

UNIVERSITY A+



PENTECOST UNIVERSITY
TRANSFORMATION AND SERVICE

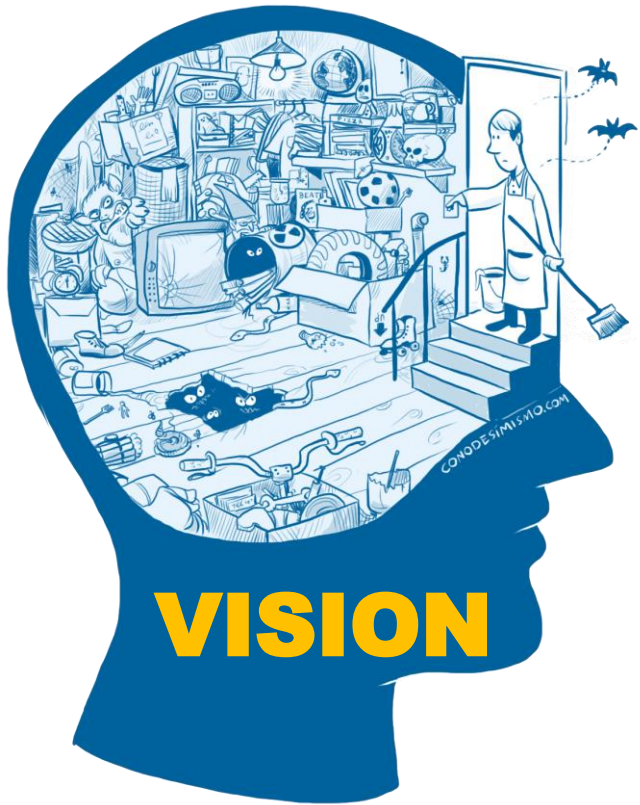


**INTERNATIONAL
DIGITAL CENTRE**



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- 01 To deliver cutting edge research and identify applications in the multidisciplinary field of manufacturing systems.
- 02 To become a distinguished RDI Centre that uses a systematic methodology to develop models for technological developments and innovations in the manufacturing industry.

AIM

GOALS

To provide support on the development of capabilities, processes and technologies needed to establish a modern manufacturing industry in Ghana and the region of sub-Saharan Africa.

- To develop collaboration and partnership with leading national and international research organizations and act as the interface for local communities and industry.
- To identify, develop, and implement processes and technologies to support the growth of the local industry and communities.
- To create material to support the education of the next generation of engineers, designers across all 16 regions of Ghana.
- To Create and support collaborative and knowledge sharing system to enable local communities and industries to learn, collaborate and grow.

SCOPE

- Provide and promote virtual engineering technologies and help to identify applications suitable for local situations and needs.
- Provide methods and processes needed to reduce cost, lead-time, and meet high-quality standards expected by international customers.
- Identify and develop methods, processes and products needed to address Ghana's grand challenges (energy generation and distribution, food production and processing, health-care, sustainable infrastructure & transport, education and environment protection).

The centre is been organized into the following units:

Virtual Design
and Simulation

Rapid
Prototyping
and Tooling

Computer
Aided
Manufacturing

Digital
Manufacturing

Software
Development
& Media

Achievements so far

- Identification of scope and role of IDC in the development of the emerging manufacturing industry.
- Establishment of relationships with Ghanaian government and integration of the centre to the government action plan.
- Allocation of space (IDC building within the Pentecost University campus).
- Appointment of the initial team (3 members with broad local and international experience and knowledge).
- Establishment of initial contacts with partners in Ghanaian research institutions and European partners (e.g. Delft University, University of Western Scotland, Palermo Technical University and Derby University).
- Support of STEM social event.
- Acquisition of initial IT and rapid prototyping equipment
 - 15 engineering laptops,
 - 1x Prusa MK3s+ with the multi-material unit,
 - 1x Prusa Mini with a solar panel and battery to support demonstration and education in local schools and communities,
 - 1x delta 3D printer for very fast prototyping (ca. ½ comparing to Prusa MK3s+),
 - 1x MSLA printer for high accuracy applications,
 - 1x laser engraver for development and demonstration of locally made souvenirs and educational products,
 - 4x Arduino kits for education and development of IoT/control systems.

TEAM

- Isaac Kuma Yeboah (acting director of IDC)
- Matthew Asiedu (Executive Secretary)
- Richard Brace (Research Fellow)
- In February 2022 the team will establish a projects' plan for 2022 and hire Pentecost University students to support the development and delivery of the projects.
- The team and the partners will help to train the students and provide support to enable them to learn required skills and gain competencies to deliver on projects of their choice.

Key deliveries for 2022

- Official opening of the International Digital Centre in February 2022,
- Securing funding for the centre operations and activities,
- Identification of students' projects from areas of:
 - software development (web design, electronic control systems for mobile phones and PC),
 - use of renewable energy in domestic use (cooking, electricity generation, water purification),
 - Design and make 3D printable medical equipment for local hospitals and practitioners,
 - Development of STEM education examples using 3D printing, laser engraver technologies,
 - design and make of products supporting local micro-manufacturers (e.g. woodcraft and carpentry, timber manufacturing, sewing and quilting),
 - Design and make small scale models of industrial robots (demonstrators and learning kits)

Key deliveries for 2022

- Develop training material for the students (Introduction to programming with C# .NET programming, fundamentals of CAD/CAM/CAE, introduction to electronics with Arduino)
- Acquiring engineering software needed for delivery of the student projects.
- Establishment of the online collaborative platform to enable efficient support and collaboration with all partners.

Collaboration and International Partners.

- Memorandum of Understanding with Bountiful Technology.
- Partner with Kumasi Business Incubator at KNUST.
- TU Delft (Netherlands) students to develop a business model using 3D Printers in IDC.



TU Delft visitors on STEM social Ghana

<https://en.unesco.org/news/unesco-approves-establishment-international-centre-excellence-engineering-innovation>

International Digital Centre units and streams

Virtual Design and Simulation

Rapid Prototyping and Tooling Unit

Unit

Computer-Aided Manufacturing (CAM and CNC)

Digital Manufacturing and Smart Factory Unit

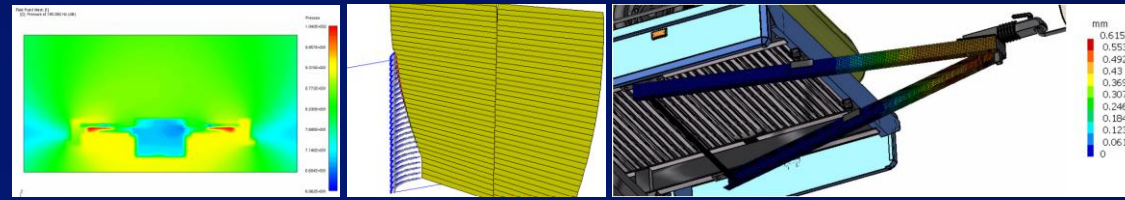
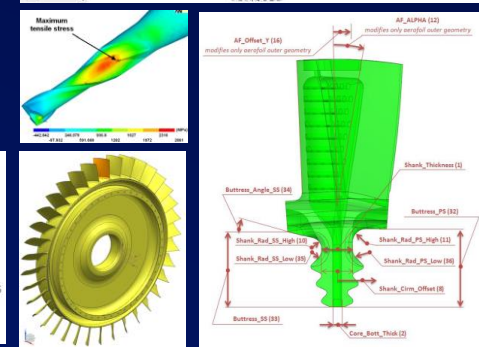
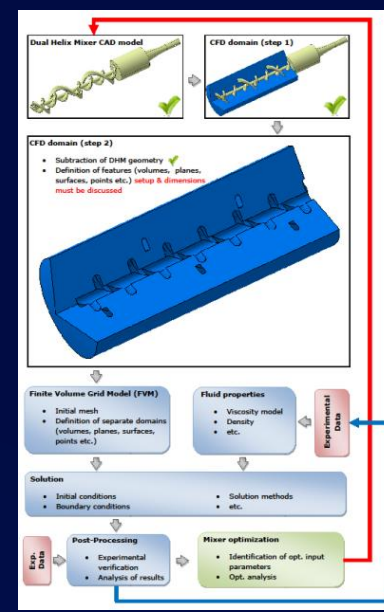
Software development Unit

Digital Media Unit

Augment Reality Lab

The aim of this unit is to develop processes and methods to support rapid product development in Ghana and the region of Western Africa.

The knowledge acquitted by the team and students will be applied on the development of IDC own solutions to support local communities.



Virtual Design and
Simulation Unit

Rapid Prototyping and Tooling Centre

Computer-Aided
Manufacturing (CAM and
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- Rapid Prototyping (RP) Centre will help to develop solutions to introduce new products to the local market and for export with reduced cost and lead time.
- RP methods and processes can also be used for the creation of tools for scaled-up production (using casting, moulding, or foam-formation processes) in various industries such as bio-medical, electronic packaging or food processing.
- The IDC has a currently available range of 3D printers supporting multi-material printing, FDM and SLA processes.

Ghanian government has implemented an action plan to attract and support international investors to employ local people. This plan includes tax, and import charges concessions. The government also provide support to build an infrastructure and has free-trade deals with USA and EU (part of EU and USA Development Support for Africa)



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Computer-Aided Manufacturing (CAM) is used to define the actual manufacturing process for Computerized Numerical Control machines (CNC).

CAM usually uses CAD (computer-aided design) models and algorithms to define tool paths to improve precision, speed and repeatability of manufacturing processes. It can be used in a variety of processes such as milling, turning, 3D printing etc.

The centre will support the development of training and capability for local industry and small manufacturers, as well as, provide support to product and process development to accelerate the introduction of modern manufacturing practices to local communities.

Initially, these activities will concentrate on small scale/desktop applications for wood, plastic and soft metal. However, the knowledge is transferable to high-end manufacturing.

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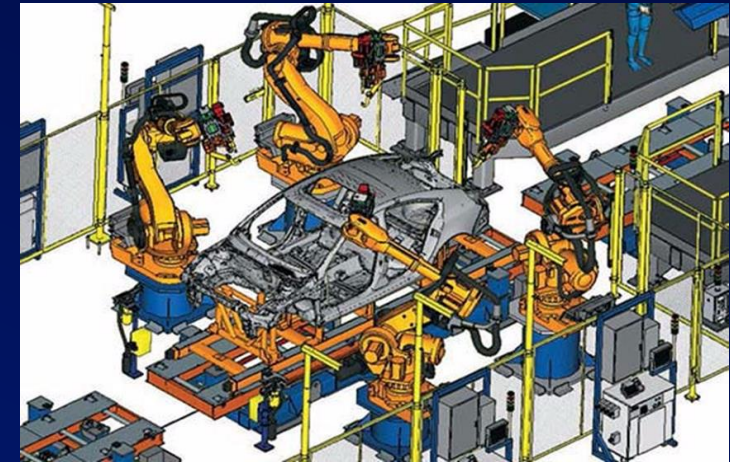
Digital Media Unit

Augment Reality Lab

Digital manufacturing is the application of computer systems to manufacturing services, supply chains, products and processes.

Digital manufacturing technologies link systems and processes across all areas of production to create an integrated approach to manufacturing from design to production and on to the final productions.

IDC will largely benefit from the experience and knowledge of [Mr. Isaac Kuma Yeboah](#) (Acting Director of IDC) in the field of automation and robotics, as well as, from extensive experience of [Prof. Rev. Kwabena Agyapong-Kodua](#) from field of smart factories.



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This unit will develop software for the following applications.

1. Software for mobile and website development
2. 3D graphics software
3. Open source development
4. Various programming languages, databases and operating systems
5. System engineering

Virtual Design and
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Augment Reality Lab

The aim of this unit will provide facilities for the creation of audio/visual content of trainings, tutorials and guides developed from all the other areas covered by the IDC.

This material will be used for trainings organised on IDC (Pentecost University) premises, in terrain (local communities, schools, customer sites) and on-line on various online platforms, including IDC own platform which will be developed and managed by the team.

For this purpose, IDC will establish an audio-visual centre with high-quality microphones, cameras and audio recorders.

Augmented Reality Lab

The VR will develop robust methodologies and tools that integrates knowledge from various sectors with suitable and realistic virtual processes and models.

The objectives:

- (a) To enables solution-oriented people and organizations from various sectors to interact, learn, test, and evaluate digital content using 3D technology,
- (b) To foster experiential and autonomous learning in a virtual setting, and supports collaborative learning through simulation and live interaction.
- (c) To allow learners also have an advanced interactive experience based on various educational context.

