Transforming Education Through Digital Technologies

Knowledge Engineering ISO 9001

The Future of Education

Series of talks by Labtech

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21st TVET

Century Learning Solutions

- World largest range of Technical Training Solutions
- Over 1,000 Technical Training Systems
- Six major technology groups covering 50 trade areas

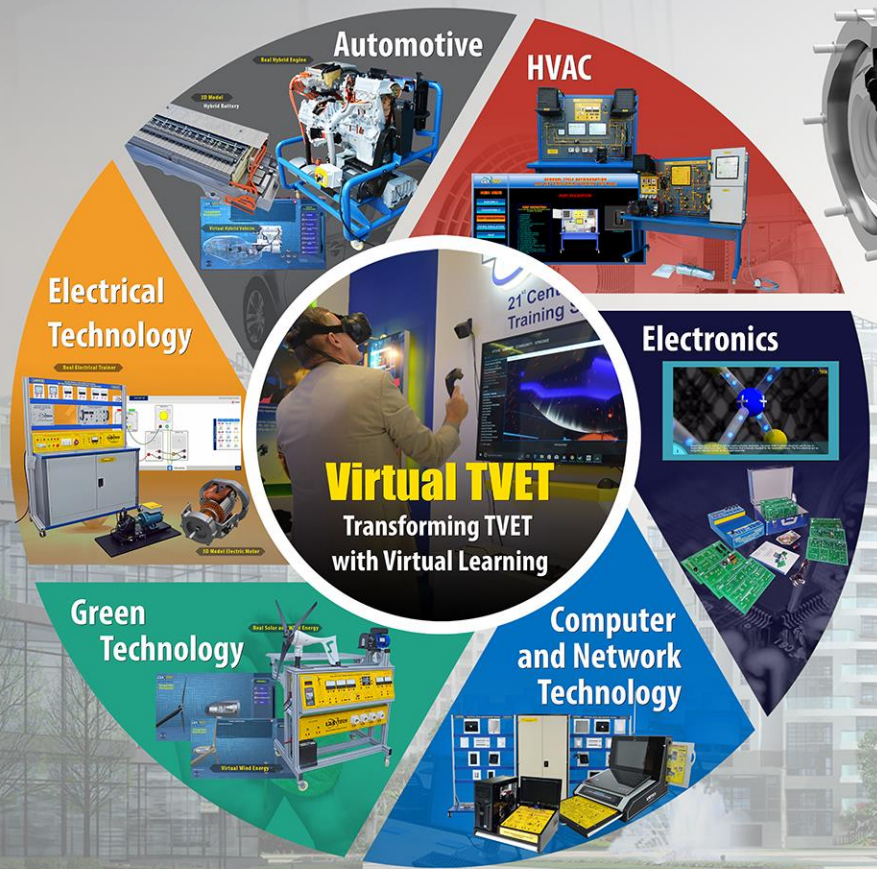
- Complete solutions for Vocational Schools and Colleges
- Providing systems to 75 countries around the world
- Programs for both hands on and virtual training

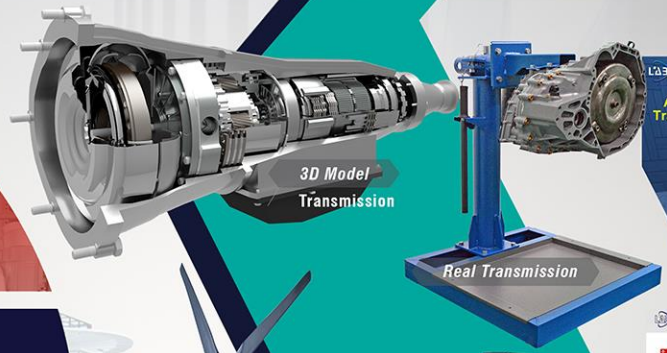
LOOKING FOR SOLUTIONS FOR CREATING EMPLOYABLE SKILLS?

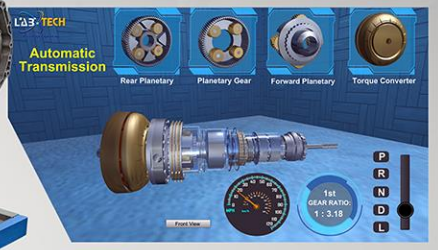
VIRTUAL TVET

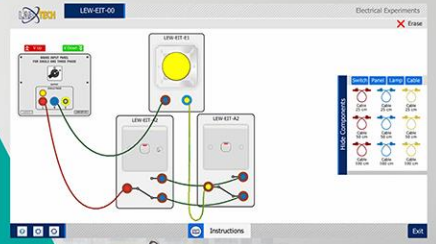
Transforming TVET with VIRTUAL Learning

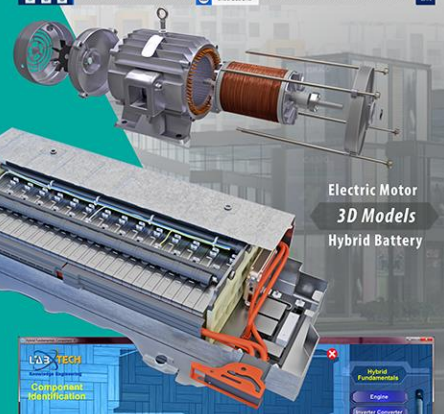
- Reduced Equipment and Operational Costs
- Faster Learning
- Deeper Knowledge and Skills
- More Efficient, Takes Less Space
- Real World Skills, Virtual Learning
- Ideal For Blended Learning

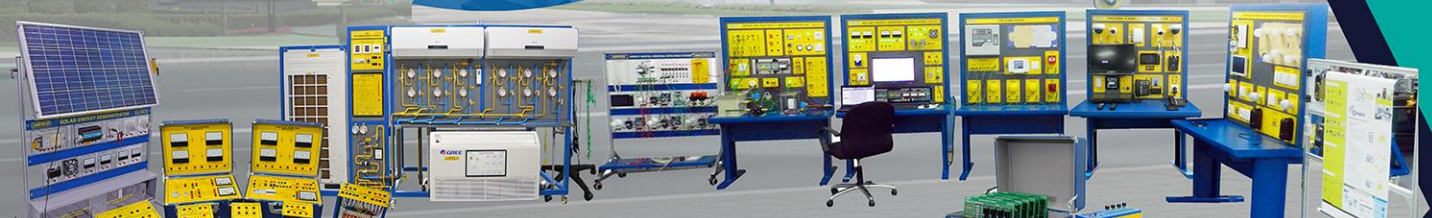












Over 80 Countries use Labtech Training Systems

Labtech Training Systems are used in over 75 countries world wide and indicated in blue on this map.
We also have 6 regional operational locations marked with a flag .

Our Discussions Today

1. Problems with Successfully Implementing Educational Technology Projects

2. Re-inventing ReINVENTing Education and TVET

3. INDUSTRY 4.0 Disruptions and Challenges

1. Problems with Successfully Implementing Ed Tech

- Initiatives are well intentioned but run into operational problems
- Often Project results are less than optimal with high overall failure rate.
- Time is important as technology has a shelf life
- Teachers, Schools and curriculum may not adapt well to new technologies
- Getting everything to work together effectively is difficult. (Even Industry has issues in this area).
- Maintenance and upkeep of systems and hardware
- Lack of a good way to measure results

High Failure Rate in Ed Tech
What is wrong?

- Many major initiatives achieve poor results

  Some Examples:
- USA – LA Unified School District –$ 500 million. Poor return on investment
- Thailand Tablet Project – nationwide program cancelled
- Turkey: FATIH tablets and whiteboard
- Many 1 to 1 computing initiatives fail
- Malaysia:

  PPSMI math and science

  1Bestarinet nationwide broadband and VLE

What went wrong?

Some common reasons:

- No change management program
- Poor Planning and implementation
- Infrastructure centric
- Little to no support for Capacity Building and integration with Curriculum
- Content (lack of)
- Pressure by politicians for quick expansion
- Poor dissemination of programs
- Poor support and training for users
- Poor maintenance and tech support
- Short term project structure and support

Educational Technology Projects are Unique and require Special Implementation

- It does not work well using traditional project development models.
- It requires special implementation and a holistic planning approach including:
  - Good Planning
  - New Concepts for school and lab designs
  - Curriculum revisions for Edtech infusion
  - Pedagogy Update (**Pedagogy 3.0**)
  - Capacity building (teachers and Admin)
    - Pre-service and In-service
  - Facilities development (Infrastructure)
  - Continued Long term support

Special Implementation Continued….

- Lack of well experienced and knowledgeable consultants and in-country staff in Ed Tech that know hardware, software and content. And who understand change management.
- Worlddidac could play a role in providing vendor neutral advise in this area.
- Cooperation: MOEs and educational companies need to work together sustainable long term initiatives. Build out capacity in both the public and private sectors.

How we Plan and Manage Schools is CHANGING

- Consideration of learning spaces
- The right balance of ICT infrastructure
- The right balance of hands-on equipment
- Consideration of learning efficiencies
- Integration of learning software
- Implementation of educational learning platforms
- Continued improvement of teacher skills
- Sustainability of New Tech & Teaching Skills

Teachers Roles are Changing

- New Skills are needed for teaching Blended learning.
- New student management concepts are used
- Pedagogy needs to be updated to incorporate infusion of ICT into the learning process.
- Pedagogy is transforming into Andragogy.
- Considerations of Info-skills embedded into learning
- **Not all teachers need to use ICT (but how much is enough?**

Educational Technology Development Framework

ISTE

- Provides International Benchmark to 21st century skills
- Foundation and Context for Implementation

3"I"s

- Framework for Investment Allocation

TAC

- Concept of Technology Diffusion
- Identifies who can most benefit early on
- Targets allocation of resources for Professional Development and Infrastructure
- Increases Rate of Success for Development Programs

CAP

- Program for continuous Upgrading for participating teachers.
- Empower teachers to learn from variety of sources including themselves and the students.

ISTE 21ST CENTURY STANDARDS

The definitive framework for learning, teaching and leading in the digital age.

TEACHERS

ADMINISTRATORS

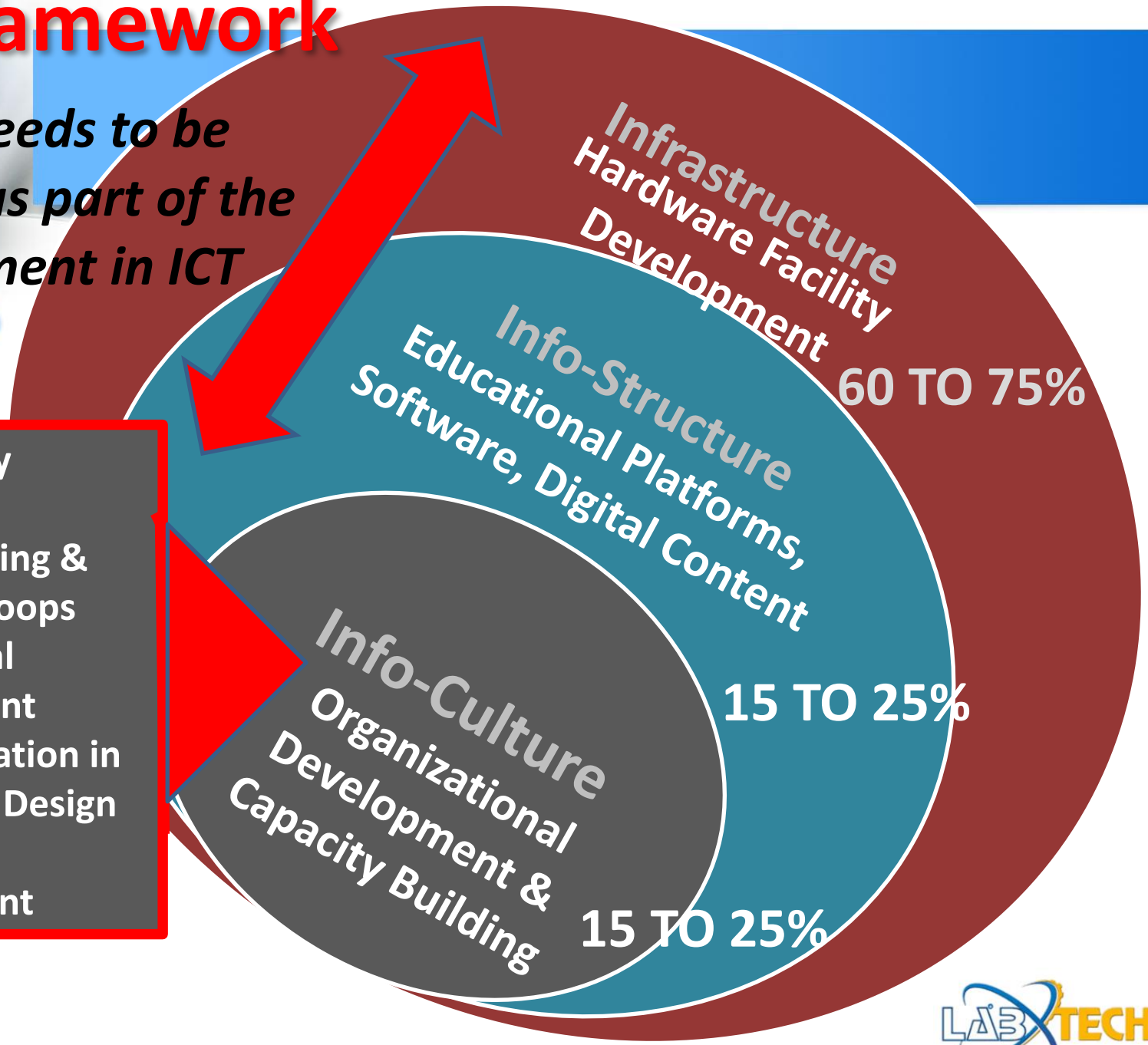
SCIENCE ED

STUDENTS

COACHES

3"I"Framework

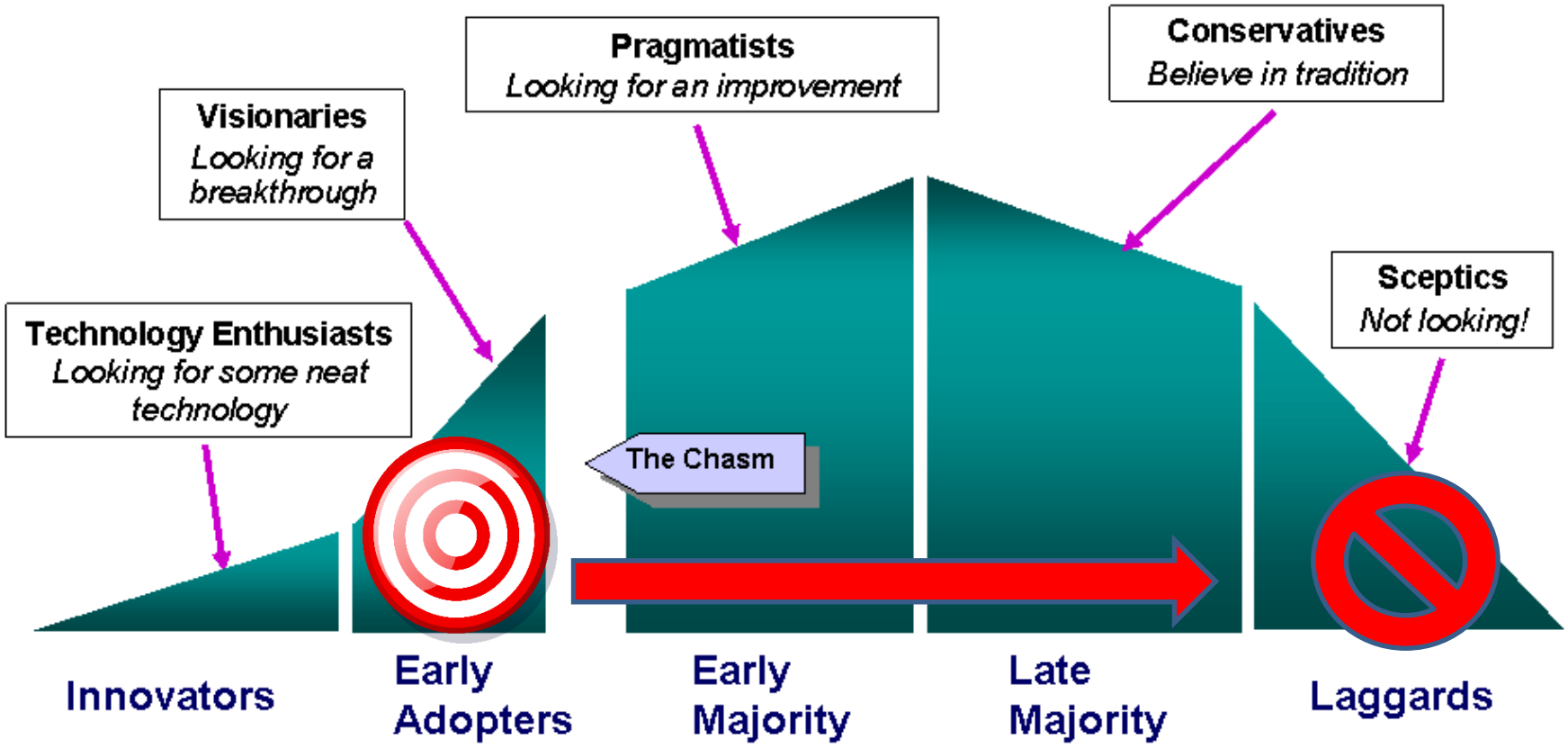
Each Area needs to be considered as part of the total investment in ICT



- 21st Century Standards
- Benchmarking & Feedback Loops
- Professional Development
- Tech Integration in Curriculum Design
- Change Management

Technology Adoption Curve:

Diffusion of e-Learning based on Profiling



Build on Success with Early Adopters and Ignore the uninterested

Technology Adoption Curve can be used to target change management and capacity building

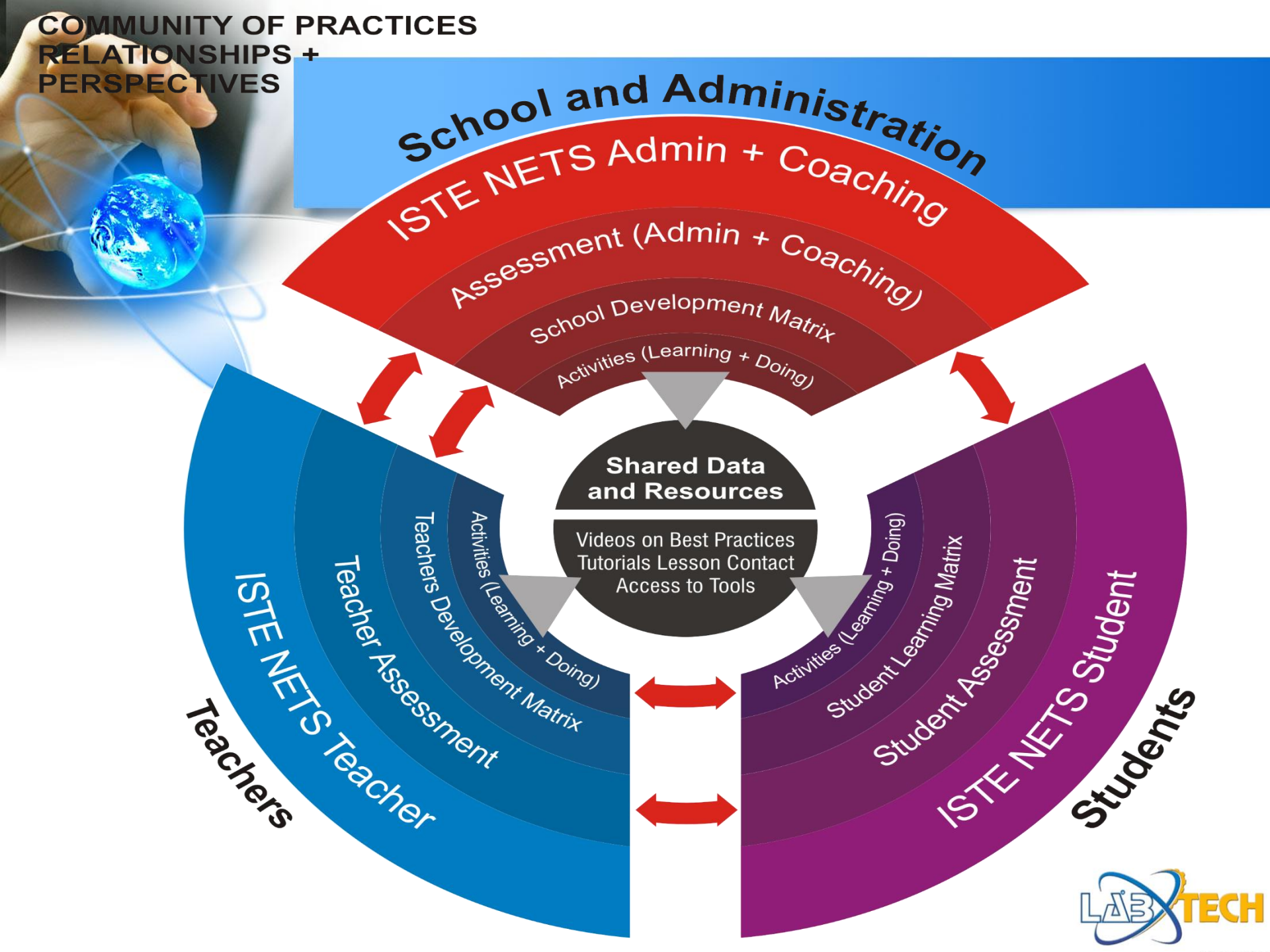
- Profiling can be used to identify innovators and early adopters so they can be targeted to be the first implementers.
- Helps overcome the inertia in updating and changing the system by working with human tendencies in adopting tech.
- Pro Development should target teachers according to the Technology Adoption Curve sequence to gain momentum and sustainability.
- If late adaptors are selected as the first cohort to implement a program, it will die. If early adaptors are targeted the rate of change is accelerated. Can be used as a tool for measuring the impact of development and training initiatives on teachers and schools.
- Assists transition from older teachers to younger ones who may have better ICT skills. We are facing about a 20 year period of major transition.

TIMS - Technology Integration Matrix

	Entry	Adoption	Adaption	Infusion	Transformation
Active					
Collaborative					
Constructive					
Authentic					
Goal Directed					

Teachers must be profiled on a matrix of their ability as well as the context in which they are working.

COMMUNITY OF PRACTICES RELATIONSHIPS + PERSPECTIVES



Potential Things To Do

- Establish a 21st century task force to investigate technologies and best practices around the world and to make recommendations for adaption to Developing Countries.
- Consider how Ed Tech is infused into T&L and where it can have the most impact
- Have a multiple pathway road map for countries at various levels.
- Set up Vanguard Schools at all levels to trial new technologies for Teaching and Learning (both nationally and regionally)
- Consider how many teachers need to be skilled in Ed Tech to have an impact on the students and be sustainable. Then identify, target , train and support.
- Develop an overall Ed the master plan to phase in and develop the "3I" Framework.

2. ReINVENTing Education and TVET

Transition to Digital Learning

Learning Module Elements

Animations

Parts Descriptions

Assembly/Disassembly

Background Theory

Formative Assesments

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21st Century Learning

Solutions for Practical and Virtual

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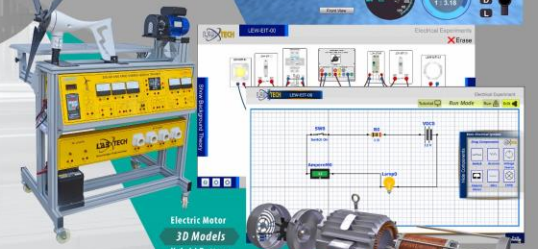
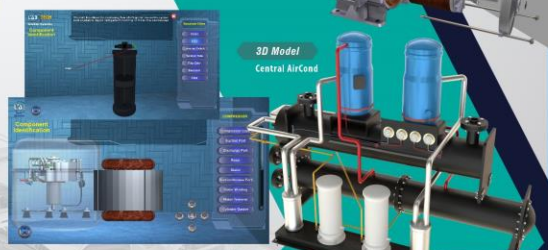
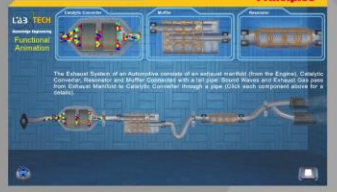




Types of Learning Modules

Principles

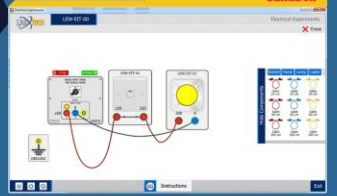


Components

Systems

Simulation

SandBox



Technology Transforming Education

- Education has yet transform through the use of technology for teaching & learning.
- In the future tech can be used for reaching people outside of institutions.
- Delivery and scalability can be improved.
- Expert AI sources will emerge
- VR will create immersive learning
- AR can guide students through learning activities (especially when combined with AI)

Teachers role in content creation

- Teachers traditionally are taught to prepare their lesson plans and also much of their content ranging from theory, practical exercises and assessments.
- New forms of digital content that take advantage of advanced graphics, learning mobility, new assessment forms, etc. require teams of developers with specialized skills ranging from Instructional designers, graphic artists, digital artists, engineers, programmers, ICT specialists, testers, optimizers, etc.
- Teachers should be content curators and deployers of content, users of assessments to match with their training program in the future.

Future Thinking - TVET Course Structures

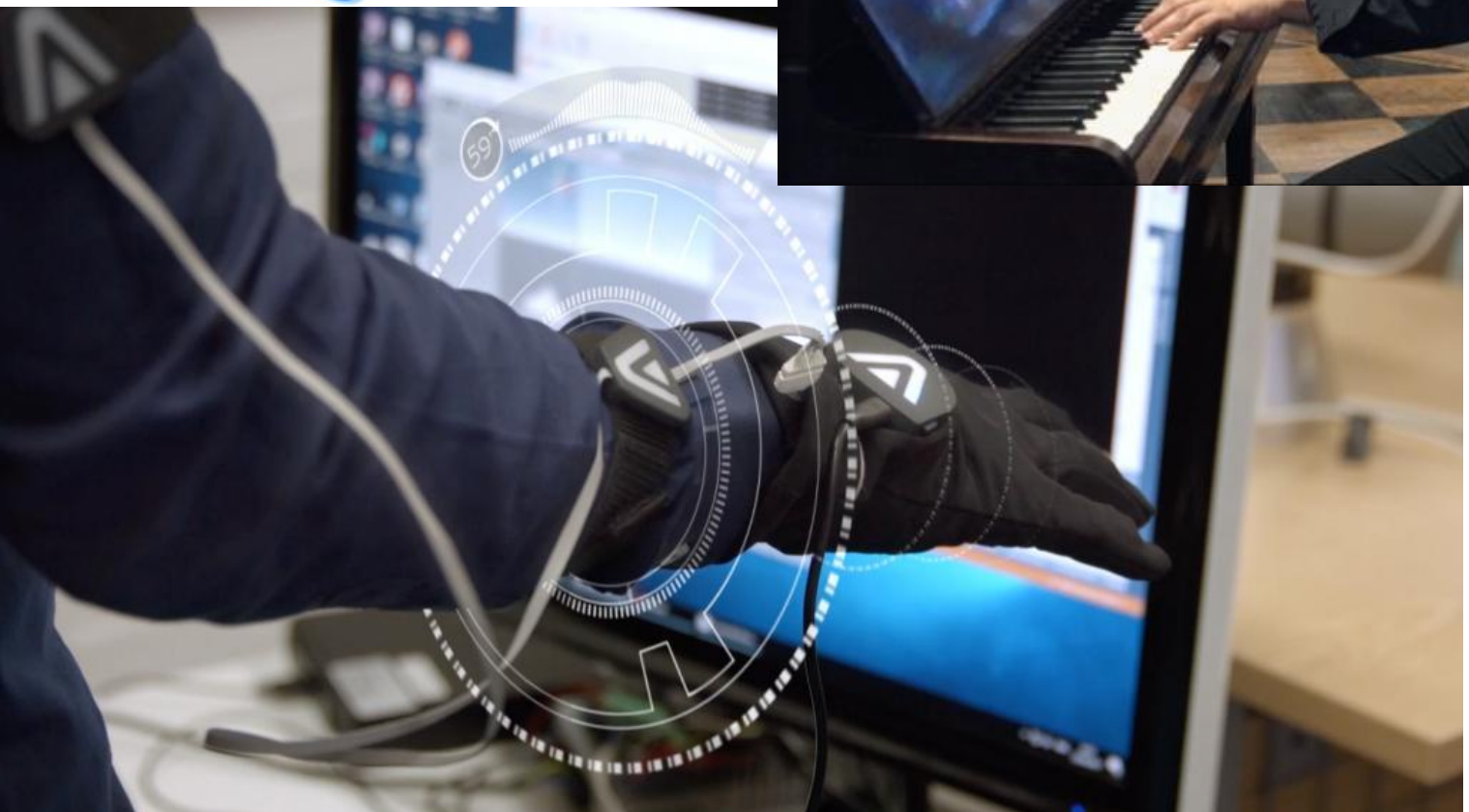
- Skills are changing in the work place
- Adult education and reskilling are essential
- Interdisciplinary training is becoming more frequent and is being seen as being valuable
- Multi-skilled is becoming a necessity
- Rethinking Skills Clusters related to jobs and how we deliver these in schools today.
- ICT element is increasing for Teaching/Learning /Working (LLL base skill)
- Should we restructure the faculties?
- Atomization of learning – Nano Degrees

Learning, Knowledge & Access to Information is changing

- Kids are learning differently: Information is becoming a commodity that is needed at specific times.
- You don't need to Know it and remember it, just know where to find it and how to use it.
- Students will need to be able to search, locate, discern and validate, process (manipulate) use and dispose of information.
- You can think of it as "Just in Time" Learning

~~K~~Nowledge

Internet of Skills and impact of 5G

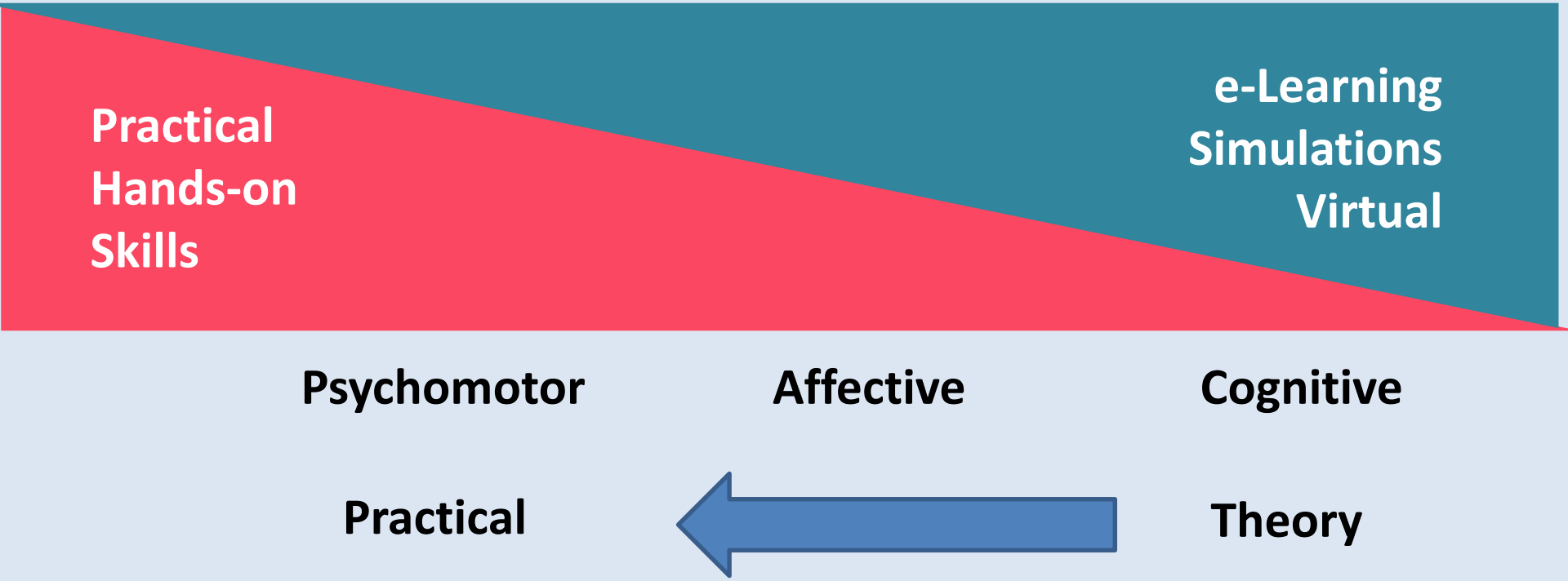


3D Virtual TVET

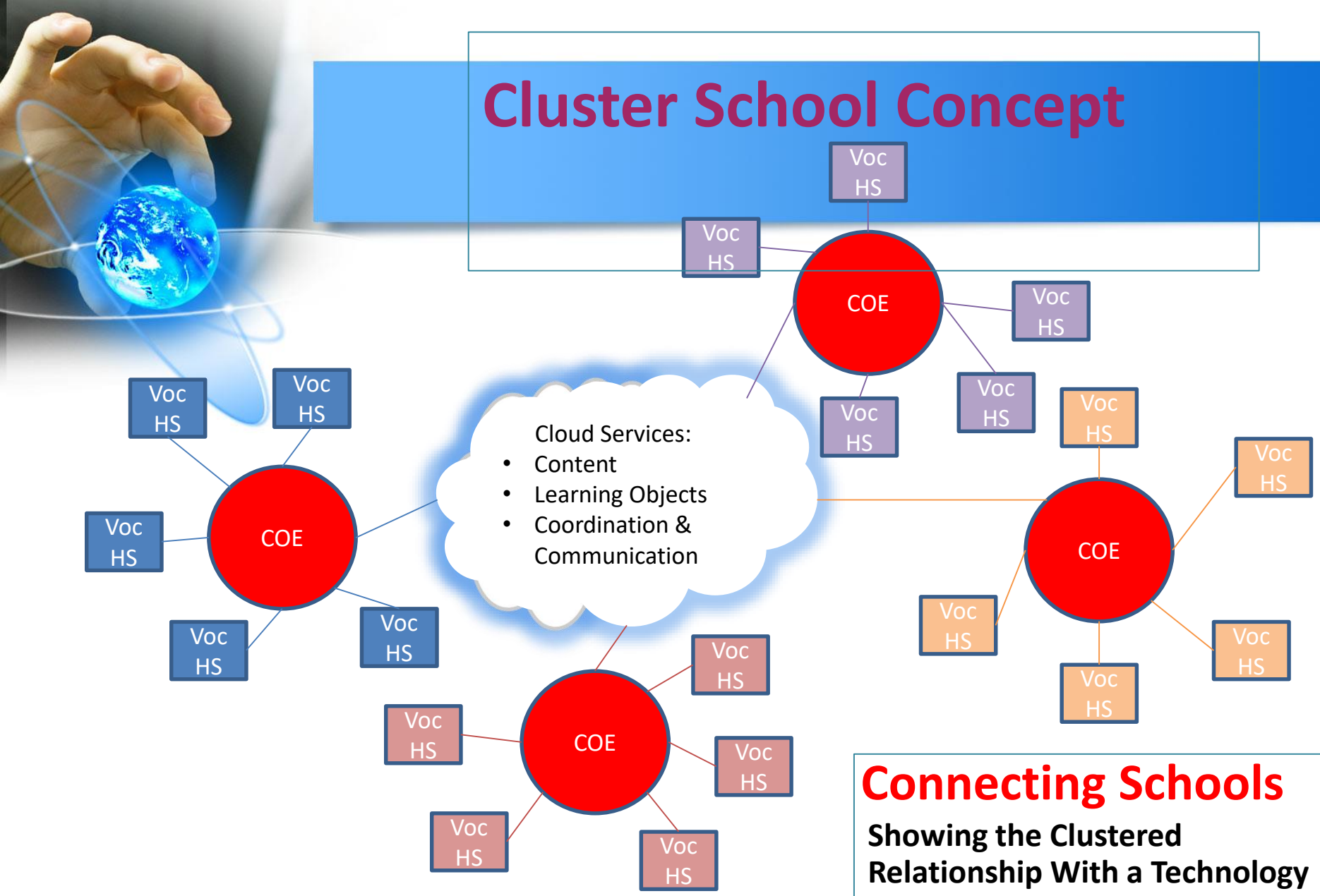
See Videos of demonstrations of Virtual TVET at: https://www.youtube.com/channel/UCPRVhTXp5oE9ktGjdWZtL9A/playlists

BLENDED LEARNING: RE-THINKING TVET

VIRTUAL: Creating the Right Balance between Theory and Practical Hands-on Learning



Cluster School Concept



Connecting Schools

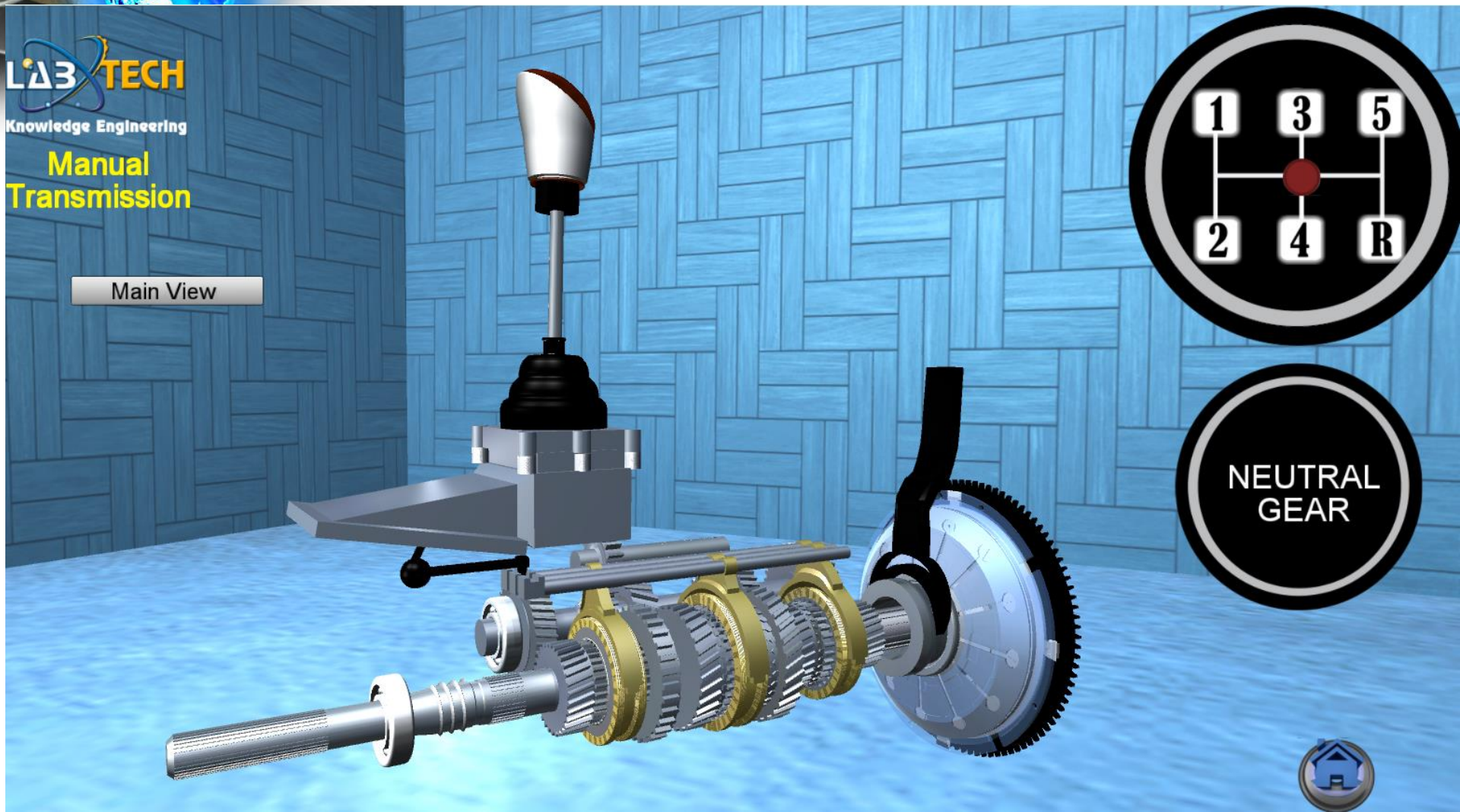
Showing the Clustered Relationship With a Technology Diffusion Model

Value Proposition for Blended TVET

TVET has been slower to utilize educational technologies and digital learning compared to the academic area yet its potential impact on costs as well as T&L is far larger

- Enhanced Learning
- Differentiated Learning
- Flexible Learning pathways
- Skills Cluster Approach
- New Assessment tools for Competency
- Learning process more similar to work
- Knowledge worker – Knowledge Tech
- **Potential for major cost reductions (up to 50%)**
- **Greater return on investment**

Labtech 3D Virtual TVET



VIRTUAL & AUGMENTED REALITY

Labtech is currently engaged is research and development of TVET Digital Content that can run in multiple Virtual and Enhanced Reality Environments. Interactive VR simulations for Zspace, Oculus Rift, HTC Vive and Google Cardboard VR are currently being developed and Labtech will continue to be on the cutting edge of TVET VR R&D with the upcoming releases of Microsoft HoloLense and Sony Playstation VR.

VIRTUAL TVET

Digital Content for Technical Education

Content Areas :

- TVET Fundamentals
- STEM
- Automotive Technology
- Electronic Technology
- Electrical Technology
- HVAC Technology
- Computers and Networks
- Renewable Energy
- Mechanical Fundamentals

TOTAL TECHNICAL
TRAINING SOLUTIONS

VIRTUAL TVET: BENEFITS & IMPACT

1. Huge Cost Savings over traditional approaches
2. Quicker Learning
3. Improved Competency
4. Increased Student Output
5. Differentiated Learning
6. Deepening Knowledge
7. Strengthens Fundamental Concepts
8. Learning Anytime, Anywhere
9. Scalability & Quick Deployment
10. Updates and complements Older Labs
11. Keeping Courses Up-to-Date
12. Cluster School Approach
13. Reduces Teachers Time
14. Transitional Learning

Potential for Virtual Learning on a National Scale

- Can quickly adapt to changing situations
- Consistent delivery nationwide
- Scalability for national reach
- Improvement in access to quality training materials
- Potential to reach Remote areas.
- Potential to lower costs of educational delivery
- Provides Platform to update learning materials nationwide easily and quickly.

3. INDUSTRY 4.0 DISRUPTIONS AND CHALLENGES

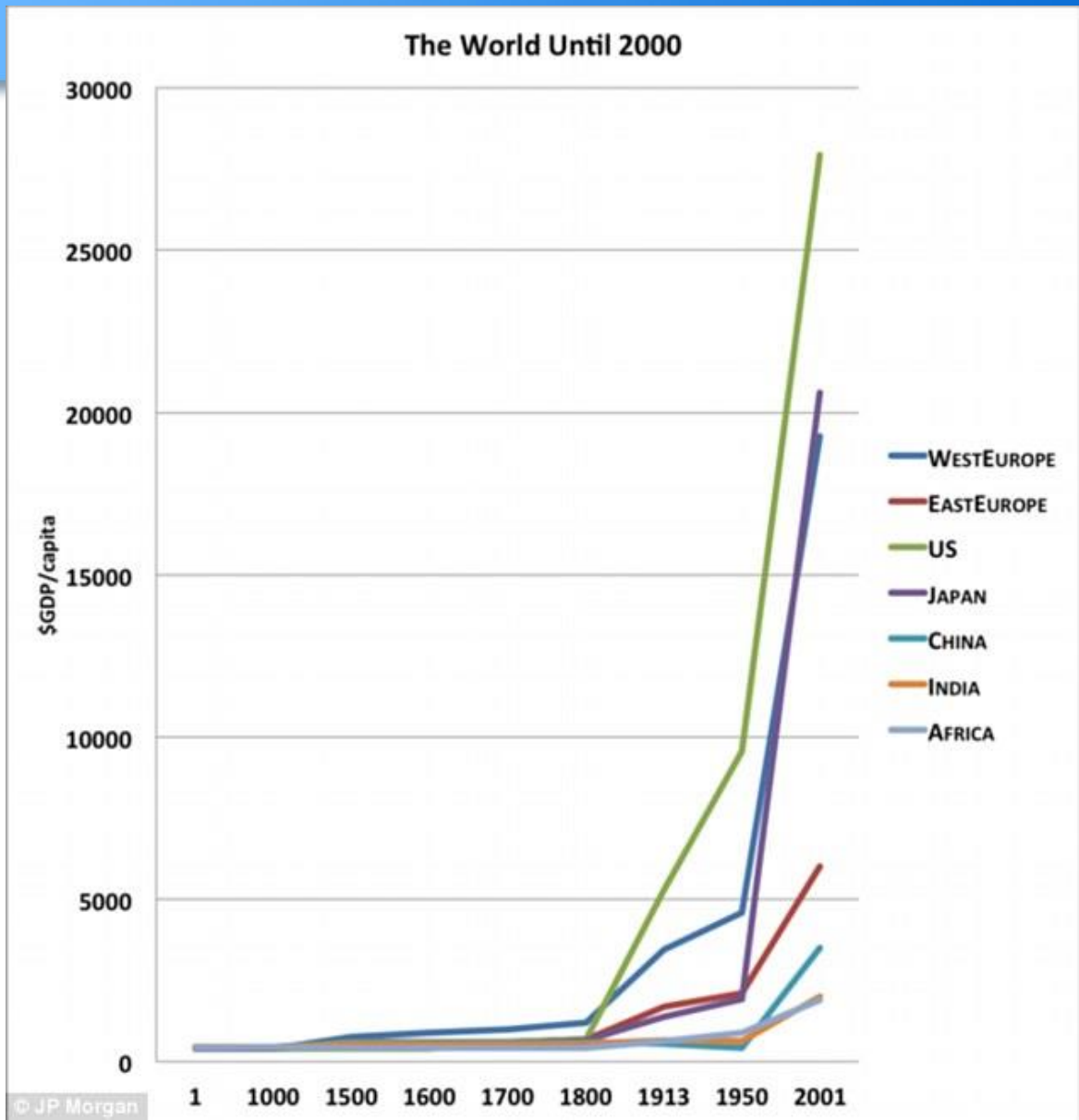
- The follow section are selected slides about the potential disruptions and impact of Industry 4.0 on the economies of developing countries and the potential roles for education and TVET.

- See video of this presentation at:
- https://www.youtube.com/watch?v=JvAQErlvJ_E

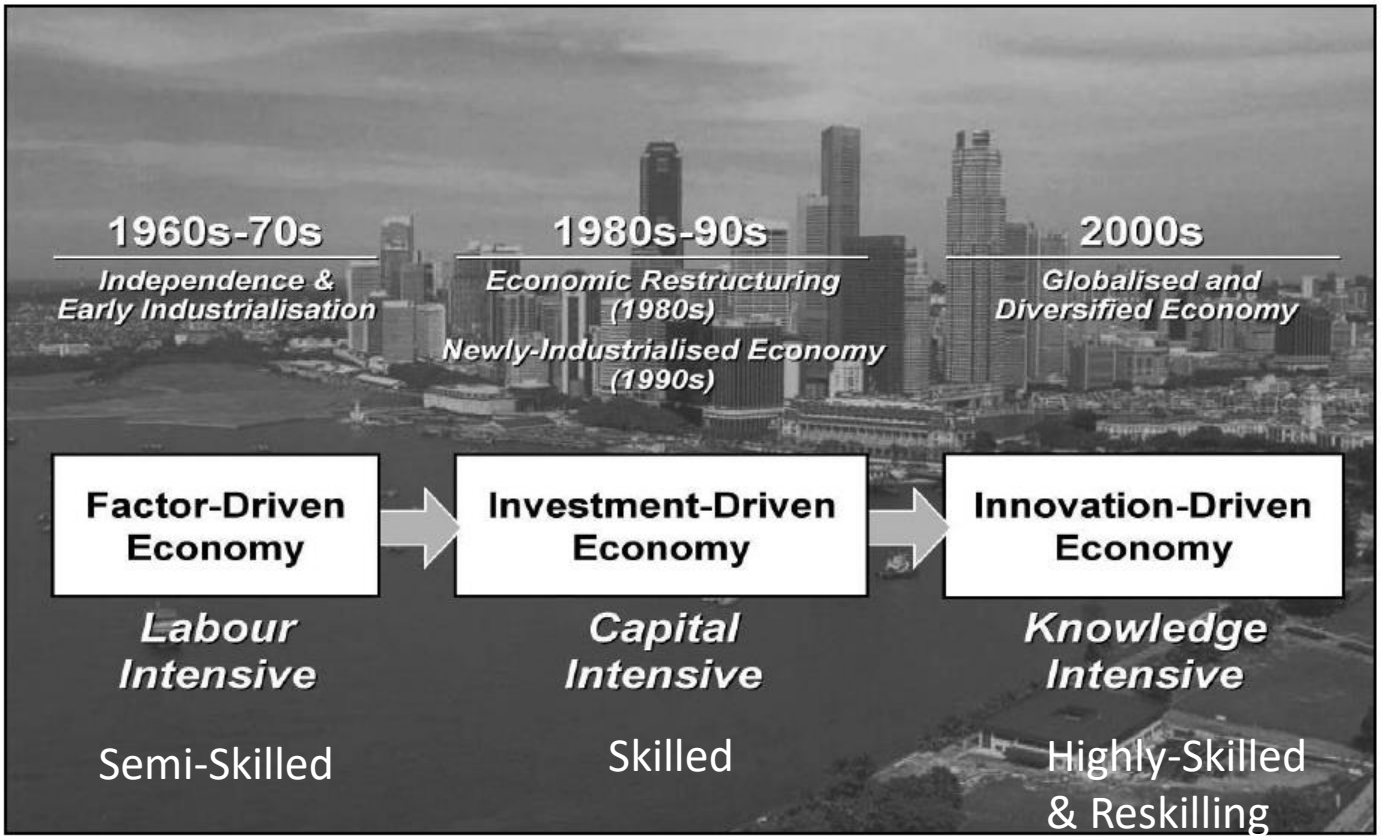
World Economic Performance

GDP Per Capita Income Growth in Western Europe, 1000 – 1999 A.D.

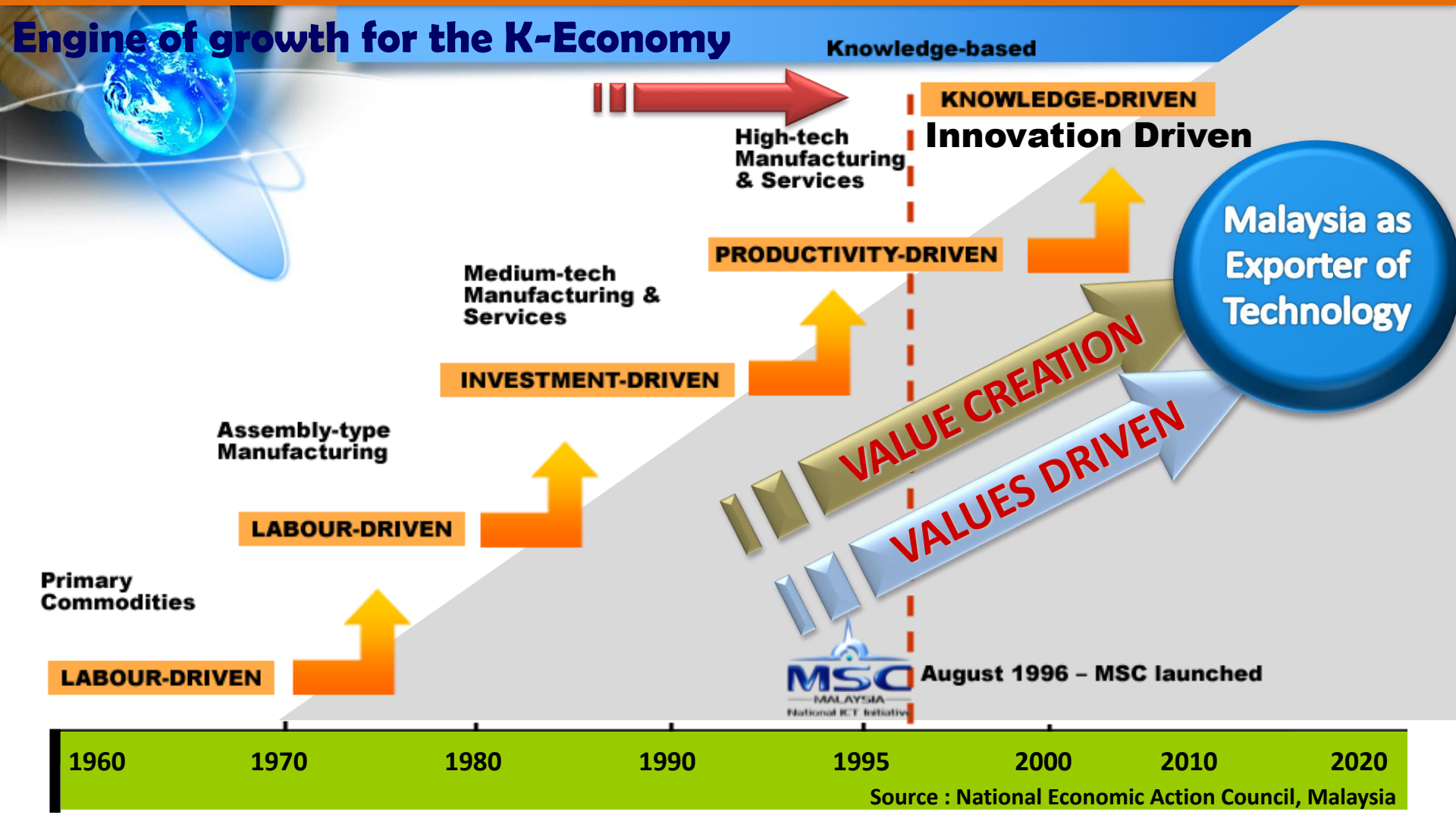
Notice the "knee of the curve" occurs at the industrial revolution, circa 1850.



Phases of Singapore Economic Development (courtesy: Dr. Law, Singapore ITE)



Transformation of Malaysia to Knowledge Economy



Malaysia is changing its economical direction from a labour driven to knowledge driven society.

Stages of Economic Development

Primary	• Resource Extraction Driven: Agriculture, Forestry, Mining.
Secondary	• Labour Driven: Heavy Manufacturing, Garment Making, Food Processing
Tertiary	• Capital Driven: Service Sector, Advanced Manufacturing
Quaternary	• Knowledge Driven: ICT, Computing, R&D

Trends in Labor Markets – reflecting development, tech and Globalization

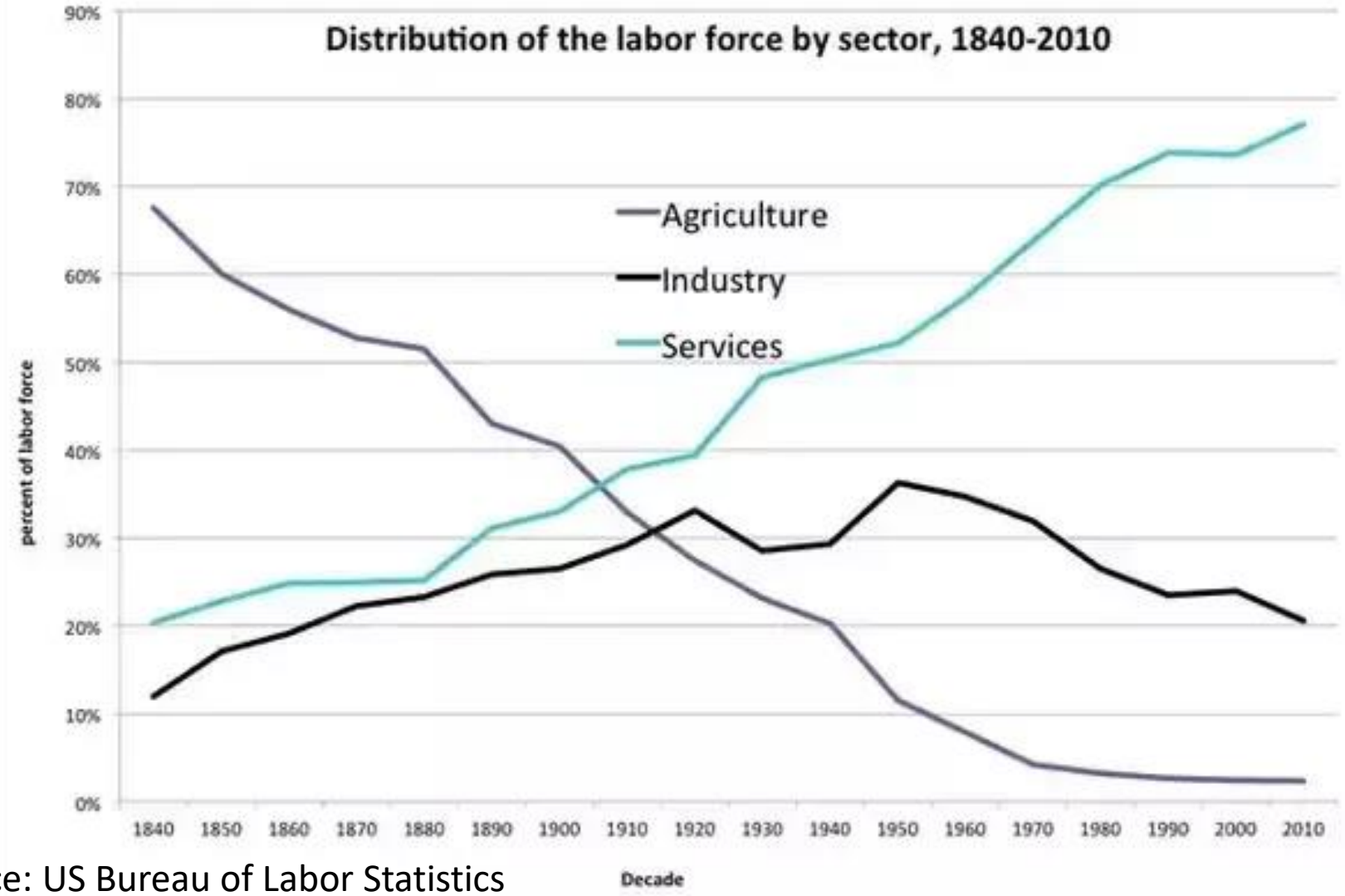
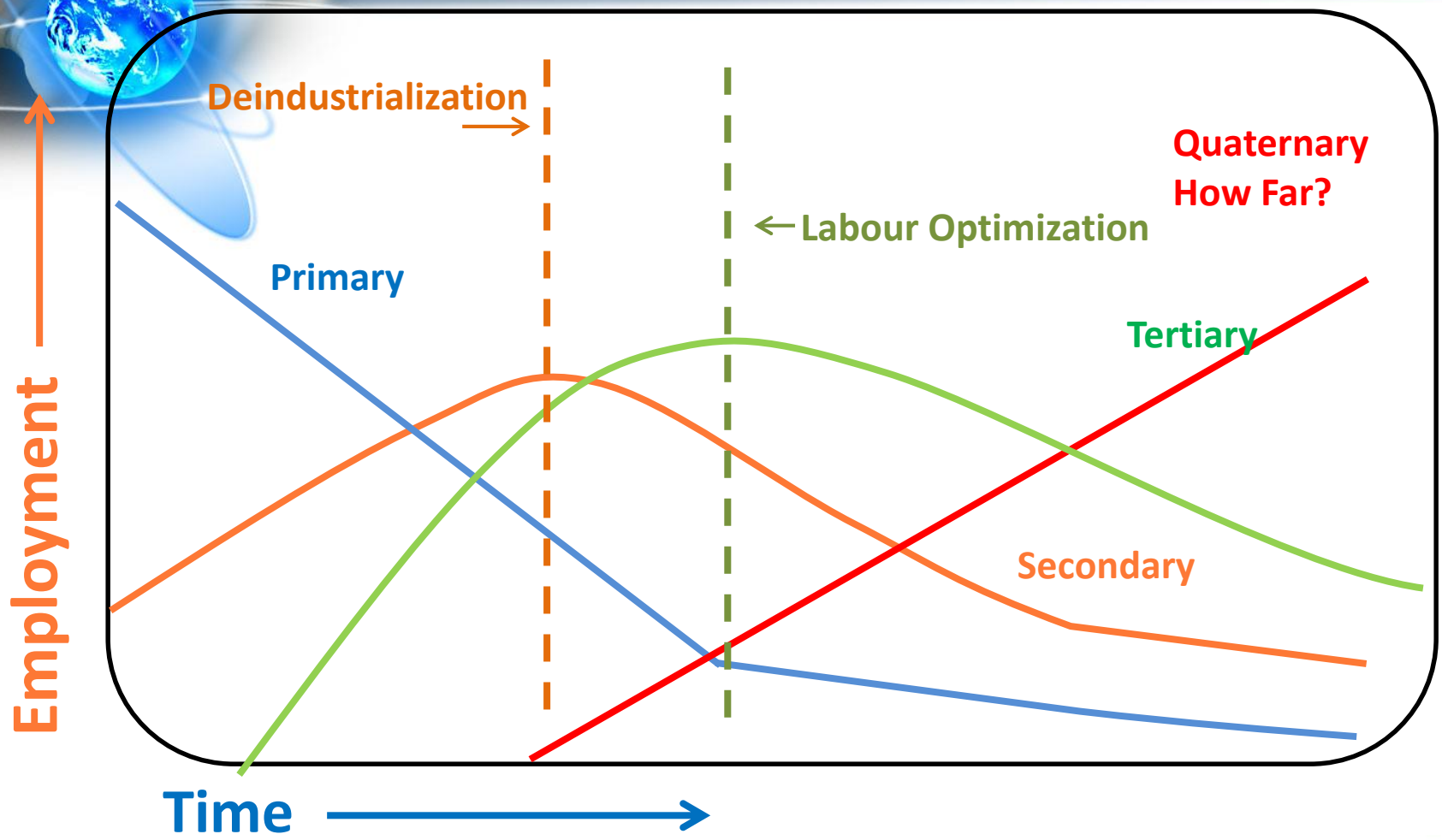


Image Source: US Bureau of Labor Statistics

Effects of Technological Change on Economic Sectors



Teaching for what does not yet exist

- A recent **World Economic Forum report** has built on this and found that 65% of children entering primary school today will end up working in completely new job types that don't exist yet.

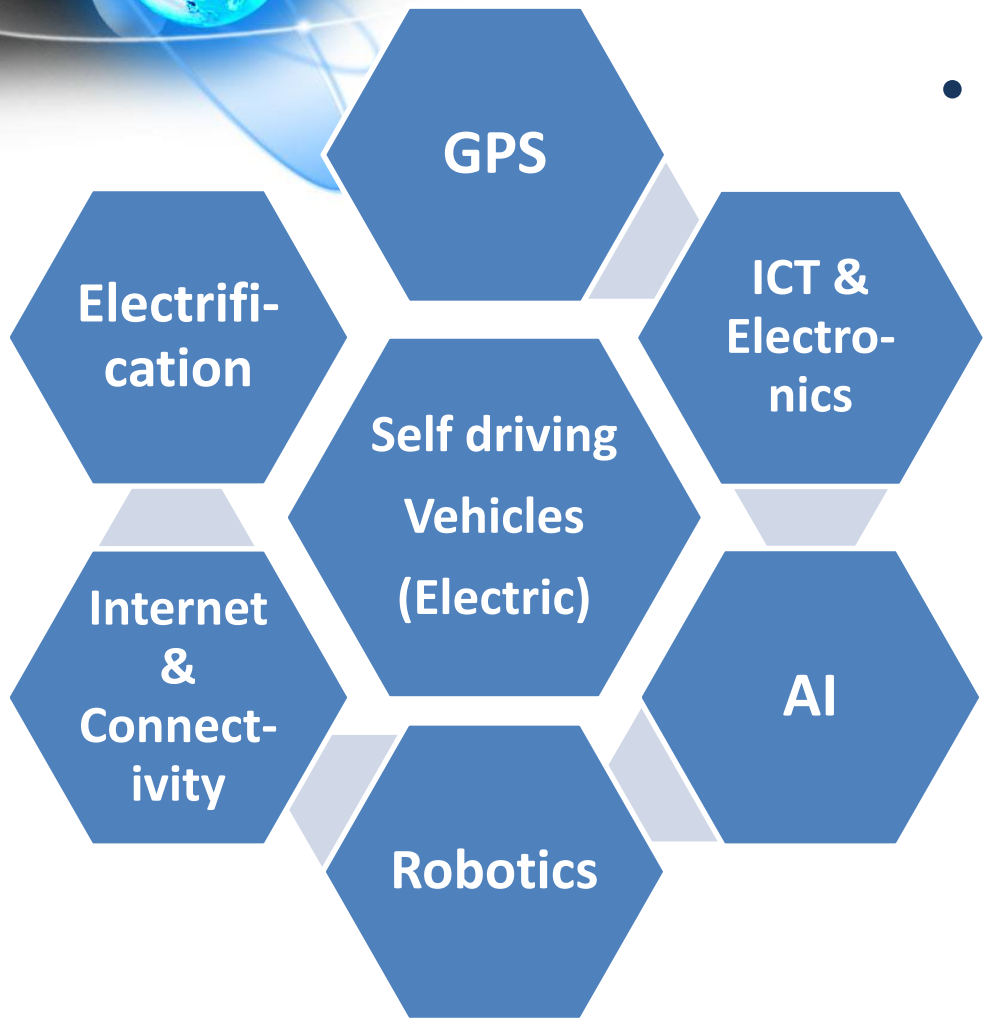
- Jobs will Shift
- Many could be left behind
- We should worry about this now

The Main Tech Drivers

- ICT the underlying driver
- Artificial Intelligence (AI)
- Automation
- Robotics
- Biotech & Genetics
- Nanotech
- Connectivity
- Internet collective knowledge and resources

The Power of Convergent Technology

- Why is it different this time?
- Practical applications are being driven by the combining of various breakthroughs leveraged into seamless innovations.



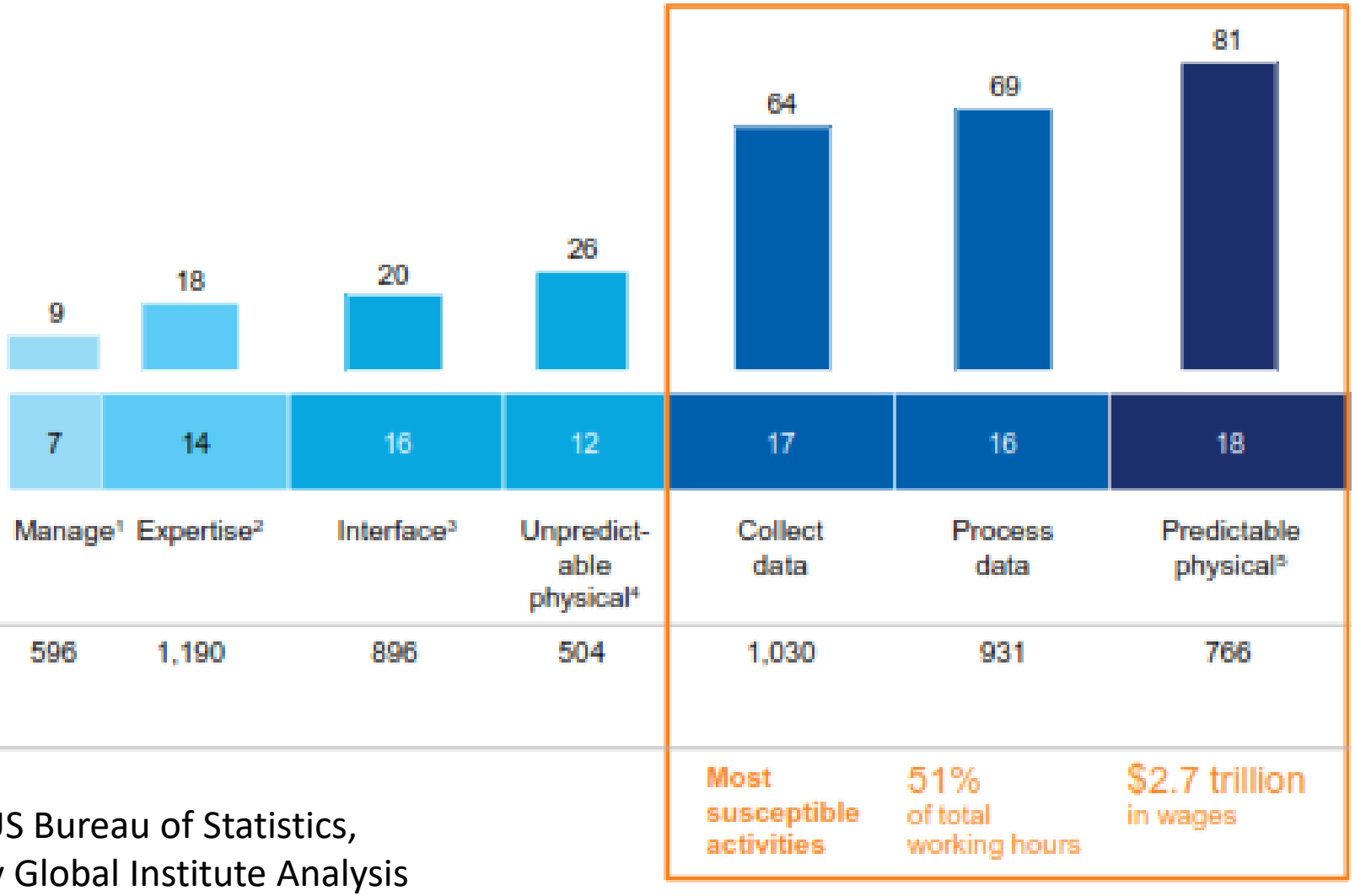
Future of Jobs – Which will Go? Which will Last?

- 35 to 50% of the current jobs will be replaced over the next 15 years.
- Young people will face perhaps 3 to 5 career changes during their working life
- Education must prepare students for jobs that do not yet exist. How do you do that?
- Rise of workforce in the service industry and decline in agriculture and manufacturing can “deskill” a country
- However education sector and professional services are a counterbalance.
- How will education evolve to rise to these challenges?

What types of work can be Automated?

Three categories of work activities have significantly higher technical automation potential

Time spent on activities that can be automated by adapting currently demonstrated technology
%



	Manage[1]	Expertise[2]	Interface[3]	Unpredict-able physical[4]	Collect data	Process data	Predictable physical[5]
Time spent in all US occupations %	7	14	16	12	17	16	18
Total wages in US, 2014 $ billion	596	1,190	896	504	1,030	931	766

Most susceptible activities

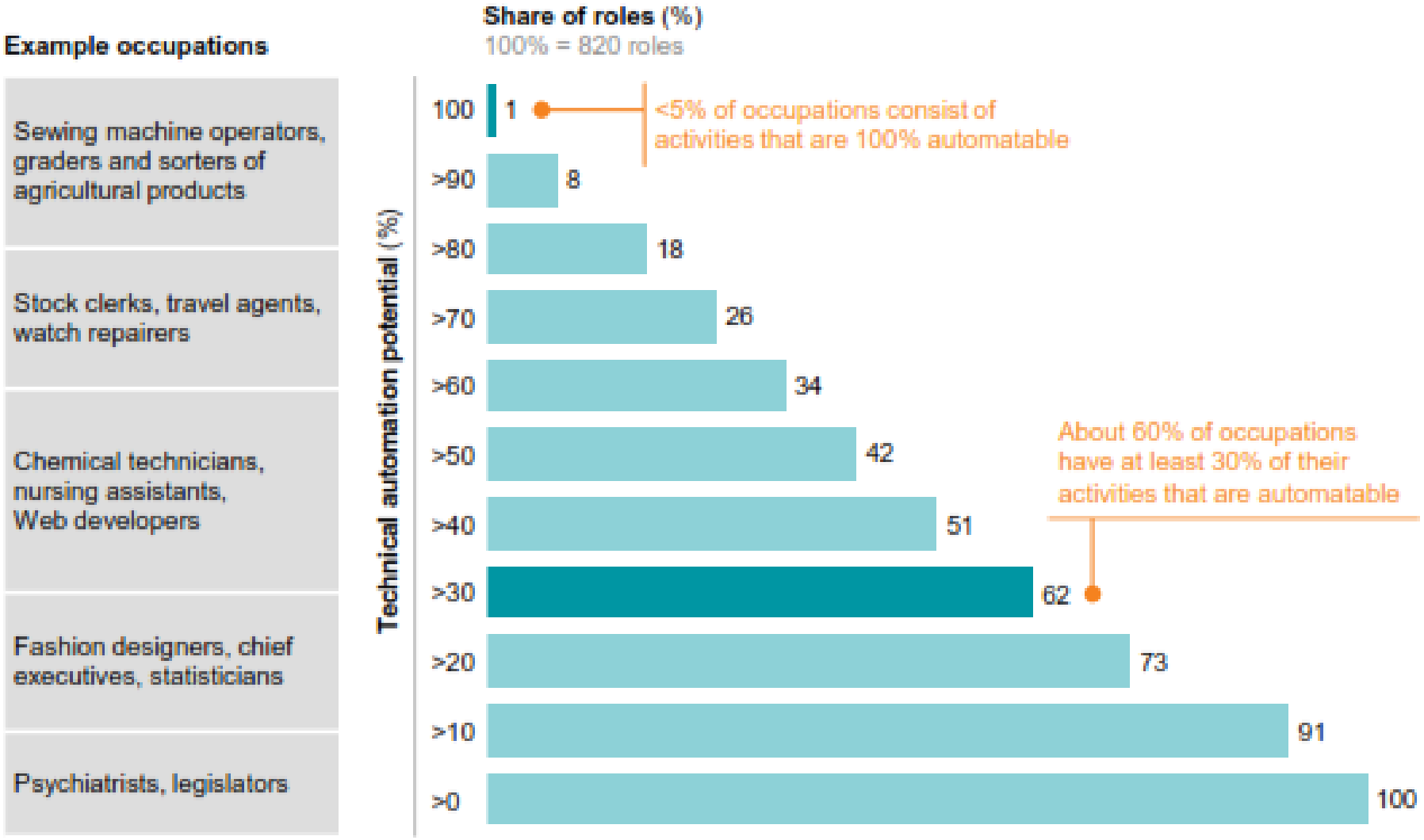
51% of total working hours

$2.7 trillion in wages

Source: US Bureau of Statistics, McKinsey Global Institute Analysis

While few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities

Automation potential based on demonstrated technology of occupation titles in the United States (cumulative)[1]



1 We define automation potential according to the work activities that can be automated by adapting currently demonstrated technology.

SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

10 jobs that will disappear or be automated in the next 20 years:

1. Drivers: taxi, bus, uber, trucks
2. Farmers and agricultural – high automated
3. Store Cashiers
4. Travel Agents
5. Manufacturing Workers such as apparel and low cost.
6. Dispatchers: Coordinators Police, ambulance, taxi, etc.
7. Restaurant Staff: Waiters, Bartenders, Fast Food staff
8. Bank Tellers, Call Center operators
9. Military Pilots and Soldiers
10. Accountants, Tax Preparers, lawyers

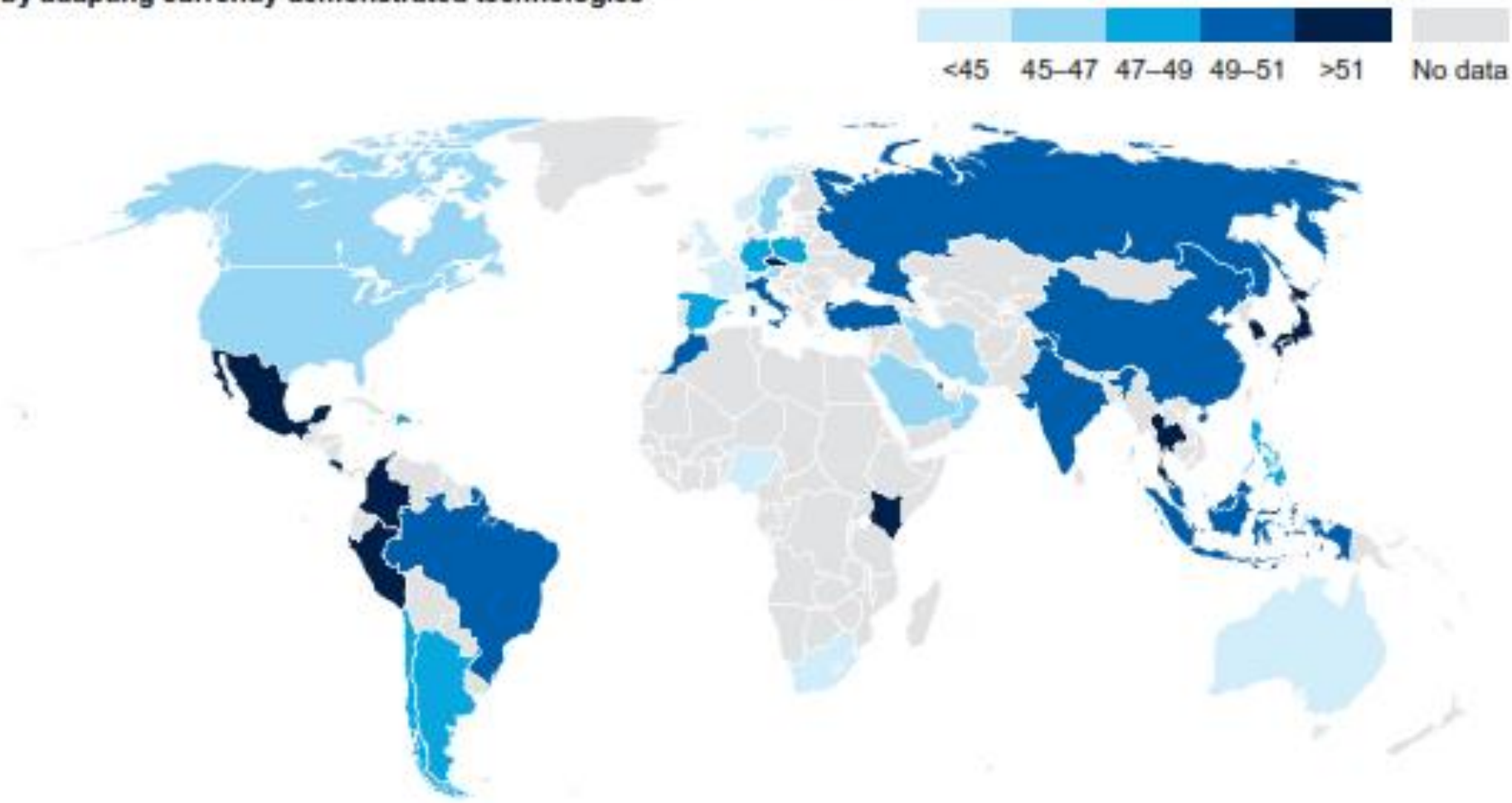
Training needs to focus on skills that will be in demand longer term

- Jobs that feature Non Routine work
  - Creative Arts
  - Product and Systems development
- Key Technologies (creation & support)
  - Complex maintenance
  - Hybrid work with AI
- Human Care and empathy jobs
  - Nursing
  - Teaching
  - Psychiatry

Where will automation happen?

The technical automation potential of the global economy is significant, although there is some variation among countries

Employee weighted overall % of activities that can be automated by adapting currently demonstrated technologies[1]



Source: Oxford Economic Forecasts

Second Wave of Globalization
Industry 4.0 Disruptions

- Shifting economies and wealth
- Shifting Production
- Shifting jobs
- Increasing Urbanization
- Jobs and Skills mismatch
- Workers being displaced
- Relentless pace of change

Harvard Business Review

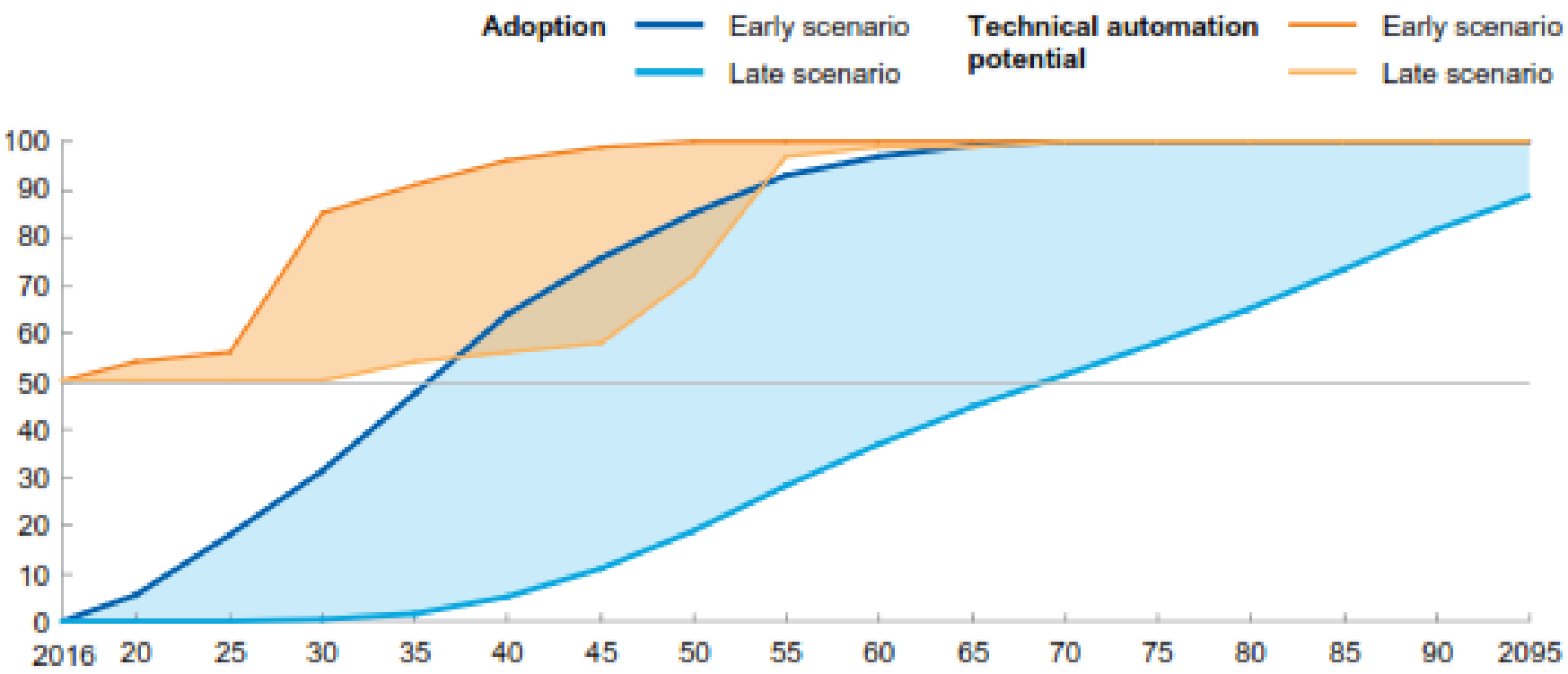
article commented on what AI can and can't do — right now.

It ultimately concluded that "the biggest harm that AI is likely to do to individuals in the short term is job displacement, as the amount of work we can automate with AI is vastly bigger than before".

So when will this happen? Answer - In our lifetime

Automation will be a global force, but adoption will take decades and there is significant uncertainty on timing

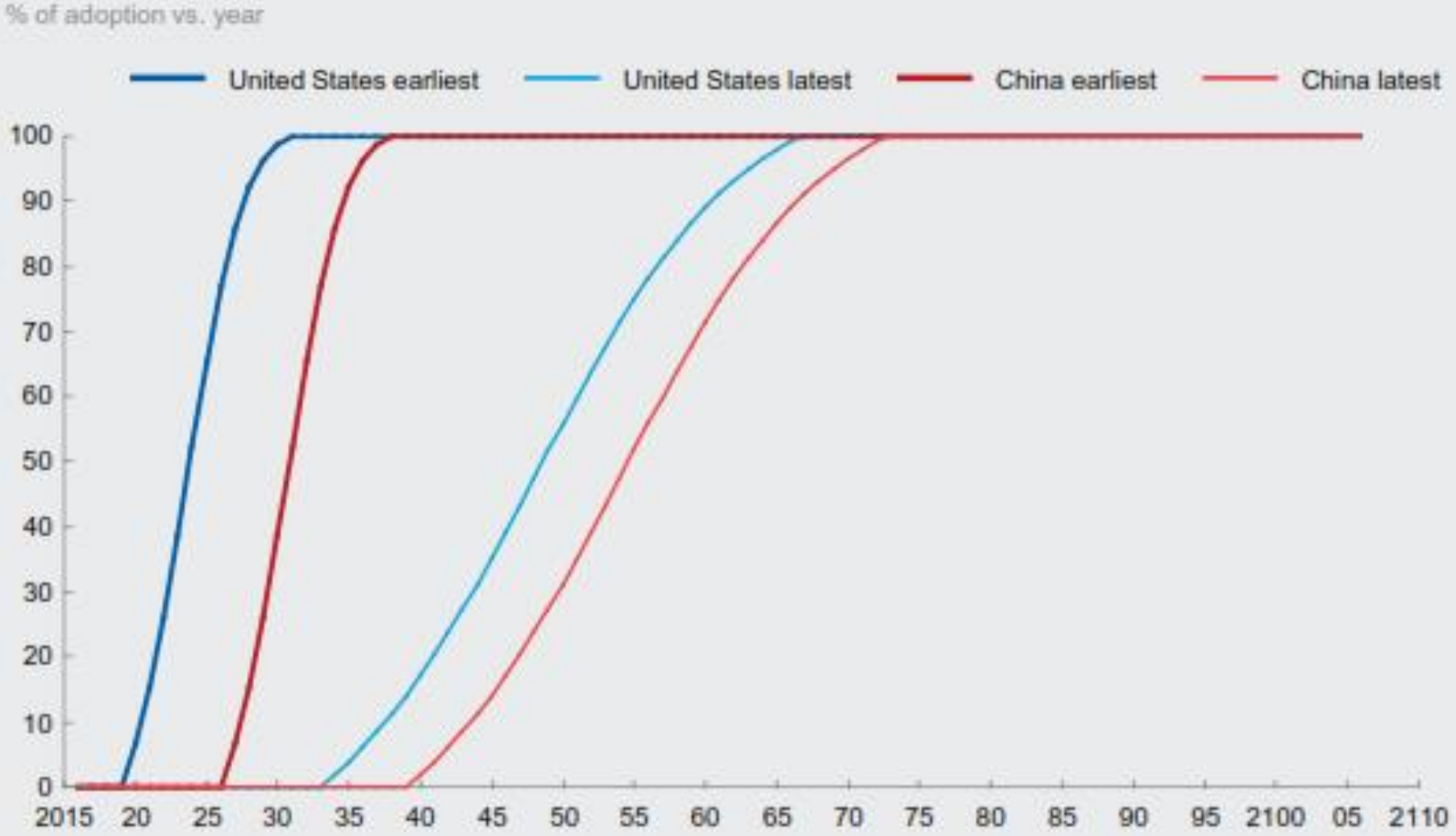
Time spent on current work activities[1]
%



1 Forty-six countries used in this calculation, representing about 80% of global labor force.

Self Driving Vehicles – When - not if

Modeled adoption of operating vehicles or material-moving equipment, United States and China[1]



1 The detailed work activity (DWA) is 4.A.3.a.4.I01.D06. Occupations using this activity include: Heavy and Tractor-Trailer Truck Drivers, Industrial Truck and Tractor Operators, etc.

Factory Location Considerations

Past

- Cost of Manual Labor
- Proximity to Raw Material (More expensive transportation costs)
- Availability of Cheap Land
- Cost of Fuel & Power
- Cost of Water
- Suitability of Land (Environmental & Political)
- Taxes
- Cost of Transport

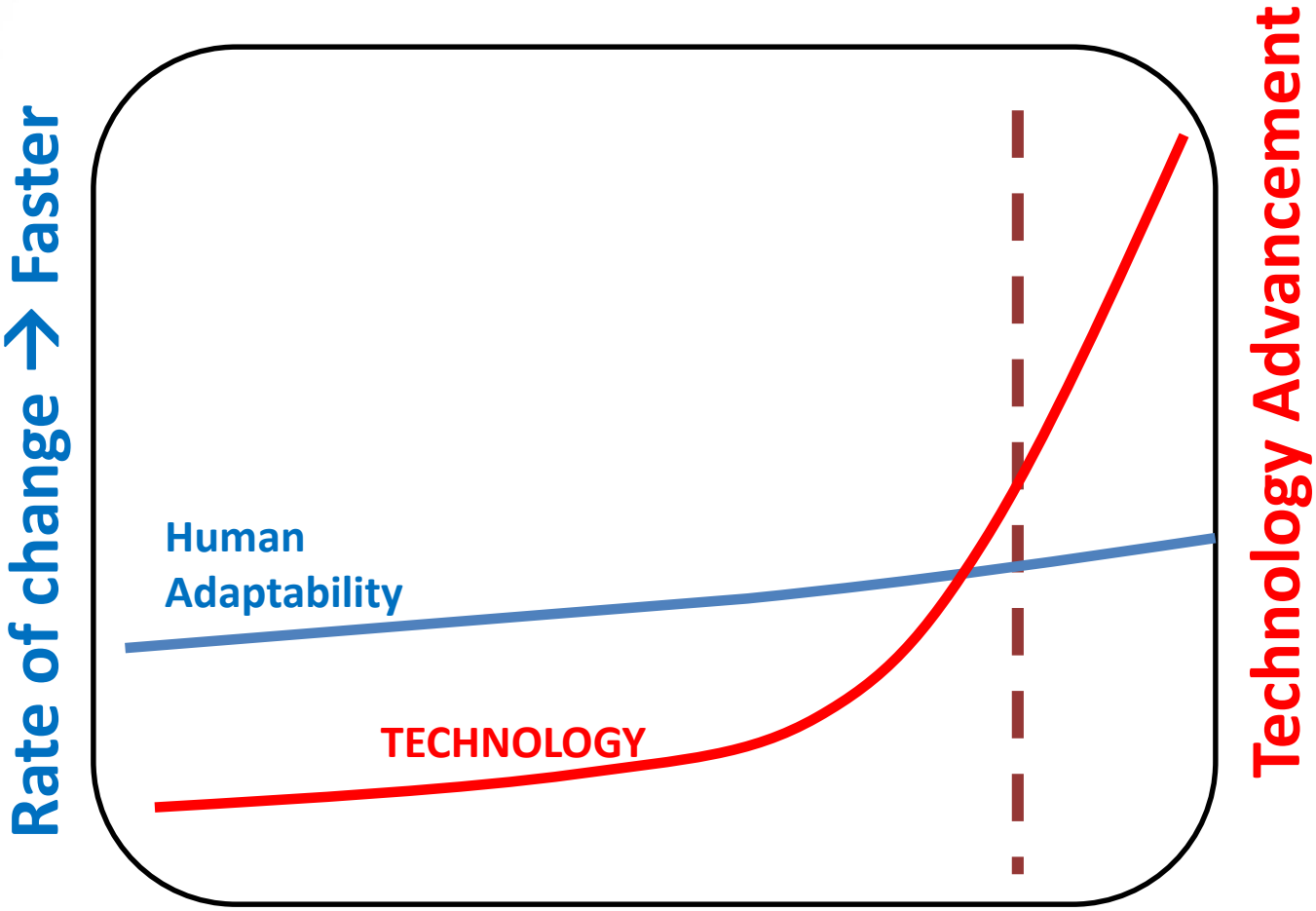
Present & Future

- Availability of Skilled Workforce (to operate machinery)
- Skilled Techs to maintain sophisticate production machinery
- Proximity to Market
- Proximity to Raw Material
- Availability of Technologically Advanced Infrastructure & Facilities
- Product delivery infrastructure
- Supporting Industries & Services

Human adaptability "X" Factors

Human Adaptability

-TECHNOLOGY ADVANCEMENT
-Applications
-Faster Performance
-More Powerful
-Widening Scope



Source: Author Thomas Freidman and Astro Teller, head of Google X

Social Issues - Social Costs: Rising

- Workers will be displaced
- Often to lower paying jobs
- Reskilling needs to be proactive
- Older persons will be challenging
- High School Grads are more vulnerable
- Will the Digital Divide Grow?
- There is a risk of nothing being done
- Governments are often slow to act
- Where do the costs come from?

How to Respond?
Who shall Respond?

- Where does responsibility lie?
- With industry or government?
- Can we build costs into the process of retooling?
- The process needs to be supportive so advancement can proceed yet be fair to all, especially the workers.
- Education systems may need to be fundamentally restructured.
- Use the tools of communication and collaboration from business to deliver ed

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Thank you very much !

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