Univerzitetna založba
Univerze v Mariboru

MARDS
Workshop proceedings

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University of Maribor

Faculty of Electrical Engineering
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November 2020

Title **MARDS Workshop Proceedings**

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Graphic material Authors

Published by **University of Maribor**
University Press
Slomškov trg 15, 2000 Maribor, Slovenia
https://press.um.si, zalozba@um.si

Co-published by **University of Maribor**
Faculty of Electrical Engineering and Computer Science
Koroška cesta 46, 2000 Maribor, Slovenija
https://feri.um.si, feri@um.si

Edition 1st

Publication type E-book

Available at http://press.um.si/index.php/ump/catalog/book/509

Published at Maribor, November 2020

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/ Univerza v Mariboru, Univerzitetna založba

Text / *Besedilo*
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CIP - Kataložni zapis o publikaciji
Univerzitetna knjižnica Maribor

378.22(497.4Maribor)(082)

MARDS Workshop Proceedings [Elektronski vir] / editors Matjaž Debevc, Irena Lovrenčič Držanič. - 1st ed. - E-knjiga. - Maribor : Univerzitetna založba Univerze, 2020

Način dostopa (URL): https://press.um.si/index.php/ump/catalog/book/509
ISBN 978-961-286-409-5
doi: doi.org/10.18690/978-961-286-409-5
1. Debevc, Matjaž
COBISS.SI-ID 38815235

ISBN 978-961-286-409-5 (pdf)

DOI https://doi.org/10.18690/978-961-286-409-5

Price Free copy

For publisher prof. dr. Zdravko Kačič,
rector of University of Maribor

University of Maribor Press

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Foreword

MATJAŽ DEBEVC

Information and Communication Technologies are also anchored strongly in the educational environment, especially in the academic and scientific environments. For proper use and progress, we need a properly educated staff who are capable of the highest level of synthesis and coordination of knowledge, experience, and independence in their research work. To this end, Higher Education Institutions strive to redesign Doctoral Study Programmes. Both Montenegro and Albania face a shortage of Doctoral students due to difficulties in funding research work and the poor visibility of Doctoral studies. Doctoral students also do not see it as attractive, due to problems with research and development overall funding.

A consortium of universities and ministries from different countries has, therefore, decided to reform Doctoral studies in accordance with the Salzburg Principles, and wants to offer students a sustainable model of study and research funding. To support the reform of Doctoral studies in Montenegro and Albania, the consortium acquired the MARDS project, entitled "Reform of Doctoral studies in Montenegro and Albania - a paradigm of good practice", which includes 15 partners who play an important role in shaping Doctoral Study Programmes in the region.

The goal of the MARDS project is to transform Doctoral studies in accordance with the Salzburg Principles, and to establish a joint interdisciplinary Doctoral Study Programme between neighbouring countries. The latter would deepen existing links between universities, and be an example of good practice in the Western Balkans. To this end, the partners reviewed the existing national regulations in Montenegro and Albania, compared their compliance with examples of good practice in the EU (Austria, Slovenia, Slovakia) and proposed a new Doctoral model and methods for sustainable funding of Doctoral studies at the national level.

An important three-day workshop was held in Maribor, which was intended to transfer skills and experience in the development of Doctoral Programmes at the University of Maribor to staff of universities in Montenegro and Albania. In this way, the experts wanted to improve the quality assurance of Doctoral studies, as well as the possibilities of professional and academic staff for the introduction of new rules on Doctoral Programmes.

In this proceeding, we combined the most important presentations and experiences of experts, who presented, among other things, the structure of Doctoral Programmes and experience in introducing a Doctoral Study Programme at the University of Maribor. The process of developing Doctoral Programmes at the Faculty of Agriculture and Biosystem Sciences was also presented in more detail. The requirements to be met by Doctoral Programmes, requirements for mentors, obligations and rights of Doctoral candidates and their mentors were presented additionally. In the proceedings we can also find a contribution on what we need for the procedures of confirmation, evaluation, and defence of a Doctoral Dissertation.

The proceedings undoubtedly provided an excellent insight into the system of preparation and implementation of Doctoral Schools, and, most importantly - the presented experiences offer a critical assessment of the applicability of new procedures in the development of Doctoral Study Programmes.

CHANGING DOCTORAL EDUCATION AT THE UNIVERSITY OF MARIBOR

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Abstract The paper gives an overview of changes in the European Higher Education Area regarding the Doctoral studies, and outlines the steps that the University of Maribor undertook to renovate the Doctoral studies in line with the Salzburg principles and Principles of Innovative Doctoral Education.

Keywords: innovative doctoral education, Salzburg principles, University of Maribor, changes.

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-409-5.1
ISBN 978-961-286-409-5

1 Introduction

The purpose of the Bologna process is the harmonisation of the Higher Education Area in Europe. The European Higher Education Area [1] (EHEA) is an international collaboration of 48 countries with different academic (as well as cultural and political) backgrounds, which are trying to implement a common set of commitments in Higher Education. The idea of the reformation of the Doctoral Studies originates from the Berlin Communique [2], where it was suggested to include the Doctoral level as the third cycle in the Bologna Process. The Conclusions and recommendations of the Bologna Seminar on "Doctoral Programmes for the European Knowledge Society" in 2005 gave the 10 basic principles of Doctoral studies, known as the Salzburg Principles I [3]:

1. The central component of Doctoral education is the advancement of knowledge through original research.
2. Integration into institutional strategies and policies (inter-sectorial cooperation).
3. The importance of diversity of Doctoral programmes in Europe.
4. Doctoral candidates are researchers in the early work period.
5. The key role of supervision and assessment (transparent contractual framework of shared responsibilities).
6. Achieving critical mass.
7. Duration of Doctoral study (usually 3-4 years).
8. The promotion of innovative structures (interdisciplinary).
9. Increasing mobility (intersectoral, interdisciplinary and international).
10. Ensuring adequate funding.

The Council for Doctoral Education [4] was established at The European University Association to support the changes in 2007. Based on the European universities' achievements since 2005 in implementing the Salzburg principles I, a second set of recommendations was released, known as Salzburg Principles II [5]:

1. The Doctorate must be based on the candidate's original research.
2. Supervision of Doctoral candidates is pivotal to Doctoral education.
3. Doctoral education is an institutional responsibility and requires a joint effort.

4. Institutional autonomy in the selection of goals and strategies and the establishment of suitable structures for Doctoral education (95 % of EUA members have established one or more Doctoral Schools since 2010).
5. Individualised Doctoral education (flexibility).
6. The Institution is responsible for the professional education of Doctoral candidates (transferable skills).

We can observe that the supervision of Doctoral students is common to Salzburg Principles I and II:

1. Supervision must be a joint effort with clearly defined and resolved responsibilities of the main supervisor, supervision group, Doctoral candidate, Doctoral School, research group and Institution that enables the individual development of the Doctoral candidate.
2. Ensuring the professional development of supervisors is an institutional responsibility, and can be organised through formal training, or informally by exchanging experiences between supervisors.
3. The development of a common supervision culture shared by both supervisors, Heads of Doctoral Schools and Doctoral candidates must be a priority for Doctoral Schools.
4. Supervisors must be active researchers.

Finally, to wrap up the discussions, development and achievements over almost a decade, The European Commission, Directorate-general for research & innovation, released 7 principles of innovative Doctoral education [5] in 2011. These are:

1. Research excellence (critical mass).
2. Attractive institutional environment.
3. Interdisciplinary research opportunities.
4. Cooperation with industry and other relevant employment sectors.
5. International cooperation (double / joint degrees, mobility).
6. Transferable skills.
7. Quality Assurance ("process-oriented QA").

The University of Maribor (UM) decided to transform the Doctoral studies in 2012 following the Salzburg principles and principles of Innovative Doctoral Education, with the goal to increase the quality of the Doctoral Theses at the Doctoral Study Programmes. In this contribution we outline the basic steps and challenges encountered during the process, which culminated in the Rules and Regulations on Doctoral Studies at the University of Maribor [6] (the Rules and Regulations in the following text) being adopted by the Senate of the University of Maribor in April 2018.

2 Reformation of the doctoral studies at UM

One of the drawbacks of the Doctoral studies as a third Bologna cycle is the danger of "pedagogisation" of the Doctoral studies, and unfortunately, several Doctoral Study Programmes at UM were caught in this trap. A change of mindset from the Doctoral education being a need for university (reproduction) was also required towards the Doctoral education as a need of the knowledge society. A survey among Doctoral students was performed in 2015, and the results were rather surprising: (i) The majority of Doctoral students had no previous research experience, (ii) Several Doctoral students were not included in research projects during the Doctoral studies, (iii) Only a minority of Doctoral students had experience in international mobility during the Doctoral studies and (iv) Doctoral students would welcome additional training in transferable skills.

The results of this survey were a kind of a shock for the academic community, which, until then, in general, felt no need for any changes. The discussions on the reformation of Doctoral study thus became very active in 2015, based on a draft of a new Act on the Doctoral studies at the University of Maribor, prepared by a Committee that was formed in 2013 with the goal to set the guidelines for the renovation of the Doctoral studies.

We decided on a step-wise approach. First, we set the starting points of the renovation of Doctoral studies by following the strategic goal for improvement of the quality of Doctoral study at UM (Figure 1), based on the $\boldsymbol{I^4}$-principle (Individualisation + Interdisciplinarity + Internationalisation + Intersectorial cooperation). The starting points were:

1. Ensuring the conditions that enable the highest and internationally comparable quality recognition of Doctorates awarded by UM.
2. Ensuring a critical mass of research activities in which Doctoral students can participate.
3. Ensuring internationally comparable quality of Doctoral Study Programmes, Doctoral candidates and their supervisors.
4. The rights and responsibilities of the Doctoral candidate, supervisor and Institution are defined clearly in advance.

Then, the discussion on specific topics followed, as described by the second author of this paper in the follow-on chapter. The process considered the views of all stakeholders, and aimed towards providing flexible solutions. We systemised unified support services and common content (transferable skills) for Doctoral education at UM. A common structure for all Doctoral Study Programmes was adopted, in order to enable interdisciplinary mobility, and to assure a research-based Doctoral education (as opposed to "pedagogical"-based study). The structure was adopted for both the 3 and 4-year Doctoral Study Programmes, and the following mandatory elements were set for all the Doctoral Study Programmes:

- Courses are designed with a number of credits (ECTS) divisible by 3 (6 ECTS are mostly preferable) to enable easier interdisciplinary mobility between Study Programmes;
- Individual research work is included in each semester from the first semester onwards, with a total of at least 120 or 180 ECTS credits for the 3-year and 4-year Doctoral studies, respectively;
- Organised forms of study, including parts of individual courses implemented as such, comprise exactly 60 ECTS, and from these
- Elective content comprises 18 ECTS at the minimum for the 3-year, and 24 ECTS for 4-year Doctoral Study Programmes;
- The first year of study includes a general course on different scientific research methods with at least 3 ECTS credits;
- The winter semester of one of the study years includes the "Transferable Knowledge" course (e.g. scientific writing, research ethics, negotiations, intellectual property, foreign scientific language, projects, communication, career development, and other transferable knowledge) with at least 3 ECTS credits.

Next, we aimed towards strengthening the internationalisation of Doctoral Study Programmes and the mobility of Doctoral candidates. A systematic transfer was developed of quality supervision practices to younger supervisors. A continuous monitoring of the quality indicators for Doctoral education was established, as well as mechanisms for appropriate adaptation. However, one crucial requirement for the high-quality Doctoral education, namely, stable funding at the national and institutional levels, has, unfortunately, not been realised yet, as reaching this goal requires systemic changes at the national level.

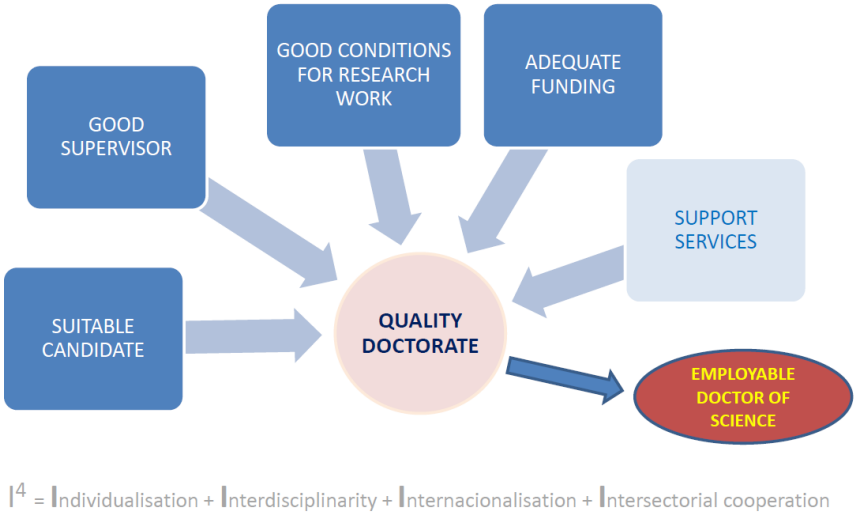

Figure 1: Components of a high-quality Doctoral education
Source: own

3 Conclusions

In this contribution we focus on the changes in the European University Area that led to the formalisation of the Doctoral studies as the third Bologna cycle. We outlined the steps undertaken by the UM towards the reformation of Doctoral studies. The final results of the process are manifested in the Rules and Regulations on Doctoral Studies at the University of Maribor [7] and are presented in another contribution to this monograph entitled *Systematic Quality Assurance of Doctoral Studies at the University of Maribor*, which focuses on the requirements and procedures that UM found most important for the Quality Assurance of Doctoral studies.

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[1] The English version of the Rules and Regulation on Doctoral Studies at the University of Maribor is being prepared, and will be available at the UM website. Until then, a draft version can be obtained on demand.

Systemic Quality Assurance of Doctoral Studies at the University of Maribor

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Abstract The paper gives an overview of the Rules and Regulations on Doctoral Studies at the University of Maribor, and focuses on the topics that the University of Maribor found to be most important in ensuring the quality of the scientific-research-based Doctoral studies.

Keywords: doctoral studies, rules and regulations, supervision, responsibilities, quality assurance

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-409-5.2
ISBN 978-961-286-409-5

1 Introduction

In 2012, the University of Maribor (UM) decided to transform Doctoral studies in order to increase the quality of the Doctoral Theses on the Doctoral Study Programmes. A Committee was formed with the goal to set the guidelines for the renovation of the Doctoral studies, and to prepare a draft of a new Act on the preparation and defence of the Doctoral Dissertation. The Committee met for the first time in 2013, and, in 2015, they handed a draft of a new Act on the Doctoral studies at the University of Maribor to the Vice-Rector for Education. A long-lasting discussion began at the university level, including the students, employees and leaderships of the 17 Faculties. A step-by-step approach was used. First, the characteristics of high-quality scientific-research-based Doctoral studies were discussed and adopted by the university Senate. Because the consensus on one Doctoral Study Programme that would comprise all the research fields of the university could not be achieved, we agreed on the term UM Doctoral School, to be used for all the Doctoral Study Programmes implemented at the Faculties. However, a Study Programme becomes a member of the UM Doctoral School only after meeting the minimum standards of excellence laid down by the new Rules and Regulations for the Doctoral Study Programmes. Then followed a discussion of parts of the new Rules and Regulations. The major discussion was on the critical mass for the accreditation and implementation of a Doctoral Study Programme, on the structure of the curriculum, on the requirements for the coordinators of the Doctoral Study Courses and supervisors of the Doctoral students, on the structure of the Committees to assess the proposal for the topic of the Doctoral Thesis and the Committees for the assessment and defence of the Doctoral Theses and, surprisingly, also on the rights and obligations of the Doctoral students and their supervisors. After three years of discussions and search for the best solutions, which include the specifics of different research fields, the Rules and Regulations on Doctoral Studies at the University of Maribor [1] (the Rules and Regulations in the following text) were adopted by the Senate of the University of Maribor on 17 April, 2018. So far, only approximately one third of the Faculties have transformed their Doctoral Study Programmes to be fully in line with the new Regulations. According to the Transitional provisions in the Rules and Regulations, in 2022 University of Maribor will open for application only those Doctoral Study Programmes that will meet the minimum standards determined by the Rules and Regulations. Until then, the Study Programmes which fall short on the new provision on the critical mass

and references of course coordinators are still open for application, providing that all the other minimum standards are met.

In what follows we shall run briefly through the Rules and Regulations, focusing on the requirements for the Doctoral Study Programmes, activities prior to enrolment and during the studies to assure the quality of Doctoral studies, requirements to complete the studies, division of responsibilities for Quality Assurance and Quality Assurance cycles.

2 Rules and regulations on doctoral studies at UM

The major sections and subsections of the Rules and Regulations are given in Figure 1. The systemic Quality Assurance of the Doctoral studies is achieved through the requirements for the Study Programmes, division of responsibilities and several Quality Assurance cycles, the major ones being performed through the activities prior to the enrolment, during the Doctoral study and the requirements to complete the studies.

2.1 Requirements for the Doctoral study programmes

The Slovenian Higher Education Act [2] defines the Doctoral Study Programmes to last for either 3 or 4 years. At UM, the proposal to set all the Doctoral Study Programmes to four years was not accepted, so our Rules and Regulations allow for both 3 and 4 year Study Programmes. Because we could not decide on having a smaller number of Doctoral Study Programmes (there are over 30 Study Programmes at the 17 Faculties), we agreed on a common structure of the curriculum, in order to enable students at one Study Programme to choose Courses also at other Study Programmes. All the Study Programmes contain a Course from the field of Scientific-research Methods and a Course on Transferable Knowledge. Because UM is a research based university, the Doctoral Study Programmes have to be based on the scientific research developed within the university. Each Study Programme contains Individual Research Work (IRW) in each semester. In all, 2/3 of total ECTS in a 3-year Study Programme, and 3/4 in a 4-year Study Programme are associated with IRW.

The critical mass for accreditation and implementation of a Doctoral Study Programme is at least six scientifically active Course Coordinators and Supervisors (at least four have to be employed at UM). Scientific activity is shown through relevant references, such as scientific articles published in journals with an impact factor (JCR) in the upper three quarters, scientific monographs or chapters in scientific monographs or patents with complete testing. Specific criteria were set for Social Sciences and Humanities where the SNIP impact factor and Scopus databases (d) and (h) are also considered as relevant. The minimum criteria for each Course Coordinator and Supervisor is at least three relevant publications in the past 5 years, where he or she has to be either the first or the leading author. As a rule, an individual Higher Education teacher is a Coordinator of only one Doctoral Study Course. The number of simultaneous supervisions of Doctoral students is limited to 5.

RULES AND REGULATIONS ON DOCTORAL STUDIES AT THE UNIVERSITY OF MARIBOR

I. **GENERAL PROVISIONS**
II. **DOCTORAL STUDY PROGRAMMES**
fundamental principles, types of doctoral study programmes, UM Doctoral School, duration and structure of the curriculum of doctoral study programmes, coordinators of doctoral study courses, supervisors of doctoral students, heads of doctoral study programmes
III. **ENROLMENT AND IMPLEMENTATION OF DOCTORAL STUDIES**
Enrolment, rights and obligations of doctoral students, rights and obligations of supervisors, obligations of institutions, monitoring study progress of doctoral students
IV. **DOCTORAL DISSERTATION TOPIC APPLICATION AND APPROVAL PROCEDURE**
beginning of the doctoral dissertation topic approval procedure, doctoral dissertation topic application, verifying the fulfilment of requirements for the doctoral dissertation topic application, processing the doctoral dissertation topic application by the competent chair/committee, expert opinion on the doctoral dissertation topic, processing the doctoral dissertation topic application by the competent committee of the member's senate, processing the doctoral dissertation topic application by the member's senate, processing the doctoral dissertation topic application by the competent committee of the UM Senate, deciding on the proposed doctoral dissertation topic and supervisor/co-supervisor at the UM Senate, subsequent change of the doctoral dissertation topic title
V. **PREPARATION AND SUBMISSION OF A DOCTORAL DISSERTATION**
doctoral dissertation content and form, language use in writing and defending the doctoral dissertation, checking the similarity between the doctoral dissertation content and other works, submission requirements and the submission of the doctoral dissertation
VI. **PRELIMINARY EXAMINATION OF THE DOCTORAL DISSERTATION**
purpose of the preliminary examination of the doctoral dissertation, committee for the preliminary examination of the doctoral dissertation, duties of doctoral dissertation examiners, deciding on the doctoral dissertation and defence
VII. **DEFENCE OF THE DOCTORAL DISSERTATION**
appointing the committee for the defence of the doctoral dissertation, time and place of a doctoral dissertation defence, public announcement of the doctoral dissertation and defence, doctoral dissertation defence procedure, doctoral student's withdrawal from the defence, unplanned absence or distance of a defence committee member, doctoral dissertation submission procedure, industrial property rights and other intellectual creations, intellectual creations of the student
VIII. **DOCTORAL PROMOTION CEREMONY**
fulfilling the promotion requirements and submitting the proposal to the Rector, promotion procedure, keeping a public record of awarded doctorates
IX. **MONITORING AND QUALITY ASSURANCE OF DOCTORAL STUDIES**
responsibility and accountability
X. **TRANSITIONAL AND FINAL PROVISIONS**

Figure 1: The structure of the Rules and Regulations on Doctoral Studies at the University of Maribor [1].

2.2 Enrolment and implementation of Doctoral studies

According to the Slovenian Higher Education Act anybody who achieved 300 ECTS for Higher Education studies can enrol to Doctoral studies. If the number of applicants exceeds the number of spaces advertised in the call for application, we have the possibility to set the selection rules. In general, this is not the case. In order to avoid the enrolment of candidates who are not aware of what Doctoral studies are (primarily, a scientific research and not passing the exams), we encourage the candidates to visit Faculties, find a tentative supervisor, narrow a research field and prepare a conceptual design of the research work prior to the enrolment. If a candidate has no tentative supervisor and the Faculty cannot find one (in agreement between the supervisor and the candidate), the candidate is notified in writing and advised against enrolment.

Upon enrolment, an Agreement on studies and supervision within a third-cycle Study Programme at the University of Maribor is signed by the candidate and the Faculty. The Agreement also contains the individual student's Study Programme with the area of research, a framework programme of the Doctoral student's research work, the intended Doctoral Study Programme Courses, the research programmes, projects, teams etc, in which the Doctoral student will be involved (as a part of Doctoral studies), and any other obligations, if relevant, in addition to those from the curriculum, which the Doctoral student is obliged to fulfil prior to the defence of the Doctoral Dissertation. The Agreement also contains the rights and obligations of the Doctoral student, and the obligations of the Doctoral study provider (these rights and obligations are defined in the Rules and Obligations).

A regular follow up of the Doctoral student`s progress is achieved through a written Annual Report on the fulfilled study obligations and the progress of the scientific research work. The Report is handed in by both the Doctoral student and supervisor (it can be a joint report). The Report is assessed by the Head of the Study Programme. Based on the Reports and further discussions (if necessary) with the Doctoral student or/and supervisor, actions can be taken, like a change of supervisor, no progress to the next year of studies etc.

2.3 Requirements to complete the Doctoral studies

In the second or third year of studies (depending on the requirements of the Doctoral Study Programme) each Doctoral student submits a Doctoral Dissertation topic application. In the application he/she defines the research problem, goals of the research, hypotheses, assumptions and potential limitations, as well as intended research methods. The expected scientific contribution has to be explained, together with an analysis of the topic`s originality. The application is evaluated by the supervisor, at least one external expert not related to the Doctoral student (no common publications or projects with the student within the past 5 years), the Department or Faculty providing the Study Programme, the Faculty Senate and, at the university level, the Doctoral Study Council and the competent Committee of the UM Senate. The Doctoral Dissertation topic is finally approved by the UM Senate. The UM Senate also appoints an official supervisor for the Doctoral students (until this appointment the supervisor is only tentative).

Based on the approved Doctoral Dissertation topic, the Doctoral student continues the research work that is eventually presented in the Doctoral Dissertation. The Doctoral Dissertation can be submitted only after the research work has been published. The published work is regarded as relevant if it is published as a research article, a monograph or a part of a monograph, the same way as required for the relevant references for supervisors and Course Coordinators. The Doctoral student has to be the first author. After the similarity with other works is checked (a test of plagiarism) and the approval of the supervisor, the Thesis can be submitted for evaluation. Prior to the defence of the Thesis, it is preliminarily examined by a Committee consisting of at least 3 members (evaluators). At least 1/3 of the members are required to be independent external evaluators (not related to the student, as described before). The Faculties are encouraged not to include the supervisor into this Committee. Each evaluator checks the formal and scientific criteria of the Thesis, and conducts an interview with the student. The evaluator can then decide to write an Interim Report and require a revision of the Thesis. In this case, the Head of the Study Programme sets a deadline for the student to respond to the Interim Report, revise and resubmit the Thesis. Based on the resubmitted version of the Thesis, the evaluator writes a Final Report. Each evaluator writes a separate and independent Final Report, while the Interim Report can be a joint Report of all the evaluators. The Final Reports are examined by the Faculty Senate, which decides on the approval of the defence of the Thesis and appoints the

Committee for the Defence. At least one member of the Committee is an external member (not employed at UM) and independent of the Doctoral student. If the supervisor (and co-supervisor) is (are) members of the Committee, they should represent less than half of the Committee members.

After the approval of the defence, the Doctoral Dissertation is available for public inspection through one copy available at the Faculty. The defence, although being a working meeting between a Doctoral student and the Committee, is open to the public.

After the defence, the Thesis is made publically available through the UM digital library and in the ProQuest Dissertation & Theses Database. Temporary unavailability is possible up to 3 years if the Thesis is associated with a particular client, in order to ensure competitive advantage, protection of business secrets, safety of persons and nature, protection of industrial property, or confidentiality of the information of a client.

After a successful defence of the Thesis, the Doctoral student becomes a Doctoral candidate. He or she is promoted to the title of "Doctor/-ica znanosti" at a Doctoral promotion ceremony, which is a public and solemn event performed by the UM Rector.

2.4 Responsibilities and Quality Assurance cycles

The systemic quality of the Doctoral studies is achieved by all the procedures and requirements described above. The Faculty is responsible for the implementation of the Study Programme, it has to ensure the infrastructure and the administrative support. The responsibility to monitor an individual Doctoral student rests primarily with the supervisor, co-supervisor and the Head of the Study Programme, who follows the progress primarily through the Annual Reports handed in by the Doctoral student and the supervisor. The Head of the Doctoral Programme is also responsible for the annual self-evaluation of the Study Programme and the development of the Study Programme. The required measures, steps and responsibilities to implement the measures are defined in the annual Self-Evaluation Report. The results are evaluated of the measures performed in the previous year(s). The scientific references are checked of the Course Coordinators. Based on the findings of the self-evaluation procedure, an application can be prepared for changes

of the Study Programme. The application for changes and self-evaluation reports are considered by the Faculty Senate. Changes to the Study Programme are then adopted by the UM Senate and reported to the Slovenian Quality Assurance Agency for Higher Education (SQAA).

A call for application to the Doctoral Study Programmes is prepared at the university level. Prior to issuing the call, changes to the Study Programme are considered, and their compliance with the university and national Acts is checked. The compliance of the actual Study Programme with the university Acts is checked as well, and the Study Programmes not meeting the Rules and Regulations are not included in the call.

Every 5 years, each Study Programme at UM undergoes an internal evaluation. This is based on the annual self-evaluations of the Study Programme and the current version of the Study Programme. External evaluators, appointed by UM, are included in the procedure.

Every 5 years UM undergoes a re-acreditation procedure that is performed by SQAA. During this procedure, separate Study Programmes can be evaluated as well. In addition, as a rule, SQAA performs annually evaluation of at least 2 % of the Study Programmes in Slovenia.

3 Conclusions

In this contribution we presented the newly adopted Rules and Regulations on Doctoral Studies at the University of Maribor, focusing on the requirements and procedures that UM found most important for the Quality Assurance of Doctoral studies. The adoption of the new Rules and Regulations was a long-lasting process (over 5 years long) that included the teaching staff, students, administration and Faculty and university leaderships. The Rules and Regulations were adopted by the UM Senate in 2018, and it will take until 2022 until they are enforced fully.

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[2] The English version of the Higher Education Act is not available.

IMPORTANCE AND ESTABLISHMENT OF PARTNERSHIP: DOCTORAL CANDIDATE - MENTOR(S) - UNIVERSITY

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Abstract The paper deals with the triangle of participants in the Doctoral Study process: Institution-mentor-Doctoral student. Shown are: Basic dimensions of the student – mentor relationship, Motivation and responsibility in the student – mentor relationship, Expectations, perceptions and satisfaction in the student-mentor relationship, Factors which influence expectations in the student-mentor relationship, Keys to Successful Mentoring Relationships on personal and interpersonal levels, Possible solutions for Successful Mentoring on the Faculty and university level, and the Benefits of those activities.

Keywords: doctoral student, doctoral mentor, university, relationship, partnership.

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-409-5.3
ISBN 978-961-286-409-5

1 Introduction

Relations are one of the most important factors which define an interpersonal partnership, equal in personal and in business environments. In this contribution we focus on formalised knowledge acquisition in the form of university study. We will try to understand the relationships between the three key participants in the study process: Students, mentors and an Institution, in this case a Faculty or University.

This paper focuses primarily on the relationship between the three actors, specifically in the field of the Mentoring Process. Mentoring occurs, and is equally important at all three levels (Undergraduate, Postgraduate, Doctoral) of study. In the spirit of Doctoral reform in Albania and Montenegro, we will deal with relations within the framework of mentoring in Doctoral studies.

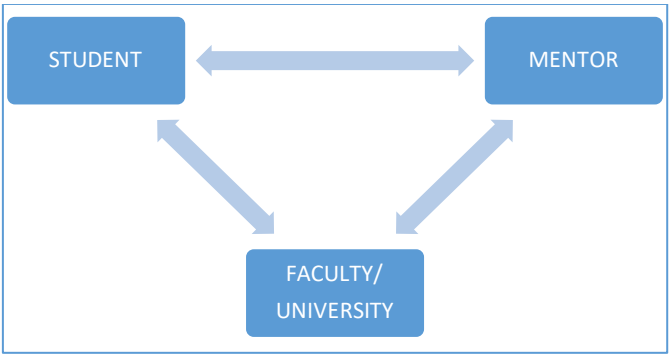

Figure 1: Relations between student, mentor and Institution
Source: own

2 Student - mentor relationship

2.1 Two basic dimensions of the student - mentor relationship

The relationship between the mentor and the Doctoral student is one of the fundamental factors that shapes the Doctoral study process, especially the process of preparing the Doctoral Dissertation. That is why it is important how we understand it and how we establish it.

There is great variability in the circumstances in which Doctoral studies are carried out at different universities and Faculties. This is influenced by a variety of factors, from objective to subjective.

Notwithstanding the complexity mentioned above, the relationship between mentor and student can be defined according to two basic dimensions:

- Quality (formal-informal) relationship
- Quantity of relations (e.g. annually, …, everyday)

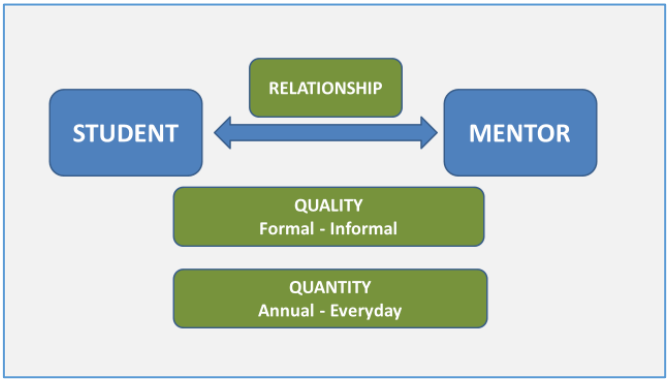

Figure 2: Two basic dimensions of the student – mentor relationship
Source: own

2.2 Motivation and responsibility in the student – mentor relationship

In the mentoring relationship, there are two fundamental questions / dilemmas between student and mentor that relate to motivation and responsibility:

- Motivation. The questions that arise in this dimension are, e.g.:
  - Who is motivated to participate - student, mentor, or both?
  - How strongly is each of them motivated?
  - Who is responsible for motivating the other, if the motivation dies down (is anyone responsible)?

  - What to do if there is a significant difference in the level of motivation (for example, a mentor puts pressure on a student who wants to lower the intensity of work)?
  - …
- Responsibility. The questions that arise in this dimension are, e.g.:
  - Who is responsible for the collaboration - student, mentor, or both?
  - Is the mentor responsible if the student does not achieve the intended results?
  - What to do if the mentor or student is not responsible for implementing the work plan?
  - …

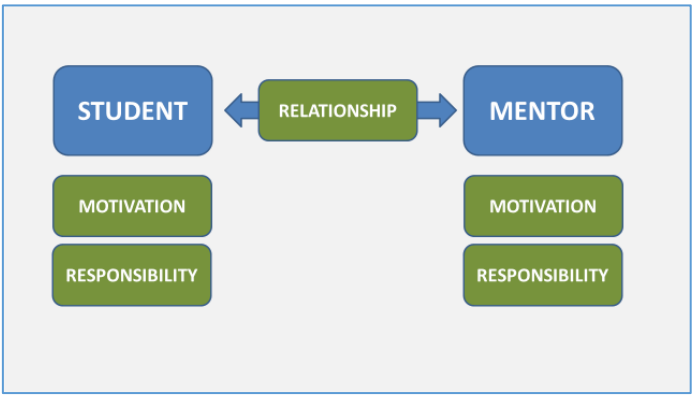

Figure 3: Motivation and responsibility in the student-mentor relationship
Source: own

2.3 Expectations, perceptions and satisfaction in the student-mentor relationship

The satisfaction of all partners (student, mentor, Institution) is a key outcome of the study process. Satisfaction is the result of the relationship between expectations and perceptions of the current situation. Expectations can be high or low, and the perceived current state may be positive or negative.

Satisfaction level, e.g. 1, is identical:

- If the perception of the current state is low (2 on a scale 1-5) and expectations are also low (2 on a scale 1-5),
- If the perception of the current state is high (5 on a scale 1-5) and expectations are also high (5 on a scale 1-5),

Dissatisfaction arises when expectations are higher than the perceptions of the current situation.

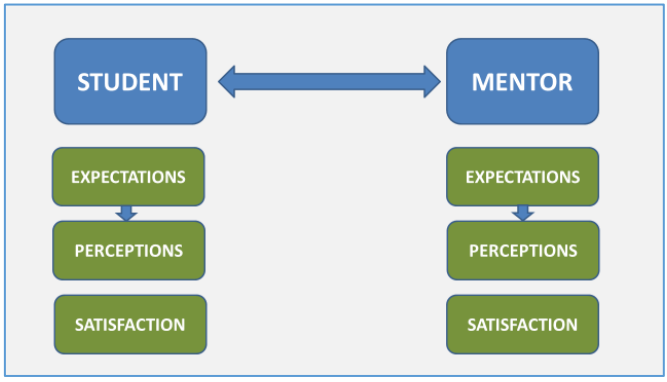

Figure 4: Expectations, perceptions of current and past situations and satisfaction in the student-mentor relationship

Source: own

The situation is further complicated by the fact that all three partners have expectations about themselves and about the other two partners. It also refers to the perception of the current state.

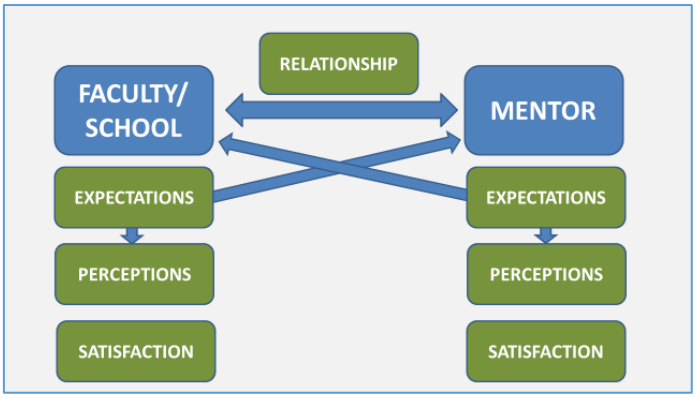

Figure 5: Expectations, perceptions and satisfaction in a Faculty – mentor relationship
Source: own

2.4 Factors which influence expectations in the student-mentor relationship

Expectations are always subjective, and depend on a set of factors. In the mentor-student relationship, expectations originate from the real, external environment (whose perception is also subjective), and from the subjective, internal environment of the individual (individual's history, knowledge, self-image, ...).

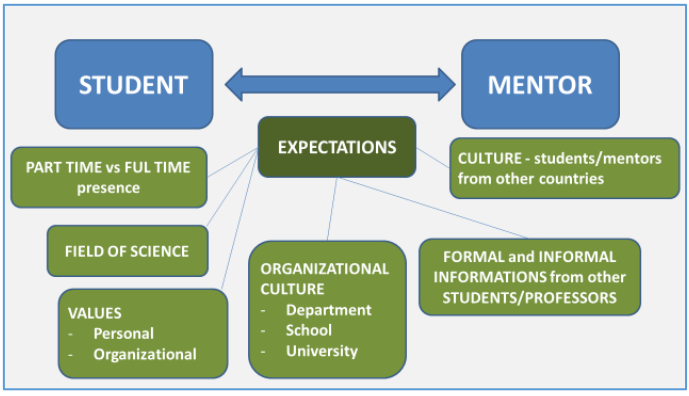

Figure 6: Factors which influence expectations in the student-mentor relationship
Source: own

Knowing the factors that influence expectations is important, as we can influence satisfaction level indirectly through raising / lowering expectations.

2.5 Keys to Successful Mentoring Relationships on both personal and interpersonal levels

There are many authors who deal with the factors of successful mentoring. As this is not the focus of this article, we only cite the recommendations mentioned by Teresa Byington [1]:

- Develop a Relationship of Trust;
- Define Roles and Responsibilities;
- Establish Short and Long Term Goals;
- Collaborate to Solve Problems.

Notwithstanding the good set of factors listed, the dilemmas of how to apply the principles in a particular case are always raised in the particular environment of each universe, Faculty and mentor-student. The question arises whether the planning and implementation of these principles is the responsibility of the provider of the Study Programme (university, Faculty) or the responsibility of the mentor or student, or all three? The answers and specifics in these answers that reflect acceptable solutions should always be sought in the light of the particularities of the given environment, and in the spirit of consensus on solutions.

Figure 7: Keys to Successful Mentoring Relationships, Teresa Byington [1]
Source: own

2.6 Possible solutions for Successful Mentoring on the Faculty level

There are several solutions to ensure successful mentoring at the Faculty level. The Faculty conducting the Doctoral Study can develop specific instructions, rules, standards, contracts, support and examples of good practice, which it (trans)forms into specific documents that are accessible to mentors and Doctoral students, and set clear frameworks within which the Study Programme is implemented, and which provides a high level of security for all three partners in the Doctoral Study process.

Figure 8: Some possible solutions for successful mentoring on the Faculty level
Source: own

2.7 Possible solutions for Successful Mentoring on the university level

A set of solutions to ensure successful mentoring also exists at the university level. The university conducting the Doctoral School or coordinating the set of Doctoral studies in more Faculties, can develop specific tools to facilitate this process and are slightly different than at the Faculty level:

- Minimal standards,
- Programme for mentoring (coaching) young mentors,
- School for mentors,
- Measuring the variables in the Doctoral Programme and process,
- …

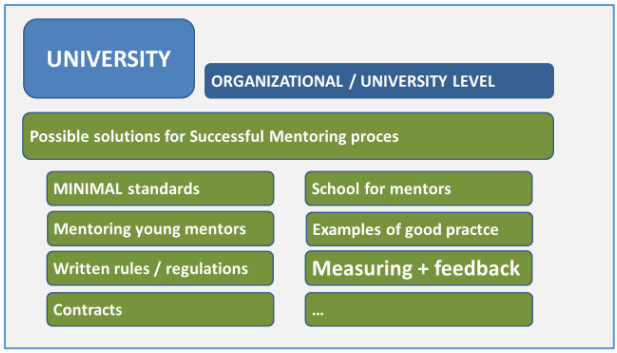

Figure 9: Some possible solutions for successful mentoring process at the university level

Source: own

2.8 Benefits

At the end of the paper let us consider a question that might also be addressed at the beginning of the paper. This question is very often encountered in the process of motivation and is *Why*, or *What benefit will I have from exercising some activity*.

It is not necessary for us to know the theory of motivation or the theory of learning to understand the importance of this question, since we are asking it constantly (most often at an unconscious level). Therefore, it is relevant in our case as well.

There are at least 5 benefits that are possible and, at the same time, are factors that are important (1) For the satisfaction of all three partners in the Doctoral Programme, (2) For the success of the Study Programme and (3) For the success of each Doctoral student. The benefits are outlined in Picture 10.

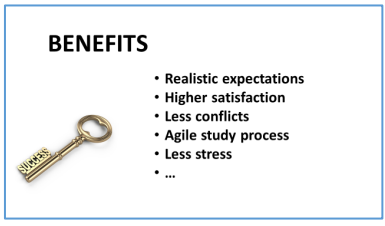

Figure 10: Some possible benefits in designing the Student-Mentor-Institution partnership triangle

Source: own

3 Conclusion

The conclusion is that there is no conclusion.

The conclusion must be drawn – in the spirit of the Doctoral studies – by the reader, just like deciding whether and what he will do. Only if the decision is his own and he understands the benefits, will it then lead to an action he will understand as a result of his own judgment, of free will, and not as a result of external pressure.

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Development of Doctoral Programmes in the Field of Agricultural Economics at the University Of Maribor

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Abstract In this Chapter we present the development of post graduate Doctoral Study Programmes in the field of Agricultural Economics at the University of Maribor. The first part of the Chapter describes the development before implementation of the Bologna reform. Then we describe development after the Bologna reform, and after the last reform of Doctoral Studies at the University of Maribor in 2018.

Keywords: agricultural economics, study programmes, faculty, PhD, University of Maribor.

University of Maribor Press
DOI https://doi.org/10.18690/978-961-286-409-5.4
ISBN 978-961-286-409-5

1 Introduction

The development of post graduate studies is a difficult and complex task. The modern Agricultural Economics is an interdisciplinary field. It is based on microeconomic theory, that tries to explain economic development in the area of Agriculture. The scientific field of Agricultural Economics is wide and very important in modern agriculture. Agricultural Economics is developed as an independent study discipline at many important universities. For instance, at the University of California, Davis, the PhD Programme of Agricultural and Resource Economics has been conducted for over 50 years, and is recognised as one of the best in the world [1].

The University of Maribor (Faculty of Agriculture and Life Science) introduced a post graduate Programme in Agricultural Economics in 1999 (the first academic year was 2000/2001). The introduction of the Programme meant a huge developmental step due to the following reasons:

- Until then, the Slovenian agricultural economists were forced to study in other countries.
- It was the first post graduate Programme at the Faculty of Agriculture and Life sciences.

We must gratefully mention that, at the time, the Rector of the University of Maribor, Prof. Dr. Ludvik Toplak and the late Dean Prof. Dr. Božidar Krajnčič, supported the development and introduction of the Programme enthusiastically, although there was only one Professor of Agricultural Economics at that time. The Programme enabled the development of a strong Agricultural Economics Department, and also Programmes at both Bachelor and Master levels. Until now, the University of Maribor has been the only University in Slovenia that offers Study Programmes of Agricultural Economics at Bachelor, Master and PhD levels, which puts us at great strategic advantage.

The aim of this Chapter is to present the historic development of Agricultural Economics at the University of Maribor. The content is divided into two parts: Pre Bologna reform and after.

2 Development of post graduate studies of agricultural economics at the University of Maribor

2.1 Agricultural Economics at the University of Maribor before 2007

A distinct lack of knowledge in Agricultural Economics (AE) in previous years has dictated the path and pace of the process where new postgraduate Study Programmes in this domain have been introduced at the Faculty of Agriculture and Life Sciences of the University of Maribor. New Study Programmes were designed to take into consideration the high degree of interdisciplinary nature of Agricultural Economics, which is embodied within it. Theoretical foundations of microeconomics, quantitative analyses, farm management, agricultural marketing, agricultural law, rural development and agricultural policy were those disciplines which constituted most distinctly the MSc and PhD Programmes in AE. Students coped successfully with a wide range of lectures taught by academics with different research backgrounds.

Several Professors from the Faculty of Business and Economics, Faculty of Law and Biotechnical Faculty were, thus, invited to complement different study areas, and to introduce to the students the high professional skills and knowledge required that are necessary for 'the state-of-the-art'. Abundant experiences from some of the most notable European universities were emulated in designing our postgraduate Programme. To alleviate this process, several Professors from England (the University of Reading) and Austria (BOKU) were also invited to give lectures. Students were, in this way, acquainted with the profoundly interdisciplinary approach that is a prerequisite for a modern postgraduate Study Programme.

The postgraduate Programme of AE (MSc and PhD) has been run by scholars from diverse disciplinary backgrounds – Economics, Management, Rural Development, Computer Science, Rural Sociology, Engineering, etc. Its profoundly interdisciplinary nature represented the big strength of our Programme. It was not a surprise that our Programme has gradually acquired a very good reputation across the country, and our students were very pleased that some important potential employers (Ministries, Agencies, etc.) have also been notified about it and approached some of the most successful graduates.

The new postgraduate Study Programme was launched at the beginning of the new millennium and first generations of students were very keen to enter it. There was a growing recognitionat that time of the necessity for students to be able to converge effectively with different reference literature, or link data across different sources. A bulk of publications (scientific papers and text books) in Agricultural Economics did enable them to pass this gap rather smoothly. Only thorough and meticulous study of an interdisciplinary subject such is AE can, namely, facilitate the understanding of the key issues that are motivated by the science. This comes neither easily nor quickly.

The perceived threat to academic freedom was overcome by giving Professors full independence in creating their 'modus – operandi'. Academics themselves defined a range of criteria and benchmarks against which the lectures and assessment (exams) would take place. Faculty management assured this process being possible by respecting 'a bottom-up approach'. It was always possible, however, to upgrade the prevailing situation by giving room to the more effective pedagogical and research novelties, unveiling new opportunities and improvements. A new knowledge gained could be a tremendous asset to all involved. The beneficiaries were both students and academics.

We offered to students both theoretical and practical ways to study AE. There is a lot of academic study of AE going on at very prominent universities, but there are very little that actually do it. Our interdisciplinary approach allowed that the most successful students were given the chance actually to practice 'science', not just talk about it. One of the most important features of our interdisciplinary Study Programme was, hence, to embrace entrepreneurship, and to develop an evidence-based decision making model in AE. Most students were truly eager to adopt this way of inter-changeable communication. The study curricula were set up to render possible this way of proactive engagement of our postgraduate students. The consequent results of this approach were apparent, especially in their research work; essays and final theses. The Programme produced 42 Masters of Science in Agricultural Economics and 6 PhDs. The most successful students in the research field (publication in the journals with journal citation report impact factor) were able to enter PhD directly without defending their Master Thesis first.

2.2 Bologna reform and after

The Bologna reform was implemented in 2006. It enabled further development of the Study Programme in the field of Agricultural Economics:

- Bachelor (1st level), Master (2nd level), PhD (3rd level);
- At least 60 ECTS (1 year) of PhD is organised;
- Vertical connection through Study Programmes: Agribusiness;Management (B.Sc.) >>Agricultural Economics (Master) >> Agricultural Economics PhD.

Such Programmes were unique in the Republic of Slovenia, and they still represent a strategic advantage of the University of Maribor. The PhD Programme lasted 3 years, where the 2nd and 3rd years were aimed for preparation of the PhD Thesis. All candidates had to publish a research paper related to their PhD Thesis.

In 2018 new rules were introduced for PhD Programmes at the University of Maribor. Their most important part were new Standards for PhD supervisors and teachers, as well as the requirement of publication of a paper related to the PhD where the PhD student must be the first author.

The teacher and supervisor must meet the criteria of scientific activity, which means that they must be the first or lead author of at least 3 quality publications in a period of 5 years. A scientific book, scientific book chapters (both from the current list of accepted publishers by the Slovenian Research Agency), and papers in journals with Web of Science Journal citation report impact factors from the first ¾ according to the impact factor. To run a Doctoral Study Programme, the individual Faculty must have at least 6 teachers that meet the criteria fully according to the Rules of UM (4 have to be employed at UM).

Likewise, the subject with respect to soft skills such as project management and research methodology were included into the curriculum as compulsory subjects.

The PhD program is currently composed as follows:

- 1st year is organised
  Compulsory subjects: Research methods in AE (6), Project Management (6) (transferable skills)
  2 individual research works subjects (30)
  1 optional course from the list, chosen with respect to the PhD subject (24)
- Years 2-4 preparation of the PhD Thesis

Figure 1: Vertical connection of Study Programmes at the Faculty of Agriculture and Life Sciences
Source: own

As can be gleaned from Figure 1 [2], the vertical connection of Study Programmes of the Faculty of Agriculture and Life Sciences at the University of Maribor [2] represents the main pillar of PhD Study Programmes. However, there is a possibility to study Agricultural Economics also from other fields (entry requirements are defined clearly in the admission rules).

Doctoral Study Programmes should be based on research activity, and PhD students should be included into existing research projects. In the case of Agricultural Economics this is not always true, because many students are employed at agricultural companies, or even run their own farms, and their PhD subjects can be related to a field from work. This presents an important connection of the Programme to the industrial sector, although it may not be in full accordance with the official policy of the University of Maribor, which says that a PhD should always be related to research projects.

Figure 2: Presentation of Agribusiness award to Dr. Matej Kolenko
Source: own

In 2015 one of PhD students who developed informational solutions for his farm received an Agribusiness award from the leading financial newspaper, Finance. In general, it can be said that the Doctoral Programme has students from 3 different countries (Slovenia, USA and Serbia), and has a good academic reputation in Slovenia and wider. The coordinator of the Programme was one of the nominees for supervisor of the year by Mlada akademija, a leading society of young academics in Slovenia [5].

3 Conclusion

Many students have enrolled in our postgraduate Study Programme with the perspective of getting better job opportunities. Academia alone is unfortunately not enough anymore, but students need to be prepared effectively for the 'real world' after study. The interdisciplinary nature of AE can ameliorate their chances to get job in Agriculture, agriculture related activities and elsewhere. This is undeniably one of the major strengths of quality Study Programmes. One way in which we tackled this issue is through supporting students in launching their own businesses (farms), or encouraging them in starting research, or even an academic career. This is a very tough job indeed, but not an impossible one.

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USE OF MODERN DIGITAL TECHNOLOGIES IN AGRICULTURE IN SLOVENIA

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Abstract The presentation summarises the development and current state-of-the-art of the Doctoral Study Programme 'Agriculture', and researches carried out in the Faculty of Agriculture Life Sciences in the field of the use of modern digital technologies in precision agriculture, such as the application of image analysis for fruit yield estimation. A second important topic represents the reduction of plant protection products in orchards, which is based on 3D tree reconstruction with LIDAR (Laser Detection and Ranging) and EMV (Electro Magnetic Valve) triggering in pulse width modulation. First experiments towards a future self-guided tractor driving, spraying or weed management by simply navigating a field robot has already been developed and tested.

Keywords: doctoral study, precision agriculture, 3D tree reconstruction, autonomous navigation, Slovenia.

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-409-5.5
ISBN 978-961-286-409-5

1 Introduction

The beginning of agriculture study in Slovenia is connected with the Faculty of Agronomy founded in Ljubljana in 1947 [1]. Today, there are two Faculties in Slovenia offering PhD study in Agriculture, namely the Faculty of Agriculture and Life Sciences – University of Maribor and the Biotechnical faculty at the University of Ljubljana.

The history of the Faculty of Agriculture and Life Sciences began in 1960, when the College of Agronomy (CA) was founded, offering two-year Study Programmes. The time of establishment coincides with the period of rapid growth of large-scale state and collective farms. In the academic year 1971/72, a new curriculum was introduced, with an emphasis on transferring knowledge to private farmers. In 1992, after Slovenia declared independence, the need for global development led to the transformation of CA. The study programmes were prolonged from five to eight semesters.

1995 represents one of the most important milestones in the history of the Faculty. The Institution went from College to Faculty, and it was officially reorganised as the Faculty of Agriculture, today offering seven Bachelor's degree Programmes, three Master's degree Programmes and two PhD Programmes. In the academic year 2000/2001, the first five PhD students matriculated from the 6 semester Study Programme [2], and after five years, in 2006, Tatjana Unuk defended successfully a PhD thesis entitled '*The analysis of interaction between crop load and nitrogen rates and its use in optimisation of apple (Malus domestica B.) cv. golden delicious yield*' [3]. In the academic year 2019/2020, the PhD Study Programme passed an additional innovative step by introducing 10 elective courses in the second semester of the first studying year, so the PhD students could easily adapt to research and scientific activities on their own dissertation topics.

The last modification of the PhD Study Programme Agriculture is predicted for the academic year 2020/2021, in which a 6 semester study is extended with an additional 2 semesters so the students would have more time for writing the scientific articles and PhD thesis.

2 The structure of the PhD Study Programme 'Agriculture'

From the academic year 2020/2021, the PhD study Agriculture is organised as an 8 semester Study Programme (240 ECTS credit points), consisting of eight compulsory courses and a list of ten elective courses. From this set, a student should select a maximal three elective courses with a total of 24 ECTS. In the following paragraphs, we will present the Programmebriefly.

2.1 Compulsory courses in the Study Programme 'Agriculture'

Compulsory courses represent 214 ECTS credits points, from which (60 ECTS) are achieved by students in the first year. In all other semesters, there is only one compulsory course per semester .

Since the very first academic year 2000/2001 there was only one compulsory course ***Scientific research methods in agriculture*** in the first semester, however, from 2021 a new compulsory course will be introduced, ***Project management (transferable skills)***.

2.2 Elective courses in the Study Programme 'Agriculture'

With additional elective courses starting in the academic year 2020/2021 we focused on actual problems connected with modern agriculture. For this reason, 10 modern elective courses, which represent the most novel interpretation of particular scientific fields, were offered to the students in the second semester:

- *Selected topics from organic agriculture,*
- *Behavioural ecology of domestic animals,*
- *Functional foods,*
- *Selected topics in the physiology of agricultural plants,*
- *Trends in pre – and postharvest treatment of fruit,*
- *Management of weeds and invasive plants,*
- *Soil management in Viticulture in relation to climate change,*
- *Factors and Risk Assessment in Nutrition,*
- *Selected topics of Grassland management and Forage production,*

- *Selected chapters of precision agriculture,*
- *Specifics of organic farming (principles, environmental issues), legislation, inspection and certification, labelling.*

3 PhD Thesis and researches connected with the digitalisation of agriculture

Digital technologies including the Internet, mobile technologies and data analytics, Artificial Intelligence, digitally-delivered services and apps, is changing agriculture and the food system. The world's first entirely machine-operated crop known as "smart farming" – a crop sown and tended without a human ever entering the field – was harvested in 2017. Digital technologies can also help governments to improve the efficiency and effectiveness of existing policies and programmes. For instance, freely available and high-quality satellite imagery reduces the cost of monitoring many agricultural activities dramatically [4].

3.1 PhD thesis

On the Faculty of Agriculture and Life Sciences the first PhD from the field of Digitalisation was defended already in 2004 by Stajnko. It was a Thesis about the application of digitalisation in apple production *Application of image analysis for potential monitoring of growth and development of apple fruits 'Malus domestica' Borkh* [5]. After this milestone, several PhD Theses were finished successfully:

- Detecting objects in natural environments using spatial-frequency analysis and multiview geometry [6],
- The use of image processing and machine learning methods for the assessment of germination of the tomato (*Lycopersicon lycopersicum* L.) [7],
- Ability of NIR spectroscopy to predict meat characteristics [8],
- Using machine learning methods for apple quality forecasting [9].

Currently, two PhD Theses are running on the PhD. Programme connected with Digitalisation; one about modelling the modern tillage equipment with the help of 3D software tools, and another dealing with non-invasive piglets` observation during sucking the milk.

3.2 Scientific research work

From the first semester of study the young PhD students are always introduced to the scientific research groups, which enables the best possible material and financial conditions for a particular PhD thesis. In many cases, excellent works were developed from such cooperative workship, which were later integrated as vital parts of bilateral or applicative projects. Recently, there have been two projects running connected with Digitalisation in Agruculture:

- Reconstruction of a tree crown on the principle of measurement with the LIDAR measuring system [10], which deals with the development of alternative plant protection product application techniques in with sensing systems for electronic canopy characterisation;
- Simultaneous localisation and mapping in a complex field environment [11], in which a highly innovative robotic management of the vineyard is being developed, which is based on the dialogue between a robotic sensor and DSS (Decision Support System) software [12].

3.3 Student activities

A special Chapter in the development of young reasercheres – PhD students in the field of Digitalisation, is represented by the project FRAMBEAST [13], in which a group of young people under the guidance of their mentors, coming from different Faculties of the University of Maribor, developed a self-driving robot capable oof locating and driving in between the rows of corn plants on the field. The 1st prize in Freestyle at the Field Robot Event 2019 represents the best achievement so far [13].

4 Conclusions

The presented developments and achievements in the PhD Study Programme Agriculture show that the Doctoral study is a dialectical, constantly evolving system, which should not only adapt, but also investigate new innovative technological achievements with the technologically advanced research field Digitalisation of Agriculture. In the future activities, mentor Professors will be aimed at strengthening cooperation with foreign research organisations on the one hand, and through

increased cooperation with industry on the other. In this way, in addition to the greater scope of participation in the triangle, student and user, faster transfer of knowledge from scientific research environments to the end users of new technologies will also be ensured.

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INCREASING EMPLOYABILITY OF DOCTORATES IN EMERGING SECTORS WITH SOFT SKILLS TRAINING

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Abstract Soft skills, sometimes referred to as transferable skills are perceived as an important factor of employability by employers from various economic sectors. Due to rapid technological development, companies in emerging sectors demand highly skilled employees, such as Doctorates. However, some studies have shown a skills gap between employers' demands and actual skills levels of Doctorates. Several European universities have decided to develop online training for soft skills, which might aid the employability of Doctorates by improving their soft skills.

Keywords: soft skills, transferable skills, employability, doctorates, emerging sectors.

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-409-5.6
ISBN 978-961-286-409-5

1 Introduction

As noted by multiple previous studies [1, 2], the area of soft skills training is of extreme importance for the employability of Doctorates in all economic sectors. In previous years, the European Commission has developed guidelines that encourage the employment of Doctorates in industry, as their needs for highly skilled professionals will increase in the following years with further development of technologies. According to them, Doctorates can foster research and innovation of new products and services that can aid in the economic growth of countries. The main reason for the European Commission's decision to encourage the employment of Doctorates in industry is the discrepancy between the numbers of Doctorates employed in industry and in the public sector. In comparison to the United States, in the European Union, the majority of Doctorates prefer to work in the public sector, for example, at universities or public research institutions [3].

In accordance with this strategy, several European Universities have decided to study the effect of soft skills training on the employment of Doctorates and initiated the project OUTDOC (Outplacement support for Doctorates in emerging areas). The goal of the study was to see what employers expect of Doctorates, what they see in them, and what they think needs to be changed in order to employ more Doctorates in industry. Project OUTDOC is focused on increasing employability in emerging economic sectors, such as IT, Waste Management and renewable energy sources by training soft skills. The main goal of the training is to simplify the transition from the PhD Programme to the labour market by reducing the mismatch between expectations of employers and Doctorates' skills. This mismatch has, for some time, been seen as a possible reason for the inadequate distribution of Doctorates who decide to work in academia and industry. The project itself started as an initiative after observing the continuous growth of numbers of Doctorates on the one hand, and stagnation of the numbers of Doctorates employed in industry on the other. Additionally, PhDs often faced the issue of not enough academic positions for all who want to work there. Nevertheless, many Doctorates in all sectors still prefer to work in academia, either due to the desire to work in research, or due to the inability to find employment in industry. Since Doctorates have some crucial competencies that other employees do not have, such as industry-specific knowledge and research skills, they can bring many benefits to the companies, such as innovation mindset, the ability to learn quickly and problem-solving skills.

2 Importance of soft skills

Development of soft skills is important for Doctorates, as these skills can make them stand out during a job search, and offer them a competitive advantage over other Doctorates with similar expertise. Soft skills are essential for the development of their careers, as some skills, such as communication and negotiation skills, make it easier to form relationships with people, create trust and lead teams [4]. This makes them better team workers, which affects the work climate in a company positively. All of these skills are expected of Doctorates, especially since they often occupy managerial positions in companies as this study shows. Nevertheless, leadership and communication skills are also demanded for the majority of positions.

On the other hand, modern workplaces are also often based on interpersonal skills. Society values active listening, collaboration, presentation of ideas and communication with colleagues. Strong soft skills ensure a collaborative work environment, which is crucial in a competitive world. In accordance with this, previous research has also shown that employers demand employees who are better equipped with soft skills. Interestingly, studies show that they believe Universities and other Higher Education Institutions should invest more time in the development of these skills [5, 6]. Most often employers suggested that Universities should add these skills to the existing curriculum. However, some employers also recognise that soft skills need to be trained in companies as well, either by mentoring, or by the principle "learning by doing".

Previous studies have shown a lack of certain non-academic skills, such as commercial thinking, adaptability and the ability to translate research results to the public [7, 8]. In 2006, a pilot study was done with joint efforts of three European institutions Eurostat, OECD and UNESCO. A few years later, the study was done in most European countries. It was focused on the difference between acquired and required skills. Data were also compared between sectors of employment. The results show that the level of research skills and personal effectiveness are satisfactory, while there is a lack of management, communication and team skills [9].

The issue is not only relevant for Doctoral students, as transferable skills can be used by students at all educational levels. Bennett has conducted a study of over 1,000 job advertisements aimed at graduates. In this study, the aim was to research how the skills requirements were determined, whether the firm offers employees training in personal skills, and what was the perceived level of personal skills of employees as perceived by managers. 18 % of respondents agreed that "today's graduates commonly possess lower levels of personal skills than are really necessary to do their jobs", while 21 % of them disagreed that graduates today leave university with lower levels of transferable personal skills than used to be the case. In this study, the skills perceived as the most important were communication, teamwork, IT and organisation. Least important were foreign languages, self-confidence, initiative and numerical skills. Employers evaluated today's graduates as best at teamwork, analysis, IT and presentation, while the worst at foreign languages, initiative, self-confidence and leadership [10]. A study in Belgium has shown that employers who already employ PhDs value their research skills, scientific knowledge and leadership skills. Those who do not employ them value technical skills, independence and self-confidence [11].

Another study in Finland has researched the academic engagement and industry-specific competence of Doctorate holders. Results show that PhDs were most often hired for their research skills, while employers also valued industry-specific knowledge. Other important skills were teaching, analysis, management and interaction skills. Employers claimed that industry-specific knowledge can be acquired through work experience, but the shortage of this knowledge was also the reason for not employing PhDs with no work experience [12]. Due to this, Doctoral students need to gain industry-specific knowledge by working in companies in their research area. Studies have also shown that company size is related to the employment of PhDs, as smaller companies do not have funds to employ PhDs, and prefer all-round employees instead of PhDs with specialist skills [13, 14].

Due to their value, soft skills are sometimes called employability skills. According to Jerome and Anthony, these skills are essential in every workplace, and are highly valued by employers. Employers' demands have changed with time, as skills such as creativity were once avoided, but are not recognised as essential for employees who work in high-performance industries. As employability skills are generic, they can be

used in various positions and industries. Due to this, another term to describe soft skills is transferable skills [15].

3 Soft skills demands by employers

The main goal of project OUTDOC was to reduce the mismatch between employers' demands and expertise of Doctorates, while identifying employers' needs. The reason for choosing Doctorates is that they possess unique skills sets and capabilities that employees with other educational levels do not have. One such example are research skills, that are developed thoroughly during Doctoral studies due to the nature of the work. Additionally, emerging economic sectors are believed to employ increasingly more Doctorates who currently work predominantly in academia. It is predicted that in the following years over one million jobs will be created in those sectors that will require highly skilled researchers. In order to apply, Doctorates need to develop their soft skills, which has been shown to increase employability effectively. One of the ways how soft skills can increase the employability of Doctorates is by improving the first impression that the employer gets, as those with good communication skills present themselves better.

Students sometimes question the importance of soft skills in comparison to "hard skills" (also known as technical skills). Findings presented in the Wall Street Journal show that 92 % of nearly 900 surveyed executives perceive soft skills as equally or more important than technical skills, yet 89 % of them said they have a "very or somewhat difficult" time finding employees with those skills [16]. Other studies that were done in various industries also found the high importance of soft skills [17].

Even though many studies have shown the importance of soft skills in comparison to hard skills, there is still not a specified list of the most important soft skills that should be trained. Additionally, it is also unclear who should be held responsible for the training of these skills; should it be universities or companies?

Jones found that, although university teachers are aware of the importance of soft skills, they decide not to teach soft skills for several reasons:

- They do not see soft skills as part of their discipline.
- They think soft skills should not be taught by them.

- They have difficulties defining soft skills training.
- They do not have experience in teaching soft skills, or do not feel qualified to do so.
- They encounter practical difficulties, such as too many students in classes or shortage of time [18].

As some participants in the said study noted, it is difficult to train soft skills such as critical thinking or communication. Training of such skills is not always systematic, but rather in other forms. Additionally, critical thinking is often assessed in essay form, which puts a high workload on the teachers who grade the submissions [18].

4 About project OUTDOC

As already mentioned, this review was done as part of project OUTDOC. This project has started as an initiative of several European universities after recognising the skills mismatch/skills gap that both employers and Doctorates experience when the latter search for employment. As previous researchers have noted, modern workplaces value interpersonal skills such as listening and collaboration with co-workers, while also presenting ideas and communicating with colleagues. Apart from employers, employers in customer service industries also need strong "people skills" in order to communicate with customers effectively and efficiently [15].

Due to this, researchers and companies have decided to utilise a novel approach, and develop an online soft skills training programme for Doctorates. In order to suit it best to the needs of employers, it will include ten soft skills which had the highest discrepancy between demanded and perceived skills levels, as these skills need to be trained the most. Development of the training programme is still in progress, but it is planned that the first Doctoral students will test it in the following months. It will be done partially online and partially as real-life workshops. The testing period will be followed by a mobility period at participating companies, where employers will get the chance to see the soft skills of Doctorates, while Doctoral students will see a different work environment. International mobility, such as the Erasmus mobility programmes have been shown to benefit the students. According to a study done by the European Commission, 64 % of employers consider mobility important for the recruiting process, and 92 % demand skills such as openness to and curiosity

about new challenges, problem-solving and decision-making skills, confidence, tolerance towards other personal values and behaviours. Additionally, more than one-third of Erasmus students who did a job placement abroad were hired or offered a position by their host company. The researchers also noted that Erasmus students are half as likely to experience long-term unemployment compared to those that do not go abroad [19]. After the project, the training programme will hopefully be implemented as part of Doctoral Schools at all participating universities.

5 Conclusion

To sum up, employers are aware of many benefits that employees with strong soft skills bring to the work environment, and consider it during the recruiting process. Many studies have been done in previous years and, as some noted, findings can also be difficult to interpret due to the language barrier, such as the use of synonyms when defining the skills. Nevertheless, as Doctoral Schools are intended to prepare students for work environments, soft skills training should become part of their curriculum to improve the employability of doctorates further.

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MARDS Workshop Proceedings

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Abstract The collection contains contributions by authors who were presented at a workshop within the Erasmus + project MARDS in Maribor, at the University of Maribor.

Keywords:
doctoral study, higher education, e-learning, distance learning, study evaluation.

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-409-5
ISBN 978-961-286-409-5

University of Maribor

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and Computer Science