Doctoral Education at Warsaw University of Technology

Andrzej Krasniewski
OUTLINE

- **Background: Doctoral education in Poland after 1989**
- **Developments in doctoral education at Warsaw University of Technology**
  - PhD programme at Faculty of Electronics & Information Technology
  - developments at the University level
- **Conclusion**
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Two paths to a doctoral degree

- "unstructured" (individual) education
- "structured" education (doctoral study programmes)

<table>
<thead>
<tr>
<th>Organisation of doctoral education</th>
<th>Number of countries</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual education only (1)</td>
<td>5</td>
<td>Bosnia-Herzegovina, Cyprus, Georgia, Malta, Montenegro</td>
</tr>
<tr>
<td>Structured programmes only (2)</td>
<td>4</td>
<td>Croatia, Estonia, Lithuania, Spain</td>
</tr>
<tr>
<td>Doctoral/graduate research schools only (3)</td>
<td>3</td>
<td>France, Liechtenstein, Turkey</td>
</tr>
<tr>
<td>Mixed (1) and (2)</td>
<td>12</td>
<td>Andorra, Austria, Belgium-Flanders, Czech Republic, Greece, Iceland, Ireland, Latvia, Poland, Romania, Russia, Slovak Republic</td>
</tr>
<tr>
<td>Mixed (2) and (3)</td>
<td>2</td>
<td>Italy, Norway</td>
</tr>
<tr>
<td>Mixed (1) and (3)</td>
<td>2</td>
<td>Belgium-Wallonia, Netherlands</td>
</tr>
<tr>
<td>Mixed (1), (2) and (3)</td>
<td>9</td>
<td>Albania, Armenia, Germany, Denmark, Finland, Sweden, Switzerland, UK and Scotland</td>
</tr>
</tbody>
</table>

source: Doctoral Programmes in Europe’s Universities: Achievements and Challenges, EUA 2007
Growing number of PhD candidates

- **social and economic changes**
  - recognition of the impact of PhD on well-being and position in the society

- **new rules for financing HEIs**
  - no. PhD students strongly affects the allocation of public funds to HEIs

**PhD students**

<table>
<thead>
<tr>
<th></th>
<th>1990/91</th>
<th>2008/09</th>
</tr>
</thead>
<tbody>
<tr>
<td>2695</td>
<td>~6000</td>
<td>32494</td>
</tr>
</tbody>
</table>

*source: Central Statistical Office, 2009*
Problems and challenges (1)

Traditional separation of MSc and PhD programmes

- low number of courses intended for PhD candidates
  - low flexibility and attractiveness of the curriculum
- PhD research frequently unrelated to work done at the Master’s level
  - long time to degree
Problems and challenges (2)

Unattractive financial status of students

- only 40% of doctoral students receive scholarships (from university or faculty budget)
- scholarships are low (300-450 euro/months)
- new forms of financial aid (from university or faculty budget) available since 2006 – insufficient
- limited opportunities for extra support from research projects

- little attractiveness of PhD study programmes for potentially best candidates
- part-time or full-time employment outside university
  → large number of dismissals
  slow progress in research (long time to degree)
age of PhD recipients

source: Central Statistical Office 2004
Problems and challenges (3)

Mismatch of training goals with needs of labour market

- ca. 5500 PhD degrees awarded each year
- limited opportunities for hiring at HEIs (saturation or decrease in the number of students predicted)

Professional careers outside of academia

At most HEIs, no serious attempts to adapt

Doctoral education still, in principle, oriented towards future university employees
Funding for PhD studies is very limited in Poland and should be expanded. … In any event, if the human resource base in the Polish research system is to be secured and enhanced, both policy making and policy implementation need to pay more attention to the funding of younger researchers, both pre- and post-PhD. In addition to specific support grants for PhD students, consideration should be given to creating special funding streams to support the research projects of younger researchers.
Background: Doctoral education in Poland after 1989

Developments in doctoral education at Warsaw University of Technology

- PhD programme at Faculty of Electronics & Information Technology
- developments at the University level

Conclusion
Warsaw University of Technology (WUT)

- 32000 students, incl. 900 PhD students
- 2400 academic staff (550 professors)
- 19 faculties
- decentralised model of PhD education
  - programmes offered by faculties
  - basic regulations by WUT Senate and Rector
- large differences in the number of PhD candidates at individual faculties
PhD programmes – selected regulations

- 4-year programmes (can be extended by one year)
- admission requirement - MSc degree
- supervised research work + coursework
- curriculum requirements determined by the Faculty Council
- no tuition fee for full-time students
- full-time students can apply for scholarships (teaching duties)
- Director of PhD programme (at faculty level) - in charge of administration
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Faculty of Electronics and Information Technology

- 4000 students, incl. 200 PhD students
- 310 academic staff (70 professors)
- entitled to award PhD degrees in
  - electronics
  - control & robotics
  - informatics (computer science)
  - telecommunications
**PhD programme**

*part of three-cycle study system*

- **1990**
  - 1st cycle
- **2000**
  - 2nd cycle
  - 3rd cycle
- **2005**
  - >10 years of experience
- **2010**
  - PhD

**Study system at Faculty of E&IT**

- Bologna Process
  - Berlin Communiqué
  - Bologna Declaration

- Candidates from outside the Faculty

Doctoral Education at Warsaw University of Technology
## Curriculum requirements

- **core component - original research (starts at 1st semester)**
- **flexibility (in selecting taught components)**

<table>
<thead>
<tr>
<th>Course Type</th>
<th>ECTS Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-engineering courses</td>
<td>6</td>
</tr>
<tr>
<td>non-advanced courses in engineering</td>
<td>8</td>
</tr>
<tr>
<td>advanced math and science courses</td>
<td>12</td>
</tr>
<tr>
<td>advanced specialization-oriented courses</td>
<td>12</td>
</tr>
<tr>
<td>advanced courses</td>
<td>18</td>
</tr>
<tr>
<td>PhD seminar (7 semesters)</td>
<td>14</td>
</tr>
<tr>
<td>PhD research (7 semesters)</td>
<td>140</td>
</tr>
<tr>
<td>editing PhD thesis</td>
<td>30</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>240</strong></td>
</tr>
</tbody>
</table>

- < 25%
Integration with MSc programme

*uncommon in Poland !!!*

- common course offer for both MSc students and PhD candidates
  - > 100 advanced courses
    - (in math & science and electronics & IT)
  - solution to ‘unsolvable’ problem of providing PhD candidates with a large number of elective courses

- partial credit transfer MSc → PhD

- administrative procedures (registration for courses, …)
  - same as for the second-cycle studies
### Credit Transfer MSc → PhD

<table>
<thead>
<tr>
<th>Course</th>
<th>ECTS Points</th>
<th>Max Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-engineering courses</td>
<td>6</td>
<td>4</td>
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**Equivalent to one semester**

For most candidates, the course load reduced to < 30 ECTS.
Support for interdisciplinary training

- PhD programme open to candidates with non-engineering background
- flexibility of curriculum requirements (courses can be taken at other engineering and non-engineering HEIs)

Research (PhD theses) outside traditional disciplines represented at the Faculty

- Electronics and Information Technology
- Biology
- Chemistry
- Medicine
- Economy
- Molecular computing
- Biomedical engineering
- E-commerce (technical aspects)

uncommon in Poland !!!
Clearly defined and transparent organisation

Areas of decision making and duties
- Rector
- Faculty Council
- Dean
- Director of PhD Program
- Director of Institute
- Head of Research Lab
- Supervisor

Tasks and duties of supervisor

Duties of PhD candidate
admission of almost all candidates approved by their future advisors 
(background and past performance – less critical)
Supervision, monitoring and QA

**advisor/supervisor**
- assistance in development of individual study programme (selection of courses)
- assistance in development of research plan
- monitoring of student’s progress in research and providing student with feedback
- assessment of student’s research report (submitted at the end of each semester), including comments
- assessment of student’s seminar presentations

**Director of PhD Programme**
- final assessment of student’s research report and advisor’s comments
- monitoring of student’s progress in coursework
- monitoring of student’s performance in teaching

- thorough examination of progress (each semester)
- dismissing those who do not show adequate progress
Funding

- Faculty scholarships for all PhD candidates who apply for a scholarship (ca. 50%)
- Special scholarships offered by University
- Support from research projects (national and European)
- Special Dean’s fund to encourage and support participation in international conferences, workshops, …
Funding research & research infrastructure

Faculty budget (2009): €25M

<table>
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<th>investments</th>
<th>research</th>
<th>education</th>
</tr>
</thead>
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<tr>
<td>12%</td>
<td>40%</td>
<td>48%</td>
</tr>
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</table>

source: FEIT Dean’s Report, 2010

European funds (>€5M)
- Framework Programmes
- Structural Funds

*PhD candidates*  
- among major beneficiaries
Successful participation in FPs

awarded to Fac. of Electronics & IT and 5 other Polish research centres

Crystal Brussels Sprout (Kryształowa Brukselka) for outstanding achievements in UE Framework Programmes in 1999-2009

31 May 2010
After 10 years – no. of students

- critical mass achieved

number of PhD students

2007
2008
2009
2006
2005
2004
2003
2002
2001
2000

200
150
100
50

good match with Faculty resources
After 10 years – completion rate

- growing „survival rate”

average time to degree: 10.9 semesters

years of studying

years of admission

completed programme (submitted thesis)
After 10 years – other indicators

- growing number of publications
  - ca. 10 publications on average (incl. papers in conference proceedings) at the time of thesis defence

- growing mobility based on formal and informal international cooperation

- growing number of theses written in English
  - < 20% in 2005-2008
  - 50% in 2009/2010
Stimulating research environment

- resources
  - academic staff (>70 professors)
  - research infrastructure
  - funding (scholarships + extra income from national and European research projects)

- critical mass: 200 PhD candidates

- wide spectrum of research areas (incl. multidisciplinary)

- large number of courses to support individual research work
Background: Doctoral education in Poland after 1989

Developments in doctoral education at Warsaw University of Technology

- PhD programme at Faculty of Electronics & Information Technology
  - developments at the University level

Conclusion
Evolution of University regulations

- inspired by developments at Faculty of E&IT
- adopted by WUT Senate

2005

- provision for double-degree PhD programmes
- flexible curriculum requirements
- obligatory training in transferable skills
- special provisions to support mobility

2007

- new forms of financial support for PhD candidates
- *The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers* - a reference in resolving problems
Extension of educational offer

coordinated by
Centre for Advanced Studies

- advanced courses in math and science
- special courses to develop transferable skills and social sensitivity
- special-topic one-semester seminars
- special events
  - lectures by renowned visiting researchers
  - thematic workshops

support for annual conference of young researchers „Young researchers facing challenges of today’s technology” (organised by the University Council of Doctoral Candidates)
Course offer for PhD students - special courses (2008/2009)

Ethical aspects of intellectual property protection

Science and business: How do they do it in Cambridge?

Technical communication for researchers
development of transferable skills

special one-week sessions
run by professional trainers (2009/2010)

- Project management
- Project human resources management
- Interpersonal communication, assertiveness and handling emotions
- Negotiations and exploiting social intelligence for development of interpersonal relations
Inter-university cooperation

**Warsaw University of Technology**
- Faculty of Electronics and Information Technology
- Faculty of Mechatronics
- Faculty of Physics

**Inter-University Programme in Optoelectronics, Photonics and Nanotechnology**

**Warsaw University**
- Faculty of Mathematics, Informatics and Mechanics
- Faculty of Physics

**Military University of Technology**
PhD programmes taught in English

offered for 2010/2011

• Faculty of Architecture
• Faculty of Automotive and Construction Machinery Eng.
• Faculty of Chemical and Process Eng.
• Faculty of Chemistry
• Faculty of Civil Eng.
• Faculty of Electrical Eng.
• Faculty of Electronics and Information Technology
• Faculty of Environmental Eng.
• Faculty of Geodesy and Cartography
• Faculty of Mechatronics

• Faculty of Mathematics and Information Science
• Faculty of Physics
• Faculty of Power and Aeronautical Eng.
• Faculty of Production Eng.
• Faculty of Transport
• Faculty of Materials Science and Technology
• Faculty of Civil Eng., Mechanics and Petrochemistry (Plock)
• Faculty of Management
• Faculty of Administration and Social Science
Key issue – adequate funding

potential source of extra funding
EU structural funds (European Social Fund) - Operational Programme „Human Capital”
Extra funding

**successful application to ESF for €25M for 2008-2015**

*to support activities aimed at the enhancement of University human capital*

**essential component (€6M):**

- activities associated with training of early stage researchers
  - development of new advanced engineering and science courses
  - training in transferable skills for PhD candidates
  - scholarships for PhD candidates, incl. international candidates
  - scholarships for post-docs
  - visiting foreign institutions by young WUT scholars
  - visiting WUT by renowned scientists and researchers

coordinated by Centre for Advanced Studies
Extra funding

in 2009/2010
- 35 scholarships for PhD candidates (1-2 years)
- 16 scholarships for post-docs (2 years)
- 15 grants for PhD candidates to stay at research institutions abroad (1-6 months; 2000€/month)
Medal for a Young Scientist

established by WUT Senate in 2007

awarded each year
to a leading Polish young researcher
for outstanding achievements
in research and technical innovation
Looking to the future

problems and challenges

discussion on the model of doctoral education

nationwide debate on the model of academic/research career

institutional strategy:
model of doctoral education at WUT

trends observed in Europe and outside Europe

international debate on doctoral education
Model of doctoral education

WUT academic community
(academic staff, doctoral candidates, students)

Senate, Senate Committees

resolution of WUT Senate
19 Dec. 2007

employers & other external stakeholders

external academic community
(other universities, Academy of Sciences, …)

WUT mission

model of doctoral education
Model of doctoral education

- vision (ideas, rather than solutions)
- basis for future actions (evolutionary improvement)
- some controversial, questionable statements - formulated to stimulate future discussion
Model of doctoral education

Key features

- diversification of educational offer: programmes addressed to different target groups
- openness to candidates with different background, including graduates from non-engineering HEIs
- more emphasis on development of transferable skills and social sensitivity
- intensive cooperation with other institutions in Poland and abroad
- high degree of internationalisation
- special emphasis on supervision
- adequate and sustainable funding
Special emphasis on supervision

- well defined rights and duties of each party
- procedure for resolving conflicts (may involve an ombudsman)
- option of collective supervision (joint, double or team supervision)

- special training for supervisors
- evaluation of the quality of supervision (by PhD candidates, PhD graduates, director of PhD programme, …)
Adequate and sustainable funding

- number of PhD candidates – highly weighted factor in formula-driven allocation of financial resources to individual faculties
- financial resources allocated to a faculty based on the number of its PhD candidates can only be used for financing PhD education
- combining different sources to increase income of good PhD candidates (scholarships, partial employment as TAs, work for research projects)
- commitment of the advisor on participation of the PhD candidate in externally funded research projects, incl. expected remuneration for the candidate – part of the admission procedure
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Conclusion
A long way to go

problems and challenges

discussion on the model of doctoral education

nationwide debate on the model of academic/research career

institutional strategy:
model of doctoral education at WUT

membership of EUA-CDE (June 2008)

trends observed in Europe and outside Europe

international debate on doctoral education

refinement & implementation
... but good prospects

- excellence in doctoral education
  - one of key strategic objectives of the Warsaw University of Technology
- better financing (EU funds)
- support of key stakeholders - PhD candidates
  - contribution to the work on the model of doctoral education at WUT
  - active promotion of the solutions adopted at WUT at the national level
more on doctoral education at WUT …

Publications (selected)


See you at Warsaw University of Technology!!!