4IR in Libraries – Where are we now & Where are we going?

Make today matter

ID van der Walt – Nov 2019
Meet your future client
Is this far fetched?

Grades R to 3 curriculum for coding, robotics ready to go - Motshekga
2019-07-17 07:49
Ethan Van Diemen

Grade R to 3 pupils will be among the first to be exposed to Fourth Industrial Revolution-ready subjects in 2020.

On Tuesday, long-serving Basic Education Minister Angie Motshekga announced that the grades R to 3 and Grade 7 curricula for coding and robotics were 100% ready for next year.

"Curriculum developments in the basic education sector are advancing at a rapid pace as we move swiftly to meet the global trends in digital and ICT [information and communication technologies] education to prepare and skill our learners for the demands of the current and future economy," said Motshekga.

"We have also begun the process of transforming our curriculum by introducing new and existing skills-based subjects."

Meet Libby - the new robot library assistant at the University of Pretoria's Hatfield campus
BY ISAAC MAHLANGU - 04 June 2019 - 18:46

The 4th industrial revolution has landed at the University of Pretoria with the employment of Libby, a new library assistant robot.

Image: Sandle Ndlovu
# 4IR In a Nutshell

<table>
<thead>
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<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
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</thead>
<tbody>
<tr>
<td>Mechanization, water power, steam power</td>
<td>Mass production, assembly line, electricity</td>
<td>Computer and automation</td>
<td>Cyber Physical Systems</td>
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4IR In a Nutshell

Building on the widespread availability of digital technologies that were the result of the Third Industrial, or Digital, Revolution, the Fourth Industrial Revolution will be driven largely by the **convergence** of digital, biological, and physical innovations.
Some 4IR Notes

- The main technology used in the context of Industry 4.0 is cyber-physical systems (CPS).
- CPS are a set of different enabling technologies
- 5 Levels of CPS
  1. Smart connection
  2. Data-to-information conversion
  3. Digital twin
  4. Cognition
  5. Configuration
Some 4IR Notes cont.

Level #1. **Smart connection**: The ability to manage and acquire data made available in real time thanks to intelligent sensors and to transfer them with specific communication protocols.

Level #2. **Data-to-information conversion**: The ability to aggregate data and convert it to value-added information.

Level #3. **Digital twin**: The ability to represent real time in a digital reality.

Level #4. **Cognition**: The ability to identify different scenarios and support a proper decision-making process.

Level #5. **Configuration**: Provides feedback on physical reality from virtual reality and applies corrective actions to the previous level.
4IR Challenges

- Data infrastructure and compatibility
- Slow adoption or lack of understanding
- Understanding the business case
- Cyber security
- Skills and training
- Organisational Culture
4IR Skills Disruption

Skills Disruption

35% of core skills will change between 2015 and 2020
4IR Skills Disruption

Top 10 skills

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

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

Source: Future of Jobs Report, World Economic Forum
So what does it look like?

Visually Impaired Project

- Convert 2D images to 3D and 3D print brail based cards.
So what does it look like?

Facial Reconstruction 1

- Convert CT scan to 3D model & 3D print.
So what does it look like?

Facial Reconstruction 2

- Receive reconstructed 3D model & print.
So what does it look like?

Vet. Science Pressure Glove

- Assist and design pressure sensitive glove for Vet. Science Department

The pressure sensor examination glove

Introduction

The overall aim of this project is to develop an examination glove with embedded pressure sensors ("pressure glove") to indicate how much pressure students can use while performing a trans-rectal palpation in a cow.

hardware to collect and store the data
So what does it look like?

UP academic pioneers world’s first middle ear transplant using 3D-printed bones

Posted on March 14, 2019

A pioneering surgical procedure using 3D-printed middle ear bones, developed by Professor Mashudu Tshifularo and his team at the University of Pretoria (UP) Faculty of Health Sciences, may be the answer to conductive hearing loss, a middle ear problem caused by congenital birth defects, infection, trauma or metabolic diseases.

“3D technology is allowing us to do things we never thought we could,” says Prof Tshifularo, who is head of the Department of Otorhinolaryngology at UP. “But I need sponsors and funding for this invention to take off the ground.”

The surgery, which can be performed on everyone including newborns, has benefited two patients already, and on 13 March, Prof Tshifularo performed the transplant on a patient born with an underdeveloped middle ear, effectively replacing the hammer, anvil, and stirrup, the ossicles that make up the middle ear. 3D-printing technology is used to print these bones, and then used in the surgery to reconstruct the ossicles.
The UP Context – Where we are now
Some More Examples @ UP
Some More Examples @ UP

UP Institute for Sustainable Malaria Control
We are more part of it than you think
### Where are Libraries Now?

- Systems / Units running in isolation.
- Detached User Experience.
- Segmented Data Gathering.

<table>
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<tr>
<th>Circulation</th>
<th>Consultations</th>
<th>Copy / Print / Scan</th>
<th>Teaching &amp; Learning</th>
<th>Research Support</th>
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<tbody>
<tr>
<td>Cataloging</td>
<td>Acquisitions</td>
<td>Digitisation</td>
<td>Makerspace</td>
<td>Mobile App</td>
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<tr>
<td>Self-Help Terminals</td>
<td>Access / Physical</td>
<td>Access / Resources</td>
<td>Libguides</td>
<td>Research Data Management</td>
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Where are Libraries Going?

- Integrated / Connected.
- Personalised User Experience.
- Aggregated Data Gathering.
- Data Driven Decision Making
- Changing User Behavior.
- Drive Skills Development.
Self-help Terminals – AI Chatbot
What we see in Libby’s brain
Our role as a library – Expose and train

UP’s GIBS named world’s most gender-balanced business school by UK Financial Times

News

UP partners with University of Cambridge synthetic biologist to build user-friendly electrical engineering capacity

Posted on November 28, 2019

What does the average biologist have to do with programming microprocessors? Everything, as it turns out.

Professor Jim Haseloff, a world-leading plant synthetic biologist at the University of Cambridge, recently presented a workshop at the University of Pretoria in which transdisciplinary teams of students and staff learned to use OpenSmart Arduino Rich Uno R3 kits and low-cost sensors and devices to build DIY bioinstruments, sensors or hardware for various practical applications in the biological and related fields. The workshop was coordinated by Dr Steven Hussey, a Senior Lecturer in the Faculty of Natural and Agricultural Sciences’ Department of Biochemistry, Genetics and Microbiology.
Horizon Report Trends – 2014

The Fast Trends : 1-2 Years
- Increasing Focus on Research Data Management for Publications.
- Prioritization of Mobile Content and Delivery.

The Medium-term Trends : 3-5 Years
- Evolving Nature of the Scholarly Record.
- Increasing Accessibility of Research Content.

The Long-term Trends : 5+ Years
- Continual Progress in Technology, Standards, and Infrastructure.
- Rise of New Forms of Multidisciplinary Research.
Time for Adoption – 2014

The Fast: 1 Year or less
- Electronic Publishing.
- Mobile Apps.

The Medium-term: 2-3 Years
- Bibliometrics and Citation Technologies.
- Open Content.

The Long-term: 4-5 Years
- The Internet of Things.
- Semantic Web and Linked Data.
Horizon Report Trends – 2015

The Fast Trends: 1-2 Years
- Increasing Value of the User Experience.
- Prioritization of Mobile Content and Delivery.

The Medium-term Trends: 3-5 Years
- Evolving Nature of the Scholarly Record.
- Increasing Focus on Research Data Management.

The Long-term Trends: 5+ Years
- Increasing Accessibility of Research Content.
- Rethinking Library Spaces.
Time for Adoption – 2015

**The Fast:** 1 Year or less
- Makerspaces.
- Online Learning.

**The Medium-term:** 2-3 Years
- Information Visualization.
- Semantic Web and Linked Data.

**The Long-term:** 4-5 Years
- Location Intelligence.
- Machine Learning.
Horizon Report Trends – 2017

The Fast Trends: 1-2 Years
- Research Data Management.
- Valuing the User Experience.

The Medium-term Trends: 3-5 Years
- Patrons as Creators.
- Rethinking Library Spaces.

The Long-term Trends: 5+ Years
- Cross-Institution Collaboration.
- Evolving Nature of the Scholarly Record.
Time for Adoption – 2017

The Fast: 1 Year or less
- Big Data.
- Digital Scholarship Technologies.

The Medium-term: 2-4 Years
- Library Services Platforms.
- Online Identity.

The Long-term: 4-5 Years
- Artificial Intelligence.
- The Internet of Things.
What worked for us

- Executive that supports and buys into innovation and the 4IR
- Following our vision to “Redefine Academic Librarianship”
- Innovation is an organisational mindset (different types of innovation)
- Accept that these disruptive forces exist and influence the way we do things
- Change Management and skills development
- Dedicated units that investigate the latest technology and trends
- Rethink of our organisational structure
- Rethink all our existing services and products
What will not work for you

- Thinking someone else will do it
- Protecting your position for the sake of keeping it
- Thinking it will not affect your industry
Some further reading and investigation
What can also help you
Thank You