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QLectives introduction

QLectives is a project bringing together top social modelers, peer-to-peer engineers and physicists to design and deploy next generation self-organising socially intelligent information systems. The project aims to combine three recent trends within information systems:

- **Social networks** - in which people link to others over the Internet to gain value and facilitate collaboration
- **Peer production** - in which people collectively produce informational products and experiences without traditional hierarchies or market incentives
- **Peer-to-Peer systems** - in which software clients running on user machines distribute media and other information without a central server or administrative control

QLectives aims to bring these together to form Quality Collectives, i.e. functional decentralised communities that self-organise and self-maintain for the benefit of the people who comprise them. We aim to generate theory at the social level, design algorithms and deploy prototypes targeted towards two application domains:

- **QMedia** - an interactive peer-to-peer media distribution system (including live streaming), providing fully distributed social filtering and recommendation for quality
- **QScience** - a distributed platform for scientists allowing them to locate or form new communities and quality reviewing mechanisms, which are transparent and promote quality.

The approach of the QLectives project is unique in that it brings together a highly inter-disciplinary team applied to specific real world problems. The project applies a scientific approach to research by formulating theories, applying them to real systems and then performing detailed measurements of system and user behaviour to validate or modify our theories if necessary. The two applications will be based on two existing user communities comprising several thousand people - so-called "Living labs", media sharing community tribler.org; and the scientific collaboration forum EconoPhysics.

Executive Summary

The QLectives Description of Work (Annex 1) proposes that there should be a 'collectively authored book' as an outcome of the project. Project members now believe that a greater impact would be made with an article rather than a book. This deliverable therefore makes the case for an article, setting out a proposed outline contents, authorship, and schedule for its preparation, with the aim of submitting the article to a prestigious journal six months after the end of the project (i.e. February 2014).

Contents

1. **Introduction / Case for approval** 1
2. **Proposed Structure** 2
3. **Content Outline** 3
4. **Timetable** 6

1. Introduction

QLectives is about supporting quality collectives. Because developments in this area are rapid, while book production is inevitably slow, the possibility of producing a long article to summarize and conclude the project instead of the book originally suggested in the Description of Work, is proposed. It appears to be a better option in order to provide a timely report of QLectives' contribution.

This would be a collectively authored article drawing on existing work with the aim of emphasizing the substantive aspects of the main principles, ideas and tools that have been developed during QLectives. It is expected that an appropriate journal for such a publication would be PLOS ONE or EJP B. In the following sections of this report, the structure, an outline of contents, partner nominations and indicative timetable are set out.

2. Proposed Structure

The article should cover all areas that QLectives has had an impact on. The following topics should, therefore, be covered. The lead partners are indicated in square brackets for each topic:

1. **Quality**
    1. What do people mean by quality? [UniS]
    2. Why and how is quality important? [UWAR, IRT]
2. **Collectives**
    1. What is the structure of a quality collective? [CNRS]
    2. The QTR algorithm [UniFr]
3. **How quality collectives can be supported**
    1. QScience [ETHZ, UniS, USZ]
    2. QMedia [TUD]
    3. GOLF [USZ]
4. **Conclusions and future prospects**

The focus will be on what the contributions made by QLectives on each topic have been, at a broad level, supported by citations to papers and deliverables that provide more detail. As a guide, each sub-section will be about 1000 words (2 - 3 pages), totaling about 7000 words in all.

3. Content Outline

1. Quality

1. What do people mean by quality? [UniS]

Quality means different things to different people in different contexts. Therefore, quality is contextual and subjective, collective and intersubjective, processual and dynamic. We draw on empirical research including a survey on *quality* addressed to the general public and to scientists, interviews on *quality in theory* with scientists, and focus group discussions focusing on *quality in practice* with scientists and young people. The aim of these studies was to interrogate the ways in which quality is understood in general and in science, in particular. The insights from these studies informed the theoretical understandings on which the QTR algorithm was developed (see 2.2 below) and on the basis of which QScience applications were designed. We also highlight issues to consider with regards to how collectives are formed.

2. Why and how is quality important? [UWAR, IRT]

In a fully networked environment with various sources of media being available to anyone, Metadata plays a fundamental role when it comes to the definition, search and retrieval of digital items, and therefore is essential for the success of Quality Collectives. Using the example of audio/video content, such content might be available in high resolution (HD) at high bitrates, but may fail to be of high quality, that is, informative or entertaining. The definition of the quality of a content item depends on the individual use case, as well as its context. Moreover, the *quality of a search result* depends on two aspects: the presence of adequate and correct metadata, and search algorithms that efficiently and precisely interpret this metadata, thereby taking into account the information provided by the seeker (such as search keywords, genres, user profile information, context, etc.).

2. Collectives

1. What is the structure of a quality collective? [CNRS]

We focus on collectives of agents who gather to produce goods that will eventually be consumed by other agents. In a high quality collective, the goods produced and consumed are appreciated because producers and consumers have similar affinities (be it in terms of subjective tastes, social proximity, interests, or beliefs about the world). The *in vivo* observation of such groups enables us to identify some of the characteristics of quality collectives, in particular in the context of scientific communities and online communities. In scientific communities, collectives are composed of academics

collaboratively producing articles that are used and evaluated by other academics in their field. We find that several socio-semantic features of such communities play a role in determining the quality of articles with respect to a field. In online communities, collectives consist of groups of users aiming to share content with each other that will be deemed to be of high quality by the group. In our study of groups in Flickr, we find that users tend to contribute more in groups where they have more social ties and where they can see that the group values their contributions.

2. The QTR algorithm [UniFr]

The QTR algorithm aims to reward the users who provide quality material to a given community (quality is measured here by popularity of the material - i.e., it is appreciated if contributions are read by many). In this section, rather than describing mathematical details and simulations, we will contrast QTR with the usual karma/reputation system typically used in various Internet fora.

3. How quality collectives can be supported

1. QScience [ETHZ, UniS, USZ]

A distributed platform to allow scientists to locate and search new communities providing quality reviewing mechanisms completely based on Free Software was designed and built. The platform is based on the CMS Drupal and built as a distribution that can be easily deployed in any node, creating a QScience network whose instances can securely and easily exchange information. The platform integrates several applications in a modular way, such as the previously mentioned QTR algorithm, a visual search engine for publications (Living Science), modules for configuration management and reutilization, publications automatic parsing, etc. A significant effort has also been made in terms on dissemination in scholar and free software communities.

2. QMedia [TUD]

We designed, implemented and deployed a quality collective around video. QMedia facilitates searching, streaming and sharing content using P2P technology. It is build upon and replaces key parts of technology developed in multiple European research grants, for instance the FP6 project P2P-Fusion that started in 2006. All technology is Open Source and has over the years been used by over 1 300 000 people under the consumer brand Tribler. The QMedia P2P core supports BitTorrent-compatible downloading, video on demand and live streaming. We have developed extensions and tested novel research ideas within our user base, resulting in sub-second content search, a reputation system for rewarding upload, and channels for content publishing and spam prevention.

3. GOLF [USZ]

In large and distributed collectives, such as the QMedia platform, participants have to be able to learn recurring patterns collaboratively in their environment, for example, to identify spam contributions or vandalism, or to differentiate between benign and malicious behavior. We have designed and implemented a massively distributed machine-learning framework for this purpose, which is based on the idea that participants 'gossip' models of interest, while improving them based on their own experience, and while combining them. We have analyzed the framework theoretically and experimentally. In addition, we integrated the framework into the QMedia platform, where it is being applied as a spam filter for torrent file descriptors.

4. Conclusions and future prospects

4. Timetable

The following timetable for the development of this article is proposed:

Stage	Date	Contributor
This Outline	February 2013	ALL
First draft	September 2013	ALL
Second draft	December 2013	ALL
Submitted to Journal	February 2014	UniS