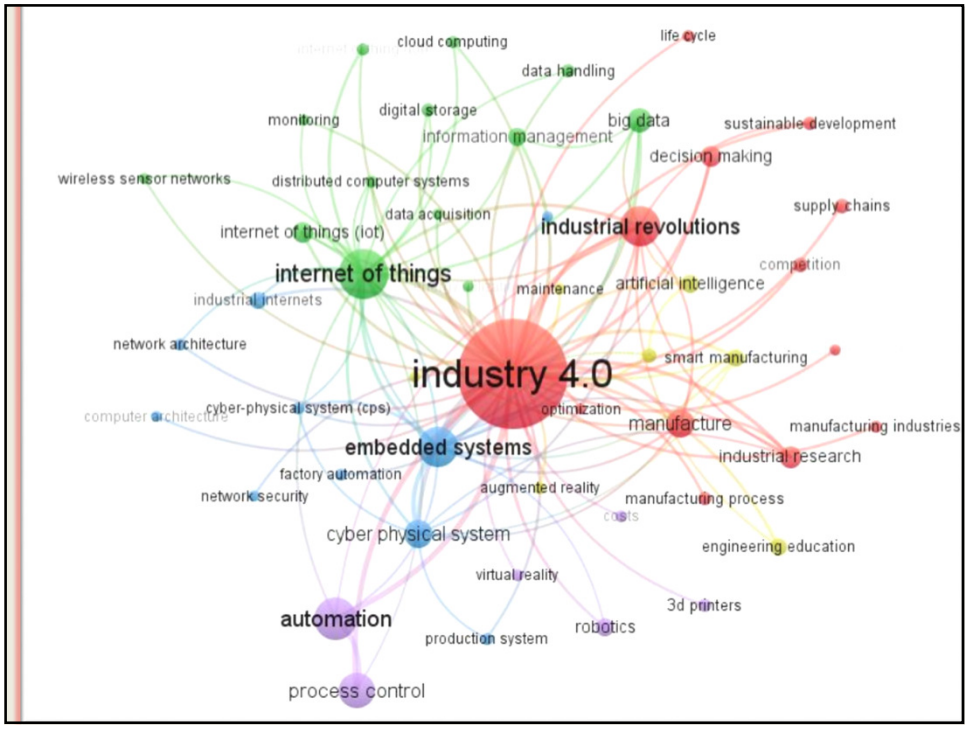
Example 1 (see Raju 2017)

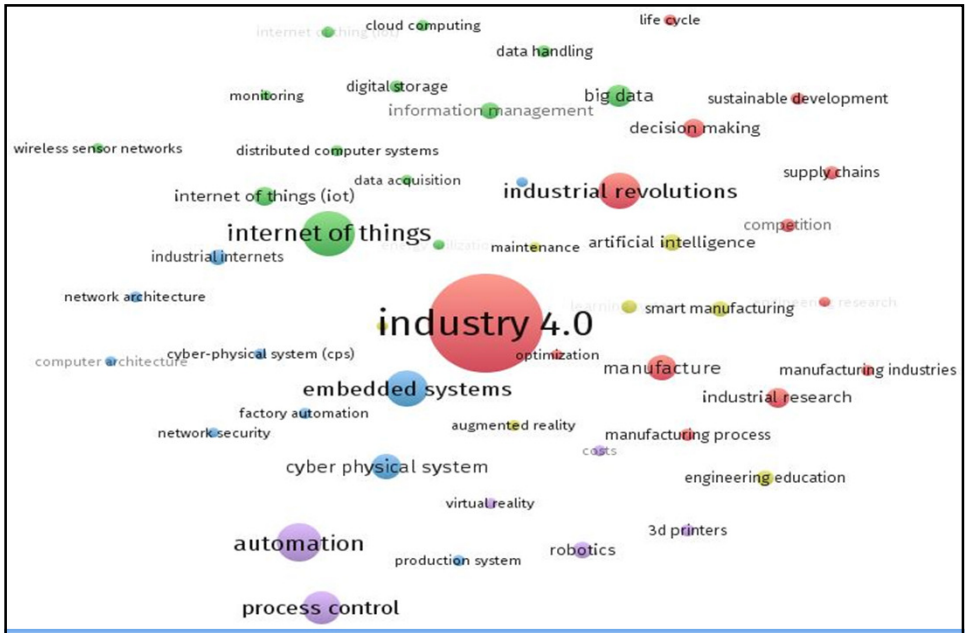
Personal attributes 33	Networking 26
Ability to work independently 33	Customer (learner) focus 26
Ability to pay attention to detail 33	Leadership skills 27
Ability to work under pressure 33	Planning and organising skills 27
Initiative 33	Teaching and training skills 27
General knowledge 34	Supervisory skills 28
Responsibility 34	Research and development, and publication skills 28
Adaptability 34	Record-keeping skills 28
Innovative ability 34	Problem-solving skills 28
Dedication/Commitment 34	Problem identification skills 29
Intellectual curiosity 34	Analytical skills 29
Passion for technology 34	Critical thinking skills 29
Diligence 35	Lateral/Creative thinking skills 29
Emotional intelligence 35	Decision-making skills 29
Pro-active capacity 35	Mentoring and coaching skills 29
Personal credibility 35	Statistical analysis skills 29
Ethical approach to all issues 35	Multi-tasking skills 29
Sound judgement 35	Academic writing and editing skills 29
Personal Drive/Motivation 35	Health and safety skills 30
Generic competencies 24	Marketing and advocacy skills 30
General management skills 24	Multilingual skills 30
General computer proficiency 25	Knowledge of trends in higher education 30
Interpersonal skills 25	Results orientation skills 30
Communication 25	Time management skills 31
Presentation/Public speaking/Workshop facilitation 25	Project management skills 31
	Website development and maintenance skills 31
Social media skills 25	Numeracy skills 32
Negotiation/Conflict resolution 26	Personal and professional development skills 32
Collaboration 26	Reading comprehension skills 32

Top 10 Skills

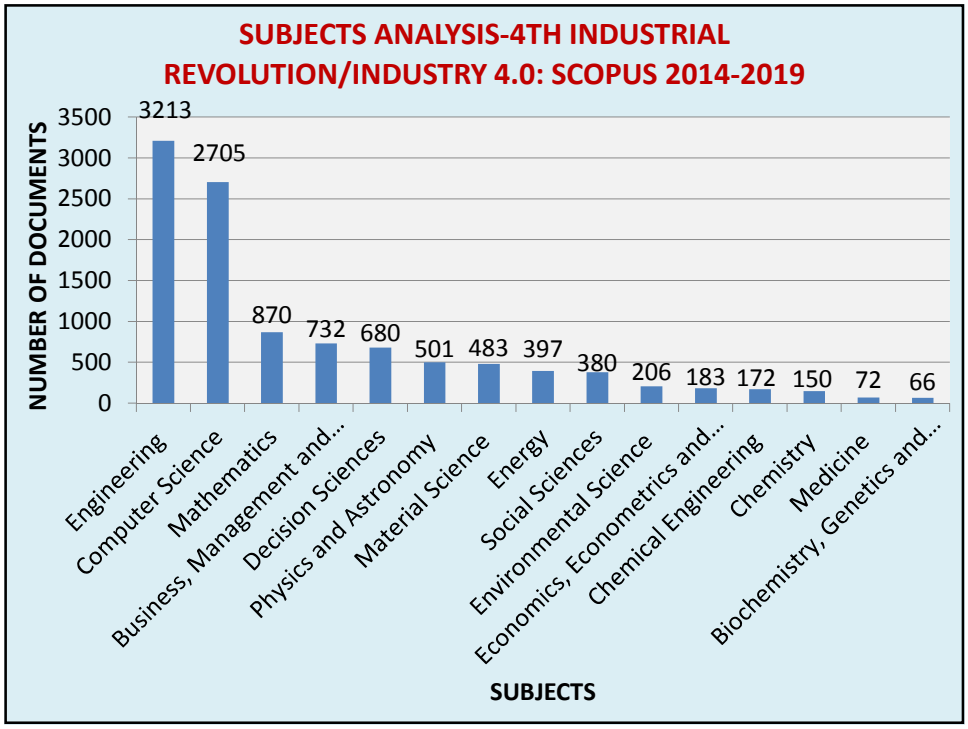
in 2020	in 2015
1. Complex Problem Solving	1. Complex Problem Solving
2. Critical Thinking	2. Coordinating with Others
3. Creativity	3. People Management
4. People Management	4. Critical Thinking
5. Coordinating with Others	5. Negotiation
6. Emotional Intelligence	6. Quality Control
7. Judgment and Decision Making	7. Service Orientation
8. Service Orientation	8. Judgment and Decision Making
9. Negotiation	9. Active Listening
10. Cognitive Flexibility	10. Creativity

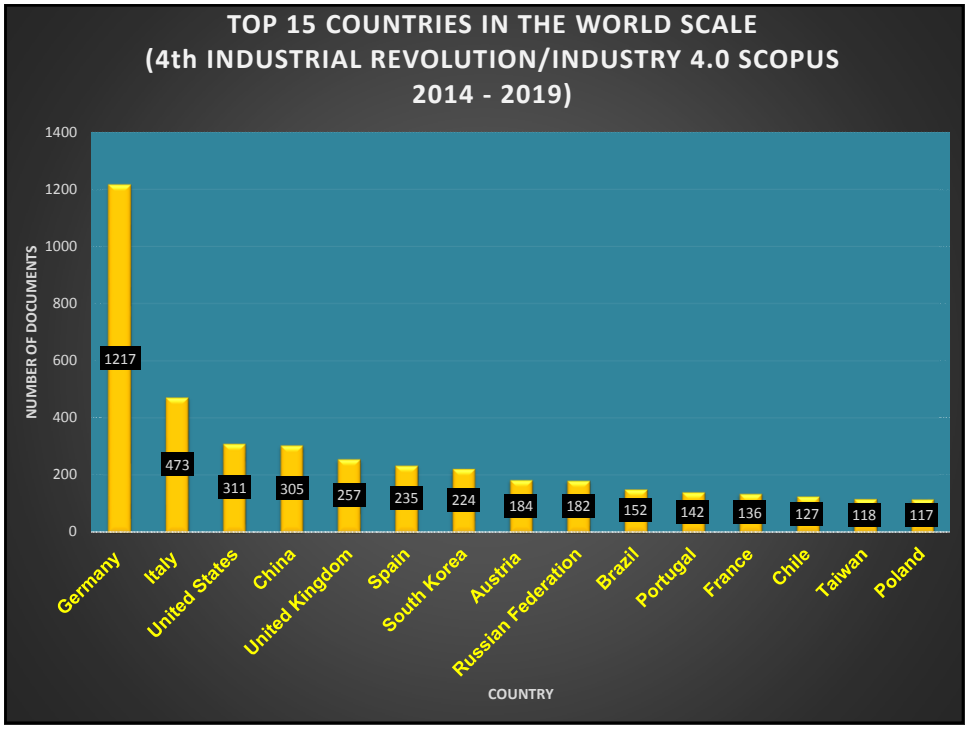
(Source: World Economic Forum, 016https://www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/)





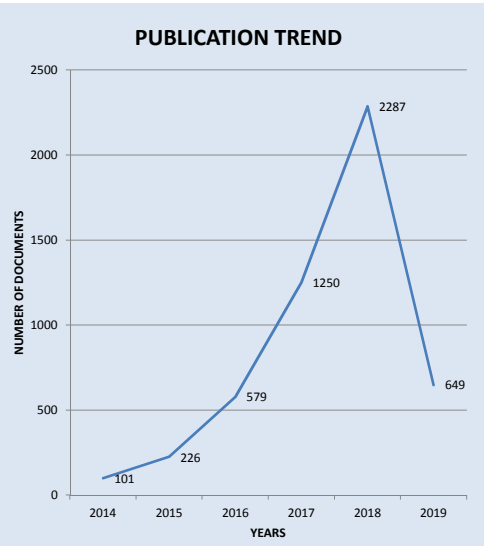
The data visualization software, VOSViewer was used to generate the figures below. All 54 documents were retrieved from Scopus, and exported to the CSV file, which is readable by VOSViewer Software. The figure presents the keywords that occur the most in 54 documents


SUBJECTS ANALYSIS-4TH INDUSTRIAL REVOLUTION/INDUSTRY 4.0: SCOPUS 2014-2019
NUMBER OF DOCUMENTS
3500
3000
2500
2000
1500
1000
500
0
3213
2705
870
732
680
501
483
397
380
206
183
172
150
72
66
Engineering
Computer Science
Mathematics
Business, Management and...
Decision Sciences
Physics and Astronomy
Material Science
Energy
Social Sciences
Environmental Science
Economics, Econometrics and...
Chemical Engineering
Chemistry
Medicine
Biochemistry, Genetics and...
SUBJECTS

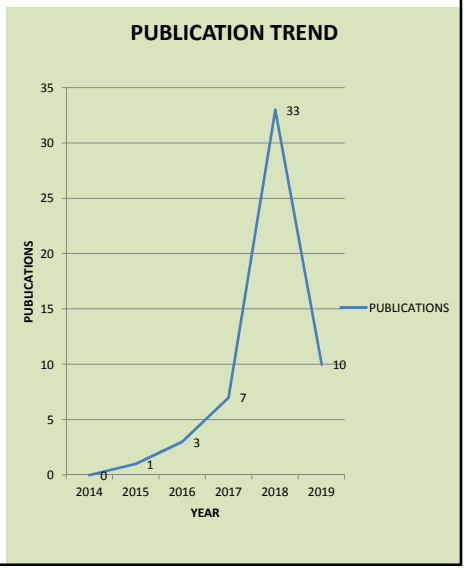

TOP 15 COUNTRIES IN THE WORLD SCALE
(4th INDUSTRIAL REVOLUTION/INDUSTRY 4.0 SCOPUS
2014 - 2019)
NUMBER OF DOCUMENTS
1400
1200
1000
800
600
400
200
0
1217
473
311
305
257
235
224
184
182
152
142
136
127
118
117
Germany
Italy
United States
China
United Kingdom
Spain
South Korea
Austria
Russian Federation
Brazil
Portugal
France
Chile
Taiwan
Poland
COUNTRY

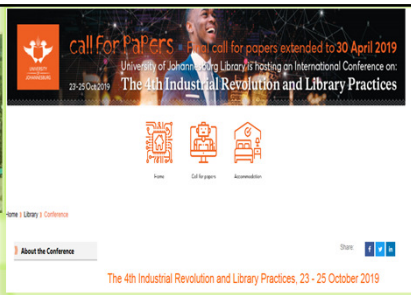
4IR* Research: SCOPUS 2014-2019

WORLD/GLOBAL: N=5092



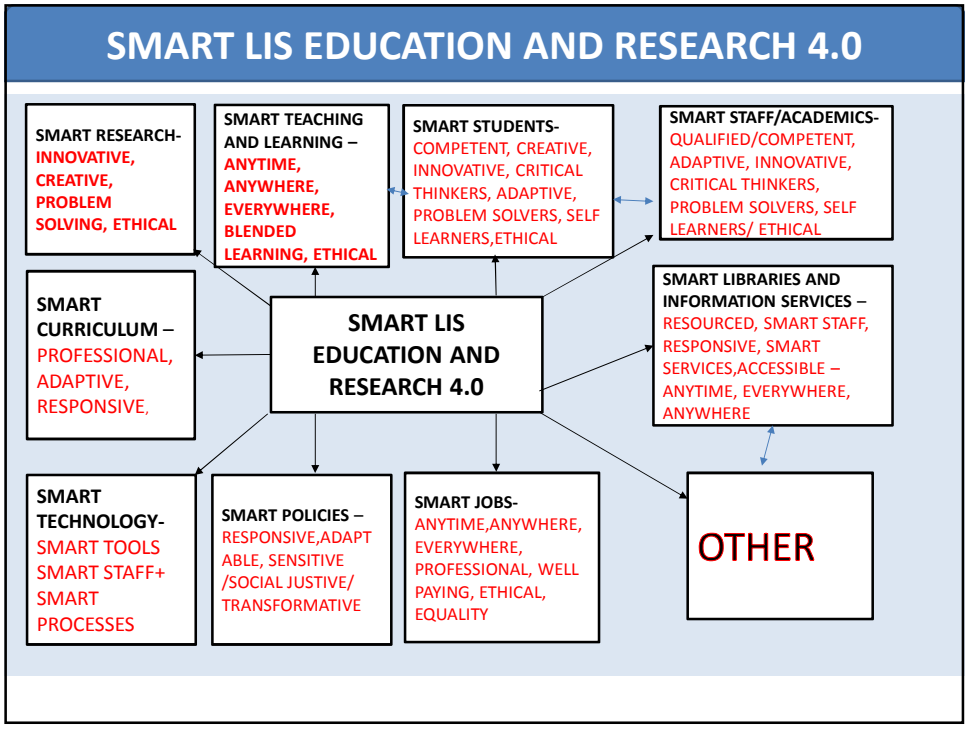
SOUTH AFRICA : N=54

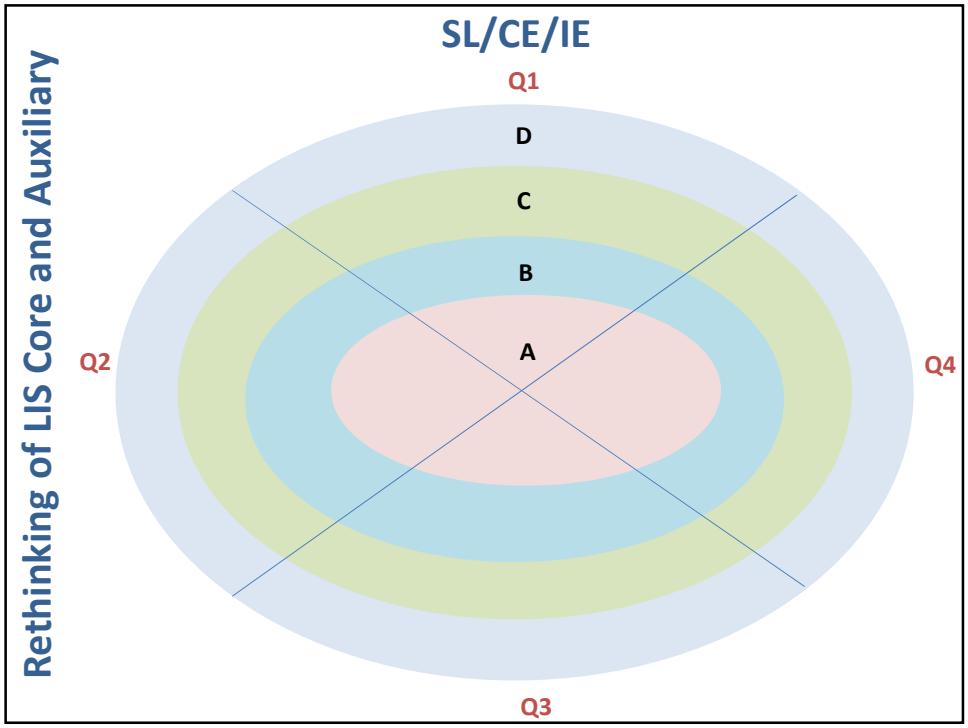




Data, Information and Knowledge for Development in Africa

The 4IR refers to a set of highly disruptive technologies which are blurring the lines between the physical, digital, and biological spheres, collectively referred to as cyber-physical systems. Technologies such as cognitive computing, cloud computing, the internet of things, big data, augmented/virtual reality, 3D systems, artificial intelligence and power supply are transforming social, economic and political systems and putting huge pressure on leaders and policy-makers to respond.


SMART LIS EDUCATION AND RESEARCH 4.0
SMART RESEARCH- INNOVATIVE, CREATIVE, PROBLEM SOLVING, ETHICAL
SMART TEACHING AND LEARNING – ANYTIME, ANYWHERE, EVERYWHERE, BLENDED LEARNING, ETHICAL
SMART STUDENTS- COMPETENT, CREATIVE, INNOVATIVE, CRITICAL THINKERS, ADAPTIVE, PROBLEM SOLVERS, SELF LEARNERS,ETHICAL
SMART STAFF/ACADEMICS- QUALIFIED/COMPETENT, ADAPTIVE, INNOVATIVE, CRITICAL THINKERS, PROBLEM SOLVERS, SELF LEARNERS/ ETHICAL
SMART CURRICULUM – PROFESSIONAL, ADAPTIVE, RESPONSIVE,
SMART LIS EDUCATION AND RESEARCH 4.0
SMART LIBRARIES AND INFORMATION SERVICES – RESOURCED, SMART STAFF, RESPONSIVE, SMART SERVICES,ACCESSIBLE – ANYTIME, EVERYWHERE, ANYWHERE
SMART TECHNOLOGY- SMART TOOLS SMART STAFF+ SMART PROCESSES
SMART POLICIES – RESPONSIVE,ADAPTABLE, SENSITIVE /SOCIAL JUSTIVE/ TRANSFORMATIVE
SMART JOBS- ANYTIME,ANYWHERE, EVERYWHERE, PROFESSIONAL, WELL PAYING, ETHICAL, EQUALITY
OTHER


SL/CE/IE
Rethinking of LIS Core and Auxiliary
Q1
Q2
Q3
Q4
D
C
B
A

Conclusions and Agenda

SMART LIS EDUCATION AND RESEARCH 4.0

- Management - Leadership
- Teaching and learning-formal ,Continuing/informal education/internship/in service, CSW
- Best practice forum/ knowledge sharing and learning from the best/niche areas, mentorship
- Self education/learning/life long learning
- Funding- government + income generation + grants + philanthropists /donations + Awards
- Quality control – policies, standards, legislations
- Employment-Creativity/Innovation/talent, Market, competency-meritocracy or mediocracy, democratic style, self/seasonal vs permanent
- Equity/social justice/ social inequality/ access vs success
- Students – quantitative(professional) Vs Qualitative education(generic) ;
- Research
- Resources / spaces
- Context - compatability with national and global goals
- Library and information services
- Jobs - staffing

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE

Agenda

✓Competency?

✓Staff and students – KSAEE

✓Indexing?

✓Visibility?

https://www.edie.net/blog/Unlocking-the-Fourth-Industrial-Revolution-for-the-planet/6098525

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE

Readings

- Butler-Adam J. The Fourth Industrial Revolution and education. S Afr J Sci. 2018;114(5/6),
- Kwanya, T., Stilwell, C. & Underwood, P.G. 2012. A competency index for research librarians in Kenya. *African Journal of Libraries, Archives & Information Science*, 22(1): 1-18.
- Moon,Youngho ; Seol, Sung-Soo Seol. 2018. Evaluation of the Theory of the 4th Industrial. *Asian Journal of Innovation and Policy (2017) 6.3:245-261*
- Ocholla Dennis and Shongwe Mzwandile.2013. An analysis of the library and information science (LIS) job market in South Africa. *South African Journal of Libraries and Information Science* Vol 79(1):35-43. Retrieved 5 August ,2013, from http:sajlis.journals.ac.za.doi:10.7553/79-1-113
- Ocholla, D.N.; Dorner,D., Britz, J.2013.Assessment and Evaluation of LIS Education: Global Commonalities and Regional Differences – South Africa, New Zealand and USA. *International Journal of Library and Information Services(LIBRI)* Vol.63,N2: 135-148
- Ocholla Dennis and Bothma Theo. 2007. Trends, challenges and opportunities for LIS education and training in Eastern and Southern Africa, *New Library World*, Vol.108,N.1/2 ,55-78
- Prisecaru, Petre. 2016. Challenges of the fourth Industrial revolution. Knowledge Horizons-economics Vol.8,No1:57-62.
- Raju, J. 2017. LIS professional competency index for the higher education sector in South Africa. Cape Town: University of Cape Town Libraries. DOI: http://dx.doi.org/10.15641/0-7992-2536-5
- Ramble,S; Gunasekaran, A; Gawankar S.A.2018.Sustainable Industry 4.0 framework: A systematic literature review identifying the current trends and future perspectives.Process and Envoronmental protection Vol 111;408-42
- Shongwe, Mzwandile Muzi.2014.The Information Technology Influence on LIS Job Descriptions in South Africa. *Information Technology for Development*, DOI: 10.1080/02681102.2013.874315
- Shongwe, M. and Ocholla, D.N. (2011). A tracer study of LIS graduates at the University of Zululand, 2000 -2009, *Mousain, Vol 29(2)* ,227-238
- Schwas, K. 2016. The fourth Industrial revolution, what it means and how to respond, Foreign affairs. Viewed 15 February 2019, from https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/

Websites:

https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/.

https://www.youtube.com/watch?v=EO2fi9acHWc&index=8&list=PLlCXf-QeGSMlLLfaT110ln_MFZ6jzPgAm

https://www.youtube.com/watch?v=kpW9JcWxKq0&list=PLlCXf-QeGSMlLLfaT110ln_MFZ6jzPgAm

https://www.youtube.com/watch?v=v9rZOa3CUC8

UNIVERSITY OF ZULULAND

https://www.edie.net/blog/Unlocking-the-Furth-Industrial-Revolution-for-the-planet/6098525

RESTRUCTURED FOR RELEVANCE

Thanks!

Questions & Answers

UNIVERSITY OF ZULULAND

RESTRUCTURED FOR RELEVANCE