Revitalising business

Professors Raymond Levitt and Kim Wikstrom and Dr Ashby Monk seek to demonstrate how effective cooperation in the supply chain can diffuse innovation in mature industries. They explain how the value of infrastructure modernisation is being realised through mutually beneficial investor partnerships.

Why might it be worthwhile for a mature industry to give thought to modular versus integral innovation?

RL: In mature industries, the ‘system architecture’ of the product or service – the specification of each key component’s function and its interfaces with other components – is becoming ever more standardised and rigid. Its supply chain therefore tends to fragment, as specialised external firms can more efficiently produce and enhance components than the original developer.

Innovations to individual modules that align with the system architecture, and as such do not affect the specification or assembly process of any other modules, are called ‘modular innovations’. These can be easily adopted and diffused through the supply chain – like a faster microprocessor. In contrast, innovations to individual modules that require matching changes in the specifications or installation process for other modules, such as touch-screen tablet computers, are known as ‘integral innovations’. These are generally much more difficult to adopt and diffuse.

Managers in mature industries should be cautious about approving the integral innovations of their supply chain partners, unless they can commit substantial coordination resources to ensuring that the innovative module can be installed and operated with existing or co-modified interfacing modules. Successfully adopting and diffusing an integral innovation often requires the original developer or groups of component manufacturers to re integrates the supply chain legally by merger and acquisition, or virtually through alliance contracting.

Recently, buildings were reported to consume 40 per cent of all energy in the US, 30 per cent of which was wasteful. Has this picture improved?

RL: In developed economies, most of the existing building stock is old and was never built with energy efficiency as an important objective. The challenge of retrofitting to enhance energy efficiency is that the building owner seldom reaps the savings, since utility bills are often paid by tenants according to the fraction of the total building area they occupy, rather than their actual use. This ‘broken agency’ problem impacts many areas of energy efficiency, but is especially acute in commercial buildings. As energy prices increase and efficiency awareness goes up, third parties are stepping in as financial arbitrageurs of the potential profits that can be incurred. Solar City in the US is one such example.

You identify the shipping industry as requiring an infrastructure makeover. Where might interventions be required?

KW: Current regulatory frameworks hamper sustainable business development and innovation. The industry needs restructuring to become an integral part of the logistical ecosystems of which it is part. Higher utilisation of capacity (eg. replacing land transport), new technology and fuel types would reduce emissions and, in turn, environmental pollution. The number of actors must be reduced, and innovations across the entire supply chain – especially in information management – need to be developed.

Why do you believe the shipping industry has potential for an ecosystem makeover?

KW: Mainly because it is lagging behind other transport industries in efficiency and innovation, and has enormous potential to impact sustainability in supply chains. Both short-sea and global container shipping are of growing importance to society. Connecting with inland water transportation would open up significant innovations and renewables in supply chains.

How is financing of civil and social infrastructure assets changing?

AM: Suboptimal access points and governance structures tend to intermediate institutional investors from such long-term alternative assets. Over the past few decades, the external fund managers investing in infrastructure have enjoyed a disproportionate share of the economic returns created in these illiquid markets. Therefore many long-term investors, such as insurance companies, pension funds, sovereign wealth funds, endowments, foundations and family offices, have begun reconsidering the way in which they access these assets. Some funds have launched in-house teams that invest in infrastructure directly. Others, however, face serious challenges in building that kind of internal expertise. So most investors are seeking to re-intermediate their investments in the domain of infrastructure, and work with more aligned, external agents rather than pursue pure disintermediation.

RL: We are seeing an increasing trend towards delivering many kinds of civil infrastructure as a long-term service. Public-private partnership, or P3, consortia of private firms self-finance and deliver infrastructure services to governments and their users as a 25-50 year service, rather than delivering infrastructure products to the government to operate and maintain. Thus, P3s eliminate a great deal of the inefficiency and broken agency that exists with traditional, design-bid-build infrastructure procurement.
Research on governance of investments in real assets, such as infrastructure or cargo ships, is currently underway at the Global Projects Center at Stanford University and Åbo Akademi University. The research points to a need for re-architecting the Finnish cargo shipping industry at the business ecosystem scale.

**The Baltic Sea** coastline of Finland is dotted with about 40 ports – the legacy of one thousand years of Finnish seafaring and trade. Together, they process nearly 90 per cent of all foreign trade and represent infrastructure assets amounting to hundreds of millions of euros. Previously, these ports were largely owned by and funded through the municipality they served. However, regulations changed this year and formerly municipal ports became limited companies. Apart from making each one financially self-sufficient, the change is designed to foster competition.

This year also saw the EU Sulphur Directive come into force for the Baltic and North Seas, in order to protect fragile marine environments and limit sulphur oxide emissions into the air from marine fuels. Shipping companies operating in these areas have had to switch to new fuels, like marine gas oil, or take technical measures, such as installing scrubbers on their ships, which has led to a ‘sulphur surcharge’ on freight costs to recoup some of the costs of ‘green investment’. “The same directive will come into force globally within five years, meaning pilot activities within this area have huge potential for business opportunities,” explains Dr Kim Wikström, Professor of Industrial Management at Åbo Akademi University, Finland.

Finland’s shipping infrastructure is significantly underused, on average only reaching 70 per cent utilisation. In addition, ships can be left in ports up to 40 per cent of the time. Apart from representing poor investment management, this adds to the local environmental burden. It is against this backdrop that Wikström has recently analysed the logistics business ecosystem of Finnish ports, in collaboration with colleagues from Stanford University, USA.

**Growing investments through cooperation**

Wikström, Professor Raymond Levitt, Dr Ashby Monk and Michael Bennon of the Stanford Global Projects Center, are collaborating in the five-year REBUS research programme. REBUS aims to create a collection of proven business practices that deliver advantage in terms of innovation, growth and efficiency. For this project, academic and public researchers from across the world are working with private companies to help them develop and explore the benefits of ‘relational business practices,’ where companies work together to maximise value for the business ecosystem in which they participate, as well as for each participant individually. This is complicated, because a business ecosystem can comprise different types of companies with divergent goals and differing managerial mindsets. Yet open communication, negotiation, cooperation and trust are essential.

A key influence in REBUS is Professor W. Richard Scott’s Institutional Theory framework that posits how institutions are perpetuated and how they change over time. “It allows us to analyse supply chains from the traditional economist’s perspective of contracts and incentives, but also from the points of view of sociologists who study group norms, and psychologists who study beliefs, culture and identity,” Levitt explains. “It has greatly enriched our ability to understand and influence the delivery of complex goods and services through fragmented supply chains.”

In terms of institutional behaviour, legal and regulatory processes are fundamental for inculcating trust. Thus a key aspect under development in REBUS is an enabling legal
RECONFIGURING THE SUPPLY CHAIN TO DIFFUSE INNOVATIONS IN MATURE INDUSTRIES

OBJECTIVE
To design organisation structures and governance regimes for project and matrix organisation structures in construction and other project-based industries.

KEY COLLABORATORS
Professor Michael Lepech, Dept. of Civil and Environmental Engineering, Professor W Richard Scott, Dept. of Sociology, Stanford University, USA
Professor Michael Garvin, Virginia Polytechnic Institute and State University, USA

FUNDING
Finnish Materials and Engineering Competence Cluster (FIMECC)
Finnish Funding Agency for Innovation (Tekes)
The US National Science Foundation
Industrial Affiliates of Global Projects Center (GPC)

CONTACT
Dr Raymond Levitt
Kumagai Professor
Sustainable Design and Construction Program
Department of Civil and Environmental Engineering
Stanford University
Stanford
California
94305-4020
USA
T +1 650 725 2390
E ray.levitt@stanford.edu


DR RAYMOND LEVITT has been working at Stanford University since 1980. There, he founded and directs the GPC, where he conducts his research on organisation and governance of projects and project-based companies as the Kumagai Professor in the School of Engineering.

DR ASHBY MONK is Senior Research Associate and Executive Director of GPC at Stanford University, USA, and Visiting Research Associate at the School of Geography and the Environment at the University of Oxford, UK. Monk conducts research aimed at enhancing the governance of institutional investors to enable them to invest directly in real assets.

DR KIM WIKSTRÖM is Professor of Industrial Management, with a specific focus on project business and industrial marketing, at the Faculty of Science and Engineering at Åbo Akademi University, Finland. He conducts research in business models of project-based companies and governance of industrial investments.

model with modular contract structures that promulgate the healthy function of the business network by warding off conflict in joint projects, which protects the interests of all.

A FRAGMENTED INDUSTRY
As the supply chain in a mature industry fragments over time, ownership of the product and/or service delivery process disperses. This is especially apparent in the construction, automotive, computer and mobile phone industries. Apart from integration or quality issues that commonly arise, institutionalised system architectures that lock in component functions and interfaces in mature industries can severely inhibit system-level innovation.

A radical change in governance mechanisms, with an emphasis on creating shared interests and more transparent information sharing, would improve investment performance

The shipping industry has evolved over time into an ecosystem where the actors’ goals are misaligned or conflict, while their activities are interdependent. One root of inefficiency in the Finnish shipping industry is the current regulatory environment. Regulation inhibits open information exchange, therefore stalling innovation. The supply chain is so fragmented that a complete overhaul of the business ecosystem is deemed necessary, including its institutions, governance and the ways in which value is created and shared among participants.

ECOSYSTEM SUPPLY CHAIN ANALYSIS
Levitt and Wikström have co-authored a new framework for obtaining better understanding of the success of large investments by analysing them as parts of the business ecosystem. Given that the governance of ecosystem workflows largely determines the value created, the framework guides analysis of workflow interconnections and interdependencies between supply chain participants, according to the degree of conflict resolution. They have trialled the model in a case study of the short-sea – Baltic coastline – cargo shipping ecosystem to pinpoint barriers to efficiency and sustainability.

The short-sea logistics ecosystem must transport goods via marine and port logistics for export industry users in a sustainable way. Its business ecosystem includes ship owners, shipyards and technical companies that supply ship components, port companies and operators, export brokers, logistics tenants, cargo owners and the ships themselves. As an industry’s competitiveness depends on the health of its whole ecosystem, the case study looked at the business activities and the interactions between them, the resources involved, and the role of each actor across a ship’s lifecycle. It paid particular attention to the nature of the actors’ governance and whether their goals were aligned. Levitt, Wikström and their colleagues characterised each interdependency as pooled, sequential, compatible or contentious (or a mix of any of these), and estimated their importance. This led them to identify several dysfunctional areas where enhanced governance could improve ecosystem functionality.

HEALING FRACUTRED SUPPLY CHAINS
This case study highlighted that management attention to the contentious-reciprocal nature of some links restricts value creation — e.g. shipyards build ships to minimise initial cost to ship owners; this increases the ship’s operating cost for shipping companies; higher operating costs are then passed on to users who depend on marine cargo services. A radical change in governance mechanisms, with an emphasis on creating shared interests and more transparent information sharing, would improve investment lifecycle performance by leveraging efficiency and innovation.

One of the challenges that remains is identifying the new governance mechanisms required: possibilities include virtual integration of the ecosystem actors through alliance contracting arrangements, enabling better communication flows and tightening links between activities, and recasting the role of cargo brokers by setting up an electronic cargo logistics marketplace. Practical options include maximising ship flexibility to allow mixed cargoes, and ensuring adequate separation of barriers to the relational business practices needed for improved supply chain efficiency. First, aligning the actors’ incentives at the whole ecosystem level fixes the ‘broken agency’ problem. “Long-term alliance contracting with reimbursable contracts and systemic-level profit sharing can create system-level incentives similar to those in legally merged firms,” Levitt observes. Second, collocation of teams helps to build mutual trust and enables easier reallocation of costs and revenues, as well as sharing of information. Where this is not feasible, digital imaging and simulation can be used to share information and expedite discovery of design, manufacturing or operations problems and clashes. Last but not least, creation of a strong shared ecosystem identity helps to refocus the behaviour of individuals toward ecosystem optimisation.