IfM

Centre for International Manufacturing

briefing

## Industrial service network design: configuring multi-organisational networks

Many manufacturing firms have developed a service dimension to their product portfolio. However, the provision of product service solutions has placed an increasingly heavy reliance on networks of multiple partners to deliver services, often right through to the point-of-use. A key area of focus at the Centre for International Manufacturing (CIM) is optimising the effective and efficient service operation of these complex and dispersed supply networks, as this briefing describes.

Understanding and configuring complex service networks

There is a growing trend for manufacturers to include services into their core product offerings for economic, strategic and environmental reasons. In the short term, companies can generate extra revenues through integrated product and service offerings. In the longer term, business models to build sustainable competitive advantages in integrated product-service systems are set to grow.

In response to this trend, CIM researchers have developed the multi-organisational network (MON) concept. The MON research team focuses on the integration of service supply chains through understanding key integrating processes – the 'touch points' between organisations.

With the emergence of complex multi-partner arrangements in services, there
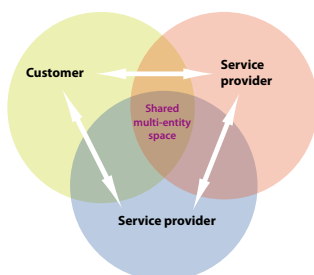
Multi-organisational network (MON)

is a growing need for firms to know how best to configure these networks. Research within CIM aims to explore the multi-organisational service network environment in order to:

- understand how best to configure these service networks (i.e. complex operating networks of customer groups, partner firms and suppliers delivering services to end users)

- understand how these networks should be effectively integrated

- establish principles of operation

The team has undertaken detailed case studies which have included a number of complex product equipment manufacturers operating within multi-entity service supply chains. With a growing emphasis on service and support activities representing their dominant revenue generator, a common set of service supply chain processes across the extended supply network has been identified to support more effective product service delivery.

Initial findings

Individual service network partners regard end-to-end supply chain integration as a desirable and mutual goal. However, case studies suggest that the criticality of particular enabling process capabilities are viewed quite differently by partners. There appears to be differences in their perspectives on what constitutes strategic and operational processes. These findings suggest that misalignment through the service supply chain is fundamentally a design issue.

The lack of a common view concerning these key processes results from the complexity of the service supply network rather than from competing commercial interests. On-going research focuses on the development of a service network configuration and design methodology.

The approach addresses the integration and alignment of partners, by assessing options for service network structure, the operational flows key to integration, appropriate governance and co-ordination modes, support infrastructure characteristics, and partner relationships. These approaches are described below.
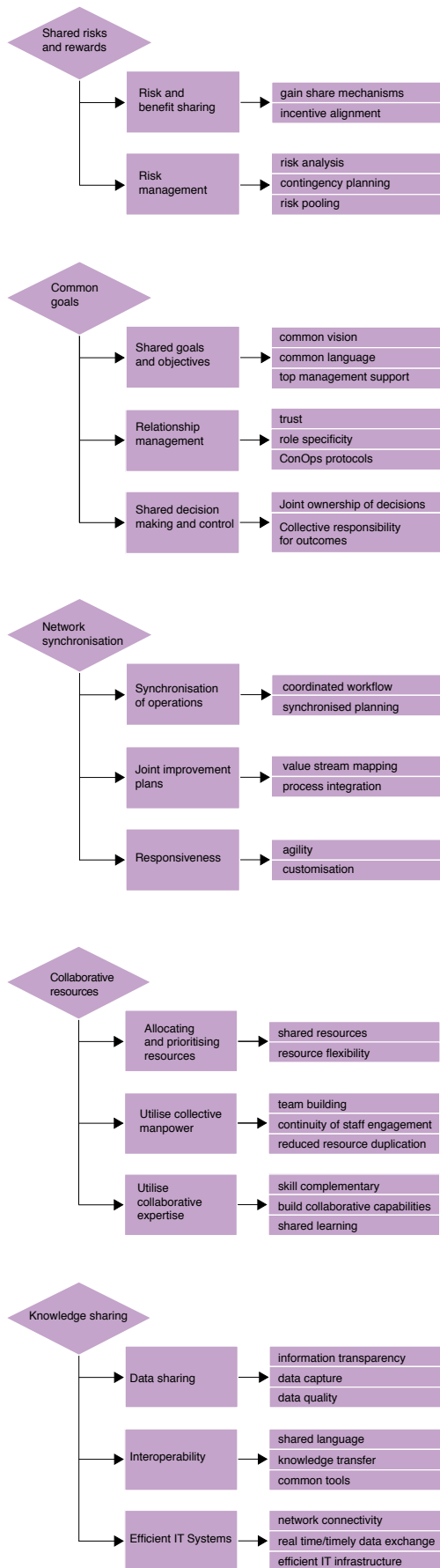
Network configuration

Existing approaches to the design and operation of service networks are largely product-oriented and pay little attention to the intangible, customer-involving and relationship-based nature of services. With the growing trend of servicisation in manufacturing, companies (particularly those that are engaged with complex, long-lifecycle products and systems) need to reconfigure their networks to support integrated product-service offerings.
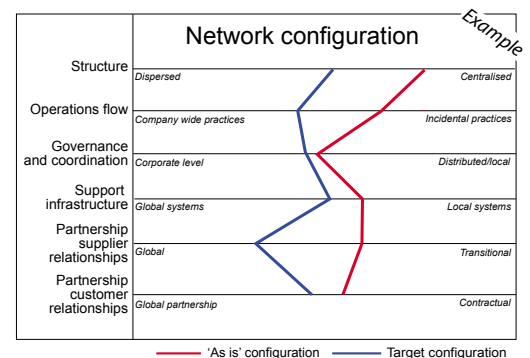
The configuration tool forms an integral part of industrial service network design as it demonstrates the configuration features of product and service-oriented engineering networks. It provides theoretical insight and practical guidance on the design and operation of integrated product and service systems, enabling identification of the key elements of 'network configuration'. 'The 'as is' configuration for an organisation can be mapped, in addition to the organisation's future 'target' configuration. This tool has

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Network integration enablers

Shared risks and rewards
- Risk and benefit sharing
  - gain share mechanisms
  - incentive alignment
- Risk management
  - risk analysis
  - contingency planning
  - risk pooling

Common goals
- Shared goals and objectives
  - common vision
  - common language
  - top management support
- Relationship management
  - trust
  - role specificity
  - ConOps protocols
- Shared decision making and control
  - Joint ownership of decisions
  - Collective responsibility for outcomes

Network synchronisation
- Synchronisation of operations
  - coordinated workflow
  - synchronised planning
- Joint improvement plans
  - value stream mapping
  - process integration
- Responsiveness
  - agility
  - customisation

Collaborative resources
- Allocating and prioritising resources
  - shared resources
  - resource flexibility
- Utilise collective manpower
  - team building
  - continuity of staff engagement
  - reduced resource duplication
- Utilise collaborative expertise
  - skill complementary
  - build collaborative capabilities
  - shared learning

Knowledge sharing
- Data sharing
  - information transparency
  - data capture
  - data quality
- Interoperability
  - shared language
  - knowledge transfer
  - common tools
- Efficient IT Systems
  - network connectivity
  - real time/timely data exchange
  - efficient IT infrastructure

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already been deployed successfully by the IfM in several service environments, primarily in defence service contracts (in air, land and sea domains).

Key elements in network configuration, taking a multi-organisational perspective, can be summarised as follows:

- **Structure**: to describe the geographical footprint of a network.
- **Operations flow**: to describe the operational processes adopted by network members.
- **Governance and coordination**: to describe the governance system and coordination mechanism of a network.
- **Support infrastructure**: to describe support infrastructures of a network, including IT systems, resources, people, and cultures.
- **Relationships**: to describe the linkage between network members, e.g. customers, suppliers and users.

Service supply chain integration

A methodology for identifying processes key to integration across MONs has been developed. Despite an inherent complexity, integration challenges can be narrowed down to key processes or 'linkages' between partners.

Preliminary results demonstrate that the agreement of a common set of network integration enablers (see left)) can be used to assess processes key to network integration. The approach also includes a process hierarchy which helps to support the integration of business, strategic and operational drivers, as well as to support the development of shared goals across the network.

The following research strands are currently under development:

Alignment of value sets in a network context

The development of a common value system is seen as an important step to support the sustainability of collaborative behaviour over time. As networks are typically formed by heterogeneous and autonomous entities, it is natural that each member has its own set of values, hence, aligning members' value sets (creating a shared value system) within a multi-organisational service network is critical.

The methodology used here focuses on the perceptions of shared value within these multi-organisational networks, building on literature on individual and firm-based values. It introduces and identifies a set of generic socio-ethical values which organisations perceive to be useful and relevant in sustaining relationships with partners. The alignment of these values within networks can be

analysed and the theories presented in literature have been successfully transferred into an industrial context using detailed case studies.

Value sets, defined as 'a list of normative beliefs that guide the behaviour of a collaborative network of firms which are co-created and sustained for the mutual benefit of all actors', are a useful dimension in aligning multi-organisational service networks.

Partnering models

Complex multi-partner arrangements in service contracting present major challenges and opportunities in network integration. A set of factors that influence partnering options within complex operational networks, and the selection of appropriate partnering arrangements in different contracting models (within a through-life context) have been developed.

End customer/industrial interface

This component of the emerging industrial service network design framework looks to identify key priorities in terms of future customer requirements to which companies may have to respond. In turn, there is scope for organisations to develop specific industrial capabilities and explore how different projects compare in terms of industrial capability requirements.

Capability acquisition

The ability to identify and manage 'capability' has become increasingly important, especially with these 'capabilities' playing a critical role in the acquisition process. A lot of acquisitions fail because the assessment of capabilities and the approach taken during the acquisition process towards capabilities is inadequate. This research strand looks to identify the considerations that are most important when designing a structured process for the 'acquisition of capabilities'. Capability features such as skills, knowledge, technology and organisational processes are an integral part of the emerging framework, within the industrial service network design context.

MON research team

The MON research team includes principal investigator, Dr Jagjit Singh Srai and lead researchers Dr Tomás Harrington, Dr Yufeng Zhang, Dr David Kirkwood and Antigoni Iakovaki.

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