

# REPORT OF THE EXPERT PANEL ON THE RE-ACCREDITATION OF THE UNIVERSITY POSTGRADUATE (DOCTORAL) PROGRAMME

INFORMATION SCIENCES

FACULTY OF ORGANIZATION AND INFORMATICS IN

VARAŽDIN,

UNIVERSITY OF ZAGREB

Date of the visit: April 3<sup>rd</sup>, 2017

**April, 2017** 



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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 Information Sciences on the basis of the Self-Evaluation Report of the Programme, other documentation submitted and a visit to the Faculty of Organization and Informatics in Varaždin, 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:

- President of the Expert Panel, Professor Andrew McGettrick, University of Strathclyde, United Kingdom,
- Professor Bjørn Erik Munkvold, Universitetet i Agder, Norway,
- Professor Henrique Madeira, Universidade de Coimbra, Portugal,
- Professor Sofia Gaio, University Fernando Pessoa, Portugal,
- Professor Theo Thomassen, University of Amsterdam, Netherlands,
- Professor Tanja Oblak Črnič, University of Ljubljana, Slovenia,
- Akram El-Korashy, Max Planck Institute for Software Systems, Germany, doctoral candidate,
- Abhishek Tiwari, Potsdam University, Germany, doctoral candidate.

The higher education institution was visited by the following Expert Panel members:

- Moderator, Prof. Bjørn Erik Munkvold, Universitetet i Agder, Norway,
- Prof. Andrew McGettrick, University of Strathclyde, United Kingdom,
- Prof. Henrique Madeira, Universidade de Coimbra, Portugal,
- Akram El-Korashy, doctoral candidate, Max Planck Institute for Software Systems, Germany.

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

- Josip Hrgović, coordinator, ASHE,
- Alma Agović, assistant coordinator, ASHE,
- Lida Lamza, interpreter at the site visit, ASHE,

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

- Management,
- Study programme coordinators,
- Doctoral candidates,
- Teachers and supervisors,
- External stakeholders,
- Alumni.

The Expert Panel also had a tour of the library, IT rooms, student register desk and the classrooms.

# SHORT DESCRIPTION OF THE STUDY PROGRAMME

Name of the study programme contained in the licence: **Information Sciences** 

Institution delivering the programme: Faculty of Organization and Informatics in Varaždin,

# **University of Zagreb**

Institution providing the programme: Faculty of Organization and Informatics in Varaždin,

# **University of Zagreb**

Place of delivery: Varaždin

Scientific area and field: Social Sciences, Information and Communication Sciences

Number of doctoral candidates: 80 active and 107 inactive (total 187)

Number of teachers: **30** Number of supervisors: **59** 

Learning outcomes of the study programme:

Students will after graduating from the doctoral study programme be able to:

LO1. Recognise open problems and pose research questions in the field of information sciences.

LO2. Critically evaluate information, data and data collection methods applying self-determined criteria based on experience, knowledge and literature.

LO3. Create and evaluate new facts, concepts, methods, principles, theories, and research projects in the field of information sciences in a way that creates original scientific cognisance.

LO4. Apply appropriate research methods in creating new scientific cognisance in the field of information sciences.

LO5. Develop original or adjust existing research methods for integration of different application areas of information sciences.

LO6. Integrate information and communication technologies in an original way in order to realise social and generally acceptable forms of communication and cooperation processes in interaction with individuals or groups of different dispositions and different cultural and ethnic backgrounds.

LO7. Critically evaluate and apply ethical and professional aspects of research plan, management of data life cycle, selection, implementation and presentation of research methods and research results in the field of information sciences.

LO8. Apply project approach to research through team work in physical and virtual environments by taking responsibility for leading a small project team in information sciences.

LO9. Organise data and manage research process and projects using self-determined research (experimental and other) protocols appropriate for research in the chosen area. LO10. Communicate results of their own work in a written and oral form, in a way appropriate for the target audience, correctly using professional terminology and appropriately extending Croatian professional terminology in case when concepts used in foreign literature still do not have generally accepted translation into Croatian language.

# 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:

**issue a letter of expectation** for the period up to three (3) years in which period the higher education institution should make the necessary improvements.

### RECOMMENDATIONS FOR THE IMPROVEMENT OF THE STUDY PROGRAMME

- 1. The implementation of suggested improvements based on the last internal programme evaluation in 2012/2013 needs to be intensified.
- 2. The load from taught courses should be significantly reduced, to free up more time for thesis work. With the current load of 9 ECTS per course, 4-5 courses total would be sufficient. However, reducing the load per course could also be considered. The three courses offering generic skills (research methods, project work, and statistics) should be mandatory. All courses need to be at doctoral level, with a clear advancement from related master courses. Finally, the panel recommends more use of online forms of teaching (MOOCs, webinars, etc.), as an effective way of acquiring state-of-the art knowledge from international experts, to replace some of the internal courses and to facilitate future continuing professional development.
- 3. The number of supervisors involved from FOI should be increased, requiring that the necessary supervisor training be provided to new staff. FOI should establish the planned training workshop for new supervisors as soon as possible.
- 4. FOI should improve online access to literature resources based on students' reported needs, particularly access to the IEEE Xplore Digital Library and to the ACM Digital Library, and should draw this literature to the attention of students both during taught courses and in research activity.
- 5. FOI staff should seek to become more involved with the top international informatics research community and to increase the impact of their research, by targeting high quality international journals. Rather than only using the Croatian Current Contents database for assessing the quality of publications, more emphasis should be put on international ranking systems such as the University of New South Wales database.
- 6. FOI should stimulate an increase in the number of doctoral theses written in English, to allow for more use of international experts in the evaluation committees. Consideration should be given to increasing the number of external members to at least two.
- 7. FOI should seek to increase the number and size of scientific projects, to bring in more research grants and to make available more positions as research assistants that can provide financial support to the candidates.
- 8. The share of candidates that are fully funded or co-funded by research projects or other public sources needs to be improved, to allow for more time devoted to PhD studies for the enrolled candidates.

- 9. FOI should consider appointing the formal PhD thesis supervisor (i.e., not just a student's advisor) at the time of enrolment or in the first months of the PhD programme. The thesis proposal should be seen, not as a preliminary version of the thesis, but as a clear identification of the research problem, accompanied by a discussion of its relevance and of the state of the art. It should be possible for the candidates to complete the thesis proposal defense during the first year of the programme.
- 10. The procedure for candidate's progress reports should be assessed, to remove any redundant reporting.
- 11. International recruitment to the programme should be strengthened, through providing more information on the programme in English, offering doctoral courses in English and encouraging use of English language for the doctoral thesis.
- 12. Steps should be taken to move the qualification exam much earlier so that the time devoted solely to research is increased to at least 2 years. The resulting changes to the nature and the timing of the qualification exam should accommodate students who are in employment so that they have the expectation of successful completion.
- 13. The learning outcomes should include attention to the ethical issues (cyber security, privacy, issues associated with machine learning, etc.) inherent in informatics.
- 14. All students enrolled on the programme should have the expectation of success and steps should be taken to ensure this (so demonstrating a caring and professional attitude to the development of young students who may have limited resources at their disposal). The number of inactive students must be reduced dramatically as a matter of urgency.
- 15. FOI should encourage more mobility for doctoral students and staff, possibly by offering grants for this, encouraging joint project activity and publication and having regard to the standing of international partners. Increasing the use of English for the doctoral courses and theses is recommended, to enable attracting international experts to contribute in the programme as teachers and supervisors.

# ADVANTAGES OF THE STUDY PROGRAMME

- 1. The programme is well-established, with well-documented procedures and regulations.
- 2. The programme has access to a large pool of well-qualified supervisors, also from related disciplines.
- 3. The interdisciplinary nature of the programme provides for interesting projects connecting to other disciplines.
- 4. The programme has a good network of collaborating European universities, which provides the opportunity for increased mobility for staff and doctoral students.

# DISADVANTAGES OF THE STUDY PROGRAMME

- 1. The programme currently has a large share of inactive students (107 out of 187).
- 2. The time taken for developing a thesis proposal is too long, mainly due to a high course load in the doctoral programme.
- 3. Most candidates in the programme have too little time available for their doctoral studies, due to a high teaching load for candidates employed in academia or other work duties for candidates from industry.

- 4. While some students are part of research groups or projects, many students express that they work on specialized topics and lack connection to other students or groups.
- 5. Limited use of English in the doctoral courses and for the doctoral theses limits the possibility for using international experts in the thesis evaluation committees.

# **EXAMPLES OF GOOD PRACTICE**

- 1. The doctoral workshops organized regularly provide an important arena for knowledge exchange among supervisors and candidates, and building a common identity of the programme.
- 2. The use of more structured candidate interviews as part of the admission procedure can help in recruiting motivated candidates and reduce drop out.
- 3. The candidates get good training in writing academic papers as part of the requirements of the programme.

# 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	YES
reaccreditation decision on performing higher education activities and scientific activity.	
2. HEI delivers programmes in the two cycles leading to the doctoral	YES
programme, i.e., first two cycles in the same area and field/fields (for	163
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).	
3. HEI employs a sufficient number of researchers, as defined by Article 7 of	YES
the the Ordinance on Conditions for Issuing Licence for Scientific Activity,	120
Conditions for Re-Accreditation of Scientific Organisations and Content of	
Licence (OG 83/2010).	
4. At least 50% of teaching as expressed in norm-hours is delivered by	YES
teachers employed at the HEI (full-time, elected into scientific-teaching	
titles).	
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	YES
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.	
Additional/recommended conditions of the ASHE Accreditation Council	YES/NO
for passing a positive opinion	notes
1. HEI (or HEIs in joint programmes) has at least five teachers appointed to	YES
scientific-teaching titles in the field, or fields relevant for the programme	
involved in its delivery.	
2. In the most recent reaccreditation, HEI had the standard Scientific and	YES
Professional Activity marked as at least "partly implemented" (3).	
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
5. All supervisors meet the following conditions:	a) YES
a) PhD, elected into a scientific title, holds a scientific or a scientific-teaching	b) YES
position and/or has at least two years of postdoctoral research experience;	c) YES
b) active researcher in the scientific area of the programme, as evidenced by	d) NO
publications, participation in scientific conferences and/or projects in the	e) YES

past five years (table 2, Supervisors and candidates);	f) NO
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.	
6. All teachers meet the following conditions:	a) YES
a) holds a scientific or a scientific-teaching position;	b) YES
b) active researcher, recognized in the field relevant for the course (table 1,	b) ILS
Teachers).	
7. The supervisor normally does not participate in the assessment	YES/NO
committees.	
8. The programme ensures that all candidates spend at least three years	YES
doing independent research (while studying, individually, within or outside	
courses), which includes writing the thesis, publishing, participating in	
international conferences, field work, attending courses 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**

		Quality assessment ("high level of quality" or "improvements are necessary") and the explanation of the Expert Panel
1.	RESOURCES: TEACHERS, SUPERVISORS, RESEARCH CAPACITIES AND INFRASTRUCTURE	
1.1	. HEI is distinguished by its scientific/ artistic achievements in the discipline in which the doctoral study programme is delivered.	Improvements are necessary  The doctoral programme involves a high number of scientific staff, with 30 teachers and 59 supervisors (including considerable overlap between the two categories). The programme is interdisciplinary, thus also involving staff resources in disciplines other than information and communication sciences (e.g. computer science, pedagogy, economics, law, mathematics, physics). In the staff overview tables in the SER, 26 full professors were listed. All staff members are research active, but the number of publications and citation impact is uneven. With a few exceptions, the citation index for the involved faculty from FOI is relatively low. Publications in conference proceedings are dominating, and the number of papers published in highly ranked journals (according to the Croatian scientific bibliography) comprise less than 10% of the total research production.  The SER documents 89 research projects from 2012 to 2016, of which half are funded from international sources. This is an impressive number of projects, but without access to more detailed information the panel is not able to judge the scientific quality of these projects. However, the visible impact of these projects on the research at FOI (number of grants funded by the projects, joint papers with international project teams, etc.) seems moderate. FOI publishes a scientific journal, organises an annual international conference and co-organizes an International Doctoral Seminar.  Recommendation: FOI staff should seek to increase the impact of their research by increasing research internationalization through more high-quality research projects at European level and by targeting high-quality journals more than conference proceedings.
1.2	The number and workload of teachers involved in the study programme ensure quality doctoral education.	High level of quality The programme involves 30 teachers, of which 26 (86.7%) are from FOI staff. Their total teaching load as specified

in the SER, although varying, is considered to be within the normal range. However, several of the teachers are listed as having their main teaching load in other study programmes, and zero load for FOI doctoral courses; this implies that they are not currently active as teachers in the programme.

1.3. The teachers are highly qualified researchers who actively engage with the topics they teach, providing a quality doctoral programme.

# High level of quality

Overall, the SER documents adequate research activity of the teachers involved. However, the number and level of publications vary considerably among the scientific staff, thus representing an area for potential improvement.

# High level of quality

The ratio of supervisors to active doctoral students is 1:1.36. If inactive students are also included, the ratio is 1:3.17. So far 33 of the listed 59 supervisors have been involved in thesis supervision, and of these only half are from FOI. Thus, there is a potential to increase the number of active supervisors from FOI, which will require adequate supervisor training. We comment further on this in point 2.4.

Among 27 of the staff who have supervised or are still supervising a thesis (total of 33 supervisors), the SER documents a research production of in total 371 publications, or on average 2.7 publications per year for each supervisor. This includes approximately 100 journal papers, but with less than 10% of the publications in highly ranked journals (CC journals).

Apart from two supervisors who are both external to FOI, all supervisors are listed as leading and/or participating in international and/or national research projects in the last five years.

Furthermore, 129 publications involving a doctoral student as co-author were reported in the period from 2012 to 2016, of which 37 in journals (7 in CC journals).

In terms of completion rate, an overall problem for the doctoral programme is the large number of inactive students and the generally slow progress of the candidates.

# Recommendations:

The number of supervisors involved from FOI should be increased, involving necessary training of these.

Supervisors and doctoral candidates should increase the number of publications in highly ranked journals.

1.4. The number of supervisors and their qualifications provide for quality in producing the doctoral thesis.

1.5.	The HEI has developed methods of assessing the qualifications and competencies of teachers and supervisors.	High level of quality  FOI has established procedures for assessing the qualifications and competencies of teachers and supervisors, based on analysis of scientific work and supervision results. This also includes annual evaluation reports from the doctoral students.
1.6.	The HEI has access to high-quality resources for research, as required by the programme discipline.	Improvements are necessary FOI provides the candidates with state-of-the-art research infrastructure, in the form of library resources and laboratories. However, several doctoral students also point to limitations in online access to literature, e.g. lack of access to the ACM Digital Library.  Recommendation: FOI should improve online access to literature resources based on students' reported needs, including access to ACM Digital Library.
2.	INTERNAL QUALITY ASSURANCE OF THE PROGRAMME	
2.1.	The HEI has established and accepted effective procedures for proposing, approving and delivering doctoral education. The procedures include identification of scientific/ artistic, cultural, social and economic needs.	High level of quality The doctoral programme was established according to the Regulation on the procedure of evaluation of study programmes of doctoral studies at the University of Zagreb. In line with this, FOI prepared an elaboration on the scientific, social and economic needs for the programme.
2.2.	The programme is aligned with the HEI research mission and vision, i.e. research strategy.	High level of quality The doctoral programme is aligned with the Strategy of Scientific Research of the Faculty of Organization and Informatics for the period 2017-2020, in terms of research focus, programme content and academic resources.
2.3.	The HEI systematically monitors the success of the programmes through periodic reviews, and implements improvements.	Improvements are necessary  The University of Zagreb carries out regular internal evaluations of doctoral study programmes, and the most recent evaluation conducted of the FOI programme was in 2012/2013. Based on the evaluation results, several improvements have been implemented related to admission procedures, progress of the candidates, and scope of the programme. While some positive effects of these changes are documented in the SER, the suggestions from the evaluation on reducing the number of courses and amount of coursework are not yet implemented, and the duration for developing the thesis proposal is still too long. Further, routines for collecting feedback from dropouts are not documented.  Recommendation: While the mechanisms for monitoring

		the success of the programme are in place, the implementation of improvements needs to be extended in scope and efficacy. In particular, this relates to reducing the course load in the programme, and the time required for developing the thesis proposal during the first year of the programme.
2.4.	HEI continuously monitors supervisors' performance and has mechanisms for evaluating supervisors, and, if necessary, changing them and mediating between the supervisors and the candidates.	Improvements are necessary  The SER documents mechanisms for monitoring and improving the quality of supervision.  According to the Regulation on postgraduate university study, requirements for becoming a supervisor include completing a doctoral supervisors' workshop or be a cosupervisor along with a more experienced supervisor. As pointed out in the SER, the University of Zagreb has not organized any supervisor workshop in the last three years. As a result of this, FOI plans to establish their own workshop, in addition to facilitating co-supervision between junior and senior faculty.  Recommendation: FOI should establish a training workshop for new supervisors as soon as possible.
2.5.	HEI assures academic integrity and freedom.	High level of quality FOI follows the Code of Ethics of the University of Zagreb, supporting academic freedom and preventing plagiarism and other unethical behaviour. The University of Zagreb has signed the European Charter for Researchers and The Code of Conduct for the Recruitment of Researchers. FOI has also provided additional ethical rules on plagiarism, authorship and conflict of interest. However, it does need to address the deep ethical issues inherent in Informatics as a discipline. Plagiarism detection software has recently been acquired and routines for the use of this are being established.
2.6.	The process of developing and defending the thesis proposal is transparent and objective, and includes a public presentation.	High level of quality Requirements and the process for defending the thesis proposal are specified in the Regulation on postgraduate university study, including the protocol and templates for thesis presentation, defence and assessment. The thesis defense includes a public presentation. The assessment committee comprises at least one member who is external to FOI.
2.7.	Thesis assessment results from a scientifically sound assessment of an independent committee.	High level of quality The regulation on postgraduate university study specifies the procedure for developing and defending the doctoral thesis, including related templates and forms. The doctoral

student is required to publish at least one paper at the A1 level, and to collect a total of 54 ECTS credits based on published research. So far, all doctoral theses developed at FOI are monographs. At least one member of the thesis evaluation committee is external to the programme. So far, only around 25% of the thesis proposals and the theses defended are written in English, which limits the possibility for using international committee members (who do not understand Croatian). Recommendations: We encourage FOI to stimulate an increase in the number of theses written in English, to allow for more use of international experts in the evaluation committees. We also suggest the expected number of external members to be increased to at least two. 2.8. The HEI publishes all necessary **High level of quality** information on the study programme, FOI publishes the necessary information on its web pages, and also uses their eLMS to provide information to their admissions, delivery and conditions for progression and completion, in candidates. accessible outlets and media. High level of quality 2.9. Funds collected for the needs of The tuition fees are allocated to expenses of doctoral doctoral education are distributed education in compliance with the Regulation on allocation transparently and in a way that of Faculty's own earnings. In addition, part of the expenses ensures sustainability and further for research activities is covered from scientific projects. development of doctoral education However, only a small share of the students participate in (ensures that candidates' research is projects, and during the last five years only 3 students had carried out and supported, so that their tuition fees covered from project work. doctoral education can be completed Recommendation: FOI should increase the extent of high successfully). quality scientific projects, to enable more research grants and positions as research assistants that can provide financial support to the candidates. High level of quality 2.10. Tuition fees are determined on the The criteria are listed in the SER, and thus transparent. However, the detailed study cost estimation per student is basis of transparent criteria (and real costs of studying). only presented in Croatian, and thus difficult to assess for the panel. 3. SUPPORT **DOCTORAL** TO **CANDIDATES AND THEIR PROGRESSION** 3.1. The HEI establishes admission quotas High level of quality After the latest internal evaluation, FOI has decreased the with respect to its teaching and admission quota and implemented a more structured supervision capacities. interview form. In 2016, only 6 new candidates were enrolled, compared to 17 enrolments in 2012. With 59 potential supervisors, the current admission can be regarded as low compared to the teaching and supervision capacities. Implementing supervisor training for new academic staff in the form of doctoral supervisor workshops and mentoring from experienced supervisors would also contribute to further increase in the supervision capacities. However, the large number of inactive students currently enrolled in the programme requires action in the form of re-engaging these in the programme or advising them to discontinue their studies.

3.2. The HEI establishes admission quotas on the basis of scientific/ artistic, cultural, social, economic and other needs.

# High level of quality

The SER refers to data from the Croatian employment service, showing no unemployed doctors of information and communication sciences. The report does not provide information on the type of employment of the PhD alumni, only for the current PhD students. The number of research projects with business partners involving PhD students is reported to be increasing, providing a basis for further collaboration with industry.

3.3. The HEI establishes the admission quotas taking into account the funding available to the candidates, that is, on the basis of the absorption potentials of research projects or other sources of funding.

# Improvements are necessary

For the majority of students in the programme, tuition is covered by their employer or by themselves. FOI covers the tuition fees for candidates employed as teaching or research assistants, but this implies a high workload that reduces the progress of the doctoral studies. So far, only three students in the programme have been fully funded from projects of the Croatian Science Fund.

Recommendation: The share of candidates that are fully funded or co-funded by research projects or other public sources need to be improved, to allow for more time devoted to PhD studies for the enrolled candidates.

3.4. The HEI should pay attention to the number of candidates admitted as to provide each with an advisor (a potential supervisor). From the point of admission to the end of doctoral education, efforts are invested so that each candidate has a sustainable research plan and is able to complete doctoral research successfully.

# Improvements are necessary

Each student is assigned an advisor at the time of enrolment in the programme; the advisor supports their work and monitors their progress until the formal supervisor is appointed after the thesis proposal defense. The panel is here of the opinion that the supervisor should be appointed at enrolment, which could contribute to speeding up the process of developing the thesis proposal. The doctoral students manage their plan in the ePortfolio system. Several of the students here expressed discontent with having to report the same information in several systems.

3.7.	The HEI ensures that the selection procedure is transparent and in line with published criteria, and that there is a transparent complaints procedure.	requirements, except that a research proposal is not a requirement for admission.  High level of quality  The selection procedure described in the SER is transparent, with the list of admitted applicants being published on the programme web pages, and a possibility for rejected candidates to appeal to the Faculty council. Rejected candidates have access to the Admission
3.8.	-	for rejected candidates to appeal to the Faculty council. Rejected candidates have access to the Admission interview form and reasons for rejection.  High level of quality For candidates with a postgraduate scientific master degree or university postgraduate specialist degree, the required number of ECTS credits from courses and publications is reduced. Similarly, applicants previously enrolled in a doctoral study programme may get ECTS
3.9.	Candidates' rights and obligations are defined in relevant HEI regulations and a contract on studying that provides for a high level of supervisory and institutional support to the candidates.	credits acknowledged for relevant courses.  High level of quality The SER documents regulations and a study contract that meets the requirements for institutional and supervisory support to the candidates.

# Improvements are necessary

The SER does not document any ordinance articles for institutional support mechanisms, but lists examples of covering doctoral students' registration fees for a bi-annual International Doctoral Seminar and the Central European Conference on Information and Intelligent Systems, both organized by FOI. Furthermore, the SER points to 36 journal publications and 68 papers at international conferences co-authored by doctoral students, but without documenting how many students received financial support for attending these conferences. In the period from 2012-2016, 29 students participated in projects at FOI, with 4 being employed at FOI.

Recommendation: The panel recommends that the institutional support for attending high quality international conferences is increased. Further, the number of candidates receiving institutional support funding through research projects should be increased.

3.10. There are institutional support mechanisms for candidates' successful progression.

# 4. PROGRAMME AND OUTCOMES

# Improvements are necessary

The SER does not provide any explicit comparison of the doctoral programme at FOI with international standards. While the procedures for supporting and assessing the individual research (supervision, doctoral seminars, thesis defense etc.) are considered to be aligned with international standards, the panel sees a need for significant changes to the course part of the programme. Most of the students are required to take 9 courses of 9 ECTS each, giving a total of 81 ECTS. Even if a main part of the coursework is focusing on the candidate's individual research through developing review papers or conference articles, this course load is significantly higher than for comparable 3-year doctoral programmes abroad. In comparison, the norm for PhD programmes in Scandinavia is 30 ECTS of coursework. In the interview with the doctoral candidates, they expressed discontent with the high number of courses, arguing that it consumes a too large share of the 180 ECTS programme.

The students at FOI can select among 27 elective courses. However, these courses are not offered every year, which according to the students can lead to a suboptimal selection of courses based on which courses are available. Further, some courses were perceived by the students as not providing sufficient progression beyond the master level, and were therefore considered less relevant for their

4.1. The content and quality of the doctoral programme are aligned with internationally recognized standards.

research.

One argument presented by the programme management for offering this large number of courses was that this enabled the academic staff to present themselves as potential supervisors to the students. However, the panel would argue that there are other mechanisms that could be used for this matchmaking, such as presentations of the staff in doctoral seminars and presentation of their research profile on the programme web pages.

The time taken to develop and defend the thesis proposal is considered too long. In most international programmes, this would be completed within the first year. This requires that the main purpose of the thesis proposal is to define the research problem, rather than also expecting research contributions to be presented by the candidate at this stage.

On the positive side, the interdisciplinary research in the programme as documented in the SER is considered to be of high quality.

# Recommendations:

The load from taught courses should be significantly reduced, to free up more time for thesis work. With the current load of 9 ECTS per course, 4-5 courses total would be sufficient. However, reducing the load per course could also be considered. The three courses offering generic skills (research methods, project work, and statistics) should be mandatory. All courses need to be at doctoral level, with a clear advancement from related master courses. The panel recommends more use of online forms of teaching (MOOCS, webinars, etc.), as an effective way of acquiring state-of-the art knowledge from international experts; this could replace some of the internal courses. Finally, the procedures and requirements for developing the thesis proposal should be adjusted, to make it possible for the candidates to complete this within the first year of study.

4.2. Programme learning outcomes, as well as the learning outcomes of modules and subject units, are aligned with the level 8.2 of the CroQF. They clearly describe the competencies the candidates will develop during the doctoral programme, including the ethical requirements of doing research.

# High level of quality

The SER and related appendices present a detailed mapping of the programme learning outcomes and the descriptors of CRoQF level 8.2, documenting that these are well aligned. Further, the programme learning outcomes are mapped to the learning outcomes for each of the 27 doctoral elective courses and other programme activities. Research ethics are addressed in the course on Research methods in information science. The panel recommends that this course is made mandatory, together with the two

		other courses providing generic skills (project management and statistical methods).
4.3.	Programme learning outcomes are logically and clearly connected with teaching contents, as well as the contents included in supervision and research.	Improvements are necessary While the mapping of the programme learning outcomes to the described teaching contents is considered adequate, the issues raised in point 4.1 about the teaching contents as perceived by the doctoral students indicate a need for improvements.  For recommendations, see point 4.1.
4.4.	The doctoral programme ensures the achievement of learning outcomes and competencies aligned with the level 8.2 of the CroQF.	High level of quality The sample of doctoral candidates' work (doctoral theses, peer-reviewed journal and conference papers) presented to the panel documents that the achieved learning outcomes are at an adequate level and comparable to international standards for doctoral education.
4.5.	Teaching methods (and ECTS, if applicable) are appropriate for level 8.2 of the CroQF and assure achievement of clearly defined learning outcomes.	High level of quality The SER documents a suitable variation of teaching methods, combining classroom teaching with laboratory work, project activities, research seminars, doctoral workshops and guided individual research. The panel recommends more use of online forms of teaching (MOOCs, webinars, etc.), as an effective way of acquiring state-of-the art knowledge from international experts and of remaining current in their future professional life; these could replace some of the internal courses.
4.6.	The programme enables acquisition of general (transferable) skills.	High level of quality The programme offers three doctoral courses covering generic skills, related to research methods, project work, and statistics. In addition, generic competences are acquired in regular doctoral workshops and in development of research papers as part of the doctoral courses. The panel recommends that the three mentioned doctoral courses are made mandatory for the candidates.
4.7.	Teaching content is adapted to the needs of current and future research and candidates' training (individual course plans, generic skills etc.).	High level of quality All doctoral courses in the programme are electives, and the students can choose freely among these. However, several of the students point to the availability of courses as a limitation, since courses are typically not offered on an annual basis. This may result in the selection of courses being decided more on availability than relevance.  As commented to point 4.1, the panel recommends that more use of MOOCs and other online course offerings

	replace traditional doctoral courses, to give candidates further possibility to adapt the teaching contents to their needs.
4.8. The programme ensures quality through international connections and teacher and candidate mobility.	Improvements are necessary  The SER documents good international connections through Erasmus agreements, and other bilateral and multilateral agreements. Calls for application for teacher and student mobility are regularly announced.  Yet, the number of doctoral candidates taking advantage of these possibilities is still very low. The volume of staff mobility is slightly higher.  The University of Zagreb has signed the Declaration of Commitment to the European Charter for Researchers and The Code of Conduct for the Recruitment of Researchers, and the doctoral students are introduced to the principles for this. As of 2016, 26.5 % of all proposed theses were written in English.  Recommendations:  FOI should encourage more mobility for doctoral students and staff, possibly by offering grants for this. Increasing the use of English for the doctoral courses and theses is recommended, to enable attracting international experts to contribute in the programme as teachers and supervisors.

# \* NOTE: RECOMMENDATIONS OF THE EXPERT PANEL TO THE ASHE'S ACCREDITATION COUNCIL AND QUALITY LABEL

The role of the Expert Panel in the re-accreditation of doctoral study programmes is manifold. The Expert Panel or part of the Expert Panel visiting a higher education institution drafts a report on the basis of a self-evaluation report, the accompanying relevant documentation, and a site visit to HEI. The draft report is adopted by all members of the Cluster Expert Panel, while the president of the Cluster Expert Panel is responsible for coordinating the assessment levels.

The report contains an assessment on whether a doctoral study programme delivered at a higher education institution complies with the prescribed laws and by-laws, as well as any additional/recommended requirements defined by the Agency's Accreditation Council, and whether a higher education institution can obtain a positive, i.e. satisfactory quality assessment according to the criteria set out in this document. Moreover, the Expert Panel must make recommendations for quality improvement.

Based on the assessment of all these elements, the Expert Panel may propose to the Accreditation Council of the Agency to issue either a confirmation on compliance, a letter of expectation for the period up to three (3) years in which period the higher education institution should eliminate the identified deficiencies, or to deny the license.

If the Expert Panel has assessed that a doctoral study programme delivered by a higher education institution does not meet legal and other requirements or that the quality of a study programme is not ensured (i.e. that HEI does not meet additional requirements or recommendations made by the Accreditation Council, or has a very poor quality assessment), they should propose to the Accreditation Council to deny the license.

If the Expert Panel considers that the relevant laws and bylaws have been met by a higher education institution, but that certain elements mentioned above do not meet the quality requirements, while they consider that the identified shortcomings can be corrected within a time frame of three years, they should issue a letter of expectation.

If the Expert Panel considers that all legal and additional/recommended requirements have been met and the quality assessment is satisfactory, i.e. that a study programme fulfils the learning outcomes appropriately defined for that level and scientific area, they may propose the issuance of a certificate and have a HEI commit to quality improvement and reporting to the Agency during the follow-up period.

Finally, if the Expert Panel has, in accordance with the criteria mentioned above, proposed issuing the certificate of compliance and assessed that, in addition to meeting the minimum quality requirements – i.e. the qualification framework level - for a study programme, the programme should be identified as a doctoral programme of a 'high level of quality', the Expert Panel may propose to the Agency's Accreditation Council that such a doctoral study programme be awarded the 'high quality label'. Thus the Agency, with the consent of the Accreditation Council, grants a higher education institution the right to use the label for their academic and promotional purposes.

The 'high quality label' cannot be proposed or awarded to a programme or a higher education institution that does not comply with the requirements laid down by the laws and bylaws mentioned in this document, and any additional requirements recommended by the Accreditation Council. Moreover, the quality assessment awarded to a study programme should reflect a high level of quality inasmuch that at least half of the sub-criteria in each of the quality assessment criteria are assessed as

being of high quality. The Accreditation Council of the Agency issues a final opinion on the label awarded. The content and form of the quality labels shall be prescribed by the Agency in a relevant general act.

The Accreditation Council of the Agency discusses the final report with all recommendations and suggestions, and issues their opinion on the report. Based on a prior opinion of the Accreditation Council, the Agency issues an Accreditation Recommendation to the minister responsible for science and higher education, and upon receipt of the minister's final decision on the outcome of the procedure, awards the 'high quality label" to a higher education institution.