

Edited by Małgorzata Runiewicz-Wardyn

Innovations and Emerging Technologies for the Prosperity and Quality of Life

The Case of Poland

 PWN

Edited by Małgorzata Runiewicz-Wardyn

Innovations and Emerging Technologies for the Prosperity and Quality of Life

The Case of Poland

Cover and title page design:

Piotr Fedorczyk

Cover photograph:

kentoh /Fotolia

Project editor:

Dorota Siudowska-Mieszkowska

Editorial coordinator:

Renata Ziółkowska

Copy editor:

Bogna Piotrowska

Production coordinator

Mariola Iwona Keppel

Typeset by

ALINEA

The book that you have purchased is the work of its author and publisher. Please respect their rights. You may make this book available free of charge to your family and friends, but do not publish it on the net. If you quote excerpts from it, do not change the original and always be sure to mention where they come from. And if you copy parts of it, do so only for your own use.

It is imperative that we respect other people's rights and property.

See more on www.legalnakultura.pl

Polska Izba Książki

Copyright © by Wydawnictwo Naukowe PWN SA
Warszawa 2016

ISBN 978-83-01-18675-3

First edition

Wydawnictwo Naukowe PWN SA
02-460 Warszawa, ul. Gottlieba Daimlera 2
tel 22 69 54 321, fax 22 69 54 288
infoline 801 33 33 88
e-mail: pwn@pwn.com.pl
www.pwn.pl

Printed and bound by OSDW Azymut Sp. z o.o.

Contents

Preface	7
Introduction	11
Chapter I	
Innovations and Technological Advances – Drivers and Challenges Related to the 21st Century	13
<i>Lech W. Zacher</i> Innovations for Socially Creating a Sustainable Future (conditions, necessary transformations, probable results)	15
<i>Janusz E. Dmochowski</i> Poland, 21st Century Technologies: Challenges and Solutions for the Global Society	33
<i>Joanna Żyra, Viktor Shevchuk</i> ICT, Innovations, Regional Growth and Wages in Poland	50
<i>Małgorzata Runiewicz-Wardyn</i> Innovations and Emerging Technologies as Drivers and Challenges of Economic Growth in the EU	69
Chapter II	
Entrepreneurship and Corporate R&D as Drivers of Innovations	87
<i>Hermann Simon</i> Hidden Champions as Drivers of Innovations	89
<i>Pietro Moncada-Paterno-Castello, Nicola Grassano</i> Innovation Without Corporate R&D? An Analysis of the Italian Case and Implications for Policy ..	98
Chapter III	
Sustainable Development: Facing Major Environmental Challenges of Poland and the EU	117
<i>Tomasz Winnicki</i> Separation Processes in Solving Strategic Environmental Problems	119
<i>Christopher George Gruszczynski</i> EU Emissions Trading System (ETS) Legislation Impact on Carbon Capture and Storage (CCS)	136

CONTENTS

Chapter IV	
The Role of Culture and Social Capital in Promoting Innovations and Competitive Advantages in High-Tech Industries	159
<i>Zbigniew Bochniarz, Katherine Faoro</i> The Role of Social Capital in Cluster and Regions' Performance: Comparing Aerospace Cases from Poland and USA	161
<i>Philip Kurz, Dirk Nicolas Wagner</i> Innovative and Entrepreneurial Opportunity Recognition – An Analytical Approach Using the Example of Poland	180
Chapter V	
Improving Quality of Life through Improved Public Services and Corporate Governance: The Case of Poland	199
<i>Marta Postula</i> The Innovative Tax Return System in Poland to Benefit Both the Taxpayers and Economy	201
<i>Barbara Kos, Joanna Kos-Labędowicz</i> The Application of ICT in Urban Transport	221
<i>Jerzy T. Skrzypek</i> The Economic Organization Platform with Cloud Computing Architecture as a Tool of Corporate Governance	238
Chapter VI	
The Ageing of the Population: Technology Solutions to Demographic Challenges in Poland	253
<i>Maria Zralek</i> The Elderly in the World of Modern Information and Communication Technologies	255
<i>Aldona Frączkiewicz-Wronka, Sabina Ostrowska</i> The Development of Health Security of Elderly Citizens through the Application of Information and Communication Technologies	266
Chapter VII	
Biotechnology Market in Poland: Selected Overview	287
<i>Barbara Kozierkiewicz</i> The Market for Clinical Research in Poland	289
List of contributors	307

Preface

Since the late 20th century we have witnessed a major acceleration of scientific and technological advance. The advent of the Internet as a result of a long term development process in the field of information and communication technologies in the mid-90's completely changed the innovation paradigm, making possible the reconfiguration of the process of disruptive innovation: a large new base of generic technologies was made available through a model that favoured new views and approaches, heavy user feedback and involvement and new methodologies for rapid prototyping and product / process initiation.

The nature of the new innovation process is very important, in the sense that it has set up and is being fed by new creative platforms where a lot of converging technologies meet, and in the process they generate new models for introducing new concepts and paradigms in an endless reconfiguration continuum. A major characteristic of these new platforms is that they do not necessarily need completely new technologies to run and produce their effects: the power of the platform approach resides in the self-organizing profile of open technologies and services that create new opportunities in driving forward convergence, which is the major model for disruptive new approaches in product / process generation. ICT emerged as a powerful enabler for global convergence, creating new devices and new services through an ever-progressing combination of features, generic technologies and scientific domains. New areas have emerged in biotechnology, medicine, chemistry, drug conception and production heavily impacted by ICT (in silico modes are overwhelmingly overtaking in vitro preparation in most of the aforementioned fields). New services have emerged for the citizen, that has now become the epicentre of a major remote access revolution covering information, banking, work, travel, leisure, and increasingly healthcare, security and communication.

The digital revolution has now entered a new phase with emphasis on data and analytics, promising to modify completely the production chain (industry 4.0, 3-D Printing, big data for cities management) as we knew it. A second wave of new and disruptive technologies has hit the market and makes already a huge impact on reconfiguring the technological offer available to modern economies.

Yet, conditions for the deployment and uptake of these technologies (and scientific breakthroughs) are not ideal; some countries are simply too far away from being able to follow the new achievements of the knowledge economy. Differences in knowledge and innovation capabilities are potentially big, and Europe is no exception in this respect. The knowledge economy has a price, and the more a country fails to adjust to the speed and depth of such technological change, the greater the risk of its being marginalized and

left out of the world game. The knowledge economy has changed dramatically the way countries integrate the global financial environment, creating harsh conditions in terms of competitiveness, growth and jobs, as several countries have difficulties in positioning themselves within the new global value chains.

It is precisely in this context that the added value of research and innovation can make a difference for countries under similar threats. More specifically, European countries that by definition adhere to the European social model of a social market economy, have no other alternative for regaining competitive advantage and repositioning themselves in the global economy. The real problem then for countries is how to maximize the quality of their research and innovation investment and design an effective strategy for setting up an efficient research and innovation ecosystem that is able to translate within reasonable timing these investments into tangible economic and social benefits.

Despite years of serious actions by the European Union using multiple funding streams and technical assistance (such as the Framework Programme for Research and Innovation, the Competitiveness and Innovation Framework Programme, the European Structural and Investment Funds and more recently the financial engineering tools introduced by the European Investment Bank), a huge innovation divide persists in Europe. Due to a host of structural reasons most countries of Central and Eastern Europe, as well as countries (and regions) in the South of Europe, present significant disparities in terms of research and innovation performance.

To fight against these disparities, Europe has a full array of programmes and tools that try to address the root causes of the problem, namely stimulate excellence in research and innovation communities, link better business, academia and government in innovation-driven partnerships, and cultivate competitiveness through research and innovation strategies for Smart Specialization (RIS3) at national and regional levels. Smart Specialization (a place-based growth strategy based on knowledge assets as priority drivers for economic development) is now earmarked in the new Cohesion Policy regulations as the pre-condition for any kind of support the ERDF would allocate to EU Member States for research and innovation investment (ex-ante conditionality). RIS3 points to an integrated strategy at local level for deep economic transformation, using new alternative routes for identifying investment priorities: Europe can only compete in global markets through knowledge investment, trying to outsmart its global partners with new ideas. This however is not possible without an integrated strategy to identify the best growth opportunities and drivers for economic change at national and regional levels. Such a strategy should be always bottom-up, involving a full participatory process of all living economic forces in a country or region, in particular all four parts of the so-called Quadruple Helix (academia, industry, government and civil society).

The European Commission has been fully supportive towards Member States' efforts for building RIS3 either at regional or national level. A RIS3 Platform has been established in the context of the Joint Research Institute (JRC), Institute for Prospective Technological Studies (IPTS) in Seville (Spain), where a dedicated team of officials and experts have been shouldering the initiatives of the MS and regions, through dedicated workshops, analytical tools, databases and guides, and a fully-fledged website. The website features also an

online database open to all interested parties (Eye@RIS3), covering the declared thematic priorities and orientations of the registered countries and regions in the database. This is an important tool that allows a better knowledge of peer priorities and a deeper understanding of trends in the European regional landscape.

With the process of planning almost completed at European level in terms of cohesion policy programming (2014-20), the attention of policy makers turns now to the challenge of implementation that calls even more forcefully for synergies and interactions with Horizon 2020, for which the European Commission published a thorough guide last year (2014). Horizon 2020 has no actions on capacity building in terms of cohesion policy, but has an important part on upgrading research and innovation performance for countries and regions that underperform. Part IV (Spreading excellence and widening participation) focuses thus on new Centres of Excellence (Teaming), extensive networking for upgrading quality and performance of involved institutions (Twinning) and an innovative action for bringing excellence in underperforming research institutions (European Research Area Chairs, or ERA Chairs). These activities are complemented through support to COST, the oldest intergovernmental cooperation framework in science, technology and innovation that has now an increased interest for the same group of underperforming countries.

This book is about the importance of knowledge and innovation for building competitive advantage in countries that need to reposition themselves at world level and gain an edge in the global economy. It focuses on Poland, one of the most dynamic European economies, engaged in a transition process. The European programmes and actions are well placed to support such efforts by offering opportunities and investment for a dynamic transformation: this is our global challenge for this young 21st century that unfolds.

Dr Dimitri CORPAKIS
Head of Unit RTD.B.5, Spreading excellence
and widening participation
Directorate for the Innovation Union and the ERA
Directorate General for Research and Innovation
European Commission

DISCLAIMER: “The views expressed here are strictly personal and do not necessarily reflect the official positions of the European Commission”.

Introduction

Emerging technologies, such as information technology, educational technologies, biotechnology, create the potential for greater efficiency, new business opportunities and economic growth. Therefore these technologies constitute an important strategic element defining the future of European Union (EU) in the 21st century.

The increased interest in emerging technologies and innovations not only is a result of the deepening knowledge regarding it and the complexity of the topic, but also reflects an appreciation of the important role they play in determining the economic welfare and quality of life in the EU. The European competitive advantage on global scene as well as its improvements in the quality of life is determined by the capacity of EU regions, communities and individuals to transform these advanced technologies into socio-economic benefits. Numerous political declarations and theoretical concepts emphasize their significance, but provide rather weak evidence of their role in the empirical studies. The emergence of these new technologies, and their increasing convergence present both opportunities and challenges, which should be investigated by researchers and further on considered by policy makers.

The following study discusses firstly, the role of emerging technologies and innovations in building economic prosperity and quality of life in Poland and the EU, and secondly point to the major present and future challenges related to these technologies on national, regional and individual levels.

The book contains seven chapters. The first chapter opens the discussion on the drivers and socio-economic challenges, such as sustainability in relation with 21st century innovations and technological advances. The second chapter emphasizes the key role of private firms and clusters for the development and adoption of these technological advances and gives some possible policy actions to boost private R&D investments and innovative climate. The third chapter takes up the role of latest developments and innovations in meeting the challenges of environmental sustainability. The recent report of the 2030 Water Resource Group predicts that the worldwide water supply-to-demand gap is likely to reach approximately 40% by 2030 unless significant efficiency gains can be made. It further on predicts that by the year 2050, around 60% of the world's population could experience severe water shortages. In the EU, water scarcity and droughts already affect one third of the EU territory across different latitudes. The same chapter outlines some of the challenges and suggests some exploitable technological solutions in this field.

The fourth chapter discusses the important role played by the entrepreneurial culture, geographical proximity and social capital networking in enhancing innovations and

building competitive advantage of regions and communities. The ageing of the population presents vast societal challenges to ensuring that our infrastructures can support the needs of older people, enabling them to live healthy, independent, and productive lives. Technological change helps mitigate demographic challenges. Chapter five discusses the role of ICT for independent living and elderly care.

Technology advances enable public sector innovations and therefore improve quality and efficiency in public services. Therefore, chapter sixth discusses the improvements of the quality of life in Poland through smart regulations and an innovative tax return system. The importance of a sound tax return system should not be viewed only through the budgetary needs – it has important implications in terms of the allocation of economic resources. It affects key economic decisions, such as investment into physical and human capital as well as the decisions to engage in entrepreneurial and innovation activities. Therefore, the proper design of revenue systems represents a key determinant of growth performance and overall standard of living.

Finally, chapter seven presents valuable views on the current state and future prospects of clinical research industry in Poland – the country that remains the largest clinical trials market in the Central Eastern European region.