



**INNOVATION &  
INTELLECTUAL  
PROPERTY**

**COLLABORATIVE DYNAMICS IN AFRICA**

**Editors: Jeremy de Beer, Chris Armstrong,  
Chidi Oguamanam & Tobias Schonwetter**

# **Innovation & Intellectual Property**

## **Collaborative Dynamics in Africa**

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JEREMY DE BEER, CHRIS ARMSTRONG,  
CHIDI OGUAMANAM AND TOBIAS SCHONWETTER

Published by UCT Press in association  
with the IP Unit, Faculty of Law,  
University of Cape Town (UCT) and  
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).



*Innovation & Intellectual Property: Collaborative Dynamics in Africa*

First published 2014 by UCT Press

an imprint of Juta and Company Ltd  
First floor, Sunclare Building

21 Dreyer Street  
Claremont, 7708  
South Africa  
[www.uctpress.co.za](http://www.uctpress.co.za)

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This book is published by UCT Press. This work was carried out with the aid of a grant from the International Development Research Centre, Ottawa, Canada, with financial support from the German Federal Ministry for Economic Cooperation and Development (BMZ), and in cooperation with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

ISBN: 978-1-91989-599-4 (Parent)  
ISBN: 978-1-77582-143-4 (EBPUB)  
ISBN: 978-1-77582-142-7 (WebPDF)  
ISBN: 978-1-77582-191-5 (WebPDF Chapter 14)

Project manager: Glenda Younge  
Editor: Daphne Burger  
Proofreader: Alfred LeMaitre  
Indexer: Ethné Clarke  
Cover designer: Farm Design

Typeset in 10.5 pt on 13 pt Minion Pro by: Integra

Printed and bound in the Republic of South Africa by Creda Communications

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This book has been independently peer-reviewed by academics who are experts in the field.

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# Preface

This book is among the key outputs of the Open African Innovation Research and Training (Open A.I.R.) Project. Based on case study research in nine African countries, the book examines the recent history and current on-the-ground realities of innovation and intellectual property (IP) in African settings. In doing so, the book reveals complex collaborative dynamics across a range of different countries, sectors and socio-economic contexts, and generates recommendations for how innovation and IP can be married with social and economic development objectives in African settings. This book's sister report, *Knowledge and Innovation in Africa: Scenarios for the Future*, situates the current realities covered in this book within a much longer historical trajectory and multiple potential futures.

Conceived in 2009, established in 2010 and launched in 2011, Open A.I.R. is a pan-African and globally interconnected research and training network, which was established to:

- raise IP awareness in African settings and facilitate critical policy engagement;
- empower a networked, epistemic IP community in Africa;
- identify IP-related innovation bottlenecks and modes of open collaboration; and
- interrogate IP-related innovation metrics, capital and power structures.

Open A.I.R. is financially supported by Canada's International Development Research Centre (IDRC) and Germany's Federal Ministry for Economic Cooperation and Development (BMZ), and collaborates with numerous other organisations and individuals – all of whom are recognised in the Acknowledgements' pages of this book. In addition to the aforementioned case study and foresight research, the Open A.I.R. network engages in a wide range of training, capacity building, outreach and policy engagement activities – both on the African continent and in settings outside the continent where matters of African innovation and IP are engaged. These engagements target external stakeholders capable of changing policies and practices, including:

- innovators, creators and entrepreneurs – individuals and companies;
- business groups such as chambers of commerce and industry associations;
- national, regional and international law-makers and policy-makers;
- issue leaders, such as politicians, judges, professors and practitioners;
- scientific and cultural research and development funding bodies;

- university researchers, administrators and technology transfer officials;
- rights-holders and collective rights management organisations; and
- representatives of indigenous and local communities.

Open A.I.R. is motivated by a vision in which innovation and creativity in Africa are sustainable, properly valued, collaborative, widely accessible and result in benefits that are distributed throughout society. Based on this vision, the network's mission is to better understand how innovation and IP processes work in African settings, how knowledge and technology currently protected by IP can be mobilised, and how IP systems can be harnessed or adapted in a manner that fosters openness-oriented collaborative innovation resulting in just distribution of new knowledge and technology.

This book and the *Scenarios* volume are two parts of a much broader attempt, by Open A.I.R. and other initiatives, to facilitate, in the medium to long term, the emergence of new, pragmatic means of valuing and facilitating innovation and creativity in Africa. Contextually appropriate metrics sensitive to the monitoring of meaningful changes in behaviour around innovation and creativity could be instrumental for promoting African grassroots entrepreneurship, broad-based business development, and a vibrant private sector built on small and medium-sized enterprises (SMEs) with a sustained ability to innovate. And the opportunities for innovation-driven SMEs could also benefit from policy-maker adoption of appropriate metrics when designing the policy and regulatory frameworks necessary to ensure predictable innovation environments for stakeholders.

Open A.I.R.'s core funders, IDRC and BMZ, have provided a framework for Open A.I.R.'s objectives. Open A.I.R. fits within the IDRC's Science and Innovation programme, which supports research and policy engagement in relation to how science, technology and innovation (STI) can be engines of socio-economic development. Within this programme, the Information and Networks (I&N) initiative, which funds the Open A.I.R. Project, aims to better understand the linkages among innovation, creativity, networked collaborations (often enabled via information and communication technologies [ICTs]), and determinants of openness – including IP rights. The IDRC also supported the precursor network to Open A.I.R., the African Copyright and Access to Knowledge (ACA2K) Project, which ran from 2007 to 2011 and generated the nucleus of the expert network now driving Open A.I.R.

BMZ supports Open A.I.R. via Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), under the GIZ commons@ip – Harnessing the Knowledge Commons for Open Innovation initiative. The commons@ip initiative focuses on how IP rights interact with open innovation, the knowledge commons, open licences and collaborative innovation. It is part of the BMZ-

mandated Train for Trade programme, which aims at strengthening the private sector and its constituent bodies in the Southern African Development Community (SADC) region through training and capacity building in export promotion, quality control and promotion of open innovation – as well as through promotion of local and regional economic development and trade.

Open A.I.R.'s training and capacity building components include:

- building the network's capacity – through online platforms, network-wide workshops, research methodology support, scenario-building meetings and thematic seminars;
- awarding Open A.I.R. Fellowships to emerging IP scholars and potential leaders – from Tanzania, Kenya, Uganda, Ethiopia, Cameroon, Nigeria and Egypt;
- exchanging knowledge through Africa-wide and South–South knowledge networking at seminars, workshops and conferences;
- growing awareness among African creators, innovators, entrepreneurs and policy-makers of openness-oriented approaches to innovation and IP matters in Africa; and
- teaching at African tertiary educational institutions, including development of a replicable, open course curriculum on IP law and development.

Because of the immense geographic size of the African continent, and unique logistical challenges of African intra-continental travel, ICTs have been instrumental in empowering the research network's "community of practice". Open A.I.R. has an offline presence in 14 African countries and in multiple countries outside the continent. Online, the network includes hundreds of individuals and institutions throughout Africa and from all corners of the globe, linked via a suite of online networking and social-media tools. The Open A.I.R. community of practice advances a culture of multidirectional exchange among African innovative and creative communities and external actors – with a view to sustainably empowering local communities and SMEs. Network members promote cross-fertilisation of ideas via original thinking and partnerships with national and international institutions, scholars, funding agencies, civil society organisations and other willing partners. Those wishing to join the community can visit <http://www.openair.org.za/join>.





## Acknowledgements

True to its emphasis on “collaborative dynamics”, this book is the product of the collective energy of dozens of people and institutions in many countries, all of whom work within the Open African Innovation Research and Training (Open A.I.R.) network. Open A.I.R. currently has core network members and institutions in 14 African countries, spanning North Africa (Egypt, Tunisia), West Africa (Senegal, Ghana, Nigeria, Cameroon), East Africa (Ethiopia, Uganda, Kenya, Tanzania) and southern Africa (Malawi, Mozambique, Botswana and South Africa). Other network members and institutions are in Canada, the United States, the United Kingdom, Germany and France. These members are, in turn, linked – via online and offline interactions – to a broader Open A.I.R. network of hundreds of individuals and institutions, including people and entities in Brazil, India, Malaysia, Australia, Switzerland and the Netherlands. The network receives generous financial support from Canada’s International Development Research Centre (IDRC) and Germany’s Federal Ministry for Economic Cooperation and Development (BMZ).

Each of the editors and authors of this volume is part of, and collaboratively exchanges knowledge and expertise with, this large network, and we the editors, and each of the contributors, are profiled in “About the Editors” and “About the Contributors” sections of this book and on the Open A.I.R. website’s Team page, <http://www.openair.org.za/content/open-air-team>. On this Team page, one can also find the names and contact details of Open A.I.R. Fellows and other network members and institutions. The network is also accessible via its social media platforms, featured at <http://www.openair.org.za/join>

Open A.I.R.’s administrative hub is the IP Unit in the University of Cape Town Faculty of Law, where Project Manager Nan Warner and Administrator Phyllis Webb are the key operational drivers. Warner and Webb receive management support from two of the editors of this book (and the co-Principal Investigators of the Open A.I.R. Project), UCT IP Unit Director Tobias Schonwetter and Jeremy de Beer of the University of Ottawa Faculty of Law. Also supporting project management are Julie Nadler-Visser of UCT’s Research Contracts and IP Services (RCIPS) unit, members of the UCT Finance Department and Faculty of Law Finance Department, and another editor of this book: Chris Armstrong of the LINK Centre at the University of the Witwatersrand (Wits) in Johannesburg.

Network strategic guidance is provided by a Steering Committee composed of De Beer, Schonwetter, Warner, Chidi Oguamanam (another of this book’s

editors) of the University of Ottawa Faculty of Law, Nagla Rizk of The American University in Cairo (AUC), Sisule Musungu of IQsensato in Nairobi, Khaled Fourati of the IDRC office in Cairo, and Balthas Seibold of Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in Bonn. Further strategic support from the IDRC is, or has been, provided by Naser Faruqui, Simon Carter, Laurent Elder, Fernando Perini, Matthew Smith, Heloise Emdon and Phet Sayo; Karim Badran and Rose-Marie Ndiaye Pereira on financial matters; and Michelle Hibler and Nola Haddadian on publications. GIZ's involvement is focused on the capacity-building components of the network, which are carried out in collaboration with the GIZ's commons@ip – Harnessing the Knowledge Commons for Open Innovation initiative. At GIZ, in addition to support from the aforementioned Steering Committee member Balthas Seibold, who advises on matters of international knowledge cooperation and networking, support has also come from Petra Hagemann, Christine de Barros Said, Ursula van Look, Marina Neuendorff, Margrit Brockhaus and the Working Group of German Development Organisations on Promoting Innovation Systems. At UCT, as well as those already mentioned, key supporters and collaborators have been the Dean of Law, PJ Schwikkard, Lee-Ann Tong in the Faculty of Law, and, in the IP Unit, the Unit's founder Julian Kinderlerer, its Deputy Director Caroline Ncube and its Senior Research Fellow Bernard Maister. At the University of Ottawa, in addition to those already mentioned, support has been provided by the Dean of the Faculty of Law, Common Law Section, Nathalie Des Rosiers, and Former Dean Bruce Feldthusen.

For this book, key network participants were the team of JD candidates in the University of Ottawa Faculty of Law – Lukas Frey, Will Sapp, Phil Holdsworth, Maya Boorah, Kristen Holman and Saara Punjani – who provided long hours of diligent editorial assistance. In addition, because the research case studies presented in this book all required collection of data from human subjects – via interviews and/or focus group discussions and/or written surveys – this book would not have been possible without the cooperation of dozens of respondents across the countries of study. For reasons of confidentiality, most survey and interview respondents are not named in this book, but we are sincerely grateful for their contributions. Also contributing to the research outlined in this book was Donna Podems of OtherWISE in Cape Town, who advised on research methodologies and supported a methodology workshop for several of the authors featured in this volume, in addition to her support of Open A.I.R.'s monitoring and evaluation (M&E) framework. At this book's publisher, UCT Press, the key drivers have been Publisher Sandy Shepherd and Project Manager Glenda Younge. The cover design for this volume is by Elsabe Gelderblom of Farm Design in Cape Town, who does all of Open A.I.R.'s design work for its website, social media tools, PR materials,

*Briefing Notes* and the network's other substantial publication output, the Open A.I.R. *Scenarios* compendium – which is available in hard-copy, and on the Open A.I.R. website, as a separate published output and companion to this book.

Network headquarters at the UCT IP Unit serves as Open A.I.R.'s Southern Africa Hub, coordinated by Project Manager Warner. There are also four other Hubs: the North Africa Hub at the Access to Knowledge for Development Center (A2K4D) of the School of Business at The American University in Cairo (AUC), coordinated by Nagham El Houssamy under the direction of Nagla Rizk; the West Africa Hub at the Nigerian Institute of Advanced Legal Studies (NIALS) in Lagos, coordinated by Helen Chuma-Okoro under the direction of Adebambo Adewopo; the East Africa Hub at the Centre for IP and IT Law (CIPIT) of Strathmore University, Nairobi, coordinated by CIPIT Director Isaac Rutenberg; and the Canada Hub at the University of Ottawa Faculty of Law, coordinated by De Beer and Oguamanam. Contact can be made with these Hubs and Hub Coordinators via the aforementioned Open A.I.R. website Team page.

Also integral to the success of the network are its nine Fellows, each of whom has spent time at the UCT IP Unit in Cape Town. The Fellows have contributed to Open A.I.R.'s case study and foresight research, to outreach and training work, and to building the network. The nine Fellows are: Esther Ngom of the Ngo Nyemeck law firm in Yaoundé; Seble Baraki of the Justice and Legal System Research Institute (JLSRI) in Addis Ababa; Moses Mulumba of the Centre for Health, Human Rights and Development (CEHURD) in Kampala; Douglas Gichuki of CIPIT in Nairobi; Milton Lore of Bridgeworks Africa in Nairobi; Eliamani Laltaika of the Tanzania Intellectual Property Rights Network (TIP-Net) in Dar es Salaam; Alexandra Mogyoros, a student in the Faculty of Law at the University of Ottawa; West Africa Hub Coordinator Helen Chuma-Okoro of NIALS in Lagos; and North Africa Hub Coordinator Nagham El Houssamy of A2K4D in Cairo.

Other collaborating institutions are the Program on Information Justice and Intellectual Property (PIJIP) at the Washington College of Law at American University in Washington, DC; the Centre for Technology and Society (CTS) in Brazil; the Centre for Internet and Society (CIS) in India; and the Open Society Foundations, where Open A.I.R.'s key partner is Vera Franz. The Open A.I.R. network has also benefited from interaction with staff at the World Intellectual Property Organisation (WIPO) headquarters in Geneva. In London, Shirin Elahi of Scenarios Architecture is the driver of Open A.I.R. foresight research work, as featured in the aforementioned *Scenarios* compendium that provides an important forward-looking complement to the current picture offered by this volume. Jo Higgs of Go Trolley Films in Cape Town did post-production on the videos available on the Open A.I.R. YouTube channel – videos which show how the network came into being and how the research was conceptualised.

All the people and institutions mentioned here have in one way or another played a role, by collaborating within the Open A.I.R. network, in the conceptualisation, planning, data collection, data analysis, writing, editing, design and production processes that resulted in successful research and the completion of this book. It is hoped that this volume's free availability online, under a Creative Commons (CC) licence, will ensure that the book's collaborative dynamics do not end here at the moment of publication, and continue long into the future in the work of the still-growing Open A.I.R. community.

*Jeremy de Beer, Chris Armstrong, Chidi Oguamanam, Tobias Schonwetter  
September 2013*

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## Acronyms and Abbreviations

A2K	access to knowledge
A2K4D	Access to Knowledge for Development Center (The American University in Cairo, Egypt)
AAU	Addis Ababa University
ABS	access and benefit-sharing
ACA2K	African Copyright and Access to Knowledge Project
ACP	African, Caribbean and Pacific Group of States
ACTS	African Centre for Technology Studies (Kenya)
ADPP	Ajuda de Desenvolvimento de Povo para Povo (Mozambique)
AERC	African Economic Research Consortium
AFTE	Association for the Freedom of Thought and Expression (Egypt)
AGOA	African Growth and Opportunity Act
AIM	Agência de Informação de Moçambique
AmCham	American Chamber of Commerce (Egypt)
ARC	Aquaculture Research Centre (Egypt)
ARIPO	African Regional Intellectual Property Organisation
ASSAf	Academy of Sciences of South Africa
ASTII	African Science, Technology and Innovation Indicators
ATO	alternative trading organisation
ATPC	African Trade Policy Centre
ATPS	African Technology Policy Studies Network
AU	African Union
AUC	The American University in Cairo
B-BBEE Act	Broad-Based Black Economic Empowerment Act 53 of 2003 (South Africa)
BCP	bio-cultural community protocol
BIH	Botswana Innovation Hub
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
BoI	Bank of Industry (Nigeria)
BOTEC	Botswana Technology Centre
BPR	business process re-engineering
CAA	Cocoa Abrabopa Association (Ghana)
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CBN	Central Bank of Nigeria

CC	Creative Commons
CCIA	Computer and Communications Industry Association
CEDAT	College of Engineering, Design, Art and Technology (Makerere University, Uganda)
CEHURD	Centre for Health, Human Rights and Development (Uganda)
CEPIL	Centre for Public Interest Law (Ghana)
CIGI	Centre for International Governance Innovation
CIPC	Companies and Intellectual Property Commission (South Africa)
CIPIT	Centre for IP and IT Law (Strathmore University, Kenya)
CIPO	Canadian Intellectual Property Office
CIPR	Commission on Intellectual Property Rights (UK)
CMO	collective management organisation
COCOBOD	Ghana Cocoa Board
CPD	Centre for Policy Dialogue (Nigeria)
CRTT	Centre for Research in Transportation Technologies (Makerere University, Uganda)
CSIR	Council of Scientific and Industrial Research (India)
CTEA	Copyright Term Extension Act (US)
CVCP	Committee of Vice-Chancellors and Principals (UK)
DACST	Department of Arts, Culture, Science and Technology (South Africa)
DEST	Department of Education, Science and Training (Australia)
DFID	Department for International Development (UK)
DHET	Department of Higher Education and Training (South Africa)
DNS	domain name system
DRC	Democratic Republic of Congo
DRM	digital rights management
DRST	Department of Research, Science and Technology (Botswana)
DST	Department of Science and Technology (South Africa)
DTI	Department of Trade and Industry (South Africa)
EAEP	East African Educational Publishers (Kenya)
EC	European Commission
ECBP	Engineering Capacity Building Program (Ethiopia)
ECOWAS	Economic Community of West African States
ECX	Ethiopia Commodity Exchange
EEAA	Egyptian Environmental Affairs Agency
EIPO	Ethiopian Intellectual Property Office
EIPRL	Egyptian Intellectual Property Rights Law
EPA	Environmental Protection Authority (Ethiopia)
EPO	European Patent Office
EST	environmentally sound technology

EU	European Union
EUEI	EU Energy Initiative
Eurostat	Statistical Office of the European Communities
FAO	UN Food and Agriculture Organisation
FCN	Friendship, Commerce and Navigation (Kenya)
FDI	foreign direct investment
FDRE	Federal Democratic Republic of Ethiopia
FDSE	Free Day Secondary Education (Kenya)
FES	Friedrich Ebert Stiftung (Germany)
FLO	Fairtrade Labelling Organisations International
FOSS	free and open source software
FPE	Free Primary Education (Kenya)
FTA	free trade agreement
GDP	gross domestic product
GEM	Global Entrepreneurship Monitor
GERD	gross expenditure on research and development
GI	geographical indication
GIPC	Global Intellectual Property Center
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (Germany)
GM	genetically modified
GOAN	Ghana Organic Agriculture Network
GOK	Government of Kenya
GR	genetic resources
GTZ	German Technical Cooperation
HSRC	Human Sciences Research Council (South Africa)
ICANN	Internet Corporation for Assigned Names and Numbers
ICIDSS	International Creativity and Innovation Development Support Services (Ethiopia)
ICJ	International Commission of Jurists
ICLS	International Conference of Labour Statisticians
ICPSK	Institute of Chartered Public Secretaries of Kenya
ICT	information and communication technology
ICT4D	ICT for development
ICTSD	International Centre for Trade and Sustainable Development
IDC	Industrial Development Corporation (South Africa)
IDLO	International Development Law Organisation
IDRC	International Development Research Centre (Canada)
IDS	Institute of Development Studies (Kenya)
IE	informal economy

IFC	International Finance Corporation
IICA	Inter-American Institute for Cooperation on Agriculture
IIDMM	Institute of Infectious Disease and Molecular Medicine (South Africa)
IIED	International Institute for Environment and Development
IIPA	International Intellectual Property Alliance
IISD	International Institute for Sustainable Development
ILC	indigenous and local community
ILO	International Labour Organisation
INAO	Institut national des appellations d'origine (France)
IP	intellectual property
IPA	Industrial Property Act (Botswana)
IPC	International Patent Classification
IPI	Industrial Property Institute (Mozambique)
IPR-PFRD Act	Intellectual Property Rights from Publicly Financed Research and Development Act (South Africa)
IRB	Institutional Review Board (Botswana)
IRENA	International Renewable Energy Agency
ISAS	integrated seawater agriculture system
ISCTEM	Instituto Superior de Ciências e Tecnologia de Moçambique
ISI	Institute for Scientific Information
ISO	International Organisation for Standardisation
ISP	Information Society Project (Yale University, US)
ITC	International Trade Centre
JBEDC	Japan Bio-Energy Development Corporation
JITAP	Joint Integrated Technical Assistance Programme
JLSRI	Justice and Legal System Research Institute (Ethiopia)
K2C Biosphere	Kruger to Canyons Biosphere (South Africa)
KE	knowledge economy
KECOBO	Kenya Copyright Board
KENFAA	Kenya Nonfiction and Academic Authors' Association
KES	Kenyan Shilling
KHA	Kenya Historical Association
KICD	Kenya Institute of Curriculum Development
KIPI	Kenya Industrial Property Institute
KIPRA	Kenya Institute for Public Policy Research and Analysis
KNAS	Kenya National Academy of Sciences
KOLA	Kenya Oral Literature Association
KTO	knowledge transfer office
LBC	Licensed Buying Company (Ghana)
LDC	least developed country

LE	Egyptian Pound
LINK Centre	Learning Information Networking Knowledge Centre (Wits University, South Africa)
LSK	Law Society of Kenya
MAN	Manufacturers Association of Nigeria
MANCAP	Mandatory Conformity Assessment Programme (Nigeria)
MCH	Maasai Cultural Heritage Organisation (Kenya)
MCST	Ministry of Communications, Science and Technology (Botswana)
MCT	Ministério da Ciência e Tecnologia (Mozambique)
MDCA	Malindi District Cultural Association (Kenya)
MDG	Millennium Development Goal
MEA	Multilateral Environmental Agreement
MIST	Ministry of Infrastructure, Science and Technology (Botswana)
MIT	Massachusetts Institute of Technology
MOA	Ministry of Agriculture (Ethiopia)
MOE	Ministry of Education (Ethiopia)
MOFA	Ministry of Food and Agriculture (Ghana)
MoFED	Ministry of Finance and Economic Development (Ethiopia)
MOST	Ministry of Science and Technology (Ethiopia)
MoU	memorandum of understanding
MRC	Medical Research Council (South Africa)
Natoil	Natural Oil Company (Egypt)
NACI	National Advisory Council on Innovation (South Africa)
NCC	Nigerian Copyright Commission
NDA	non-disclosure agreement
NEP	National Enquiry Point (Botswana)
NEPAD	New Partnership for Africa's Development
NESC	National Economic and Social Council (Kenya)
NESTI	National Experts on Science and Technology Indicators
NIALS	Nigerian Institute of Advanced Legal Studies
NRF	National Research Foundation (South Africa)
NGO	non-governmental organisation
NIALS	Nigerian Institute of Advanced Legal Studies
NIPMO	National Intellectual Property Management Office (South Africa)
NIS	national innovation system
NMIMS	Narsee Monjee Institute of Management Studies (India)
NPR	National Public Radio (US)
NPSB	National Policy and Strategy on Biofuels (Mozambique)
NRC	National Research Centre (Egypt)

NREA	New and Renewable Energy Authority (Egypt)
NWLR	Nigerian Weekly Law Report
OA	open access
OAPI	Organisation africaine de la propriété intellectuelle
OCEES	Oxford Centre for the Environment, Ethics and Society
OCFCU	Oromia Coffee Farmers Cooperative Union (Ethiopia)
ODEL	open, distance and electronic learning
ODI	Overseas Development Institute (UK)
OECD	Organisation for Economic Co-operation and Development
OER	open educational resource
Open A.I.R.	Open African Innovation Research and Training Project
ORD	Office of Research and Development (Botswana)
PBIP	place-based intellectual property
PCT	Patent Cooperation Treaty
Petromoc	Petróleos de Mozambique
PIIPA	Public Interest Intellectual Property Advisors (US)
PIJIP	Program on Information Justice and Intellectual Property (American University, US)
PPS	probability proportional to size
PRO	public research organisation
ProBEC	Programme for Basic Energy and Conservation in Southern Africa
R&D	research and development
RCIPS	Research Contracts and IP Services unit (UCT, South Africa)
RIPCO (B)	Rural Industrial Promotion Company (Botswana)
RMI	rights management information
SADC	Southern African Development Community
SARUA	Southern African Regional Universities Association
SCE	Society for Critical Exchange (Kenya)
SID	Society for International Development (Kenya)
SINER-GI	Strengthening International Research on Geographical Indications
SME	small and medium enterprise
SMIEIS	Small and Medium Industries Equity Investments Scheme (Nigeria)
SMME	small, micro and medium enterprise
SNA	social network analysis
SON	Standards Organisation of Nigeria
SPS	sanitary and phytosanitary measures
STCI	Science and Technology Capacity Index
STEP	Science Technology and Economic Policy (US)
STI	science, technology and innovation
STS	Society for Technology Studies (Ethiopia)

SVKM	Shri Vile Parle Kalamani Mandal (India)
TBT	technical barriers to trade
TCE	traditional cultural expression
TGE	Transitional Government of Ethiopia
THE	Times Higher Education (UK)
THRIP	Technology and Human Resources Programme (South Africa)
TIA	Technology Innovation Agency (South Africa)
TIP-Net	Tanzania Intellectual Property Rights Network
TISC	Technology and Innovation Support Center
TK	traditional knowledge
TKDL	Traditional Knowledge Digital Library (India)
TPMs	technological protection measures
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
TTO	technology transfer office
TVET	Technical and Vocational Education and Training (Ethiopia)
UB	University of Botswana
UCC	Universal Copyright Convention
UCITA	Uniform Computer Information Transactions Act (US)
UCT	University of Cape Town (South Africa)
UEM	Eduardo Mondlane University (Mozambique)
UGT	Uganda Gatsby Trust
UK	United Kingdom
UM	utility model
UNCST	Uganda National Council for Science and Technology
UNCTAD	UN Commission on Trade and Development
UNDESA	UN Department of Economic and Social Affairs
UNDP	UN Development Programme
UNECA	UN Economic Commission for Africa
UNEP	UN Environment Programme
UNESCAP	UN Economic and Social Commission for Asia and the Pacific
UNESCO	UN Educational, Scientific and Cultural Organisation
UNFCCC	UN Framework Convention on Climate Change
UNICAMP	University of Campinas (Brazil)
UNIDO	UN Industrial Development Organisation
Unilag	University of Lagos
US	United States
USAID	US Agency for International Development
USPTO	US Patent and Trademark Office
WAK	Writers Association of Kenya
WATH	West Africa Trade Hub



WBCSD	World Business Council for Sustainable Development
WCT	WIPO Copyright Treaty
WEF	World Economic Forum
WEP	World Employment Programme
WHO	World Health Organisation
WIPO	World Intellectual Property Organisation
Wits	University of the Witwatersrand (South Africa)
WPIS	WIPO Patent Information Service
WPPT	WIPO Performances and Phonograms Treaty
WTO	World Trade Organisation
ZAR	South African Rand

# **Chapter 14**

## **Towards University–Industry Innovation Linkages in Ethiopia**

Wondwossen Belete

### **Abstract**

*This chapter analyses findings from research into the apparent disconnect in Ethiopia between the state's innovation policy and the practical realities of scientific research in the country. The research found that the Ethiopian government's emphasis – in its Science, Technology and Innovation (STI) Policy of 2012 – is on IP protection, and patenting of outputs from publicly funded research. Meanwhile, it was found, there is a dearth of innovative research at Ethiopia's universities, and scant linkage between universities and the private sector. The chapter argues that the Ethiopian government should look beyond the current focus on IP protection and patenting and seek the optimum balance among a variety of models of university–industry knowledge transfer.*

### **1. Introduction**

Ethiopia is the second most populous country in sub-Saharan Africa, with a population of 84 million. Agriculture accounts for 41% of gross domestic product (GDP) and 85% of employment, and is also the main source of foreign exchange and raw materials for domestic industry. Although the country is one of the poorest in the world, its economy has demonstrated signs of improvement in recent years. At the time of writing, Ethiopia had experienced double-digit GDP growth for nine consecutive years, making it one of the fastest-growing economies in Africa.

Despite promising signs of economic improvement, poverty eradication still remains a priority for the Ethiopian government. The country's low level of technological development is a major constraint on this national development objective. Promoting technological progress is therefore seen as essential to achieving

broad-based, accelerated and sustained economic growth. The government in 2012 approved a Science, Technology and Innovation (STI) Policy based on a national innovation system (NIS) approach. The NIS approach is premised on the assumption that the flow of technology and information among people, enterprises and institutions is key to the innovative process. The Policy emphasises the need for strengthening the interaction among universities and industrial enterprises to enhance the innovative capacity of industry. Other government policies and programmes also view the wealth of knowledge generated through academic research as a source of industrial innovation and national competitiveness (FDRE, 2010a, 2010b, 2012; MOST, 2010).

In turn, intellectual property (IP) rights have been identified as important tools to facilitate the transfer of university-generated knowledge to industry. Various studies have recommended policies that permit universities and government research institutes to retain IP rights (EIPO, 2007; Mengistie, 2006; MOST, 2009). The studies do not mention specific foreign policies to be used as models, but a critical examination of the studies reveals that priority is being placed on the adoption of IP policies from developed countries in relation to the promotion of university–industry interaction (EIPO, 2007; MOST, 2009). These studies have had a significant influence on the IP strategy of the STI Policy – an important point, given that the recommended strategy provides for the development and implementation of institutional IP systems that could, if implemented, lead to increased privatisation of the knowledge outputs from publicly funded research (FDRE, 2012).

There are a number of challenges associated with cross-national emulation of STI policies between developed-world and developing-world contexts. STI policies need to cater to a country's socio-economic context, the research environment in its universities and research institutes, the capacity of a country's domestic firms to absorb external knowledge, and the availability in the country of resources for research and innovation. Hence the appropriate policies needed to enhance the benefits of STI are highly context-specific. In order to build an innovation system that works in the Ethiopian context, it is necessary to base STI policy development on research evidence reflecting the current situation of science and technology.

This study aimed to produce evidence on the potential impact of IP dynamics on university–industry interaction – a matter of heated debate in Ethiopian STI policy-making. The study sought to answer the question: *How does IP protection of academic research output potentially influence the performance of innovation in Ethiopian industry?*

The study reviewed the policies and laws in place in Ethiopia to promote a university–industry alliance, and examined the views of stakeholder groups regarding the different channels of knowledge transfer between universities

and industry and the policy environment affecting that knowledge transfer. Establishing a system that stimulates effective university–industry interaction requires a clear understanding by academic researchers, industry managers and policy-makers of the relative merits of the different models of knowledge transfer, and this study sought to generate findings that can contribute to this process of understanding.

The next section of this chapter (Section 2) outlines the study’s methodology. The third section reviews the relevant literature in order to establish the context of the study. Section 4 analyses the relationships between IP rights, publicly funded research and industrial innovation in Ethiopia on the basis of information gathered during the research. The fifth and final section provides conclusions and policy recommendations. (See Chapters 13 and 15 of this volume for more research, in South Africa and Botswana, respectively, into matters at the intersection of IP and publicly funded research.)

## **2. Research methods**

This study used two main data collection methods: document analysis and questionnaires. The documents analysed included government policies, laws, plans, programmes and study reports. Also analysed were research strategies of universities and study papers produced during recent university reforms in Ethiopia – in order to gather information on research performance and management at the institutional level. In addition, previous research in this area was reviewed to identify questions that needed to be answered and to explore different viewpoints on the application of IP protection in relation to publicly funded research.

Questionnaires were used to collect information from groups categorised into (1) universities, (2) industrial enterprises and (3) government agencies. The universities included in the study were selected according to the following factors: number of academic staff, size of public research funding, research performance and previous experience in collaborations with industry. Researchers in universities who directly participate in publicly funded research, or who are involved in the process of design and implementation of research projects, were selected for the study. Industrial enterprises were chosen based on their levels of innovative activities and prior collaboration with universities. The respondents from enterprises were selected on the basis of their roles in research management and protection of enterprise IP. The government agencies included in the study were those with active roles in the development of STI policy. In these agencies, government officials with technical knowledge of IP rights administration were targeted as respondents.

Because the nature of the information gathered from each group had some level of variation, three separate questionnaires were developed. The questionnaires were delivered as attachments to e-mail messages. The questionnaires included background information about the study and posed questions intended to collect information on the impact of academic patenting on industrial innovation. Each question gave respondents a range of options to select from. In cases where answers did not fit into the given options, respondents were allowed to provide their own comments. The questionnaires also contained a section that allowed respondents to add their individual thoughts on IP and the dissemination of university research results.

Some of the university researchers targeted as respondents did not respond to the questionnaire. This limited the study's ability to incorporate the views of people with in-depth information on the subject. In addition, since the study focused on a recent policy issue that has not yet been extensively or systematically researched in the context of least developed countries (LDCs), it was difficult to find materials written from the perspective of such countries. Although innovation policies are context-specific, LDCs share commonalities associated with their low level of technological development.

### **3. IP rights and university research**

#### ***IP and dissemination***

Over the past three decades, IP protection of publicly funded university research has been the subject of intense policy debate in both developed and developing countries. Some people consider the dissemination of university research via patent licensing as a model that facilitates economic and social returns from university research. Others have highlighted the potential for this model to generate unintended and deleterious consequences for innovation systems (Boettiger and Bennet, 2006; Montobbio, 2009; Sampat, 2006).

The UK Commission on Intellectual Property Rights (CIPR) found that the underlying argument for patenting university inventions and exclusive licensing of technologies is to increase the rate of commercial application of knowledge by encouraging private sector investment (CIPR, 2002, p. 123). University inventions are often in the very early stages of development, and therefore require substantial development before commercial application. It is thus argued that unless companies are able to negotiate exclusive access to the IP from university research, the companies will not have the incentive to invest the resources necessary for developing marketable products. The argument for university ownership of IP rights, therefore, “pertains not to *ex ante*

incentives for invention, but to incentives *ex post* for downstream users to invest in commercialization of federally funded inventions” (Thursby and Thursby, 2007, p. 4).

The opposing argument is that the interests of technology transfer and commercial application will be best served by the widest possible dissemination of knowledge in the public domain. According to this perspective, increased focus on IP protection of academic inventions is a threat to the objectives of universities (Davis *et al.*, 2011). Academic researchers have traditionally been committed to “open science”, which involves peer evaluation, a shared culture of scientists that emphasises the importance of motivational factors other than economic ones, and the widespread dissemination of research findings (David, 2003; Dosi *et al.*, 2006; Liebeskind, 2001; Lundvall, 2008; Sampat, 2006). It is argued that the open science approach helps to avoid excessive duplication of research efforts, to promote information-sharing and to allow the development of a strong public knowledge base from which subsequent researchers can draw (Fabrizio, 2006).

### ***Bayh-Dole and its international emulation***

The 1980 Bayh-Dole Act in the United States permitted university patenting. Proponents of the Act argued that there was a significant informational divide between the world of academia and the world of industry, making it difficult to implement university inventions in practice (Colyvas *et al.*, 2002). Bayh-Dole aimed to promote the commercialisation of university research results that were seen as going to waste (Fabrizio, 2006). The Act responded to a belief by policy-makers that stronger protection for the results of publicly funded research and development would accelerate the commercialisation of these results and the realisation of economic benefits for US taxpayers (Mowery *et al.*, 2001). Furthermore, allowing universities to share in the proceeds from faculty inventions would create incentives for the universities to advertise these inventions to industry. Bayh-Dole “provided blanket permission for performers of federally funded research to file for patents on the results of such research and to grant licences for these patents, including exclusive licenses, to other parties” (Mowery and Sampat, 2005, p. 228).

Recent policy initiatives in a number of industrial economies have revealed that there is considerable interest in emulating the Bayh-Dole Act. Many European countries changed their innovation policies to accord with the American example, entrusting universities with IP management and providing support to intermediary units that help to facilitate the university–industry technology transfer process (Pogljajen, 2012). Similarly, Bayh-Dole provided a model of reform for Japanese policy-makers (Walsh *et al.*, 2008). Several developing countries have

also adopted legislation modelled on Bayh-Dole, while others are considering the introduction of such policies (Foley and Lardner, 2011; Graff, 2007; Koyama, 2010; Vartak and Saurastri, 2009).

Despite this apparent popularity of cross-national policy emulation in the case of the Bayh-Dole Act, there is a strong argument that policy copying without due consideration of country-specific situations is not desirable. Verspagen (2006) argues that the justifications given for the adoption of Bayh-Dole in the US may not be applicable in the European context. Crespi *et al.* (2006) used their data from a large-scale survey of European countries to argue against Bayh-Dole-like legislation in Europe. According to their argument, there is no indication of market failure, in the dissemination of university research in Europe, to justify legislative intervention. Mowery and Sampat (2005) argue that the emulation of Bayh-Dole in other industrial economies is based on a misreading of the empirical evidence of the effects of the Act, and a misreading of the importance of the facilitating role of IP rights in the transfer and commercialisation of university inventions. There is also a lack of firm evidence on the effect that Bayh-Dole has had on the quantity and quality of university research output and its level of commercialisation (CIPR, 2002).

Various authors have criticised the emulation of Bayh-Dole in developing countries. Anthony *et al.* (2008) are doubtful that the benefits of legislation modelled on Bayh-Dole can outweigh the costs in developing countries. Sampat (2009) examined the theory and evidence supporting the main goals of the draft Indian Bill for the Protection and Utilisation of Publicly Funded Intellectual Property. Like Bayh-Dole, India's proposed Bill was to apply to all research resulting from government grants. Sampat noted the difficulties inherent in cross-national policy emulation, and advised that India and other developing countries considering Bayh-Dole-like legislation should not precisely follow the American model. These insights are also applicable in Ethiopia.

## **4. IP, university research and industrial innovation in Ethiopia**

### ***Government policies***

Seeking to foster the development of domestic technological capabilities, various government policies in Ethiopia emphasise the need for stronger interaction between universities and industry. These policies are intended to strengthen graduate training and university research, to establish mechanisms to facilitate collaboration and information flow, and to create industry demand for knowledge generated by universities.

Ethiopia issued its first national Science and Technology Policy in 1993 (TGE, 1993). This Policy contained directives intended to establish and/or strengthen science and technology institutes and research and development (R&D) centres. The Policy also addressed the need for dissemination and application of research results, and encouraged the private sector to invest capital, participate in the promotion and development of scientific and technological activities, and promote mutual support between research and production (TGE, 1993). However, the Policy followed a linear approach to innovation that limited its ability to create a strong alliance between universities and industry. The linear approach postulates that innovation starts with basic research, then adds applied research and development and ends with production and diffusion.

Hence in 2012 the government adopted a new STI Policy. This new Policy envisages the establishment of a national innovation system that strengthens the links between different innovation actors. The Policy contains strategies for creating strong connections between universities, research institutes and industry in the learning and adaptation of foreign technologies (FDRE, 2012).

The government's Education and Training Policy of 1994 emphasises the creation of an appropriate nexus between university research and industrial innovation. The Policy sets out the research-oriented role that higher education should play, in order to enable students to become problem-solving professional leaders who address broader societal needs in their fields of study. The approach gives priority to research with practical societal impact that fosters cooperation among stakeholders (TGE, 1994). The Higher Education Proclamation of 2009 serves to consolidate the Education and Training Policy. One of the objectives of the Proclamation is to promote and enhance university research by focusing on knowledge and technology transfers consistent with the country's priority needs (FDRE, 2009).

Industrial development and capacity-building policies also stress the importance of universities as sources of new ideas with industrial application. These policies consider the interface between universities and their socio-economic environment as one of the key factors for development. While giving recognition to the role of universities as breeding grounds for professional leaders and researchers, these policies emphasise that tertiary institutions should be engaged in activities aimed at generating knowledge that can be applied in industry. Universities are required to have a role in problem-solving activities that address the specific needs of industry and contribute to innovation through technology transfer (FDRE, 2002a, 2002b).

However, it is this author's view that there is no evidence to suggest that the focus of these policies – on universities as instruments for knowledge-based



economic development and change – has yet brought the envisaged change in industrial innovation and economic growth in Ethiopia. Examination of the factors constraining the contribution of universities to technological capacity building and national competitiveness is a broad research subject that goes beyond the scope of this study. However, the following subsection outlines capacity-related constraints that seem to explain the scant collaborative links between universities and industry in Ethiopia.

### **University research and innovation performance of firms**

Over the past 15 years there has been a significant expansion of higher education in Ethiopia, facilitating improved access to tertiary education for many young people. The number of universities increased from just two in 2000 to 32 in 2011. Undergraduate enrolment increased from 149,694 students in 2005 to 319,217 students in 2009. Postgraduate enrolment increased from 3,884 students to 10,125 students over the same period (MOE, 2005, 2010, 2011). University research has not, however, shown parallel growth. Only a handful of universities, chiefly Addis Ababa University (AAU), Haramaya University and Mekelle University, are engaged in notable research activities. Furthermore, it was found that there is a disconnect between the research focus of the universities and the needs of the economy. A situation analysis of research activity at AAU found that none of the units at the university had set research priorities based on national development objectives (Lemma *et al.*, 2008). A shortage of qualified researchers, lack of adequate research funding and weak research infrastructure have also been identified as factors limiting the involvement of universities in development-oriented research programmes (Belete, 2010; Lemma *et al.*, 2008).

The strength of university–industry links depends not only on the amount and orientation of university research activities, but also on the ability of industrial firms to identify, assimilate and apply knowledge generated in universities. The absorptive capacity of recipient firms is a major factor in potential transfer of university knowledge and effective university–industry interaction. Viewed from this perspective, most Ethiopian industrial enterprises have weak absorptive capacity for externally generated knowledge. They face problems related to their lack of information on available technological options, financial constraints and skill gaps (i.e. differences between the skill requirements of the enterprise and those possessed by graduates) (Belete, 2010). The resulting lack of required technical skills negatively influences the technological capabilities of enterprises. Most of the technical staff working in firms are trained by the Technical and Vocational Education and Training (TVET) institutes of Ethiopia. However, in my experience, many TVET graduates do not meet the

expectations of industrial enterprises. TVET has traditionally concentrated on institution-based training, which favours theoretical instruction. Until recently, TVET training was input-oriented and followed curricular requirements instead of workplace and labour market requirements. Moreover, training and continuous upgrading for the existing workforce was only partially in place. A meaningful structure for steady adaptation to workforce demands and life-long learning was missing (MOE, 2005).

The structure of the industrial sector is another factor contributing to the innovative performance of industrial enterprises and their connections with universities. Ethiopia's manufacturing sector is dominated by small and medium enterprises (SMEs), which are often owned by individuals or families. These SMEs tend to be risk averse. Enterprises willing to invest in new management systems or new production processes are relatively scarce. It is rare to find separate units within these enterprises focusing on innovation; rather, innovative activities are carried out informally along with day-to-day manufacturing operations (Belete, 2010; UNCTAD, 2002).

The government has launched several initiatives aimed at improving the linkage between universities and industry in Ethiopia. Starting as early as 1986, these initiatives focused on encouraging industrially relevant university research and improving the capacity of industry to absorb and utilise university-generated knowledge (Gebreyesus, 1998; Kitaw, 2008; Wasmuth and Nebelung, 2006). The most recent of these initiatives is the Engineering Capacity Building Program (ECBP). In 2011–12, the ECBP established Institutes of Technology at different universities. The Institutes are engaged, *inter alia*, in an interdisciplinary approach to applied technology research and technology transfer, in an effort to impact the development of Ethiopia's regional and national economies. Also among the core tasks of the Institutes are the establishment of sustainable partnerships for development and mutual support between industry, the business community and national and international institutions (Edhardt and Scholz, 2009).

### ***The national IP system and institutional IP management***

IP protection is a relatively new concept in Ethiopia. The country's first patent law was adopted in 1995, and regulations implementing it were introduced in 1997. The national IP system began to take shape only after the establishment of the Ethiopian Intellectual Property Office (EIPO) in 2003. The EIPO operates as an autonomous government agency with responsibility for the administration of IP rights. It is also mandated to conduct studies in various IP fields and to recommend policies and legislation (FDRE, 2003).

Despite the demanding tasks entrusted to the EIPO, it suffers from a shortage of professionals with sufficient knowledge and skills to carry out its mandate.<sup>1</sup> The examination of patent applications is performed by personnel who lack the requisite training and experience. Moreover, there is a general lack of appreciation of how specific IP policies affect creativity.

Under Ethiopia's 1995 patent law, employers are the default owners of any patents on inventions created by employees in the course of employment. This provision may be interpreted as entitling universities to retain the IP rights on research conducted by academic staff using institutional resources. However, inventions that are not related to an employee's employment or service contract and were created without the use of the employer's resources, data, materials or equipment, belong to the employee (TGE, 1995). The Higher Education Proclamation of 2009 recognises individual IP rights and confidentiality agreements when university-generated knowledge is used for public benefit (FDRE, 2009). However, the Proclamation does not contain any explicit provisions for institutional ownership of patents on inventions generated by university research. Such a provision was included in the Research Policy at AAU, which was submitted for discussion to the academic community in 2011. The University's Research Policy requires all potentially patentable inventions conceived by academic staff in the course of their employment, and in sponsored projects, to be disclosed on a regular basis to the Office of the Vice President (AAU, 2011). This gives the University the right to patent inventions developed as a result of public funds or other public financing being channelled through the University. At the same time this AAU Research Policy creates the potential for delays in the publication of research results until a patent application is filed. The Research Policy of Adama University, like that of AAU, requires academic researchers to disclose all inventions resulting from their research activities in the course of their employment, so that the University may claim patent ownership. The University consequently gains the right to grant exclusive licences to industry (Adama University, 2010).

As a consequence of policy emphasis on strengthening university–industry interaction, technology transfer units were established within the organisational framework of some of the country's institutes of higher education, including the aforementioned universities in 2011–12. The technology transfer units are tasked with encouraging links between the institutes and the economy. Within this scope, the technology transfer units are responsible for the management of IP (Edhardt and Scholz, 2009). However, it is my view that the units are not

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1 The author served as the EIPO's Director of Intellectual Property Policy and Planning in 2004–06, Director of Trademarks in 2007–10, and Director of Intellectual Property Protection and Technology Transfer in 2010–11.

sufficiently resourced to staff offices with adequately trained IP-knowledgeable professionals who can determine how and when to use IP as a tool for technology transfer.

### ***Perspectives of policy-makers, industry managers and academic researchers***

Effective interaction between knowledge-generating universities and industry is dependent on the capacity of IP policy-makers to appreciate the various factors affecting the relationships between research, innovation and economic development. However, this study found, via the questionnaires completed by government officials, that Ethiopia lacks sufficient IP expertise in the government agencies responsible for science, technology, industry and trade. Most policy-makers, understandably, have a limited understanding of the complex and multifaceted role of IP in national innovation systems. Those government officials with IP knowledge tend to have technical knowledge of IP rights administration and only a limited understanding of the role of IP as a tool of regulatory and economic policy.

The government respondents surveyed for this study cited an absence of noticeable transfer of knowledge between university research and industry. They indicated that universities are not engaged in large-scale research activities and argued that the small amount of university research lacks relevance to industrial innovation. Further, respondents pointed to the inadequacy of public funds allocated for university research. The absence of research infrastructure and a shortage of qualified researchers were also identified as factors limiting the amount of research conducted in universities.

The government officials responsible for STI policy cited a lack of clarity on IP ownership of university research as a factor limiting university–industry collaboration. They argued that IP policies allowing university ownership of publicly funded research outputs are essential for strengthening collaborative ties between universities and industry. A critical look at the questionnaire data found that government respondents viewed the alignment of national IP laws (as well as national and institutional IP policies) with international standards as necessary to build national competitiveness. Their views seem clearly to be influenced by the proclaimed positive impact, in developed countries, of IP on national innovation systems. Furthermore, the government respondents implicitly favoured the replication of IP policies of developed countries as important in strengthening university–industry linkages in Ethiopia.

At the same time, information obtained from government respondents demonstrated that universities in Ethiopia are not significant players in terms

of ownership of IP rights. Most of the local applications received by the EIPO are from SMEs. These SMEs are mainly requesting utility model certificates for their incremental inventions (which may not fulfil the criteria of patentability). Government respondents considered the low utilisation of IP by universities as an outcome of the low level of awareness about IP among the academic community.

Respondents from industry shared the views of government officials regarding the scale and orientation of university research. All industry respondents considered universities to be relatively unimportant information sources for Ethiopian industry's innovative activities. New products and processes introduced over the last few years by their enterprises have, the respondents said, been mainly developed internally, while others have been acquired from local technology centres or foreign research institutes. The inadequate supply of industrially applicable university knowledge and the weak alliance between university and industry actors were both noted as factors limiting the transfer of innovation to industrial enterprises.

Most industry respondents' knowledge of IP systems was limited to the technical requirements for IP protection. While the views expressed by industry respondents varied according to their level of understanding of the subject matter, some opinions were found to be shared among respondents. First, they agree on the need to view the issue of IP, in the context of current STI policy efforts in Ethiopia, as a tool for potentially facilitating the development of domestic technological capability – with industrial enterprises used as loci of innovation. Second, they agree on the need to eliminate barriers constraining industrial enterprises in their efforts to access university knowledge. Third, respondents said they believe that there is a need to devise mechanisms that will stimulate university researchers to engage in industrially applicable research. Finally, industry respondents cited the need for balance between measures stimulating industry-oriented university research and measures ensuring improved access to university knowledge by industry.

Similar to the other two stakeholder groups surveyed, the academic researcher respondents demonstrated a low level of awareness and understanding of IP. The limited IP expertise that can be found at universities is apparently concentrated in the schools of law, which offer semester-long courses in IP. I found the lack of IP awareness surprising, given that the respondents who participated in this study are directly involved in research or research management at their respective universities. (It was therefore presumed that they would have an interest in IP in the university context and a greater level of understanding of the topic.) The researchers' primary concern is apparently funding. The respondents stated that inadequate funds hinder their ability to carry out meaningful research that

will be considered worthy of industrial application. Also cited as problems were: inadequate research facilities; a shortage of qualified research staff; a lack of information resources; a lack of institutional incentive mechanisms; and a lack of clear research strategy. Researcher respondents were also critical of the heavy teaching loads and administrative burdens faced by most university professors, limiting their involvement in research.

The university researcher respondents indicated that the direct commercialisation of research outputs is not an incentive that drives research. Furthermore, they indicated that IP considerations play a negligible role in the transfer of university research output to industry. However, respondents were of the view that as long as mandatory requirements on patenting research are not imposed on researchers, IP can be used as but one in an array of mechanisms for the transfer of university-generated knowledge to industry. Conferences, workshops, journal articles and personnel mobility – more than IP rights – were all identified as the prevailing mechanisms for the dissemination of university research results.

The researcher respondents indicated that the potential mutual benefits that can accrue from universities working closely with industry include networking and researcher access to industry partners, access to industry laboratories and equipment, and financial benefits from consulting activities. Respondents did not place importance on the generation of income through IP protection for university research. According to the responses, the focus should be on improving knowledge transfer between universities and industry, and the patenting and licensing of university knowledge should be viewed as an option for income generation only so long as it does not constrain the academic objectives of open science. They consider IP as but one mechanism for commercialisation of university research, not as a default option.

## **5. Conclusions and recommendations**

Ethiopia's national STI Policy of 2012 envisions building of capabilities to enable rapid learning, adaptation and utilisation of effective foreign technologies. The realisation of this vision depends on the existence of institutional structures that support the process of technological learning and innovation. Publicly funded university research, which forms an important element of such structures, can play a central role in the process of technological catch-up called for by the Policy of 2012, especially catch-up through adaptation of foreign technologies to suit local conditions. Promoting innovation in industrial enterprises requires wide dissemination of technology research outputs generated by universities.

Universities in Ethiopia were found by this study to be playing only a limited role as research centres for the adaptation of foreign technologies and as sources of knowledge for problems affecting industry. They have weak research capacities, both in terms of infrastructure and qualified manpower. Furthermore, the research activity in these institutions (what little there is of it) was found to be not aligned with the needs of industry, and thus it has little relevance to the economy. University institutional IP policies that prioritise patenting of academic inventions have the potential to further limit the degree and rate of academic knowledge transfer, thus slowing the rate of innovation.

The capacity of firms to absorb externally generated knowledge is an equally important issue for facilitating university knowledge transfer. Ethiopian firms are significantly limited in their capacity to seek out and make effective use of externally generated knowledge, due to a lack of investment in building internal research and innovation capacity. Companies depend heavily on minor in-house innovative activities aimed at adapting technologies to specific local circumstances. Moreover, most firms in Ethiopia operate on a small scale and face resource constraints, limiting their capacity to acquire university knowledge through mechanisms that may require some financial investment.

In this context, university–industry interactions that require less financial commitment by enterprises will contribute more effectively to the enhancement of technological capacities at the company level. For this reason, making university research available in the public domain could be a more effective way – more effective than the use of IP rights – of improving access to research knowledge by industry. Moreover, the Ethiopian government’s current emphasis, on IP protection for the transfer and commercialisation of publicly funded university research outputs, may have undesired consequences for the innovation process. Patenting of publicly funded university research should be considered the best option only when there is empirical evidence to suggest that other models of knowledge transfer would fail to ensure effective utilisation of the research outputs.

This study’s review of Ethiopian government policies clearly found that the underlying IP focus is on building the technological capability of local enterprises, by facilitating their access to improved technologies emerging from university research. The views expressed by the different stakeholders surveyed also emphasised the importance of strengthening the interaction between universities and industry through the flow of university knowledge. But there was a clear view among many of the researcher and industry respondents that the desired strong university–industry nexus is more likely to be achieved through encouraging knowledge transfer via open science methods – such as publications, conference presentations and informal contacts – than via formal technology transfer methods based on IP rights. Therefore, Ethiopia’s government actors and policy

community need to look beyond the current IP focus and seek the optimum balance between different models of university–industry knowledge transfer (with IP-related models as but one part of the mix).

For a developing country like Ethiopia, technological catch-up requires emphasis on the use of information in the public domain, not emphasis on privatisation of knowledge. The primary focus, therefore, should be on enhancing the research capacities of universities to improve the supply of research outputs with potential applications in industry. Rather than, or at least in addition to, relying on the privatisation of university research through IP, the research environment in universities can be improved by upgrading the skill levels of the researchers, increasing the research budgets, implementing a salary structure that incentivises research, and giving better recognition to the intellectual contributions of academic researchers. Such measures would, in this author's opinion, enhance universities' research performance and ensure wider dissemination of university knowledge for the improvement of social and economic returns from academic research.

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