



The EDUPROF project: developing indicators of applied research

Final report

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The EDUPROF – developing indicators of applied research team

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Introduction: the EDUPROF project

The European knowledge society demands high skilled and flexible professionals. The new European professional is a professional who continuously produces new and interdisciplinary knowledge on the basis of knowledge skills, creativity and innovative talent. UAS (Universities of Applied Sciences) throughout Europe are educating these professionals in the diverse fields of economics, business and management, teacher training, engineering, social work, health care, fine and performing arts, and agriculture to the benefit of SMEs and companies from the public and social sector. As the demands for the new European professional change, so their education should change correspondingly.

In order to meet the demands of an advanced knowledge-based society, applied research is becoming a core element of the professional education mission of UAS. Questions that arise are: how to ensure a good system of quality assurance for applied research; how to translate research findings into educational programmes; how to adjust the qualities of staff members in relation to applied research; how to form good regional networks; and how to finance the research activities. It was the goal of the 'EDUPROF'-project (October 2008 – October 2011) to mirror the various developments within countries and regions to the European level. In this way both peer learning and European harmonisation between UAS was stimulated on the subject of integrating the combination of education and applied research in the curricula of the new European professional. EDUPROF was funded with the support of the European Commission.

The EDUPROF consortium

The core members of the consortium were eleven national expert organisations on strengthening the socio-economic position of the UAS within their own country and beyond. It concerned the national associations (or rectors' conferences) from Ireland, Denmark, Finland, Estonia, Lithuania, Germany, Austria, Switzerland, Portugal, France and the Netherlands, united in UASnet (Universities of Applied Sciences Network). However, many (representatives of) individual institutions took part in different parts of the EDUPROF project.

Developing indicators of applied research

One of the project activities was aimed at developing and pilot testing indicators of applied research, as well as, in a way, the development of a manageable benchmark, which fits UAS throughout Europe.

With this initiative the project partners aimed to contribute to greater transparency about the research mission, profiles and performances of Universities of Applied Sciences, and to help institutions to better position themselves and improve their research strategies, - quality and - performances. As Kaiser, Jongbloed and van Vught stated in a paper on applied research, knowledge transfer and indicators selected in the U-Multirank and U-Map projects, 'the discussion on the construction of indicators to capture research and knowledge transfer activity in all its sub-dimensions is still very much unresolved'¹. By developing and testing indicators of applied research, the partners aimed to take that discussion further.

Fourteen Universities of Applied Sciences were involved, originating from ten different European countries: Finland, Lithuania, Portugal, Estonia, Denmark, Austria, Switzerland, Ireland and Flanders (invited to join in by the project partners). Expert on higher education policy and management and project leader of the U-Map and U-Multirank projects Frans van Vught guided the process.

This paper is about this indicators project. Discussed are the goal, background and the policy context of the project, as well as the process of developing and testing the indicators, the indicators themselves and the outcomes. The paper concludes with some reflexions on the outcomes and suggestions for further research.

¹ Kaiser, F., Jongbloed, B., van Vught, F. (October 2010), *Research, applied research, knowledge transfer and indicators selected in the U-Multirank and U-Map projects*, p. 2. Paper (draft), provided by the authors.

Goals, background and policy context

The goal of this part of the EDUPROF project was to develop and pilot-test a list of indicators of applied research. In order to do this, the participants had to answer two questions:

- 1) What are good indicators of applied research?
- 2) Are these indicators feasible / can we find and compare the data?

There are three reasons why such indicators are important. The first reason is that they contribute to greater transparency: Universities of Applied Sciences need to show their research profile. The European Commission has stated many times that it is important to achieve greater transparency regarding what different institutions do and how they perform in various fields where they operate. This will make it easier for students and researchers to choose where to study and work. Moreover, in the face of global competition, European higher education institutions need to modernize, for example by diversifying according to their strengths. Transparency is a necessary precondition for diversity to be a strength.

Secondly, good indicators of applied research can help Universities of Applied Sciences to compare and benchmark amongst each other: to find comparable institutions, to discuss differences and learn from each other.

Thirdly, offering more accessible and comparable information will help institutions to better position themselves and evaluate and improve their research strategies and – performances.

Related initiatives

Several other initiatives in Europe have a somewhat similar purpose, even though they may have a different focus. U-Map², supported by the European Commission, is an ongoing project in which a European classification of higher education is (further) developed and implemented. It offers two tools to enhance transparency: a *ProfileFinder* that produces a list of higher education institutions that are comparable on characteristics selected by the user. A *ProfileViewer* gives the user an institutional activity profile he or she can use to compare up to three institutions. The U-Map classification is based on a multidimensional perspective (dimensions such as teaching and learning, student profile, knowledge exchange, research involvement) and aims to classify all European higher education institutions.

U-Multirank³ is a new international ranking tool which is multi-dimensional, multi-level and user-driven. The project, also supported by the European Commission, started as a feasibility study into a new global ranking aimed at comparing similar (comparable) institutions and programmes. Unlike the U-Map classification, U-Multirank is about showing an institution's performance on five dimensions: teaching & learning, research, knowledge transfer, international orientation and regional engagement. Currently, U-Multirank is expected to be launched and further developed in the next few years. In its September 2011 agenda for modernisation of Europe's higher education systems, the European Commission announces it will launch U-Multirank.

'(...) a new performance-based ranking and information tool for profiling higher education institutions, aiming to radically improve the transparency of the higher education sector, with first results in 2013'⁴.

Finally, the Dutch ERiC project (Evaluating Research in Context)⁵ aims to develop and disseminate information about how to measure the social impact of research, including that of research carried out at Universities of Applied Sciences.

In the EDUPROF project 'developing indicators of applied research', the participants have tried to learn from these other initiatives and build on their findings. The EDUPROF project should be seen as complementary to the above mentioned and other initiatives aiming to improve the transparency of the higher education sector.

² See www.u-map.eu

³ See www.u-multirank.eu

⁴ COM(2011) 567 final, p. 11

⁵ See http://www.eric-project.nl/nwohome.nsf/pages/NWOA_6TZJ28_Eng

Process & participants

The participants & experts

Fourteen Universities of Applied Sciences took part in the indicators project:

- FH Joanneum UAS, Austria
- Leuven University College, Belgium
- University College Zealand, Denmark
- University College Lillebaelt, Denmark
- Tallinna Tehnikakool UAS, Estonia
- Satakunta UAS, Finland
- Mikkeli UAS, Finland
- ITT Dublin / Tallaght Institute of Technology, Ireland
- Kaunas UAS, Lithuania
- Utrecht UAS, The Netherlands
- Polytechnic Institute of Braganca, Portugal
- Bern UAS, Switzerland
- UAS of Western Switzerland
- UAS Northwestern Switzerland

All institutions were asked to name a representative who served as a contact person and who participated in the working sessions. These participants always had the final say: they decided which indicators to test, which definitions to use and which indicators to include in the “final” list.

Two experts were asked to guide the process: Frans van Vught and Marcel de Haas. Frans van Vught is a well-known expert on higher education policy and management, advisor to the President of the European Commission, Mr. José Manuel Barroso, former Rector of the University of Twente and the founding director of the Center for Higher Education Policy Studies (CHEPS). He was also the project leader of the U-Map (classification) and U-Multirank (ranking) projects.

Marcel de Haas is a senior policy advisor at the Netherlands Association of Universities of Applied Sciences and the secretary of the Validation Committee for Research Quality Assurance (The Netherlands).

Five phases

The project was divided in five phases: a preparatory phase, a first working session, a testing / data collection phase, a second working session and the final phase.

Preparatory phase

During the preparatory phase, a longlist of indicators was produced under the guidance of Frans van Vught. The longlist consisted mainly of indicators of the research impact Universities of Applied Sciences have on professional fields, teaching and training, the scientific body of knowledge and on society at large. The participating institutions were asked for input by email and asked to look at the relevance of the indicators.

First working session with UAS: December 7 2010

After the digital discussion during the preparatory phase and the creation of the long list of indicators, a first working session was set up with representatives of the participating UAS. During this session, the indicators were discussed with a focus on validity, robustness and feasibility. Based on this discussion and their experience in daily operations of their institute, the representatives of the participating UAS selected 23 indicators to be tested during the testing phase.

Drafting the questionnaire & the testing / data collection phase: April – June 2011

The testing phase was aimed at testing the feasibility of the indicators: was it possible to find the necessary data for the indicators? The material from the discussions held so far was used to design a questionnaire. One important question was how to define the indicators: this was discussed by email. Eventually, a questionnaire was sent to all participating Universities of Applied Sciences, who had about two months to provide the coordinator with data for the 23 indicators. Near the end of the testing phase the participants were asked to give feedback based on their experience with the testing phase.

Second working session with UAS: June 15 2011 → Final list of indicators

After the data collection, the results, feedback, indicators and their definitions were discussed with the UAS during a second working session. Eventually, the participants concluded that, even though some further work is need on a few indicators, 20 indicators are feasible on a European scale as well as manageable in data collection. Also, some suggestions for further research were formulated.

Final phase

In the final phase of the project, a report as well as this paper were written, putting together all outcomes of the project. Moreover, the outcomes of the project were presented during the September 2011 EDUPROF closing conference in Helsinki, Finland.

About the indicators

In order to be able to discuss indicators of research meaningfully, it is imperative to agree on the function and significance of research. These can be derived from statements by UASnet on the mission of Universities of Applied Sciences in Europe.

The mission of Universities of Applied Sciences

In its position paper *Towards a European Framework for Innovation and Impact Research Alliances: making the Innovation Union work*, UASnet writes that ‘the UAS focus on developing the high level skill needs of the regions through fulltime and continuing professional higher education, and on engaging in applied research and innovation with regional SMEs, public institutions, the not for profit sector and social profit sector. This focus by the UAS sector on supporting regional needs makes it an ideal partner to deliver on all facets of the Innovation Union agenda’⁶.

In the view of UASnet, Universities of Applied Sciences are the knowledge institutes that take the professions of the world of work as the outset for their education and research. Therefore, UAS see it as their mission to improve professional practice in the public and private sector. UAS do this by educating reflective practitioners, who have R&D capacities, are reflective of their profession and can innovate it according to the demands of the current knowledge society. In this way UAS provide the world of work with the needed human capital. Both in the private sector of business and SMEs and the public sector of not-for-profit organizations and NGO’s. UAS are able to educate those professionals (both young professionals and lifelong learners) in line with the demands of the labor market because they are involved in all sorts of demand-driven innovative projects from the world of work. UAS-led research projects are bottom-up initiatives, starting from actual questions in professional practice or society, with fast-time realization of innovation results.

Indirect indicators

Also taken into account were the contributions of the ERiC project (Evaluating Research in Context, the Netherlands. ERiC defines societal relevance by (1) ‘the degree to which research contributes to and creates an understanding of the development of societal sectors and practice (such as industry, education, policymaking, health care) and the goals they aim to achieve, and to resolving problems and issues (such as climate change and social cohesion)’ and by (2) ‘a well-founded expectation that the research will provide such a contribution in the short or long term’⁷. The second part of the definition emphasizes the *probability* of research having an impact: it is very hard if not impossible to be a 100% sure about the contribution of research to a certain effect, to measure impact directly. Therefore, indicators used to measure impact are usually indirect indicators, or proxy-indicators.

Productive interactions

According to ERiC, the probability of the effect (that is: of research having an impact) can be derived from the interactions between a research group and its (societal) stakeholders. ‘Such interaction can take place when the research agenda is defined, during the research itself, or afterwards, when the results are communicated to stakeholders. (...) A summary of instances of such interaction is therefore an essential element of the information on a research group’s performance. If productive interaction exists between research groups and stakeholders, there is more reason to expect that the research will sooner or later have a societal impact’⁸.

ERiC distinguishes several types of productive interaction:

⁶ *Towards a European Framework for Innovation and Impact Research Alliances: making the Innovation Union work*. UASnet position paper, May 2011. See <http://www.uasnet.eu/publications>.

⁷ *Evaluating the societal relevance of academic research: A guide*, p. 10. See http://www.eric-project.nl/nwohome.nsf/pages/NWOP_82ZCTD_Eng.

⁸ *Ibidem*, p. 10

- Through personal contact (for example in joint projects, networks, consortia, consultancy relationships, part-time practitioner work, through stakeholder input into the group's research agenda);
- Through stakeholder contributions to the research (financial, direct involvement, facility sharing)
- Through publications (papers, reports, protocols, educational material);
- Through artefacts (exhibitions, software, websites, models, musical scores);

Areas of impact & the ordering of indicators

What follows from this is that in order to show the research profile of Universities of Applied Sciences, one has to look at the impact of UAS research on:

- a) Professional fields.
- b) Teaching and training
- c) The scientific body of knowledge
- d) Society at large

The participants of the project believe this is a fruitful categorization for areas of impact. An indicator should express that the contribution to the area is actually delivered or that it is likely to be delivered. Therefore, both input, output, outcome and impact / benefits indicators were involved.

Discussing the indicators

The longlist of indicators was discussed by the participants before, during and after the first working session. Each indicator was evaluated with regard to the following methodological criteria:

- **Relevance:** is the indicator acceptable to the salient stakeholders as relevant indicator?
- **Validity:** does the indicator measure what it is supposed to measure?
- **Robustness:** is the indicator reliable?
- **Feasibility:** is data collection for the indicator possible?

This evaluation resulted in a shortlist of indicators that was used in the testing phase of the project.

Indicators used in the testing phase - overview

A total of 23 indicators were tested by the participating institutions. This list was the result of discussions by the participants before, during and after the first working session. It includes several non-research indicators that are needed in order to be able to compare the different scores on the indicators of applied research. The individual indicators and their definitions are discussed in the paragraph on outcomes of the project.

Money

- Total income (x1000€)
- Direct basic government funding for research (x1000€)
- Research income from competitive research funding sources (x1000€) [impact on scientific body of knowledge]
- Research income from working fields (private and public) (x1000€) [impact on professional fields]

People

- Total of academic staff - number
- Total number of academic staff – FTE
- Total FTE spent on research
- Total FTE spent on teaching
- Total number of staff involved in both research and teaching [impact on teaching and training]
- % students involved in research [impact on teaching and training]

Publications and media appearances

- Total number of research publications [impact on scientific body of knowledge]
- Number of peer-reviewed research publications [impact on scientific body of knowledge]
- Number of research publications relevant to professional fields (self-reported) [impact on professionals fields]
- Total number of research presentations [impact on scientific body of knowledge – see definition]
- Total number of research presentations relevant to professional fields [impact on professionals fields]
- Total number of publications/presentations/appearances in popular media [impact on society at large]

Artefacts and services

- Total number of new artefacts and services in professional fields [impact on professionals fields]
- Total number of Continuous Professional Development (CPD) courses offered as a result of research [impact on teaching and training]

Patents/licenses/start-ups/spin-offs/awards and prizes

- Total number of patents [impact on professionals fields]
- Total number of licenses [impact on professionals fields]
- Total number of start-up firms [impact on professionals fields]
- Total number of spin-offs [impact on professionals fields]
- Total number of awards and prizes won

A few examples of indicators that didn't make it to the testing phase:

- *Use* of new artefacts and services in professional fields – considered to be highly relevant, but not robust and not feasible;
- *Appreciation* of new artefacts and services in professional fields – highly relevant, but not robust and data collection might be problematic;
- Size of knowledge transfer facilities – not very relevant;
- Collaboration with private business and public organizations, number of companies / organizations – relevant, but not very robust;

- Number of journal articles in top-ranked, high impact journals – considered not to be very relevant for research at Universities of Applied Sciences by the participants;
- Citations: impact scores – also considered not to be very relevant for research at Universities of Applied Sciences;
- Number of post-doc positions as a percentage of total staff – not relevant for UAS research;
- Number of new products, services for consumers and citizens – very relevant, but not very robust nor feasible;
- Appreciation of teachers involved in research – relevant, but problems with validity, robustness and feasibility.

The outcomes of the project

Overview

In short, the outcomes of the project can be summarized as follows:

1. 20 out of 23 indicators are feasible and can be used to, for example, introduce a common benchmark on applied research for Universities of Applied Sciences;
2. 3 indicators should be feasible in due time;
3. There is still work to do: even though most of the participating institutions were able to collect data for most of the indicators, there are still questions of comparability. Moreover, it is imperative that databases are being developed that cover non-traditional (peer-reviewed) research output;
4. Finding indicators that are innovative, relevant as well as robust, valid and feasible is very complicated. The participants identified several indicators that they considered to be very relevant but couldn't be included because they were not feasible, robust and/or valid;
5. Because of this (3 + 4), further research is recommended.
6. A final – and in the eyes of the participants very important – outcome is the impact of this project on the participating and other institutions. Like other initiatives aimed at providing more transparent information about higher education in Europe (such as U-Map and U-Multirank), this project stimulated and stimulates institutions to think about ways to enhance transparency about their profile and performances as well as to better position themselves and evaluate and improve their research strategies. For example: the Lithuanian Colleges Director's Conference developed a list of national evaluation criteria of applied research, based on the indicators that were discussed and developed during this EDUPROF project. The criteria are now under consideration of the Lithuanian Ministry of Education and Science.

Several of the outcomes will be discussed more fully below. Outcomes 3, 4 and 5 are discussed under the paragraph 'Some reflexions and suggestions for further research'.

Feasible indicators – definitions and remarks

Money

Total income:

- Definition: the total transfers to your institution from the following sources: direct public expenditures, fees from households and students, direct expenditures of other private entities (other than households), direct foreign payments;
- This indicator is used to calculate the relative "scores" of the indicators mentioned beneath.

Direct basic (government) funding for research:

- Definition: all amounts received as direct government funding ('core funding') by the institution through acts of a legislative body (i.e. ministry or national funding agency), except for competitive grants and contracts, plus the part of fees from households, students and other actors devoted to research;
- The adjective "basic" or "core" means recurrent funding that is normally awarded each year. In many institutions, the direct basic funding for research is part of the general institutional funds that the institution receives as an integrated amount (i.e. a 'block grant', or 'lump sum') for its education, research and other services. In that case, the best estimate is to be provided for the part devoted (directly and indirectly) to research.

Research income from competitive research funding sources:

- Definition: income from the following activities:
 - a) European research programs: this category includes research funds administered by the European Commission or – on its behalf – one of its bodies. For example: the Framework Program, the European Structural Funds;
 - b) Research councils: revenues from government agencies and other public bodies, awarded competitively for specific scientific research carried out by the institution. This includes research projects funded through grants and contracts by research councils, ministries and

other government agencies. Such grants and contracts are normally awarded after a peer review of research proposals submitted by (teams of) academics. Funds provided by the ERC are also included. Research related project based funding has to be included in this category as well;

- c) Research councils specifically aimed at facilitating applied research, knowledge exchange (e.g. the Dutch RAAK scheme managed by the Foundation Innovation Alliance that aims to improve knowledge exchange between Dutch SME's, public sector organisations and universities of applied sciences) and/or valorization, including income from pre-seed funds and proof of concept programmes.

Example: research income from competitive funding sources - Switzerland

Most UAS in Switzerland have a differentiated funding system in place that supports research activities and is tailored to the researchers' needs. Generally, it covers the entire innovation process: a basic financing is provided to generate new knowledge and to do preliminary work for third-party funded research projects. Additionally, some projects that are funded by these systems actively support inter- and trans disciplinary research activities. Furthermore, research activities in cooperation with partners from business as well as private and public institutions in Switzerland are often financed by Swiss funding organizations such as the Swiss National Science Foundation (SNF) and – primarily in the technical fields – the Commission for Technology and Innovation (KTI). The mixed financing of KTI research projects (50% public / 50% private) ensures a quick implementation and commercialization of innovations. As is the case with other UAS, the Bern University of Applied Sciences has a so called “matching fund” that is targeted at leveraging these acquired external funds directly: each externally raised Swiss Franc is matched with approximately 30 cents (30% matching) of internal funding. Besides, successful research cooperation often results in further external research assignments and long-term collaborations with the partners.

Research income from working / professional fields (private and public):

- Definition: privately funded research contracts, i.e. all research income that is based on contracts that are not part of funding flows originating from governments (national, international, federal, regional) or other public organizations (such as research councils). Privately funded research includes research contracts and consultancies / services carried out for private (profit or non-profit) organizations, such as industry, medical charities, public organizations and private foundations – from the country itself or abroad.

People

Total (number and FTE) of academic staff:

- Definition: all (non-administrative) personnel involved in academic work (e.g. teaching and research) . Student teachers or teaching / research assistants are only included if they receive a financial compensation for their research / teaching efforts;
- Teachers and researchers that are not formally related to the institution who are (temporarily) engaged in academic work at the institution should be included;
- Data needed: the total contracted FTE's (both employed staff and contracted staff).

Total FTE spent on research:

- Definition: number of FTE's spent on research;
- Needed is the amount of FTE's that is actually spend on research (by both employed and contract researchers).

Total FTE spent on teachers:

- Definition: the number of FTE's spent on teaching;
- Needed is the amount of FTE's that is actually spent on teaching (by both employed and contract teachers).

Total number of staff involved in both research and teaching:

- Definition: the number of staff members (not FTE) involved in both research and teaching.

Example: staff involved in both research and teaching – Ireland

In 2008 researchers at ITT Dublin / Tallaght Institute of Technology secured a capital equipment grant from Enterprise Ireland* of ca. €600.000 to establish a process analytical technology (PAT) capability with applications for the pharmaceutical industry. This has been deployed to support applied research projects with the industry, seven projects have been completed since mid-2009. These have focused on solving pharmaceutical manufacturing problems, enabling improved understandings of chemical processing, supporting new product/formulation developments, and development of new process optimisation strategies. The researchers (principal investigators) involved have also successfully introduced these new technologies into a taught M.Sc. programme in Pharmaceutical Technology aimed primarily at persons working in the industry seeking a strongly focused add-on qualification. To date over 30 students have completed this programme ensuring the transfer of new knowledge and skills into the industry supporting those companies in the adoption of new technologies, improving competitiveness, and efficiency.

**Enterprise Ireland is the government organisation responsible for the development and growth of Irish enterprises in world markets.*

Example: staff involved in both research and teaching – Belgium / Flanders

As a supporting measure for the introduction of new research topics in the Bachelor programmes, the UAS 'Lessius Mechelen' in Belgium has introduced an incentive credit for teaching staff to become familiarized with research. The incentive credit is meant for staff members who have no research experience but who do have expert knowledge on their teaching topic. Usually they transfer this knowledge to the students in their teaching. With the credit, they are motivated to use their expert knowledge also for research. How does it work? Members of the teaching staff are partly (0,2 FTE) exempt from their teaching duty in the course of an academic year. During that time they are supposed to build a new line of research related to the Bachelor programmes they are involved in. The evaluation of this measure consists of a check of the submitted project proposals.

Publications and media appearances

Total number of research publications:

- Definition: the total annual number of research publications of the institution published in journals, books, proceedings and/or magazines.

Total number of peer-reviewed research publications:

- Definition: the total annual number of *peer reviewed* publications of the institution;
- These publications can be traced bibliographically (via Scopus, Web of Science).

Number of research publications relevant to professional fields:

- all publications (annual number) published in, for example, journals/books/proceedings/professional magazines addressed to a professional audience. (self-reporting by the institution);
- There can be an overlap between peer-reviewed publications and publications relevant to professional fields, since a publication can be both peer-reviewed (addressed to a scientific audience) and relevant to professional fields (addressed to a professional audience).

Total number of research presentations:

- Definition: the annual number of presentations by researchers (including teachers involved in research) *addressed to a scientific audience*.

Total number of research presentations relevant to professional fields:

- Definition: the annual number of presentations relevant to professional fields by researchers (including teachers involved in research);
- Professional fields are professions for which research is undertaken.

Artefacts and services

Total number of Continuous Professional Development (CPD) courses as a result of research:

- Definition: the number of CPD courses taking place in the institution. Continuous Professional Development is ‘the means by which members of professions maintain, improve and broaden their knowledge and skills and develop the personal qualities required in their professional lives, usually through a range of short and long training programmes, some of which have an option of accreditation’⁹;
- Only CPD courses that can be clearly demonstrated to relate to research at the institution are to be counted.

Example: CPD courses offered as a result of research - Lithuania

At Kaunas University of Applied Sciences - one of the biggest higher education institutions in Lithuania - Continuous Professional Development (CPD) courses as result of research are offered in several areas. Research in the area of nursing, for example, has led to CPD courses such as “Mental health nursing” and “Specialist of emergency medical care”. As a result of research in the area of food quality and safety, several CDP courses were created: for example the “Cheese producer training program” and “Food preparation technology”.

Example: CPD courses offered as a result of research – Portugal

The Polytechnic Institute of Bragança (IPB, Portugal) offers a range of short and long training programmes devoted to the improvement and broadening of the knowledge and skills of its students, graduates and professionals from the region. Particular relevant and with an evident social impact, IPB offers, in collaboration with the Business Association of the district of Bragança (NERBA), initiatives for small and medium business enterprises, that include joint training and consultancy services to improve their management capacity and to increase their competitiveness, modernization and innovation capacity of the companies. These initiatives are complemented with a broad range of CPD courses to non-formal and adult learners and to professionals in the main labor areas of the region, including agriculture, engineering, business, health and teacher training.

Patents/licenses

Total number of patents:

- Definition: the annual number of new patent applications filed by the institution (or one of its researchers/departments) with a patent office.

Total number of licenses:

- Definition: the number of new licensing agreements per year.

⁹ van Vught, F. A., Kaiser, F., File, J. M., Gaethgens, C., Peter, R., & Westerheijden, D. F. (2010). *U-Map: The European Classification of Higher Education Institutions*, p. 77. Enschede: CHEPS.

Example: promoting innovation through patents and licenses - Switzerland

The number of patents and licenses issued can to a certain extent be considered as a suitable indicator for innovation. Measured in the number of licenses and patents issued, Switzerland has been enjoying a particular success in innovation in the worldwide rankings over the last years. Several reasons are responsible for this positive placement: First of all, applied research at Swiss universities is usually carried out in close cooperation with business partners as well as partners from private or public institutions. Thus it is very implementation-oriented. Second, Switzerland has a differentiated funding system that takes these kinds of interactions into account and promotes the cooperation between partners from research and industry. And third, a general formalization and professionalization of knowledge and technology transfer at UAS can be seen that has emerged over the last years in Switzerland. At the Bern University of Applied Sciences, for example, several dedicated Technology Transfer Offices as well as the STI, a foundation for technological innovation of the Cantonal Bank of Bern, support the researchers and business partners by providing advice and support regarding commercial evaluation and the implementation of inventions and patents.

*Start-ups/spin offs*Total number of start-up firms:

- Definition: the number of student companies / firms set-up by (former) students or staff, excluding spin-offs. The institution has to be involved;
- The three-year average as well as the annual number should be provided. If data is available for one year only, this should be mentioned.

Example: start-up firms set-up by students – Finland

Satakunta UAS in Finland has developed the so-called “Enterprise Accelerator”, in order to encourage students to start an enterprise during their studies. The Enterprise Accelerator operates within all degree programs and helps students to become entrepreneurs before their graduation. Students are supported by a mentor network, an expert mentor will encourage and advise the student entrepreneur. Students can obtain as many as 60 EC for completed studies related to the setting up and development of their own enterprise.

So far, during its ten years of operation, the Enterprise Accelerator has created over 150 enterprises and over 200 new entrepreneurs. This year, a record number of new enterprises created by the Accelerator is expected. The five-year survival rate is over 90%.

*Awards and prizes*Total number of awards and prizes won – number:

- Definition: the annual number of prizes and honorary awards awarded to researchers/teachers involved in research for their involvement in research. A three year average is requested. If data is available for one year only, please mention this.

Indicators that should be feasible in due time*People*% students involved in research:

- Definition: the number of students involved in research projects formally recognized by the institution in the reference year as percentage of the total number of students enrolled in the reference year;

- A student's project (Bachelor or Master thesis) is not automatically a research project. Whether a student receives any kind of financial compensation is not relevant.
- Not yet feasible because many institutions do not yet have sufficient data on the % of students that is involved in research. There was also a lot of discussion about the definition of the indicator, since it was not always clear which research projects are covered in this indicator. Some further work needs to be done on the definition;
- Not all participants considered this indicator to be relevant. In some countries, Universities of Applied Sciences do not involve students in research projects for, for example, SME's.

Example: students involved in research - Denmark

A large number of physiotherapy students is involved in a research project that aims to assess the present and future health effects of the increased physical education in sport schools in Svendborg, Denmark. The project, which is led by a Ph.D. student, consists of an intervention program of six lessons of physical education each week. So far, 64 physiotherapy students have been part of the research project. A total of 23 final assignments by these students were based on the research project. Participating students have indicated their involvement in the research project has 'opened their eyes' to research in their profession and improved their critical thinking skills.

Publications and media appearances

Total number of publications/presentations/appearances in popular media:

- Definition: the annual number of publications/presentations/appearances relevant to professional fields in popular media (i.e. not addressed to a scientific or professional audience);
- For example: daily/weekly/monthly newspapers, magazines (print media or online), web-based journals (if edited) radio, television, teletext. Not included are blogs, messages on twitter or Facebook pages or articles on an institutions own website.
- Not feasible yet because most institutions do not count these publications/presentations/appearances in popular media and don't know how do count them.

Artefacts and services

Total number of new artefacts and services in professional fields:

- Definition: the number of new artefacts and services per year, including equipment, protocols, rules and regulations, relevant to professional fields.
- 'Artefacts make up the fourth major channel of interaction. Artefacts are concrete, physical forms in which knowledge can be carried and transferred. They are more or less 'ready to use' such as machinery, software, new materials or modified organisms, and disseminated to an end-user (e.g. a private company, not necessarily to the public). This is often called 'technology'. Artefacts may also extend to art-related outputs produced by scholars working in the arts and humanities disciplines'. Examples: 'machinery, software, a musical composition, works of creative art, new materials or modified organisms, technology'¹⁰
- Not feasible yet because many institutions do not yet count artefacts. Also, more work should be done on refining the definition of this indicator.

¹⁰ Kaiser, F., Jongbloed, B., van Vught, F. (October 2010), *Research, applied research, knowledge transfer and indicators selected in the U-Multirank and U-Map projects*, p. 6. Paper (draft), provided by the authors.

Example: new artefacts and services in professional fields – The Netherlands

Utrecht University of Applied Sciences is committed to developing the creative sector in its region. In the so-called Creative Learning Lab Experience, students, teachers, researchers and (creative) entrepreneurs work in multidisciplinary teams to develop new knowledge and innovative products and services. One example of such a product is the Mobile Safety Watch: an application for smartphones aimed at increasing reporting behavior of minor crime incidents among citizens in order to improve public safety. Using their smartphone, including an integrated camera and location services, users can report behaviors and activities that make them feel uncomfortable or do not look right. This product was developed on request of the Utrecht Police Department, the Dutch Center for Innovation and Safety and a Dutch television show called 'Opsporing Verzocht' (Investigation Required).

Two extra indicators

During the second working sessions, the participants decided to add two indicators to the list:

People

Total number of students

Publications and media appearances

Number of peer-reviewed research publications relevant to professional fields:

- Definition: all publications (annual number) published in journals/books/proceedings/professional magazines that are addressed to a professional audience and that can be traced bibliographically.

Some reflections and suggestions for further research

As stated earlier in this paper, it is not easy to measure the impact of applied research. It was the goal of the participants of this project to develop a list that comes as close as possible to measuring the impact of applied research. However, it is also important to be transparent about the limitations of this project and about the difficulties the participants encountered:

- The indicators that were developed, tested and used in this project are indirect indicators: they do not measure the impact of research directly;
- The indicators do not measure the methodological quality of research. They are about a different kind of quality: the impact of applied research on professional fields, teaching and training, science and society;
- There is always a tension between contextually and comparability. Understandably, a participant from country A may point out the specific circumstances in his own country or institution and suggest to take this into account in the definition of the indicator. However, this might make the indicator much less comparable on a European level. Since it was the goal of the participants to develop and test a list of indicators that can be used on a European level, institutional, regional and/or national contexts could not always be taken into account;
- There is still an “availability issue”: because there are no (national, European or international) databases for non-traditional research output, because there is no system of peer-reviewing non-traditional research output and because many institutions do not yet collect many of the data that were considered, the participants had to remove some of the more innovative indicators from the list because they were not feasible.

Suggestions for further research / future projects

The participants suggest the following:

- There is more work to be done to increase comparability of data across Europe. In a future research project, this issue could be dealt with by, for example, looking at developing new databases of non-traditional research output or connecting existing (national) databases. Secondly, it would be interesting to look at a new system of peer-reviewing non-traditional research output. In this project, self-reported data collected by the participants were used. Databases and a new system of peer-reviewing will make the data collection much easier *and* allow for an evaluation of the research output;
- Several definitions could be further developed, this will also increase comparability of the data;
- During the project, several suggestions for additional indicators were discussed. The participants believe extra indicators of the international dimensions of research as well as its regional impact should be developed and tested;
- The participants believe testing the indicators with a larger number of institutions will help to both disseminate the results of this project and develop the indicators further;
- Based on this project, Universities of Applied Sciences across Europe could develop a UAS benchmark;
- Given the experience that has been built up in this project, UASnet can contribute to the further development of U-Map, U-Multirank and other related projects.

What will happen now?

UASnet will discuss the outcomes of this project during its network meeting of November 2011. One important question UASnet will have to answer is how to build on the outcomes of the EDUPROF project. Should UASnet, for example, propose a new project focusing on the further development of indicators of applied research? The network members have already indicated they will make sure the knowledge developing during and results of the project will be disseminated and communicated to as many researchers, research managers, UAS presidents and other stakeholders as possible.

In any case, the project has been a positive experience for the participating institutions and the members of UASnet. It was not easy to develop and test the indicators: not only because , ‘the discussion on the

construction of indicators to capture research and knowledge transfer activity in all its sub-dimensions is still very much unresolved¹¹, but also because, in general, Universities of Applied Sciences do not yet have that much experience with the collection of the data needed in this project. This project gave the participants the opportunity to gain more experience in collecting data for indicators of applied research, to learn from each other and compare data collection methods as well as outcomes. They decided which indicators to test, which definitions to use and which indicators to include in the final list. By doing this, they have given their colleagues within UASnet as well as other stakeholders something to build on.

¹¹ Kaiser, F., Jongbloed, B., van Vught, F. (October 2010), *Research, applied research, knowledge transfer and indicators selected in the U-Multirank and U-Map projects*, p. 2. Paper (draft), provided by the authors.

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- Kaiser, F., Jongbloed, B., van Vught, F. (October 2010), *Research, applied research, knowledge transfer and indicators selected in the U-Multirank and U-Map projects*. Paper (draft), provided by the authors.
- van Vught, F. A., Kaiser, F., File, J. M., Gaethgens, C., Peter, R., & Westerheijden, D. F. (2010). *U-Map: The European Classification of Higher Education Institutions*. Enschede: CHEPS.
- UASnet (May 2011), *Towards a European Framework for Innovation and Impact Research Alliances: making the Innovation Union work*. UASnet position paper, <http://www.uasnet.eu/publications>.
- European Commission (2011), *Supporting growth and jobs – an agenda for the modernisation of Europe's higher education systems*. COM(2011) 567 final.
- *Evaluating the societal relevance of academic research: A guide* (June 2010), http://www.eric-project.nl/nwohome.nsf/pages/NWOP_82ZCTD_Eng.

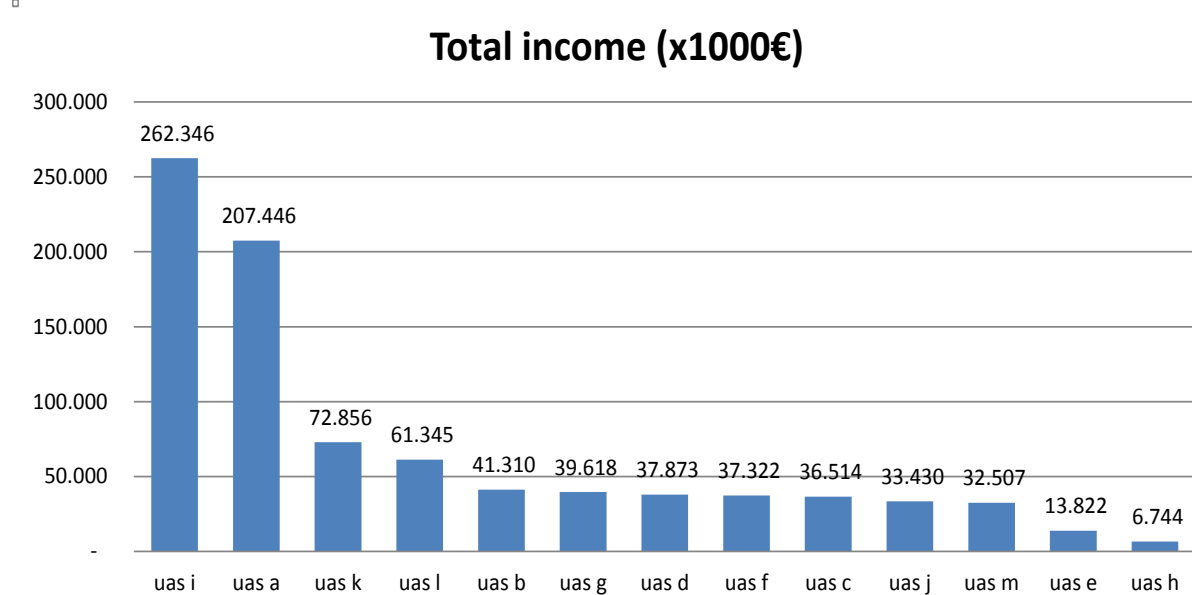
Websites:

- www.uasnet.eu
- www.u-map.eu
- www.u-multirank.eu
- http://www.eric-project.nl/nwohome.nsf/pages/NWOA_6TZJ28_Eng

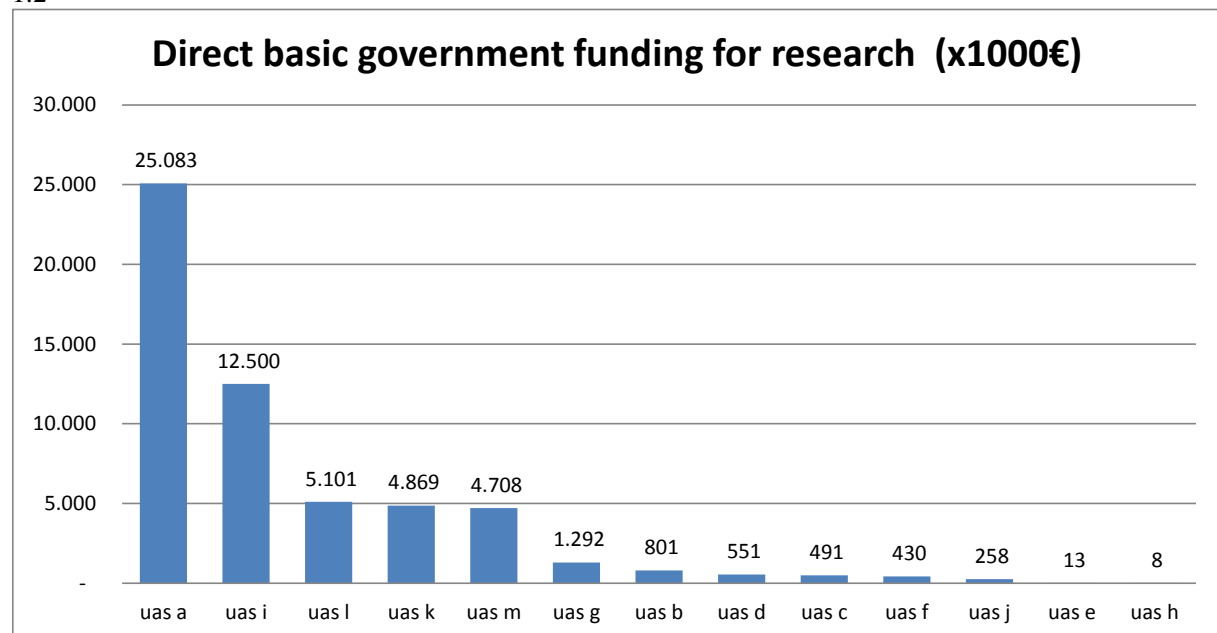
Annex: results of the testing / data collection phase

Money

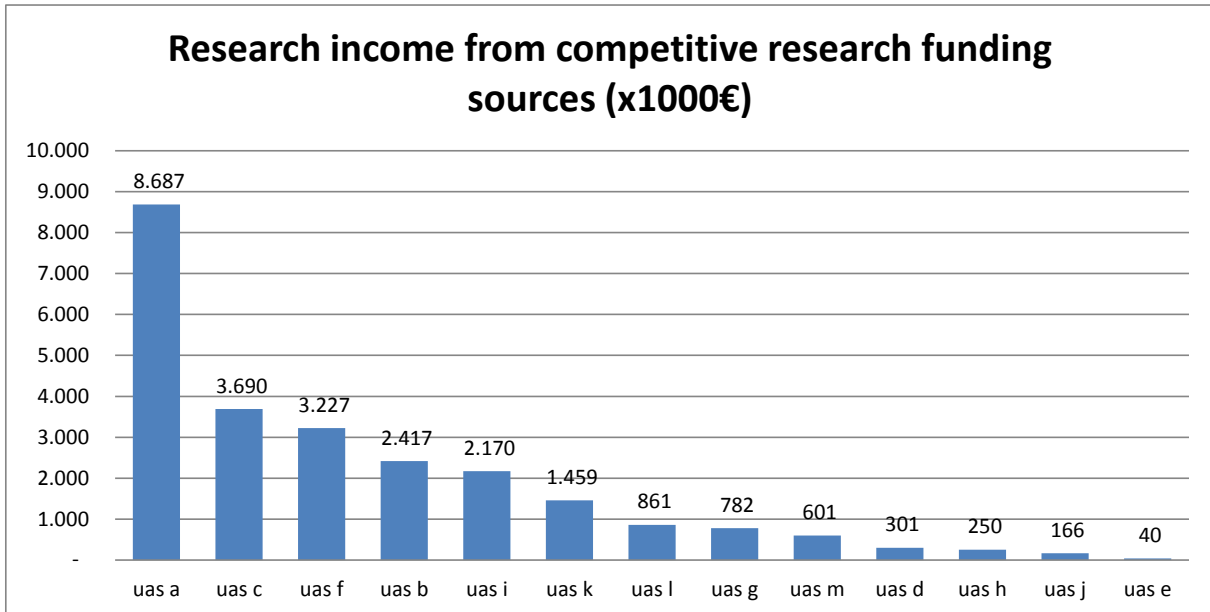
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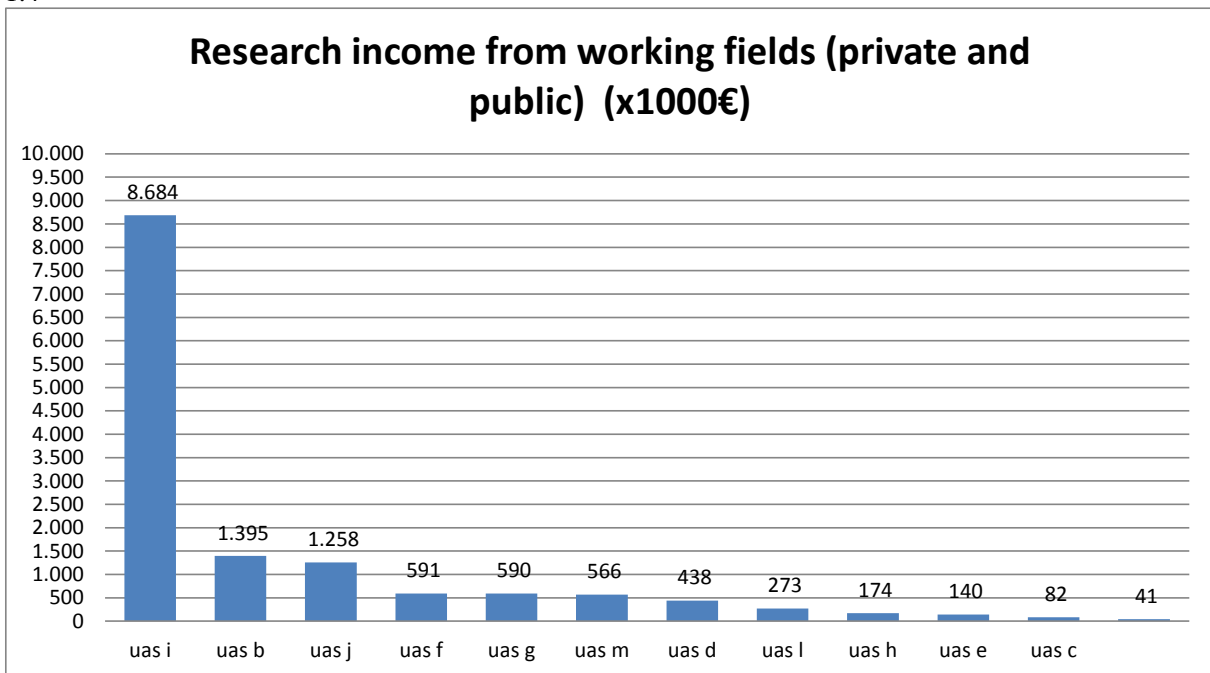
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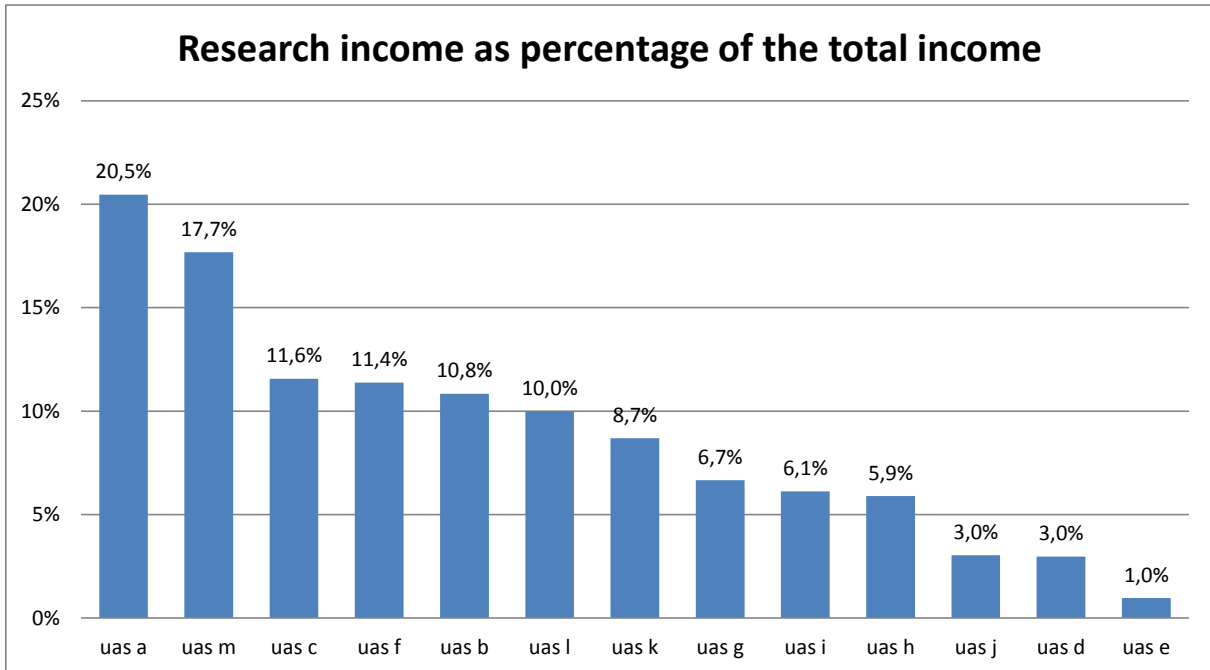
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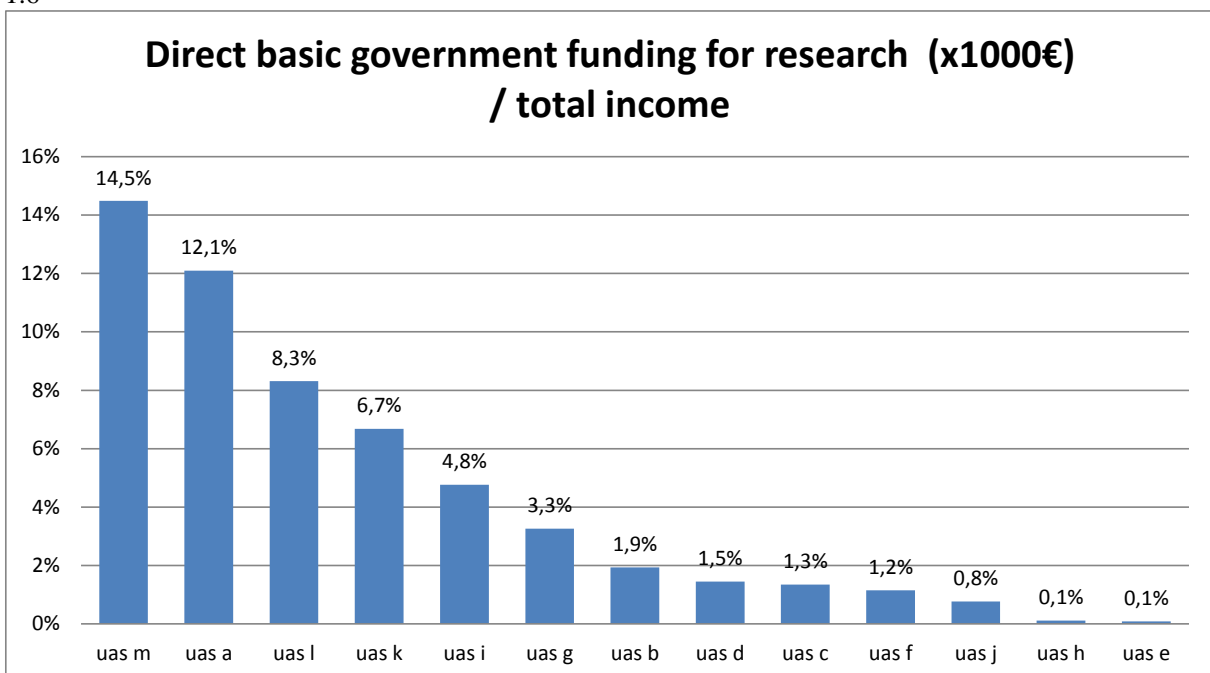
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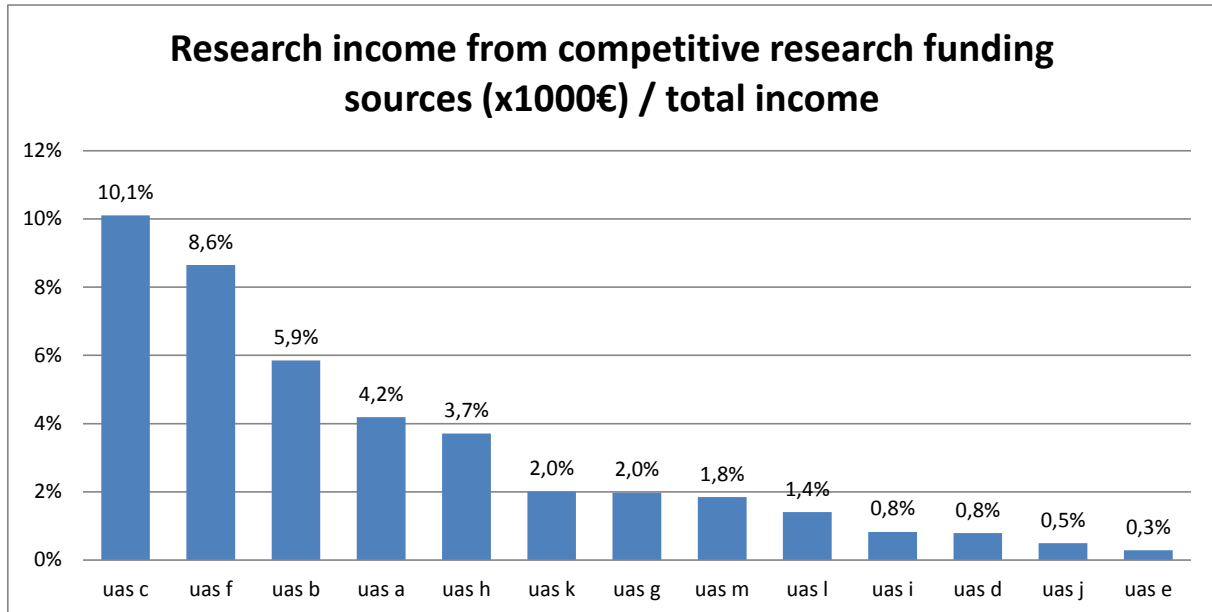
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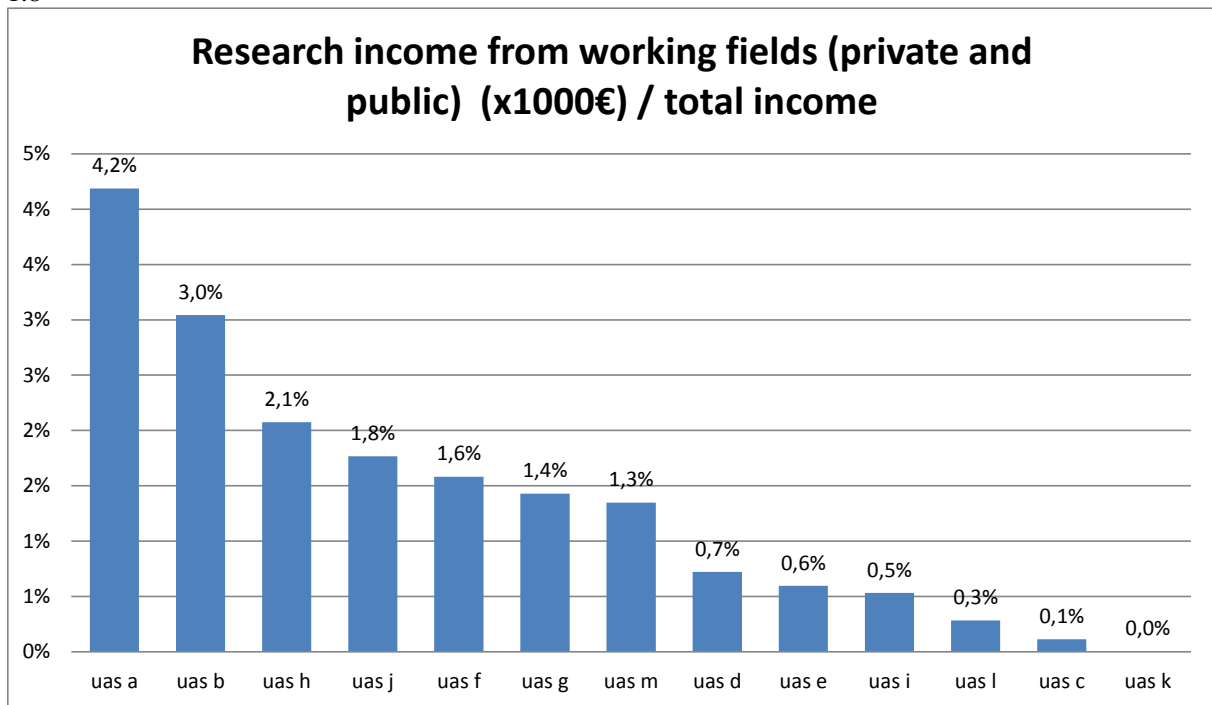
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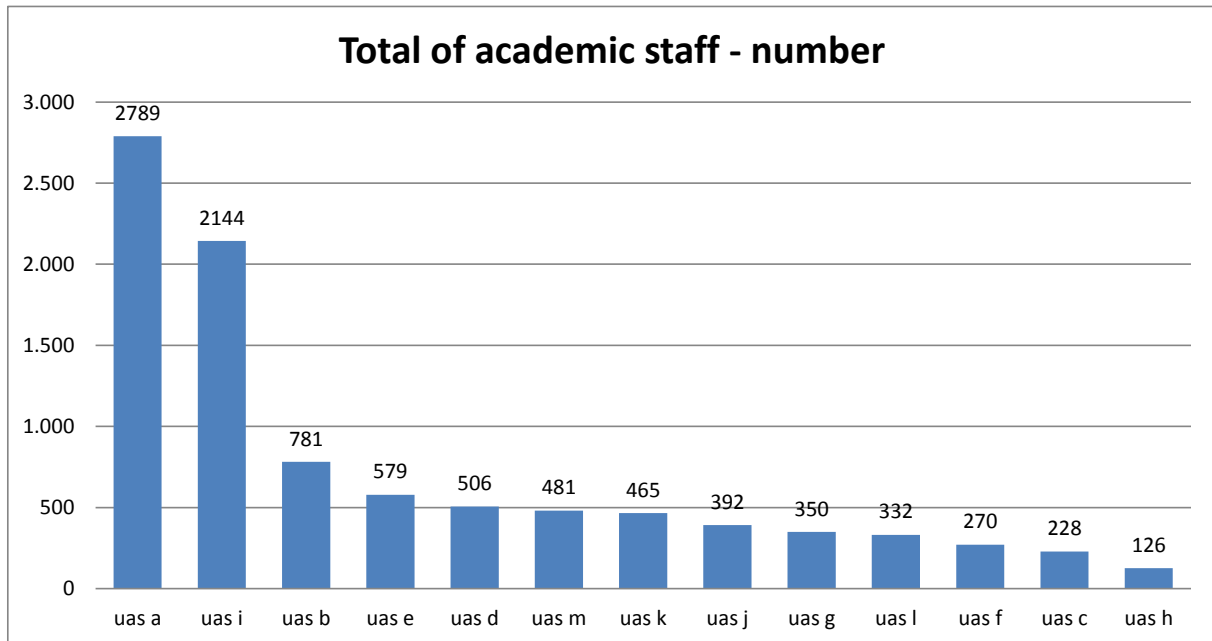


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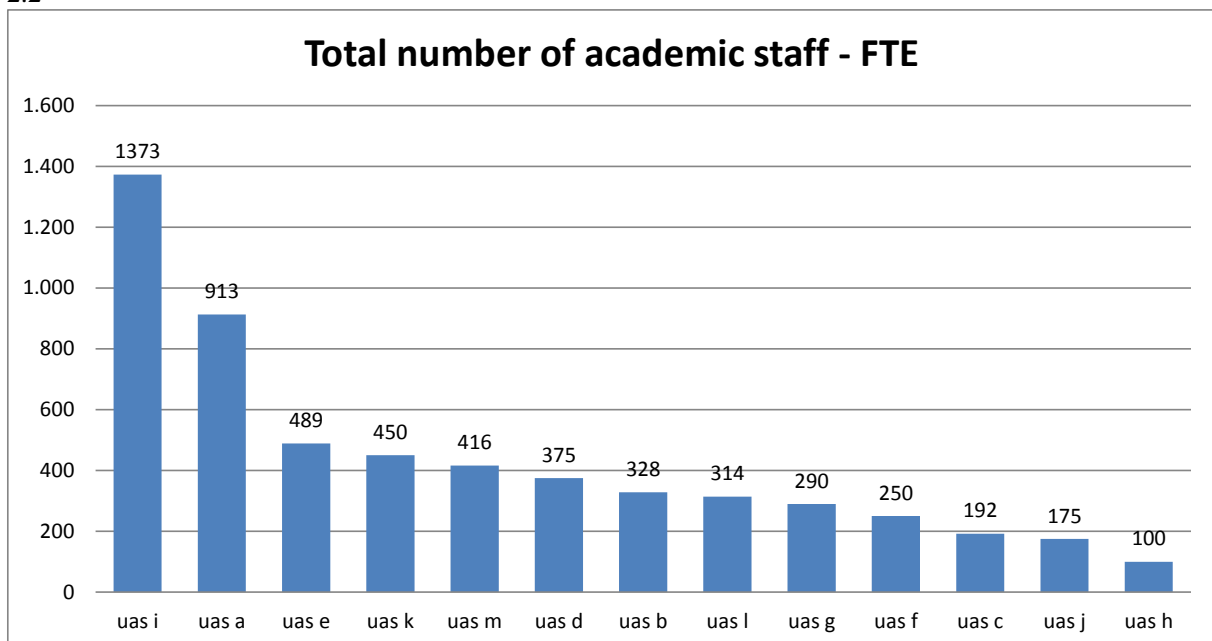


People

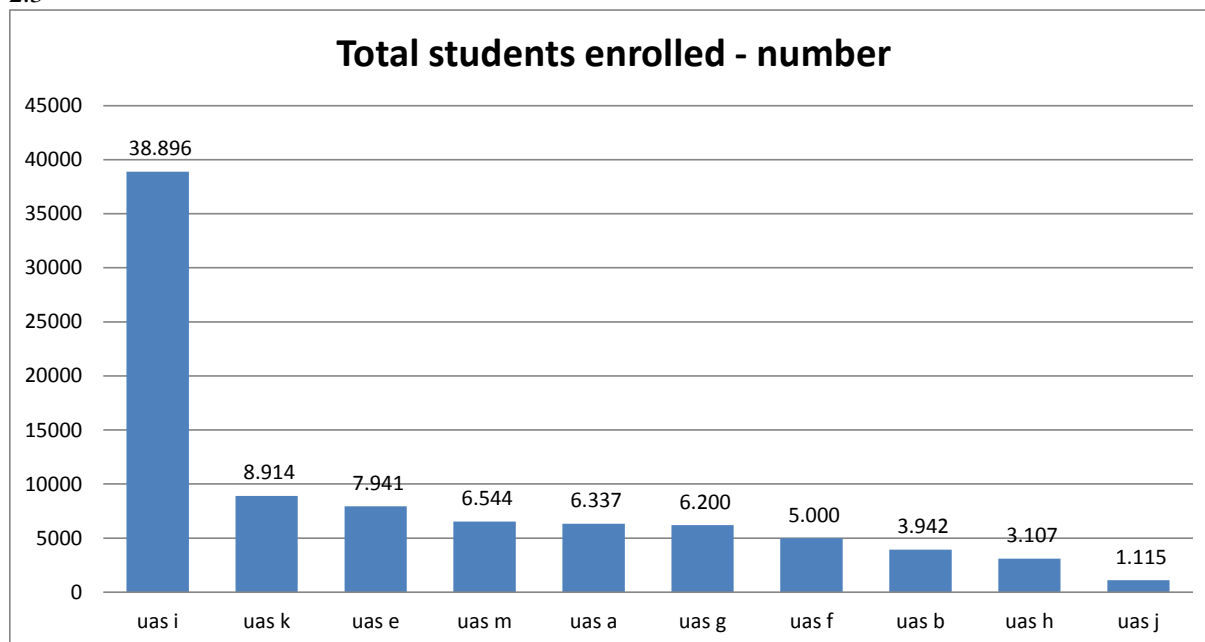
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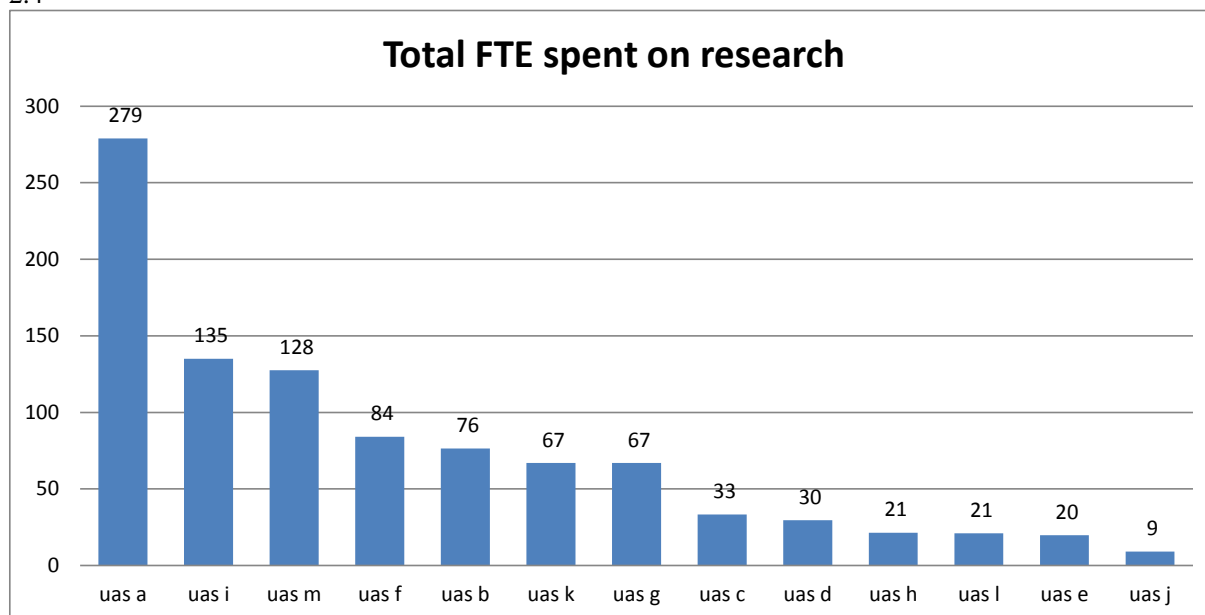
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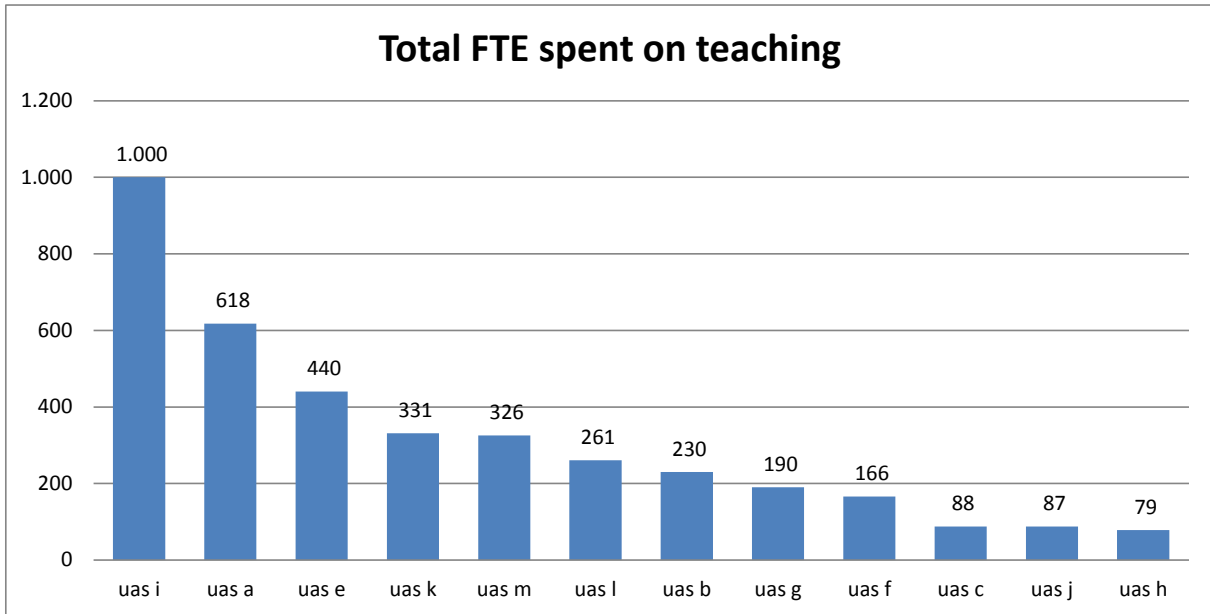
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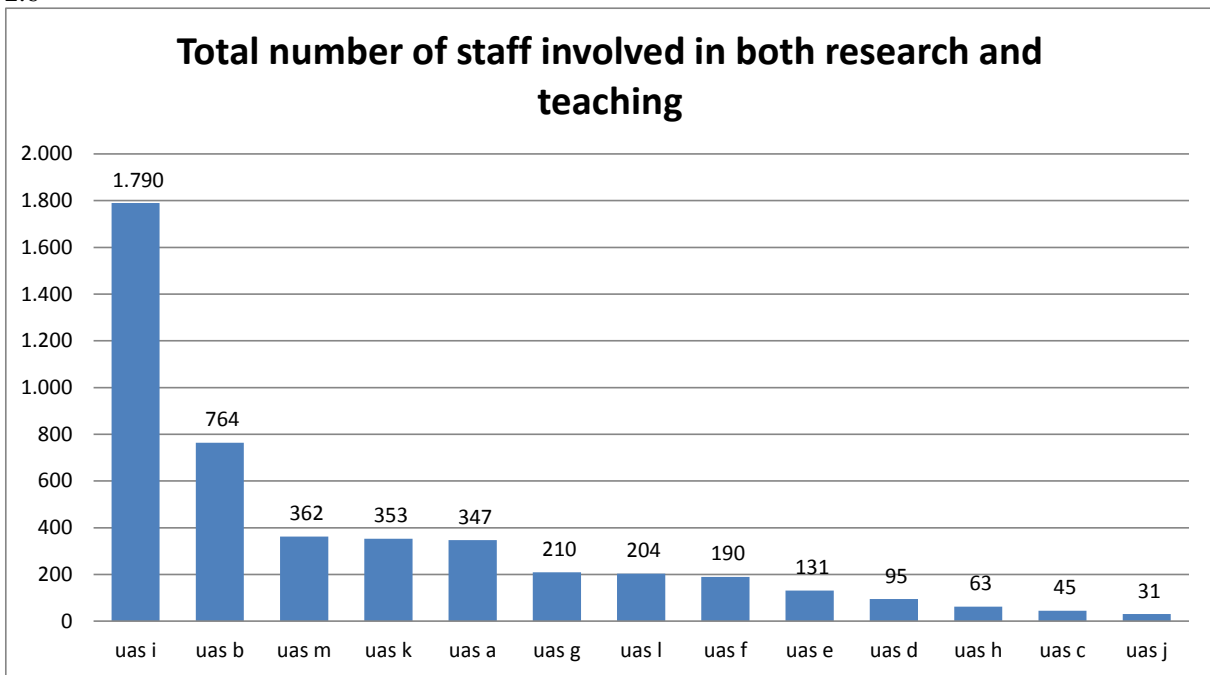
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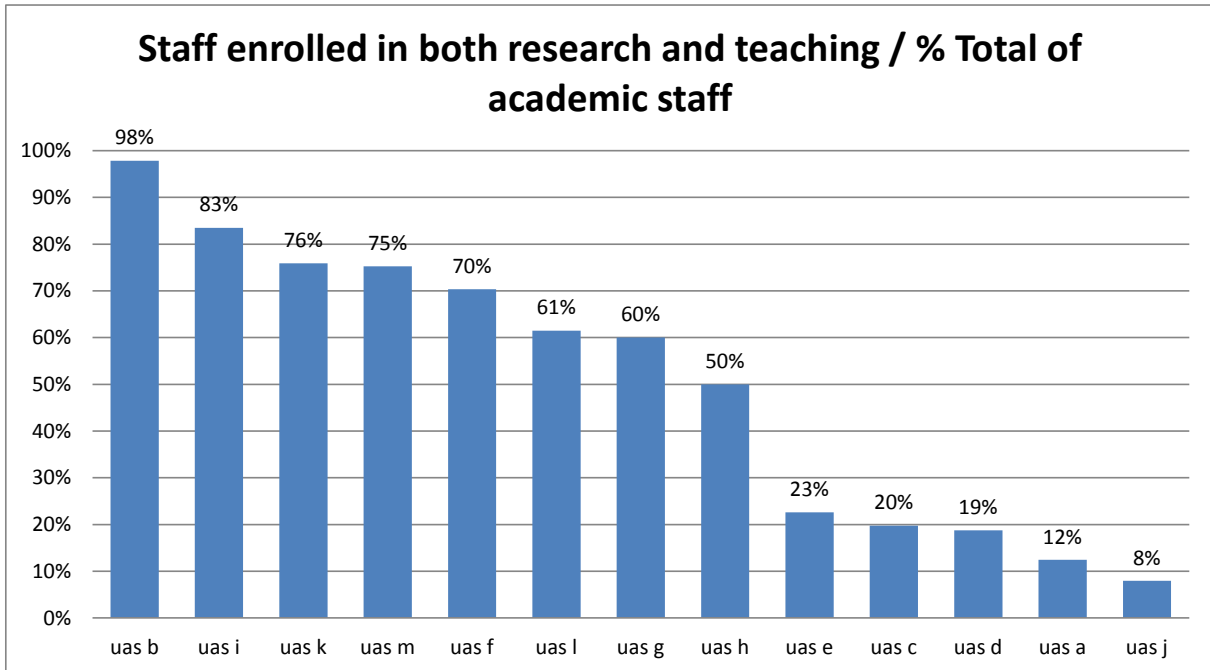
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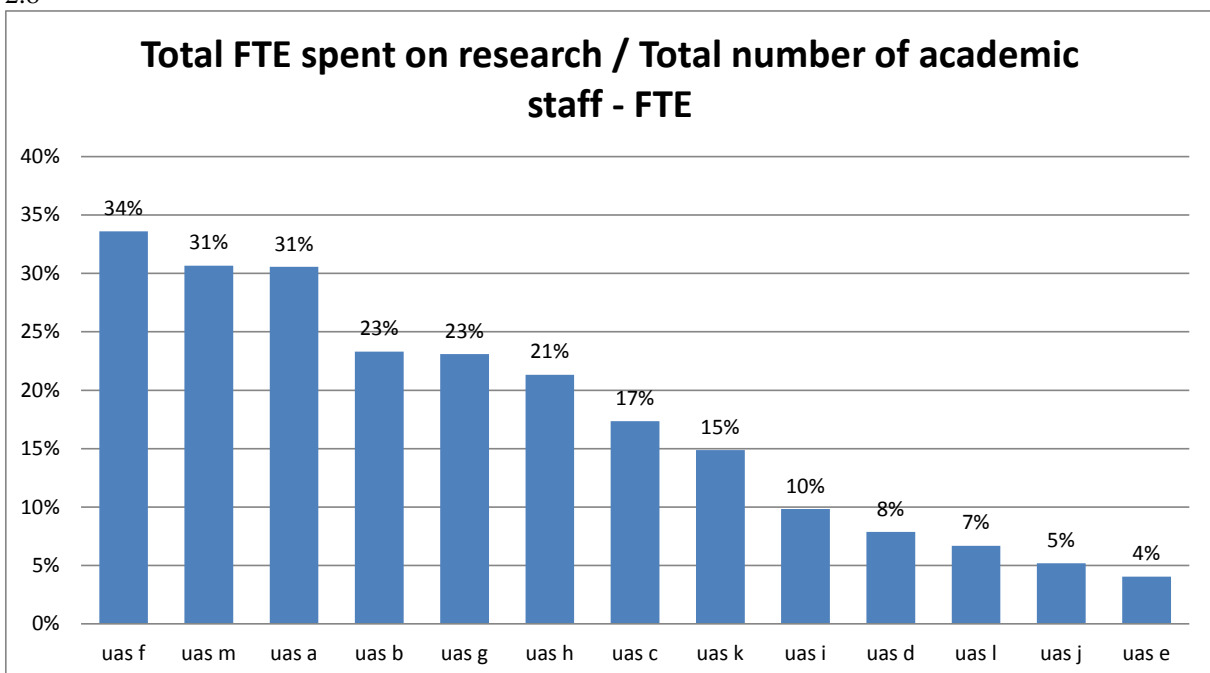
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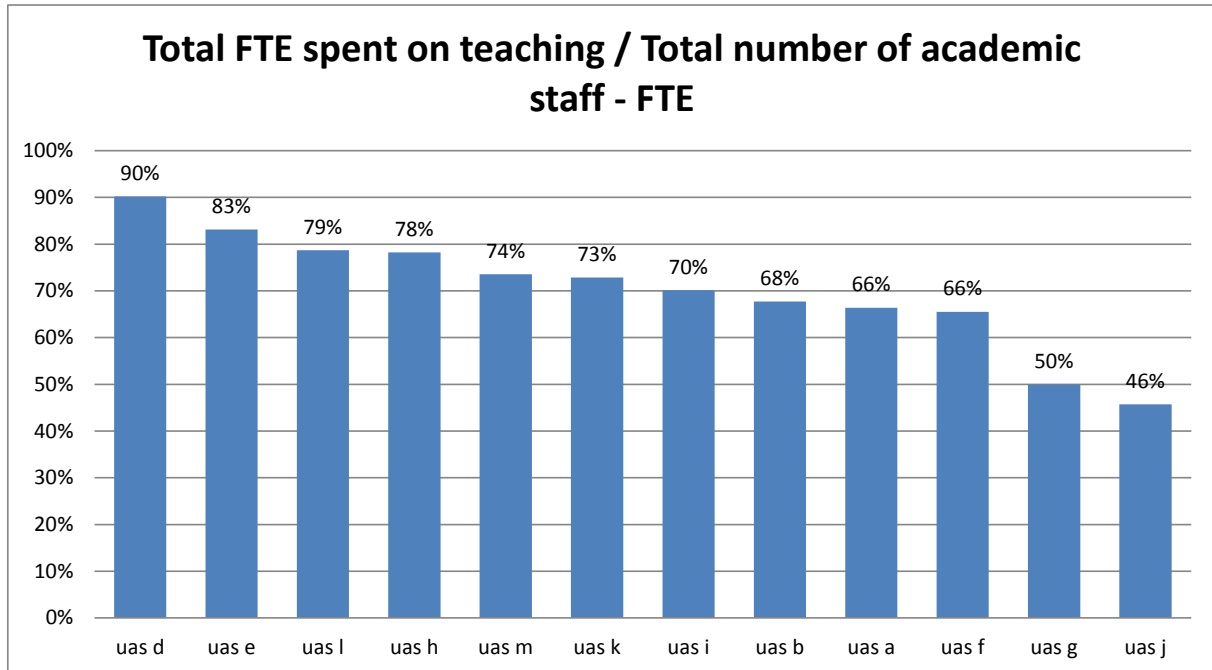
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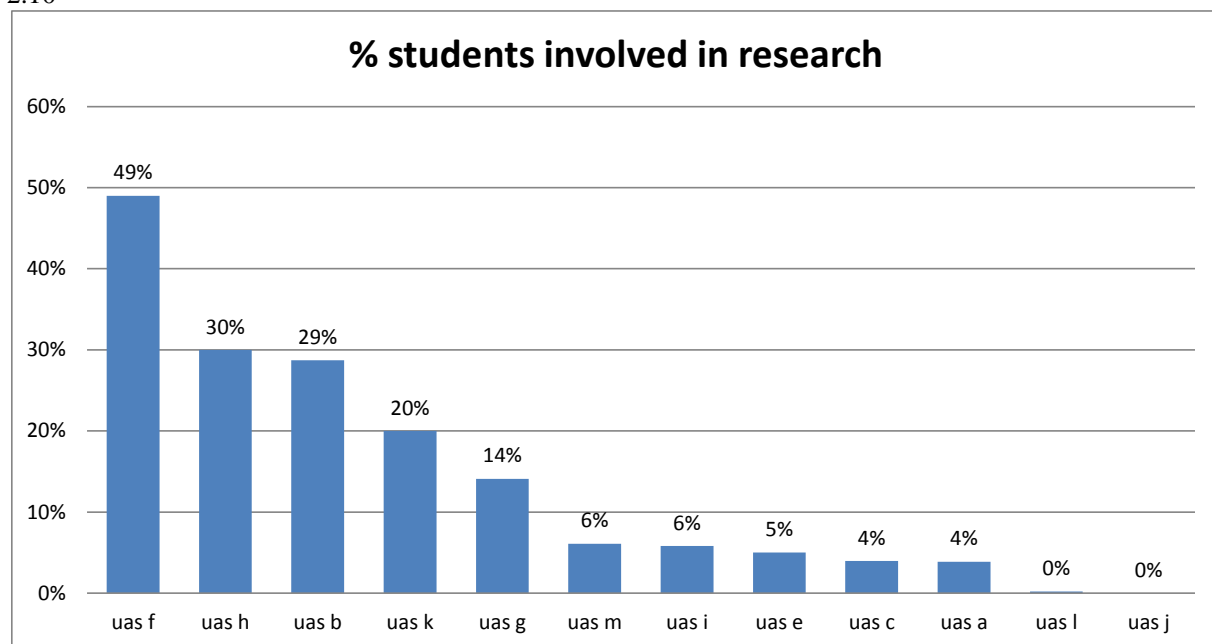
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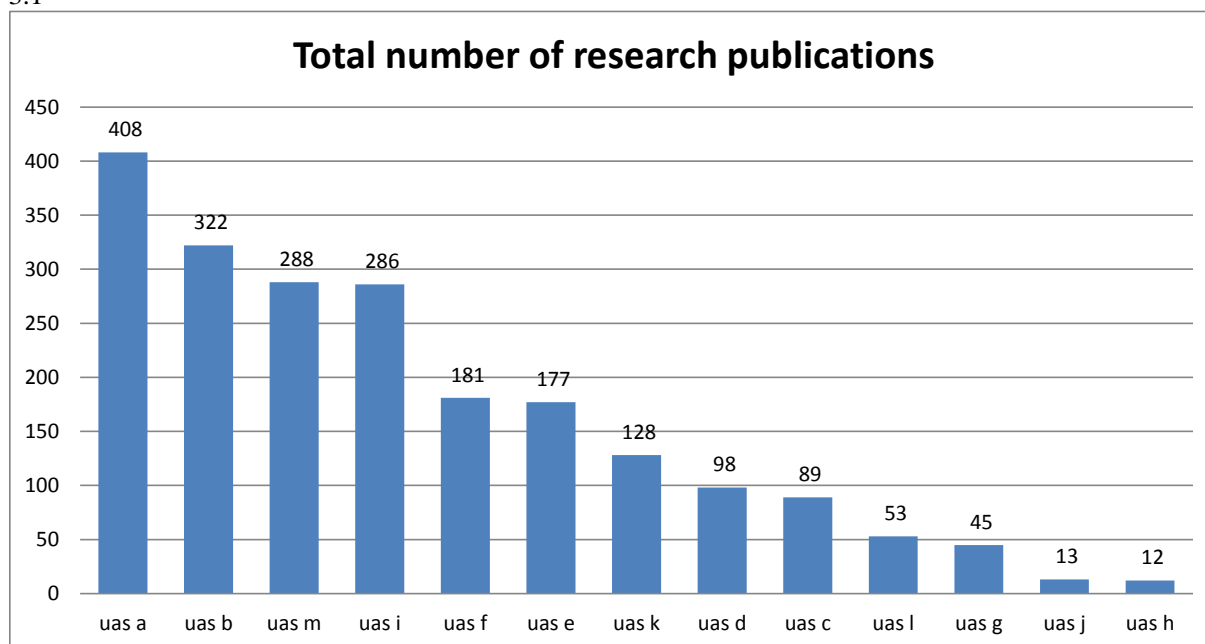


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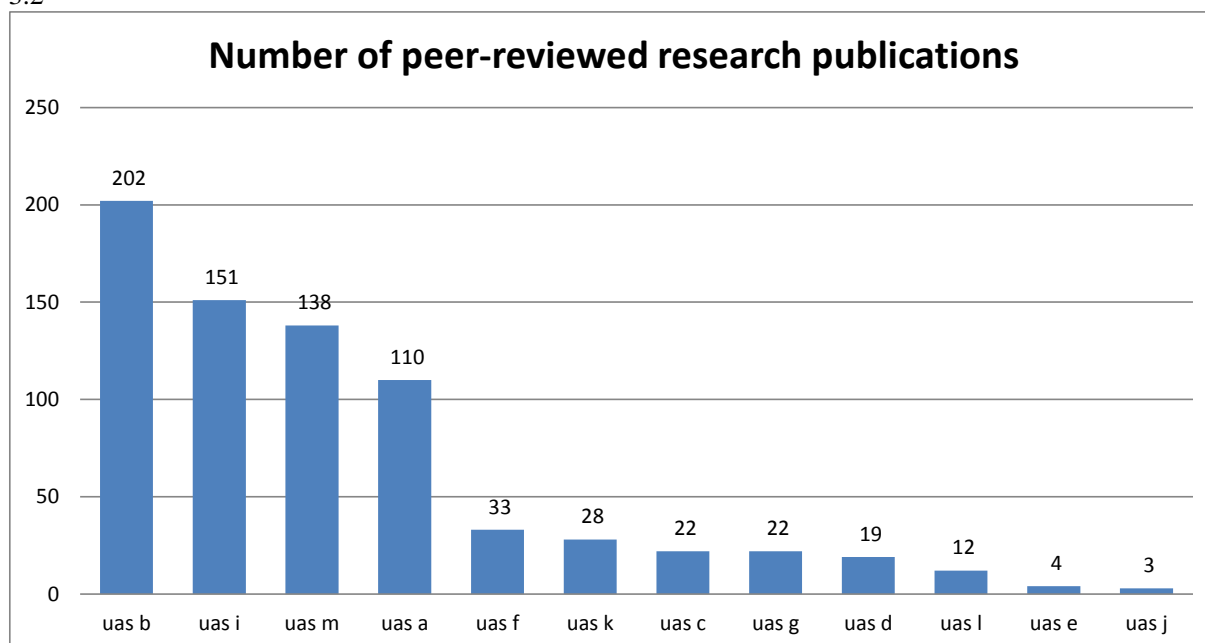


Publications and media appearances

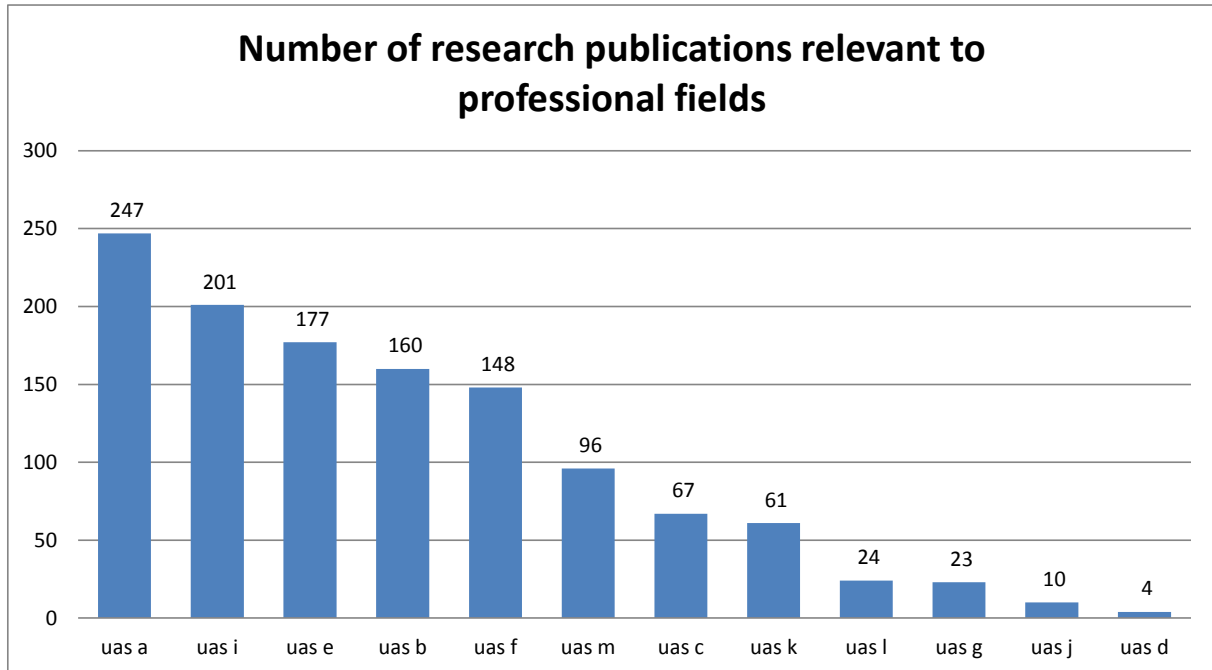
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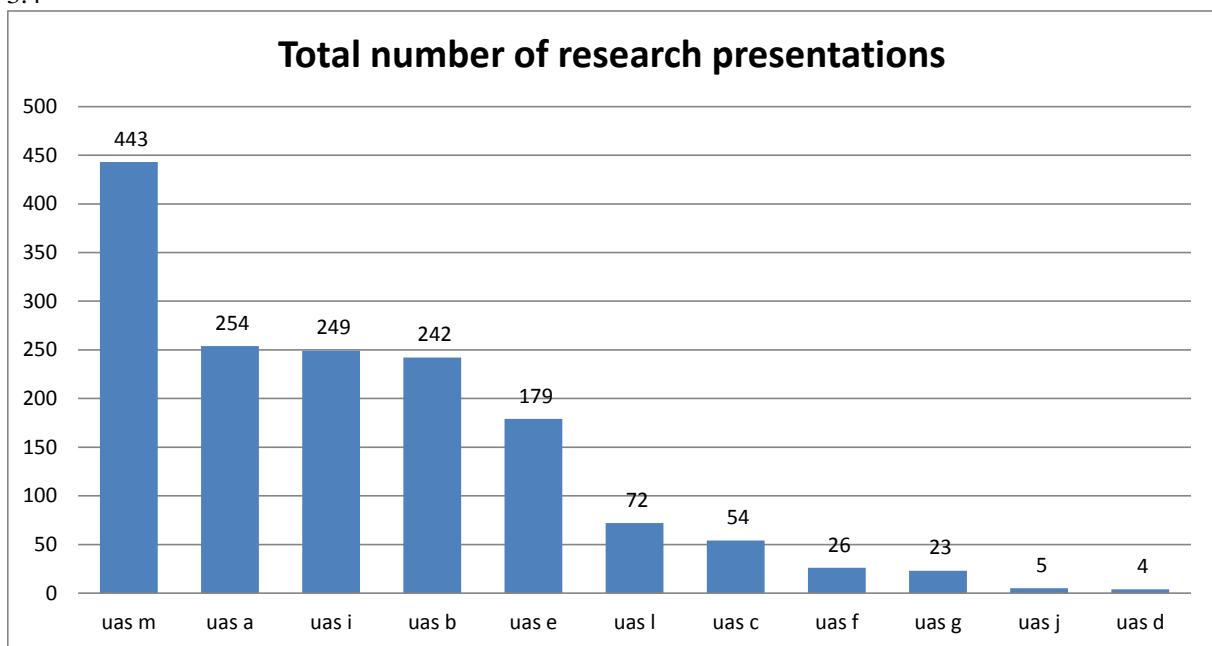
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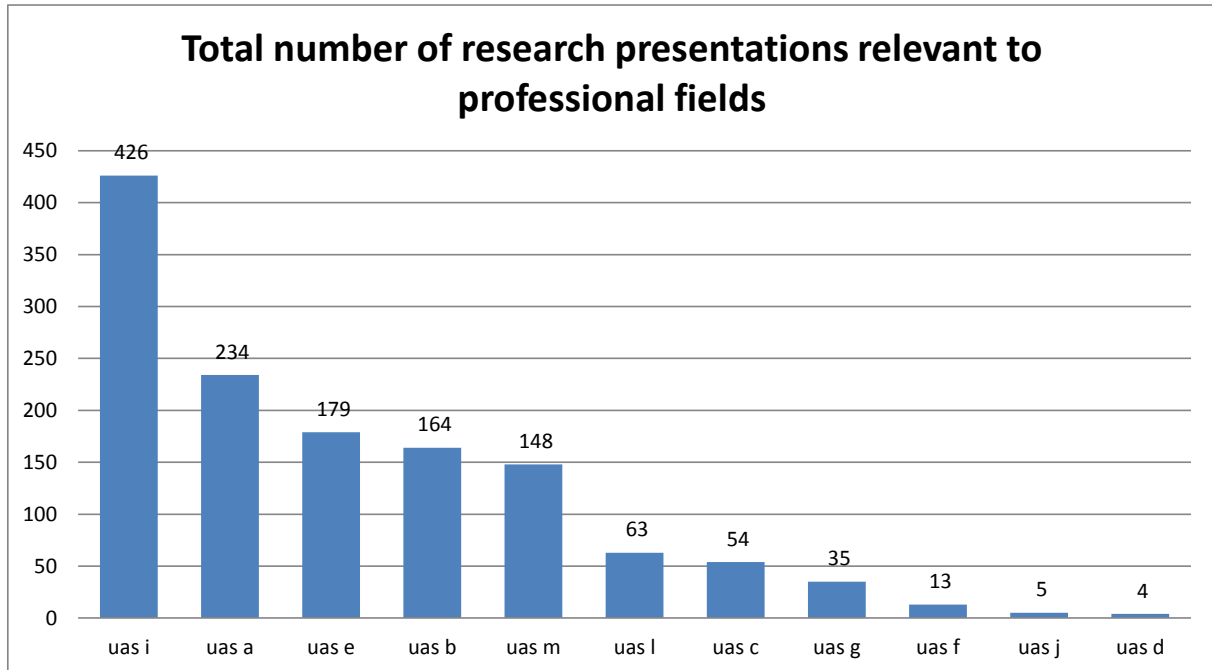
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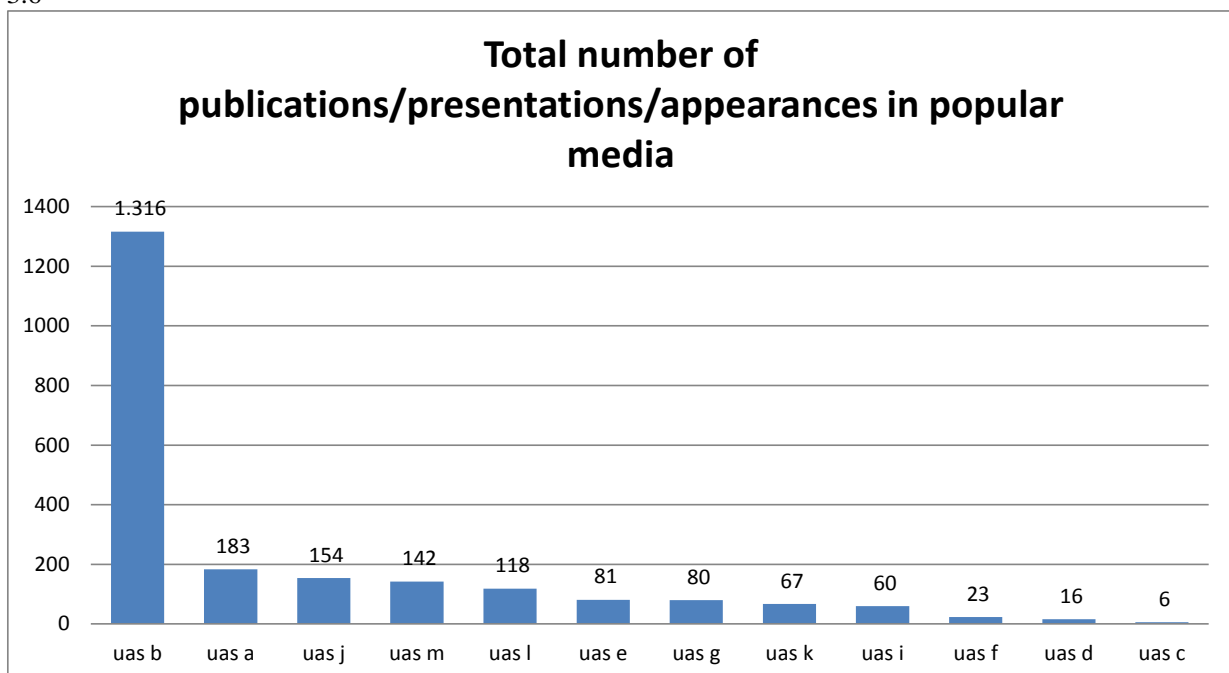
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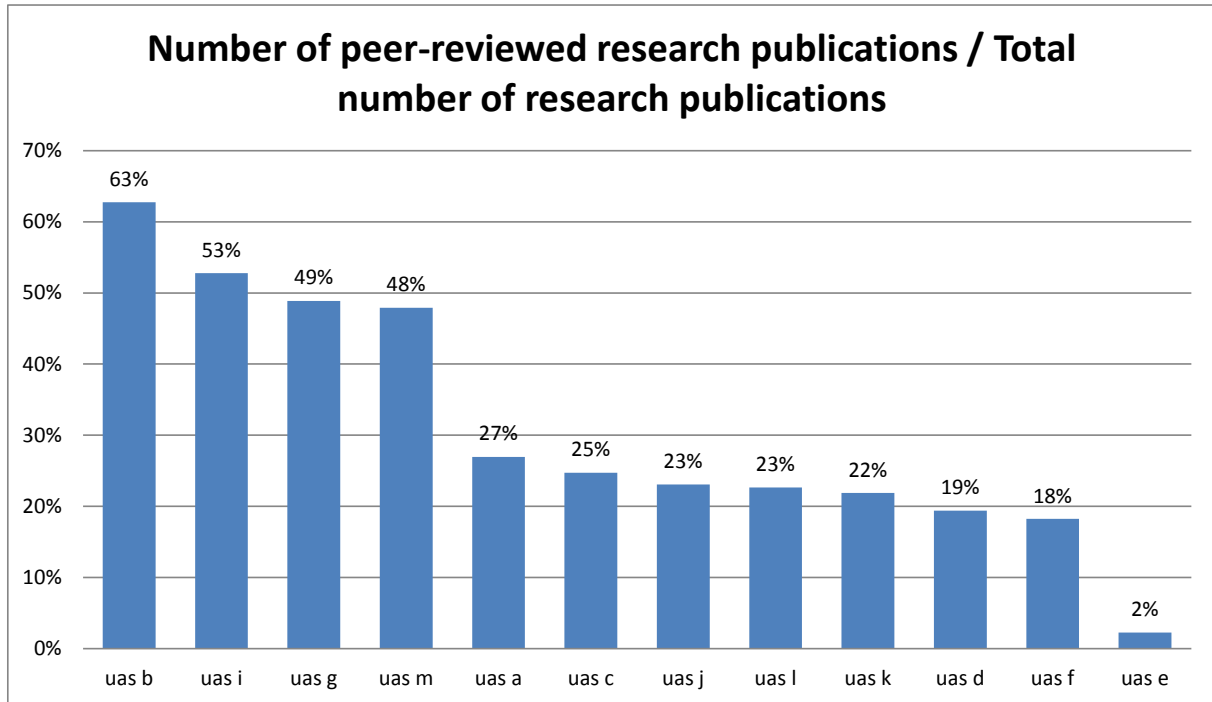
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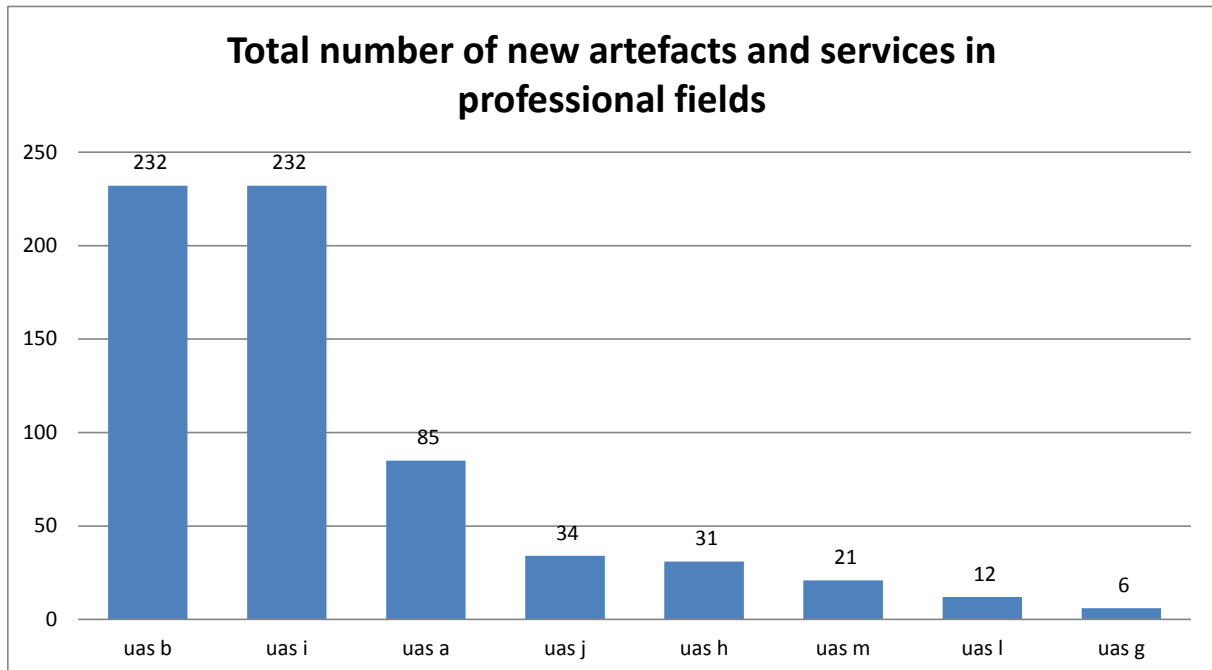


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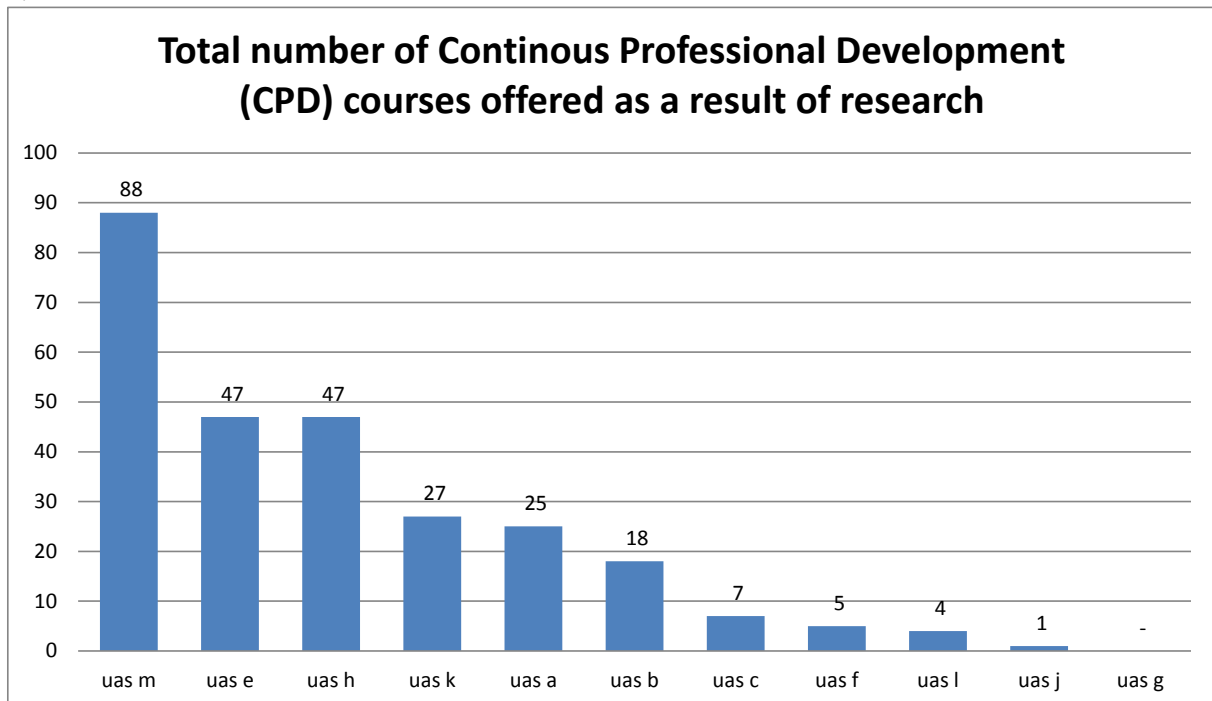


Artefacts and services

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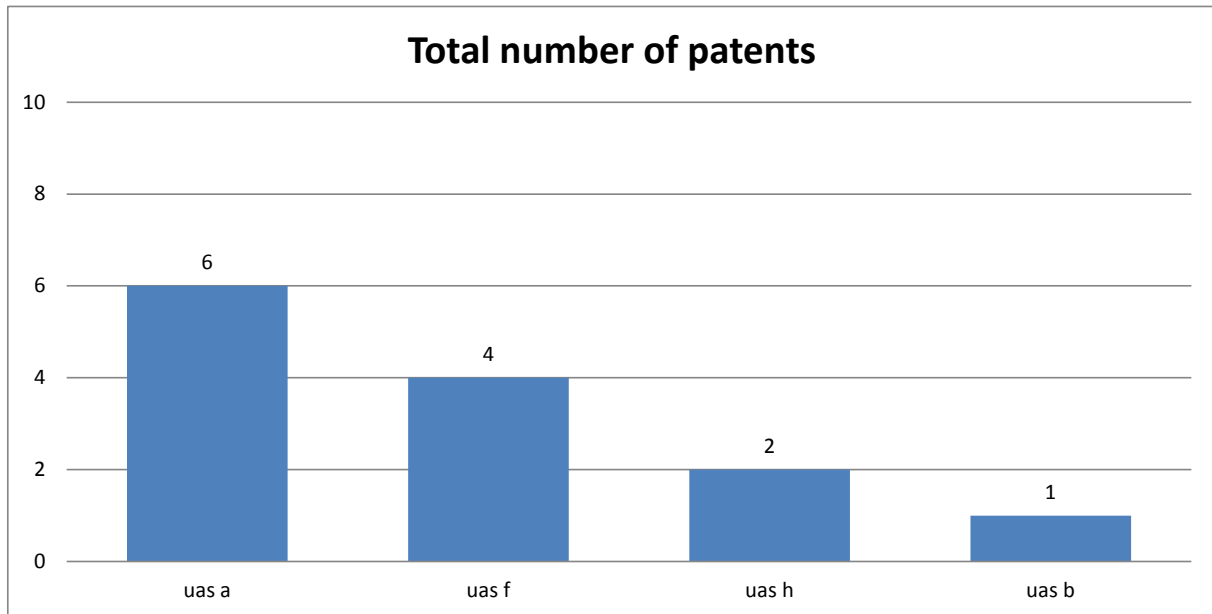


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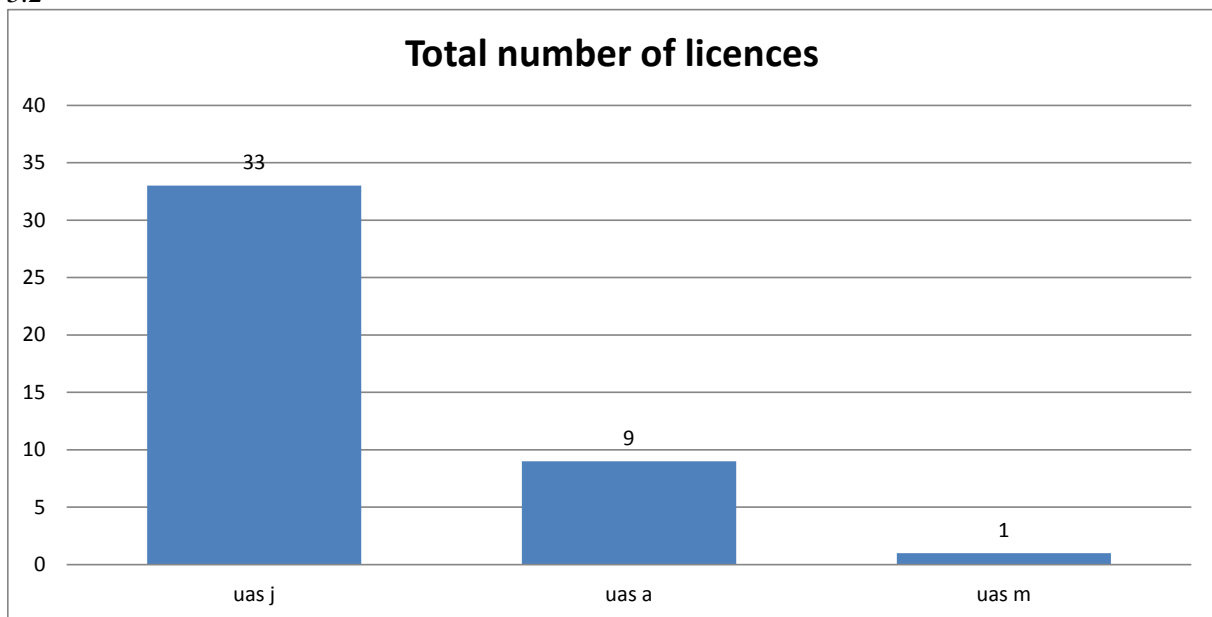


Patents/licences/start-ups/spin-offs/awards and prizes

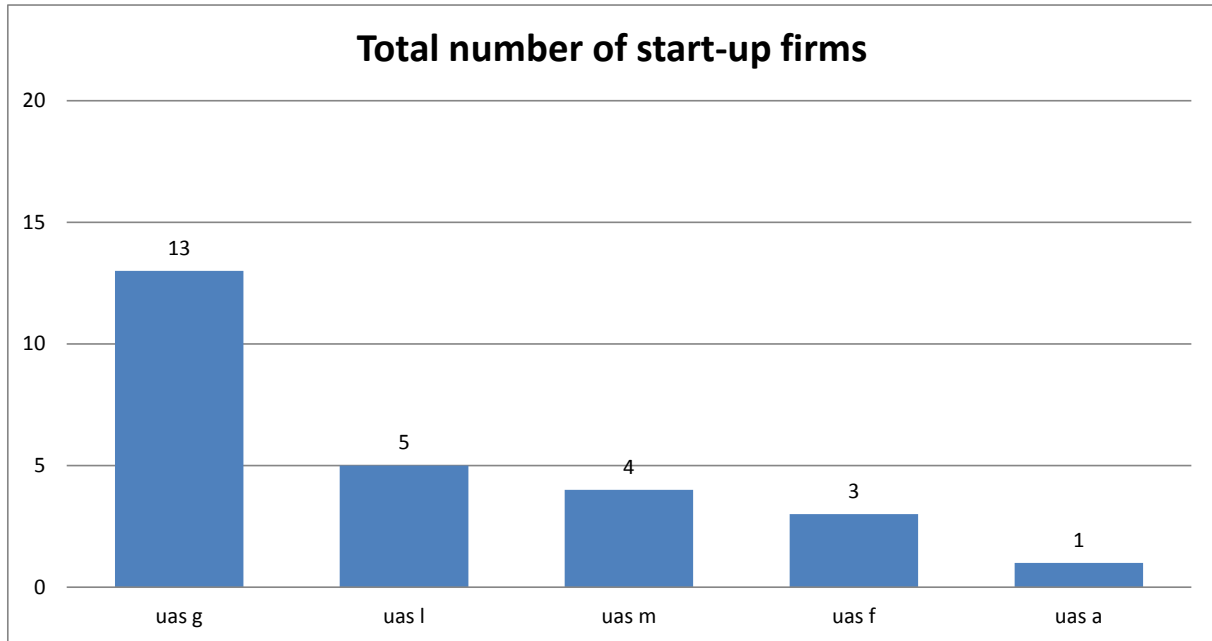
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