NESSI Prospectus

Introduction

Software and services are a key part of ICT and are key drivers for the European economy. The importance of software and services is increasing through its growing role as a ubiquitous technology across all sectors of the economy, such as transportation, energy, and healthcare, and as a key enabler for solutions to societal and economic challenges.

NESSI, the Networked European Software and Services Initiative, is an industry-led European Technology Platform (ETP). ETPs provide a framework for stakeholders to define research priorities and action plans. NESSI provides a platform to allow industry, research centres and academia to discuss, elaborate and influence technological advancements, competitiveness and sustainability in the field of software and services research and innovation.

NESSI was established in 2005 but since then every dimension of the research and innovation landscape has changed often in a dramatic way. Information and Communication Technology (ICT) has progressed with accelerating pace and a clear convergence of technologies (telecoms and infrastructure, software and services, information and content). New paradigms have emerged, such as Cloud or Mobile Computing, and via in-memory computing the processing of large amounts of data is now possible in real-time, making data the currency of the new Internet. These changes influence how industry is innovating, how business is conducted and how research institutions are aligning the research and innovation needs of industry and society.

NESSI is a major player in this domain and drives these developments. It does this through a community of partners and members engaged in software, software-based services and data technologies that will enable citizens, the public sector and industry to thrive. As an ETP, its goal is as an industry-led stakeholder forum charged with defining research priorities in a specific technological area for the benefit of Europe.

NESSI's first objective is to engage with European ICT Industry and to promote the need for dramatic changes due to new ICT eco-systems and innovations which are a pre-requisite for Europe to stay competitive globally. Innovation will take place in infrastructure, software, platforms, products, services, and information. Individual technologies will advance in areas such as servicification of products, platforms interoperability, real-time data analytics, Software-as-a-Service (SaaS) and virtualisation and these will all be supported by advanced software engineering.

NESSI's mission is to open windows of opportunity in Europe for new services and applications which have business and societal value. NESSI's impact on Research and Innovation (R&I) strategy is based on a strong track record of significant contribution by all its stakeholders including strategic research agendas, white papers, position papers, and through R&I in many ground breaking projects.

NESSI thus provides value and benefits to its stakeholders and to the wider community through its contribution to research and innovation policy, to ICT work programs, and by furnishing the community with relevant information, providing networking forums to meet and partner, and providing an alignment of industry and academic research.

Dr Stephan Fischer

Head of Applied Research, SAP AG; Chair of the NESSI Board

Join Us: NESSI Membership is open and free. If you are interested in our mission and ideas please find out more: Website: http://www.nessi-europe.eu NESSI Office: office@nessi-europe.eu

Digital Information Society and Economy 2.0

NESSI promotes that software, services, and data are key enablers to help resolve European societal and economic challenges across all sectors such as manufacturing, transportation, energy, and healthcare.

NESSI's vision is the "**Digital Information Society and Economy 2.0**" which allows European businesses and citizens to stay competitive, to swiftly create new economic value and to experience new service offerings. This digital world provides a hyper-connected environment, where services are accessible ubiquitously and immediately; where collaboration among organisations, communities, and individuals are happening in an agile, adaptive and dynamic manner; and where the growing amount of data provides opportunities for new business, increased well-being and productivity efficiencies.

The software and service industry has seen tremendous change during the last decade. Just a few years ago software and even services were seen as an "on premise" phenomenon orientated around a Service-Oriented Architecture (SOA). Today, services are increasingly offered in the cloud or as SaaS, particularly enabling SMEs, and accessed by smart mobile devices. Enormous computing power, coupled with new technology, has made data processing possible in real-time, making data the "new currency" of the Internet.

The way software is engineered, developed, provisioned, and used has changed. Transformation through the use of social networking technologies has caused fundamental changes in the relationships between individuals, enterprises, and public services. Businesses once solely based on material and hardware are turning into service intensive companies running virtually in the Cloud across the globe.

Tight budgets and increased global competition makes it essential for a business to adopt these new software and service technologies to allow for more efficient and agile resource allocation, to focus on filling the innovation pipeline, and to ensure that products are faster to market. Agile enterprises and countries that can master the design, development, delivery and continuous operation of software-based services will drive the convergence and transformation of industry.

NESSI Manifesto 2.0

A new era is starting: Digital societies and economies are based on ubiquitous and instantaneous access to **information**, and upon the agile, adaptive and dynamic **collaboration** between organisations, communities and individuals. Europe and the world will significantly change by 2020. Digital Convergence will **transform** 21st century society and will have a **disruptive influence** on **social innovation**.

Established **sectors will be reshaped by ICT** most prominently in domains such as healthcare, transportation, manufacturing, telecommunications, and energy. **Software,** software-based **services and data** will be the **key facilitators** for these changes. They will fuel **web entrepreneurs** and the creation of **new businesses.**

NESSI brings together the stakeholders who will power these transformations. Software and services will enable vibrant digital **ecosystems**. These ecosystems will **redefine roles** throughout industry, including software vendors, software-intensive users, system integrators, service providers and consulting companies. **New roles will emerge**, including data vendors, brokers, integrators, and data scientists. These stakeholders and communities will create new business models to ultimately drive **prosperity in Europe**. The new ecosystems will be formidable engines for the creation of new jobs, based on the invention and elaboration of new economic and social opportunities.

Innovation driven by Software and Services

The future software and services landscape will enable agile collaboration among stakeholders of all sizes and cultures within digital ecosystems. Business value and impact will be generated through continuous adaptation of software, services, and applications in response to changing requirements, context, markets, and customer behaviour. Data- and Information-as-a-Service will add value through the continuous, real-time aggregation of data streams from open data, business sources, the Internet of Things, social networks and crowd-sourcing. Services based on cloud infrastructures, networks, platforms, and business objects will be extensively used resulting in secure and trustworthy advanced industrialized software and service supply chains. The holistic life-cycle management of software, services, applications and data value chains, and their operation allows sophisticated value chains based on ICT co-innovation and fast innovation cycles to be created and maintained.

Software and Services are the key technologies enabling all these transformations. Software controls the Internet and keeps it running; Software powers ubiquitous digital devices; Software implements services and platforms providing new ways of communication and opportunities to increase productivity and well-being; Software enables the processing and analysis of data by extracting value for enterprises and societies; Software helps mitigate the risks by addressing security, cybercrime and privacy. In addition, Big Data and Information Analytics grow the hyper-connected society into a hyper-informed society. Cloud computing has given a push to the next level of servicification by providing the platform for "Every-thing-as-a-Service". Software Defined Networking provides on-demand access to networking resources and opens up opportunities for new service innovations.

The convergence of the network of services, the network of things, and the network of data and content will open further doors in the digital world. Developments such as cloud computing, social media, data analytics, and mobile communication allow the rapid formation of these ecosystems. Therefore, innovations in software and services need to be understood as a composition of complementary elements in the following areas:

- Infrastructure innovation
- Information innovation
- Product, Service and Process innovation
- Software innovation
- Platform innovation (Social Innovation)
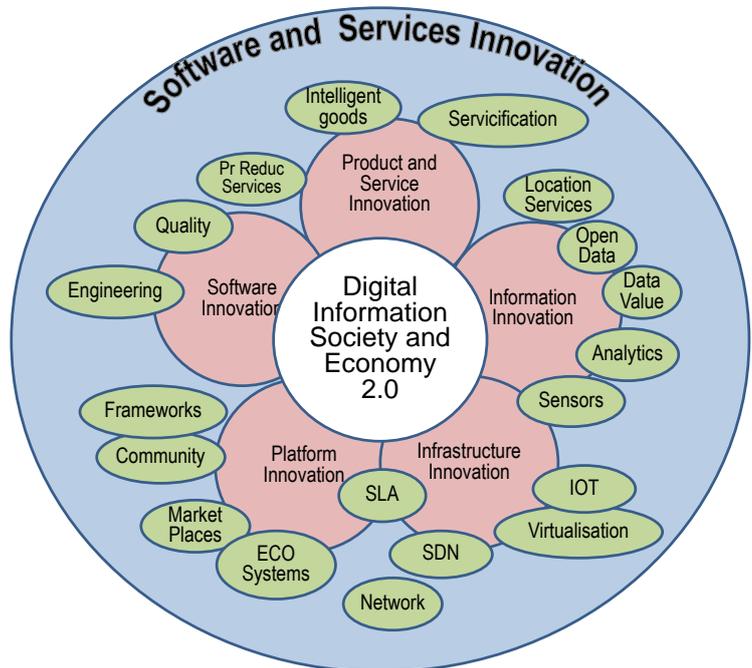
These elements, promoted by NESSI, all underpin the Digital Information Society and Economy 2.0.

Infrastructure Innovation

The infrastructure sector is changing dramatically with the convergence of Information and Telco technologies, the arrival of the Cloud and SaaS paradigm and software defined networks. The Internet of Things has significantly extended the scope of fixed and mobile networks to a hyper-connected environment of machines, devices, sensors, businesses and humans. Networks are becoming an increasingly integral part of software and service provisioning and vice versa and thus value creation moves up the technology stack to software-based platforms and ecosystems. Only a holistic view of an advanced and programmable infrastructure, allowing orchestrated and dynamic access to computing, storage, and networking resources, will lead to an innovation cycle that will accelerate this value creation.

Infrastructure Innovation Opportunities

- Establish a holistic view across infrastructure layers – including services, network infrastructures, devices and sensors – and adopt an extended view of services to include not only quality of service, but also security, compliance with regulatory and legal frameworks, quality of experience, and interoperability / accountability in complex scenarios.
- Provide support for the agile development and deployment of dynamic applications and services on heterogeneous clouds in particular for optimizing the exploitation of services in terms of accessibility, quality and cost.
- Create open programmable networks to enable ecosystems offering a plethora of innovation opportunities for the software industry including SMEs and web entrepreneurs – new high-quality services and revenue streams will be introduced more quickly and at lower risk whilst keeping the network reliable and secure and improving its utilization and operational efficiency.
- Engineer energy-aware software to improve the power-efficiency of software systems and services. Such efficiencies can be assured by developing scalable solutions, applying context information, and pervasive computing in wide-scale scenarios.

Information Innovation

The volume of structured and unstructured data continues to grow exponentially through video streams, images, audio, social networks, business data, sensors, devices, prosumers, machines etc. Variety, velocity and complexity pose significant challenges to the processing and analysis of this vast amount of data to turn it into information. New technologies need to address these challenges and advance the state of the art from pure information searches to the real-time and automatic discovery and analysis of information.

Such Big Data technologies will enable innovative ecosystems to generate value out of data. Data- and information-as-a-Service, aggregating data streams in real-time, integration into business processes and associated value chains will all provide smart solutions in many sectors. At the same time, attention has to be paid to all aspects of the availability, accessibility and governance of data, especially when dealing with various combinations of open data, restricted data and closed data.

Information Innovation Opportunities

- Provide single-source-of-truth information environments enabling improved channel marketing for business, product information networking, and reviews for consumers, through the syndication of digital content and assets along information and supply chains.
- Integrate real time data analytics to allow the continuous adaptation of the behaviour of services to new circumstances– e.g. new location, change of personal perspective - and thereby increase the quality of experience and improve customer satisfaction.
- Increase productivity and efficiency through the widespread use of Big Data technologies in various decision-making domains, ranging from health and environment, to energy and industry.
- Develop more effective public services by adopting Big Data concepts and technologies in areas such as fraud detection and prevention, tax collection, economic forecasts and policy, monitoring of health care spending, security and threat identification, etc.
- Improve the wellbeing of citizens by smart monitoring of health, sport and activity, and the food chain.
- Provide an open European test-bed containing user-orientated business data, public data, sensor data and other content to allow service providers within the big data and open data communities to prototype business and data analytics as well as novel information services.

Product, Service and Process Innovation

Today physical goods and products are being enhanced and extended by the addition of services (e.g. smart glasses) or are turned into services (e.g. car sharing). This "Servicification" is based on the increased utilisation of sensors, shared content, embedded software and aggregation in to service offerings.

The economic and social value of these next-generation "offerings" will be created by software based services that source, broker, bill, manage, and aggregate. The value is determined by the information that can be created, processed and provided for decision making on buying, using or repurposing.

NESSI FOCUS: Industry 4.0

In "Industry 4.0", intelligently networked, self-controlled manufacturing systems combine classic production techniques with IT. Machines and product communicate with each other to achieve increased flexibility and productivity goals.

Thanks to embedded systems, products in the machine's production process can themselves determine how they should be processed throughout their lifecycle. Sensors indicate to the "smart product" the current stage of the production process, or which areas need to be improved. Processes govern themselves in a decentralized system.

In the future, tailored components will be able to be produced faster and more cost-effectively in small batch numbers – with automatic, simultaneous replenishment of individual parts, and complete transparency of the company's order process.

Products, Services, and Process Innovation Opportunities

- Providing an environment for "Servicification" (Everything-as-a-Service) by developing software platforms and facilitating ecosystems enabling innovative services and processes offerings.
- Developing approaches for the efficient co-development of software and hardware supporting new forms of interactivity with goods such as smart glasses, wearable devices and augmented reality.
- Provisioning highly customized and personalized goods through embedded software based services and with providing a new level of Quality of Experience (QoE) to Customers.
- Allowing manufacturing-on-demand of highly customized goods by smart factories in an Industry 4.0 scenario.

Software Innovation

Next generation software, services, and applications will be able to continuously adapt in response to changing requirements, context and markets. They will be produced in secure, trustworthy, advanced industrialized software and service supply chains including extensive (re)use of existing software, services, business objects and processes. New software and service engineering methodologies will allow for alternative approaches, including community-based software and service engineering on scalable cloud platforms. There will be holistic life-cycle management and operation of software, services, applications and data value chains.

Software Innovation Opportunities

- Facilitating community-based service engineering where collaboration will power the innovation engine.
- Materialising Service Engineering by developing new ways for designing user-centric services, through immersive and interactive environments, and with the direct involvement of end-users.
- Improving fast, continuous and secure software development and deployment mechanisms by providing a high degree of automation and allowing for accelerated service and feature introduction.
- Designing software models, languages, and tools to support parallel modelling and programming and enabling its widespread use within the software engineering community.
- Creating new paradigms where emerging large, complex, and distributed systems are underpinned by consistency, stability and resilience.

Platform Innovation (Social Innovation)

Consumer platforms, e.g. social networking sites, have had a huge impact on a citizens social life and the interaction between individuals. Business oriented platform innovation is a key to the Information Economy 2.0. These new platforms will enable agile collaboration among organizations of all sizes and cultures within digital ecosystems. New and sophisticated value chains will be established based on co-innovation and fast innovation cycles. Marketplaces will adopt new pricing models (micro payments, brokerage, fraud control, etc) and provide self-service environments suitable for SMEs to configure. New approaches such as community and crowd sourcing will increasingly contribute to economic value and collective awareness platforms will continue to enhance both social and business life.

Platform Innovation Opportunities

- Establishing federated platforms to virtualize from specific technical platforms and contextualised by design.
- Providing frameworks for platforms, market places, and cockpits which allow self-service environments for SME to configure and deploy configurable and interconnected SaaS features and applications.
- Supporting cyber-security mechanisms for the detection of abnormal events, allowing end-to-end privacy, anonymisation, and context-based security.
- Facilitating a European testbed bringing together platform technologies and data to be leveraged by business and prosumers.
- Innovating mechanisms to support self-service marketing places and application function-fusion in the cloud.

NESSI Value Proposition and Member Benefits

Software and services are a key part of ICT and are key drivers for the European economy. The importance of software and services is increasing through its growing role as a ubiquitous technology across all sectors of the economy, and as a key enabler for solutions to societal and economic challenges. It is essential that software, service, and data research and innovation takes place. Thus, it is vital for an industry-led forum to promote stakeholder needs, create awareness and give the community direction within Europe.

NESSI is the forum that brings together like-minded companies, from multinationals to SMEs, research and innovation institutes, and academia. NESSI provides a single point-of-access in this sector which is efficient and effective for all stakeholders. NESSI helps to improve the research and innovation capacity of its members. NESSI gives the European Commission coherent engagement with a community of practice, and gives its members a voice which is heard by the European Commission. Larger organisations come together on common ground. SMEs are able to overcome disadvantages caused by their size.

NESSIs Strategic Research and Innovation Agenda (SRIA) represents a common vision of the future. NESSI, with the strong support from its community of almost 500 members, can ensure that software and service technology challenges remain at the top of the European and national policy agendas.

NESSI is a forum for all stakeholders for discussion, elaboration and dissemination of the interests of industry, research centres and academia. Actively participating members of NESSI are in a privileged position to benefit from their involvement in European public funding discussions with many proven advantages. Internationally NESSI explores wider collaboration and promotes joint research worldwide. Since NESSI is an open membership oriented ETP, it provides these benefits for all its members: SMEs, corporates, academics, research, and innovation institutes. These benefits have been confirmed by a NESSI members' survey in 2010.

NESSI provides a forum to develop roadmaps, project ideas, and to engage in policy debate for a competitive and advanced European software and service industry. NESSI contributes to technology policies, publishes influential white papers, and facilitates the realization of innovation and knowledge transfer agendas. NESSI contributes to the shaping of the research landscape by providing thought leadership to the European Commission and national agencies.

NESSI's industrial partners, large and SME, can tune their research and innovation strategies to align with research programmes within Europe with an early insight into new and upcoming research, innovation, and technology matters that are relevant for their strategies. They are thus able to react to new developments rapidly and prepare timely projects and products.

NESSI's research partners appreciate being able to concentrate efforts on industry needs, get involved in longer-term industry research strategies, and go beyond the state of the art in a direction which makes European industry more competitive.

NESSI has developed a close relationship with its stakeholders within European institutions by establishing a trusted advisor relationship (e.g. EC DG CONNECT). Its SRIA is used as reference for European and national funding discussions and its white papers on technologies such as Cloud Computing influence relevant European policy developments. The character of NESSI as an independent ETP makes it possible to evangelize the role of software and services in the future digital society.

NESSI is –*the*- European Technology Platform, for the new Digital Information Society and Economy powered by software and services and data