

# **Towards the Third Generation University**

**Managing the university in transition  
by  
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# Contents

Contents

Figures

Tables and boxes

Acknowledgements

Introduction and summary

Part I

TOWARDS THE THIRD GENERATION UNIVERSITY

.....	2
.....	<b>Error! Bookmark not defined.</b>
.....	<b>Error! Bookmark not defined.</b>
.....	<b>Error! Bookmark not defined.</b>
.....	4
.....	<b>Error! Bookmark not defined.</b>
.....	<b>Error! Bookmark not defined.</b>
1. From the Medieval and Humboldt University to the Third Generation University .....	<b>Error!</b>
<b>Bookmark not defined.</b>	
1.1 Three phases of university development.....	<b>Error! Bookmark not defined.</b>
1.2 The Medieval University .....	<b>Error! Bookmark not defined.</b>
1.3 The First Transition Period .....	<b>Error! Bookmark not defined.</b>
1.4 The Humboldt University .....	<b>Error! Bookmark not defined.</b>
1.5 Limits to the Humboldt University and new opportunities...	<b>Error! Bookmark not defined.</b>
1.6 Summary: the Second Transition Period.....	<b>Error! Bookmark not defined.</b>
2. Contours of the Third Generation University.....	<b>Error! Bookmark not defined.</b>
2.1 The Cambridge Phenomenon .....	<b>Error! Bookmark not defined.</b>
2.2 The nine characteristics of the Third Generation University.....	<b>Error! Bookmark not defined.</b>
<b>defined.</b>	
2.3 Summary: 3GU Octagon .....	<b>Error! Bookmark not defined.</b>
3. Two case studies .....	<b>Error! Bookmark not defined.</b>
3.1 A classification of universities.....	<b>Error! Bookmark not defined.</b>
3.2 Case 1 - Institut Teknologi Bandung .....	<b>Error! Bookmark not defined.</b>
3.3 Case 2 - Wroclaw University of Technology.....	<b>Error! Bookmark not defined.</b>
2.4 Conclusions: three stages of university development .....	<b>Error! Bookmark not defined.</b>
PART II.....	<b>Error! Bookmark not defined.</b>
KNOW-HOW CREATION AND EXPLOITATION.....	<b>Error! Bookmark not defined.</b>

4. Creation of knowledge and value in industry .....	<b>Error! Bookmark not defined.</b>
4.1 Evolution in industrial research: the first four regimes .....	<b>Error! Bookmark not defined.</b>
4.2 Research at Royal Dutch Shell.....	<b>Error! Bookmark not defined.</b>
4.3 The fifth regime: Tech-Business.....	<b>Error! Bookmark not defined.</b>
4.4 Creating value from knowledge: Open Innovation.....	<b>Error! Bookmark not defined.</b>
4.5 Summary .....	<b>Error! Bookmark not defined.</b>
5. Technostarters .....	<b>Error! Bookmark not defined.</b>
5.1 Meet technostarters .....	<b>Error! Bookmark not defined.</b>
5.2 What makes a technostarter?.....	<b>Error! Bookmark not defined.</b>
5.3 The impact of technostarters .....	<b>Error! Bookmark not defined.</b>
5.4 The role of universities .....	<b>Error! Bookmark not defined.</b>
5.5 Summary .....	<b>Error! Bookmark not defined.</b>
6. Financing technostarters and spinouts .....	<b>Error! Bookmark not defined.</b>
6.1 Financing a start-up.....	<b>Error! Bookmark not defined.</b>
6.2 Private equity, venture capital and business angels.....	<b>Error! Bookmark not defined.</b>
6.3 Investment Funds .....	<b>Error! Bookmark not defined.</b>
6.4 Financing and IPR strategies .....	<b>Error! Bookmark not defined.</b>
Part III.....	<b>Error! Bookmark not defined.</b>
ORGANISING THE THIRD GENERATION UNIVERSITY.....	<b>Error! Bookmark not defined.</b>
7. Organisational structure and management style.....	<b>Error! Bookmark not defined.</b>
7.1 Organisational structure .....	<b>Error! Bookmark not defined.</b>
7.2 The management structure .....	<b>Error! Bookmark not defined.</b>
7.3 Financing the 3GU.....	<b>Error! Bookmark not defined.</b>
7.4 Good university management.....	<b>Error! Bookmark not defined.</b>
8. The know-how commercialisation function .....	<b>Error! Bookmark not defined.</b>
8.1 The market of Know-how Commercialisation .....	<b>Error! Bookmark not defined.</b>
8.2 Organising cooperation and commercialisation of know-how .....	<b>Error! Bookmark not defined.</b>
8.3 The Technostart team in detail.....	<b>Error! Bookmark not defined.</b>
9. Implementation and assessment of 3GU .....	<b>Error! Bookmark not defined.</b>
9.1 Change management.....	<b>Error! Bookmark not defined.</b>
9.2 Intervention model .....	<b>Error! Bookmark not defined.</b>
9.3 Assessing progress: the Triple Six Model .....	<b>Error! Bookmark not defined.</b>
9.4 Conclusion.....	<b>Error! Bookmark not defined.</b>
Appendix I. Understanding innovation .....	<b>Error! Bookmark not defined.</b>
I.1 Innovation and entrepreneurs.....	<b>Error! Bookmark not defined.</b>
I.2 Technology, invention, innovation .....	<b>Error! Bookmark not defined.</b>
I.3 Technological dynamics .....	<b>Error! Bookmark not defined.</b>
I.4 Product and process innovations and standards.....	<b>Error! Bookmark not defined.</b>
I.5 The Innovation Pentagon .....	<b>Error! Bookmark not defined.</b>

Appendix II. Educating technostarters .....	<b>Error! Bookmark not defined.</b>
II.1 The funnel model and synchronised education .....	<b>Error! Bookmark not defined.</b>
II.2 Is teaching entrepreneurship compatible with scientific education? ..	<b>Error! Bookmark not defined.</b>
II.3 Teaching entrepreneurship.....	<b>Error! Bookmark not defined.</b>
II.4 Getting started .....	<b>Error! Bookmark not defined.</b>
II.5 Minors in entrepreneurship.....	<b>Error! Bookmark not defined.</b>
Bibliography .....	<b>Error! Bookmark not defined.</b>
Glossary .....	<b>Error! Bookmark not defined.</b>
Notes and references.....	<b>Error! Bookmark not defined.</b>
Index	

## Introduction and summary

Universities are changing in a fundamental way, moving from the model of the science-based university that emerged after the Napoleonic period into what we will call the *Third Generation University* or 3GU for short. Several forces propel this change. The first is that top universities that want to continue carrying out cutting-edge scientific research are seeking alternative funding as the cost of such research has risen above the budgets that governments can provide. As a result, leading universities across the world are seeking collaboration with technology-driven enterprises. This coincides with a second force, which makes technology-driven enterprises discontinue carrying out fundamental research themselves, seeking instead collaboration with universities of a high standard to work jointly on basic research projects that they consider of vital importance for their future competitive power. As a result, the once separated worlds of academic and industrial research increasingly intertwine.

The third force is globalisation, which does not stop at the gates of the universities. Most universities used to have a *de facto* regional monopoly concerning the intake of students. With the improved opportunities to study abroad and the increased mobility of students, universities are now actively competing for the best students. Academics have likewise become more mobile with ambitious scientists seeking the best career opportunities on the global academic market, enabling top universities addressing a global market for their academic staff. Thirdly, the improved means of communication and the low cost of international travel enable technical corporations to address a global market for farming out research activities, especially activities concerning fundamental research. This has created a threefold global competition between universities: for the best students, the best academics and the best research contracts. The result of this threefold competition is a rapidly increasing gap between top and lesser

universities. The winners of this race are those universities that manage to become the nucleus of an international know-how hub, a site of international excellence where academic institutions mix with institutions of industrial and other research, a place that no-one in the field of interest can miss: students, academics, corporations.

The fourth force has its roots in the changing perspective of national governments. In the epoch of the science-based or Second Generation Universities, governments were content with universities carrying out scientific research and providing scientific education. Now they also see universities as incubators of new science- or technology-based commercial activities, whether by existing firms or start-ups. Hence, governments demand that universities take an active role in the exploitation of their knowledge and they make funds available to support such activities. Thus, universities have become explicit instruments of economic development in the knowledge-based economy. Second Generation universities (2GU) focused on pure science and did not regard the application of their know-how as their task. In contrast, Third Generation Universities actively pursue the exploitation or commercialisation of the knowledge they create, making it their third objective, equal in importance to the objectives of scientific research and education. Know-how exploitation includes an active involvement in stimulating technostarters – students or academics who start their own technology-based firm. Leading US universities such as Massachusetts Institute of Technology (MIT), Stanford University and Harvard University as well as European role models such as the University of Cambridge and the Catholic University of Leuven, show the way.

There is a fifth force of a quite different nature. Research in the Second Generation University era was mainly monodisciplinary. Nowadays, the vast majority of scientists work in interdisciplinary teams that focus on specific research areas; Master's courses are often connected to such research teams. In the monodisciplinary epoch, faculties were the perfect organisational form. For interdisciplinary teams, faculties however are an obstacle and new organisational forms have to be sought. This goes up to new organisational forms for university management, which has to create responsibilities for the task of know-how exploitation and that has to adapt in order to remain effective in a time of increasing size and complexity.

A sixth driver is a reaction to the massive increase in the number of students that began during the 1960s and led to large-scale universities with increased government spending and controls. This made universities bureaucratic and they had to find new ways to ensure effective management. The soaring of student numbers led to mass education, which diluted the scientific element in academic education. Universities are now experimenting with special courses for the best and brightest, students and staff, bringing scientific education back to the ideals of the Renaissance and the Enlightenment.

The seventh and last force is the creation, by government departments, of their own, dedicated research establishments, the ‘third way’ of R&D, located between academic and industrial research and having links with both. This started, at the end of the 19<sup>th</sup> century, with institutes for applied research in agriculture. The enormous success of these institutions in improving the quantity and quality of food triggered, as from the 1930s, the creation of government-sponsored institutes for applied research in specific industrial areas. The military already had a much older tradition of government-sponsored research. The phenomenon of dedicated government-sponsored research institutes accelerated with the creation of specific national and international research institutions such as the National Aeronautics and Space Administration (NASA), the European Organisation for Nuclear Research (CERN), the European Space Agency (ESA) and many others. These institutions offer challenges to academic and industrial research while they also offer large-scale opportunities as they farm out a great deal of their R&D activities to universities and industrial corporations, mostly on the basis of competitive offers.

- Rising cost of top research, requiring top universities to seek alternative funding
- Technology-driven enterprises farm out fundamental research
- International competition in academic education, academic employment and industrial research contracts
- Emerging role of universities as an instrument of the knowledge-based economy, leading to an active role in the exploitation of R&D (third university objective)
- Rise of interdisciplinary research
- Bifurcation of university education into standard education and education for the intellectual elite
- Rise of government-sponsored independent research institutions

Box 0.1. Driving forces of the Third Generation University

In conclusion, one may say that the external and the internal landscapes of universities as well as their ambitions are changing in a fundamental way. Universities are used to accommodate new developments by adding, say, a new faculty for a scientific subject on the rise. The present field of developments however calls for a new perspective, a new paradigm for universities, rather than just adding say a department for technology transfer or an incubator for technostarters. For readers of Alvin Toffler’s *Third Wave*, it will come as no surprise that the three generations of universities coincide with the three ‘waves’ of human development he describes. Like his book, ours is not strictly a scientific book but rather a motivated view of what is likely to happen and a consultant’s guide for getting there. A number of universities have adopted the 3GU principles as guidelines for their development although they may deviate in details from the descriptions presented in this book.

At this point, we need to clarify the author's position on the Third Generation University. It is our opinion that the 3GU is both inevitable and desirable. It is *inevitable* because the trends that are destroying the 2GU model cannot be ignored:

1. The pressures on quality that are the result of a massive influx of students since the 1960s
2. The impossibility to govern universities in the traditional way as a result of the increase in student numbers and the resulting strong intertwining with government departments
3. Globalisation, which also affects universities and leads to competition on three fronts: students, academics and research contracts
4. The rise of interdisciplinary research and the resulting frictions with the faculty organisation
5. The increased cost of cutting-edge research
6. The challenges offered by the establishment of specialised top research institutes outside the universities
7. Government demands that universities play a role in technology-based economic growth in the knowledge-based economy
8. The opening up of corporate research and the opportunities offered by collaboration with industry as a consequence
9. The rise of academic entrepreneurship, kicked off by the university-driven IT companies in the US.

Although the 2GU had its charms and has brought us unprecedented wealth, it must not go down in history as a rosier picture ('free academic research') than it was; even Nobel laureates had to fight constantly for adequate budgets. In the 2GU epoch, the role of universities was limited to scientific research and education; it was considered wise not to bother them with the application of what they invented. This originated in the nineteenth century thinking in terms of specialisation: universities would generate the basic knowledge while companies and institutes for applied know-how would 'translate' it into practical solutions. That was the time that was; now, a new model must be found to cope with the trends mentioned above. The 3GU model gives the university more freedom to choose its own way. As we shall see, it has nine fundamental characteristics that offer challenges:

1. Fundamental research was and will be the core activity of the university.
2. Research is largely transdisciplinary or interdisciplinary.
3. 3GUs are network universities, collaborating with industry, private research and development (R&D), financiers, professional service providers and other universities via their knowledge carousel.
4. 3GUs operate in an internationally competitive market. They actively compete for the best academics, students and research contracts from industry.
5. 3GU's are two-track universities. While they cannot in general escape from being mass universities, they create special facilities for the best and brightest students and academics.
6. 3GUs embrace the concept of consilience and creativity as a driving force of similar importance to the rational scientific method.

7. 3GUs are cosmopolitan; they operate in an international setting with a wide and diverse range of staff and students; in this respect, they are close to the Medieval Universities. They employ the English language for all courses as the new lingua franca.
8. Exploitation of know-how becomes the third university objective as universities are seen as the cradle of new entrepreneurial activity in addition to the traditional tasks of research and education.
9. 3GUs will be financed by output financing rather than input financing. Input financing concerns the creation of capacity which is then combined with a government inspection system. Output financing means that research grants are tendered; any university can participate and only the best offers will win. State financing will no longer be direct but the state's funds will be transferred through independent institutions that finance research and education on a tender basis.

The last point does not mean that the state can stop supporting universities. Fundamental research can only be pursued at the top level if both state and industry contribute. The 3GU is not a commercial enterprise in which everything is geared to profit maximisation. It is not a kind of engineering bureau with some enhanced educational facilities. Rather, it continues to be true to its mission: to create new knowledge and to make education part of the knowledge-creating process. This mission has to be carried out in today's context. Doing that, as we shall see, is very rewarding and that makes the 3GU *desirable*.

This book sets out, first of all, to explore the historic development of universities (Chapter 1) which leads to a description of the contours of the university-to-come (Chapter 2). The University of Paris very much served as the role model for the Medieval or First Generation University while the Humboldt University of Berlin did this for the science-based or Second Generation University. We have chosen the University of Cambridge in the UK as the role model for the Third Generation University, the legislative and cultural environment of this university being closer to the majority of the world's universities than US universities such as MIT and Stanford that were earlier in adopting elements of the Third Generation University. In order to show that not only top universities can adopt Third Generation University principles, two universities that are working their way towards the 3GU model have been described as case studies; these are Institut Teknologi Bandung in Indonesia and the Technical University of Wroslaw in Poland (Chapter 3). These three chapters constitute Part I of the book; this part aims to outline the new paradigm for universities, in the historic context.

Part II of the book addresses the main partners of the Third Generation University: technology-based enterprises, technostarters and financiers for start-ups and young enterprises. Chapter 4 discusses developments in the way technology-based enterprises manage their research and development activities, using Shell Global Solutions as a case study. In the management of R&D a number of regimes can be distinguished that have been used in successive phases of



the development of such enterprises. The latest regime incorporates the concepts of Open Innovation and this matches the development in universities. Technostarters are the subject of Chapter 5, which describes their motivation and shows their impact on economic developments. The role of financiers has been essential in creating the successes of MIT's know-how hub, Silicon Valley, the 'Cambridge phenomenon' and many other examples of spinning out university knowledge through new ventures, whether at the initiative of enterprising students or staff members or the university itself. Chapter 6 describes the different kinds of financiers and the way in which they operate and make deals. For many university leaders this is new material. However, a university that does not understand angel and venture capital financing is like a farmer who does not understand rain.

Part III discusses the way in which changes in the university's mission should be reflected in organisational changes. This is the 'how-to' part of the book; it may be of great interest to university leaders and policymakers who face the implementation problems of universities during the transition stage. The changing emphasis on what we call interdisciplinary research has organisational consequences: a shift from the faculty structure to a unit management structure in the form of relatively independent University Institutes. Such Institutes will become the main organisational elements of a university with faculties eventually disappearing. A five-member Board of Management creates clear responsibilities for the three university objectives as well as general leadership and the responsibility for finances. Many countries are attempting to replace the input-based financing system by output-based financing. Such a change is mandatory for universities to become less intertwined with the Ministries of Education and Science and hence become more governable. This concept has tremendous consequences, the possibility for universities to go bankrupt being one of them. Chapter 7 ends with a discussion on university management. Like professional service firms, many universities are managed by the principles of the management of industrial organisations. This does not fit the academic context and causes unnecessary loss of motivation and effectiveness. We need a new understanding of how to manage (or, rather, not manage) professional service firms including universities. Chapter 8 focuses on the organisation of the know-how commercialisation function. This represents a new element in universities, which often lack even a marketing department. Management of know-how exploitation requires first of all an overview of the many ways in which a university can dissipate its know-how while maintaining its academic integrity. The structure and the respective tasks of the know-how commercialisation function follow this overview. Finally, the chapter focuses on the support activities for technostarters. Chapter 9 addresses the issue of change management, starting with some observations on attitudes towards change and possible strategies. The chapter then proceeds by outlining an intervention model according to the step-by-step method, working at three levels: overall strategy, structure and culture, academic education and non-academic support. This model was used successfully to help migrating universities from the 2GU to the 3GU model. A description of the Triple Six model by which progress can be monitored,

concludes the chapter and Part III. Appendix I describes basic mechanisms of technological development and innovation while Appendix II discusses models for education in entrepreneurship and the creation of awareness based on the 'funnel model' for educational activities and the concept of 'synchronised education'. A Bibliography and an extensive Glossary complete the book.

This book was written for university leaders to help them find the route to the future and offer practical advice on implementing the necessary changes. It was equally written for the university's partners: technology-based enterprises, technostarters and financiers, to help them see their role in the context of the changing university. Academics that are in charge of courses in entrepreneurship can benefit, and so can those in charge of know-how commercialisation and services for technostarters. We hope the book will also find its way to governmental departments and advisory committees on higher education as many countries are drafting new policies on innovation in which universities play a pivotal role. Higher Education Policy is being discussed in about every country in the world. May it lead to challenging discussions and ultimately to change, because whether one likes it or not, change is inevitable and it is always wise to think and act proactively rather than to be taken by surprise.