Report of the Expert Panel on the REACCREDITATION of the University Postgraduate (Doctoral) Programme

Textile Science and Technology

Date of the visit to the Faculty of Textile Technology, University of Zagreb: June 8th, 2016

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INTRODUCTION

The Expert Panel appointed by the Agency for Science and Higher Education (ASHE) created this Report on the Re-accreditation of the University Postgraduate (Doctoral) Programme *Textile Science and Technology* on the basis of the Self-Evaluation Report of the Programme, other documentation submitted and a visit to the *Faculty of Textile Technology, University of Zagreb*.

The Agency for Science and Higher Education (ASHE), a public body listed in EQAR (European Quality Assurance Register for Higher Education) and a full member of ENQA (European Association for Quality Assurance in Higher Education), re-accredits higher education institutions (hereinafter: HEIs) and their study programmes in line with the Act on Quality Assurance in Science and Higher Education (Official Gazette 45/09) and the Ordinance on the Content of a Licence and Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/10). In this procedure, parts of activities of higher education institutions and university postgraduate study programmes are re-accredited.

Expert Panel is appointed by the Agency's Accreditation Council, an independent expert body, to carry out independent evaluation of post-graduate university study programmes.

The Report contains the following elements:

- Short description of the study programme,
- The recommendation of the Expert Panel to the Agency's Accreditation Council,
- Recommendations for institutional improvement and measures to be implemented in the following period (and checked within a follow-up procedure),
- A brief analysis of the institutional advantages and disadvantages,
- A list of good practices found at the institution,
- Conclusions on compliance with the prescribed conditions of delivery of a study programme,
- Conclusions on compliance with the criteria for quality assessment.

Members of the Expert Panel:

- Professor Diana Gregor-Svetec, PhD; Faculty of Natural Sciences and Engineering, University of Ljubjana, Republic of Slovenia, President of the Expert Panel
- Professor Stefan Friedrich Herbert Brües, PhD; Faculty of Electrical Engineering, University of Wuppertal, Federal Republic of Germany
- Professor Robert Matthews Christie, PhD; School of Textiles & Design, Heriot-Watt University,
 United Kingdom of Great Britain and Northern Ireland
- Professor Reinhard Rudolf Baumann, PhD; Chemnitz University of Technology, Federal Republic of Germany,
- Ewelina Katarzyna Pabjanczyk-Wlazlo, doctoral candidate, Faculty of Material Engineering and Textile Design, Lodz University of Technology, Republic of Poland,
- Ivana Carev, doctoral candidate, Faculty of Science, University of Zagreb, Republic of Croatia.

In the analysis of the documentation, site visit and writing of the report the Panel was supported by:

- Ivana Borošić, coordinator, ASHE,
- Ivana Šimić, assistant coordinator, ASHE,
- Goran Briški and Ivana Rončević, interpreters at the site visit,
- Goran Briški, translator of the Report, ASHE.

During the visit to the Institution, the Expert Panel held meetings with the representatives of the following groups:

- Management,
- Head of PhD programme,
- Doctoral candidates,
- Supervisors,
- External stakeholders,
- Alumni.

The Expert Panel also had a tour of the library, laboratories and IT room.

SHORT DESCRIPTION OF THE STUDY PROGRAMME

Name of the study programme contained in the licence:

Textile Science and Technology

Institution providing the programme:

University of Zagreb

Education provider(s):

Faculty of Textile Technology, University of Zagreb

Place of delivery:

Prilaz baruna Filipovića 28a, 10 000 Zagreb

Scientific area and field:

Technical Sciences,

Field: Textile Technology

Learning outcomes of the study programme:

Not defined

Number of doctoral candidates:

47

Number of teachers:

43

Number of supervisors:

20

RECOMMENDATION BY THE EXPERT PANEL TO THE ASHE'S ACCREDITATION COUNCIL

Upon the completion of the re-accreditation procedure and the examination of the materials submitted (Self-Evaluation Report etc.), the visit to the higher education institution and interviews with HEI members in accordance with the visit protocol, the Expert Panel renders its opinion in which it recommends to the Accreditation Council of the Agency the following:

1. **issue a confirmation on compliance** for performing parts of activities (renew the licence)

RECOMMENDATIONS FOR THE IMPROVEMENT OF THE STUDY PROGRAMME

- 1. HEI should define and align the learning outcomes.
- 2. Rules and procedures regarding revoking the academic title, plagiarism checks, ethical issues in research should be defined at the Faculty level. A formal procedure to identify possible plagiarism must be developed. Ethics policy related to research should be explained in detail.
- 3. Uniform ownership and awareness of research strategy and its implementation among Faculty staff and student have to be ensured.
- 4. In evaluating the quality of doctoral study, completion rates should take into account all enrolled students in a certain time period to give the real picture, and not only active students.
- 5. Due to too high workload of some teachers, the quality of supervisors' work may be reduced. External foreign experts should be included, also improving the internationalization.
- 6. Utilization of available on-site equipment should be intensified to improve research excellence and ensure a higher quality of papers by PhD students and supervisors.
- 7. The quality of publications of teachers should be improved by publishing in high-quality journals (CC, SCI, SCI-Extended).
- 8. Visibility of doctoral theses should be improved by making them public and available on website (DAR).
- 9. Doctoral programme should be made more available for international students.
- 10. A stable financing basis for PhD students should be provided.
- 11. Doctoral programme should enable PhD students to acquire competences aligned with the level 8.2 of the CroQF, meaning that in addition to acquiring knowledge and developing cognitive and practical skills, social skills and responsibility should also be developed. Acquisition of general (transferable) skills should be more included into the study programme (e.g.: project planning and management competencies, applying for funding, communication skills, etc.).
- 12. Research related to industry problem solving and innovations should be encouraged more.
- 13. Courses could contain more practical activities and less lectures.
- 14. Research excellence and research impact on society should be promoted more.
- 15. Interdisciplinary research encouraging multiple supervisors should be further developed.
- 16. The topic of the doctoral thesis could be defined earlier than is practiced now.
- 17. Research equipment should be more available for students, especially for self-funded PhD students and PhD students not employed at the TTF.

ADVANTAGES OF THE STUDY PROGRAMME

1. Detailed strategy based on analysis of needs.

- 2. Strong formal procedures for internal quality assurance.
- 3. High quality research equipment base, which is providing the potential for competitive science-based projects with high innovation potential.
- 4. Good quality of documentation and their online accessibility.
- 5. Good relations with the textile industry, public institutions and international cooperation. Relations with the industry have high potential and there is a willingness from the Faculty, as well as companies for a higher level of future cooperation.
- 6. Good supportive research environment.
- 7. Transparent admissions procedure, defined obligations and rights for PhD students, established rules and procedures for the entire study cycle, from enrolment into the study programme to doctoral thesis defence.
- 8. Contractual framework of shared responsibilities between PhD students, supervisors and faculty.
- 9. Feedback on supervisors and study programme quality provided, and analysed in detail.
- 10. Strong personal relationships and cooperative atmosphere between supervisors and PhD students observed during the site visit.

DISADVANTAGES OF THE STUDY PROGRAMME

- 1. Learning outcomes are not defined at the level of doctoral study programme or individual courses
- 2. There is limited content and diversity of doctoral study programme for design-oriented students.
- 3. Limited level of participation in staff development workshops.
- 4. Doctoral theses are available only in the Faculty library; although the University Zagreb established a Digital Academic Repository (DAR), the final works from PhDs are not available at DAR
- 5. Workload of most of the teachers is too high.
- 6. Majority of scientific papers of teachers and supervisors are published as conference presentations/proceedings.
- 7. Currently only two national projects are still running.
- 8. PhD students are not recruited internationally.
- 9. Low international participation of PhD students and teachers in the doctoral study programme.
- 10. Mobility of teachers and PhD students should be promoted more.
- 11. Acquisition of general (transferable) skills is not promoted enough.
- 12. It is not clear whether doctoral programme provides competences in research ethics.
- 13. Procedure for detecting plagiarism need to be better defined.
- 14. Financial constraints.
- 15. Funding and scholarships are available only for Croatian students; international students encounter many obstacles.

EXAMPLES OF GOOD PRACTICE

- 1. Faculty has a developed research strategy, carries out self-analysis and quality assurance procedure and strategy, which improves the quality of the doctoral programme.
- 2. Excellent facilities in terms of state-of-the-art equipment, which is in many cases enables PhD students to carry out good research work.
- 3. Institutional support for mobility.
- 4. Faculty organizes an international conference and national scientific/professional conference, where PhD students have the opportunity to present their work.

- 5. Student research project funded by ESF, developed by a PhD student with the help of Faculty that became a part of the PhD thesis.
- 6. PhD study topic for the students from the industry, in which they solved a problem in industry and provided a solution for a company through PhD research (2 good examples).

COMPLIANCE WITH THE PRESCRIBED CONDITIONS FOR THE DELIVERY OF A STUDY PROGRAMME

Minimal legal conditions:	YES/NO notes
1. Higher education institution (HEI) is listed in the Register of Scientific Organisations in the scientific area of the programme, and has a positive reaccreditation decision on performing higher education activities and scientific activity.	YES
2. HEI delivers programmes in the two cycles leading to the doctoral programme, i.e., first two cycles in the same area and field/fields (for interdisciplinary programmes), and employs a sufficient number of teachers as defined by Article 6 of the Ordinance on the Content of a Licence and Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/10).	YES
3. HEI employs a sufficient number of researchers, as defined by Article 7 of the Ordinance on Conditions for Issuing Licence for Scientific Activity, Conditions for Re-Accreditation of Scientific Organisations and Content of Licence (OG 83/2010).	YES
4. At least 50% of teaching as expressed in norm-hours is delivered by teachers employed at the HEI (full-time, elected into scientific-teaching titles).	YES
5. Student: teacher ratio at the HEI is below 30:1.	YES
6. HEI ensures that doctoral theses are public.	YES
7. HEI launches the procedure of revoking the academic title if it is determined that it has been attained contrary to the conditions stipulated for its attainment, by severe violation of the studying rules or based on a doctoral thesis (dissertation) that has proved to be a plagiarism or a forgery according to provisions of the statute or other enactments.	YES
Additional/recommended conditions of the ASHE Accreditation Council for passing a	YES/NO
positive opinion	notes
1. HEI (or HEIs in joint programmes) has at least five teachers appointed to scientific-teaching titles in the field, or fields relevant for the programme involved in its delivery.	YES
2. In the most recent reaccreditation, HEI had the standard Scientific and Professional Activity marked as at least "partly implemented" (3).	YES
3. The doctoral programme is aligned with the HEI's research strategy.	YES
4. The candidate : supervisor ratio at the HEI is not above 3:1.	YES (2,1:1)
5. All supervisors meet the following conditions: a) PhD, elected into a scientific title, holds a scientific or a scientific-teaching position and/or has at least two years of postdoctoral research experience; b) active researcher in the scientific area of the programme, as evidenced by publications, participation in scientific conferences and/or projects in the past five years (table 2, Supervisors and candidates); c) confirms feasibility of the draft research plan upon admission of the candidate (or submission of the proposal); d) ensures the conditions (and funding) necessary to implement the candidate's research (in line with the draft research plan) as a research project leader, co-leader, participant, collaborator or in other ways; e) trained for the role before assuming it (through workshops, co-supervisions etc.); f) received a positive opinion of the HEI on previous supervisory work.	YES
6. All teachers meet the following conditions:	YES
a) holds a scientific or a scientific-teaching position;b) active researcher, recognized in the field relevant for the course (table 1, Teachers).	
7. The supervisor normally does not participate in the assessment committees.	YES
8. The programme ensures that all candidates spend at least three years doing independent research (while studying, individually, within or outside courses), which includes writing the thesis, publishing, participating in international conferences, field work, attending courses	YES

relevant for research etc.	
9. For joint programmes and doctoral schools (at the university level):	N/A
cooperation between HEIs is based on adequate contracts; joint programmes are delivered in	
cooperation with accredited HEIs; the HEI delivers the programme within a doctoral school in	
line with the regulations and ensures good coordination aimed at supporting the candidates;	
at least 80% of courses are delivered by teachers employed at HEIs within the consortium.	

QUALITY ASSESSMENT

1. RESOURCES: TEACHERS, SUPERVISORS, RESEARCH CAPACITIES AND INFRASTRUCTURE

1.1. HIGH LEVEL OF QUALITY

Scientific achievements are evident from the quantity of publications in the past five years: 655 papers in the field of textile technology and 525 papers in the field of natural sciences (STEM area). This shows that there are significant numbers of papers relevant to the discipline. However, most of the papers are published as conference papers, with only 20% as papers of high impact, quoted in the WoS.

The programme management (The Council of PhD Studies) is a good example for developing the scientific research reputation, considering the number and quality of scientific publications of council members and their involvement in international and national projects that considerably surpass the criteria for election of teachers in the field of Textile Technology.

The TTF is nationally and internationally recognised by taking part in the European Technology Platform and by membership in the association AUTEX, through European and other international programmes and projects (Eureka, Bilateral, COST, CEEPUS), and by a substantial number of agreements on cooperation with universities and research institutes. The development of the level of international cooperation, including staff exchanges and research collaborations, is demonstrating good progress.

Of prime importance is the existence within the Faculty of the Textile Science Research Centre (TSRC), which has provided a focus for the research activity since 2008, and an ability to develop research capacity.

The TTF is the organizer of two conferences: International Textile, Clothing and Design Conference (ITC&DC) and Textile Science and Economy (TZG), and co-organiser of 7 national and international conferences. Inspection of the proceedings of ITC&DC that were made available demonstrated that the papers developed (in English) from the conference were international as well as national, and of good quality. This provides excellent opportunities for participation by the PhD students.

1.2. IMPROVEMENTS ARE NECESSARY

The number of teachers is adequate. In the doctoral programme, 36 teachers (3 of them are retired - prof. emeritus) employed by the TTF are engaged, which represents 84% of the total.

The overall staff workload is monitored. The average total teaching workload of 33 active teachers employed by the TTF is 399 hours, and is above the recommended 350 hours. With 12 teachers among the 20 that have a teaching workload on doctoral programme, the workload is higher than the recommended standard from 10 to 340 hours, while for 8 teachers the workload is over 100 hours higher.

It is conceded that, at times, in understandable individual circumstances, the standard workload is exceeded, but quality of supervision does not appear to be adversely affected. However, it is recommended that the Faculty introduces some mechanisms that could prevent such high teaching overload of some teachers.

1.3. IMPROVEMENTS ARE NECESSARY

The data presented in the table demonstrates that certain staff involved in PhD supervision have a high number of publications in relevant research topic areas. However, this is not uniform, and a few have a small number or no papers at all in the A category. In the last 5 years, 27 teachers have published within the field of textile technology a total of 655 papers, which means 4.8 papers/teacher/year. Among those papers, 61% are based on conferences and only 20% are papers published in journals included in CC, SCI and SCI Expanded, which averages at 1 publication/teacher/year. Teachers engaged in the doctoral programme have quite a high number of scientific publications relevant to the programme area and field, but the quality of papers should be improved.

To assure and develop the educational quality, a programme of advanced vocational training for students' supervisors has been established. However, there seems to be space to improve the participation quota (currently 30%).

1.4. IMPROVEMENTS ARE NECESSARY

The PhD student/supervisor ratio is appropriate. Currently 20 teachers are supervisors in the doctoral programme; PhD student:supervisor ratio is 2.1:1. In the last 5 years, they have published within the field of textile technology a total of 530 papers, which breaks down to 5.3 papers/supervisor/year. Among those papers, only 19% are papers published in journals included in CC, SCI and SCI Expanded, which averages at 1 publication/supervisor/year. There is no completely consistent performance among supervisors in terms of number and quality of publications.

Excellence in research should be improved also to provide a higher research impact on economy and society. Supervisors have participated in 23 international and 28 national projects, and actively lead 10 international and 13 national scientific research projects. Most of them were included in several projects. There is participation in leading projects but not uniformly. The supervisors should have projects, preferably international, in which they can involve PhD students.

There is a process of supervisor performance assessment, including publication arising from doctoral study. PhD students are clearly directed towards treating the publication criterion as a high priority. From doctoral research 41 PhD students published 211 papers, among them 40 were published in journals with the impact factor.

Completion rates as reported are broadly satisfactory, although the time to completion can be longer than is desirable.

Supervisors are encouraged to participate in workshops for supervisors in order to offer a high quality of mentorship to PhD students.

1.5. HIGH LEVEL OF QUALITY

The Faculty has developed formal mechanisms of assessing and monitoring the qualifications and competencies of teachers and supervisors, based on research excellence. Competences of teachers are assessed through the quality and quantity of the publications output from projects and cooperation. Since 2014, the Faculty has a protocol for the supervisors (Protocol of the procedure from the doctoral thesis proposal to its defending).

The documentation and discussion demonstrated that there are rigorous and clearly understood assessment processes in place for staff competences and encouragement for individual performance to develop above minimum standards.

1.6. HIGH LEVEL OF QUALITY

The Faculty is well-equipped with a range of modern equipment, including machines and analytical instrumentation that is superior to many comparable European HEIs. Much of the equipment was acquired through a substantial FP7. In some cases, Faculty staff has developed specially-constructed equipment, for example in the clothing area, tailored to specific areas of research. The availability of this high-quality equipment offers high potential to develop the research profile further.

The library resources are appropriate to the programme and access to relevant databases is provided. Technically, the access to the internet may be improved.

2. INTERNAL QUALITY ASSURANCE OF THE PROGRAMME

2.1. HIGH LEVEL OF QUALITY

The doctoral study programme at the TTF has been launched and approved in line with the regulations. The programme justification was documented, including the analysis of social, academic, economic or

other needs of the community. The Faculty has an impressive research strategy document, which details how this range of needs have been identified. For example, the outcome of a SWOT analysis is presented. There is evidence of good cooperation with industry nationally.

The doctoral study programme is focused on the development of advanced technologies, materials and innovative products. In line with the novel European R&D directions and list of priorities, materials research is of major importance, and also composites, smart and functional textiles are included. The focus on traditional textile technology is being redefined towards advanced technologies, new developed materials and sustainability, which is in accordance with the doctoral study programme.

2.2. HIGH LEVEL OF QUALITY

The TTF has prepared the Research strategy of TTF for 2014-2020 and the Development strategy for 2014-2020, where the faculty's research focus and potential are demonstrated. The strategy identifies a series of topics that are relevant and in keeping with contemporary trends in textile research, including sustainability, advanced materials and measurement system development. The Faculty has identified 9 research topics, among them 6 priority topics, which are also the topics of doctoral study programme. Doctoral theses are selected from these research topics. Individual PhD programmes appear aligned with the themes and also reflect supervisors' interests.

2.3. HIGH LEVEL OF QUALITY

The TTF has established mechanisms for periodically reviewing and improving the quality of the doctoral programme. Mechanisms include:

- national programme review by ASHE;
- annually monitoring and evaluating by TTF;
- continuous monitoring and analyses of research productivity of supervisors (form DR.SC.-09, Report on the work of supervisor, Annual report on the activities of the faculty);
- continuous monitoring and analyses of research productivity of PhD students (form DR.SC.-05, DR.SC.-09, Report on the work of assistants (for PhD students employed at the faculty, Annual report on the activities of the faculty);
- collecting and analysing feedback from PhD students (form DR.SC.-04, anonymous postgraduate student survey), alumni (internal survey) and drop-outs, especially concerning the supervision system and the support provided by the HEI, or reasons to drop out;
- collecting and analysing feedback from other stakeholders (thematic discussions at round tables, forums, public discussions).

Improvements were implemented on the basis of the following procedures:

- adoption of the recommendation for submission of the research plan at the enrolment (only for the PhD students financed by the Croatian Science Foundation- CSF);
- teaching workload of the PhD students has been reduced to 16.7% of the full workload (30 ECTS credits);
- retired teachers, except for those bearing the title of professor emeritus, can no longer be independent lecturers of doctoral study courses. The courses delivered by retired teachers have been deactivated for the time being, until teachers with required competences are appointed after approval of the Council of PhD studies.

Clear mechanisms and procedures are in place for reviewing quality periodically, on occasions involving international participants. Feedback from students is gathered regularly and involves anonymity. Data on feedback from students demonstrate that it is broadly positive.

2.4. HIGH LEVEL OF QUALITY

The TTF has established the mechanism to monitor supervisor performance through:

- PhD students' research performance (from 3 to 14 papers);

- feedback from current and former candidates (feedback on form DR.SC.-04 analysed from the Council of PhD studies, interview through internal online survey);
- completion rate;
- documents, procedures and practices of changing supervisors and mediating in the case of problems between a supervisor and a PhD student (form DR.SC.-06, Regulations on doctoral studies at the TTF, discussion at the Council of PhD studies).

There are mechanisms in place to monitor and assess supervisor performance. The feedback from students on the quality of supervision (based on surveys) is generally very positive, although there are individual instances of criticism.

Completion rates are satisfactory, although they tend to discount students who quit study early. Change of supervisors is possible and has taken place on more than one occasion.

2.5. IMPROVEMENTS ARE NECESSARY

The Faculty follows ethical principles stated in Code of Ethics of the University of Zagreb, but does not have any other regulations or procedures for revoking the academic title if it has been attained by plagiarism or forgery. Plagiarism and other forms of academic fraud can be detected only if the supervisor and other members of committee detect them during reading and defence of doctoral thesis, and there is no formal procedure for preventing plagiarism.

There is an issue that plagiarism software is not available in the Croatian language. In its absence, a procedure aiming to detect plagiarism during the thesis defence was described. However, a strengthened procedure is required to be developed on the Faculty level. It is suggested to provide software for written part of PhD thesis to avoid plagiarism and prevent academic fraud.

The formal and clear procedure for conflict solving between PhD students and the Faculty (supervisors, teachers) must be introduced, including the higher instances (e.g. filing an appeal to the University Senate) and the possibility of introducing an external observers (independent from the Faculty). Also, the decision making in this process should be carried out by independent persons/entities.

2.6. HIGH LEVEL OF QUALITY

The Faculty has developed clear and formalised procedures for developing and defending the doctoral thesis proposal, which are described by Regulations on doctoral studies, and by the Protocol of the procedure from the doctoral thesis proposal to its defending.

For the evaluation of the doctoral thesis, one member of commission is external, from another institution. A detailed proposal for defence protocol, proposal templates and clear presentation guidelines and templates for proposal assessment are provided.

Presentation of the doctoral thesis is public and the minutes are signed by commission members.

2.7. HIGH LEVEL OF QUALITY

The Faculty has developed procedures for developing and defending the doctoral thesis which are described by Regulations on doctoral studies, and by the Protocol of the procedure from the doctoral thesis proposal to its defending.

Some of regulations are:

- the PhD students can compose their theses in two different forms;
- the guidelines on how to compose the thesis are public (form DR.SC.-08, Regulations in doctoral studies at the University of Zagreb);
- thesis assessment guidelines are published;
- a detailed thesis defence (viva) protocol is published;
- participation of external or international examiners in the thesis defence committee is obligatory.

PhD student is obliged to earn at least 62 ECTS credits by publishing scientific papers, and at least one paper should be published or accepted for publication in an internationally recognised journal.

The range of theses inspected were of good quality. There is evidence that alternative thesis presentation is acceptable (Scandinavian model).

2.8. HIGH LEVEL OF QUALITY

Information on the doctoral study programme, admission, delivery and conditions for progression and completion of study are published on Faculty website.

2.9. IMPROVEMENTS ARE NECESSARY

The Faculty has established a system for funding the doctoral study programme within the institution. Doctoral study programme is mostly financed by tuition fees, but also by scientific projects financed through state budget. The Faculty also finds additional sources of funding PhD students' research. A part of the financing comes from the institution's own income, from sponsors, through contracts with Croatian and foreign institutions (student and researcher exchange) and cooperation agreements with the University, counties and cities.

The largest part of tuition fees is spent on material costs (with contributions also to publishing research results in journals, conferences; purchase of books, journals; equipment maintenance and purchase), with only small amount going to teachers.

It was stated that the Faculty has a quite stable funding position. This is encouraging. It is clear, though, that there are funding constraints within the system and there is a need to expand funding opportunities from a range of sources, to sustain the quality of the programme into the future.

2.10. HIGH LEVEL OF QUALITY

The tuition fee for the doctoral program at TTF is 7,000.00 HRK per semester. The TTF Faculty Council determined the fee upon assessing the real costs of the doctoral study programme, and takin into consideration that some costs for supervisors and PhD students which are included into the research projects are covered from the projects. Fees appear to be set at an appropriate level.

3. SUPPORT TO DOCTORAL CANDIDATES AND THEIR PROGRESSION

3.1. HIGH LEVEL OF QUALITY

The admission quota to doctoral programme at TTF is currently 20 PhD students per year. The admission policy takes into account:

- the ratio of supervisors to students, which is currently 1:2.1;
- the quality of supervisors, which is continuously monitored, especially if competencies suit the students' research proposals;
- the number of PhD students per supervisor, which is no more than 3 PhD students on the programme as a whole, every teacher can take only one mentorship in a generation;
- teaching workload of supervisors, which is in most cases too high, and exceeds the existing legal thresholds.

Admission quotas are carefully considered and restricted appropriately. Supervisors are suitably experienced, though in many cases their supervision and teaching work is not balanced adequately.

The obligations of supervisors and co-supervisors, PhD students and research teams are clearly defined by the Regulations on doctoral study at the TTF.

It should be noted that every process of admission is preceded by a thorough consultation session, during which a PhD student is advised and guided in the selection of thesis topic and area of research.

3.2. IMPROVEMENTS ARE NECESSARY

The number of admitted PhD students takes into account the number of students graduating from graduate studies, the number of graduated students interested in attending the doctoral study, their

financial situation and the demands of the industry and research and educational institutions for this type of expert. The admission quotas are based upon the analysis described in the strategy document and are aligned with the labour market demands in Croatia and broader region, especially Bosnia and Herzegovina.

The analysis of PhDs' employment area for PhD students who earned their degree in the period 2011-2015 showed that the majority of graduates are employed in education/research institutions. There is no data about innovative companies established by PhDs and the number of knowledge transfer projects and prototypes, and only one PhD student is co-author of 3 patents. The record of such practices should be introduced and analysed.

The number of research projects with the business sector, other higher education institutions and public research institutes is low. For the business sector, TTF mostly conducts the testing of products, without any research work.

There is limited uptake of graduates by industry due to the financial constraints and opportunities for research in the Croatian textile industry as currently structured. However, the research topics offer opportunities for future industrial exploitation.

3.3. HIGH LEVEL OF QUALITY

At the TTF, the funding available to PhD students in the last five years was wide-ranging, mostly from public sources (such as MSES, University), research projects (EU and national) and a small percentage from industry. The funding available appears to be distributed fairly among PhD students. There is support from projects, although efforts will be required to ensure this continues in order to sustain the programme successfully.

In accordance with the Rules on the award of scholarships to the TTF students for the doctoral study of Textile Science and Technology, the Faculty ensures the award of TTF scholarships to the best PhD students from its own funds since 2014.

3.4. HIGH LEVEL OF QUALITY

At the TTF, each PhD student has a study advisor, who is the potential supervisor, though not necessarily. The study advisor monitors the student's progress throughout the study and helps the student in the selection of the courses to be aligned with the research topic and in preparation of a plan of obligations. An individual research plan is settled with the help of the study advisor.

There are appropriate processes and procedures in place for assigning supervisors and developing topics and plans, to ensure timely and successful completion. The average time for research topic development appears long by some international standards, but appears to be in line with the Croatian practice, and students are strongly satisfied with this feature.

3.5. IMPROVEMENTS ARE NECESSARY

The open calls for the admission to the doctoral study are published on the TTF website and in a daily newspaper. The best graduate students at TTF with an inclination towards research are encouraged to enrol in the doctoral study. As the number of candidates is lower than the admission quota, everyone who applies and meets the criteria is enrolled. The call for applications is published also on the AUTEX website, but no action to recruit candidates internationally is applied. There is very little international recruitment, although there is international demand for doctoral study. Improvements will require implementation of a pro-active strategy to address the issue.

International students should be encouraged to apply for PhD studies in a transparent way and the Faculty is suggested to find a sustainable way of funding these kind of students.

3.6. HIGH LEVEL OF QUALITY

Good procedures are reported and implemented. At TTF the call for applications is announced at least one month prior to the beginning of the academic year, on the website and in the daily newspapers. The

criteria for selection of applicants include past performance, a demonstrated interest in scientific research, recommendations by teachers and a proposal for the area of research. An interview with the applicant is a compulsory part of the selection procedure. Candidates also must prove their knowledge of one foreign language. From 2016/17 academic year, the submission of a research plan will be obligatory for admission to the doctoral study.

3.7. IMPROVEMENTS ARE NECESSARY

The selection procedure is clearly defined and documented. The admission documents are kept in the office for PhD students and the list of admitted applicants is made public on the Faculty website. The applicants who were not admitted have a right to inspect the competition documents, however the appealing process in such cases is not clear enough. Constructive feedback to unsuccessful candidates should be improved.

The TTF should provide a process for transparent selection of both national and international students with transparent criteria, a public decision, and both the right and the time for filing the complain.

3.8. IMPROVEMENTS ARE NECESSARY

Upon a candidate's request, the Council of PhD studies at TTF can recognize prior achievements relevant for the doctoral programme for applicants who have earned the title Master of Sciences (MSc), though no clear procedure exists about recognition of publications, or non-formal and informal learning.

3.9. HIGH LEVEL OF QUALITY

The TTF has an ordinance Protocol for the procedure from the doctoral thesis proposal to its defending, which defines the rights and obligations of PhD students. This document ensures a high level of institutional as well as supervisory support to the students. PhD students and faculty sign a study contract. PhD students are informed on all of their rights and obligations upon admission. Meetings with PhD students are held at least twice a year.

Students are satisfied with the fact that they are appropriately informed.

3.10. HIGH LEVEL OF QUALITY

Support mechanisms are strong and students are generally satisfied with the level of support. PhD students are supported by the TTF financially through ongoing projects and the Faculty's own funds. They are encouraged to carry out part of their research at institutions abroad. In the period from 2011-2016, 15 PhD students stayed a total of 2149 days in different institutions in Austria, Slovenia, Portugal, England, Italy, Switzerland and France.

Students are motivated for publishing and presenting at conferences, and provided with adequate support. Cooperation with industry is reasonable. 47 PhD students participated at 159 international conferences, 10 PhD students have published 14 papers in high quality journals with impact factor.

Faculty offers support to the PhD students in their research and career development, with support mechanisms which are elaborated in the Strategy of scientific research at the TTF. Since 2010/11 academic year, there is an annual competition for the best scientific paper in the field of textile technology at TTF.

4. PROGRAMME AND OUTCOMES

4.1. IMPROVEMENTS ARE NECESSARY

The doctoral study programme at TTF complies with the national and international professional standards. It is comparable in programme's objectives, content, duration, volume of teaching and the ratio between teaching and research, admission criteria and procedures for PhD students, supervision

procedures, procedures for thesis assessment and defending, with international doctoral programmes from Slovenia, Germany, France, and England.

The PhD students' mobility is organised through competitions (Erasmus, Ceepus) where they can acquire international experience. In the case of 6 PhD students in the period from 2011-2015, research was interdisciplinary and a co-supervisor was from a different research area.

The doctoral programme is in most respects of good quality. There is scope for enhancement of some areas, which would ensure that international comparability is achieved. This is exemplified by features that have been identified in this report, such as the level of publications and project leadership of certain supervisors.

The programme is research oriented. 30 ETCS credits out of 180 (16.7%) are obtained by passing 2 obligatory and with 6 elective courses. Besides the PhD student's independent research work on the topic of their doctoral thesis, students obtain 18 ECTS credits for 3 project tasks, which consist of individual work on different research topics. 62 ECTS credits are obtained for published research work (published papers in journals, conferences, books, patents) and 70 ECTS credits are for doctoral thesis. It can be concluded that the programme provides three years of independent research experience, as regulated by the Croatian Qualifications Framework.

There is some room for improvement with regard to the content of courses taught. While there is some interdisciplinarity, the textiles area offers scope to extend this in the doctoral programme, providing the student with more than one supervisor. Also, an extension of the PhD programme concerning available courses in Textile Design area is recommended.

The PhD students can acquire some generic (transferable) skills from two taught courses and from workshops offered by the University of Zagreb and TTF, which PhD students can attend. However, there is a significant need to increase the number of available courses in this area for interested students (e.g. project management, communication skills, public speaking etc.); there is space for improvement of the attractiveness of a PhD students' career in both international industrial and R&D environments.

4.2. IMPROVEMENTS ARE NECESSARY

For the doctoral study programme at the TTF, there are no defined learning outcomes at the level of programme or individual courses; the Faculty website list only competences. There are courses descriptions, but the intended outcomes are not defined. Also the description of project tasks and independent learning and research is not available.

The description of the doctoral study programme and submitted doctoral theses demonstrate the quality of research competencies, competencies in research methodologies, and reading and writing skills. The PhD students are able to develop the ability to analyse and synthesise, research skills in team work, the skills of managing relevant information and in critical evaluation. Other skills developed are the ability to create new ideas, to work in an interdisciplinary team, employ interdisciplinary knowledge and gain some knowledge on how to design scientific research projects, manage and lead such projects, how to solve problems and reach decisions, as well as to develop innovative and ethical approaches.

The documentation concedes that learning outcomes are not defined for doctoral programme. In its place, a series of acquired skills are listed. These could form the basis for specifying and assessing learning outcomes in the future.

The competencies in research ethics are addressed with information related to public announcement of the results of research, which should prevent the plagiarism, and publicly available documents: The Code of Ethics of the University of Zagreb, Salzburg principle and the Code of the Recruitment of Researchers on the Faculty web pages.

4.3. IMPROVEMENTS ARE NECESSARY

The doctoral study programme at the TTF has no defined learning outcomes for its programme or individual courses.

With no specified learning outcomes, the connection with teaching and research contents is not made. There is space for a more appropriate alignment of the topics of financed projects from which PhD

students are paid, and therefore work on daily, with the topics that the PhD students are working on to prepare their PhD theses.

4.4. HIGH LEVEL OF QUALITY

The doctoral programme at the TTF has developed procedures which assure quality. The 3 project tasks students have to write are reviewed and must be approved by the Council of PhD studies. The doctoral theses are of high quality, which enables students to acquire competencies at the level 8.2. The PhD students participate actively at the international conference ITC&DC and at the scientific-professional conference TSE organised by TTF. They are encouraged to publish in high-impact journals. In the last five years, 10 PhD students have published 14 papers in high quality journals.

In spite of the absence of learning outcomes, it is clear from inspection of theses, conference presentations and publications that PhD students receive a high quality experience and acquire the relevant competences.

4.5. IMPROVEMENTS ARE NECESSARY

Courses are divided into obligatory, elective in the field of textile technology, and general elective. Obligatory courses are delivered *ex-cathedra*. The elective courses are mostly given as consultations and some of them include laboratory work. As teaching is in practice carried out individually, this ensures achievement of the course objectives, but since learning outcomes are not defined, it is difficult to assess the achievements.

The PhD students can be involved in the scientific research from the first year of study, though not in all cases.

The TTF asserts with some confidence that the teaching methods used and training of skills in laboratory practice are of high quality.

4.6. IMPROVEMENTS ARE NECESSARY

In the frame of doctoral programme, some generic skills are obtained through the obligatory course, Methodology of scientific work, and the elective course, Intellectual property. On the University level and also on Faculty level, specialised workshops to improve generic skills are organized. The PhD students are informed about these workshops via the website and e-mail communication.

This form of acquisition of general skills is initiated by the supervisor and the Council of PhD studies. The Council of PhD studies evaluates the number of ECTS awarded.

Some courses that aim to provide generic transferable skills are provided. Research methodology is addressed adequately and is popular with students. However, the broadening of training in business and management skills (e.g. project management, entrepreneurship, company performance, business development) would improve the career perspectives of the PhD students.

4.7. IMPROVEMENTS ARE NECESSARY

The PhD students, together with study advisors, compile the individual course plan. As most of the courses are delivered in the form of consultations, they assure some flexibility and adaption to individual research plans. However, there is no clear guidelines concerning the completion of such courses (credit criteria). 10% of the workload is associated to project tasks, which are in the area of current scientific research of the Faculty, though they are not connected to the research topic of the PhD student.

It is not clear whether there is a high level of flexibility towards providing instruction tailored to individual needs. There is scope to introduce wider diversity aligned with individual research plans.

Some students expressed the opinion that there is too much emphasis on mathematics for their specific needs.

Aiming towards an extension of the PhD programme into Textile Design as requested by a few students, a close cooperation with Design Schools is recommended.

In order to provide doctoral programme adapted to individual student needs, more optional courses should be provided in the programme. A wider selection, but less in total number, is desirable as practical activities are preferable on this level of the student development.

4.8. IMPROVEMENTS ARE NECESSARY

At the TTF internationalisation and mobility are achieved:

- by providing opportunities for and using research staff mobility, though at the moment only 1 teacher is engaged abroad;
- with systematically providing information on opportunities for PhD students' mobility on University of Zagreb and TTF websites, via e-mail, organised forum, through members of IRO. PhD students are encouraged to apply for Erasmus+ and Ceepus programmes by their teachers.
- by international cooperation of teachers, who attract international academic experts to participate in the doctoral study. The expected results in attracting foreign excellent PhD students were not achieved;
- the Faculty is acquainted with the European Charter of Researchers and Code for Recruitment of Researchers and implements its principles in some parts, such as:
 - o including teachers from foreign HEIs who participate in the doctoral programme;
 - encouraging PhD students to spend a part of their education on another institution (15 PhD students spent 2149 days at foreign institutions);
 - encouraging PhD students to participate in international conferences by awarding them ECTS credits and providing travel funds;
 - o providing opportunities to write the thesis in a foreign language (3 thesis were written in English language in period 2011-2015);
 - o providing opportunities to replace the thesis with publication in internationally recognized outlets (1 doctoral thesis).

There is strong evidence of international cooperation on staff level. The biennial conference ITC&DC is useful in encouraging such interactions. Although there is some well-established international exchange of students, it is obvious that further development of the internationalisation of student activities depends on financial limitations. However, the Expert Panel has identified that strategic development of this feature is of high priority.