Internet Science Curriculum Construction in EINS

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ABSTRACT

In this paper we present an experience of ongoing work within the EINS Europeean Project: the construction of an Internet Science Curriculum.

Keywords

Curriculum construction, internet science.

1. Internet Science

Internet is nowadays a reality experienced daily by billions of human beings. This network that has evolved in 40 years from a small experiment involving 4 nodes into a web crossing continents, and connecting hundreds of millions of servers and routers is now an essential component of contemporary world. Internet is not the first network to play a central role in humanity. Different networks have largely shaped the human history: networks of roads, financial, social, families, etc. Network are therefore playing a central role in the development of human societies and their wide spread make networks and their properties the topic of study of a "Network Science".

Internet Science is an emerging science targeting the study of Internet as a societal and technological artifact, whose evolution is increasingly intertwined with that of human societies. Internet Science is by nature strongly multidisciplinary as several disciplines like network engineering, computation, complexity, security, trust, mathematics, physics, sociology, game theory, economics, political sciences, humanities, law, energy, transport, artistic expression, and any other relevant social and life sciences, study Internet Systems

The theoretical and empirical foundations of Internet Science are based on a holistic understanding of the complex techno-social interactions related to the Internet. Internet Science is therefore supposed to provide firm foundations for defining policies for future technological, social, political choices concerning Internet technologies, infrastructures and policies made by the various public and private stakeholders. It studies for example the far-ended possible consequences of architectural choices on social, economic, environmental or political aspects, and ultimately on quality of life at large.

2. EINS

EINS is a Europeean network of excellence in Internet Science, bringing together researchers from 35 European institutions, coordinating multidisciplinary investigation on specific internet-related topics at the intersection between humanistic and technological sciences (http://www.internet-science.eu/). The project is structured around joint research activities concerning different facets of Internet science, such as:

- Governance, regulation and standards
- Internet privacy, trust and reputation mechanisms
- Virtual communities
- Internet as critical infrastructure: security resilience and dependability aspects
- Internet for sustainability

The project aims laying the foundations for an Internet Science, hence the following joint research activities:

- Towards a theory of internet science
- Emergence theories and design methodologies
- Evidence and experimentation

The link between the research conducted and education is considered at different levels in the project, spreading from the proposition of joint courses and summer schools to the construction of a master/PhD level Internet Science Curriculum.

The project is currently in the process of defining the curriculum, and the goal of this paper (presentation) is to present this experience. After presenting the different challenges the curriculum (construction) has to address (section 2), we look at the process we are following (section 3).

3. INTERNET SCIENCE CURRICULUM CHALLENGES

When starting to build the Internet Science Curriculum, we realized that there are a certain number of challenges we have to address. We present some of them hereafter, related to the context and target population, the content as well as the format of the curriculum.

3.1 Curriculum Context and Target Population Challenges

To begin with, there is the **diversity of potential input students**. Internet Science being an interdisciplinary domain, and the target level being master and/or PhD, the potential students may come from computer sciences as well as from humanities. How would the curriculum cope with this heterogeneity?

The fact that the curriculum is a European curriculum implies that we have to cope with different existing education frameworks. A simple example with huge implication is the length of master: one year in some countries, two in others.

3.2 Curriculum Content Challenges

The next challenge is related to the **maturity state of the field from both academic and industry perspective**. From the academic perspective, the project is laying the foundation of Internet Science. The domain is by definition young, but also broad and multi-disciplinary. The curriculum should identify "the absolute must", in an evolving context. From the industry perspective, "internet scientist", is not a current job labeling. So identifying "typical job situation" (Tardif, 2006) to use as input for a competence-based curriculum is more than challenging.

Another content related challenge comes from the multidisciplinary nature of Internet Science. Should the curriculum aim at educating specialist in different disciplines and aware of Internet Science or Internet Science specialists?

The curriculum has to find the balance between forming students "*knowing everything about nothing*" and students "*knowing nothing about everything*".

Moreover, is there a meta-level related to interdisciplinary work? Are there special abilities to posses or acquire?

3.3 Curriculum Format Challenges

The process of building the curriculum is intrinsically related to its final format.

In order to obtain a competence-based curriculum, the process has to focus on the apprentice. What should be his/her abilities, what are the typical job situation, *etc.*

For a program-oriented curriculum, the process focuses on finding the content that is to be proposed. What are the topics to be taught in each one of the disciplines?

The challenge is to handle the tension between these two approaches, and to find the good balance given the particular context (see 2.1).

Another challenge in format is related to pedagogical choices. What are the choices foster interdisciplinary? What should be the proportion of mandatory interdisciplinary group work?

4. THE ONGOING WORK

The Internet Science curriculum is under construction. The first draft is to be delivered by the time the conference will take place. We present hereafter the curriculum construction process as well as elements related to its shape and content.

4.1 The curriculum construction process

Given the big number of involved partners a decision has been made that a small committee of motivated people will be mandated to make a curriculum proposition. Up till now the committee preceded by meeting several times by conf-call, and had one working day meeting were the bases of the curriculum have been set.

In the first step of the construction process, a reference curriculum will be proposed.

Once the theme definition refined (cf. section 4.2), a call for compatible modules will be made among the project partners. This will provide feedback on the curriculum "implementability" within the universities that are partners in EINS, and also allow for adjustments of the reference curriculum if necessary.

In parallel with this, a survey of the European education programs that might support the curriculum implementation will be conducted in order to identify the most promising ones (cf. 4.3). The potential choices might impose constraints on the curriculum final shape. Nevertheless, the curriculum implementation is not part of the EINS project.

4.2 Content and Shape

The curriculum is content oriented, and currently structured around six main areas: internet technology, internet economics, internet governance, human internet, science for internet science, and philosophy for internet science.

The curriculum is a master curriculum, and constructed around 12O ECTS. The ECTS, European Credit Transfer System, is a credit system first introduced in Europe in 1989 within the educational exchange program Erasmus. However, the ECTS is now widely used throughout higher education institutions as it facilitates student mobility within Europe and the comparison of study programs and courses (http://www.studyineurope.eu/ects-system). The reference curriculum is thus design for 2 years studies, but some variations may occur during the implementation.

Among the 4 semesters, one is reserved for the master thesis. Each one of the six main areas proposes a number of courses. Around 80% of these courses are mandatory. For the 20% remaining « à la carte » courses are proposed, allowing the students to tailor the curriculum to their interests or constraints. The constraints can be related to several factors, among which mobility availability, the student's background, etc.

5. ACKNOWLEDGMENTS

6. REFERENCES

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