# Carnegie Mellon University
## Rwanda

**CMU, Rwanda**

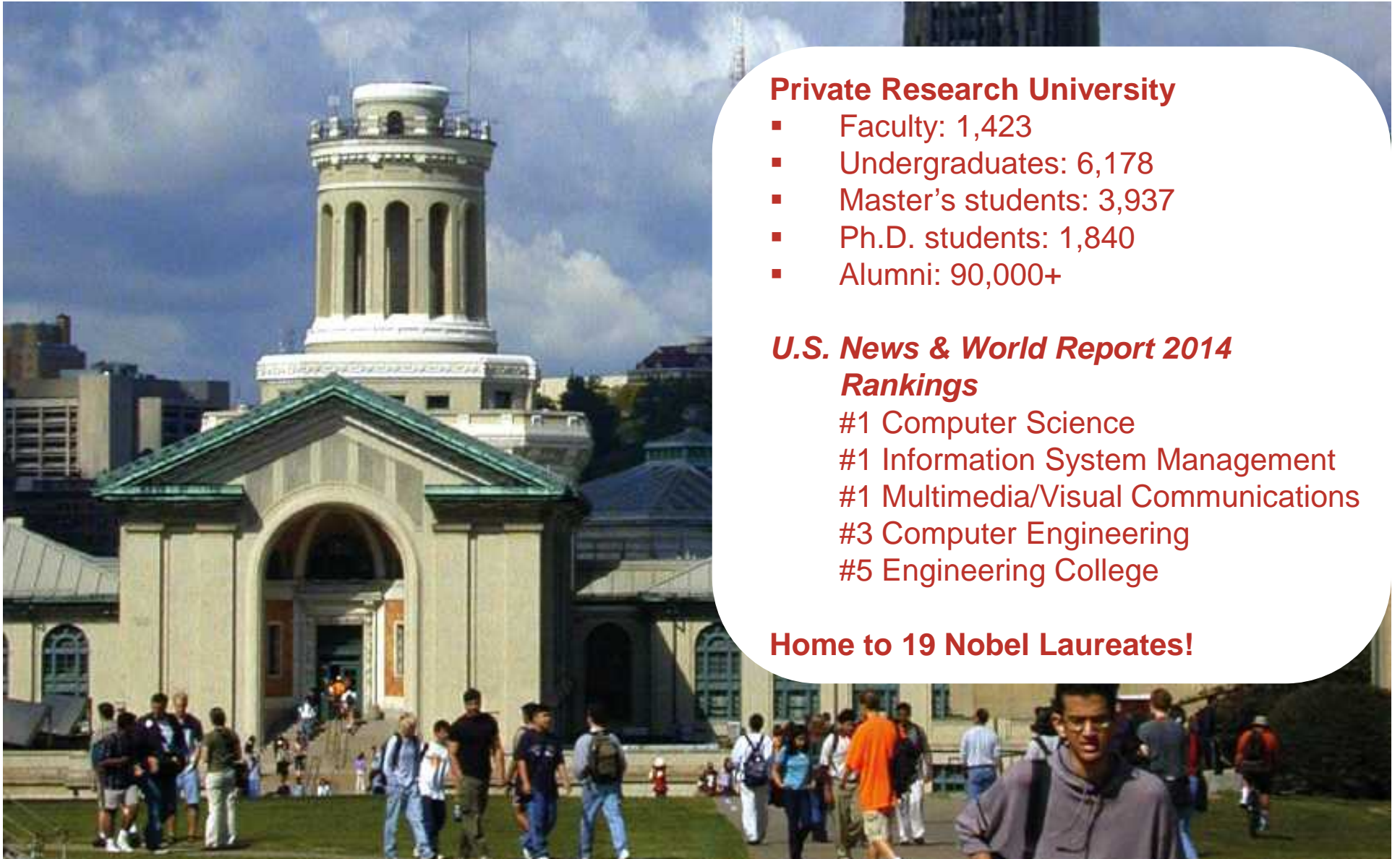**EACO Conference**

**Academia - Industry Group**

**Professor Zain Khan, CMC**

**June 20, 2016**

www.cmu.edu/rwanda

# Carnegie Mellon University

## Pittsburgh, Pennsylvania, USA



**Private Research University**
- Faculty: 1,423
- Undergraduates: 6,178
- Master's students: 3,937
- Ph.D. students: 1,840
- Alumni: 90,000+

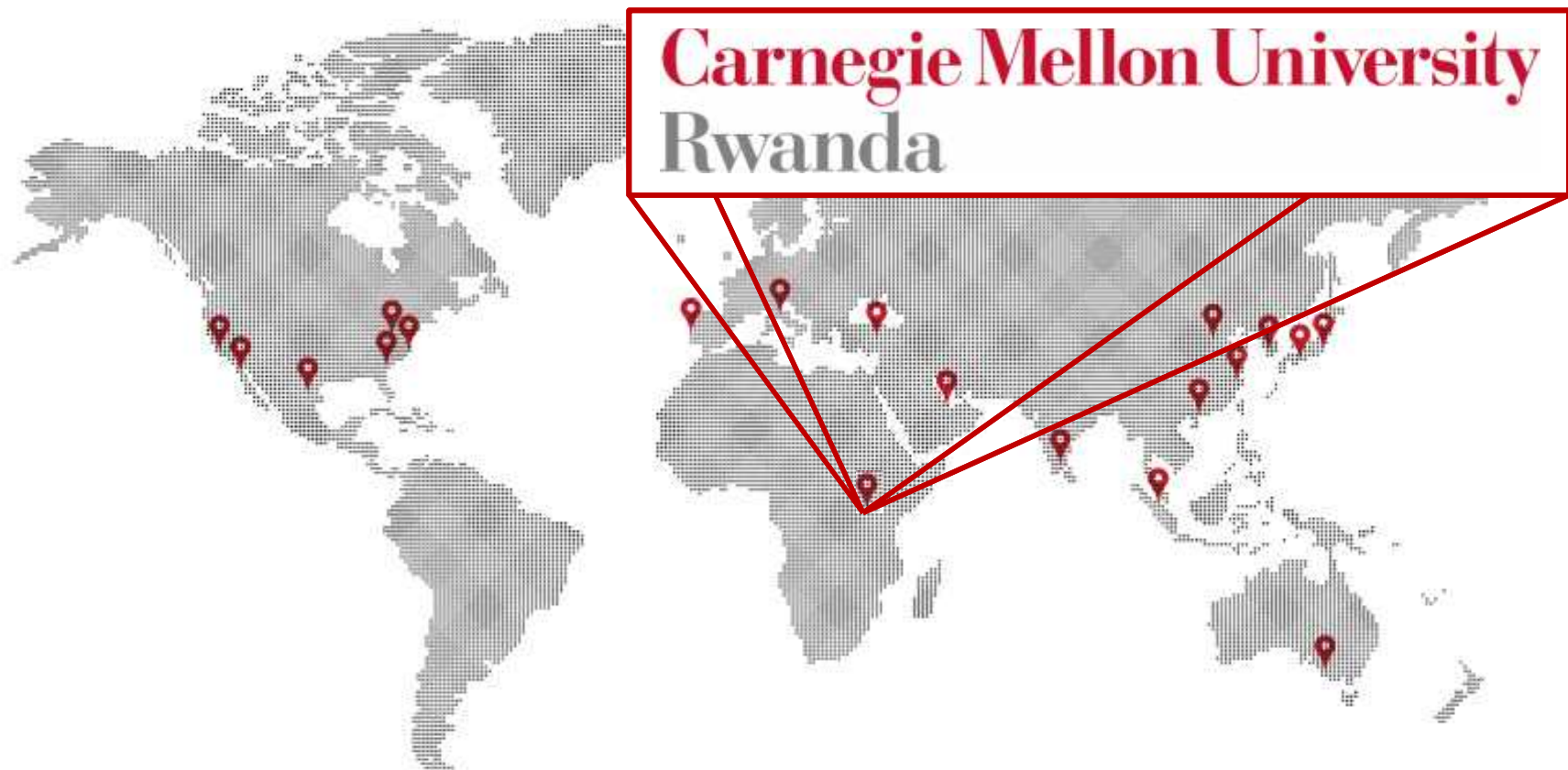***U.S. News & World Report 2014 Rankings***
#1 Computer Science
#1 Information System Management
#1 Multimedia/Visual Communications
#3 Computer Engineering
#5 Engineering College

**Home to 19 Nobel Laureates!**

# Carnegie Mellon's Global Presence

# Carnegie Mellon's Global Presence

# Carnegie Mellon University in Rwanda
## A Pioneer Program

CMU is the 1st top-ranked US research institution with a global strategy offering degrees in Africa with an in-country presence

Adheres to the same quality standards used for education at all of CMU's campuses

Courses taught by CMU faculty

Programs that are integrally linked with the region's economic and technological development

Graduates receive the same degree as U.S.-based graduates upon successful completion of the program

# CMU-R Campus



## *Current location*
**Telecom House**
- CMU-R floors 4-5
- Rwanda National Data Center (hosting our servers)
- Control center for the national fiber optic network
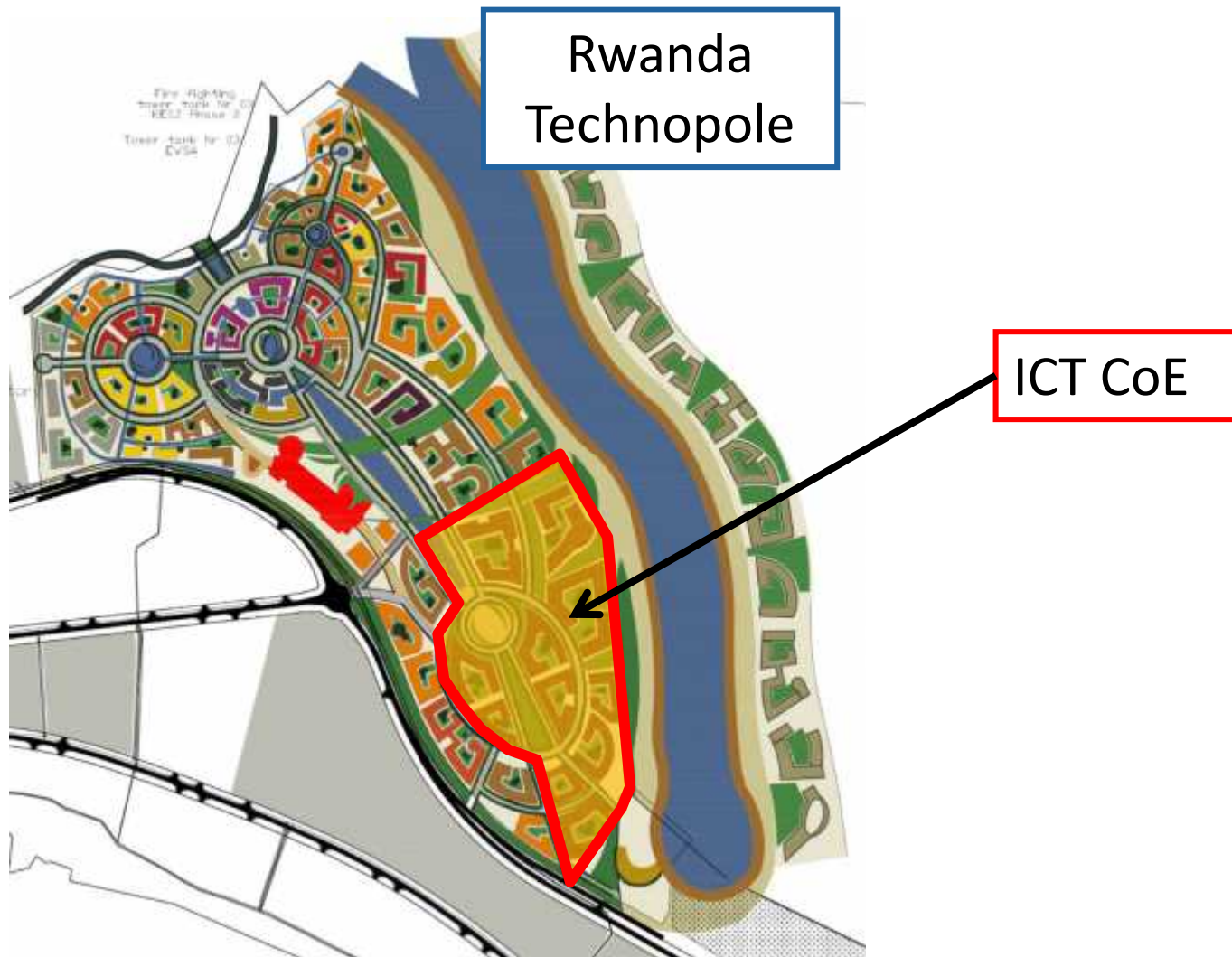- Several ICT companies (BSC, KT,…)
- kLab innovation hub

## *Future location*
**Kigali Technology Park**
- 15 hectares reserved for CMU-R
- African Development Bank funding for campus design and construction
- Target completion date: July 2016

# ICT CoE located in the Kigali Technical Park



Rwanda Technopole

ICT CoE

# Regional ICT Center of Excellence
## Under construction
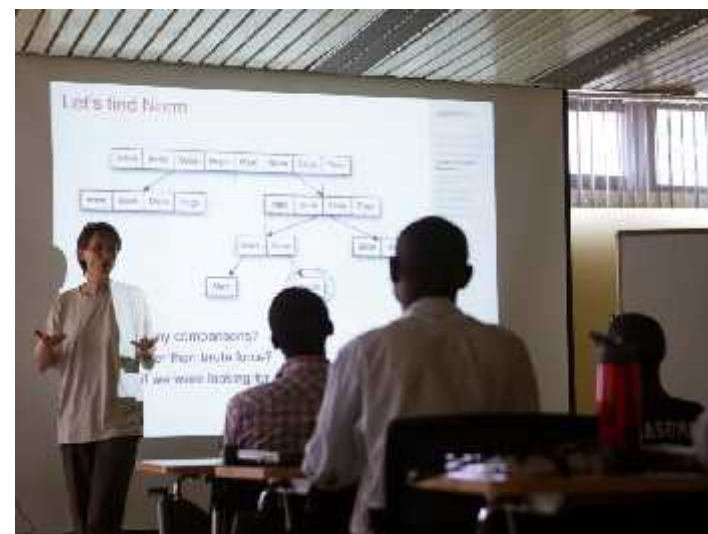
# Campus under Construction

# CMU-R Master's Programs

## M.S. in Information Technology (MS IT)

- Began August 2012
- From Dept. of ICT
- Required units: 144
- Required QPA: 3.0/B

## M.S. in Electrical and Computer Engineering (MS ECE)

- Begin August 2014
- From Dept. of ECE
- Required units: 96
- Required QPA: 3.0/B

# Tuition

The newly announced fees starting with the 2015-2016 academic year, is $16,000 per year (versus $41,000)

Thanks to GoR, for EAC students, there is a further reduction of 50% bringing the fees to $8,000 per year – a very affordable amount based in the African context - for all students from Kenya, Uganda, Tanzania, Burundi, Rwanda

# Courses available on campus (1/2)

| Number | Course Title | Units |
|---|---|---|
| 04-601 | MSIT First Year Seminar | 3 |
| 04-602 | MSIT First Year Seminar | 3 |
| 04-605 | MSIT Second Year Seminar | 6 |
| 04-611 | Strategic Use of Digital Information in Enterprises | 12 |
| 04-612 | Innovation Mgmt and Business Strategy | 12 |
| 04-630 | Computer Science Principles for Practicing Engineers | 12 |
| 04-635 | Introduction to Info Security | 12 |
| 04-641 | Fundamentals of Telecommunications and Computer Networks | 12 |
| 04-644 | Wireless Networks | 12 |
| 04-800/A | Mobile Social Apps | 12 |
| 04-800/B | E-Enabling Service Delivery in a Multi-Sector Environment | 12 |
| 04-800/C | Geosensors Networks | 12 |
| 04-800/D | Embedded System Development | 12 |
| 04-801/A1 | Research Methods | 6 |
| 04-801/A2 | mHealth Technologies | 6 |

# Courses available on campus (2/2)

| 04-801/A3 | ICT Policies for Social-Economic Development | 6 |
|---|---|---|
| 04-801/B3 | Business Economics | 6 |
| 04-801/A4 | Entrepreneurship in Emerging Markets | 6 |
| 04-801/A5 | Smart Grid Technologies | 6 |
| 04-801/B1 | Networking Laboratory | 6 |
| 04-900 | MSIT Practicum | 24 |
| 04-980 | MSIT Research Project | 3-15 |
| 18-372/RW | Fundamentals in Electric Energy Systems | 12 |
| 18-652 | Foundation of Systems Engineering (Tech Enhanced) | 12 |
| 18-756/R | Packet Switching and Computer Networks | 12 |
| 18-859/RW | Telecommunications Policy in Developing Countries | 6 |
| 18-882/R | Microgrids and New Generation Power | 12 |
| 18-899/R1 | Applied Time Series Analysis | 6 |
| 18-899/R2 | Data Science and Risk Management Applications | 6 |
| 18-899/R3 | Data and Inference | 6 |
| 18-899/R4 | Applied Machine Learning | 6 |

# Courses available online (1/2)

| 05-499/B | Mobile Service Innovation | 12 |
|---|---|---|
| 05-839 | The Information Pipeline: Collecting & Computing with Data for IS | 12 |
| 15-602/A3 | Innovating for underserved communities | 6 |
| 15-619 | Cloud computing | 12 |
| 17-653 | Managing Software Development | 12 |
| 17-655 | Architectures for Software Systems | 12 |
| 18-637 | Wireless Network Security | |
| 18-640 | Foundations of Computer Architecture | |
| 18-641 | Java Smart Phone Development | |
| 18-645 | How to Write Fast Code | 12 |
| 18-732 | Secure Software Systems | |
| 18-765 | Digital System Testing and Testable Design | |
| 18-842 | Distributed Systems | 12 |
| 18-879 | Special Topics in Systems and Controls: Stochastic Optimization | 12 |
| 67-362/A3 | Big Data Analytics | 6 |
| 91-801 | Data Analysis for Managers | 12 |
| 94 -813/B3 | Project management | 6 |
| 94-806 | Privacy in Digital Age | 6 |
| 94-842/A4 | Programming R for Analytics | 6 |
| 95-703 | Database Management | 12 |
| 95-705 | Telecommunications Management | 12 |
| 95-706 | Object Oriented Analysis & Design | 6 |
| 95-710 | Economic Analysis | 6 |

# Courses available online (2/2)

| | | |
|---|---|---|
| 95-715 | Financial Accounting | 6 |
| 95-716 | Principles of Finance | 6 |
| 95-722 | Digital Transformation | 6 |
| 95-730 | E-Business Technology and Management | 12 |
| 95-752 | Intro to Info Security Management | 12 |
| 95-753/A1 | Internet Security | 6 |
| 95-756 | Information Security Risk Analysis | 6 |
| 95-757 | Information Security Risk Policy & Management | 6 |
| 95-761/A4 | Cyber Security For Critical Infrastuctures | 6 |
| 95-763 | Intro to Human Computer Interaction | 6 |
| 95-769 | Network Security Analysis | 12 |
| 95-794 | Tech Startup (NEW-fall 2012) | 6 |
| 95-796 | Statistics for IT Managers | 6 |
| 95-796/Z4 | Statistics for IT Managers | 6 |
| 95-797 | Data Warehousing | 6 |
| 95-807 | Object Oriented Programming for Mgrs | 12 |
| 95-808 | IT Project Management | 6 |
| 95-808/A4 | IT Project Management | 6 |
| 95-831 | Enterprise Architecture (NEW-fall 2013) | 6 |
| 95-831/Z3 | Enterprise Architecture | 6 |
| 95-833 | Global IT Management and Sourcing | 12 |
| 95-865/A4 | Text Analytics | 6 |
| 95-872/A38 | Art & Sci Busines Analytics | 6 |

# CMU-R Internships



**MOU with companies defines the expected internship experience and financial support for the student.**
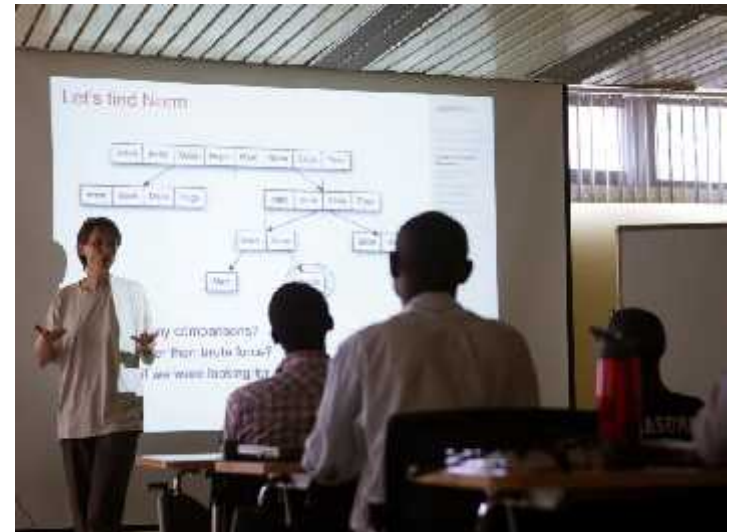
# Master's Programs

**M.S. Information Technology**

- Began August 2012
- From ICT CoE

**M.S. ECE**

- To begin August 2014
- From Dept. of ECE

# Our Students

## Class of 2016

|  | MSIT | | MS ECE |
| --- | --- | --- | --- |
|  | Male | Female | Male |
| Rwanda | 15 | - | 3 |
| Kenya | 2 | 1 | - |
| Uganda | 3 | - | - |
| Total | 20 | 1 | 3 |

## Class of 2017

|  | MSIT | | MS ECE | |
| --- | --- | --- | --- | --- |
|  | Male | Female | Male | Female |
| Rwanda | 14 | 8 | 3 | - |
| Kenya | - | 1 | - | - |
| Uganda | 3 | - | 2 | - |
| Tanzania | 1 | | - | - |
| USA | | | | 1 |
| Total | 18 | 9 | 5 | 1 |

# Our Students all four cohorts

## Gender



Women, 23

Men, 79

## Nationality



Kenya, 5

Tanzania, 1

USA, 1

Uganda, 10
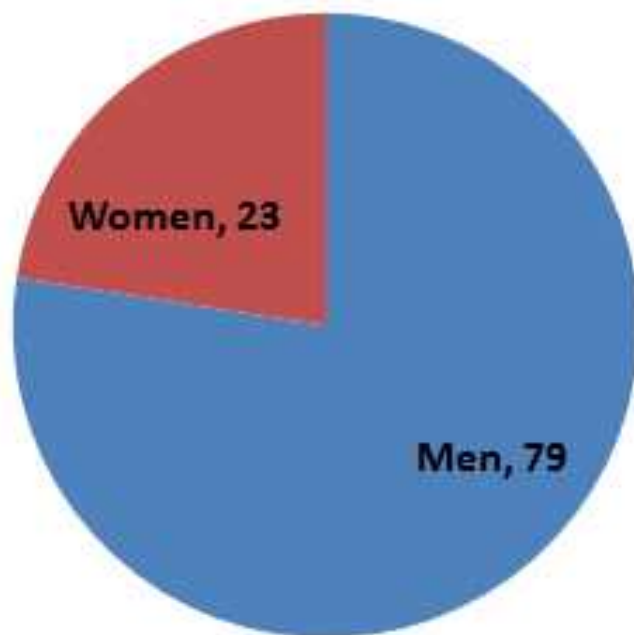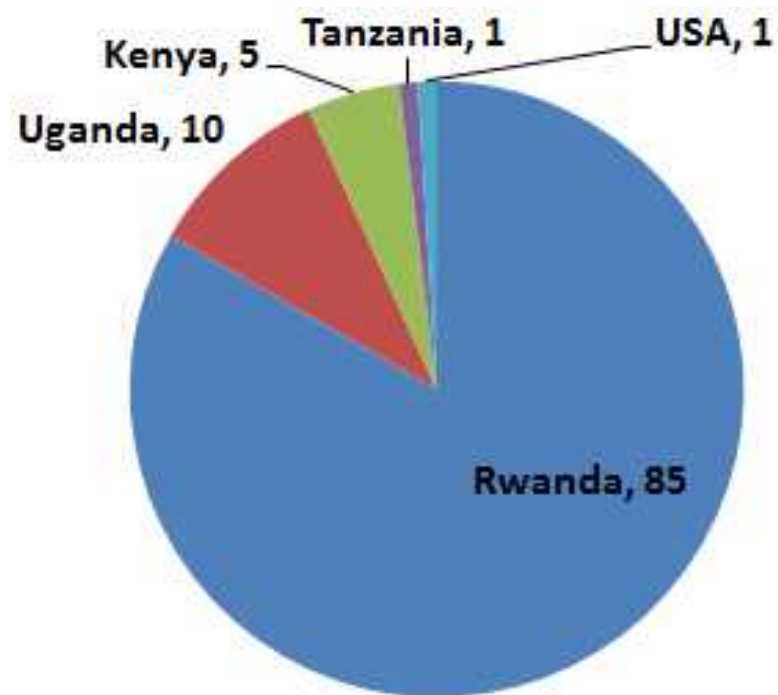
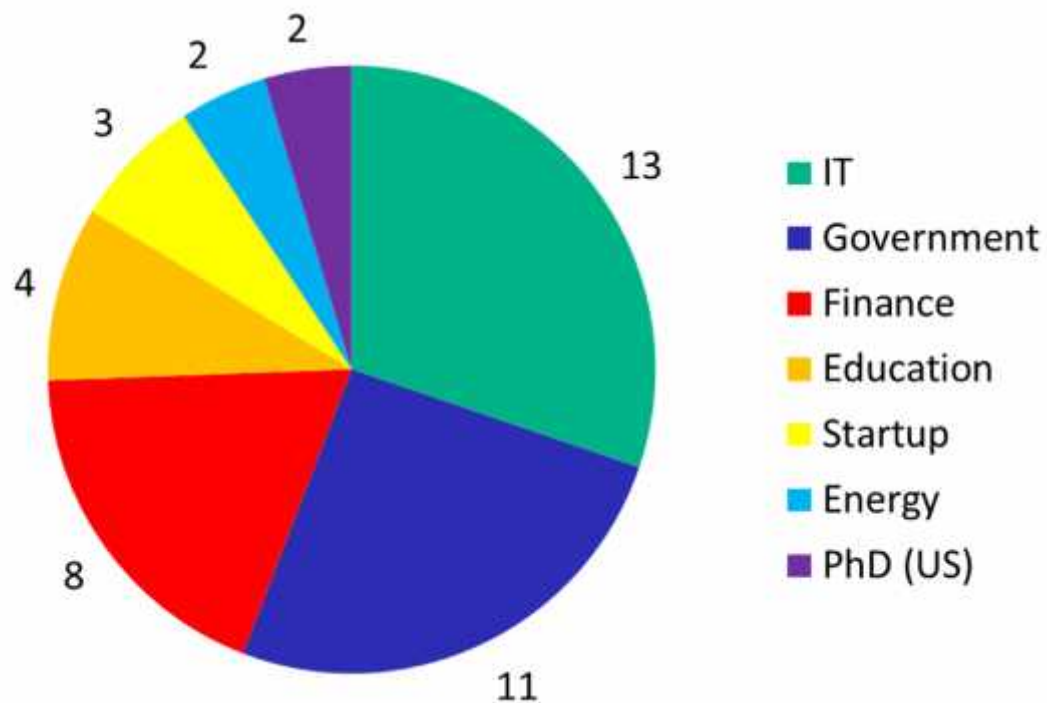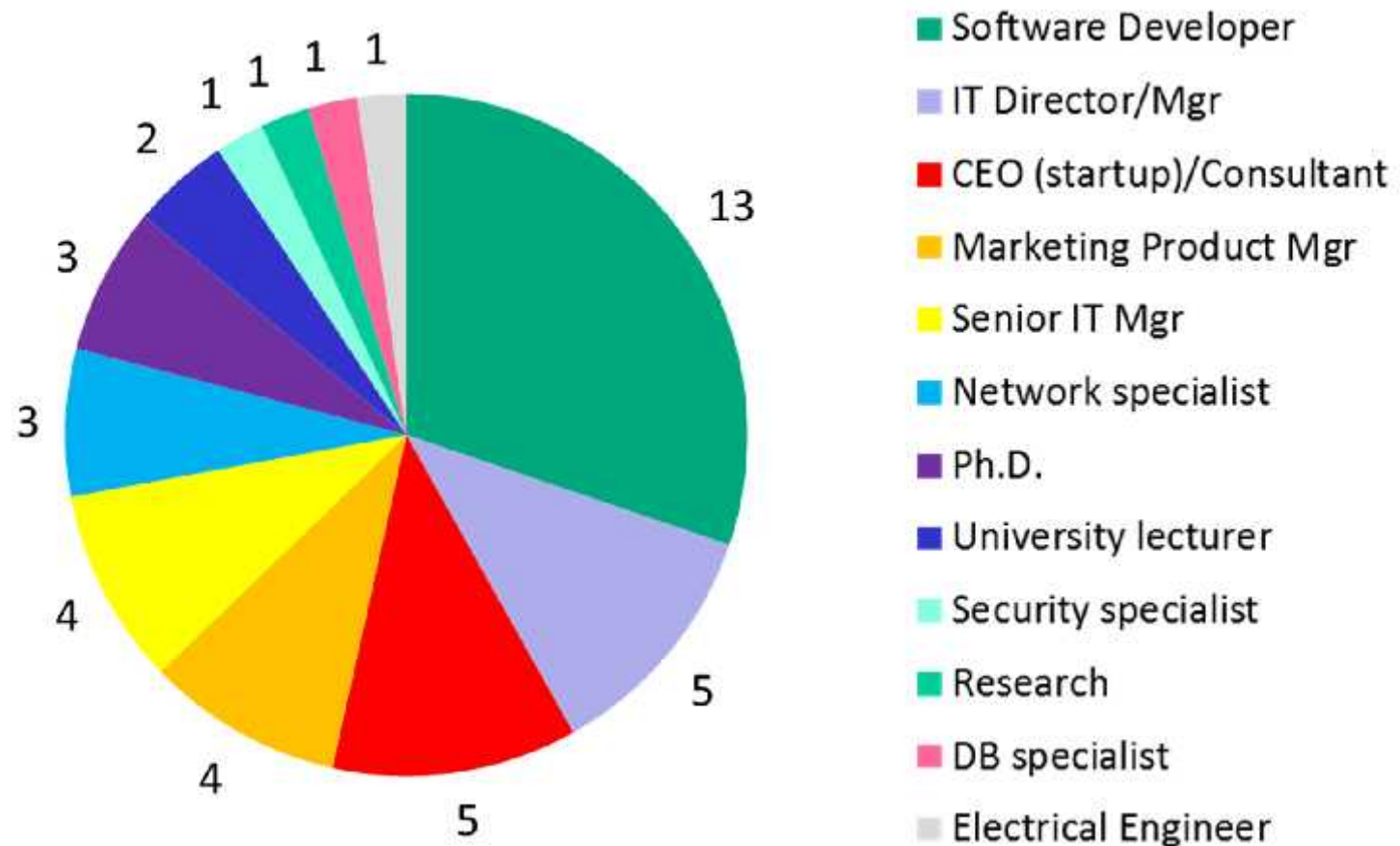Rwanda, 85

# What Our Graduates are Doing

## Employment Sectors

# What Our Graduates are Doing

## Job Titles

# Research at CMU-Rwanda

networking, security, wireless, mobility, energy, data analytics, telecommunication policy, healthcare, business

**Healthcare**

**Smart Grid**

CMU-R has received $100,000+
in research grants to-date

**Mobile Networks**

**Mobile Solutions for SMEs**

# Looking Forward

**Regional ICT Center of Excellence and broader initiatives in the Kigali Innovation City**

**Establishing the Kigali Collaborative Research Center**

**Industry Partnership Program**

**Global Advocacy Council**

**Mid-Term Review**

# The CMU-Rwanda Vision

**Educate a new generation of ICT innovators, entrepreneurs and industry leaders**

**Contribute to the development of the ICT industry in East Africa**

**Collaborate with stakeholders in Africa for research and development of solutions to Africa's challenges**
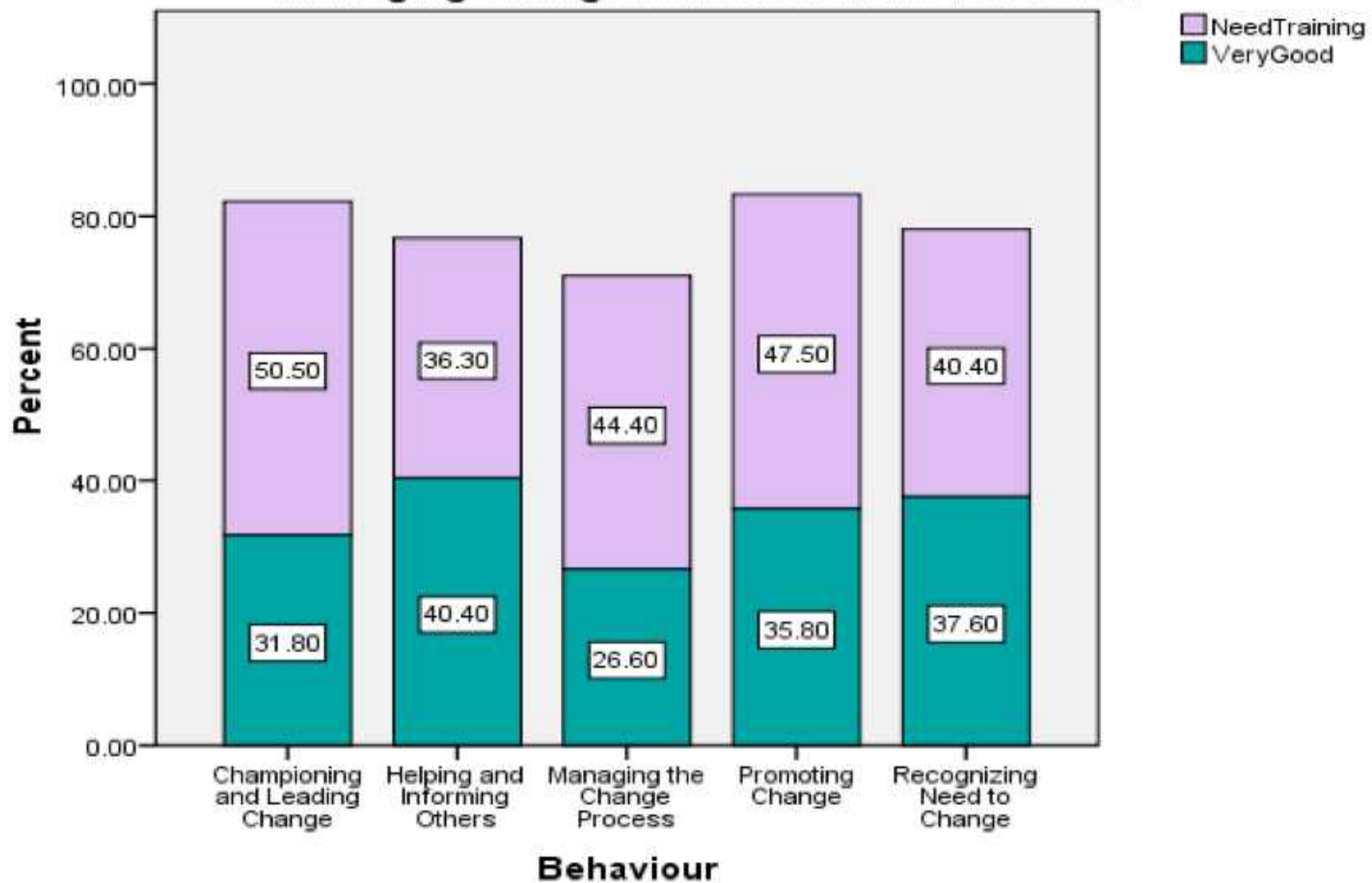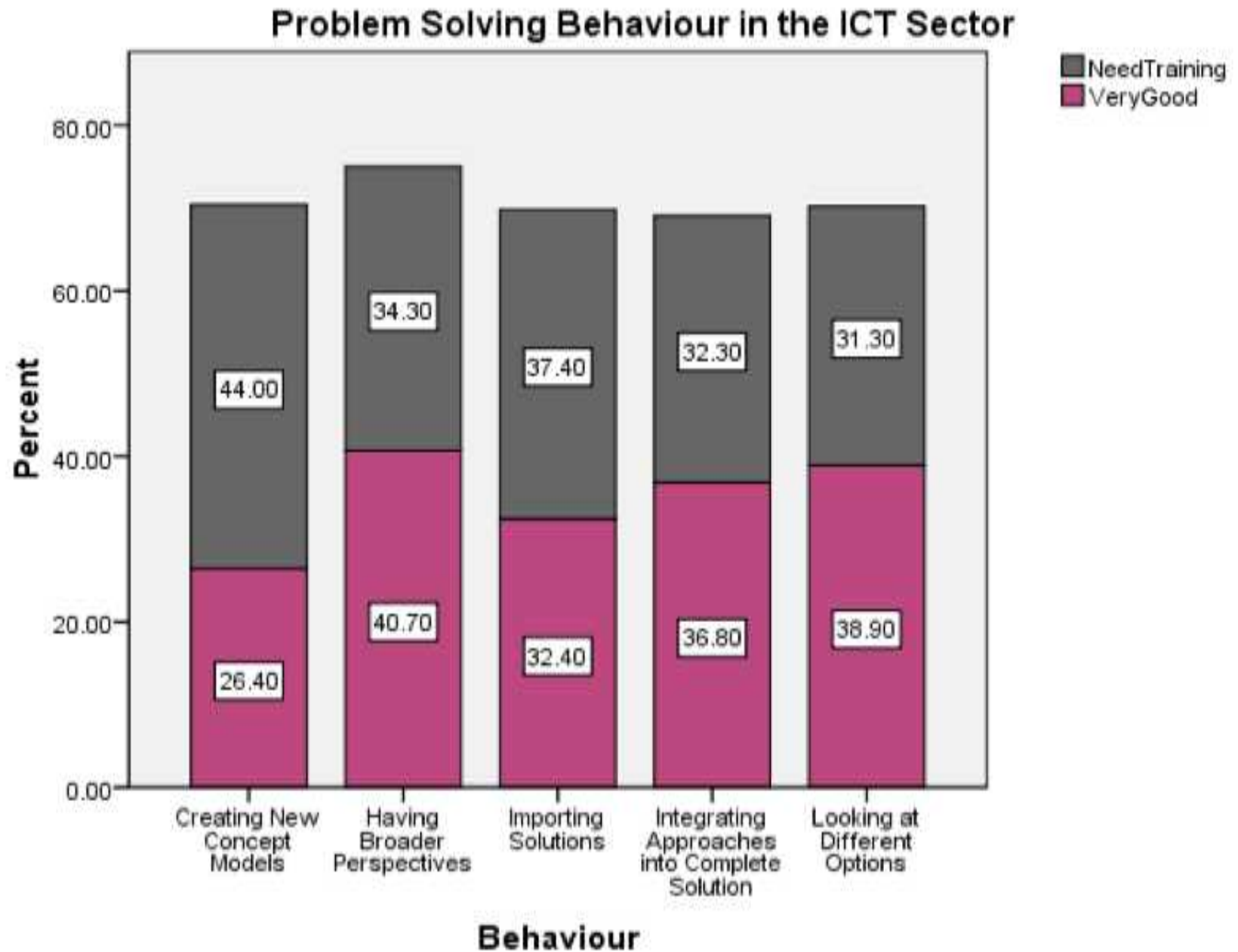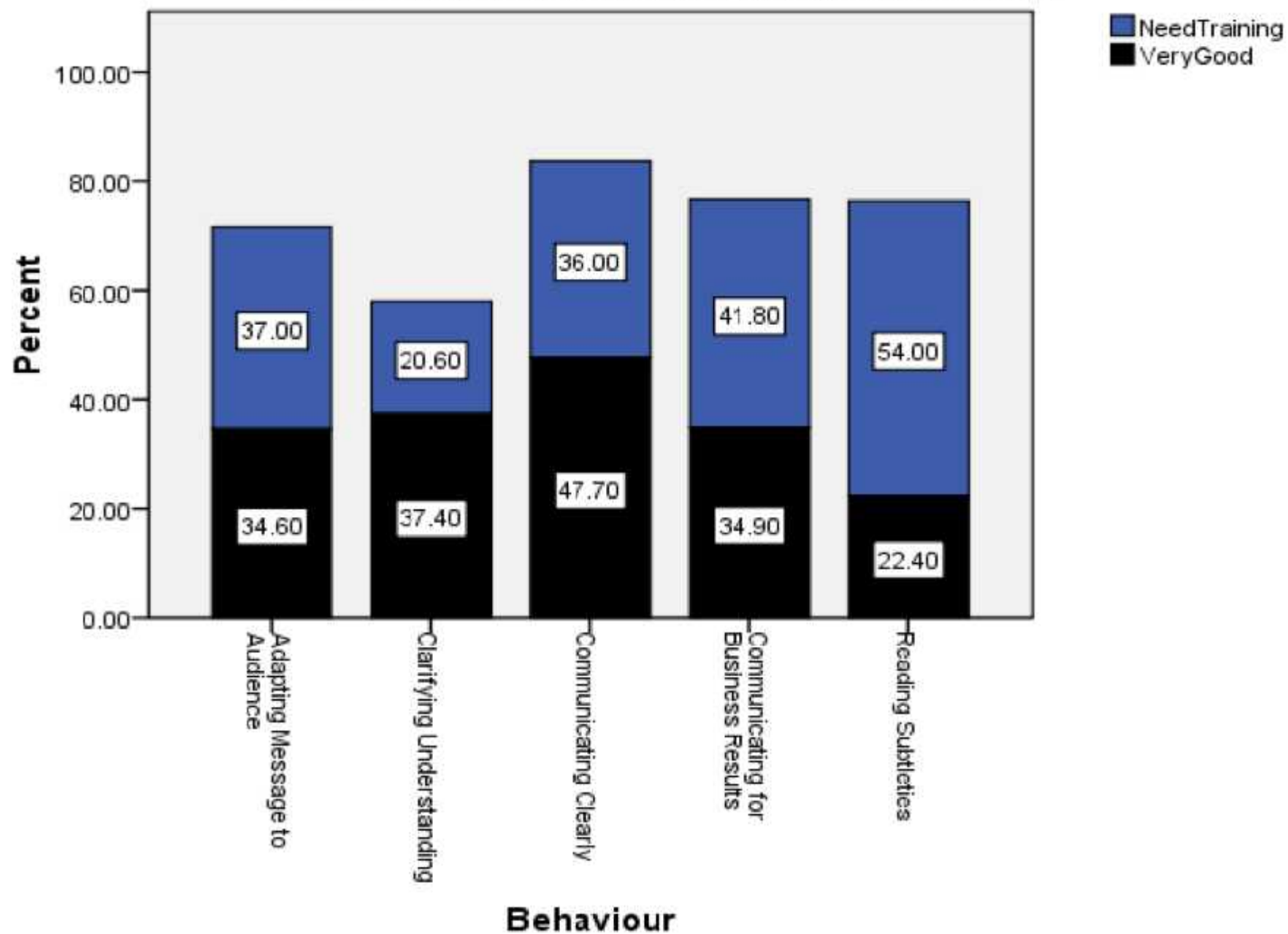
# RWANDA SKILLS SURVEY 2012



## ICT SECTOR REPORT

## Managing Change Behaviour in the ICT Sector



Legend:
- NeedTraining
- VeryGood

Percent (Y-axis): 0.00, 20.00, 40.00, 60.00, 80.00, 100.00

| Behaviour | VeryGood | NeedTraining |
|---|---|---|
| Championing and Leading Change | 31.80 | 50.50 |
| Helping and Informing Others | 40.40 | 36.30 |
| Managing the Change Process | 26.60 | 44.40 |
| Promoting Change | 35.80 | 47.50 |
| Recognizing Need to Change | 37.60 | 40.40 |

**Behaviour**

Problem Solving Behaviour in the ICT Sector

# Communication Behaviour in the ICT Sector



■ NeedTraining
■ VeryGood

Percent

100.00

80.00

60.00

37.00

40.00

34.60

20.00

0.00

20.60

37.40

36.00

47.70

41.80

34.90

54.00

22.40

Adapting Message to Audience

Clarifying Understanding

Communicating Clearly

Communicating for Business Results

Reading Subtleties

**Behaviour**

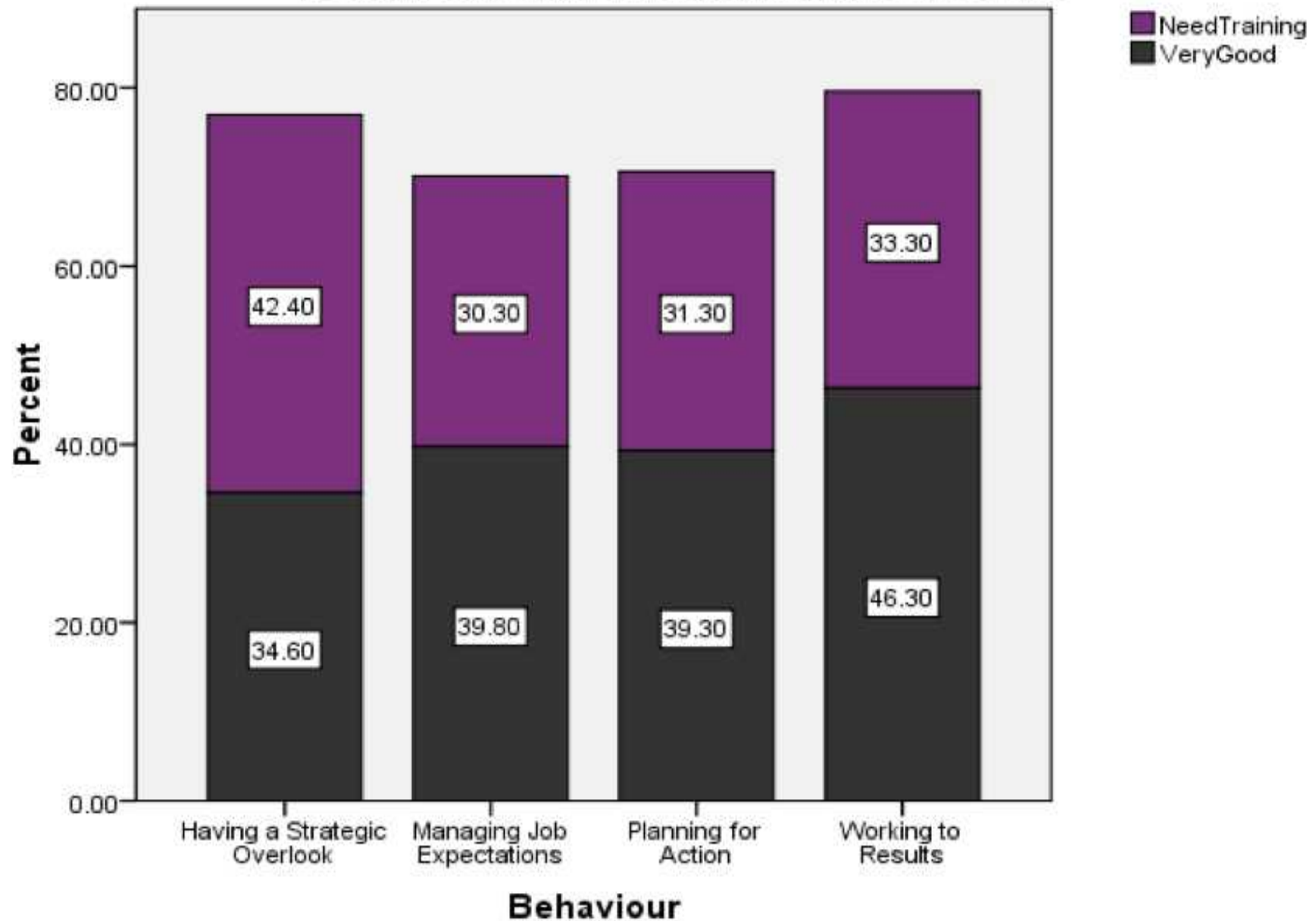Leadership Behaviour in ICT Sector
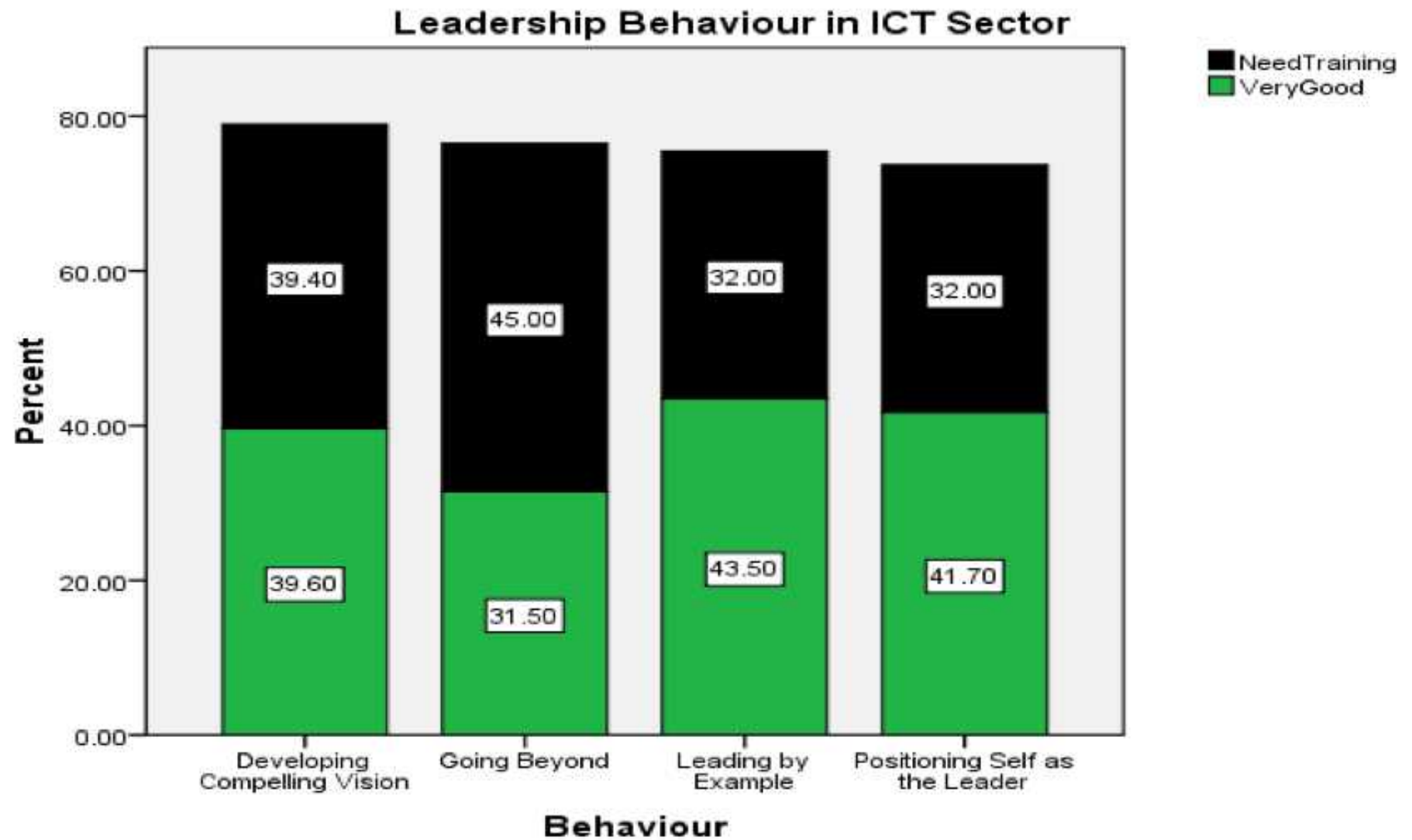
Results Orientation Behaviour in ICT Sector

# Overall Gaps by Broad Industrial Category

| Broad Occupations classification | Overall Gaps | % |
|---|---|---|
| ICT managers | 326 | 34.7 |
| ICT Scientists professionals | 84 | 8.9 |
| ICT technicians | 72 | 7.7 |
| Liberal Professionals | 172 | 18.3 |
| Artisans | 286 | 30.4 |
| Total | 940 | 100 |

# Sample of critical needs

**Software development and Engineering**

**Mobile Computing & Distribution Systems**

**Forensic Information Technology & Cybercrime Security**

**Networking Engineering**

**Digital electronics and Engineering in Electromechanical**

**Multimedia courses and Film production**

# Discussion

# Carnegie Mellon University
## Rwanda

# Thank You!

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