Helping small firms with big ideas reach global markets

Do you have an acorn of an idea?
Most great products and services start life as the seed of an idea which is nurtured, developed and ultimately brought to market. The idea might be sparked by experience, an accident, desperation, or, dare we say it, just by having some fun! But, wherever it comes from, EurExcel will enjoy helping you turn your innovative dreams into reality. “Every oak tree started out as a couple of nuts who decided to stand their ground,” Anonymous.

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How can we help you nurture it?
Firstly, we get involved, and most certainly two heads are better than one when generating ideas for EC-funded research. We’ll work together with you to identify the potential for your ideas. We’ve learnt that many ideas eventually reach the market via routes not previously even considered, so we explore all possible applications of a concept and its commercial potential, before judging its ultimate value and matching it to a research call. We can help you to build the optimum consortium for your project, we know the combination of qualities that make up a successful partnership and have access to a wide database of SMEs Europe wide, and further afield that we can call on to work with.

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With a commercial end always in sight, right from the start we implement exploitation and dissemination strategies that mean your idea can be propelled to market at the appropriate time. We can help you to identify future financing, post-market development, Intellectual Property management, and organise multi-media events to stimulate market interest.

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FP7 Project Services: Concept Generation; Consortium Development; Proposal Writing and Evaluation; Project Management; Intellectual Property Evaluation and Management; Dissemination and Exploitation of project results; SME Surveys; Membership Services
The famous Coliseum in Rome was started in AD70 and still stands after nearly 2000 years of use. Built largely from a specialised kind of concrete which was state of the art at the time - and still being studied today in some European research projects - the building carried great importance for Rome and its Emperor Vespasian.

I wonder if the Emperor would have guessed that after being used in its heyday for gladiatorial contests and executions before 80,000 enthusiastic Romans, the Coliseum would go on to become a cemetery, a fortress, and even a building supplies storage yard (I bet he didn’t see that coming) before its current use as a tourist attraction. Nowadays it would have all been detailed in the building lifecycle study and virtual building demonstrator.

Today, any customer, builder, architect or end user knows that every new construction or retrofit project is a massive exercise in bespoke design, equipping and flexible working practices that would leave most other industries gasping. Unforeseen difficulties, customer foibles, and technical issues mean that construction artisans have to alter their plans, designs and expectations as a matter of course, whilst on the job every single day. Most buildings simply wouldn’t happen without this flexibility.

Revolutionary
I3CON (Industrialised, Integrated, Intelligent Construction) was born out of these conditions and has resulted in a revolutionary new set of parameters, products and procedures which will transform and serve the industry.

I3CON offers a step change in new techniques, products, and technologies... value adding business models and monitoring methods, Combi coolers and climate simulators, wireless sensor networks and multi service trunking systems, industrially produced panels and integrated building operating systems, sprinkler systems and smart glass...

I invite you now to take a look inside and find out exactly how far construction has come, since AD70, towards a fully industrially produced, integrated and intelligent future.

Darren Morrant
EurExcel
I3CON: now, that was an important project

I3CON – Industrialised, Integrated, Intelligent Construction has been a resounding success for both its consortium members and for the European Union.

CAN ONE European construction project be successful by providing the technologies and knowhow to help revolutionise the international construction industry? It’s a big challenge.

On 30 September 2010 the European Integrated Project called I3CON came to an end. Having begun enthusiastically 48 months before, back in October of 2006 in Madrid, it included over 1390 person months of effort from 26 partners including research institutions, large corporations, small and medium sized enterprises and Universities. The total cost, as originally planned, was €17.36 million, with the European Commission partly funding the project to the tune of €9.5 million.

So, project number 26771 was a very serious and highly funded undertaking and at this stage, now the work is done and the money spent, one all important question needs to be answered, did it achieve what it set out to do in terms of results and value for money?

Well, in order to answer that question we need to understand the aims of the project and how it planned to achieve those aims. Fortunately the ambitions of the project have been extremely well defined and, as with any successful European funded project, they have also been meticulously well considered throughout its four years. Simply stated I3CON was to facilitate a transformation in the European construction industry towards a more sustainable future, by delivering technologies and know-how. It even had green credentials, suggesting that it would contribute to the overall strategy of all industrialised nations by reducing the environmental footprint of the industry.

The core partners believed that the speed and quality of construction would be improved by the development of industrialised construction methods such as off-site manufacture, and that improvements in the functionality of buildings could be obtained by further introduction and use of smarter building components which, fully integrated into building services, would use both structural and architectural elements. In order to do this the partners planned to develop select technological innovations.

Innovations
Associated procedural innovations would be required which would enable the delivery of planned high-performance buildings. So on top of new structural and architectural components they would need to define new management processes that would support the combination of initial design and construction with the on-going operation, maintenance and eventually the full life-cycle management of buildings. Following on from the new management processes, a set of new business models would be developed that would bridge the gap between planners, owners, operators and their customers by playing the crucial role of enhancing the sustainable application of these solutions.

So, what then did the Consortium actually do in order to take up and fulfil the challenge represented by those considerable and somewhat daunting aims? In one of the final deliverable reports, presented by the project to the European Commission, was the Exploitation Plan.
Its title outside of the world of European Research and Development projects means little, however, the content of the document gives us critically important information in the search for our answers because it describes what the partners produced and how they plan to use it to enhance their business offering. It basically tells us if they achieved any or all of their stated aims.

Results
The project has produced 21 exploitable results, including design concepts and principles, services, applications and products, plus nine training courses which have been developed for university and industry. The exploitation plan lists the predicted advances in technological components such as a revolutionary universal building services trunking system and HVAC set up, which are detailed later in this magazine, along with design concepts for ventilation systems and water systems. Also huge advances in software and building management systems are presented, with mobile browsers, positioning and navigation tools, wireless and web enabled back end applications, system control tools and a very impressive development to a building performance simulator.

In support of the component and technological advances there are business and management processes and business model selection tools that harmonise the planning function of construction, from the initial design phase right through change of use to recycling and demolition in a virtuous circle. Not only do these toolsets bring together the phases of work, but also the stakeholders, so that many previously excluded parties can have input and therefore ownership of some part of the design, performance and overall impact of the buildings.

Training
Finally, there are training and educational considerations that must come with such a far-reaching project. This ensures that, apart from the purely industrially driven profit motive, which will be considerable, the knowledge developed by the project can be disseminated, absorbed, discussed and improved in the future. Several universities and eminent industry sector training providers have created modules and courses to achieve this.

The I3CON Project certainly has delivered what it set out to do from its beginning and is set to continue through industrial exploitation of its technological developments and through its communication to the future innovators in the construction industry through training. Not only has it ticked all the boxes, it has done something more than merely provide good value for money. It has taken on a frighteningly large challenge in terms of its ambition and returned real benefits that will affect, improve and ultimately provide stimulus towards a revolution in the way construction practitioners see their industry and how they will solve their problems in the future. Now, that was an important project.

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Less is more when it comes to keeping cool

Fläkt Woods has come up with a significantly more efficient air conditioning system that can make a big impact on business energy costs.

SOMETIMES LESS is more – and the notion that simplicity and clarity lead to good design has certainly been demonstrated by Fläkt Woods, a global leader in air management, in its latest product, the Combi Cooler.

As part of the I3CON consortium Fläkt Woods has developed an integrated system where an air handling unit, cooler, chilled beams and controls are combined in a single unit with the whole system optimised for the best life cycle costing. The integration of these, previously modular, units provides optimum functionality, performance and energy efficiency for the end-user which translates into lower operation costs, less floor space required, simpler installation, and lower investment cost.

Cooling is provided using chilled beams, fan coils or ceiling-mounted cassette chilled beams. Because the Combi Cooler replaces other components, such as liquid coolers and external condensers, the unit takes up less space. It is integrated into the air handling unit, so all components are located in the plant room, avoiding outdoor or roof installation. FläktWoods' patent pending Combi Cooler provides completely new opportunities for those planning and specifying cooling systems. The module can be integrated and mounted directly into the air handling unit and is particularly suitable for use with chilled beam systems, as it is able to deliver cold water to the chilled beam circuit – and heating to the supply air – at the same time.

40% energy savings
The Combi Cooler gives architects and consultants another useful key to energy efficient buildings. In business and office spaces, lighting, apparatus and people all represent a heat load. For a comfortable room tem-

Because the Combi Cooler replaces other components the unit takes up less space

Schematic showing how the Combi Cooler can be integrated into a building

perature of 21–24°C, the need for energy for cooling is even greater than that for heating. Systems using the Combi Cooler reduce energy consumption such that a cooling capacity of 100 kW can be obtained with 21.5 kW instead of 35 kW.
Calculating your cooling requirements
Taking room sizes into account, and using a Combi Cooler, it’s easy to measure the cooling capacity of a system. Using the air handling selection tool ACON, a cooling system can be designed to render excellent efficiency. Because maximum cooling capacity is only needed for 3–5 per cent of the time the system is operating, it’s important that the unit operates efficiently even when little cooling capacity is required. With this in mind, the Combi Cooler has three power stages, and the lower the power output, the greater the efficiency of the cooling unit.

The modern solution for ventilation cooling
The Combi Cooler provides a solution for small or medium cooling requirements (max 50W/m²) in offices, small industrial units, shopping centres or refurbishment projects. Features and benefits include
- Fitted liquid cooler
- Heating and cooling coil integrated into the supply air
- One module, integrated into the air handling unit
- Optimised for use with chilled beam systems
- Less installation work indoors and no installation work outdoors
- Greater operating reliability because all components are designed and sized to work together
- Easy commissioning as the unit is factory tested
- Reduced need for space in the plant room because it only has one cooling coil
- No liquid cooler to install in the plant room
- The air conditioning unit is only marginally longer despite the built-in cooling equipment
- No condensers on the roof to detract from the appearance of the building
- The perfect solution when refurbishing old buildings
- Energy efficient solution

WHAT MAKES THE COMBI COOLER SO ENERGY EFFICIENT?
1) The supply air to the air handling unit is only cooled to 18°C instead of the 15°C in traditional systems. This avoids energy-intensive condensation. Because the supply air temperature is slightly higher, areas such as empty meeting rooms with no heat load, maintain a comfortable temperature, and unnecessary cooling is avoided. Electricity consumption is reduced by 14% (including the supplementary power used by the circuit for the chilled beams).

2) Vigorous subcooling of the refrigerant and a higher evaporation temperature reduce the energy required by 29%.

The total energy saving is 100 - (0.71 x 0.86) x 100 = 39%

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Unlocking the heating secrets of every house

Calculating the energy consumption of an individual house is subject to innumerable factors, but now there is a solution in the form of IDA Indoor Climate and Energy (IDA ICE) – a simulation tool that accurately models all the variables.

EVERY BUILDING is a bespoke undertaking with innumerable combinations of external and internal conditions. Successfully evaluating indoor climate and energy consumption presents quite a challenge.

Location, weather, orientation, air spaces, zones, building components, glazing, furniture, lights, equipment and of course people present a formidable number of variables to analyse. IDA ICE 4.0 offers the solution.

What do a swimming pool, a restaurant, an ice-rink and a supermarket have in common? Not a lot, but they can all benefit from ICE-assessment, since the cost of developing customised versions of both the models and the interfaces for these very different situations is a fraction compared with the traditional tools of the past.

Developed within the I3CON Project, IDA ICE 4.0 is a new type of simulation tool that takes building performance to another level. Able to predict the dynamic behaviour of a building with its HVAC systems and controls before it has been built, IDA ICE 4.0 will give the user an effective understanding of the cost benefits of different potential systems for both new and refit buildings. It accurately models the building, its systems, and controllers – ensuring the best possible occupant comfort at the lowest possible energy consumption. The user interface is designed to make it easy to build and simulate simple cases, but it also offers the advanced user full flexibility.

At the core of new features is a detailed real-time 3D environment. It’s now possible to illustrate input parameters and produce animated results, including solar and shading graphics. There’s an overview throughout all the steps of a project, and impressive presentation graphics. As well as a complete overview of individual parameters in complex models, you can view and edit all important input data, and see useful totals for, for example, floor areas, u-values, or external wall areas. Simple procedures make it easy to compare different systems and results.

Aftersales service is considered of paramount importance. The IDA ICE user support team understands the time constraints of a design project, which is why the support and development teams are on hand to help… immediately!

Flexibility and Support
Equation-based modeling using the Modelica language, or Neutral Model Format makes it quick to expand the software with new modelling capabilities, either by EQUA’s in-house development team or by the experienced user. IDA ICE 4.0 can import all common 2D and 3D CAD files and supports IFC BIM models generated by ArchiCAD, AutoCAD ADT, MagiCAD, Revit and many other tools.

TESTIMONIAL

“Within one of the i3CON work packages, software from EQUA was applied for the first time in the implementation of Saint-Gobain’s electrochromic glazing and their specific control strategy. The handling of the software is very intuitive and the open source code also enables the implementation of very complex control strategies. A special feature – the dynamic annual visualisation of the results as a multicoloured view – was also very well commended as it enables even the non-professional to gain a good understanding of the results.”

Christian Baun, Project Engineer – Ed. Züblin AG
Which Tool... traditional vs. IDA ICE 4.0?
As well as providing a tool that’s technically adept, EQUA has also tried to address some of the broader considerations?

■ Will it endure? Investments in training and customisation may need to last 15-30 years
■ HELP! Is there someone to ask when you have a problem or need something special?
■ Adolescent or over the hill? Is there scope for the tool to grow and develop?
■ It is commercially viable, internationally? Does it have a future?
■ Is it flexible, flexible, flexible?

Traditional tools like IES, EnergyPlus, DOE-2 and TAS have been primarily designed for whole-building, whole-year studies by well-trained designers. Usually with an emphasis on predicting energy consumption, they are often targeted to a specific engineering culture. The simulation methodology used is rooted in the 70s and 80s when the price of computational power was somewhat different from today!

ICE is built with growth in mind, and a different approach to simulation: equation based modeling, a method that is rapidly gaining foothold in several different engineering disciplines due to its ability to deliver fast, robust and above all flexible simulation models. While adding a new ‘feature’ to traditional tools may require

TESTIMONIAL

“In developing a concept for HVAC and window systems, we had some ideas regarding indoor air climate, control strategy and energy savings that needed to be verified. We decided to use the IDA ICE4 calculation software and it proved to be a powerful and flexible tool for this purpose. Looking at the new technology based on the electro chromic window, we discovered a need for some new algorithms which were rapidly implemented in the software by EQUA”

Jan Risen, Product Development and Technology Director – Fläkt Woods

PhD-project-sized efforts and expertise, major ICE models can be developed in a fraction of the time by people with local knowledge of the model to be added.

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According to bd.online.co.uk it is estimated that in the US alone $20 billion worth of energy is lost through windows each year. Saint-Gobain Recherche, as part of the i3con Consortium have been working to address this.

The electro-chromic (EC) glazing system that has been developed enables the smart control of daylight and glare for optimum visual and thermal comfort, while saving energy at the same time. Smart Glass allows users to control the amount of light and heat passing through it, by changing from a transparent to a translucent state.

Clear view
A bit like a pair of reactolite sunglasses, but far more sophisticated, the window can be switched by the control system from clear to fully darkened or maintained at any level of tint in between. Even though the light is partially blocked, a clear view of the outside environment is constantly maintained. Smart Glass can save costs for heating, air conditioning and lighting, and also blocks most UV in both its clear and dark states.

The window system comprises an electro-chromic glazing (double unit glazing) coupled with an IBAC system and is composed of thin films deposited onto the glass. By applying a small voltage (around 1V) the window can limit the light and energy transmission through it. This new system offers a major step forward from the current static system solutions such as blinds or shutters which have to be controlled by the user. In contrast the EC system is calibrated to offer maximum comfort all the time. The use of blinds and shutters is often self defeating because the reduction in HVAC use by avoiding thermal heat from the sun is offset by the increase in lighting demand as the room darkens. The EC system brings its users comfort as well as energy saving on HVAC and lighting.

Supercars
The current price of electro-chromic technology puts it in niche markets: atrium, marine and the top-end car industry, with the fabulous Ferrari ‘Superamerica’ identified as Saint-Gobain’s first client. Its application here, as a glazed roof, enhances the ambience for passengers, improving thermal, acoustic and atmospheric comfort, safety and security, protection from the sun and privacy… see without being seen. The EC memory means that the glass can maintain the darkest setting, for example, while parked, keeping the interior cool, protected from both harmful sun’s rays and prying eyes. Of course if transparency and freedom is your choice … just flick the switch!

With decreasing prices, the technology will mainly address the building market: lobby, non residential windows, skylight and architectural projects, but can also find use in indoor applications, for example the protection of objects from UV, say, under glass in museum displays. For maximum effectiveness in buildings the glazing should be linked to other related systems such as artificial lighting, HVAC and sensors, and Saint-Gobain are working on a plug and play solution for clients.

While the current price puts it in niche markets, it is envisaged that a price of less that €300/m$ would be the threshold to address the mass building market. Saint-Gobain are confident that this can be achieved with the technology available… in the meantime we’ll just have to enjoy it in our Ferraris!

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Virtual becomes reality for builders

THE CONSTRUCTION sector is the largest industrial sector in Europe, so any changes in operation makes an impact of monumental proportions.

To date, the industry has been slow in taking up virtual product development using computer models long ago embraced by other sectors such as the automobile and shipbuilding industries. There, before a product comes anywhere near an assembly line it will have been designed and constructed in 3D within a virtual environment, and had its entire product life from conception to final disposal analysed for sustainability and eco friendliness.

The construction industry is now bracing itself to face the challenge of implementing these revolutionary changes. Help is at hand in the form of the 5D Initiative, a group of like-minded European construction companies that are taking action to pave a way forward.

To facilitate the development, implementation and sustainability of the new era ‘virtual construction’ tools, the 5D Initiative partners have collaborated to identify and harmonise the hardware and software requirements of the European construction industry as a whole. By describing commonly identified essentials in a catalogue aimed at the hardware and software industries, this initiative has the goal of coordinating the development of powerful tools tailored specifically to the needs of the construction industry.

The ‘Virtual Construction’ suite will comprise four central components:

- **5Di Modeller** - an intuitive and easy-to-learn user interface, which enables the detailed, comprehensive and fast generation of any kind of three-dimensional model.
- **5Di Data Management** - a system for handling all relevant sets of data – geometry, attributes, descriptions, specs etc.
- **5Di Viewer** – a central graphical user interface that closely interacts with the 3D-/4D-/5D-modelling and data management components.
- **5Di Process Management** – a tool to handle the interaction and communication between the three tools above.

To achieve their goal, the partners have fostered an ‘open’ and ‘active’ approach. They encourage openness between all interested construction companies, and the shared requirements for software and tools within the global ICT architecture are clearly identified and published.

The joint evaluation of existing solutions and tools provides a common starting point for the development of new tools and determining future research activities. The group welcomes participation from all interested parties from software and hardware industries, research institutes and the construction industry.

"The great thing about being an architect is you can walk into your dreams"

Harold E. Wagoner

Contact:
www.5d-initiative.eu
ONE OF the key objectives of I3CON is industrialisation; the development of efficient production methods capable of being scaled and modified to meet the needs of a constantly evolving construction industry.

Today, virtual design and simulation allows the client, designer, craftsperson and end user to give vent to their dreams in an integrated design process. Coupled with this has to be a commitment to developing automated production techniques that permit such mass customisation, but without the generally associated price rises. Flexibility and multi-functionality is a common feature in I3CON.

One context where this industrialisation is being played out is in the building envelope. This is no longer considered as a singular element, but as a functional component of the whole structure to be integrated with other building services and systems. Spanish company Dragados, one of Europe’s largest construction companies, has developed a range of prefabricated façade panels that can be arranged in a modular way to satisfy both the customer’s aesthetic and functional requirements.

The façade types used are Glass Reinforced Concrete (GRC), stud-frame and sandwich panels, with a metal frame anchored to the main structure giving support to all the external elements of the façade. The idea of the façade panel is to have a modular component that can be configured according to customers’ wishes and be easily produced in the factory – the same ‘base panel’ being adapted to different situations. Different types of panels seek to tackle different problems and customers can pick and choose a configuration according to their own personal wish list: improved thermal management, acoustic insulation, performance, cost efficiency ratio, ease of assembly, along with their preferred finish.

Development and Demonstration

In enhancing the fundamentals of existing GRC panels, Dragados have built on their own considerable market

A product demonstrator showing the various permutations of the system
knowledge of the prefabricated façade panel sector along with the information accumulated from customers during tender bids, project negotiation and execution. Research into new technologies is ongoing to improve efficiency and productivity as well as to provide a range of products with different aesthetic finishing and functionality to meet customer’s demands.

The Façade panels are being tested in a ‘Mock-up’ building at a Dragados subsidiary factory in Seville. A test and monitoring plan to analyse the operational data and improvements (temperature, humidity, acoustic insulation, etc.) of the new components will be carried out in the next few months extending until after the end of i3CON. Panels will also undergo specialist testing at laboratory facilities before being presented to market.

Benefits
Dragados aims to achieve the following improvements over existing façades:

- an anchoring system which allows the external frame to be connected to the main structure;
- built-in conduits in the core of the sandwich panels, which will house electrical cabling and plumbing pipes to facilitate the renovation of installations;
- to satisfy customers’ aesthetic tastes and functional requirements the façade modules will be available in a range of different materials and colours: photovoltaic, wood, ventilated ceramic, metal, vegetated panels, etc;
- improved insulation and thermal management using PCM (Phase Change Materials) in the core or inner sheathing of the panels;
- lighter GRC panels contribute to functionality and are easier to transport, assemble and replace;
- renovation of some building services is made simpler by the use of pipe in pipe and guide tubes in the core of the panels;
- industrialisation;
- reduction in time from design to finished construction;
- improved quality control.

Who are these panels for?
Architects and builders – anyone who needs a short execution period, easy assembly and replacement in their constructions, great quality and resistance, and the possibility of choosing between different colours, texture and shapes – will benefit from the flexibility and functionality of Dragados’ façade panels.

When development and testing have been completed, the façade panels will be marketed direct from Dragados in project tenders and products catalogues, also as part of their turn-key solution packages. With patent applications currently in process for some of the technology, this is a product to track!

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Building a service superhighway for the industry

The Multi-Service Trunking System delivers all services to a building through one, multi-functional pipe, offering a multitude of advantages over existing systems.

The Multi-Service Trunking System (MSTS) has been investigated and developed by Loughborough University. As its name suggests, the integrated MSTS enables the delivery of multiple services such as water, gas, air and data through a single coordinated arrangement of integral channels.

The system provides a unique and valuable set of benefits for building designers and engineers while also substantially reducing the cost of building services including waste, energy, installation and maintenance.

The development of the MSTS has been so successful it will form the backbone of the building services pathway in a mock-up demonstrator building, which will be constructed in Spain during the final months of the I3CON project and will also be demonstrated as a virtual prototype for those who cannot make it to Seville.

Designers and engineers will be able to plan whole networks using a user-friendly software package. They will find that the real beauty of the product is the coupling of a pleasing design aesthetic with uncompromised and ruthless efficiency. The MSTS offers, for the first time, the opportunity for building services to become part of the chain of a development.

Commercial and environmental Impact

The MSTS will have an impact on many commercial sectors and on a societal level:

- direct and considerable reduction in the cost of building services
- elimination of costly varied skilled labour for installation and maintenance of building services
- design and installation time will be shortened as a computer program will generate the whole MSTS network for any type of building or requirement
- the aesthetic aspect of current building services will be radically transformed into design features that blend perfectly into the overall architecture.

The technology has already attracted interest from partners within the I3CON-EU project consortium and external parties.

Integrated service delivery, regulations and standards

MSTS adheres to current building regulations and standards and even allows direction of flow to be chosen.
without breaching the accepted proximity rules. The newly generated shell structure and nodal solution is supported by a physics study on how the integrated utilities interact with each other in an all directions delivery and distribution mechanism. MSTS consists of horizontal and vertical piping with ‘nodes’ of run intersections and distribution points where media supply can branch off (Figure 1).

Delivery of different services is achieved through a shell type arrangement of the channels that are concentric and superimposed on each other. This setup displays all the channels in a way that allows access to any layer from any direction by simple penetration through any other layer. A spherical concentric set of shells is the best option for the design of the distribution node from which any number of delivery multi services runs can be joined, with installation being quick and simple.

Integration into the design process
The structural elements of a building will take the MSTS into account from the very beginning of the design process, because it is the main building services pathway (Figure 2). After a first design iteration, structural elements will be planned around the geometry of the MSTS and its main thoroughfares. The effect on the analysis is substantial: all trades will therefore be easily planned in conjunction with the installation of the MSTS.

Generation and production of MSTS will be by Advanced Manufacturing Technologies. 3D modelling and Additive Layer Manufacturing (ALM) are the way forward for delivery of the next generation of MSTS. ALM processes such as Stereolithography, selective laser sintering or fused deposition modelling have already been used for the production of objects layer by layer. Sophisticated software and interactive graphic systems such as CAD have enabled remarkable advances in the fabrication of complex forms and structures.

Status of technical development
Laboratory prototypes (figures 3 and 4) have been tested extensively and show the ease of joining and assembly together with the highly efficient sealing capability. The experimental testing rig will be set up in a portable cabinet to assess the real capabilities and the integration aspect of all the services in the system.

Currently, ongoing work involves the evaluation of energy performance as a result of the concentric layer channelling, interfacing mechanism to connect MSTS to conventional ways of delivering services, studying the potential materials for manufacturing, investigating the conventional methods to produce long runs and the further development of a software tool to generate customised circuits to address exact utility requirements for buildings.

The Research Team includes: Dr Farid Fouchal, Prof. Tarek Hassan and Prof Dennis Loveday.

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Figure 2: MSTS as the main BS backbone. Designs proposed by Zueblin and Loughborough

Figure 4: Another view of the lab prototypes
Sprinkler system is an unobtrusive life saver

The Uponor sprinkler system is designed for the domestic environment and can raise fire safety levels dramatically when built into properties.

I3CON CONSORTIUM partner Uponor is passionate about home safety and the prevention of fatalities caused by fire, its favoured solution is the use of home sprinklers systems.

Of course, home sprinklers are nothing new having been originally introduced in the US in the 1970s. Well, what is new then? The Uponor multi-purpose water supply system combines a fire sprinkler system with the home’s existing tap water supply system. Linked in this way the new system contributes to the sustainable building vision by conserving water, by using less energy and benefiting from cleaner installation methods.

The benefits of sprinklers are well-proven. Industry research shows that installing smoke alarms improved survival rates by 50%; add in a fire safety sprinkler system and that increases to 97%. Smoke alarms only help those who can help themselves, while some elderly, disabled or otherwise vulnerable people may not be in a position to do so, even if they discover that they are in danger early enough. The Uponor Sprinkler System is activated by heat and at 68°C a liquid-filled glass bubble collapses, triggering the sprinkler’s shut-off valve. It takes only five minutes for a fire to engulf a typical home, but sprinklers can control or even extinguish a fire in just seconds. Being only triggered by heat, not vibrations, burnt food or cigarette smoke, reliability is extremely good, with just a one in 16 million risk of accidental water release.

Fire reports show that property damage is nine times lower in homes equipped with sprinkler systems.

It takes just five minutes for a fire to engulf a typical home.
The concept is focused first on saving lives and then on saving property and it is this prioritisation, along with the use of retro fit plastic pipes that makes it possible to connect the sprinkler system to the building’s cold water supply. Fire reports show that property damage is nine times lower in homes equipped with sprinkler systems. According to the Residential Fire Safety Institute hoses used by firefighters may discharge up to 946 liters of water a minute into a home – the Uponor Fire Safety System – just 57!

The system is quick, easy and cost effective to install using flexible Wirsbo-PEX pipes and the novel patented Q&F fitting Technology. Wirsbo-PEX is a unique plastic, which is extremely resistant to both heat and cold. The sprinkler is activated long before the plastic is affected by heat and the water passing through the pipe also cools it in the event of a fire.

The system is based on the same principles as the Uponor Tap Water System PEX; a waterproof, hidden installation with Pipe-in-Pipe, no joints or connections in the walls, secure couplings and connection boxes, and designed to connect several small sized pipes to each sprinkler. Sprinklers are connected to a network that is self-regulating to ensure supply of water, optimum pressure and flow. Also, as the sprinkler forms part of the home’s general plumbing system, each time someone say, flushes the toilet, water runs through the sprinkler system providing a functional check of the supply flow. Everything is interchangeable, reliable and maintenance free.

Cost effective installation
The Uponor Sprinkler system can be installed for as little as half the cost of other commercial systems when it is incorporated into initial building, or rebuilding work where the same simple installation method as the tap water system is used.

Keeping a low profile
In comparison with the ugly and oversized traditional sprinkler systems, the Uponor system is shy of showing itself. Small white nozzles in a ceiling may be the only evidence that one of the new generation sprinkler systems has been installed, and even these can disappear with the concealed sprinkler option. Likewise, pipes can be hidden, laid above a ceiling, embedded into ceiling beam layers or located behind cover boards. This simple reliable and affordable system means that everyone can feel safe at home, without having to compromise on décor.

Industry research shows that installing smoke alarms improved survival rates by 50%; add in a fire safety sprinkler system and that increases to 97%
Building the wireless future in the home

Thales Wireless Sensor Network and Web Enabled Information Sharing System will be influencing the effectiveness of buildings in the years to come

UNTIL RECENTLY building systems have by necessity been rigidly yoked to the wired sensors they use, limiting flexibility. This is changing with the emergence of Wireless Sensor Networks.

Greater efficiency and flexible positioning of wireless sensor devices bring significant benefits particularly in the context of monitoring the environment in and around buildings. The challenge now is how best to process and present the data generated. As part of I3CON, Thales Research & Technology UK Ltd (TRT (UK)) developed a Web Enabled Information Sharing System; a mechanism to integrate, manage and make sense of the labyrinth of services, systems and wireless sensors within the new generation of intelligent buildings.

This new system for use in commercial, residential, mixed use or even retrofit settings, aims to integrate applications and management systems with operational services, for information sharing, monitoring, control and management of the building unit as a whole. The Wireless Sensor Network (WSN) will provide accurate and up-to-date monitoring information from sensors dispersed throughout the premises to the other applications and services including building management system. The building manager can then adjust settings to improve efficiency, economy and comfort. Other applications can also tap into the data, treating the WSN as an information service provider.

Test bed

The WSN provides information – temperature, humidity, light intensity, CO2 level, electricity, cold and hot water consumption – for the building occupants or manager through a data portal, a Lonix Information Display Panel PC and an Intracom Mobile Browser. A WSN test bed was initially set up at TRT (UK) premises for the trial of gateway and sensor nodes, debugging software codes, setting up the server, verification, integration, and performing initial proof of concepts.

The system has also been deployed at the Margaritas residential building in Madrid and further integrated with other external applications including the Building Management System and deployed in a mock-up building in Seville.

Traditionally, building services have been regarded as confined, operating in isolation and providing minimal support for overall coordination and holistic management. In contrast, this novel software provides a dynamic, coordinated platform where all aspects of the system are decoupled and considered as service providers and consumers. This then offers a system that is open and extendable, and able to address the diversity and scalability issues related to any building.

Given the wide applicability of WSN, the market for a WSN system is substantial and the TRT approach is to adopt and adapt a Web standard that enables sensor information to be presented in a well-defined and accessible manner. While commercialisation is a way off, the concept of a Web Enabled Information Sharing System and Wireless Sensor Network must be viewed as a key technology enabler in the forge towards ‘Smart’ buildings.

Contact:
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Aiming for a better business model

Fraunhofer has been researching a test bed for business models to see if they can be improved for the construction industry of the 21st Century

IN i3CON, Fraunhofer has been channelling its application-oriented research expertise towards the development and structure of three methodologies to serve the Construction community following three major objectives: (1) Guiding construction contracts towards performance based business models, (2) identifying and selecting the best technologies for each single project and (3) creating a framework for the purposeful development of facility management services.

Do Business Models Matter?
Business models such as Public Private Partnership (PPP) or Private Finance Initiative (PFI) are well established in most European countries. The challenge remains to recognise the value drivers for suppliers, contractors, clients or users and to select the most appropriate business model for each single construction project.

Fraunhofer has created a test-bench for Business Models to support the selection of the best business model (by aligning the model to the project specification) and thereby optimising the performance of products and services for all stakeholders.

Which Technologies to Choose in Construction Projects?
With the aim of facilitating information transfer between projects, departments and business units, Fraunhofer are developing a social software-supported methodology for technology monitoring. This is particularly geared to the requirements of industries with a focus on custom-built products... including construction. "Technology monitoring," says Fraunhofer's Sven Schimpf, "is pivotal to business organisations to ensure they remain competitive in the long term. The objective of technology monitoring can be specified as the early recognition of technological opportunities and threats."

The methodology is split into five major phases: identification and specification of the search field, collection of information, evaluation of technologies, storage of information, and communication of results. The whole process is supported by social software systems: Wikis, social networking and social bookmarking systems.

A Framework for developing facility management services?
Facility Management Services are a major pillar of success for most construction companies as they generate higher profit margins than traditional construction activities. Despite that, only very few organisations develop buildings and linked services in an integrated and structured process. Fraunhofer is developing a process and supporting methods for optimised service engineering that will ensure a structure for the future and pave the way for hybrid product-service solutions in the construction industry.

The results of all three new methodologies have been integrated into the consultancy programme of Fraunhofer IAO and its close cooperation partner IAT University of Stuttgart.

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Knowledge and wisdom is worth sharing!

Our academic partners have developed a number of training modules as a means to showcase the technological advancements in products and business processes gleaned from I3CON.

**THESE COURSES**, for implementation by industry and academia, provide tools and virtual environments for skills development and practice. They enable the construction community to stay informed of the latest technologies and techniques and provide practical tips on how they can be implemented in an industrial setting.

In keeping with the ‘flexibility’ ethos of the project each training module provides for interoperability and reusability in different educational and industrial settings. With such a range of diverse modules and units there is potential to supply tailor-made programmes that cherry pick modules from different partners, one-day specialist courses or even an all encompassing ‘I3CON’ course covering all modules. The overall aim is to foster competence-oriented study and lifelong learning.

Learning materials are already being implemented by four academic partners as shown below, with a fifth partner the University of Ljubljana designing the training environment and evaluation procedure for the piloting exercise. BSRIA, a consultancy/research organisation has also developed an industrial training course. Here is a taste of the different programmes that have been developed.

Please do not hesitate to contact the relevant training supplier if you require details about any of the course modules as described below, contact details can be found in the contacts page of this publication.

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**Loughborough University**

Novel Construction Solutions – Presents learning material based on the novel solutions developed within I3CON. The construction industry has the potential to see a direct economic impact by embracing the novel products and solutions developed within the project in its day to day practice.

Lectures include the use and application of Additive Layer Manufacturing (ALM), the application of automation in the construction industry, digital technologies and the ALM method for the production of a revolutionary new trunking system called Multi Service Trunking System (MSTS).
BSRIA
Industrial Training Course – UK based BSRIA, a consultancy, test, instruments and research organisation, has developed an Industrial Training Course which has been piloted and is now available either direct from them, or on the E-learning system developed by the University of Ljubljana. The course - which comprises four Modules of four units each lasting half or one day - would be of interest to building designers, product manufacturers, project managers, and facility management & service providers.

Politechnika Wroclawska
Modern integrated HVAC systems and I3CON achievements – Aimed at students on Master or PhD programmes linked with building design (Environmental Engineering, Architecture, Structure Engineering, etc). Lectures present information on the state of the art in thermal comfort and building physics, HVAC and BAS, smart components, design tools and new technologies developed in I3CON such as the Combi Cooler.

Istanbul Technical University.
Integrated Building Information in Intelligent Industrialised Construction – This course describes new trends in construction and was delivered to graduate students at Istanbul Technical University in January 2010. The target students, also working in the industry as practitioners were able to gain an awareness and overview of the I3CON project and related concepts through the course. Part of the “New Trends in Construction Management/Case Studies in Construction Management” course, the module has four units and concentrates on systems for smart, intelligent buildings.

Universidad Carlos III de Madrid (UC3M)
Robotics & Automation in Construction (Masters) – This piloted training programme is delivered as a set including an introduction and four lectures with titles such as typology of applications, classification of robots in the construction sector, ‘TICS in construction’, sensor systems and actuators.
Boosting builders’ life-cycle analysis

The Construction Industry Life Cycle Cost Analysis software is a bold attempt to reduce the cost and environmental impact of the building industry.

The CILECCTA Consortium is working to develop a suite of software set to revolutionise the way we manage construction in Europe.

CILECCTA software will provide cornerstone decision support for the construction industry and its associated supply chains. How? By offering the assessment of sustainable strategies through improved resource efficiency, the development of client-driven knowledge-based processes products and services, along with improvements in the use of ICT for increased connectivity.

The Problem in Construction today – “Just because it’s big doesn’t mean it’s efficient!”

With a total value in EU27 of €21,304 billion, providing 16.4 million jobs across 2.9 million enterprises (of which 95% are SMEs), and with overseas construction exports amounting to €50 billion… the European Construction industry can only be described as colossal! However… that doesn’t necessarily mean it’s efficient. The industry is perceived as fragmented, dominated by local standards and regulations, poorly organised and largely supply-driven with its main target being lowest cost of initial construction. And… it is one of the largest producers of industrial waste, contributing 40-50% of landfill in some EU countries. So far… not so good!

A better way …

What’s needed is a culture shift away from short-sighted, low capital cost construction towards a culture of forward planning for optimal resource efficiency over the full life cycle of a building or engineering project. As a result of EC recommendations, there has been the development of a common Life Cycle Costing (LCC) methodology at European level, and an outline framework for the development of LCC software tools to implement the methodology. By linking cost-based Life Cycle Costing and environmentally-based Life Cycle Analysis (LCA) methodologies, CILECCTA will be able to assess the impact of whole projects on the environment, and estimate their sustainability.

CILECCTA – compatible with Price Banks (PBs) and Life Cycle Inventories (LCIs) across Europe – will be customisable and configurable for whole assets and their components, able to provide decision support by assessing the sustainable options and very importantly… user-friendly to the millions of construction SMEs and professionals across Europe.

The goals
CILECCTA’s benchmark for success will focus on effective demonstration of its main technological objectives in three major construction projects.

The objectives include:
- The identification of Price Banks and Life Cycle Inventories for analysis and integration into a single CILECCTA system.
- The development of optimized software architecture for access to partner PBs and LCIs.
- The development of new theoretical underpinning for advanced LCC and LCA calculations based on ‘real options’ analysis of decision-making under uncertainty.
- The specification, build and testing of the CILECCTA software suite (version 0.1+X) capable of using cost data from PBs and environmental impact data from LCI indicator databases as input in the decision processes.
- The development of a simple web based, user-friendly interface minimising the need for specialist knowledge.

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www.cileccta.eu

What’s needed is a culture shift away from short-sighted low capital cost construction.
I-SSB DEVELOPS an ‘Intelligent house’ approach that combines comfort with hazard resistance. The project has developed and demonstrated an earthquake- vibration- noise- fire-safe concept that provides long-term seismic and fire safety through the collaboration of the structure with components and monitoring systems.

Partners have collaborated to develop the new modular concept – based on multi-functional dry wall systems coupled with dynamically optimised steel-stud framework incorporating sensors and actuators together with embedded wireless network – to monitor and control dynamic oscillations within buildings. Mechanical strength, thermal insulation, fire-resistance, and dynamic response to external perturbations make dry-walled, steel-framed constructions an attractive option for house building, especially in areas at risk from earthquake or fire. New types of plasterboards and design-construction methods for steel frame buildings with improved ability to withstand extreme conditions have been developed and successfully tested. Seismic tests have been performed in an I-SSB mock up structure and a full-scale residential house has been constructed in Greece for monitoring purposes.

The Integrated Safe & Smart Built Concept (I-SSB)

Contact:
Project website: www.issb-project.com

The technology being developed in eDIANA will improve energy efficiency and optimise building energy consumption by 25%, providing real-time measurement, integration and control. Moreover, comfort will improve making the user aware and enabling user-controlled policies for household devices. Such progress in the state of the art will enable the building to become an “active MacroCell” in the energy network, connected to similar MacroCells in the district or urban area.

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THE REEB project – European strategic research Roadmap to ICT enabled Energy-Efficiency in Buildings and construction – aims to drive progress in future RTD, supporting the transition to an energy-efficient economy and a sustainable society. In ICT it aims to facilitate the transition to energy-efficient, low-carbon buildings and districts.

The main goals of the project are first to develop a vision and strategic research agenda (SRA) dedicated to the innovative use of ICT supporting energy efficiency in construction. This comes along with a set of recommendations for implementing the SRA: policies, coordination, research and technology development, take-up, standardisation, and education and training. Second, REEB is working to bring together the ICT community and key actors in the Construction Environment and Energy business sectors, for co-ordinating and rationalising current and future RTD in the field of ICT support to energy efficiency in the built environment of tomorrow.

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Consortium contacts

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