



## Case Studies in Service Innovation, CSSI'12

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### Workshop Organisers

Centre for Service Research, University of Manchester, UK

Informatics Research Centre, Henley Business School, UK

UK Chapter, Service Research and Innovation Institute



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## INTRODUCTION

The purpose of Case Studies in Service Innovation is to give the reader insights into how innovation occurs in practice and to stimulate understanding of the underlying theories, models, and tools that contribute to innovation, how it works in practice and how its impact is evaluated.

Case Studies in Service Innovation brings together contributions from researchers and practitioners in a celebration of achievements in innovation in practice but also at the same time to look forward by examining the sources of service innovation that are likely to come to the fore in the future and the role that information system professionals will play. Each case provides a description of the context in which the innovation occurred, the opportunity that led to the innovation and an overview of the innovation itself. It also addresses how success was measured, what success has been achieved to date and links to further information.

Experience has shown that innovation may be driven by new architectures, information services or disruptive technologies but real business benefit is often not fully achieved without accompanying process innovation, organisational change or wider innovation management. We hope that the Case Studies in Service Innovation will help to better understand and untangle this complexity and illustrate new transdisciplinary ways of thinking to help us do so.

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## AGENDA

Time	Activity
08:30 - 09:30	Registration
09:30 - 09:40	Opening and Welcome
09:40 - 11:00	<p>Keynote Presentation:</p> <p>"Disruptive Business Platforms: A Technique for Using Sustainable Technical Innovation to Deliver Growth"</p> <p>Sarah Greasley, IBM Distinguished Engineer</p>
11:00 - 11:30	Coffee Break
11:30 - 13:00  (Session 1: 15 minutes per presentation)	<p>Chair: Babis Theodoulidis, Manchester Business School, UK</p> <p>Case Study 1: The Reverse Side of Servitization: An Orthopaedic Case Study. Ivan Velikanov , Mairi Macintyre, Michael McMahon, John Naybour, Sam Arkle, and Jannis Angeli.</p> <p>Case Study 2: A Service Revolution In Fasteners: The Story of Two Businesses with the Same Goal But Very Different Strategies, Nick Frank</p> <p><i>Discussion: Cross case learning (15 minutes)</i></p> <p>Case Study 3: R&amp;D and Innovation Organization within KIBS. Oihana Basilio</p> <p>Case Study 4: Innovation in KIBS: Lessons from University-Based Business Incubation Center in Taiwan. Mei Hsiu-Ching Ho, Alger Lee and Yee-Man Lai</p> <p><i>Discussion: cross case learning (15 minutes)</i></p>
13:00 - 14:00	Lunch
14:00 - 15:30  (Session 2: 15 minutes per presentation)	<p>Chair: Yin Leng Tan, Henley Business School, UK</p> <p>Case Study 5: "Meeting with Bill"- Innovation Process of Establishing Enterprise Culture and Enhancing Service Quality. Chien-Lung Hsu, Jia-jen Ni, Ming-Chien Chiu and Hsi-tzu Chen</p> <p>Case Study 6: A Global Impact Service Innovation: The Case of Geological Survey Activity. Victor Liger, Florie Bugeaud, Antonio Guillen, Dominique Morin and Paul Pietyra</p> <p><i>Discussion: Cross case learning (15 minutes)</i></p> <p>Case Study 7: Knowledge Intensive Processes Characteristics and Improvement: A Banking Best Practice Example. Vaughan Mitchell</p> <p>Case Study 8: Opportunities and Challenges in Financial Markets Integration: The MILA Case. David Díaz and Andrés Araya</p> <p><i>Discussion: cross case learning (15 minutes)</i></p>

15:30 - 16:00	Coffee Break
16:00 - 17:20  (Panel Session)	<p>Panel Session: Future Service Innovation</p> <p>Panel Chair: Linda Macaulay, Manchester Business School, UK</p> <p>Members:</p> <ul style="list-style-type: none"><li>• Sarah Greasley, IBM, UK</li><li>• Mairi Macintyre , University of Warwick, UK</li><li>• Erik Proper, Henri Tudor, Luxembourg</li><li>• Nick Frank, Noventum Service Management</li></ul> <p>Panel Topics:</p> <ul style="list-style-type: none"><li>• What sources of innovation are likely to come to the fore in the future?</li><li>• What role will Information Systems Engineers play in future service innovation?</li></ul>
17:20 – 17:30	Closing Remarks

## **KEYNOTE: DISRUPTIVE BUSINESS PLATFORMS: A TECHNIQUE FOR USING SUSTAINABLE TECHNICAL INNOVATION TO DELIVER GROWTH**

Sarah Greasley

Client Technical Director  
Distinguished Engineer & Executive IT Architect, IBM, UK

### **Synopsis**

The emergence of platforms within the consumer world has driven explosive growth for companies such as Apple, Facebook and PayPal. IBM has applied the concepts behind these platforms to the business environment, building on underpinning technical innovation, and the business capabilities which this enables. Sarah will explore the concepts and characteristics of business platforms, the technology triggers and techniques for identifying platforms.

### **Biography**

Sarah Greasley is a Client Technical Director and Distinguished Engineer at IBM; she is currently responsible for the technical relationship between IBM and one of its biggest Financial Services customers.

She also works across a number of financial services customers and financial services industry bodies, advising them on the use of technology to drive business innovation and business transformation, as well as the technical implications of regulation. In addition, Sarah leads the Architect Profession within IBM in the UK, and works closely with a number of professional bodies to drive professionalism in the IT Industry in the UK.

Sarah has worked in the IT Industry for over 25 years, and her technical leadership is externally recognised by her appointment as a Fellow of the British Computing Society, and a Fellow of the Institute of Engineering and Technology.

## PANEL SESSION: FUTURE SERVICE INNOVATION

### Introduction

The aim of the panel session is to consider future of service innovation, focussing on two main questions:

- What sources of innovation are likely to come to the fore in the future?
- What role will Information Systems Engineers play in future service innovation?

The panellists are asked to give their view and enter into discussion with the workshop participants.

**Chair: Linda Macaulay**, Manchester Business School, UK, <http://www.lindamacaulay.com/>

**Linda** is Emeritus Professor of Information System Design Manchester Business School and Visiting Professor at the University of Technology, Malaysia; twice holder of the prestigious IBM Faculty Award and a Fellow of the British Computer Society. Until recently she was co-Director of the Centre for Service Research and Principal Investigator on the SSME UK network project and in 2011 completed a book of Case Studies in Service Innovation. She holds a degree in Mathematics from Sheffield University; a Masters in Computational Science from St. Andrews, Scotland and a PhD in Computation from the University of Manchester.

### Panellists

**Sarah Greasley**, IBM, UK, Client Technical Director, Distinguished Engineer & Executive IT Architect (see above for details biography)

**Mairi Macintyre**, University of Warwick, UK

Mairi Macintyre is a Principal Teaching Fellow with the Warwick Manufacturing Group at the University of Warwick and is an active member of the Service Systems Group. She is the course director for the MSc Service Management and Design. She has led a number of funded projects supported by the Knowledge Transfer Partnership of the UK Technology Strategy Board. She was lead co-editor of the Springer 2011 book 'Service Design and Delivery' which explores strategies used in the design and management of services across various sectors. Her work on lean implementation in the UK National Health service has been published in the prestigious British Medical Journal.

**Nick Frank**, Noventum Service Management

Nick Frank founded Frank-Partners in late 2010. It came from his passion for industry and the growing trend that services are essential for the survival of many organisations that face commoditisation of their business. Nick has over 25 years' experience as an International Manager in industry with a track record of turning strategy into concrete results in a number of different manufacturing and technology industries. He has built an expertise in developing services businesses within high value manufacturing companies.

He was General Manager of After Market Sales at Husky Injection Molding SA, where over a 3 year period he transformed a traditional customer support organisation into a proactive services business, providing lifecycle services that supported all aspects of the machines, molds and hot runners. Nick held a number of Service Director level positions at Textron Fastening Systems over a

14 year period, where he was a key leader in creating their Services business. He was responsible for starting up the first of Ford Europe's Fastener Full Service Provider programs. This laid the foundation for a \$30million services business, for which he later led the commercial development. Prior to working in services, Nick was a Global Product **Manager** and Electronics Sales Manager with Avdel, a specialist manufacturer of fastening systems.

Nick graduated with a mechanical engineering degree from the University of Southampton and started his professional training with Xerox Corporation as a subsystem engineer where he was granted a number of patents and gained his chartered engineering status. Xerox sponsored Nick to complete an MBA at the Cranfield School of Management, after which he was made Launch manager of a low end copier program.

**Erik Proper**, Henri Tudor, Luxembourg, <http://www.erikproper.eu/>

Prof.dr. Henderik A. Proper, called Erik by friends, is a senior research manager at the Public Research Centre – Henri Tudor in Luxembourg (<http://www.tudor.lu>), where he leads the Services-oriented Enterprise Engineering research line. He is also a Professor at the Radboud University Nijmegen, The Netherlands.

Erik has held a variety of roles in both academia and industry. His professional passion is the further development of the field of enterprise engineering and enterprise architecture. His long experience in teaching and coaching a wide variety of people enables him to involve and engage others in this development. He has co-authored several journal papers, conference publications and books. His main research interests include enterprise architecture, enterprise engineering, enterprise modelling, systems theory, business/IT alignment and conceptual modelling.

Erik received his Master's degree from the University of Nijmegen, The Netherlands in May 1990, and received his PhD (with distinction) from the same University in April 1994. In his Doctoral thesis he developed a theory for conceptual modelling of evolving application domains, yielding a formal specification of evolving information systems.

## CASE STUDY 1: THE REVERSE SIDE OF SERVITIZATION: AN ORTHOPAEDIC CASE STUDY

Ivan Velikanov , Mairi Macintyre<sup>1</sup>, Michael McMahon<sup>1</sup>, John Naybour<sup>2</sup>, Sam Arkle<sup>2</sup>,  
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**Abstract.** This study explores how, by undertaking customer-oriented service analysis, an orthopaedic equipment and medical devices company transitions from service provision to a more product focused approach. Particular attention is drawn to the role of business models and process analysis in company value transition through product-related services and equipment. The analysis of business models indicates the need for a modified framework concentrating on the separation of product and service offerings, in this instance by creating independent single use instruments instead of reusable equipment provision. A number of operating theatres were involved in process analysis and, as a result, the need for a new business model is justified.

**Keywords:** medical devices, reverse servitisation, value co-creation

### 1. Background/Context

Providers of orthopaedic equipment have traditionally viewed their business model as that of a traditional manufacturing organisation. Competitors have vied for the attention of medical staff with the introduction of more sophisticated products variants, such as improved material properties, longer lifetime performance, and improved design. This case explores the transition of one company's offerings from surgical equipment, through improving operation efficiencies to broadening out to the before and after processes and how this has led to the divorce of product and service rather than the union of the two areas.

The company is a recognized leader in the production of orthopaedic products and additional equipment for surgical procedures requiring application of complex methods for operation. Complexity of surgical procedures necessitates conformity with company standards, which in turn requires use of tools and techniques established by the orthopaedic manufacturer. As a result, health institution managers and surgeons involved in operation process have a strong need for specialized surgical equipment. The company management, in its turn, understands the importance of customer value creation leading to mutually beneficial terms between producers and customers.

Therefore, the medical device company has a mission to enable surgeons achieve excellence in their orthopaedic surgical practices through products that solve unmet needs and tailored educational initiatives. As a result, new service and product offerings offered independently from the product solutions are established. These measures may potentially offer higher profit margins in comparison with initial orthopaedic products or simply allow the company to be more competitive and maximize revenues of its current product offerings.

## 2. Opportunity

Service orientation strategies may allow companies to create more value by establishing appropriate product-service mixes or independent services that better fulfill a given customer need than pure product offerings. Moreover, due to service intangibility and labor dependability established product-service solutions may be more difficult to realistically replicate and thus provide the incumbent firm with a competitive advantage [2], [3].

The service concept has been subject of much debate, with many definitions of service suggested. For application, the relationship between the service provider and its customers has to be developed so that understanding of the key requirements can be better understood and integrated into the value creation process[4]. Shifting from discussions on differences between services and goods, recent definitions tend to be more externally oriented with a stronger customer focus [5]. Many product-oriented companies have recently drawn their attention to the establishment of supplementary service offerings in addition to existing product offerings. Baines et al. [6] classifies such combination of product and service solutions aimed at a final result rather than pure service or product realization as Product Service Systems (PSS). Tukker [7] expands on the categorization of various product-service solutions into three groups: product-oriented (realization of products with additional related services such as maintenance and consulting); user-oriented (selling possibility of using the product characterized by rent, leasing, etc.); and results-oriented (selling final solution instead of a product, which often remains the property of the service provider with all ensuing obligations aimed for further maintenance).

Following these categories, providers may choose the extent of service integration to their original product offerings. This provides a competitive differentiation strategy that offers unique products and services based on providers product competencies that customers are willing to pay for [8]. However, as noted by Smith and Ng [5], PSS is conceptually a product-oriented or centric activity that seeks provision of additional product value through the establishment of related services.

Studies by Vargo and Lusch [9] explore the importance of services in the service-dominant logic framework, which has a strong element of customer contribution to the value creation. This finds support in Irene Ng's work [10], who states the need for understanding customer roles in process establishment, making active customer participation in value realization a necessity for successful offerings [9]. Further studies have emphasised the importance of customer roles in the development of models with product-service combinations [11]. However, since such models are generic and not necessarily applicable to the specific context, the employment of a product-service model may require modification to fit with the case situation.

As noted in several studies [1], [12],[8],[13], moving from pure product to more service-oriented offerings, similar to the shift explored in PSS, covers several linear steps [14],[9],[15]:

- First, assignment of market opportunities and customer requirements is needed. A clear understanding of possible outcomes of service implementation including risks, opportunities, customer wants and overall market attractiveness have to be considered.
- Second, an internal capabilities analysis should follow. The step covers analysis of existing service solutions and methods according to the internal capabilities and resources of the company. The analysis is marked by an assessment of the value proposition inherent in the existing service solutions. Identified limitations of current methods can induce development of modified service offerings.
- Third, the formulation of an appropriate product-service strategy is made. This stage defines the way of value proposition by means of structured system development consisting of products, services and infrastructural elements organized in accordance with customer requirements.

For the development of such product-service strategy, the model has to be explored further. The transformation towards service provision is a complicated process requiring certain level of accuracy and precision in each of the stages involved. A number of different examples from the healthcare industry have shown the need for further understanding of the establishment and ongoing improvement of product-service solutions [16]. Hence, data concerning possible service utilization by the end user should be considered, as well as additional characteristics measured during the performance phase [17].

Shifting a business model in the case company studied towards a more service-oriented one may require education of customers and the front line orthopaedic sales staff to help them understand this shift in value proposition. Having the ability to see the processes of their customers, managers at the case company are able to analyze processes in terms of effectiveness and efficiency and report the results back to their customers on how operations can be improved. Through this data analysis, a model for service provision can be implemented. Process management and monitoring is important at this stage, with cost saving options and overall performance levels considered. Results of the process implementation monitored in this stage can provide the scope for further improvement.

### 3. Innovation

The studied company illustrates how a medical device company focused on production of orthopaedic products has turned towards establishment of related services such as surgical equipment provision. The strategy was formed on the grounds of high level of orthopaedic product complexity requiring utilization of specialized instruments for operations. As a result, a set of multiuse surgical tools for installation of various orthopaedic implants was developed. Due to relative complexity and high cost of such equipment separate sales of instruments did not seem to be justified in this case. Therefore, reusable instruments were provided not as individual products, but as supplementary service offerings giving surgeons the right to possess those instruments within a specified time limit in addition to the primary products.

The transition model discussed above gave an overview of the general strategy of similar product- service systems provision with regard to necessary stages of development. However, despite the promising nature of the model and overall tendency of introducing similar services in addition to core products among other organizations, the model seems to require more attention in this case.

Results from the process analysis conducted in a number of health organizations involved in orthopaedic operations has revealed several disadvantages inherent in the provision of multiuse equipment:

- Complexity and inflexibility of surgical equipment requiring use of a relatively high number of different tools in each operation
- Considerable number of tools utilized in each operation leading to use of cumbersome containers for their storage and transportation
- Large weight of containers and equipment
- Need for all equipment sterilization even in case only one item from a container is used
- High costs of multiuse instruments production

To summarise, the present product-service offerings are marked by a number of disadvantages due to a number of design aspects intrinsic to the multiuse equipment. With this in mind, the company, has focused on the development of lightweight multifunctional single use tool kits

designed for specific orthopaedic products. Changes in product material leading to reduction in weight, multifunctional surgical equipment affecting container size and leading to compactness in addition to lower production costs broadening the scope for higher margins have led to creation of an independent product on its own. This new type of instruments combines a number of features lacking in the preceding products. New product introduction has led to establishment of high quality, low weight multifunctional single use instruments. Although no additional features are visible, there are other advantages such as they are provided sterile, less assembly required leading to quicker set up and clean down times. There may be issues around the perception of quality from some surgeons.

#### **4. Success Measurement**

Success of the transition model can be measured by both tangible and intangible indicators. The tangible indicators reflect the functional requirements of Single Use Instruments which are to mitigate the issues derived from their Reusable counterparts such as reduced weight, reduced container size and lower production costs. The intangible indicators of success reflect the non functional requirements which can help to increase brand awareness and build upon customer relationships and loyalty by being perceived to be interested in their [the customer's] productivity and efficiency measures.

#### **5. Success Achieved**

In addition to the success measures which reflect the product orientated aspect of the transition model; the achievements have the potential to be many. Initially, the short term achievements in pilot studies have highlighted bottlenecks in processes and procedures not necessarily related to the surgery and more identifiable with the perioperative processes which become critical in efficiency measures.

The product functional requirements and measures of success will enable the operating departments to highlight their weaknesses and strengths and exploit those product benefits such as reduced weight/container to improve productivity, efficiency and ultimately lead to reduced overall surgical process time.

Further studies are necessary to provide evidence of such claims, however the concept can be expanded to include further breakdown of product usage and perhaps qualitative surveys with medical staff and patients alike.

The case describes the shift towards the joint value proposition involving both customers and product suppliers has shown the need for a new product creation, rather than the supplementary service proposition practiced before. Therefore, the need for a modified transition model focused on customer needs, but still considering an option of new product introduction instead of service provision seems justified in this case.

#### **6. Further Information**

Studies are ongoing to validate the performance of single use instruments.

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## **CASE STUDY 2: A SERVICE REVOLUTION IN FASTENERS: THE STORY OF TWO BUSINESSES WITH THE SAME GOAL BUT VERY DIFFERENT STRATEGIES**

Nick Frank

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**Abstract.** This case study is a real life case study of the servitisation of manufacturing. It compares and contrasts two different ways to approach services innovation, driven by the changing needs of customers and the competitive environment. It demonstrates the lasting impact this type of innovation has on both a companies organisation as well as the industry dynamics.

### **1. Background/Rationale**

The fastener industry would seem an unlikely manufacturing sector to undergo a service revolution. This is the world of nuts & bolts, rivets, washers and clips, and all those bits and pieces that hold products together. Yet for the past 30 years, European fastener companies have increasingly had to live in a world where manufacturing and services have been converging. There has literally been a slow moving revolution of how not only the manufacturers develop their business, but also how their customers purchase and manage their supply chain.

It started in the late 80's when Western European manufacturers came under immense cost pressure from low cost imports. In reviewing their cost base, many realised that they spend a disproportionate amount of effort in managing their fasteners, which represented up to 25% of their part numbers, but only 1-3% of the products cost. At the same time they saw the emergence of Taiwan as a source of low cost, high quality standard fastener product. Putting these two factors together, smart distributors developed a compelling business argument for manufactures to source all their needs to one supplier. This not only reduced piece part costs, it simplified the purchasing organisation and by delivering directly into the factory, eliminated inventory and internal logistics costs.

With manufacturers cut off from their customers, a 'services war' broke out. Some manufacturers focused on selling the value of their Application Engineering service to reduce the total cost of assembly. Other's tried to develop or buy Just-In-Time(JIT) or Vendor Managed Inventory(VMI) distribution businesses. Manufacturing competitors would partner up to try to win contracts from distribution. Some distributors moved into manufacturing as they looked to position themselves as a technology provider. Literally the fastener industry was turned upside down.

This case study highlights how the line between services and manufacturing can blur as the requirements of customer change. If leaders do not understand the business and cultural implications, they run the risk of slowly being restricted and literally squeezed out of customers.

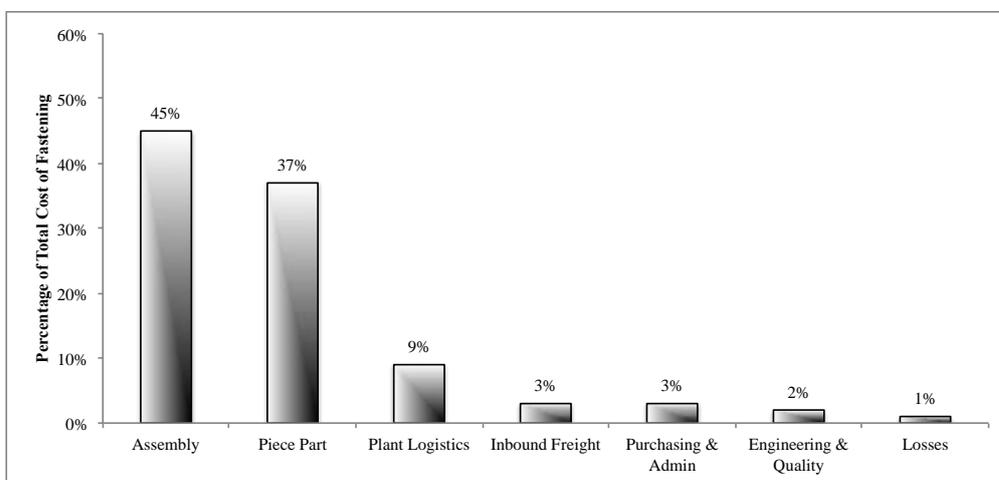
Over more than three decades of 'revolution', we see that those fastener manufactures that have transitioned successfully into this new world have given their services a very clear focus through either concentrating on a specific technology niche's or establishing a separate services business unit or even dropping in-house manufacturing all together.

## 2. The Opportunity

### Late 80's: intense cost pressure forces manufacturers to review their cost base

In the late 80's fastener manufacturers operated in a market where their customers began to face intense price competition from low cost high quality manufacturers. The focus was on piece part cost reduction, lean manufacturing and a trend to outsource non-core activities. The balance of power in organisations had definitely swung away from Engineering towards Purchasing.

So it was a question of survival, where many manufacturers had to reduce their cost base or perish. Fasteners were not an obvious target, as they represented perhaps 1-3% of the material spend. However fasteners were also 25-30% of the piece parts to be managed on a production line, through purchasing, logistics and quality function. In fact there was a growing awareness that the cost of a fastener only represented perhaps 30-40% of the total cost of assembly as shown in Figure 1.



**Figure 1:** An estimate of the Total Cost of Assembly for an Automotive OEM, based on the authors own experience of running a Full Service Provider Programme

Companies that could offer piece part savings, and reduce the other 60-70% of the total assembly costs, would be a very attractive proposition to their customers.

### Two companies with the same goal, but a very different journey

To illustrate how in this sector, manufacturing and services have converged, we will follow the journey of two fastener companies. Both sold into the industrial and automotive sectors, and both saw the opportunity to provide a 'one-stop-shop' for manufacturers fastening needs.

In the late 90's Haden MacLellan a struggling UK manufacturing group went through a major restructuring in which they sold off their core engineering businesses and emerged as INFAST, a €70million group focused on industrial fasteners. They had identified the fragmented nature of fastener distribution business in the UK as an opportunity for consolidation and bought a number of smaller UK distribution companies. Their strategic focus was to be an integrated source of all fasteners and C-Class (low value) items.

On the other side of the world and in the same timescale, Textron Inc, a publically quoted US company, also saw the fragmented fastener market as an opportunity for consolidation. Through the acquisition of a large number of very profitable, niche manufacturing business they created a new division, Textron Fastening Systems (TFS), with revenues of €1.4bn. Their goal, to create a one-

stop-shop for industrial and automotive customers which would reduce total assembly costs by providing a range of fastening technologies from one provider, and so reduce the number of suppliers and resulting costs that needed to be managed.

### 3. Description of the Innovation

#### **Service Innovation: seizing the opportunity of changing customer needs**

Infast's network of industrial distributors, through their customer intimacy identified the pain points of their customers and started to actively promote very simple low cost solutions:

1. They saw an opportunity to reduce stock through direct delivery to the point of need in the factory, using low technology but reliable Kanban processes. They already delivered parts in a fleet of van's and light truck's. It was a relatively easy process to extend this to delivering to a Kanban bin in a factory.
2. By leveraging a low cost global supply chain, they were able to significantly undercut local manufacturers.

Combining these two factors enabled them to put together a compelling value proposition for many smaller manufacturing groups:

'If you allow us to supply all your part numbers, we will reduce your overall piece part costs by 10-20% yet retain quality'.

'By reducing from upto 50 suppliers to a single source, we will eliminate all your fastener purchasing people and by delivering parts directly inside your factory we will eliminate your logistics staff'.

'We will eliminate your fastener inventory and improve cash flow by delivering on a just-in-time basis, and you will only pay when you use the fastener'.

As they targeted more customers, they developed their IT systems to deliver Vendor Managed Inventory systems that could operate remotely. For example electronics businesses such as Flextronics could build new plants in low cost regions such as Eastern Europe, working with their existing fastener supplier and not have to worry about the organisational infrastructure of delivering fasteners.

Infast started to bring this model to automotive markets, first through the lower tiers, then the larger tiers and began to supply OEM's such as Rover at Longbridge, UK.

In this way the fastener supply chain was revolutionised from being dominated by manufacturers supplying directly to their customers, to one where an intermediary service company now owned a relationship with the OEM. It was these service companies that decided the sources they would purchase from and their buying criteria were focussed more on part cost and less by savings elsewhere in the value chain.

So successful was this strategy in the UK that Infast sold all its manufacturing operations and transformed into a pure service company. Manufacturers no longer able to sell their value arguments directly to engineers, had to either rely on the strength of their brands and technology niche, or find a new way to do business.

#### **Service Innovation: driven by a demanding customer**

Faced with the same market dynamics, Textron Fastening System(TFS) took a different route. They chose to focus on technology and application engineering services to persuade their clients that even though their piece part costs were higher than standard products, there were significant savings in assembly time and part number reduction.

In industrial markets, this value proposition was not strong enough versus the JIT distributor and market share was quickly eroded. For example TFS had a premium brand position for rivets. In 1993 UK sales were about £20M, but by 2003 this had fallen by as much as 70%. However this same phenomenon was not true across all markets and highlights the importance of culture in service businesses. For example in Germany and France, OEM's were much more motivated to have the direct contact with the fastener manufacture, so as to access technology innovation. Hence the growth of the VMI/JIT services has been slower in these markets than in the UK.

What TFS did find was that for larger key accounts, and especially automotive OEM's, the ability to offer a wide variety of technologies through one supplier was very attractive. In itself this was not innovative. TFS Europe had a number of accounts such as Renault, PSA, VW and Daimler Chrysler, where it supplied between 40-50% of the fasteners used in their assembly plants. However without realising it, TFS had developed a service led approach in these accounts. At the decision making level, relationships were not based on individual piece part discussions, as there were simply too many fasteners involved. Instead they were based on a global price of the whole package of parts, supporting the growth into low cost regions of the world or optimising the logistics and inventory in the supply chain globally.

So when in 1999 Ford Europe made a strategic decision that they wanted to develop Full Service Provider (FSP) that supplied all the fasteners, logistics and engineering support for the Fiesta model, TFS won the contract. Ford were in major financial difficulties and needed to drastically reduce their fixed overhead and outsourcing to their suppliers was one of the solutions they implemented. They wanted to go way beyond the pure JIT model that INFAST had employed in Rover. Their rationale was that the supply chain benefits were a one off, but that Engineering could drive long term cost reduction in assembly, quality and part number proliferation. Hence they specifically chose a manufacturer that had the technical expertise to manage the wide range of joints found on a car as well as the depth of resources to implement a logistics solution.

They also wanted to convert their fixed costs into variable, so they demanded a fixed price per car for supplying all the parts (approximately 500 part numbers). So this programme that first started with the Ford Dagenham plant in the UK, and was expanded within 6 months to include their Kolin plant, was the:

1. First time that a single price per car was applied that covered the bill of material for fasteners and service.
2. First time that a fastener supplier had engineering responsibility within an OEM design team for fasteners. This involved making recommendations on technology, supplier decision and managing the supply chain for prototype through to production parts.
3. Largest JIT logistics programme in Europe supplying an annual build volume of over 400K cars at two sites.

Unlike INFAST who actively won market share in the Industrial segment, the premier European automotive suppliers were much more conservative and product orientated. Hence this is an example where the customer has led the innovation process and the supplier has followed, because of the potential commercial reward.

#### **4. Which Approach Was the Most Successful?**

Successful innovation is difficult to measure, but within this context there are ultimately two criteria for success through the impact of a service innovation:

1. Did it have a lasting impact on the market and customers?
2. Did it add value to the enterprise through increased revenues or improved profitability or more loyal customers.

Did the development of JIT, purchasing and engineering services have a profound effect on European industry? The answer is 'yes':

1. INFAST was one of the leading company's developing JIT fastener supply into the UK market. Back in the 90's perhaps 20% of fasteners were supplied through this channel. Now it is closer to 80%. This same trend is being seen across Europe, all be it at a slower pace.
2. Within the Automotive sector adoption of the innovation has been slower according to the culture of the OEM or the Tier. The Full Service Provider concept spearheaded by TFS has been introduced into all Ford car assembly and engine plants, such that there are now 5 such suppliers, one of which is INFAST. BMW have used a similar concept to support the design and production of the Mini, as do Jaguar and Land Rover. The French OEM's have not gone so far as logistics and parts supply, but do run engineering programmes with key suppliers. In transportation, Volvo Truck manages their global fastener supply through a single service company.

The response to the second criteria of increasing enterprise value is also positive, but with some caveats;

1. INFAST has gone from being a predominantly UK based business with revenues of approximately €70million to being part of a global €4bn specialist distribution business (Anixter Inc) where the fastener & c-class product businesses represents approximately 15% of sales or around €600M.
2. When Textron Fastening Systems first started its FSP programme, it had a manufacturing content of approximately 8%. The programme is still running despite TFS being spun out of Textron and eventually broken up. The manufacturing content has climbed to over 50%, resulting in an additional €8.4M per year of sales to the production plants. The resulting gross margins generated over more than 10 years of operation, demonstrate that the programme itself has brought a significant amount of value to the business.

However in terms of enterprise growth, Textron Fastening Systems in Europe despite being a prime mover has failed to develop the service outside this specific account. They integrated their services business into a manufacturing P&L, and from their failed to develop the infrastructure to be competitive. This is in contrast to competitor (FACIL) who started with a similar size project in Ford, but has grown their business five fold across a number of different OEMs and tiers. FACIL was the result of a joint venture between 2 manufacturers who chose to create a stand-alone service business to address this market opportunity.

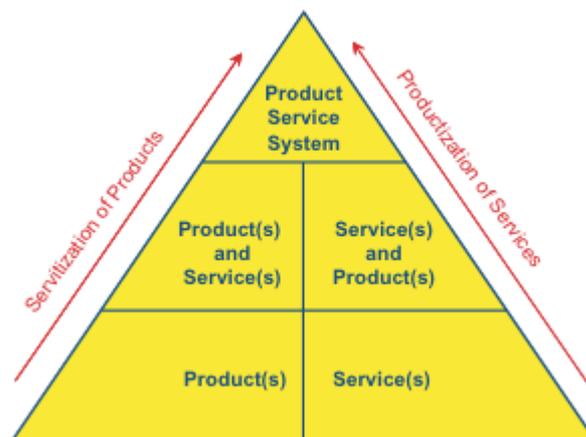
## 5. What Lessons Can We Learn From This Case Study?

One of the primary conclusions we can draw is that focus dramatically increases the likelihood of a service idea being successfully executed and developed.

1. INFAST had a very clear focus that they were a service business. They understood the strengths of their model, but have also then been able to address their weaknesses. For example investing in their engineering resources in the automotive environment to overcome objections that that they did not have the technical or manufacturing know how.
2. TFS were successful in implementing this project, because initially they set up a separate dedicated team, which included non-automotive experience that allowed them to break the mould and break new ground within the company and the industry.
3. TFS were not successful in growing their service business outside this project, because their service business got lost with in a product orientated environment and so was unable to develop a cost effective infrastructure versus its competitors.

A second factor of importance is that when pushing at the boundaries of service innovation, co-creation becomes a very important concept. For example the notion of the single price per vehicle was truly ground breaking and risky for both sides. Although it was eventually found to be unworkable and abandoned on later models of the Fiesta, it was only through a joint desire to succeed that solutions were found that kept the supplier/customer relationship intact.

The third factor was the ability to clearly make the trade off between service and manufacturing margins, so as to make the best decision for the whole enterprise. INFAST did not have this issue and so already had clear commercial objectives. Within TFS, losing the service business within the manufacturing P&L meant that it was swallowed up by a Product mind-set dominated by manufacturing KPIs. This made it difficult for senior managers to find the right balance in their



**Fig. 2** Evolution of the Product Service System Concept [1]

decision making between risk and opportunity.

And finally through these two case studies we see an example of how service and manufacturing are converging, especially within the Ford environment where both INFAST and TFS were present. Essentially Ford wanted a joint that is fit for purpose on the vehicle which requires a Product Service System approach[1]. As shown in Figure 2, TFS built on their traditional product strengths and added logistics and purchasing services to their capability effectively servitizing their product. INFAST having transformed themselves into a service business, added the features of a product company such as engineering, technology and quality management in order to reach the same goal.

And very aptly in light of this case study a quote from Henry Ford. He was not just a brilliant supply chain innovator. He was a natural entrepreneur who understood business in all its dimensions.

"A business absolutely devoted to service will have only one worry about profits," he said. "They will be embarrassingly large."

## 6. Links to Further Information

Anixter Corporate Website, [www.anixter.com](http://www.anixter.com)

Facil Corporate Website, [www.facil.be](http://www.facil.be)

Bulten Corporate Website, [www.finnveden.com/en/bulten/Services/FSP-Full-Service-Provider/](http://www.finnveden.com/en/bulten/Services/FSP-Full-Service-Provider/)

TR Fastening Corporate Website, [www.trfastenings.com/pages/About+our+Services](http://www.trfastenings.com/pages/About+our+Services)

Textron Press Release of Ford VMI, 26th October 1999,

<http://phx.corporate-ir.net/phoenix.zhtml?c=110047&p=irol-newsArticle&ID=958780&highlight=>

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## CASE STUDY 3: R&D AND INNOVATION ORGANIZATION WITHIN KIBS\*

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\*The results presented in this paper are part of the PhD thesis of the author.

**Abstract.** Challenging the literature that supports that knowledge and innovation in services are produced ad-hoc and in co-creation with customers, the paper describes the R&D organization of a multinational consultancy company. Based on a single case study, and drawing from research on industrial R&D organization, the paper shows that the typologies of R&D units found in KIBS nowadays are very similar to those in technology-intensive manufacturing and that the internationalization of R&D in services follow similar patterns and motivations to those found in industrial R&D.

**Keywords:** KIBS, Innovation Organisation, R&D

### 1. Context

Research on service innovation has been mostly focused on the co-creation with customers and on ad-hoc innovation within projects [1], while the existence of specific units for innovation within service companies has been neglected [2] or treated as a residual feature or a legacy of their history [3]. Besides, literature on service innovation is not organizational; in other words, it does not focus on how innovation is organized within services companies and on how the existent structures or functions interact and have different missions regarding innovation. To illustrate this, Sundbo sais “service firms innovate on the basis of quick ideas, not from scientific results, and they develop the innovations in ad hoc organisations, not in permanent R&D departments” [4]. Similarly, Sundbo and Gallouj stated “service firms have not been good at organizing the innovation process in a formalized and systematic way and learning from the process” [5]. As a result, the analysis of the organization of innovation in services such as consultancy, engineering, or design has often been approached from the project-based firms perspective [6], in contrast to the functionally organized firms. There are, however, some authors that have analyzed some organizational issues related to innovation in services. For example, Djellal and Gallouj defend that innovation is rarely organized along the lines of specialized departments, whether they are R&D departments or (less traditional) innovation departments, and that it is more often organised in flexible modes, such as temporary formal or informal “structures” [7]. Similarly, Miles highlights that it is atypical for firms in most services sectors to have an R&D department [8].

Even though conventional R&D management structures seam not to be the general trend, Miles highlights that “there is now overwhelming evidence of services’ activity in R&D” [9]. However, many service companies make no clear distinction between “research” and other innovative activities they perform and, in fact, it seems that when they use this term it most often refers to scanning of the competitive and market environments. In other cases, R&D within services might even go unrecognised because of the complexity and less specificity of its definition [10]. In this sense, there have been important critics to the traditional definitions of R&D, hardly applicable to services as many innovative activities in these sectors involve different types of knowledge (e.g. related to social science and humanities) and transformative processes than those in manufacturing. Miles and

colleagues stress that R&D in KIBS is generally of a wider scope (e.g. including market exploration), and often emerges as knowledge developments that spin-off from ongoing projects, with a high importance of client inputs [11].

## 2. The Opportunity

This paper challenges the idea that innovation and knowledge in services are produced ad-hoc and with no specialized units for R&D. We defend that this framework needs to be reviewed in the light of the insights gained on a single case study of a large multinational company in the area of business services. With more than 200,000 employees, our case study company provides different kinds of business services (i.e. consulting, technological solutions, and business processes outsourcing). The company has a broad expertise in industries as varied as financial services, automotive, communications, health, human resources, energy etc. and provides business solutions to over 1,000 clients in more than 50 countries. Based on 36 interviews and additional documentary analysis that aimed at a general understanding of the innovation and knowledge circulation processes within the company [12], we have detected the existence of a network of dedicated knowledge producing units, that is, diverse R&D units that pursue differentiated objectives and roles.

In order to analyze the R&D units detected in our company, we draw from the literature on industrial R&D organization. However, Argyres and Silverman highlight that research efforts have focused on the interfirm organization of R&D almost to the exclusion of intrafirm organization and devoting relatively little attention to the relationship between internal organization structure and innovation outcomes [13]. These authors state that debates about the appropriate organization of research have been common amongst technology-intensive firms, giving rise to wider variation in R&D organization structures than overall corporate structures. Parallel to a process of decentralization of R&D [14], over the last decades industrial R&D has been through a process of increasing internationalization, and many authors have focused on analyzing this trend and the factors and strategies behind the process [15]. Nobel and Birkinshaw emphasized that

“the motivations for internationalizing R&D are many and varied, but typically include access to scientific talent, access to ideas in multiple markets, responsiveness to local needs, responsiveness to host governments and international division of labour” [16].

Summarizing these motives, we can mention three important reasons to establish R&D sites abroad: a) the quest for external science and technology, that is, the will to access technical know-how and expertise available in specific places around the world, b) the quest for new markets and new product, that is, the access to local customers and lead users, and c) the reduction of the innovation costs by accessing country-specific advantages (e.g. lower wages). Besides, there have been a number of studies that have developed comprehensive typologies of foreign R&D units based on their specific role, achieving high levels consistency among the proposed typologies. Even though these authors have distinguished different numbers of categories and given them different names, we can differentiate 2 general types of R&D units depending on their role as: a) adaptors of existing technology and knowledge to local needs, and b) creator of new technology and knowledge. Table 1 summarizes these issues.

Table 1: Focus of R&amp;D units depending on the reason of existence and role

	Main reasons for internationalizing R&D		
Main role of the R&D unit	Access to SCIENCE and TECHNOLOGY	Access to MARKET and LED USERS	Reduction of innovation COSTS
<b>ADAPTOR</b> of existing knowledge	Not common	Focus on enhancing and adapting the technology to local needs	Focus on technology transferring to local producing unit
<b>CREATOR</b> of new knowledge	Focus on long-term research	Focus on product development	Focus on product development and long-term research

Own elaboration based on Nobel and Birkinshaw (1998) and Zedtwitz and Gassman (2002).

We try to add to the literature on R&D organization by analyzing an industry that has been less studied: services. The analysis of the detected R&D units and their roles aims to show that the organization of innovation in consultancy companies nowadays may not be that different from the organization of R&D in technology-intensive manufacturing. In fact, we show that the organization of R&D in services follows similar patterns and that the different units detected in our case study company have similar roles to those in manufacturing.

### 3. Description of the Innovation Organization

Looking at our case study company we have found the following typologies of R&D and innovation units that are distributed worldwide:

- a) *Creators with a focus on science and technology (S&T)*: The company has 4 Technology R&D Units whose function is to explore, prototype, and build solutions using emerging technologies, that have not been commercialized yet. That is, they focus on long-term research in technologies that are expected to be important for the future development of the business. The innovations created within these units are transmitted to the rest of the company, expanding its technology offer and knowledge base. These R&D Units have their own budget and strategic plans based on comprehensive analysis of key technology trends, and they hire experts from Universities so that they develop new technology seeds. In terms of size, the smallest Technology R&D Unit has around 5 people and the biggest, in the USA, has more than 50. One of the units in Asia is expected to grow to 100 people in the following years. These units are located in global sites of widely recognized science and technology resources.
- b) *Creators with a focus on markets and led users*: The company has many Strategic Centres that play an active R&D role, developing new tools, knowledge etc. in specific research areas, such as analytics, health, supply chain, and social media. They make use of the corporate technologies developed in the Technology R&D Units, but create new knowledge related to these technologies by applying them to specific domains and industry areas. Besides, there also exist diverse Collaboration R&D Centres that conduct the same type of applied research in collaboration with other companies and technology alliances. These alliances push the boundaries of the company and "form R&D relationships that meet R&D needs, no matter where the R&D source might be located" [17]. These typologies of R&D centres are located all over the world, and most of them have been created between the end of 2009 and 2011.
- c) *Adaptors of existing technologies to local markets and needs*: As it is widely acknowledged, the close understanding of user needs is a must for successful performance and innovation in services. As a consequence, the case study company has created a wide number of decentralized R&D units that allow tapping into the specific markets and focus on enhancing

and adapting company's technologies to the needs of the customers. The company has created numerous centres that offer end-to-end experiences for clients, showcasing the technologies developed in the Technology R&D Units, offering demos and simulations, visits etc. They provide experiences related to many different areas, such as information management, open source, automotive and industrial manufacturing, media and entertainment, transportation services, financial services, etc. Their activity is based mainly on delivering experiences, but these interactions are a very important source of new ideas. In fact, these ideas are often sparked when customers explore emerging technologies, brainstorm with company R&D team and gain first-hand experience with the showcased technology prototypes. Because the resources demanded by these units are lower than the ones required by the "creators", the number of centres that work as adaptors is much higher. It is important to say that these kinds of centres are located in areas that are well known for their led users in specific markets, such as the location of the centre specialized in automotive manufacturing in the city of Detroit.

d) *Adaptors with a focus on reducing innovation costs*: Additionally, some of the centres created in developing countries, have their focus on reducing the costs of the development of the company technology solutions, evidencing a parallelism with the dynamics of found in industrial R&D. Besides, because of the science and technology base quality in the area, these typology of units also aim to be important creators of new knowledge and development.

Table 2 summarizes the different R&D unit typologies detected worldwide. As it is evidenced, the different typologies of R&D units form a global network that benefits from the science and technology sources located in specific places around the world (e.g. Silicon Valley), from the markets and led users located in specific regions (e.g. Detroit as a led market for the automotive manufacturing industry), and from regions with specific cost advantages and high quality of technology training (e.g. some Asian economies). Hence, we can say that the creation of these specialized units for innovation follow a global strategy very similar to the patterns followed by technology-intensive industries.

Table 2: Summary of the company's R&D unit typologies and location

Typology of R&D unit	Focus	Nr of Units	In developed countries	In developing countries
Creators	S&T	4	2 US, 1 EU	1 (Asia)
	Markets and led users	9*	3 US, 3 EU, 1 Japan, 1 Australia	1* (Asia)
Adaptors	Local markets and needs	13*	6 US, 3 EU	4* (Asia)

\*This is a minimum number of units detected in the documents of the company. The exact number and distribution of units needs to be confirmed in further research.

Moreover, besides the described global innovation network, there exist many *local innovation initiatives*. For example, in Spain, the company launched an innovation programme in 2008 that aimed to transform the internal culture regarding innovation and creativity and to develop specific innovative services for the clients. As a consequence of this initiative, the Spanish subsidiary has established new collaboration mechanisms with some of the most important Universities in Spain, supporting R&D on innovation by sponsoring PhD and Master thesis, and the creation of new start-ups by providing training and mentoring. Besides, the innovation programme "identifies, commercializes an puts in economic value innovation, independently of its source". In other words, it mobilizes the knowledge from all available sources, both internal, drawing from the technologies

developed within the Technology R&D Units and other centres, and external, following the open innovation model and, hence, collaborating with a large list of organizations, such as Universities, business angels, entrepreneurs, investors and more than 30 start-ups and research groups in various topics (e.g. analytics, CRM, mobility, security). In addition, the Spanish innovation programme has launched a bottom-up initiative, that incentives all employees in Spain to give their ideas about new products and services, internal processes and improvement of the workplace, and has established the mechanisms by which ideas are selected, analyzed, prototyped, validated and marketed, integrating employees in the development of their own ideas.

As consequence of the open innovation perspective, the company has already detected many innovative companies that operate mainly in Spain, signing various collaboration agreements. For example, it has detected and started business activity with companies that develop tools and methodologies to trigger a new way of thinking and creativity, text-mining tools, real-time tele-presence technologies, content-analysis technologies for assisting in decision making, automatic asset-appraisal services, etc. Looking at the Spanish experience, we can say that the innovation programme has followed the expanded-enterprise network model [18], functioning as a broker that creates R&D relationships with a wide set of internal and external partners, looking for new knowledge, ideas and R&D wherever they might be located.

This section has described the different R&D and innovation units found within the company, both from a global and local innovation strategy perspective. From the global perspective, it has been evidenced that the main reasons to internationalize an R&D unit are the same that are found in industrial R&D, that is, access to S&T reasons, to markets, and to cost advantages. Similarly, the roles accomplished by the different units are also basically the same: whether creating new knowledge and technology, or adapting them to the specific needs of the clients. From the local perspective, we have shown that service companies nowadays also pursue local innovation strategies and create specific units that are devoted to the access of new knowledge and ideas wherever their source, internal or external. In fact, we have detected that the focus of these types of local initiatives is also becoming increasingly international, looking at new opportunities outside their country.

After describing the specific R&D organization of the company, however, it is extremely important to add that the aim of this paper is not to deny that knowledge in services is mainly produced through the close interaction of consultants with customers, as they try to find innovative ad-hoc solutions to their problems. In fact, it is very true that the final destination of the different technologies and knowledge created within the described units will be their ad-hoc implementation by consultants in the company's clients, customizing the technologies to customers' specific needs. The aim of this paper, hence, is to show that the idea that services produce their knowledge in co-production needs to be extended in the light of the results of this case study that evidences the existence of a complex R&D organization within KIBS nowadays.

#### **4. Measurement of Success**

We have described two different innovation management strategies in terms of their global or local reach, which in fact have constituted important organizational innovations within the case study company. We believe that an important way of measuring the success of these initiatives is to analyze the flows of the new knowledge created in the different units: a) among the described different typologies of R&D units, b) from these units to the consultants facing clients, and c) from the customers back to the R&D units. However, this has not been analyzed yet and will be the objective of future research. Besides, success can also be measured in terms of achieved R&D and innovation outcomes, such as new research reports and publications, developed new technologies, launched new services etc. Moreover, we believe that the creation of new R&D units worldwide is itself a reflex of the success that the company is achieving with the described innovation management strategy.

In terms of the effective R&D and innovation outcomes, and taking as a reference the Spanish innovation programme, which represents a globally acknowledged successful initiative within the company, there have been interesting results regarding new agreements with innovative companies and research groups, pilot projects with clients using the technologies detected and developed within the programme, new collaboration agreements with Universities and R&D studies published etc. However, in this sense, we do not have the necessary data to do comparisons with the results in other KIBS, or data to make a longitudinal analysis of the success. These limitations will be faced in further research.

## 5. Conclusions

Based on a single case study of a multinational consultancy company, we show that the idea that innovation and knowledge in services are produced ad-hoc needs to be revisited, as KIBS nowadays do have specific R&D and innovation units and follow R&D organization patterns that are very similar to those followed by technology-intensive industries.

Moreover, we describe the different R&D unit typologies and map their international distribution. This allows seeing that the motives for the internationalization of R&D units are also very similar to the motives in manufacturing, that is, access to science and technology, to market and led users, and to costs savings.

Finally, the selected company is a great example of the complexity of innovation organization and management in services nowadays.

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## CASE STUDY 4: INNOVATION IN KIBS: LESSONS FROM UNIVERSITY-BASED BUSINESS INCUBATION CENTER IN TAIWAN

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**Abstract.** In recent years, many governments have made efforts on promoting the development of KIBS (Knowledge Intensive Business Service) industry. Establishing incubation centers to facilitate entrepreneurs and industrial innovation is one of the important policy tools. In Taiwan, UBBICs (University-based business incubation center) are facing the challenges to operate independently with limited public financial supports. The case (NTUIIC) initially was operated under its parent university with public funding. When facing policy changes, NTUIIC applies a new organization mechanism to integrate public and private resources and extend its business boundary. This case study applies two-side market concept to explain how NTUIIC successfully achieves financial independence while still providing high-quality KIBS.

**Keywords:** University-based Business Incubation center, Two-sided market, organisational innovation, knowledge intensive business Service

### 1. Background/Context

Establishing many new companies to exploit new business opportunities has long been recognized as a key driving force to economy development and growth. Usually driven by owner's entrepreneurship and enthusiasm, newly established companies in general are more innovative and productive to their old counterparts. That means they are more competitive in delivering new values, and better products and services to the market than the incumbent companies. The process of setting up new companies will create new jobs as well. Therefore, having many new companies established is beneficial not only to the economy but also to the society as whole.

However establishing new company is always a risky undertaking. Many of them will not be able to survive their first few years, let alone making their business profitable and growing. To succeed, start-ups require an array of tangible and intangible resources and capabilities (e.g. inexpensive office space/utility service, training/skill course, business advice, financial/technical support, business networking assistance, and technology/innovation capability), which are constantly in short supply due to market failures. Therefore, incubation service seems to be one of critical services in KIBS market.

In recognition the benefits and difficulties of establishing new company, since 1994 the Small and Medium Enterprise Administration (SMEA), Ministry of Economic Affairs (MOEA) in Taiwan has been planning a number of business incubation policies to assist potential entrepreneurs and start-ups. For example the SMEA passed "the Guideline to Encourage Public and Private Institutes Setting up Business Incubation Center" and "Five-Year Plan for Strengthening the Innovative Incubation of Small and Medium Enterprises" (2001 to 2005)" in 1997 and 2001, respectively. To further improve the capabilities and quality of the incubation centers, the "Incubation Center Knowledge Service Environment Construction Project" was launched in 2006. To better leverage

the Higher Education (HE) Institution's resources and capabilities, particularly in science and technology areas, the SMEA presented "the Four-Year Value-added Plan to Encourage Industry-University Cooperation through Incubation Centers" in 2008.

The SMEA's incubation policies are originally designed to encourage all kinds of public and private institutions to help start-ups. However, in more than ten years, the emphasis of SMEA's business incubation policy has been overwhelmingly shifted to improve the performance of university-based business incubation centers for two main reasons.

Firstly, the number of university-based business incubation centers increases rapidly. Until 2010, there are 116 business incubation centers in Taiwan. Among them, 93 are university-based, 11 non-profit institution-based, 11 government-based, and one private-owned. However, in general the performance of 93 university-based ones is not ideal.

Secondly, the public funding to encourage establishing incubation center or industry-academic cooperation comes not only from the SMEA, but also from the Ministry of Education (MOE). The abundant financial resources do not only, in effect, lower the barrier to access public funding for universities, but also make their incubation centers becoming more depending on public subsidies.

The SMEA wants to alter this situation because it is finally unsustainable to the government in the long run. Meanwhile, the SMEA also wants to keep as many university-based business incubation centers (UBBICs) as possible, because they play an important role in innovation, economic development and job creation. The SMEA wishes that universities could take the "making UBBICs financially self-sustained" approach to solve the problem. However, this is not easy to do. Nowadays many universities are still heavily relying on public funding to keep their UBBICs afloat. National Taiwan University Innovation and Incubation Centers (NTUIIC) is one exception. Therefore, this case study will illustrate how (and by what innovative undertakings) NTU and NTUIIC successfully achieve financial independence. Hopefully this case will shed some lights on the issue that concerns the SMEA's business incubation policy.

## **2. The Opportunity**

In fact, the SMEA is aware of the problem of having a large number of underperformed yet heavily subsidized UBBICs. Therefore, since 2002 it has been trying to "privatize" the UBBICs by bringing in more private capital to the system. However, many attempts have failed except one – National Taiwan University Innovation and Incubation Center (NTUIIC).

NTUIIC, established by National Taiwan University (NTU) in 1997, is the very first UBBIC in Taiwan. It was mandated to provide incubation services (e.g. operation consultation, R&D, business management, marketing, and enterprise development) to tenant firms. After operating for a number of years, NTUIIC has found that its autonomy (i.e. being financially independent) and growth (i.e. providing more and better services) is constrained by the University Act, because, back in 2002, the Act prohibits the government-funded universities and their subdivisions from investing in private company.

However, based on its experience, NTUIIC reckons that allowing UBBIC to invest in and capitalize on the start-ups, particularly the burgeoning ones graduated from its own incubation, is the key to growth and financial independence. Therefore, in 2002 NTU and NTUIIC initiated a series of organizational innovations to overcome the institutional constraints, while improving its balance sheet and performing the role (i.e. economic development and job creation) that the government wishes the UBBICs could play.

## **3. Description of the Innovation**

NTUIIC is the only UBBIC that transforms into a new business model successfully. In 2002, incubation centers were encouraged by government to operate independently without public

funding. NTUIIC took the opportunity to operate in a new way via making a management contract with NTUIICo Ltd (NTU Innovation and Incubation Co., Ltd., NTUIICo). By the new organizational mechanism, NTUIIC enlarges and diversifies the funding sources, reforms the relationship with stakeholders, transforms the management team and practice, and implements new graduation-reciprocation protocol. The further details will introduce as follows.

First, in the relationship with relevant stakeholders, a new organisational cooperative mechanism was established by several actors. NTUIICo, established by the graduates of NTU, banks and institution investors in 2002, is expected to operate NTUIIC with a better efficient business model. NTU, as an independent role, did not invest in NTUIICo. However, to put the NTU's influence in NTUIICo, all shareholders of NTUIICo were asked to donate 20% stock share to NTU when NTUIICo established. Because of the donation, NTUIICo starts to manage NTUIIC legally. This helps to balance the benefit between private and public sectors.

Secondly, NTUIIC can transform the management team and practice to NTUIICo with a management contract. In organisational view, the business of NTUIIC is operated and managed by NTUIICo so a new business model is running without NTU's domination. The cooperative contract has renewed every eight years since 2002. Under the organisation innovation, besides government grant program, incubation centers also have financial input from external actors. Incubation centers provide not only pure incubation services but also evaluate possible investment projects. (Fig. 1)

The final one is how NTUIIC can make further connections with the firms "graduated" from the incubator centers. A new graduation-reciprocation protocol has been applied by NTUIIC that NTUIICo, as a third party, can invest in the graduated firms so that the organization itself can create positive feedback for further growth. Gaining the positive feedback is the base for incubation to keep being a KIBS provider in the market. When new private participants join university-based incubation centers, the centers should manage well between private funding and public missions. The integration of public and private resources thus drives the center to balance the benefits between public and private sectors. This cannot be reached if there exists no organizational innovation in NTUIIC. At last, all these changes, in the end, make NTUIIC a successful UBBIC self-operation case.

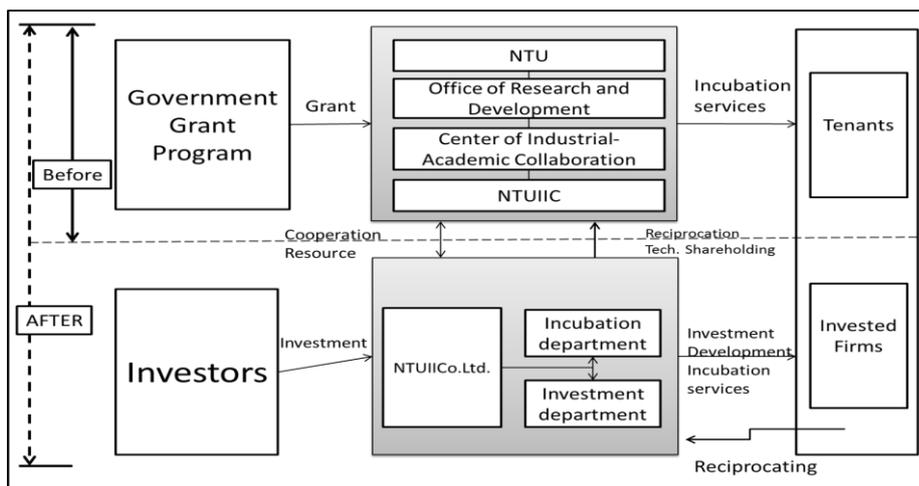


Fig 1. The organization framework of NTUIIC

The concept of two-sided market seems to be helpful to explore how UBBICs can continue the business by organizational innovation. According to Rysman (2009), two agents in a two-sided market can interact via market intermediaries or communication platform. Incubation centers face different stakeholders, which some provide funding (e.g. government), some provide resources (e.g. professors), and some need services (e.g. firms). When government subsidy must exit the market, UBBICs need flexibility to operate business. In the case of NTUIIC, it uses new organisation

mechanism to integrate public and private resources so that the benefits of different stakeholders can be balanced.

#### 4. How Success is Measured?

About the goals of UBBICs, Mian(1997) used three dimension to show the performance. These three dimensions are program sustainability and growth, tenant firm survival and growth, and the contributions to the sponsoring University's mission. This means the incubation centers are expected to not only accomplish the goals of parent university but also self-operate independently. To do so, there are two main characteristics to show the success of incubation centers. First, the success is highly related to whether incubation centers have *competence in operating knowledge-intensive business service* to the relevant stakeholders. UBBIC faces a two-sided market, including the demand of incubator resource and the supplier of resources for incubators. An incubation center itself is like a mediator (Bergek & Norrman, 2008), who connects the demand side (i.e. the entrepreneurs) and supply side (i.e. the professional resources embedded in the university) of incubation resources. Resource providers (e.g. professor) need more incentives so that they are willing to share knowledge in the transaction. For example, the professors can commercialise the research output and transfer technology to new-born firms with reasonable prices. In the demand side, facing different KIBS requests in a specific value activity, UBBIC should possess a full package of knowledge-intensive service. Some firms need services in pre-incubation whereas some need in post-incubation. Each UBBIC, on a long-run view, need to find a right position itself in KIBS market, otherwise, an institution, like UBBIC, may just disappear because of competitions.

Secondly, a successful and independent UBBIC need *the autonomy in business strategies*. Initially, universities set up an incubation center fulfil the basic requirement of MOE's policy. Most of universities fail to make a good strategic plan on how incubation centers should position in the institutional framework of the university. In other word, many have no precise organisational missions to achieve incubation performance because they are under the safe umbrella.

Concerning the competence and autonomy of incubation centers, to In Table 1, we summarize several dimensions to compare the traditional incubation centers and NTUIC. A new mechanism helps NTUIC to be more flexible as one of KIBS providers in the market.

#### 5. What Success has been Achieved to Date?

A subsidy programme always has its sunset clause to exit the market. In the case of supporting incubation centers, the incubation centers are expected to be an independent KIBS service provider. First, organisation innovation in NTUIC explains how this center overcomes the difficulty and finds its position in KIBS market. NTUIC can accumulate professional management skills through the new type management mechanism. The management team can also utilize different social network (including some indirect linkages to government) and alumni network to extend KIBS business. New financial resources are created. In other words, NTUIC is more successful in gaining better competence in being a KIBS provider. The demand side and supply sides of incubation services are coordinated by the new organisational mechanisms, NTUICo. Both public and private benefits are well balance in the new business model. This helps NTUIC find its strategic position in the KIBS market. To operate independently, the benefits of different stakeholders are concerned in the new business model.

Table 1. The comparison between traditional UBBICs and NTUIIC

	Traditional UBBICs	NTU_incubation center (NTUIIC)
Public funding (Governments)	Yes, majority of income source;	Yes, but less;
Parent support	<ul style="list-style-type: none"> <li>– Hardware: space, facilities;</li> <li>– Software: financial support; human resource, e.g. professors;</li> </ul>	<ul style="list-style-type: none"> <li>– Hardware: space, facilities;</li> <li>– Software: human resource, e.g. professors;</li> </ul>
Business position	– University dominant	– University & managing board in the incubation center
Competence	<ul style="list-style-type: none"> <li>– internal resource: professors with less incentives;</li> <li>– external resources (depends on UBBIC manager's personal capability)</li> </ul>	<ul style="list-style-type: none"> <li>– internal resources: positive feedbacks create more opportunities for professors in diversified fields;</li> <li>– external resources, including social connections by NTU graduates, management team's networks;</li> </ul>
Mechanism	<ul style="list-style-type: none"> <li>– Providing low-rent space for entrepreneurs.</li> <li>– Mediating resources between entrepreneurs and professionals;</li> <li>– No feedback from graduated entrepreneurs.</li> </ul>	<ul style="list-style-type: none"> <li>– providing low-rent space;</li> <li>– Mediating the resources;</li> <li>– Gaining certain stock share of graduated entrepreneurs;</li> <li>– Creating new mutual benefits for both entrepreneurs and professionals in NTU;</li> <li>– Looking for new tenants under organisational planning;</li> <li>–</li> </ul>
Administrative management	– Universities assign administrative staff;	– NTUIICo Ltd.
Client connections	– Fulfil local demand mostly;	<ul style="list-style-type: none"> <li>– Fulfil local demand;</li> <li>– Diversified demand via alumni network;</li> </ul>
KPI (Key performance indicator)	<ul style="list-style-type: none"> <li>– Numbers of finished incubation services</li> <li>– Number of incubators registered/graduated in UBBIC</li> </ul>	<ul style="list-style-type: none"> <li>– Besides traditional KPI, NTUIICo. proposed to be a KIBS provider:</li> <li>– Capability in different incubation services</li> <li>– Autonomy in business strategies</li> <li>– Social responsibility on the basis of governmental initial UBBIC subsidy programme.</li> </ul>

Secondly, because of the innovation input in organisation, NTUIICo., NTUIIC initiates more business strategies and missions in incubation service industry. NTUIIC has accumulated capabilities to manage new incubation business. The organisational innovation motivates NTUIIC now construct its autonomy to allocate resources in different incubation services. This implies NTUIIC can be more efficiently utilize academic and scientific resources supported by NTU, and play a more efficient role in being a brokerage between industrial actors and universities. Although the NTUIIC is still not a profit-making institution, the adoption of new organisation mechanism, NTUIICo., is helpful to find a right position, including the social responsibility expected by NTU, in KIBS market.

In this case, NTUIIC tries to overcome the regulations in law environment by adopting organisation innovation can lead a new way for growth. NTUIIC utilizes management contract to license NTUIICo Ltd which have higher autonomy and better professional management team on business. Because of the special background of NTUIICo Ltd, the private investment becomes to be one of the supports on incubation center's business. At current stage, NTUIIC has decreased the reliance on governmental funding since NTUIICo has the professional management skills to operate NTUIIC independently. NTUIICo also considers the role of NTU and balance the benefits of different stakeholders. In supply side, professors in the universities hope to have more interactions with industrial actors from which the new application ideas sprout. This helps university to identify the right direction on research and accumulate more useful resources for industries. In demand side, firms might need different types of services in different stages so providing low-rent spaces is not able to fulfil the demand of different types of KIBS. Obviously, most of incubation centers should face and solve the difficulty at current stage. To continue the incubation service, all centers need innovations to create a sustainable two-sided market.

## 6. Links to further information

1. National Taiwan University Innovation Incubation Center(NTUIIC),<http://www.ntuiic.com/eng/intro.htm>
2. Small and Medium Enterprise Administration(SMEA), <http://www.moeasmea.gov.tw/>
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## **CASE STUDY 5: “MEETING WITH BILL”- INNOVATION PROCESS OF ESTABLISHING ENTERPRISE CULTURE AND ENHANCING SERVICE QUALITY**

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**Abstract.** Gudeng was established in 1998 as a mold processing facility with an annual sales volume of \$240,000 (U.S. dollars). In 2000 it transformed itself into a semiconductor manufacture, and by 2011, its annual sales volume had jumped to \$25,000,000. Gudeng was under tremendous pressure during this transformation as it was changing both its product type and its customer service pattern. This paper discusses how they used a training program to innovate their services during such a crucial period. With traditional Chinese philosophy as a guideline, they successfully changed employee attitudes and dramatically increased their annual sales volume. Because of this change, Gudeng has emerged as a high quality manufacturer, winning several different national prizes.

**Keywords:** Chinese traditional philosophy, training, service innovation

### **1. Background**

Gudeng Precision Company was founded in 1998. It was an enterprise specializing in plastic shell mold processing for 3C (computer, communication, and Consumer Electronics) products. In its ten-plus years' development process, Gudeng Precision had the opportunity to transition from the mold processing industry to the semiconductor manufacturing industry. However, these two industries are totally different. The business models and the methods of communicating with their external customers are all different. Briefly speaking, the mold processing industry is known as a labor intensive industry. All people need to wear work suits and work very hard in the countryside factory as blue-collar labor; even the boss is the same. Since they have been devoted to this industry for a long time, employees think they don't need to study more knowledge about this industry; they believe they can handle all the situations. Once Gudeng stepped into the semiconductor manufacturing industry, their senior enterprise executives needed to wear formal suits and ties, sitting in the decorated offices and discussing business development directions with their world-leading partners. In the meantime, all employees had to understand their roles have changed. They had to change from only delivering finished products to local customers to being a global semiconductor factory's best partner. They needed to learn more about the new area and learn how to voluntarily help their customers solve problems. Mr. Chiu (Bill) knew that they must undergo a knowledge innovation process to change their service pattern. They needed updated training to change their attitude so they would have the chance to succeed.

## 2. Opportunity

After the transformation, Gudeng developed a cooperative relationship with TSMC (Taiwan Semiconductor Manufacturing Company Limited), and sales development has been positive. But relatively, the great problem was determining how the company could make continuous improvements to their technology and external customer service levels. If the employees refused to change their minds and would not accept the organization change, Gudeng could not survive long-term. Given such an opportunity, Mr. Chiu determined to start with himself. He felt that only when his own mind and views had changed could he ask all his employees to follow him. This is the ancient Chinese Confucian philosophy. Confucius always served as a living example, he believed in teaching his followers through actions rather than words. He preferred to rule by virtue rather than laws. Confucian leaders believe that the leader's personal and moral values will be the best principles (Wah, 2010).

This is really a process for a traditional mold industry marching towards a high-technology industry as well as a process for a traditional manufacturing industry moving towards a service industry. At the same time, it also highlights a conflict between educated elites and basic professional and technical personnel, and this training program is exactly the connection to bring the two extremes closer.

## 3. Description of the Innovation

The training course, "Meeting with Bill," began in 2006. It takes about six months (26 classes) for each session, one class per week, three hours per class. The employees have to meet with Bill on every Thursday night. The company not only encourages new staff to attend courses to integrate into the company as a whole family, but also encourages senior managers to take this opportunity to learn new development in this industry. This is a Chinese management culture which stresses human relationships and personal connections as described by the Chinese word "guanxi" (Yeung and Tung, 1996).

In this special training program, 20% of the courses are real cases happening in the company. The cases may be real customer complaints, or the conflict happening between R & D and the marketing department. All cases are caused by slight negligence but greatly affect the company's image, performance, or customers' trust in the company. The employees need to discuss how to solve the problem and avoid its happening again. The other 80% of the courses are the mental training courses, somewhat similar to the Carnegie training courses, and the majority of the content of the courses belongs to the category of Confucian philosophy. The company hopes to train the employees to have good communication skills and feelings of understanding toward the customers, thereby enhancing the team's operational capabilities.

Mr. Chiu thinks this mental training, the so-called "internal training of the spirit," is the people's minds of the Chinese philosophy. In Confucius's book, it is recorded: "Set your direction to fit the moral standard (sounds like 'Tao'), supporting your behavior with virtue (sounds like 'De'), getting along with others with humanity and with kindness (sounds like 'Ren'), and accompanying your life with different skill (sounds like 'Yi')." Tao, De, and Ren, all belong to the root of the internal spirit, originating from one's thoughts. In Confucian philosophy, their activities are shaped within the scope of virtue, benevolence or humaneness which deals with kindness, love, forgiveness, magnanimity and sensitivity to other people (Fernandez, 2004). If employees can keep this philosophy inside their minds, they will put all the customers' needs first, and do their best to help all their business partners.

On the other side, "Yi" is taught from outside; it is the training course for studying all artistic skill in the society. In ancient China, one needed to study many traditional artistic activities, and at the same time, one needed to learn the right manner of doing these activities. Like practicing social manners, playing instruments, playing archery, practicing how to ride a horse, reading Chinese traditional philosophers' writings, and knowing how to count with numbers—all these Chinese

cultural activities need to be followed in their correct manner. The most important thing is to know how to deal with different kinds of people with the correct etiquette. One needs to attend many artistic activities, then one will learn how to change one's thoughtfulness. This training program arranged these kinds of artistic courses during the midterm of the program. One time, when the company arranged to enjoy a traditional Chinese Opera, some students requested to change the course because they never watched this opera before. In their minds, this opera was very boring, so they thought it would be better to go to the movies. Mr. Chiu rejected the proposal and said: "This is a training program, not entertainment, so you must abide by the course requirements. Everyone needs to change their attitude, since they can't make a judgment before they try it!" Such experiences made a big change in the staff's attitude; they learned about facing a new experience.

Only after employees finish this training program and get the certificate can they be promoted into a higher position. That is why all the employees need to be involved in this program. By the way, there are two instructors: the general manager, Mr. Lin, is also an instructor. With Mr. Chiou and Mr. Lin together, the direct benefit is to let the employees have a model to learn. The staff can learn directly from the two founders' experiences so they don't need to waste their time on trial and error. Besides, Mr. Chiou and Mr. Lin can deliver their dreams about the future during the courses. All employees can understand their future in this company and what the bosses' goals entail, and get more cohesion with all the members in the program.

The other example is that employees must go to a high-class restaurant to get their certificates. Mr. Chiu requires all the members to dress formally. He thinks it is a really important experience for those members to have the chance to learn how wealthy people do things. If they are inspired to live like the wealthy people, they must set the objective clearly and work hard. Therefore, these courses teach members not to depreciate themselves; they can look forward to the future achievements and follow up with the motivation to work hard.

Therefore, the main aim of this course is to change the attitude of the staff by changing their minds inside, not just their behavior outside. This program is not just skill training, but also training in the Tao, the ancient Chinese philosophy. The staff can find the right direction as this inner voice guides the staff forward.

#### **4. How is Success Measured?**

It is very difficult to use external ratings to measure the success of this training course. However, during the period in which the company started this training program, its performance increased. This training program uses case studying skill to teach members, so they ask all the members to participate in the group discussion. This kind of group discussion helps the members to practice two-way communication skills. Everyone learns how to adopt the views of others during the discussion with each other, or to convince others to accept their opinions. They need to involve the same scenario the case describes and find the best way to solve it. Through the slight changes of these little things, Gudeng hopes all employees can understand and consider the customers' ideas when they provide services for the customer in the future. This is the indicator of future success.

#### **5. What Success has been Achieved to Date?**

"Meeting with Bill" is to train the employees in decency, communication and coordination, improving their ability to solve problems. It is very difficult to quantify specifically the results of training, but from the company's growth data, Gudeng's revenue in 2006 shows exponential growth compared to the previous year. They expect the goal to be \$4,333,333 (U.S. dollars) by 2012, almost more than 10 times their numbers in 2005. This indicates that this training program is really important kinetic energy for the company's growth.

Of course, the company's growth is related to a number of factors and resources, so the great difficulty is determining the specific proportion of growth that is due to the effects of this training course. We can find some special case of this program to prove it really works. First, the cultivation

of enterprise culture is the mental and spiritual aspect. "Meeting with Bill" instills the "I believe" idea, getting the employees to believe the organization's goals exist. Employees can remember the operators' dreams, corporate philosophy and corporate goals, and believe that the dreams will come true one day, thus contributing their effort to the company. Secondly, we consider the enhancement of the service quality. This training program affords the opportunity to let all employees raise their spirits and change their thoughts, and then enables the members to properly use the skills in practice, and keeps them in a positive, serious, responsible work attitude. There was a case in which TSMC's south branch was destroyed during the 921 earthquake (September 21, 1999), the most serious earthquake in Taiwan's history. Gudeng is the supplier of TSMC's semiconductor processing equipment, and is also stationed onsite to help with maintenance and repair work. Gudeng engineers worked until midnight to help TSMC resolve issues with destroyed machines and equipment. One day, the director of TSMC's sixth factory met Mr. Chiu, praising Gudeng's engineers who took responsibility for repairing not only their own equipment, but also helping them to repair equipment from other manufacturers which were also used at the plant. The director complimented Mr. Chiu; he thought all Gudeng's employees were very different from others. He asked Bill how to educate his employees. That proves the effectiveness from this program again.

In addition, Gudeng has received the national awards since 2006. The prizes range from the "Small and Medium Enterprise Innovation Research Award" to the "2011 National Quality Award." This special training program has made undeniable contributions. As for the National Quality Award, the assessment criteria has eight items, and this special training program may have helped Gudeng to get the extra points in (1) Leadership and Business Philosophy, (5) Human Resources and Knowledge Management, and (8) Business Performance. It also allows the Ministry of Economic Affairs to believe that that adopting this process is precisely what others need. They hope more businesses can follow Gudeng's way to deliver the soul training courses. This is the success of "Meeting with Bill" again!

This kind of service innovation is not technology innovation, not the SOP process, but the spirit change. In a high technology industry, using Chinese Confucian philosophy to train employees may be considered outdated, but Gudeng can prove it really can work. In order to create and sustain a competitive advantage, a company should not only develop technologies to create products and processes that meet customer needs, but also stimulate a corporate culture that commits to continuous performance improvement (Pun, Chin, and Lau, 2000). Ancient Chinese wisdom can do this. It can be the inner culture, and everyone can follow the rule. Gudeng can train their employees to serve their customers with more care, treat their customers like their family, and solve their customers' problems like their own problems, and then, they get amazing performance!

Table 1. The award record of Gudeng Precision Industrial Co., Ltd.

Year	Award
2006	13th Taiwan Small and Medium Enterprises Innovation Award
2007	16th National Award of Outstanding Small and Medium Enterprises in the Taiwan
2007	30th Model For Business Start-up
2008	11th "Rising Star Award of the Ministry of Economic Affairs"
2009	17th Personal Achievement Award for Industrial Technology Advancement Award - Outstandingly Youth Innovation Award
2009	Award by Ministry of Economic Affairs for technology that "uses a specialized process to reduce the introduction of impurities and other contaminates during transit"
2011	18th Taiwan SMEs Innovation Award
2011	21th National Quality Award

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## CASE STUDY 6: A GLOBAL IMPACT SERVICE INNOVATION: THE CASE OF GEOLOGICAL SURVEY ACTIVITY

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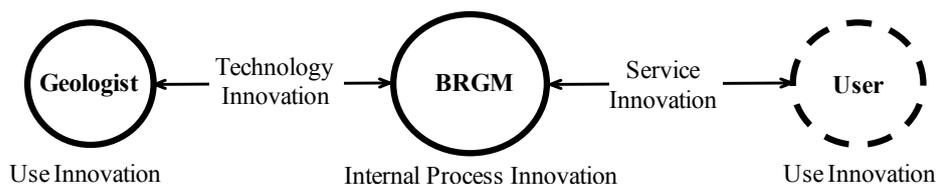
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**Abstract.** This paper presents a case study regarding a service innovation in the field of geological survey. In a context of organizational change and research activities development, the BRGM (the French Geological Survey) called upon Nekoé (the French specialist of service innovation) to identify possible values and develop a complete and complex three levels innovation service (focusing on the use of geologists, the BRGM internal process and the use of its end-customers). Researchers and practitioners from various disciplines worked together to identify the involved dimensions and to design adapted solutions. This paper presents the context, opportunities, innovations and first successes of this real life case study.

**Keywords:** Service innovation, Innovation process, Transdisciplinary approach, ICT-enabled innovation, Performance

### 1. Introduction and Context

This paper presents a current real life case study within the domain of geological survey. It depicts a global impact innovation that has taken into account use and technology dimensions (Fig.1) and that has led researchers and practitioners to work together. This project supports the BRGM (the French Geological Survey) in its commitment to improve its existing services, expand its offering and highlight its research activities.



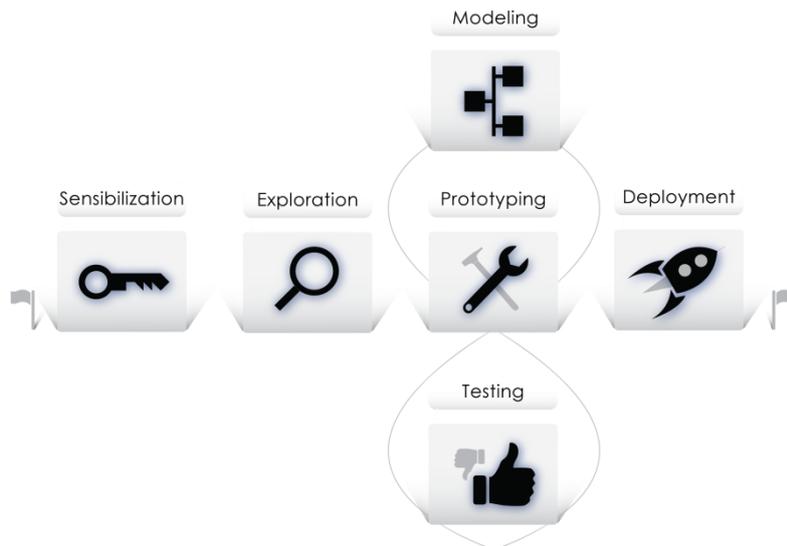
**Fig. 1.** Innovation levels within the case study

As detailed in the following sections, this project is based on three innovation levels (Fig.1). The first two concern the organization and its members (hence the back-office part of the case): (1.) a use innovation based on a new adapted supporting tool for geologists' surveys, (2.) an internal process innovation that was essential for the overall organization change. The third innovation level is based on (3.) a use innovation intended for the BRGM clients through an adapted service offering (hence the front-office part of the case). Level (2) is highly impacted by levels (1) and (3) and designed lastly.

Sections 1.1 and 1.2 introduce our approach and the BRGM case. Section 2 presents the opportunities. Section 3 describes the application of our approach. Section 4 gives some indications about the characterization and measurement of the achieved success.

### “Innovation through services” approach

Our work addresses the overall complexity of the service concept thanks to a user-centered approach, a transdisciplinary team (user experience analysts, designers, computer scientists, strategists, etc.) and a collaborative partnership during the six steps of the methodology (Fig.2).



**Fig. 2.** Nekoe's global support approach

This approach is based on key concepts (service system [1], user experience, etc.) and key theories (services science [2], practice-oriented design [3], etc.) that are not going to be developed in this paper (which is dedicated to the case study). Moreover, we use a very innovative software called Umagus. It has been specified by Nekoé and it aims at supporting the overall process thanks to the industrialization of methods and tools such as personas, blueprints [4][5], etc. Umagus is further presented in Section 3.

### The French Geological Survey (BRGM)

The BRGM is a French public industrial and commercial establishment dedicated to surface, subsurface, resources management, and risks prevention. It is a reference within the field of Earth Sciences. It has recently launched a project to enhance its research, to deploy solutions to facilitate the work of its geologists, to accelerate its processes (by leveraging its researchers' expertise and its geologists' needs) and to think about the evolution of its offering. Its main objectives are to: understand geological processes and associated risks; develop new methodologies and techniques; produce and disseminate relevant high-quality data; develop and provide the necessary tools for surface, subsurface and resource management, pollution risks prevention, and public policies development support. The BRGM provides both public services (to the Government, public institutions or local authorities) and commercial services such as geoscientific expertise or R&D for private companies.

Geologists in the field are key protagonists since they are the largest provider of geological information. Our project focuses on their activity (geological data collection, interpretation and modeling) and on the service in which they are involved (provision of geological mapping and data analysis).

## 2. The Opportunities

A first step has consisted in a series of meetings and workshops to raise awareness and creativity. It helped us to identify the case study's opportunities.

The work of geologists faces important contextual constraints and is mostly done manually. Indeed, a geologist generally goes in the field with a paper notebook, a map, a GPS, an altimeter and some colored pencils. His job consists in transcribing his observations on a map and in accompanying them with structural interpretations in 2D (eg. polarity of layers, layouts and dips of faults, etc.). Then, the overall objective of our project is to rethink the geologists' activities in order to automate them.

This opportunity has led to the development of a numerical tool considering the dimensions of use and service (that are required for the three levels of innovation). To provide at least the same service than the starting solution (with his usual and manual tools), it was necessary to deploy a mobile solution for the collection and management of geological data. This solution should be based on the capabilities of a modeling software of geological data ("3D GeoModeller" owned by the BRGM) that would interpret and model three-dimensional information (from the geologists' observations) in real-time. Geologists would then be able to quickly build and validate geological concepts. It is important to note that, in our project, ICT are only a support to meet geologists' uses and needs. They are a tool for the use innovation that substantially alters the activity of a geologist through industrialization and automation.

Level (2) of innovation has led to a deep reflection about the services offered by the BRGM, based on the geologists' activity. The change involved by level (1) of innovation gives rise to new services opportunities based on geological data and analysis.

The promotion of an ICT-based fields mapping and surveys service seems possible. This service would address various (and international) clients such as public institutions aiming at mapping their territories or private companies aiming at evaluating the soil quality or its resources (eg. oil companies). It would give them a more accurate, complete and timely access to data. This would be a real new way of geological mapping delivery but it requires to review the selling process and to adapt the internal processes. Moreover, it may be interesting to study the potential new users to target (in France but also abroad).

## 3. Innovations Description

To reduce the risk of poor design, we have taken into account three main elements during the design and deployment steps: the technical innovation coherence within the user's environment, the user's innovation learning, and the support of the potential changes within the use environment. The objective is to imagine and create a solution that would be completely adapted to the geologists' activity and context, and that would not be a source of difficulties or rejection. In other words we had to take into account technical as well as use constraints in order to propose an appropriate innovation. Three main steps have been carried out (Fig.4 sums these steps up):

1. An in-situ ergonomic analysis of the geologists' activity: our user experience analyst has observed some geologists working in natural context (Fig.3 on the left). He has noted and characterized their objectives, tasks and tools in order to model their activity. Then he has created a list of recommendations intended for the designers. The deliverables are an online presentation of the ergonomic analysis ("web-documentary") and a complete model of the geologists' ecosystem in terms of actors, objectives, actions and tools ("ecosystem mapping").



**Fig. 3.** In-situ observation (on the left) and mobile solution design (on the right)

2. A design approach based on the fundamental elements of the geologists’ activity: the results of the first step have helped our designers to immerse themselves in the users’ daily life and to ensure a real coherence between the innovation and its application within the use environment. Our designers have realized a prototype based on an ICT solution (Fig.3 on the right, tablet with 3D GeoModeller).
3. The accompaniment of few “pilot / experimental” users: some tests have been conducted by our ergonomist to identify the pain points and ensure the solution’s appropriation by its users. Indeed, it is important to measure, understand and adapt to the changes which are noticeable for use.

Level (1)	Exploration	Modeling	Prototyping	Testing
Actor	Ergonomist	Designer, Strategist	Designer	Ergonomist
Tools	In-situ observation, Interviews	Web-documentary, Ecosystem map	Mobile prototype	Real environment tests
BRGM involvement	Interviews and observation	Workshops	Technical expertise	Test

**Fig. 4.** Management of level (1) of innovation

Levels (2) and (3) are currently in progress. We design the service and impacts on the internal process considering results of the level (1). This phase follows three rules: collaboration, user-centered design and iteration. A key point is to enable collaboration between professions within the organization but also with external partners. The exploration necessarily involves the intervention and the provision of data by different professions, but also the portability of data. Four main stages have been implemented in an iterative way (Fig.5 sums all these stages up and shows actors involved):

1. Exploration: we have conducted various targeted user’s interviews in order to define some users’ profile and build associated personas. The elaboration of these profile and criteria enables to classify clients in terms of uses, and not in terms of commercial or social criteria.
2. Modeling: we have defined the clients’ journeys and interactions, and model the associated blueprints [4]. Personas and experience-oriented blueprints (helping at positioning the client at the heart of the problem) are modeled through Umagus (our services design software). This original tool is helpful in a collaborative design context. Given the fact that the BRGM’s service brings in various professions, the design of back-office is a key step to define its coordination based on a user-centered view, the data journeys and transformations, the interactions, etc.

3. Definition of the concept / proposition: with the BRGM we have co-defined a service of web-based cartography and geological analysis with an ICT support. The concept is the outcome of a creativity workshop, where actors are faced to 4 concepts linked to users' needs.
4. Prototyping and testing: as mentioned in the previous section, we have designed an ICT solution based on an adapted tablet (for every natural context, ie. mountains, oceans, etc.) and the specialized software 3D GeoModeller. Then we prototype the service. Visual prototypes are used: storyboards and mock-ups for example. These prototypes are finally presented to users to get their feedbacks.

Level (2) & (3)	Exploration	Modeling	Prototyping	Testing
Actor	Designer, Strategist	Designer, Strategist	Designer	Ergonomist
Tools	Interviews, creativity	Umagus (Personas, Blueprints, ...)	Storyboards, Mock-ups	Tests of prototypes
BRGM involvement	Creativity workshop	Workshops	Workshops	Validation
End-user	Interviews	Workshops	Workshops	Test

**Fig. 5.** Management of level (2) and (3) of innovation

#### 4.Characterisation and Measure of the Success

The first contribution of this work is linked to the methods, models, tool (Umagus) and innovation process accompaniment we set up. This methodological contribution helps at describing the case study context and at identifying and describing an innovative service. It goes further than a new solution or architecture: it is a key approach in a wider context of organizational change and innovation management.

Moreover, we have noted some impacts on geologists' activity. Even if they have not been quantitatively measured, these impacts seem very positive for both geologists and the BRGM. The main impact is linked to the contribution of the 3D dimension to geologists' work. This dimension and the technological support of 3D GeoModeller offer a great support to data interpretation. It brings precision, transparency, quick analysis and decision-making. It improves the geologists' productivity and the quality of their work. It also enables capitalization and collaboration between actors in the field and actors of the back-office. From the end-customers side, it provides high quality data in real time and available anywhere. It also reduces the risk of poor analysis and interpretations, and the costs of exchanges with the field.

Finally, we plan to measure the success of the overall service innovation. An ongoing work is studying the values of services. It requires the consideration of various dimensions: use, experience, economy, social issue, technology, etc. A complete evaluation that will take into account BRGM's end-customers is planned in order to measure the overall impact.

#### 5. Conclusion

For this case study, we have developed and applied a methodological framework that intends to address issues of a global impact service innovation project. Divided in two phases, the methodology enables us to reach three levels of innovation.

The first phase focused on the use of geologists. It led to specifications for an ICT innovation and great improvement in terms of productivity and quality for geologists. This phase has been

convincing for both actors. The second phase is mostly focused on clients and services delivered by BRGM, and highlights innovation needs on the internal process to provide these services.

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## **CASE STUDY 7: KNOWLEDGE INTENSIVE PROCESSES CHARACTERISTICS AND IMPROVEMENT: A BANKING BEST PRACTICE EXAMPLE**

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**Abstract.** This paper identifies characteristics of knowledge intensive processes and a method to improve their performance based on analysis of investment banking front office processes. The inability to improve these processes using standard process improvement techniques confirmed that much of the process was not codified and depended on tacit knowledge and skills. This led to the use of a semi-structured analysis of the characteristics of the processes via a questionnaire to identify knowledge intensive processes characteristics that adds to existing theory. Further work identified innovative process analysis and change techniques that could generate improvements based on an analysis of their properties and the issue drivers. An improvement methodology was developed to harness a number of techniques that were found to effective in resolving the issue drivers and improving these knowledge intensive processes.

**Keywords:** knowledge intensive process, cognitive demand complexity, interaction density

### **1. Introduction**

Three banking securities front office processes from a major tier one investment bank with 60 thousand staff in over 90 countries were analysed as part of a process improvement exercise using 6 Sigma methodologies. The processes were found difficult to improve.

- a) These processes were not codified, relied on the process users' tacit knowledge of the client requirements and their skill and experience to make decisions/deliver a solution, making process management difficult.
- b) Traditional process mapping was ineffective due to the complexity of options and decisions and the rapid adjustment of the activities as new facts and knowledge was gained and learnt.
- c) Client needs were complex/event driven and processing time and outputs varied widely for apparently similar inputs, making traditional capacity planning and process management difficult.
- d) The expertise of the process actors enabled large incomes/value add to be generated from clients and hence optimising these processes would increase profit.
- e) The process actors were all highly educated and well paid and hence management and retention of staff was critical, especially when the knowledge and expertise was not codified.

The results from 3 case studies [8] have been set in context of KiP research for this paper and additional references have been added since the case studies. Space limitations restrict us to discussion of case 1 only.

## 2. The Opportunity

The opportunity enabled analysis/understanding of knowledge processes and to develop process improvement techniques as part of a reengineering of front office processes using 6 Sigma Methods. Each problem was identified by a problem statement (P) of the issue and a metric M for the size of the problem and a related set of issue drivers Id that relate to the issue ie: P is a function of (issue, issue metric M), and P is a function of (issue drivers Id).

### Portfolio Trading Case: Productivity Improvement

A portfolio trade is a mixed group of equities (eg telecoms, banking and pharmaceutical stocks) held by a client which are bought and sold. The trading process is split between sales trader/ portfolio trader and covers 6 key activities each with a range of tasks. The Case 1 problem was to improve productivity in terms of portfolios traded per trader by 20% given staff cutbacks. ie P1 is a function of (increase productivity by 20%, (M = portfolios traded/trader)). Also P1 is a function of (issue drivers) and (workload event complexity , capacity to do work)

### Knowledge Intensive Processes

Remus', cited in [2], defined 3 types of knowledge intensive process a) Processes relying on knowledge to add value b) Processes combining different knowledge activities (creating and distributing knowledge) c) Knowledge management processes (trying to improve knowledge). The processes analysed were found to be of type a), relying heavily on human knowledge to add value to the client. These can now be classified as knowledge intensive processes (KiP) which we defined as a sequence of intellectual activities involving higher cognitive levels of analysis, pattern recognition, design and judgment that converts unstructured and poorly defined inputs into well-defined and often original and value adding creative outputs [8] Examples include; analysis and problem solving of unstructured problems (eg surgeons, engineers, legal) creative product, process, software design [4]. Adapting Gronau's terminology, a knowledge intensive process has activities and tasks that are carried out by process actors which add value through their tacit knowledge and skills and use and produce knowledge artifacts [2]. Knowledge objects represent explicit knowledge eg trading conditions/share prices, to drive knowledge activities [3].

## 3. Description of the Innovation

There is a three stage process innovation:

- a) methods of identifying KiP process/activities,
- b) aggregation of the factors vs. the reported problems to develop 4 technique themes to resolve them based on the cases
- c) integration of the techniques into a general methodology for improvement of KiPs.

### Method of Identifying Kip Processes and Activities

A detailed input-process-output analysis was carried out using semi-structured interviews [11] of process users for each of the processes and a comparison made with users of operational transaction processes that had been improved by 6 Sigma methods. Eight key characteristics were defined for the processes [8], later extended to 10, based on literature relating to KiPs to support the findings, as figure 1.

**Table 1.** Kip Factor Comparison Analysis

Ref	Factor	Value	Knowledge Intensive Processes (KiP)	Value	Operational/Transaction Processes
1	Process driver/Work content	Event driven	Client event inputs, processing options and output are not very predictable	Predictable	Client event inputs, processing options and output are predictable
2	Knowledge type	Tacit	Work processes dependent on tacit knowledge built from experience	Explicit	Work processes can be codified into explicit procedures and knowledge
3	Activity Cognitive Level (Bloom)	High 3+	Activities involves higher level cognitive tasks eg problem solving, creativity	Low	Activities involve basic level cognitive tasks eg comparison, observation etc
4	Process/ Activity Decisions	Multi-variable	Decision making via extensive analytical and creative judgements dependent on multiple variables	Few variables	Simple rule based with few variables
5	Problem Type	III	Problems are typically type III goals unstructured/ outcomes clear	I	Problems are simple type 1 with known inputs/solutions
6	Activity Complexity	High	High complexity activities with multiple variables	Low	Low complexity activities broken into to rule based tasks
7	Process change and Learning	Fast	Rapid learning and tacit knowledge growth with adjustments to process & new activities	Low	Little or slow learning and adjustment of process
8	Workload demand/response	Non-linear	Work inputs and workload are non linear (client and activity affected)	Linear	Work inputs generally increases linearly with number of clients
9	Actor Role	Problem solver	Human as expert problem solver and developer of the process and rules	Operator	Human as operator of a codified rules based process
10	Skill level	Highly skilled	professional and advanced degree level experience requiring extensive training	Low levels	Basic skills due to rules focused activities

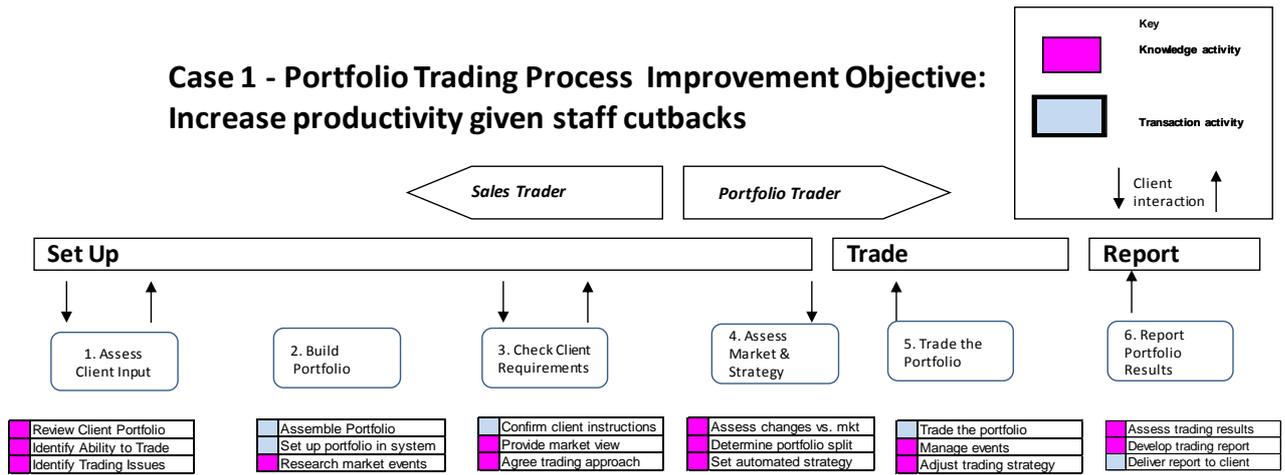
### 3. KiP Analysis Methodology

The survey showed that much of the knowledge of what to do and the rules of the process are tacit knowledge, requiring highly skilled and intelligent process actors and hence they are high cost [2]. These processes, KiPs, are also difficult to manage due to need to develop the cognitive skills and 'on the job' experience and have high entry barriers due to the need for individuals able to use the highest cognitive/intellectual skills eg high pressure securities trading. The event driven input and problem solving focus results in activity time and complexity variations and complex workload management. Process task and output variation means that normal 6 sigma and other operational methods of controlling variation cannot easily be applied as central tendencies and standard deviations of the outputs are not readily defined outputs [2]. Processes vary as demands/events rapidly change, new knowledge is applied altering the process sequence, and complicating standardization/automation. The need to learn and adjust the process makes it difficult to retain/disseminate the knowledge. Mapping the factors to the issues reported earlier results in four key themes.

- a) KiP Process Activity Analysis (3,4) - how to identify value adding knowledge activities, manage the process consistency and knowledge to ensure value added client focused activities given the lack of process codification in (i)?
- b) Workload Analysis (1,5,6,8). - how to identify event driven client demands and their complexity and process routes as in (iii)?
- c) Process Knowledge analysis (2,7) - how to recognise and capture process knowledge and manage the variation in process activities and decision making in (ii)? Knowledge Actor Analysis (9,10) - how to allocate knowledge/skills and dissemination of tacit knowledge to the knowledge actors?

#### Theme 1: KiP Activity Analysis

The 10 factor analysis above was used to identify the three KiP processes for the case study. However, no one process will be purely knowledge driven but perhaps a major proportion of the work activities and tasks will be knowledge intensive tasks and it is these tasks that involve the tacit knowledge, unpredictability and variation that differentiate the KiP from traditional rule based transaction processes. Knowledge intensive tasks were differentiated from operational tasks by questioning process actors using Bloom's categorisation of lower and higher level cognitive tasks, with knowledge intensive tasks defined as tasks involving the higher cognitive levels 4,5,6 [7], as seen in figure 2.



**Fig.1.** Case 1 KiP Activity Analysis

In Case 1 the Portfolio Share Trading Process - below 50% of the process by number of activities were knowledge intensive activities vs. transaction activities.

**Theme 2: Workload Complexity and Driver Analysis**

Knowledge processes focus on higher cognitive levels of analysis and problem solving and are best suited to solving poorly structured and unpredictable problems often driven by events. Part of the KiP capability is to provide structure to the problem, analyse and solve it via actor knowledge and experience. In a KiP the client requirements are translated into deliverables where value is created by applying the higher level cognitive skills to solve client problems and creating new knowledge. Therefore the workload will depend on what we call the ‘intellectual complexity’ of the client demand in terms of the cognitive level of the tasks driven by the client. For example ‘create a new way to trade my portfolio’ would be level 5 [7]. For knowledge tasks with many unknowns, the client and the KiP actor interaction may be frequent involving additional questions/new cognitive demands. We therefore need to define the density of the client cognitive interaction measured by the duration of the contacts/intensity of cognitive demands. Hence workload is a function of (cog. demand complexity, interaction density). The capacity to meet the client cognitive workload for KiPs is dependent on the capability of the process actors using existing and creating new, knowledge and packaging results into added value knowledge artifacts. However KiPs are rarely differentiated and are often a mix of knowledge activities and operational/lower cognitive level activities. Hence capacity will also depend on the time available to focus on the value adding knowledge activities. Understanding how the complexity of client requests drive task and what drives capacity is a key element in developing a methodology that improves KiPs. Our research suggests two levels of event driver.

In case 1 the issue of trader productivity was directly correlated to the issue drivers. Traders were asked to differentiate the complexity of the client demands and the impact on their workload. They identified low complexity, simple or vanilla client instructions to trade a portfolio eg sell at highest prices vs. complex trades where there were multiple client instructions eg sell x shares at prices y, z shares at any price etc. 60% of the input trade portfolios were simple client demands and processing (eg setting up a trade portfolio) and on average take 17% of the time, but were 50% of process activities. The remainder were complex activities (eg trading a portfolio) taking 83% of the time. Client input strategies eg number and complexity of trading instructions and instruction timing were also a driver with some clients waiting to the end of the day near market close to request a portfolio trade and hence further increasing the workload. Unpredictable environmental events can also impact KiPs [6]. Market trading events were found to be a productivity issue driver and distorted the workload by extending the time taken to sell portfolios. For example market trading conditions

rapidly changing may result in the need for a trader to take over manually from an automatically processed trade as he uses his skills and knowledge to make sense of unusual market conditions. We need to model the impact of external events beyond actor control will have on capacity. However, the multivariable complexity of the problem means that linear models won't work and hence a best case/worse case updated by experience was found to work best in the absence of more detailed simulation as illustrated below.

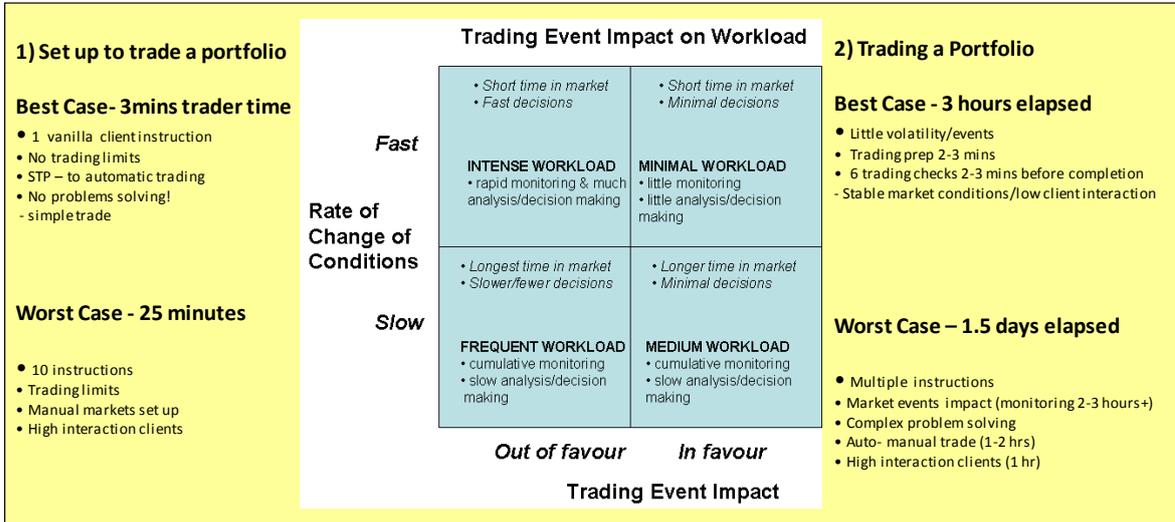


Fig.2. Event Drivers: Case 1

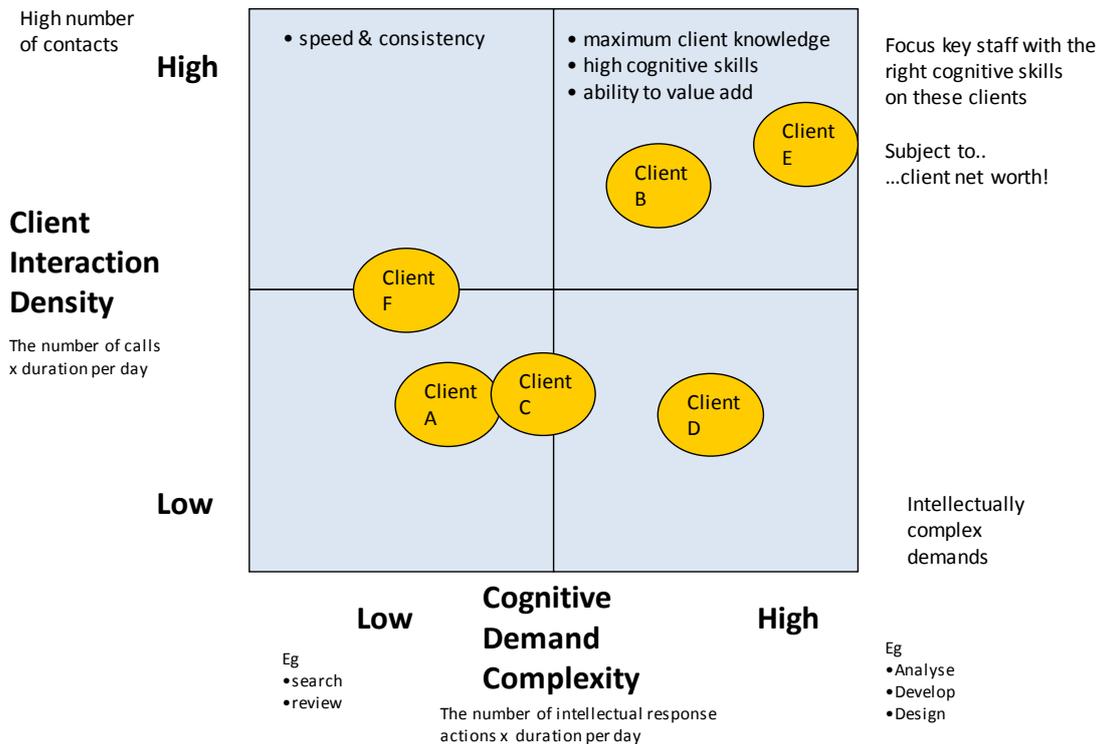


Fig.3. Client Demand vs Workload: Interaction Demand Complexity

**Theme 3: Process Knowledge Analysis**

In KiPs knowledge and skills are bound to the individual as tacit knowledge [2] enabling the process actors to add value, in contrast to a transaction process where rules and procedures are mainly codified and operators use rules at lower cognitive levels. Adopting Gronau's personalisation

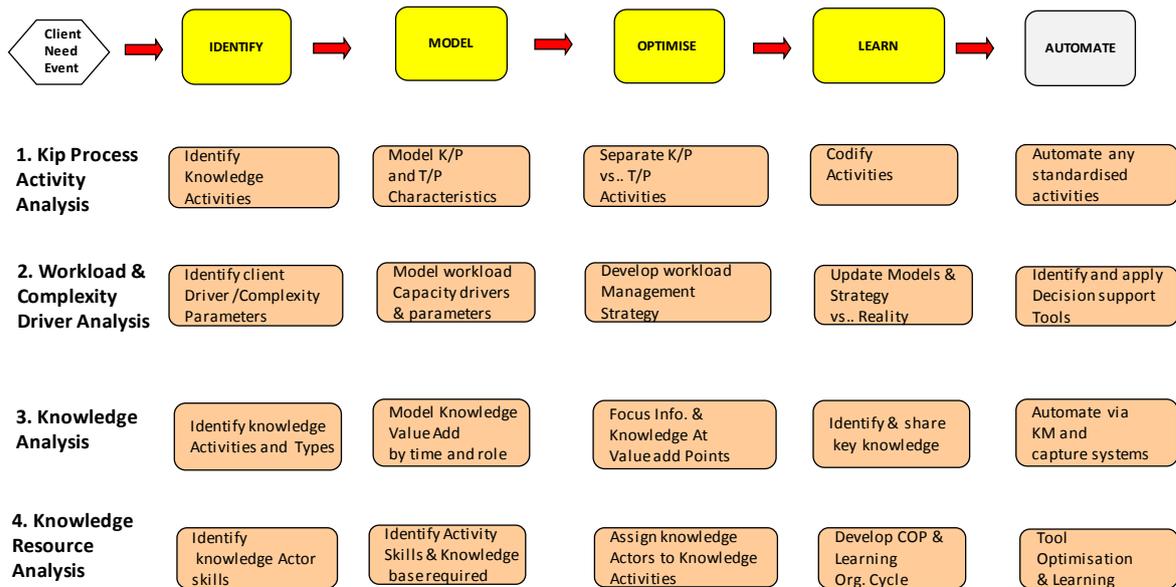
approach we need to identify the places where knowledge is created in two steps. Firstly 'Knowledge Types': Having identified the knowledge activities earlier we questioned users to identify the types of knowledge for these activities based on the work of Anderson and Krathwohl [7]. Process users were asked to identify the type of knowledge used vs. the cognitive activity levels applied to determine the type of knowledge required and the activity complexity. Secondly, 'Value Analysis': Critical knowledge creating activities are found by value analysis of client deliverables identified in the workload section. For case1, activities 1-6, the knowledge object [3] input by the client is a portfolio of shares and return on investment requirements that ideally results in value added by the process ie shares traded meet requirements and a client report. Tacit knowledge is created in the traders based on their experience of the trading and in learning and deciding the trading activities and any new actions resulting from their trading.

#### **Theme 4: Knowledge Resource Analysis**

This analysis identified which roles should execute particular activities and what knowledge/skills are to be disseminated in two steps: a) assign the Right Knowledge actors: Marjanovic asserts the value in a knowledge intensive process lies in the knowledge/skills of the KiP actors [1]. Having identified the value adding knowledge activities and workload capacity drivers we need to focus the right knowledge actors with the right knowledge and skills to the knowledge tasks and roles that maximise client benefit. Mismatches between activities and level of cognitive skills will reduce efficiency/effectiveness and reduce productivity and customer service quality. b) Grow, Share and Disseminate Knowledge: It is important to capture and share new knowledge created in Kips, either stored as tacit knowledge or applied to develop new tasks and knowledge processing techniques.

#### **4. Methodology: KiP Improvement Method**

The methodology uses four analysis themes representing horizontal views and 5 sequential vertical time stages. The methodology elements were validated through feedback from both knowledge actors in the three cases and process improvement practitioners [5]. In case 1, as 60% of the trades are simple and take 17%, of the time, productivity improvements must focus on complex trade types and their drivers. Workload driver analysis identified that client input complexity varied significantly by client type and market events greatly distorted the workload. Some markets are manual and require more manual low level cognitive processing reducing time available for complex client problems. Some customers wait to end of day for trading, often increasing the workload on junior traders, as the work complexity is not understood and allocated based on skills/demand. Process knowledge analysis identified that the complex trades required more skilled actors, but there was no differentiation between actors allocated to the trades. Actor analysis identified that much of the client critical knowledge resided in only a few of the actors with minimal knowledge transfer and that Client needs/thoughts were not always captured, resulting in unnecessary and unproductive rework to recapture the information.



**Fig.4.** KIPIM - Knowledge Intensive Process Improvement Method

Workload modeling enabled complex vs. simple client demands to be understood and routed to the most able knowledge actors. Knowledge actor analysis identified which actors had the skills to process the complex client demands. Meetings were agreed to identify key skills, develop, share them and cross train actors. The result was approximately 300% improvement in actor productivity, of which technology was estimated to provide 75% of this improvement through the use of decision support tools automating activities of loading and creating the portfolio of shares, releasing more time to focus on knowledge activities.

## 5. Conclusion

This paper has described the analysis of an example knowledge intensive process as part of 3 case studies and identified factors that enable their identification. The characteristics and problems of this process type were analysed and methods that enable improvement where traditional methods have failed have been identified and developed into a methodology. This has demonstrated significant improvements to two of the cases and vindicated the existing understanding of the type of knowledge intensive process and its best practice management in the third.

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## CASE STUDY 8: OPPORTUNITIES AND CHALLENGES IN FINANCIAL MARKETS INTEGRATION: THE MILA CASE

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### 1. Background

On September 2009, three Latin-American stock markets and their respective Central Securities Depositories (CSDs) signed an agreement with the intention of establishing a model for the integration of their equity markets. The Latin-American Integrated Market (MILA) which was formed as a result, allows brokers in Colombia, Peru and Chile to trade securities listed on any of the exchanges directly from their local terminals alongside the locally listed stocks. MILA is offering services for negotiation, compensation, liquidation and intermediation of trades and it is the second largest market in the region in terms of capitalization after Brazil and the largest in terms of number of potential issuers. The first phase of the integration was completed on November 2010 and the CSDs of the different countries were admitted as valid deposit holders preparing the provision of trading services for the parties. This required changes to existing services for the various CSDs, which includes custody of securities, register of transactions, liquidation of transactions, capital events, and issue of certificates of custody. On May 30th of 2011, MILA was officially open for business. Since its launch 50% of trades correspond to transactions in Colombian equity securities, 49% correspond to transactions in Chilean equity securities, and 1% in Peruvian equity securities [1].

The initiative was born out of the need of offering competitive trading services for investors that seek to trade easily across emerging markets, as well as, to respond to the need for high frequency trading. These platforms decrease latency, the speed at what transactions are made, and increase the volume of trade at competitive costs. Furthermore, the integration provides the potential to attract external investment, as well as, helping to defend their competitive position due to the increased popularity of the Latin-American market, as evidenced by recent interest of foreign exchanges to operate in the region [2]

### 2. The Opportunity

The opportunity arose when the Chief Information Officers (CIOs) of the respective stock markets began looking at ways to standardize trading platforms and decided to invest on technology that was compatible with other trading platforms around the world. Following the decision to use the FIX 4.4 protocol [3], the CIOs decided to explore the opportunity to leverage their platforms by proposing the creation of an integrated market. According to Jitendra Puri, CIO of Bolsa de Valores de Colombia *"Since FIX is the de facto standard in the capital markets industry, we adopted it in MILA for the following two reasons, first, to leverage global best practices while reducing the overall technical effort involved in an integration of such magnitude, and second, adhering to a widespread industry standard opens new business opportunities and facilitates a decrease in time to market of new products."* [3]

This new infrastructure opened the possibility for global investors to access the Andean region, one that is perceived as politically stable and with a positive outlook for growth in the coming years [4]. Furthermore, the new infrastructure enables customer service improvements, cost cuttings, and compliance for financial institutions. It is expected that the integrated market will become an attractive platform for issuers wishing to raise capital, since it is now easier to access funding from all countries in the network. For brokerage firms, MILA brings further opportunities given that the integration fosters competition and increases the potential services that can be provided to customers. Moreover, gives them the opportunity to strengthen their technology and to adopt international standards of trading. **Table 1** presents a brief description of the opportunities and benefits of the integrated market:

**Table 2.** Opportunities and Benefits of MILA

<b>For Investors</b>	
<ul style="list-style-type: none"> <li>• More choices of financial instruments extending the possibilities of diversification</li> <li>• Better risk-return balance</li> <li>• Ability to create new portfolios for distribution to local customers</li> </ul>	<p>MILA has a combined market capitalization of \$705,857 million in March 2012 [5]. MILA also lists just over 550 companies—the largest number in Latin America. While it is second largest in terms of capitalisation after Brazil BM&amp;FBOVESPAs, it nonetheless creates a regional option for large-scale investment, positioning MILA as an attractive alternative to Brazil's market and Mexico's BMV exchange [6]. As a result of the integration MILA will have a lower correlation with world indexes, such as the Morgan Stanley Capital International (MSCI) index, than either the Brazilian or Mexican markets, meaning a greater level of diversification for portfolios [4]</p>
<b>For Issuers</b>	
<ul style="list-style-type: none"> <li>• Access to a wider market</li> <li>• Expanding demand for their own financing by attracting the interest of more investors</li> <li>• Reduced capital costs for companies</li> </ul>	<p>Smaller firms and those traditionally outside popular economic sectors could benefit by accessing a wider audience of potential investors. Also, in MILA, each market has its own complementary investment niche, with Chile focusing on the retail, banking, and service sectors; Peru on mining, construction, and raw materials; and Colombia on the financial and energy sectors [7]. According to [8], the combined exchange can <i>“offer investors the advantages of economies of both scale and scope. Issuers and investors from the three countries will receive a higher aggregate value in financing terms without increasing transaction costs.”</i></p>
<b>For Intermediaries</b>	
<ul style="list-style-type: none"> <li>• Integration promotes the stock markets to be more attractive and competitive</li> <li>• Increases the range of products for distribution to its customers and enables the creation of new investment vehicles</li> <li>• Strengthening in technology and adoption of international standards</li> </ul>	<p>The MILA integration will not increase the intermediaries costs of trading. This in turn fosters the creation of new products and services like <a href="#">S&amp;P MILA 40</a> designed to provide exposure to the largest and most liquid stocks trading on the MILA. By 1st of March 2012, ten months after MILA started, eight new mutual funds have attracted over US\$ 56 million [5]</p> <p>In terms of technological innovations and adoption of international standards, MILA opted for FIX version 4.4, an open source standard for messaging and trading. According to Fix Protocol Limited, (FPL), the non-profit organization that owns the intellectual property rights to the protocol, FIX adoption offers significant cost savings and efficiency gains by connecting firms to trading partners both domestically and across geographic borders in a standardized and cost effective manner by minimizing switching costs. By offering FIX connectivity, MILA makes it easier for overseas investors to invest in equities in three of the fastest growing Latin American economies [3]</p>

In summary, the opportunities consider new products and services to be offered by brokers, stock markets, depositaries trusts, and investments companies. Moreover, integration will help to reduce transaction costs and increase the number of products, improving the opportunities for diversification of investors. In terms of competitive advantage, the integration will help strengthening the position both globally and regionally.

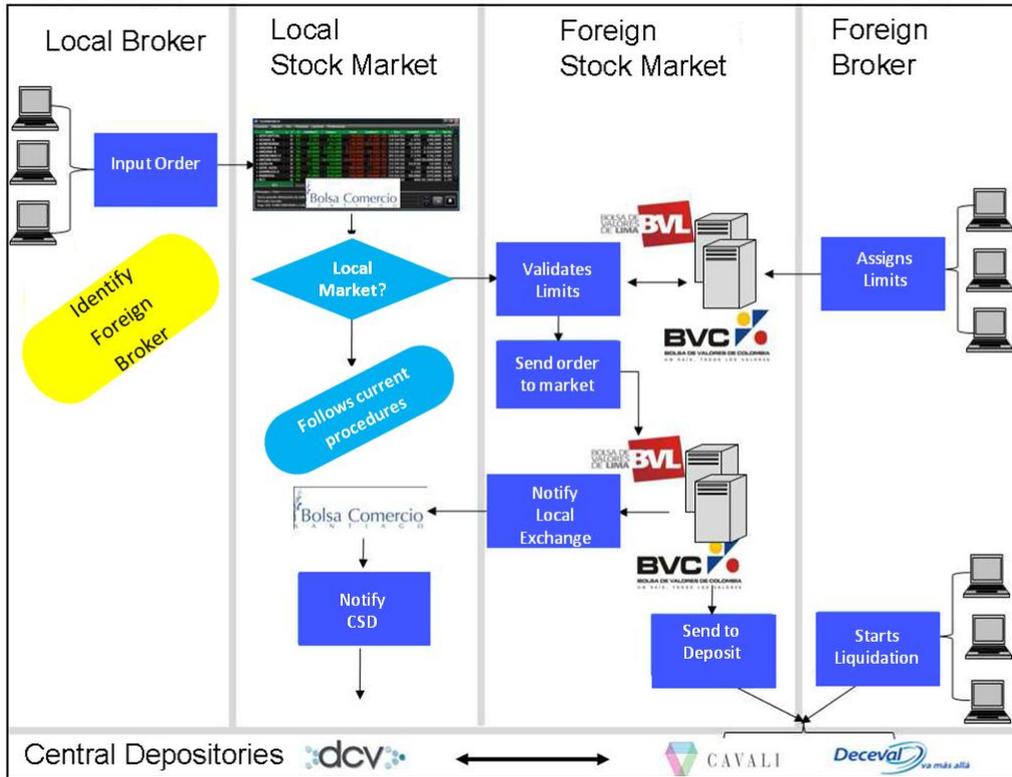
### 3. Description of the Innovation

The description of the innovation is based on the official documentation of MILA-Bolsa de Santiago [9]. Thanks to the integration of the stock markets: Bolsa de Valores de Colombia (BVC), Bolsa de Valores de Lima (BVL) and Bolsa de Comercio de Santiago (BCS), and of the corresponding depositary trusts or CSDs: Depósito Centralizado de Valores de Colombia (DECEVAL), Caja de Valores de Lima (CAVALI) and Depósito Central de Valores de Chile (DCV), local brokers are able to negotiate securities listed on these foreign exchanges directly from their terminals. For this to happen, first it was necessary to establish the MILA framework agreement and allow foreign securities to be registered with local regulators under the sponsorship of the local exchange. The MILA agreement established a federated market where orders to buy or sell are routed to the market in which securities were originally listed using the local currency. All foreign securities accessed in this way are under the supervision of the local authorities and of the legal frameworks applicable for these purposes. The mechanism for trading requires that local brokers open reciprocal accounts with foreign brokers, and that each stock market manages the orders received following its own procedures and regulations. Supervision of these trades is the responsibility of the regulator in which the respective security or issuer is registered, whereas trading, liquidation and differences for exchange rates are the responsibility of the local broker with which the securities are traded. **Table 2** summarizes the main aspects of the MILA agreement.

Table 3. MILA Agreement

Negotiation	Routing and matching of orders under local rules Integrated and extended trading terminal for brokers/payment and cash-in
Compensation	Responsibility lies with local intermediary/broker Omnibus accounts held at the local CSD under the name of the investor
Intermediaries	Different range of services and services levels agreements
Securities and Issuers	To be recognized reciprocally as valid public offered instruments and issuers
Institutional Investors	Are recognized reciprocally as valid investors
Surveillance, Monitoring	To be done locally by stock market following local rules
Regulators	Enforce and monitor local markets following local standards and rules; MOUs are used to share information about securities, investors, issuers and intermediaries

In terms of technology implementation, and how IT enabled trading services are provided, local brokers inputs their orders to buy or sell using a specially designed terminal. When the order is received, this is immediately sent to the respective foreign exchange. Once the order is matched, a notification is sent to the respective local CSD and foreign CSD. The local broker will then finalise the trade with its foreign counterpart agreeing the method of payment and currency exchange procedures. Securities traded will remain physically located in the depositary trust in which the securities are listed. The local CSD, through a local holding account, will guarantee to the local broker the holding and custody of the securities assigning them to the local broker account and allowing them to obtain certificates and reports of holdings and ownership rights. **Fig. 1.** presents an example of the workflow for a Chilean broker sending orders to trade securities listed in Peru or Colombia, i.e. workflow of trading services.



**Fig. 1** Chilean broker sending orders for trade to MILA exchange (securities in Peru or Colombia)

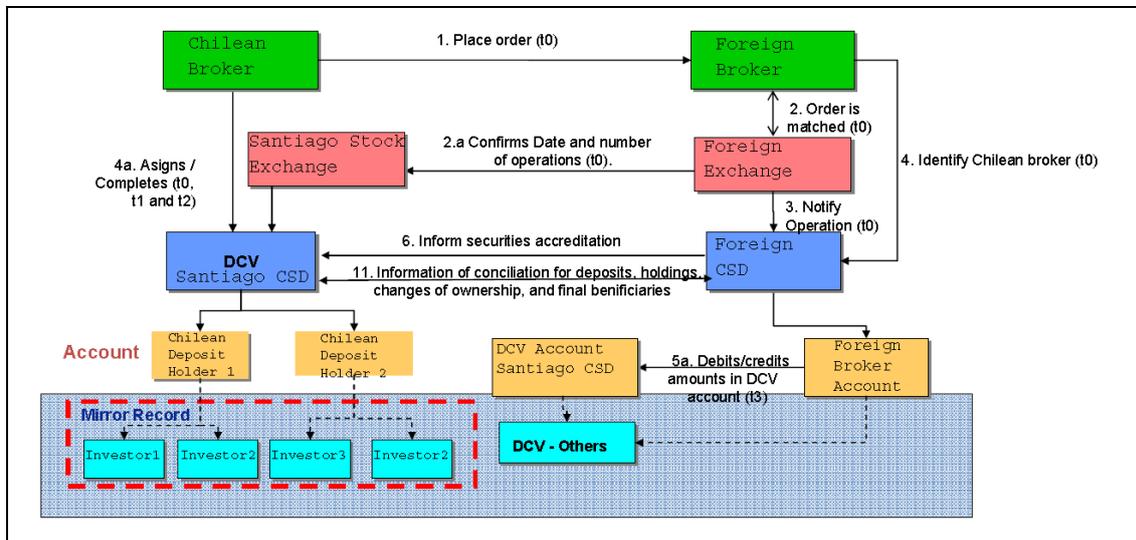
In terms of visualization of trading, MILA implemented different views that are accessible for brokers in their respective terminals. **Fig. 2.** left panel, for example, follows a colour coding indicating the period of negotiation in which the security is currently being trade. Red indicates the security is suspended for trading and orders are not allowed at this moment. Yellow indicates that the security is currently in an open auction, i.e. orders can be sent, modified or eliminated, but no automatic matching of orders is taking place. Green indicates the security is under a continuous negotiation or matching period (automatic matching of compatible orders)

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**Fig. 2** Terminal Visualization for Best Offers

**Fig. 2** right panel, shows how columns 'Bolsa' (exchange) and 'Moneda' (currency) indicates quickly to the local brokers where and in what currency securities are traded. Furthermore the systems include components that allow customers to view permissions and limits assignment management. In this, users with customer management rights can allow or disallow local operators to trade with foreign brokers, also assigning, if necessary, maximum limits for trading and the periods for which

these limits are valid. Finally **Fig. 3** presents the workflow for the provision of depositary services for a typical trade started by a Chilean Broker. In the figure it is possible to appreciate the steps for confirmation, double registration of trades (mirror records) and flows of information as required by counterparties and regulators.



**Fig. 3.** Depositary trusts services. Workflow: Chilean Broker selling to Foreign Broker

#### 4. How is Success Measured?

It is possible to identify different dimensions in which success can be measured. From a financial markets point of view, measurements of efficiency and integrity are regarded as the most relevant, the former describing the condition where all traders have the ability to transact easily and at low costs; whereas the latter describes the ability to transact in a fair and informed market where prices reflect all publicly available information [10]. In terms of efficiency, latency, bid-ask spread, liquidity, volatility and number of trades can be regarded as key indicators of performance. In terms of integrity, indicators such as the number and type of market manipulations, the number and type of MOUs between regulators, and the incidence of errors (both human and machine made) are relevant indicators. From a business model point of view, several other indicators are appropriate, such as revenue model, return of investment, total volume of trades, number of listed companies, total market capitalisation, number of products and services offered, number of Initial Public Offerings (IPOs), number of agreements between local and foreign brokers, new trades and agreements with overseas markets and investors, and other macroeconomic indicators, such as, amount of foreign investment and the impact of the currency exchange rates. From a service point of view, other measurements can be considered, including service quality in both its quantitative and qualitative dimensions. Using SERVQUAL or Service Dominant Logic [11–13] perspectives for analysis, service quality can be measured on reliability, assurance, tangibility, empathy, and responsiveness [14] and on the different value that is created for stakeholders during the service provision, including value co-created [12], value in-use [15], value in-social-context [16, 17], and on the performance of resources across the value co-creation process [18].

#### 5. What Success has been Achieved to Date?

Although it is still very early to be definitive on the level of success of the initiative, it is possible to assert that the integration has shown positive signs towards greater achievements in the near future. Considering that the market was launched during a global market slowdown, and close to the period of elections of the Peruvian president, MILA has managed to attract considerable attention and volume of trades. As mentioned above, MILA has a combined market capitalization of \$705,857

million in March 2012 [5]. MILA also lists just over 550 companies [5]. From its launch on May 30th of 2011, to the last trading day of the year, the total value traded in MILA reached USD \$ 15,5m, and there were 16 IPOS raising US\$8.756m [1]. Also, there were 39 agreements in place between brokers of the three participating countries and the total number of transactions executed through the MILA infrastructure came to 611 trades [1]. One clear sign of the success of MILA is also the agreement of intent on the merger with Mexico's BMV Exchange. This is planned to be implemented in the near future and will result in MILA raising its market capitalization to USD \$1 trillion [7].

In terms of market efficiency, although there are no official figures released as of now, it is expected to result in a reduction in volatility and increased liquidity, which will help to reduce costs of trading and bid-ask, spreads [19]. Also, comparison of MILA with other indices shows less volatility. Using returns from 2002 to 2008, MILA has an annualized standard deviation of 17% compared with the MSCI LatAm (33%) and the MSCI World (21%) [8]. In terms of market integrity and service quality, there is still a need to investigate and measure these dimensions, as these are important key performance indicators. Furthermore, cross-border trading introduces special challenges relating to various aspects of market monitoring and surveillance including high frequency trading scenarios, regulatory frameworks and data sharing aspects. This is something that would be important to address in the future, not only for MILA but also for all integrated markets.

## 6. Future Challenges

The future challenges include the need to expand the confidence of the market participants in MILA and encourage closer collaboration among members, moving from a federated approach to a fully integrated market. This could help implement a more uniform trading environment and a region-standard regulatory framework. MILA should also be able to take advantage from opportunities to grow through providing a wider range of market data offerings and related trading services, while continuing to extend the reach of order routing services that it offers across the region [20]. This should happen together with closer collaboration between regulators, and within an appropriate regulatory framework that considers the cross-border challenges explicitly. Furthermore, there could be opportunities for closer economic and political ties among Mexico, Peru, Chile and Colombia – and potentially others – that would further ease access to their capital markets. This could also include further links with the Brazil Exchange and with international firms that want to access Latin America using high frequency platforms [20]. Finally, further challenges include the possible expansion of trading services to other securities such as fixed income and derivatives.

## 7. Links to further information

MILA Official Website: [mercadointegrado.com](http://mercadointegrado.com)

Bolsa de Comercio de Colombia: [www.bvc.com.co](http://www.bvc.com.co)

Bolsa de Valores de Lima: [www.bvl.com.pe](http://www.bvl.com.pe)

Bolsa de Comercio de Santiago: [www.bolsadesantiago.com](http://www.bolsadesantiago.com)

Depósito Centralizado de Valores de Colombia: [www.deceval.com.co](http://www.deceval.com.co)

Depósito Central de Valores de Chile: [www.dcv.cl](http://www.dcv.cl)

Caja de Valores de Lima: [www.cavali.com.pe](http://www.cavali.com.pe)

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