

	OPAALS PROJECT Contract n° IST-034824
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WP9: Communication and Dissemination

Del 9.11 – Media Information Pack

	Project funded by the European Community under the "Information Society Technology" Programme
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Project Acronym: OPAALS

Deliverable N°: D9.11

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Short Description: This deliverable provides a condensed overview of the major philosophical, organizational, social and epistemological aspects of the project, and is intended for a broad readership: the general public, to whom OPAALS seeks to open the project, reach and inform during its final phase.

Author: Niall Brennan, Mehita Iqani

Partners contributed: All

Made available to: General Public

Versioning

Version	Date	Name, organization
1.0	15 July 2009	Niall Brennan, Mehita Iqani: LSE
2.0	29 July 2009	Niall Brennan, Mehita Iqani: LSE
3.0	12 August 2009	Niall Brennan, Mehita Iqani, LSE

Quality check: Ilaria Lener, T6

Internal Reviewers: Gerard Briscoe, Neil Rathbone: LSE

Dependencies:

Achievements*	This deliverable, in keeping with the aims of Phase III to enter a more public-facing dimension of the project, seeks to inform as great an interested audience as possible about the project, which until presently, has not been a major objective.
Work Packages	This contributes to public dissemination of the efforts of all Work Packages, but is geared towards a more philosophical, organizational and personal understanding of all Work Packages' efforts.
Partners	All partners.
Domains	The social science, computer science and natural science domains are all covered in equal part in this deliverable.
Targets	The general public with any level of interest in Digital Ecosystems and the research involved.
Publications*	The work was not published, but will be publicly disseminated.
PhD Students*	Two PhD students: Mehita Iqani (LSE), Niall Brennan (LSE).
Outstanding features*	This deliverable reflects new efforts within the project to communicate and disseminate its work on widely understandable terms and to a broad interest base.
Disciplinary domains of authors*	Mehita Iqani, Social Sciences; Niall Brennan, Social Sciences.

The information marked with an asterisk () is provided in order to address Recommendation n. 4 from the Year 2 review report*



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MEDIA INFORMATION PACK

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About the project

Vision

OPAALS is a research Network of Excellence funded under the European Union's 6th Framework Programme for Research and Development.

OPAALS' main aims are to develop an integrated theoretical foundation for Digital Ecosystems, and a sustainable and open community of Digital Ecosystems research. Digital Ecosystems, distributed adaptive open socio-technical systems, with properties of self-organisation, scalability and sustainability inspired by natural ecosystems, represent the next generation of Internet development in which operating systems and software applications are as open and distributed as the underlying Internet.

As an open, global network, OPAALS is characterised by a radically interdisciplinary research agenda combined with the emergence of a new paradigm that requires the development of new ways of working across disciplinary boundaries, in particular between social science, computer science, and natural science.

The OPAALS network supports the on-going trend toward the extension of traditional disciplines into new disciplines. It takes inspiration from the Open Source community process to create the conditions whereby an Open Knowledge community of research can form and grow. Because an open-source community is already forming around projects in the EU's Future Internet Enterprise Systems (FinES) Cluster, our efforts start from this common overlap and extend toward the natural, physical and social sciences through ever-wider inclusion of academic and industrial partners who wish to collaborate on the research.

Ultimately, OPAALS aims to contribute to the betterment of society by developing an open-source, peer-to-peer information technology system that can facilitate productive exchange among businesses and communities of interest, such as SME networks or academic research communities, and ultimately between such groups. We envision that a technological resource of this kind can empower individuals, organisations and communities to advance their interests in a democratic and collaborative manner, and thereby contribute towards sustainable socio-economic development.

Identity

OPAALS is defined by the following characteristics, which have emerged through our community, discussion and collaboration.

We are a collaborative community

OPAALS is a network of people from organisations of many kinds, and from many locations, who are actively involved in defining the leading edge of the emerging science and technology of Digital Ecosystems. The network facilitates us collaborating, cooperating, communicating and sharing as a group and a community.

We believe that we will cause radical change

We believe that Digital Ecosystems will cause a global paradigm shift in information technology and associated social development, thus contributing to changes in both the economic and social landscape.

A child of the Internet revolution, it represents the next generation of Information and Communication Technologies (ICT) use: one which could not have been conceived without the

interconnectedness of today's society, though one which is not a linear progression, but an entirely new mixture of genes and which, with our nurture, will grow to improve the lot of humankind.

We are a diverse mix, consisting mainly of researchers and economic development actors. The researchers come primarily from three established domains: computing, social science, and to a lesser extent, natural science. The economic actors are mostly regionally based and concerned with ICT adoption and development in their region. This unusual mix of science and economic development is necessary since this science cannot progress without users and vice-versa.

We are open, democratic and sharing

Network membership is open and therefore constantly changing. There is no divide between inside and outside our network. There are no fixed rules. Members may take passing interest and use our work, or become deeply involved in contributing to the science and the application. We are meritocratic: a role in the network is whatever each member, in collaboration with others, wants and allows it to be. We are constantly developing and implementing a concept of the democratic process that we all feel happy with.

We are global

Any organisation in the world may come into our network, and we have active participation internationally. We welcome the widely different perspectives this brings to the potential applications of Digital Ecosystems.

We link science with regions and end-users

By incorporating members who have regional economic development responsibilities and direct contact with small businesses and end-user communities, we are able to benefit from a panoramic viewpoint that covers everything from the theoretical basis of Digital Ecosystems to the use cases of the final application.

The Digital Business Ecosystems (DBE) project pioneered the concept of Regional Catalysts who provide the direct link to end-user communities and have the contact and the social capital to involve such communities in early stage use and even in research.

We are interdisciplinary

Digital Ecosystems, while physically based on ICT, represent far more than the interconnection of machines. There are powerful social mechanisms that cannot be avoided, as well as economic implications. There is also the natural science surrounding the phenomena of ecosystems: whether that science is biological or physical or mathematical.

We strive to be truly *inter*-disciplinary rather than simply *multi*-disciplinary. This is one of our greatest challenges – to move people to work in the spaces between disciplines, rather than simply connect disciplines together with researchers remaining on their home ground.

We connect to other research

OPAALS was formed as the result of the European Union Research and Development (R&D) Framework Programme, under a specific theme to create Networks of Excellence (NoEs). We participate in clusters of similar European projects and are open to cooperation and links with any complementary project.

We also participate in and associate with projects of international cooperation in R&D and ICT development in order to build our global knowledge and influence.

We recognise the political dimension of our work

We are apolitical in the nationalistic, governmental, or party sense. However, we recognise that Digital Ecosystems have a potential effect, and even a role in history, to change the balance of social order from globalisation involving large and centralised oligopolies, to small, decentralised, and democratic entities that have global reach. With our contributions, the inequality within current economics that enables monopolies to be created from de facto lock-in to proprietary products will shift significantly.

We work on trust

Trust forms the fundamental principle upon which everything related to OPAALS will always be based. We each have a responsibility to protect each other, as individuals and as a community. Trust and the obligations it brings come before everything else.

You can participate in the network

Participation is open and free. There are no mechanisms. We are a community and so a new member must gradually come to know and interact with that community.

Our rights within the network

We expect every participant to treat every other participant with respect and courtesy. We expect the behaviour of participants to be responsible and ethical in terms of their native culture, to be sensitive to the cultures of others, and to adapt to the emerging ethic of the group.

The rights of the network

No individual or organisation represents the whole network. We have the right to speak openly and freely to represent our own views, but we do not have any right individually to assume representation of the network to the wider world.

The graphical images and identity statements may be freely used and adapted by anyone who regards themselves as an active member of the OPAALS network, provided it is not used such that it may be construed as indicating endorsement, ownership, or formal representation of the network.

Intellectual property is important to us

We respect all intellectual property rights but believe that the existing proprietary model is flawed and that alternatives must be developed. We expect participants in the network to publish using a derivative of the General Public Licence or Creative Commons as appropriate.

We change, we adapt

Just as a Digital Ecosystem is a complex adaptive system that can change, so the OPAALS network adapts and changes. Thus there is no rigid program, no grand design. While we do not know what the future holds, we do believe we have the conceptual and practical framework of an organizational identity to be ready to embrace it.

Deliverables

OPAALS reports on its work through project deliverables, which are submitted periodically to the European Commission. These deliverables contain the outcomes and results of our research: theoretical frameworks, insights into the methodologies that we have used, reports on the information systems developed by the computer science experts in the consortium, and findings from our quantitative and qualitative studies.

All of these deliverables are available to the public to download and read. They are stored in an online repository. A guide to these deliverables, featuring abstracts of each, is available at this link: <http://wiki.opaals.org/DeliverableAbstracts>.



Abstracts of Submitted Deliverables

This page constitutes a dynamic (and growing) list of short abstracts for all submitted deliverables. They are arranged according to Work Package and year. Deliverable authors are invited to edit these abstracts where necessary. All deliverables are available to the public at this link [public repository](#) for downloading. Direct links to each deliverable appear after each abstract.

WP 1: Automata Theory and Autopoiesis

Year 1 Deliverables

No deliverables in Year 1.

Year 2 Deliverables

D1.1: Towards a Biological and Mathematical Framework for Interaction Computing

Authors: Paolo Dini, Gerard Briscoe, Alastair Munro, Sonia Lain

This report discusses interdisciplinary research leading to a mathematical framework for biologically inspired computing aimed at achieving the project's objectives in self-organising software behaviour, an model for interaction computing, and the first steps towards an autopoietic digital ecosystem model. The report begins with an introductory chapter that defines the epistemological context of this research and provides an overarching framework for biologically inspired computing. Chapter 2 summarises the scientific output involved in the creation of Ecosystem-Oriented Architectures from the Digital Business Ecosystem (DBE) project. In Chapter 3 the discussion turns to the process of computational biomimicry to create autopoietic Digital Ecosystems in software. Relevant biology, namely the properties of cellular autopoiesis and gene expression from the point of view of cancer. Chapter 4 introduces an approach to computational biomimicry; namely, to create autopoietic Digital Ecosystems in software through Biologically inspired Design Patterns which can augment the Ecosystem-Oriented Architecture presented earlier. Chapter 5 lays the groundwork for an integrative mathematical theory of self-organisation and interaction

About the partners

The OPAALS project is a consortium formed of 21 partner institutions based around the world. These partners are either academic or research institutions such as universities or smaller research or technology SMEs.

Create-Net (Center for Research and Telecommunication Experimentation)

Trento, Italy

Create-Net is a unique international centre in which some of Europe's finest researchers are brought together in a dynamic environment in order to engage in innovative quality projects. The top-notch research team focuses on converting talent and human capital into start-ups for promoting European high-tech competitiveness.

www.create-net.org

Using a multi-disciplinary approach, Create-Net bridges researchers, communities and industry in order to address fundamental issues of services centred on users and community. This work has particular emphases on conducting high-quality research and participating in the research community; leveraging the innovation arising from its research and technology to create start-ups; and continuing to obtain public funding from European, Italian and local sources, especially industrial ones.

<http://www.create-net.org/create-net/cda/aree/index.php?area=6>

Fachhochschule Salzburg GmbH (Salzburg University of Applied Sciences)

Salzburg, Austria

The Fachhochschule Salzburg – Salzburg University of Applied Sciences (SUAS) – offers interdisciplinary, bachelor and master programmes geared to the needs of the labour market in the innovation-oriented areas of Information Technologies, Business and Tourism, Media and Design, Health Studies and Social Work as well as Wood and Biogenetic Technologies.

<http://www.fh-salzburg.ac.at/en/>

In particular, SUAS is working to provide OPAALS a simulation framework for biologically inspired P2P systems: an Evolutionary Environment (EvE) simulated within a part of a Digital Ecosystem, or EvESim. EvESim is a collaborative platform that sustains interdisciplinary research and provides a framework for understanding, visualising and presenting DBE concepts to contributors.

<http://evesim.org/>

Food and Agriculture Organisation

Rome, Italy

The Food and Agriculture Organization of the United Nations leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information. We help developing countries and countries in transition modernise and improve agriculture, forestry and fisheries practices and ensure good nutrition for all.

www.fao.org

In particular, the FAO has an interest in advising OPAALS on the use of DEs as systems of knowledge for agricultural development in India and other areas of the developing world.

<http://www.digital-ecosystems.org/de-2007/programme.html>

Indian Institute of Technology Kanpur

Kanpur, India

Indian Institute of Technology Kanpur carries out original research and technology development at the cutting edge. It imparts training for students to make them competent, motivated engineers and scientists. The Institute celebrates freedom of thought, cultivates vision and encourages growth, and inculcates human values and concern for the environment and society.

<http://www.iitk.ac.in/>

IITK is contributing to the OPAALS project through automatic identification of workflow components from business-process specifications, and the use of OKSs in allowing multiple users to model, host and share knowledge fragments, such as in social networks. IITK has also contributed to knowledge exchange networks that build digital repositories and ontologies for domains in Indian agricultural and rural communities.

http://www.iitk.ac.in/dord/DORD/2005_2007.pdf (pages 24 and 36 in particular)

Instituto de Pesquisas em Tecnologia da Informação

São Paulo, Brazil

IPTI's group of specialists is formed by researchers with both doctoral and master's degrees from different areas of knowledge, all with a broad performance base in Information Technology, which always guarantees a tangible multidisciplinary in all of its developing projects.

<http://www.ipti.org.br>

IPTI is one of the lead partners on the development of the OKS visualisation and its technical functionality. Much of this initial work has been realised in an early-stage version of the OPAALS OKS, accessible here:

<http://www.opaals.org.br/>

For more information of the research work of IPTI, please see here:

<http://www.ipti.org.br/site/internal-pages/researches-def.jsp?page=research>

Instituto Tecnológico de Aragon

Aragon, Spain

The Aragon Institute of Technology is a public entity closely linked to the Department of Science, Technology and Universities of the Government of Aragon. Its objective is the promotion of research and development and the encouragement of technological innovation in business.

<http://www.ita.es>

As a regional catalyst, ITA coordinates regional training and community building activities in its region. ITA does not have to provide all regional network contacts, or provide all training; rather, as a regional catalyst it activates other potential partners and influencers, identifies drivers and

discoverer SMEs and coordinates between main regional actors. ITA thus acts as a catalyst in the process of regional DBE community building.

<http://www.ita.es/dbe/?ID=204>

London School of Economics and Political Science

London, UK

LSE has an international reputation for excellence in both teaching and research in the social sciences, and is consistently rated among the very top universities in the UK.

www.lse.ac.uk/collections/media@lse

LSE's role in spearheading the OPAALS project is significant, intellectually and fiscally. Faculty based in the Department of Media and Communications have coordinated the research efforts of institutions between 12 countries, as well as a budget of €9m, towards developing sustainable regional Digital Ecosystems.

<http://www2.lse.ac.uk/ERD/pressAndInformationOffice/newsAndEvents/archives/2006/OPAALSProject.aspx>

Ministério da Ciência e Tecnologia

Brasília, Brazil

Brazil's MCT was created on 15 March 1985, fulfilling the promise of then-president Tancredo Neves to the national scientific community. As an organization of administration rights, the MCT's core competencies are in the following areas: national politics of scientific research; technology and innovation; planning, coordination, supervision and control of science and technology activities; politics and development of information and automation; national politics of biosecurity; space-related politics; nuclear politics and control of the exportation of sensitive goods and services.

<http://www.mct.gov.br/>

Within MCT is the Secretary for Social Inclusion (SECIS), responsible for activities related to digital inclusion in Brazil with a special emphasis on the use of ICTs for socioeconomic development. SECIS partnership with OPAALS is based on the common objective of building virtual knowledge communities. SECIS has use cases and continues to search for research-based partners that can help improve Brazil's IT infrastructure, among other activities, in order to make it more efficient.

<http://www.mct.gov.br/index.php/content/view/78953.html>

National University of Ireland - Maynooth

Maynooth, Republic of Ireland

Following two centuries of internationally renowned scholarly activity on the Maynooth campus the National University of Ireland, Maynooth was established under the 1997 Universities Act as an autonomous member of the federal structure known as the National University of Ireland.

<http://www.nuim.ie>

NUI Maynooth studies the social and spatial structures of collaboration and knowledge among SMEs in the biotechnology and digital media sectors in Ireland.

http://www.nuim.ie/nirsa/people/research_fellows/ChrisVanEgeraat.shtml
<http://sociology.nuim.ie/AphraKerr.shtml>

National University of Rwanda

Butare, Rwanda

The National University of Rwanda (NUR) was created in 1963 conjointly by the Rwandan government and the Congregation of the Dominicans from the Province of Quebec (Canada). NUR was then composed of three academic units: the Faculty of Medicine, the Faculty of Social Sciences and the Teacher Training College (ENS). At that time, it had 51 students and 16 lecturers. By 2005, the university had 8,221 students and 425 lecturers.

<http://www.nur.ac.rw/>

Our partner at NUR leads a research group in Rwanda's Open Source Software and Systems Initiatives (ROSSSI), is a project leader of the Wireless Africa Alliance in Rwanda, a member of the Organisation for Social Science Research in Eastern and Southern Africa (OSSREA) – Rwanda Chapter – and the ICT expert on the ongoing project Poverty and Information and Communication Technology systems in Urban and Rural Eastern Africa (PICTURE Africa).

<http://euroafrica-ict.org/downloads/rwanda/Akorli.pdf>

Tampereen Teknillinen Yliopisto (Tampere University of Technology)

Tampere, Finland

Hypermedia Laboratory is a research, education and service unit at the Tampere University of Technology (TUT). From 1994, its year of establishment, Hypermedia Laboratory has been working actively in the field of hypermedia by researching and developing.

<http://matriisi.ee.tut.fi/hypermedia/en/>

Drawing on work done during the DBE project, TUT's Hypermedia Laboratory is continuing to define and visualise the OKS using semantic web principles. Hypermedia Laboratory also collaborates on research in DE languages and ontologies, as well as in common research community integration activities.

<http://matriisi.ee.tut.fi/hypermedia/en/research/knowledge-modelling-and-visualisation/>

TechIDEAS Asesores Tecnologicos

Barcelona, Spain

TechIdeas is a state-of-the-art custom software developer, highly specialized in Embedded Systems, Telemetry and Realtime Information for secure, mobile environments. TechIdeas delivers innovation for blue-chip clients in the automotive, banking, infrastructure, energy, retail and public sectors.

www.techideas.es

As an SME, TechIdeas is collaborating with the research outputs of the LSE, University of Surrey and SUAS on developing an OKS.

<http://www.techideas.es/projects.html>

T6 Società Cooperativa

Rome, Italy

T6 is a strategic consultancy that researches digital innovation through international research projects aimed at providing solutions and instruments for a new use of information and communication technologies. One such project is OPAALS.

http://www.t-6.it/t6_en

The three particular areas of specialisation that T6 contribute to OPAALS are management of publicly funded projects within the EU (but also with experience in other large organisations such as the UN and UNESCO); research in environment and communities, with expertise in technologies for natural risk prevention, resources protection and the promotion of alternative and sustainable energy resources; and digital innovation, with an emphasis on the adoption of Open Source Software (OSS) solutions.

http://www.t-6.it/t6_en/projectmanagement.html

http://www.t-6.it/t6_en/ambiente.html

http://www.t-6.it/t6_en/oss.html

University of Cambridge

Cambridge, UK

Cambridge is one of the world's leading research universities. It has more than 80 Nobel Prizes to its credit, more than any other single university in the world.

www.cam.ac.uk

The efforts of our University of Cambridge partner are focused on the nearby community of Peterborough to discover if DEs can become key to the community's improvement of its business ranking and address some of its existing social issues.

<http://www.miltoncontact.co.uk/node/42>

University of Dundee

Dundee, UK

The University of Dundee is one of the UK's leading universities, internationally recognised for its expertise across a range of disciplines including science, medicine, engineering and art. In 2007, the University celebrated 40 years since it became an independent university after a 70-year relationship with the University of St. Andrews.

<http://www.dundee.ac.uk/>

Contributions from the University of Dundee's Surgery and Molecular Oncology Department have been made towards understanding and modelling fundamental biological concepts and processes. From this work, Biological Design Patterns can be constructed and used in defining technical components of Digital Ecosystems.

<http://www.maths.dundee.ac.uk:80/mbg/media/media.html>

University of Hertfordshire

Hatfield, UK

As the leading business-facing university in the UK, the University of Hertfordshire is focused on developing new and creative approaches to learning, teaching and research with a commitment to adding value to employers, enterprise and regional, national and international economies.

<http://www.herts.ac.uk/about-us/our-business-facing-vision.cfm>

The Biocomputation Research Group, based in the University of Hertfordshire's Science and Technology Research Institute (STRI), is involved in the mathematical and computational modelling of genetic regulatory networks, biochemical, multi-cellular and other complex systems.

<http://strc.herts.ac.uk/bio/>

University of Kassel

Kassel, Germany

The University of Kassel (UniKassel), founded in 1971, is the newest university in the state of Hessen. At present, it has 18,113 students. The number of staff is more than 2,120, including 327 professors, approximately 900 other academic staff, and about 1,100 technical and administrative staff.

<http://cms.uni-kassel.de/unicms/index.php?id=4872>

UniKassel has spearheaded work on a research platform that provides examples and results of successful collaboration between its researchers working in linguistics and others in social and computer sciences. In particular, UniKassel's research covers linguistic analysis, social research of communities and the collaborative research in the computer science domain. Another focus is the Evolutionary Framework for language, which explores the mechanisms and forces of natural language evolution and links them to research on DEs and Formal Knowledge Spaces.

<http://matriisi.ee.tut.fi/hypermedia/events/opaals2008/articlelist.html#opaals2008-article20>

<http://matriisi.ee.tut.fi/hypermedia/events/opaals2008/articlelist.html#opaals2008-article18>

University of Limerick

Limerick, Republic of Ireland

The University of Limerick has an established reputation for being Ireland's leading university in industry-led research. This has resulted in significant research commercialisation activities and collaboration between its leading researchers and industry. All of UL's key research indicators are showing strong growth, with increases in research applications, research income, postgraduate numbers and commercialisation activities complementing the strong gains in research outputs.

www.ul.ie

University of Limerick's work on the OPAALS project has centred on issues of community currencies, governance and open source technologies, with a more recent move towards a community focus. Previously, research covered commercial adoption of open source and the various business models involved. This is shifting to include communities and how they have expressed commercial interest in open source products in order to better understand open innovation, open sourcing and the communities involved.

<http://www.lero.ie/research/>

University of Surrey

Guildford, UK

The University of Surrey is an international university with a worldwide reputation for excellence in teaching and research.

<http://www.cs.surrey.ac.uk/>

With a history of contributions to the DBE project, the team at Surrey is currently developing a new, adaptive and open P2P network architecture that fully supports long-term business transactions.

<http://www.cs.surrey.ac.uk/SS/Projects/DBE/index.html>

<http://www2.surrey.ac.uk/postgraduate/research/feps/computing/>

University of Zaragoza

Zaragoza, Spain

The University of Zaragoza is the main centre of technological innovation in the Ebro Valley and has great prestige among both Spanish and European universities with which it holds relations.

<http://wzar.unizar.es>

UniZar is a member of the Integration Coordination Team of OPAALS' NoE and is developing a task within the project to deal with Regulation and Governance of Digital Ecosystems.

http://labje.unizar.es/info_proyecto.php?id=dbe

Waterford Institute of Technology

Waterford, Republic of Ireland

Waterford Institute of Technology (WIT) is a university-level institution in the southeast of Ireland with over 10,000 students and 1,000 staff. WIT offers taught and research programmes in various areas from Higher Certificate to degree to PhD.

www.wit.ie

Key members of WIT's Telecommunications Software & Systems Group (TSSG) developed a collaborative, knowledge-sharing framework between ecosystem participants and defined distributed accountability, identity and trust models for autopoietic P2P environments and community networks. Current and future work involves refining the initial models for distributed identity, trust and accountability and implementing these models in the Open Knowledge Space (OKS).

http://www.tssg.org/archives/2007/09/opaals_sd.html

People

A large number of people contribute to the research and work of OPAALS. The following researchers are especially key in defining and managing our organisation's agenda.

Saulo Barretto



Saulo Barretto is a civil engineer with a PhD in numerical methods for structural analysis. Since 1998, his research interests have moved to distance education and more recently to virtual knowledge networks. In October 2003, he helped to found IPTI where he is one of its associate researchers.

Before joining OPAALS, Dr Barretto was involved in the coordination of a national program of digital inclusion based on a cultural perspective in Brazil. This project, named *Digital Cultura*, opened up the potential of ICT as a means to improve socio-economic development, as well as to emphasise local culture and identity. This completely changed the way the use of ICT for education, e-business and e-citizenship was seen in Brazil.

His core contribution to OPAALS' research involves the coordination of the development of Guigoh, a significant aspect of the Open Knowledge Space (OKS). Dr Barretto is motivated to explore Digital Ecosystems research because, since his involvement with the *Digital Cultura* project, he realized that cyberspace only makes sense as a new scenario for knowledge if it is related to a perspective of collective knowledge-building, and if an OKS is the platform that allows such collaboration and collective production and sharing.

Dr Barreto believes that a huge number of research interests are provoked by the use of an OKS to support knowledge communities as well as virtual enterprises and that several aspects of society can be influenced by the outcomes of such research (education, health, e-citizenship, etc.) He sees the Internet as a great opportunity to allow people to find solutions for their social and/or economic problems at the local level, and hopes that its potential can be exploited so as to provide an e-governance scenario that allows people to work in collaborative ways to improve democracy, participation and citizenship. He believes that an important research output of OPAALS will be the DE architecture, composed by a peer-to-peer and distributed identity layer.

Gerard Briscoe



Dr Gerard Briscoe holds a PhD in Electrical and Electronic Engineering and an MEng in Computing. He is currently a Research Assistant in the Digital Ecosystems Lab of the Department of Media and Communications at the London School of Economics and Political Science.

Before joining OPAALS, Dr Briscoe worked in a variety of systems engineering roles, notably including a successful application to the Santa Fe Institute's inter-disciplinary Complex Systems Summer School, which provided him a formative experience of inter-disciplinary research. His core contribution to OPAALS' research involves the exploration of the biological metaphor for the technical component of Digital Ecosystems. This has involved creating the digital counterparts of biological ecosystems, possessing their properties of self-organisation, scalability and sustainability; and Ecosystem-Oriented Architectures that automate the search for new algorithms in a scalable architecture through the evolution of software services in a distributed network.

Dr Briscoe is now focused on Community Cloud Computing, which makes use of the principles of Digital Ecosystems to provide a paradigm for Clouds in the community, offering an alternative architecture for the use cases of Cloud Computing. This is more technically challenging, as it deals with issues of distributed computing, such as latency, differential resource management, and additional security requirements. He considers this area of research crucial. due to the need to retain control over our digital lives and the potential environmental consequences.

Dr Briscoe's vision for the future of the Internet is that it will continue to grow, becoming ever more pervasive and integrated into society, nonetheless remaining a balance between more open community interests and more closed commercial interests. However, the Internet needs reformulating to reflect its current uses and scale, while maintaining the original intentions for its sustainability in the face of adversity. This would include extra capabilities embedded into the infrastructure, which would become as fundamental and invisible as moving packets is today. Without such developments, the future of the Internet will no longer be defined by the innovation of individual users, as it has been to great success in the past, but to the interest of the large commercial entities that have arisen from the Internet.

An important research outcome of OPAALS will be the principle of community-based digital infrastructure, where individual users share ownership: an inspiration from natural ecosystems integrated with an understanding of social systems.

Jayanta Chatterjee



Dr Jayanta Chatterjee is a professor at the Industrial Management Engineering Department of IITK. His teaching and research interests span across Technology management, Knowledge and Innovation strategies, Information Systems and Enterprise processes.

Dr Chatterjee is the lead researcher for the Science and Technology Applications for Rural Transformation (START) project at Media Lab Asia, IITK and is on the board of the Innovation Incubation Centre at IITK. He is an Adjunct Professor of Hong Kong Polytechnic University and serves on the International Advisory Board of the Knowledge Management Laboratory at National University of Singapore.

Dr Chatterjee graduated in Electrical Engineering from Jadavpur University and acquired his MTech and PhD from IIT Delhi in Management Systems. He has worked as a management expert in Siemens and the Rockwell Corporation in global operations and in his own venture-funded operation in California. He continues to consult at major technology organisations in India and elsewhere in Asia.

Paolo Dini



Dr Paolo Dini is a Senior Research Associate in the Department of Media and Communications at the London School of Economics and Political Science.

His research is concerned with complex systems at the boundary between social science, computer science, and natural/physical science. Coming from a background in aerospace engineering and aerodynamics modelling, he has taught physics at university level for five years at Carleton and St Olaf colleges in Minnesota (US), has then worked as a system integrator, digital design engineer, and project manager for a wearable computer company for three years, also in Minnesota, followed by one year in the Software Engineering and Applications group of Philips Research Laboratories, UK.

Dr Dini then spent two years at the MIT Media Lab Europe in Dublin where he led research projects centred around the concept of self-organisation in a wide range of fields, from the self assembly of proteins around carbon nanotubes, to Biological Design Patterns in software engineering, communities of software agents on mobile devices, and resource sharing in ad-hoc networks. He also led the Wireless Ad-Hoc Network for Dublin project, that involved the specification and deployment of a wireless 802.11 network infrastructure in the centre of Dublin, a qualitative and ethnographic research effort to study different potential user groups, and distributed applications such as interactive narrative spaces navigable in an outdoor museum context but that also reflected on the local community and contributed to community identity.

Dr Dini is the project coordinator of OPAALS, and also a sub-project leader in the BIONETS integrated project (FET Unit). He was also the Scientific Coordinator of the FP6 DBE Integrated Project.

Paul Krause



Professor Paul Krause has over 20 years experience in research and application of advanced software engineering techniques. He has been Professor of Software Engineering at the University of Surrey since January 2001 and holds a PhD in Geophysics.

His primary research interests are in the specification and testing of high-integrity distributed software applications. Specific research contributions in formal modelling of interacting software components, automated generation and execution of software test cases for highly concurrent software applications, and software quality prediction using Bayesian Networks.

Prior to 2001, Professor Krause was Senior Principal Scientist at Philips Research Laboratories, where he successfully migrated results from a range of his research projects on the specification and testing of software into development organizations within Philips Electronics. This focus on applicable research continues with the strong industrial interest in his research at the University of Surrey.

For 10 years prior to moving into Software Engineering, Prof. Krause was a successful research physicist and this background provides useful input into the OPAALS project. His current contribution involves the overall coordination of the development of the OPAALS digital

infrastructure. He envisions the most important research outcome of OPAALS as the delivery of core digital infrastructure, and understanding how to facilitate and manage the societal transitions needed to start to a vision of the future internet.

Thomas Kurz



Thomas Kurz holds degrees in Information Technologies, Software and Systems Engineering, Interpersonal Communication, Economics and Mechanical Engineering. He is currently a researcher at SUAS and a member of the OPAALS Integration Coordination Team.

Before joining OPAALS, he participated for three years in the DBE project, and participated in one of its most recognised research outcomes: EvESim. His role in the project involves the coordination of work packages and systems integration through the Integration Coordination Team. He acts as a linking point between social science and computer science.

He is motivated by a desire to work with different people and understand and explain developments in heterogeneous settings. He envisions the future Internet as evolving to centre on the needs and interests of people, who will be the focus of new inventions. He believes that the Internet needs to adapt to the people and enable the diversity of human society.

Paul Malone



Mr Paul Malone graduated from Waterford Institute of Technology with a first-class honours degree in 1998. He completed an MSc in Network Accounting in 2001.

Mr Malone has worked on several network and service accounting projects since graduating including SUSIE, Bandwidth2000, and OPIUM and DBE. He is currently a Project Manager with the Telecommunications Software & Systems Group (TSSG) in Waterford Institute of Technology, where he managed the TSSG's participation in the IST DBE (DBE) project. TSSG's involvement in the DBE integrated project included the development of open-source software building blocks for deployment as DBE services as well as distributed contract negotiation mechanisms.

Mr Malone's current research interest is in the design and development of fully distributed accounting mechanisms for the realisation of economic enablers in peer-to-peer B2B environments. He has published 10 peer-reviewed research papers in international IT conference proceedings.

Sotiris Moschoyiannis



Dr Sotiris Moschoyiannis is a Research Fellow and Lecturer in the department of Computer Science at the University of Surrey. He holds a degree in Mathematics (University of Patras, Greece), an MSc in Information Systems and a PhD in Computer Science from Surrey.

Dr Moschoyiannis has been researching interactions for some time, and has always been intrigued by the interrelationship between local (micro) and global (macro) level interactions. He developed a technique that allows someone (a developer or designer) to check that parts of a system are correct locally and from that, derive that the overall system will behave correctly. This means there is no need to check again at the system level, which is typically more costly due to scale and complexity.

Dr Moschoyiannis' core contribution to OPAALS' research involves the development of a formal language for describing the complex interactions that are involved in Digital Ecosystems, and providing ways for deriving compensating sequences of actions that can effectively undo the effects of the part of the interaction that has already taken place before some failure (service, transaction or network failure) occurred. This work on coordinating forward and compensating actions, and identifying alternative scenarios is central to the design of the overall P2P network, which participants can use and provide business and knowledge services.

Andrea Nicolai



Dr Andrea Nicolai is CEO and Founder of T6 since 1999. His expertise and his research activities have spanned through several domains (tourism, media, local development, SME) and technologies (distributed networks, multimedia content delivery, web based education etc).

Currently he is project manager of international projects of FP6 (DBE) and has been coordinator of some FP5 projects (FETISH and DAFNE), dealing with research and innovation in ICT in the areas of tourism, cultural and media industries sectors and SME innovation paths. He also acts as an international expert on Information Technology for Tourism, acting as a member of the Valuation and Selection Panel concerned with research projects for the European Commission. He is a permanent member of European Commission expert advisory groups on technology for tourism and on Open Source Software issues.

Before this, Dr Nicolai has been national coordinator of InTourSME (linking and connecting the tourism resources of more than 50 regions in Europe); coordinator of the area "infomobility" applications in KNITE; coordinator of the development of an Internet service for tourist marketing and promotion system for the city of Rome during the Holy Jubilee. He has been speaker and chairman in several international conferences on ICT application to tourism, innovative business models, e-business and advanced technology, such as the Jini Community Meeting, JavaOne, ENTER, IST Conference and many others.

From 1995 to 1997, Dr Nicolai led several Italian workshops on Internet use in different domains: "Internet and Benchmarking Learning", "Internet for Healthcare Industry", "Internet for SMEs", "Internet for Public Administrations" and "Strategic Management of Internet and Intranet". He was an invited lecturer in postgraduate and graduate courses on e-business scenarios and ICT for tourism and SMEs: ISUFI University of Lecce Master School; University of Rome; the

European Commission funded course on "Multimedia Project Management" held in Milan. He is an active member of the Jini and Java Community, where he held the group on marketing and business research. He has been involved since 1995 with the Internet Society, the Electronic Frontier Foundation and the Open Source Community.

Ossi Nykanen



Dr Ossi Nykanen is senior researcher at the Tampere University of Technology. He holds a DSc (Tech) in Mathematics and an MSc in Computer Science. His responsibilities include teaching and managing the studies of hypermedia (a main subject of the information technology undergraduate program with several completed MSc degrees per year), launching and managing the W3C Finnish office, and various R&D projects.

Before joining OPAALS Dr Nykanen pioneered computer-verified math assignments for university-level educational math applications using computer algebra systems in Finland. This work also continues in a European-level project, called the Math-Bridge. His core contribution to OPAALS research addresses the evolution of language and visualisation, and he is the team leader for the Tampere University of Technology (TUT) partner. He has actively participated in the development of the Wille2 visualisation system, the OKS Data Model, OKS evolution studies, and has both written code

and published several scientific papers on these subjects. He is in computing on the level of information and knowledge and bridging different research disciplines.

Dr Nykanen's personal research interests include applications of logic in information technology, mechanical inference and machine learning, (computer-supported) mathematics and education, information modelling and visualisation, and related (Web) applications. This work yields applications in, e.g., structured documents, knowledge management, and intelligent-kind-of systems. From Dr Nykanen's point of view, the OPAALS research project and the community nicely complement and support his research interests. He believes that the future Internet will be defined by mobile computing, and that ad-hoc networks will become increasingly popular. Increased mobility and continuous access will inevitably also affect the ways people communicate, as well as access and use information-related applications.

He also believes that core technologies of the different physical media are converging considering the public Web; this is sometimes expressed as the objective of the "One Web". He thinks the OPAALS project, through the general digital ecosystem and specific OPAALS Open Knowledge Space research, will demonstrate the concept of an evolutionary, contributed knowledge system that is also knowingly treated as a research object. This work should provide fertile ground for several kinds of applications and future research.

Antonella Passani



Dr Antonella Passani is responsible for socio-economic research at T6 Ecosystems, SRL, an Italian SME that brings together project management and scientific research and in doing so, provides consulting services for technological innovation, local development, and environmental and territorial protection.

Before joining OPAALS, Dr Passani worked for five years at CENSIS, one of Italy's largest research institutions. There, she participated in the DBE project by working primarily on territorial deployment of Digital Ecosystems in tandem with SME clusters and regional catalysts. She has a PhD in social science, conducts research and teaches at the University of Rome.

Dr Passani's research activity in OPAALS focuses mainly on aspects of the social impact of Digital Ecosystems and their implications for local innovation. She is a member of the Integration Coordination Team and is especially interested in improving reciprocal understandings between computer and social scientists.

As a social scientist, Dr Passani sees ICTs not simply as instruments but rather as integral parts of our culture; a culture with important global and intercultural dimensions that require analysis in interdisciplinary ways. OPAALS allows her the opportunity to work closely with researchers from many different fields and cultures. She finds this environment helps her to better interpret crucial social processes that bring together democracy, power, communication and sustainable development issues.

In terms of technology and society, Dr Passani finds it difficult to separate the two. The Internet has already changed the way people see and interpret their lives. So if the Internet remains a free and neutral entity, Dr Passani sees it as continuing to transform the ways in which people learn, work and participate in politics in a positive and more horizontal fashion. This is not automatic, she cautions, nor is it a characteristic of the technology itself. It can only be achieved if political and legal aspects of the Internet are developed with such goals in mind. The Internet, in other words, should be conceived as a common, public good.

In Dr Passani's opinion, the most important research outcome of the OPAALS project will be a self-sustaining community of researchers interested in surpassing their disciplinary boundaries. This will hopefully result in the development of territorial Digital Ecosystems able to support other research communities, SMEs and citizens.

Lorena Rivera-Leon



Lorena Rivera-Leon is an economist with an MA Honours, and works as a consultant to OPAALS through both T6 Ecosystems and the London School of Economics and Political Science. She is also a consultant on Innovation Policies and Information Society at Technopolis Group Belgium.

Before joining OPAALS, Ms Rivera-Leon was an intern at the European Commission Directorate General for the Information Society and Media, in the unit in charge of the Digital Ecosystems cluster of projects. She contributed to the Digital Ecosystems Book, published by the European Commission in 2007.

Her focus in OPAALS addresses building a methodology that bridges Digital Ecosystems research to the knowledge economy that responds to the practical concerns of regional development policy. She works to develop a methodology for 'measuring' the socio-economic impact of Digital Ecosystems deployment. In complement, Ms Rivera-Leon works in the dissemination of the Digital Ecosystems approach to regional development among European policymakers and regional authorities.

Frauke Zeller

Dr Frauke Zeller is Assistant Professor and Lecturer at Ilmenau University of Technology, Germany. She holds degrees in "Modern Languages and Economics" (Dipl. Ang.) from the University of Kassel, Germany, and "English Linguistics" (BA Honours) from the University of Central Lancashire.

Frauke's work in graduate school had a primary focus in the areas of Computational Linguistics and Applied Discourse Studies in Social Science and Technology, leading to a PhD in Computational Linguistics awarded at the University of Kassel in 2005. In the context of her research work over the last few years, she has been involved in the coordination and management of Kassel University's Research Lab in Computational Linguistics and Media Studies, with programme and budget responsibilities for a number of international research projects.

Dr Zeller is the OPAALS Social Science Domain coordinator and member of the Project Management Board. Her contributions include management on task, work package, domain and project level, and research in the fields of online communities, knowledge management and production, language and communication and social software. OPAALS provides her with the opportunity of not only conducting theory-based research but also to conduct empirical research on online communities and Digital Ecosystems. She envisions that an important research output from OPAALS will be a joint 'language' – and hence interdisciplinary and intercultural research arena – for Digital Ecosystems.

Perspectives on Digital Ecosystems

We asked a few OPAALS consortium members to explain, in their own words, how Digital Ecosystems can advance society from the perspectives of research, industry, regional development and education. Here is what they had to say.

Research Viewpoints

Sotiris Moschoyiannis (computer science)

I'm motivated to explore this area of research because OPAALS is in a unique position of examining the best solutions for providing a technological infrastructure whose characteristics and main features are not only informed by the socio-economic context in which this infrastructure operates, but also continuously adapted to the changing needs of the social and economic environment in which it lives.

I envision the Internet evolving into an open digital environment, which provides fast and accurate access to vast amounts of information and a huge array of services that can be combined and mashed-up in large-scale web applications that are not only set up by small or large enterprises, but rather emerge from society itself and in that way reflect current trends and aspirations in our day-to-day lives.

An important outcome of this research, in my opinion, will be the formation of a diverse research community around important, foundational aspects of Digital Ecosystems.

Frauke Zeller (social science)

The social sciences in OPAALS encompass a broad perspective with different research foci: from traditional communication studies in online environments, to governance, community theories and the understanding online communities, as well as open source communities and knowledge innovation. The two main activities of the social science domain are therefore to *analyse* digital communities and environments in order to *develop* concepts for the development and sustainability of Digital Ecosystems.

An important part of the activities is also the interdisciplinary work, particularly trying to bridge the different scientific domains in OPAALS: computer sciences, natural sciences and social sciences. The social sciences can act here as an important catalyst, drawing upon their inherent expertise in communication and social interaction. As a result, the social sciences' overall perspective in OPAALS regards language and communication as the predominant and challenging feature of Digital Ecosystems, both on theoretical and applied levels. For example, communication is the core tool for interdisciplinary work. However, different disciplines rely on different communicative patterns (i.e., specialised vocabularies) and on distinct forms of knowledge creation and validation.

The OPAALS' fields of communication studies and linguistics integrate the necessary tools to understand these differences and try to catalyse them in order to facilitate interdisciplinary work. Moreover, social sciences are often inherently interdisciplinary themselves, like computational linguistics (combining the fields of linguistics and computer science into natural language processing techniques), or the theoretical integration of approaches from biology regarding autopoietic systems (which is a main research area of OPAALS).

Because of its multiple roles, the social sciences domain has developed into a highly interactive and interdisciplinary community in OPAALS that can offer a rich set of results and concepts tackling the main issues of Digital Ecosystems: community (building, emergence and sustainability), trust, identity, economic development and innovation.

Gerard Briscoe (computer and natural sciences)

We have collaborated on the idea of a Digital Ecosystem, with inspiration and understanding from the natural sciences helping us in developing technical systems in the computer sciences, for the creation of socio-technical systems with desirable properties, such as openness, democratic control and sustainability.

The World Economic Forum has created and made available a video, which proposes a few models for how the Digital Ecosystem could evolve, and we consider the natural and computers science research to be enabling of the more distributed open models.

http://decommunity.net/watch_the_video

Industry Viewpoint**Anne English**

I see research being undertaken into Digital Ecosystems as enabling the future sustainability and survival of SMEs (small and micro businesses and enterprises) and regional development.

Our project, an advanced research programme funded by the European Commission in computer science and software engineering, was founded, in part, to do just that: develop an integrated ICT development and adoption strategy to suit and support SMEs across the different regions of Europe.

This integrated programme includes experts from industry, academia and policy who contribute to the interdisciplinary body of research in e-business, software engineering, computer science, natural science and social science; as well as regional and European policy.

Our work is in accordance with the objectives of the Lisbon Strategy on the Information Society and the Knowledge Economy. Regarding Digital Ecosystems and industry, additional useful references can also be found at the following:

http://www.digital-ecosystems.org/events/2005.05/de_position_paper_vf.pdf

<http://www.digital-ecosystems.org>

http://en.wikipedia.org/wiki/Digital_ecosystem

<http://debii.curtin.edu.au/>

<http://www.digital-ecosystems.org/book/de-book2007.html>

http://www.bain.com/bainweb/publications/publications_detail.asp?id=26414&menu_url=publica

<http://www.issues.org/22.1/smith.html>

Regional Development Viewpoint

Lorena Rivera-Leon

I believe that Digital Ecosystems are a new approach for formulating development policies under the principles of collaboration and participation of all socio-economic actors.

Furthermore, I think that in the future, the Internet will be a network of networks: interrelated social and economic actors able to collaborate, interact and share information for economic and social transactions.

An important research outcome of OPAALS will be the formulation of new economic models for sustainable development.

Education Viewpoint

Paul Krause

How will someone doing my job work in the future?

As a lecturer and researcher, I would choose to live on Crete for personal and family reasons. I would live in a low energy home and (along with 90% of the population) not own a car because the community bus will always call in our village if one of our family members makes a request or our diary indicates we may need it. We may get almost all of our food either from our own garden, or through our involvement in a local community farm.

As a teacher, I might have contracts with a number of universities around the world, where I deliver my courses through an access grid. I can present interactive lectures where the students in the lecture are displayed on my video wall. I can also interact with students in smaller tutorials or individually.

For my research, I could be a participant in a number of immersive collaboration spaces for team projects. In addition, I have my own personal research space that is openly accessible for people to explore my research achievements.

Perhaps I am also facilitator of one of the most successful virtual cafes, where there is a chance of meeting some of the key figures in ecological modelling.