Innovation in regulated industries

Measuring progress in becoming an innovative sector

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Innovation in regulated service industries with a legacy of state ownership, such as public transport, energy supply and postal delivery, remains a major challenge in many countries. In our Prism 2/2010 article "A systems approach for accelerating innovation in regulated service industries" we focused on the pre-requisites for innovation and what policymakers and companies can do individually to overcome the barriers. One of our main conclusions was that successful sectors such as air travel and telecoms have been good at adopting a "systems approach" to innovation – i.e. enabling introduction of innovations to benefit the service as a whole, rather than relying on individual players in the system to innovate. In so doing they have been able to build constructive relationships, understand bottlenecks for innovation and take joint actions to overcome them. In the article we also referred to the challenges of the UK rail industry where, among other things, fragmentation of the industry and the lack of a clear overall systems leadership authority were acting as barriers to better innovation.

Two years on, it is interesting to see how the UK rail industry has fared. Already some good progress has been made in strengthening the "systems leadership" of the railways (e.g. through new/strengthened governance arrangements), reducing fragmentation (e.g. some routes are adopting alliancing arrangements between Network Rail and the train operators, bringing together train and track), and building stronger relationship networks between the key players and the wider supply chain to unlock innovation potential.

But one key question has remained difficult to answer: how do you actually measure progress in becoming an innovative sector? This is especially difficult for regulated service industries in which government is still a key funding partner. In unregulated commercial sectors with linear supply chains that deliver products and

services to markets, innovation performance of the sector can be fairly easily inferred by aggregating the innovation performance of the main players in the sector (e.g. new products/services introduced etc.). However, in regulated service sectors the picture is not quite so simple. For one thing, it often takes much longer to implement technological innovations in an interdependent, regulated "system" with long capital investment cycles, such as a railway, and in any case what constitutes a "product"? You could measure R&D spend but whose spend would you include, and how do you know it is having the desired impact? For governments that are investing heavily in a national regulated service (e.g. the UK railways cost the taxpayer some £4 billion per year), just hoping that better innovation performance will emerge 10-15 years down the road is not enough. Governments would like to be able to see where the regulated service is today in terms of its innovation capability, and in particular what progress the service is making, and whether it's on the right track. If government intervention is required, they would like to see how and where it could best be applied. Is there a way to measure the progress of a whole service sector towards innovation excellence?

In this article we look at one possible approach to doing this that has been developed by the UK rail industry with support from Arthur D. Little. While it was designed for one industry operating in one country, the principles and approach are just as suitable for other geographies and other regulated service sectors looking to improve their innovation performance. We call this the Industry Innovation Maturity Model.

The Industry Innovation Maturity Model

The Industry Innovation Maturity Model (IIMM) is a framework that aims to understand what a whole sector needs to do in order to evolve its innovation capability, including what individual companies can do on their own, where wider industry collaboration is required, and where government intervention is necessary.

The model is based on a number of levels of capability with descriptions of innovation activity and performance

Maturity level		Key characteristics	Descriptions of the levels
Increasing industry innovation capability	**Integrated/ Adaptive**	Integrated and strategic approach across transport sectors	Widely used mechanisms across systems and down supply chains that direct innovation efforts. Sector strategy and capability pursued. Sector strategy integrated with other national strategies (e.g. transport, energy, communications and manufacturing sector, national and FDI).
	Optimized	Sector fully coordinated and focused	Sector technology and innovation strategy is visible and used by organizations to set direction. System perspectives are used to prioritize and pursue best options. Research and technology base is integrated with supply chain innovation. Technology demonstrators extensively used to reduce risk. Innovation within and between organizations is widespread and methodologies are continuously refined. Good facilities and resources.
	Managed	Limited coordination within supply chain and with key clients	Organizations are developing their innovation strategies based on their understanding of customers' needs. Bilateral relationships along supply chains are being formed for innovation. Research outputs are disseminated for wider benefit.
	Competent	Competent but uncoordinated	Organizations innovate effectively individually, but find it difficult to manage up and down supply chain. Integration and testing / trialing of new products and systems is difficult and few mechanisms exist to manage the risks of introduction.
	Initial	Inconsistent	Innovation is ad hoc, conducted by individual organizations independently. Little use of UK research base. Facilities are in-house only

Table 1 **The Industry Innovation Maturity Model** *Source: ADL analysis*

Five-level innovation maturity scale

The basis of the framework is a scale that defines five levels of innovation maturity.

The framework recognizes a progression in terms of how innovation takes place across the sector, beginning with inconsistent and uncoordinated approaches by individual companies, and progressing through increasing cooperation, collaboration and coordination towards an "integrated/adaptive" state in which there is full strategic integration across the industry, taking full account of the interplay with other sectors.

To achieve this sort of progression, a regulated service sector would need to ensure that the returns of investment in innovation are shared equitably, so that there are positive reasons for all parties to collaborate for mutual benefit. It would need to adopt new business models, form new sorts of alliances and partnerships and use new metrics, incentives and rewards. These, underpinned by new contractual and alliance mechanisms, will allow innovation that delivers benefit across an otherwise fragmented system.

On its own, the framework is already useful at a high level for gauging where a sector or a part of a sector is in terms of innovation maturity across a five-level scale. However, a more valuable next step is to identify in more detail what sort of things need to be done to progress up the scale. Using the principles of good innovation practice it is possible to identify a typology of different categories of intervention or "enabler" that could be applied to achieve innovation maturity progress. This typology is illustrated below:

We can identify a typology of six 'hard' and two 'soft' categories of enabler for driving innovation maturity. Enablers exist on a spectrum from national to company levels

National level	**Regulation and governance**	Legislation and regulation that defines the structure and conduct of the industry, such as standard contracts, franchises, period accounting measures and targets and engineering standards. Hierarchy from European through national, to supply chain and company levels.
'Hard' enablers	**Organizations and institutions**	The organizations and institutions that exist to manage and co-ordinate industry planning and operations in order to encourage innovation.
	Innovation competence and infrastructure	Capabilities and tools that are available to support, enable and drive innovation. Covers competences and infrastructure that enables innovation (e.g. test facilities, innovation centres). Also includes conceptual structures, e.g. agreed system architectures and interfaces that support modular innovation.
	Business models	The sources of funding and funding schemes available to be applied specifically to promote and support innovation.
Company level	**Processes**	The management processes by which innovation is planned, initiated and undertaken
'Soft' enablers	**Communication and collaboration**	The mechanisms and forums that support and enable communication and collaboration, within and between companies, to underpin innovation performance.
	Culture change	The mechanisms to influence those aspects of organizational culture that make it more supportive of innovation.

Table 2 **Enablers for improved innovation** *Source: ADL analysis*

Eight categories of innovation enabler

As shown in the Table, eight categories of intervention are recognized, covering a spectrum from national to company level. Six of these are "hard enablers" – specific and tangible changes that will assist innovation. The remaining two are "soft enablers" – less tangible but nevertheless valuable drivers of behaviors and relationships. All of these categories of enabler have some influence on the innovation performance of a regulated service industry.

Mapping enablers to players in the system

By mapping the enabler categories to the various players in the system – from company, through supply chain, industry and government, we can see what interventions are candidates open to each to enable innovation, as shown below:

Enabler	Company	Supply chain (What the supply chain needs to have in place)	Industry	Country/ Government
Regulation and governance	■ Corporate vision of innovation ■ Supporting innovation and functional strategies	■ **Model contracts** ■ **OEM and Tier 1 company standards supportive of innovation**	■ Industry Standards (RGS, NR) supportive of innovation ■ Railway Technology Strategy	■ Industry targeting and legislation (e.g. HLOS) ■ Transnational standards (e.g. TSIs) ■ National economic regulation (e.g. train operator franchising) ■ Integrated transport policy
Organizations and institutions	■ Innovation organization and responsibilities	■ **Project steering groups / discussion fora initiated by prime contractor**	■ Systems Authority ■ TSLG ■ Rail Delivery Group	■ DfT ■ TSB ■ Infrastructure UK
Innovation competence and infrastructure	■ Open system interface specs ■ Innovation training and competence development ■ Company test facilities	■ **Supply chain standards** ■ **System architectures and Interfaces / functional standards and specs** ■ **Early provision of integration and test opportunities**	■ Means to pursue industry research and innovation (e.g. Catapult Centre, RSSB, research base) ■ Testing capability (e.g. industry test tracks, High Marnham, Old Dalby)	■ Policy research to explore barriers and develop integrated mobility concepts (e.g. Future Cities, intermodal nodes etc.) ■ EU research
Funding	■ R&D budget ■ Pursuing R&D tax credit ■ Accessing incentive and award schemes	■ **Shared risk/reward contracts** ■ **Accessing support schemes for collaborative / open innovation**	■ CP5 Innovation Fund ■ Project funding supportive of prototypes and trials	■ National subsidies and grants (e.g. DfT TSB, "Accelerating Innovation in Rail") ■ Other fiscal measures (e.g. Soft loans, tax breaks)
Business models	■ Business model innovation competence (mapping and design)	■ **Business models in support of innovation (e.g. risk-shared partnering, availability-based contracting etc.)**	■ Flexibility to redefine business boundaries and roles (e.g. DB mobility solutions, Siemens train maintenance) ■ Data sharing	■ Policies to overcome market barriers towards implementation of integrated mobility solutions ■ Risk-sharing models (e.g. REBS)
Processes	■ Good practice innovation management processes (e.g. stage-gate, idea mgt, metrics etc.)	■ **Supply chain management processes to encourage innovation** ■ **Good practice innovation management processes in the supply chain**	■ Rail Technical Strategy development process ■ Industry program to encourage innovation ■ Technology route-mapping	■ Periodic review and consultation processes
Communication & collaboration	■ Open/collaborative innovation approaches ■ Participation in communities of practice	■ **Open/collaborative innovation approaches (e.g. RIA Unlocking Innovation Scheme)** ■ **Participation in communities of practice**	■ Networking events (e.g. RIA Innovation conference) ■ Professional institutions	■ National transport and mobility forums, networks and collaborative projects ■ Transport KTN
Culture	■ Culture change tools (e.g. barrier analysis, behavior change etc.)	■ **New forms of contract to encourage collaborative innovation and risk management**	■ Industry target setting to encourage innovation and entrepreneurship ■ Industry culture change program	■ National transport industry structures, regulation and targets to encourage innovation and entrepreneurship

Table 3 **Enablers for improved innovation, illustrative example for UK rail** *Source: ADL analysis*

In the table above we have shown how, looking vertically, it is possible to see what enablers each main player in the system can put in place. We can also look horizontally and see how each type of enabler could be implemented by, respectively, individual companies, the supply chain collectively, the whole rail industry and government. The value of this mapping is that it provides a comprehensive picture of what each part of the regulated system can do in order collectively to enable better innovation.

Identifying intervention actions to progress innovation maturity

Finally, based on the analysis above it is possible to put together a set of maps of what each key player (company, supply chain, industry, government) can do across each of the eight categories of enablers to contribute to the achievement of each of the five innovation maturity levels. This exercise has already been done for the UK rail industry. For brevity we have not reproduced the full results in this article, but in overview the result is a series of key actions to progress towards innovation maturity, as illustrated below.

We can show key actions from different stakeholders to help the industry mature

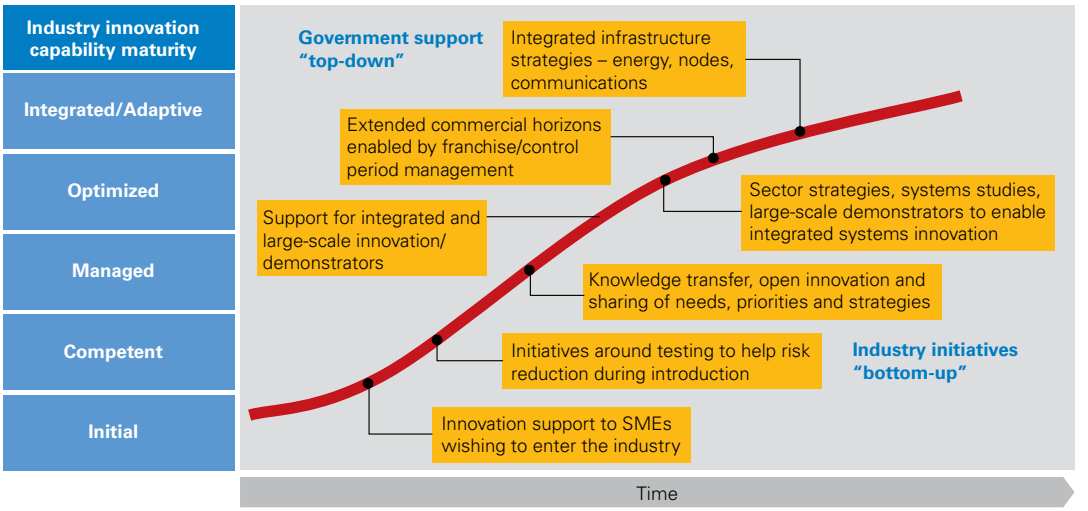

Table 4 **Annex: Prior plots of industry initiatives on the Maturity Model** *Source: ADL analysis*

The full detailed mapping provides a complete menu of actions or interventions for companies, supply chain, industry and government for each level of innovation maturity. Once the mapping has been done, it is also possible to identify a suite of metrics to enable measurement of progress. This has also already been done for the UK rail industry.

Reflections on the methodology and its applicability

So what are the conclusions on the IIMM so far? It seems to work in theory but does it work in practice? And what is its applicability in terms of how and where it could be further applied?

In terms of whether it works in practice, it is certainly true that many examples of the kinds of innovation we are envisaging already exist. For example, Rolls-Royce has for many years worked with its supply chain to increase competitiveness through innovation, while at the same time managing the associated development risk that could adversely impact on its high-cost, long-duration projects. Research and development risk is shared with suppliers in return for greater long-term rewards. Specifically, the supply chain receives a share of the profit from each engine that Rolls-Royce sells, plus assured access to the replacement parts business through the life of the engine.

Invensys, a major player in the railway supply chain, is changing its signalling systems product range by adopting a modular approach and architecture. A key element of this is the sharing of interface specifications with sub-suppliers, enabling the company and suppliers continually to develop new products and technology that will fit within the overall system architecture.

With regard to application of the IIMM, we believe it could be adapted for any other sector where the provision of a public service is dependent on industry, regulators and government working together within a closely coupled system. As well as rail, this could include other forms of transport (e.g. road), energy and perhaps communications infrastructure.

In terms of what the methodology could be used for, we see a number of applications. For example:

- **Governments**: Measuring sector-level progress in innovation capability; understanding and prioritizing where interventions may be needed.

- **Industry associations/bodies**: Reporting to stakeholders on innovation progress achieved by the sector and its supply chains; identifying where to focus efforts for improvement.

- **Companies**: Demonstrating innovation excellence to customers and other stakeholders; understanding how other key players in the system could help to support their internal efforts; negotiating with partners to contribute to innovation of mutual value.

The benefits of removing sector-level barriers to innovation through working on enablers are potentially very significant indeed, as can be seen in sectors such as telecommunications and aerospace. This methodology is still at the pilot stage and more time will be needed to determine how it will be taken forward. However, the initial signs are promising. Driving innovation in a high-investment, capital-intensive, highly interconnected, part-public/part-private service sector is a complex challenge, and there is ample scope for further development of tools and approaches to assist.

The previous article about innovation in regulated industries was published in PRISM / 2 / 2010 and can be found at: www.adlittle.com/innovation_regulated_industries

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