How do large companies benefit from strategic partnerships with universities?

Developing and testing a novel framework

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*** Tomas Coates Ulrichsen**
tc267@cam.ac.uk

Eoin O'Sullivan
eo252@cam.ac.uk

Overview

- Background / motivation
  - Practitioner workshop: University-industry strategic partnerships
  - Need systematic understanding of benefits of UI partnerships
  - Need better technical characterisation of UI partnerships
- Literature / framework-building (key dimensions)
  - Innovation categories (product, process, operations, etc)
  - Innovation chain activity (research, development, demonstration…)
  - Innovation enabling factors / practices
- Survey sample / results
- Discussion / conclusions

Background: 2014 Workshop

Building Long Term Strategic University-Industry Partnerships

PraxisUnico. Impact through innovation

UIDP University-Industry Demonstration Partnership

UK Science & Innovation Network

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Aim of the workshop

Identify approaches for strengthening ability of universities and industry to develop mutually beneficial and **effective long-term strategic partnerships**

Drew on collective experiences of 70+ senior practitioners from leading UK & US universities, multinational firms (and government agencies)

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Key message from workshop

Need for more systematic understanding of benefits of partnerships, in order to:

- more fully articulate and communicate the value proposition
- make better investment decisions
- understand the effectiveness of such investments

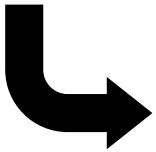
More 'technical' characterisation of benefits of uni-industry partnerships:

- types of innovation (product, process, supply chain, etc)
- types of innovation chain activity (research, development, demonstration…)
- types of innovation enabling factors / practices

Research Problem

Characterizing features/benefits of UI partnerships

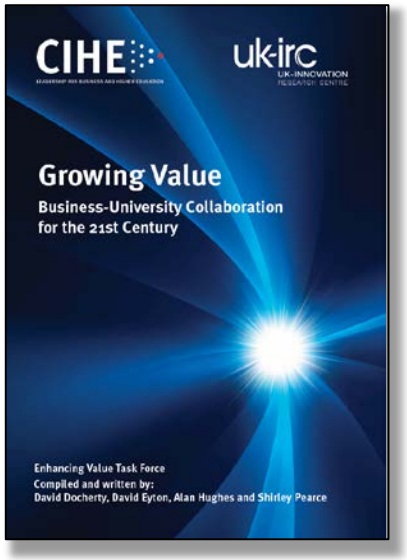
- Attention in literature to **importance of strategic partnerships** and **challenges of understanding benefits**, e.g.:
  - Important part of **innovation strategies of major firms** (Bercovitz & Feldman, 2007)
  - Significant **challenges estimating benefits** / fully monetised costs (Hughes & Martin, 2012)
  - Significant **variety of types of contributions** (Hughes and Kitson, 2014)
- Limited literature related to systematically **characterising / capturing breadth of contributions of UI partnerships**, with some exceptions, e.g.:
  - Distinguishing benefits to **exploration vs exploitation** (Bercovitz & Feldman, 2007)
  - Exploring impact along **value chain** (Hughes & Kitson, 2013)
  - Distinguishing between phases of **technology development** (Lee, 2000)



No effective framework to help practitioners (or academics) systematically characterize key features and benefits arising from university-industry strategic partnerships

University-Industry Strategic Partnerships (UISPs)

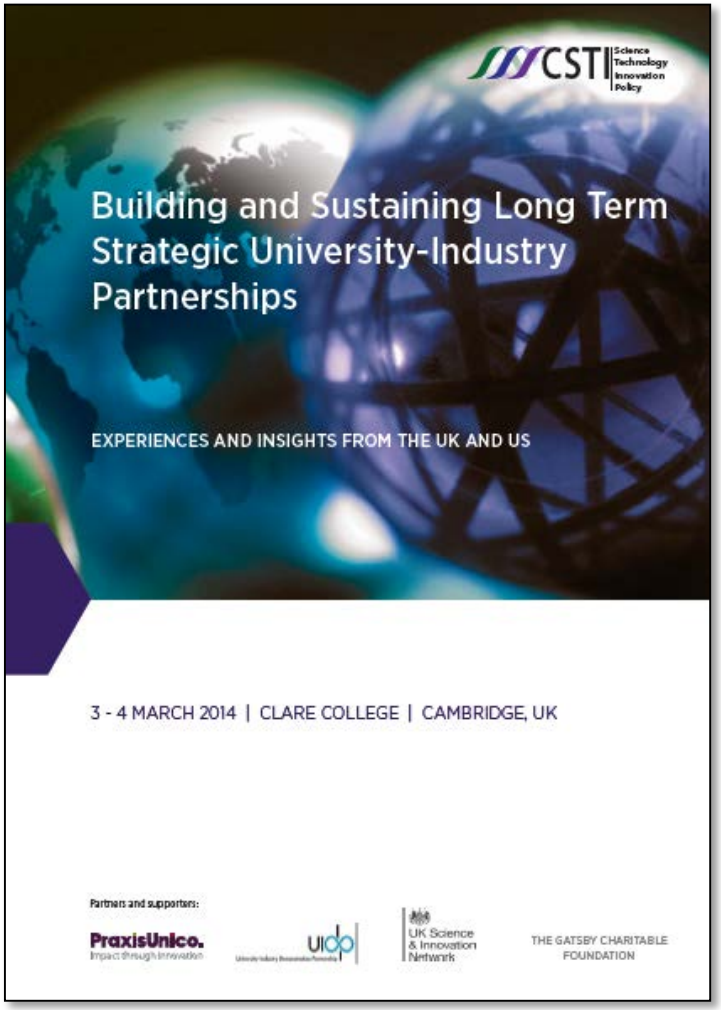
Phenomenon of firms **consolidating relationships** with unis around core set of strategically selected **multi-faceted** and **longer-term** partnerships



"Many big companies are developing fewer but longer-term strategic partnerships with universities, particularly for science-based business…"

"Long-term commitments are believed to deliver results that have more impact than isolated collaborative projects, and can provide a broader range of benefits to all parties involved..."

Defining and characterising
University-Industry Strategy Partnerships (UISPs)



Strategic partnerships include higher value partnerships that have most or all of following features:

- Are for the longer term (beyond lifetime of typical project)
- Transcend any one project
- Transcend any one individual
- Exhibit some degree of selectivity on part of leadership of the firm and university
- Involve investment / commitment to, developing deeper, stronger and longer term relationships
- Aim to achieve greater return on each partners' investment of resources (financial / non-financial)

Research design

- **Exploratory phase:** Workshop & preliminary scoping interviews – explored how firms benefited from strategic partnerships
- **Framework development:** Evidence from exploratory phase combined with insights from literature to develop conceptual framework
- **Survey:** Dimensions of conceptual framework tested through a structured survey of firms engaged with universities in both UK and US
- **Survey sample:** 26 major R&D-intensive MNCs with experience in developing longer term strategic partnerships with universities

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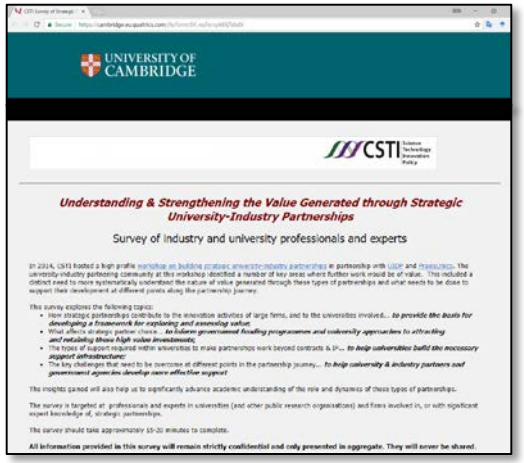
Insights and concepts from literature



Survey of industry and university professionals /experts

www.ifm.eng.cam.ac.uk/research/csti/

Framework building

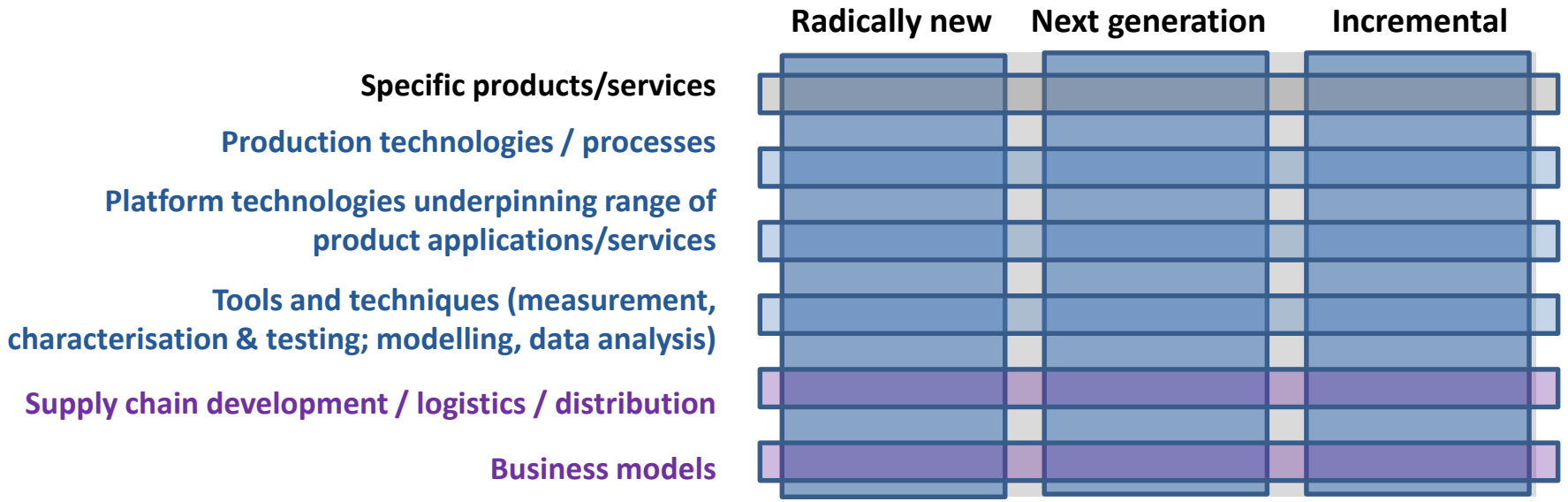
- types of innovation
- types of innovation (chain) activity
- types of innovation enabling factors / practices

Developing the conceptual framework:

Types of innovation

Different types of innovation require different knowledge inputs and interactions (Tödtling et al., 2009), suggesting UISPs may contribute to them in different ways. In this context, we:

- Distinguish types of innovation: **technical innovations** in products, processes, etc, and **organisational innovations** in supply chains, etc (OECD, 2005; Meeus & Edquist, 2006)
- Distinguish **varieties of technology** (Tassey, 2004; 2005), e.g., generic product technologies, process technologies, enabling 'infratechnology' tools/techniques
- Distinguish between types of innovation, in terms of **degree of novelty** (incremental, next generation, radical) (Betz, 1997)

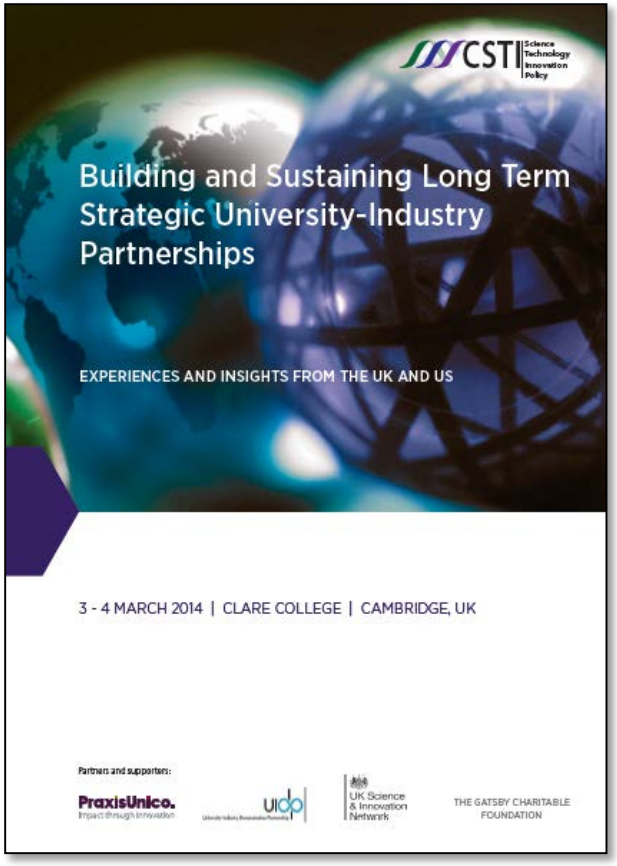


Developing the conceptual framework:

Innovation enabling factors

Based on insights from literature (& workshop), we identify **set of factors known to influence ability of firms to innovate and compete**, and which UISPs have potential to influence:

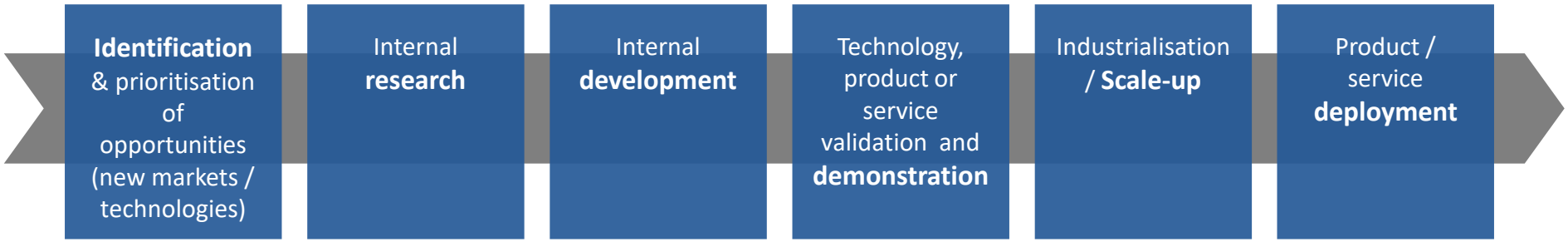
- Innovation processes, routines and protocols
- Technical skills underpinning innovation activity
- Management skills and processes to make strategic decisions
- Organisational structures and processes
- Organisational culture
- Reputation in key technology, product/service market segments
- Market/technology system development (e.g. standards, regulations, policy, social acceptance)



Developing the conceptual framework:

Type of innovation chain activity (technology development stages)

- Literature suggests that university-industry interactions contribute to **different aspects of the technology innovation process**, e.g.:
  - **Exploration** and to **exploitation** (Bercovitz and Feldman, 2007),
  - **Suggesting new R&D projects** and **completing existing ones** (Cohen, et al., 2002)
  - **Fundamental research, prototype design,** and **product development** (Lee, 2000)
- To systematically capture where along **technology development process** UISPs contribute, we adopt insights from technology development / innovation process literatures to **distinguish between the following phases**:



Developing the conceptual framework:

How do strategic partnerships contribute to firm innovation?

Enhancing **innovation practices and capabilities**

University-industry linkages and R&D partnerships literatures - combined with workshop insights - suggest the following categories of ways firms may realise these contributions (to innovation activities, innovation chain stages and innovation enabling factors):

Research & technology

- Achieve greater leverage of funding for R&D and innovation
- Develop critical mass activity around key challenges
- Engage with university on challenges at different stages of technology development lifecycle
- Influence direction of academic research agenda
- Look at challenges/R&D questions in new ways
- Undertake longer-term/higher risk R&D

Access to resources

- Access capabilities/resources to support exploitation of knowledge
- Access to latest scientific advances
- Develop/access specialised infrastructure supporting innovation
- Share proprietary information with partners

Effectiveness & efficiency

- Ability to absorb & exploit knowledge/technologies generated within university
- Reduce costs of working with universities

Skills & workforce development

- Ability of firm staff to spend time in university setting
- Align curricula & training programmes to firm needs
- Develop collaboration skills and processes to work with universities
- Motivate staff / provide workforce development opportunities
- Recruit students and researchers into the firm

Technology & market intelligence

- Develop technology/product/market/country intelligence

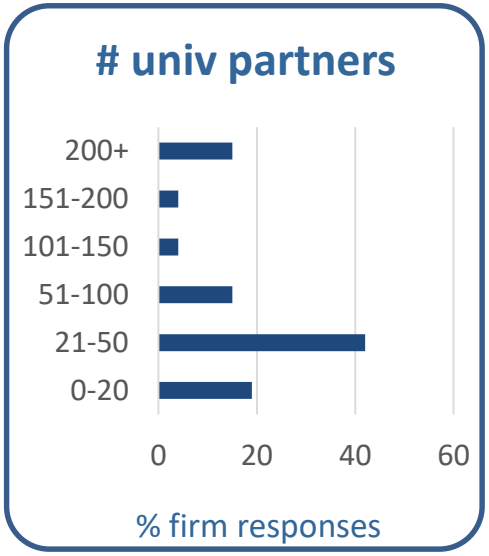
Survey and Results

Survey sample characteristics

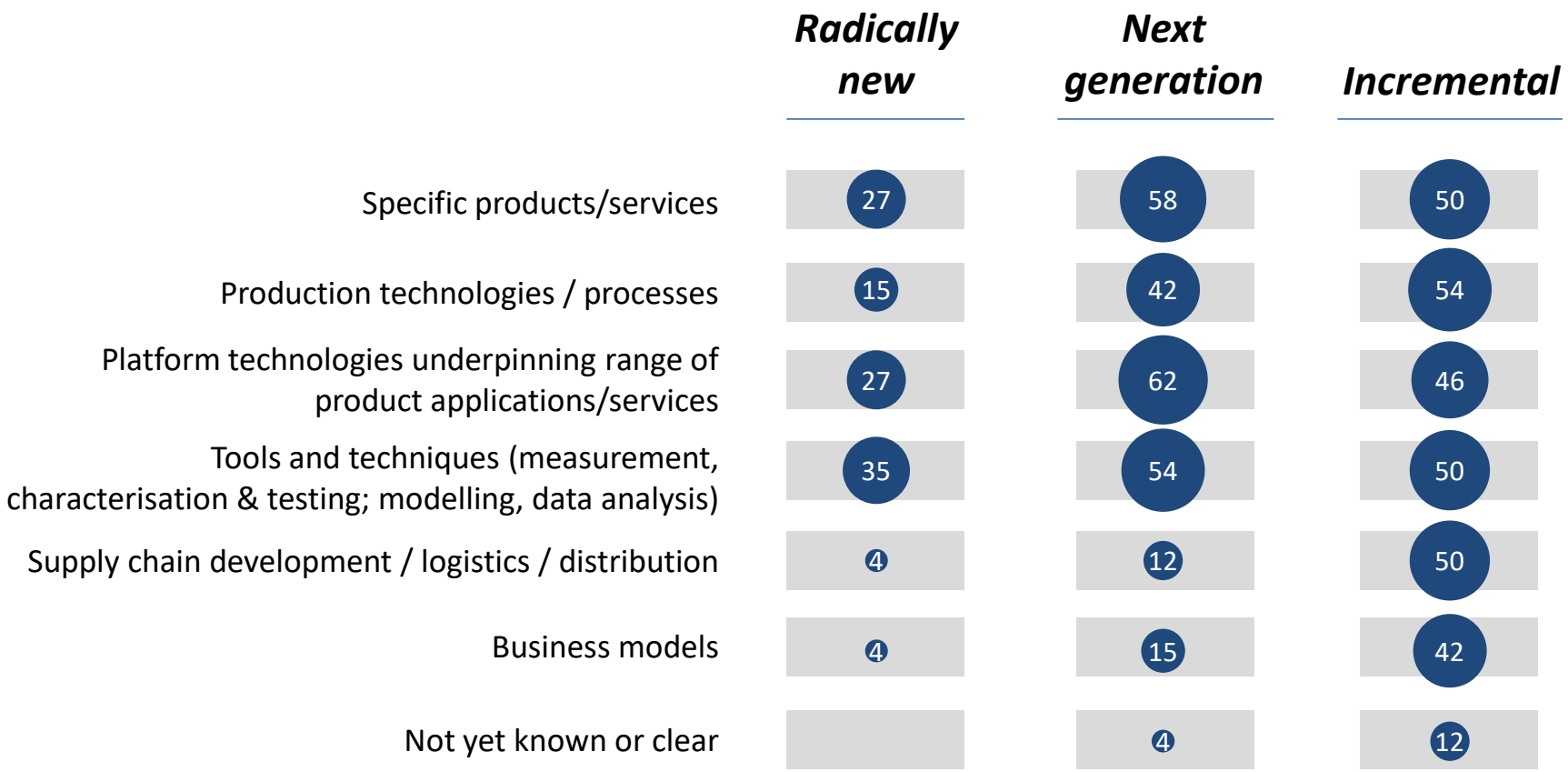
- Targeted **large, R&D-intensive product driven MNCs with experiences developing UISPs with UK / US universities**
- Targeted senior individuals within firm **responsible for / involved in developing strategic partnerships** with universities
- Built from following sources: UIDP membership, EPSRC 'business partners', PraxisUnico 2013 '*What Industry Wants*'…

- **95 target firms identified**
- **26 responses (27% response)**
  - **R&D exp. (2014) of responding companies: ~US$ 33B**
  - **Employees of sample: ~1.7M**
  - **Sales (2014): ~US$ 1.2B**
  - **Total # of strategic partnerships: 270**

Sector	Responses	
	Number of responses	% responses
Aero, Defence & Eng	10	38
Pharma, biotech, medtech	4	15
Oil & Gas, Elect'y & Chem	3	12
ICT	5	19
Food, Beverages & FMCG	2	8
Other	2	8
Total	26	100



What types of innovation do strategic partnerships contribute to?



CSTI survey of large firms 2015-16 (N = 26)

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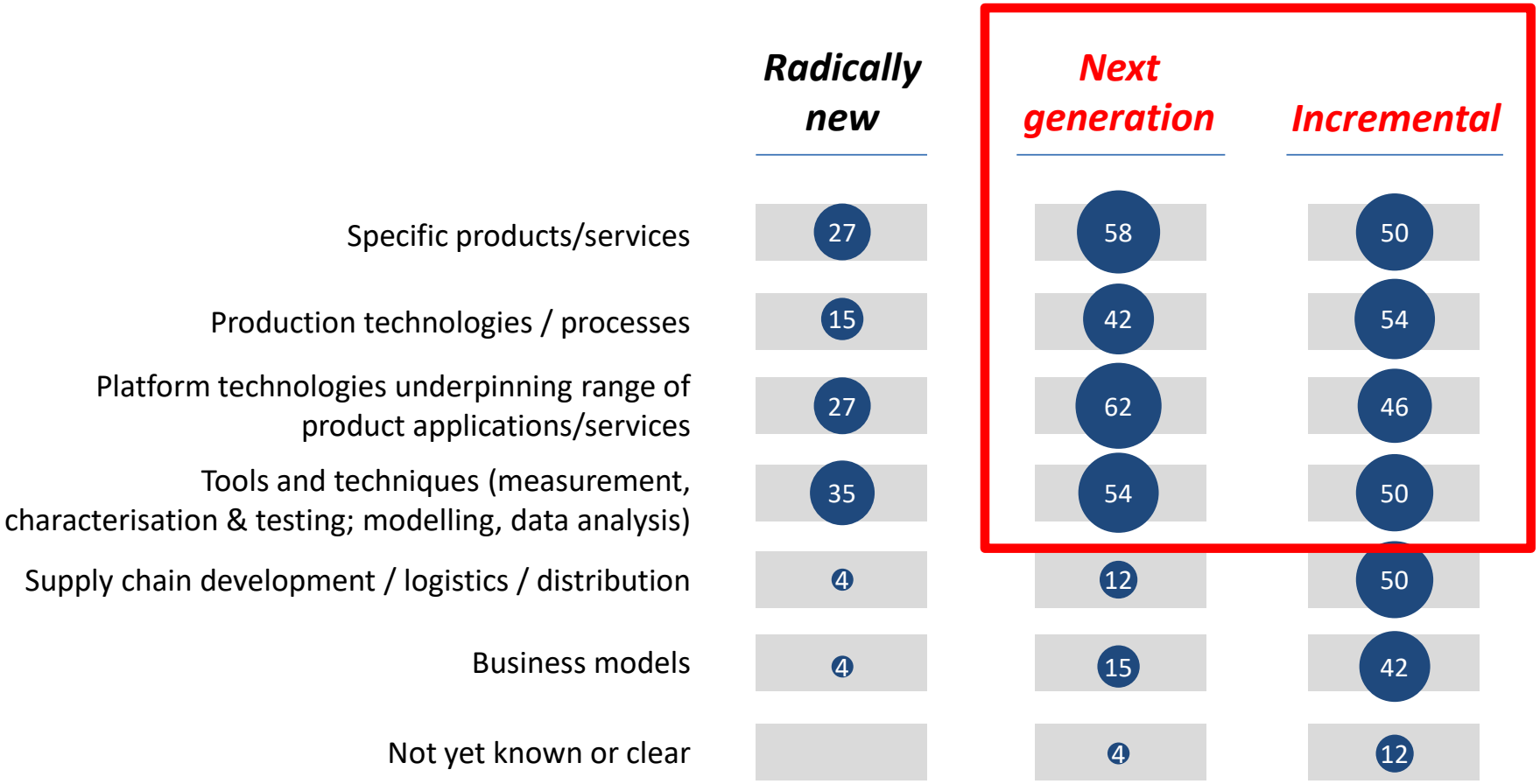

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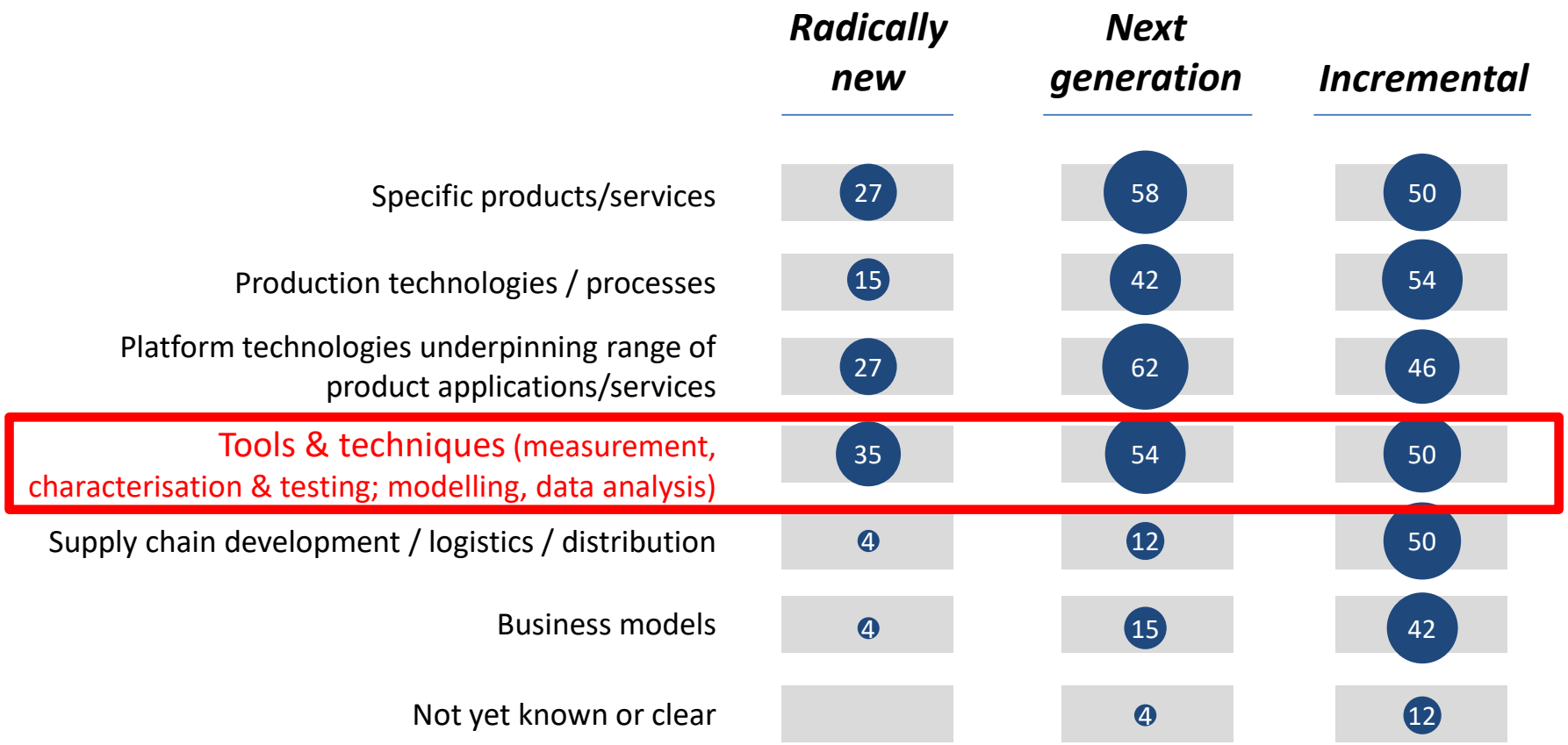

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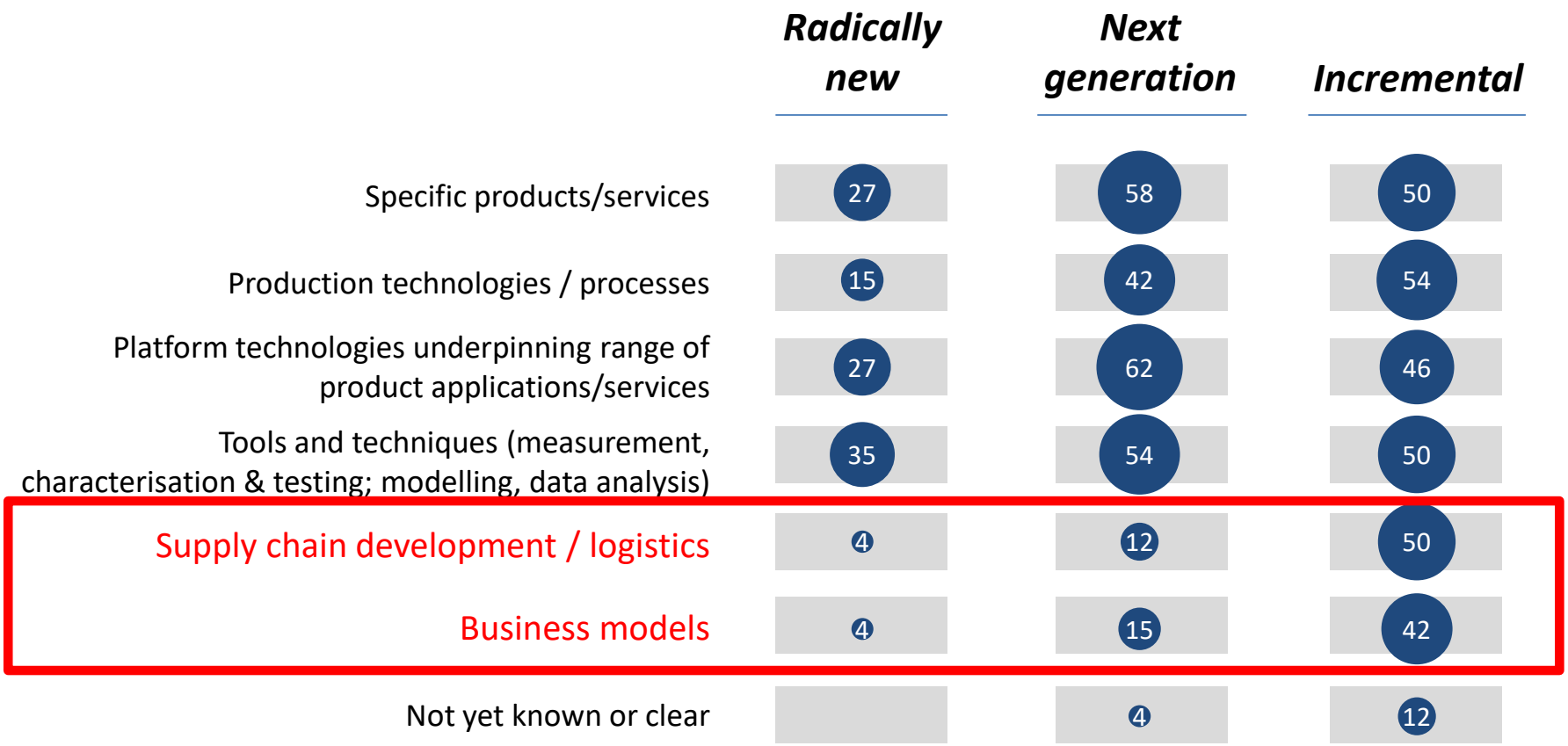

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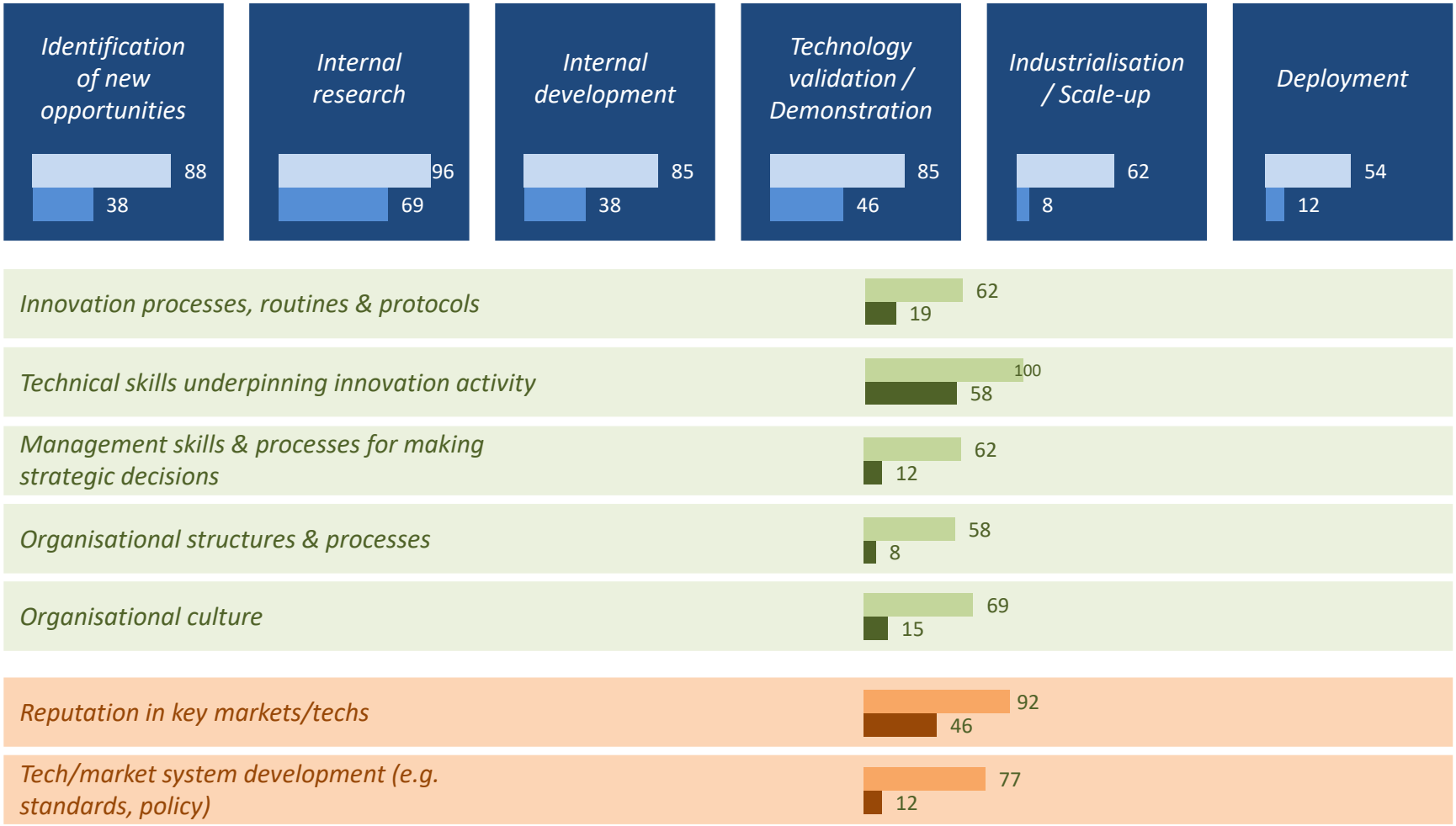
What innovation activities do strategic partnerships enhance within the firm?



KEY: *Any contribution* / *Significant contribution*

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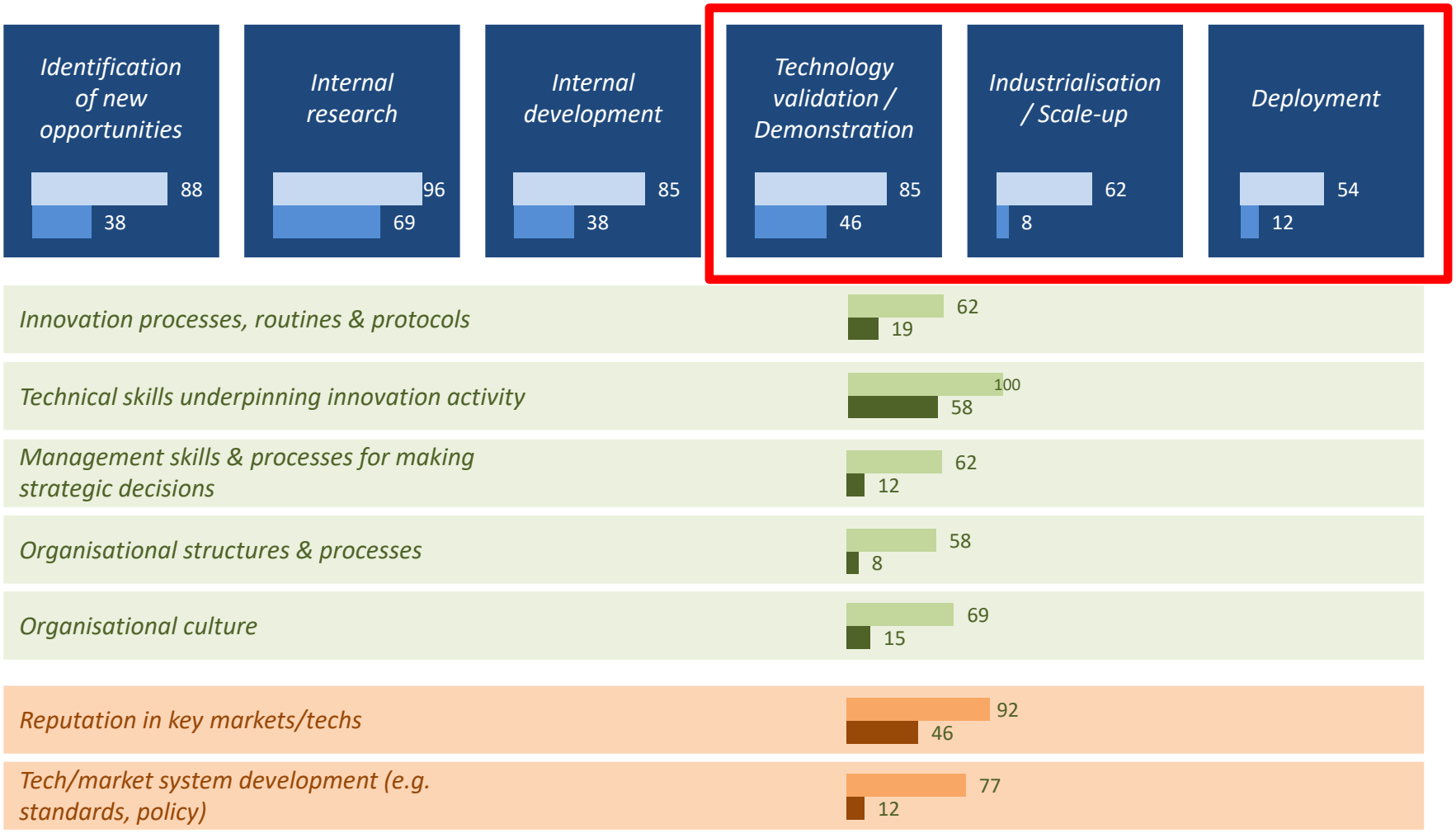

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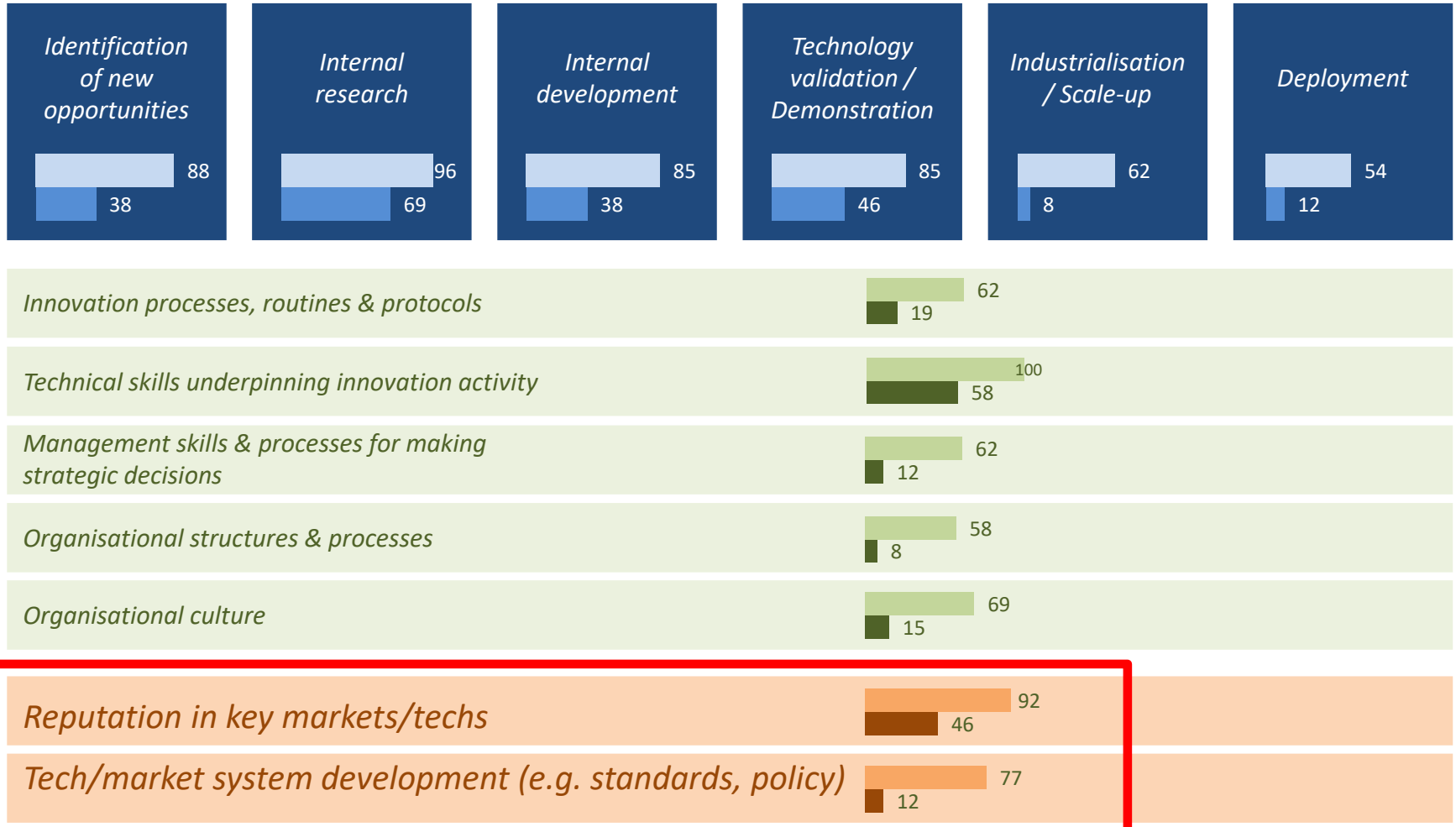

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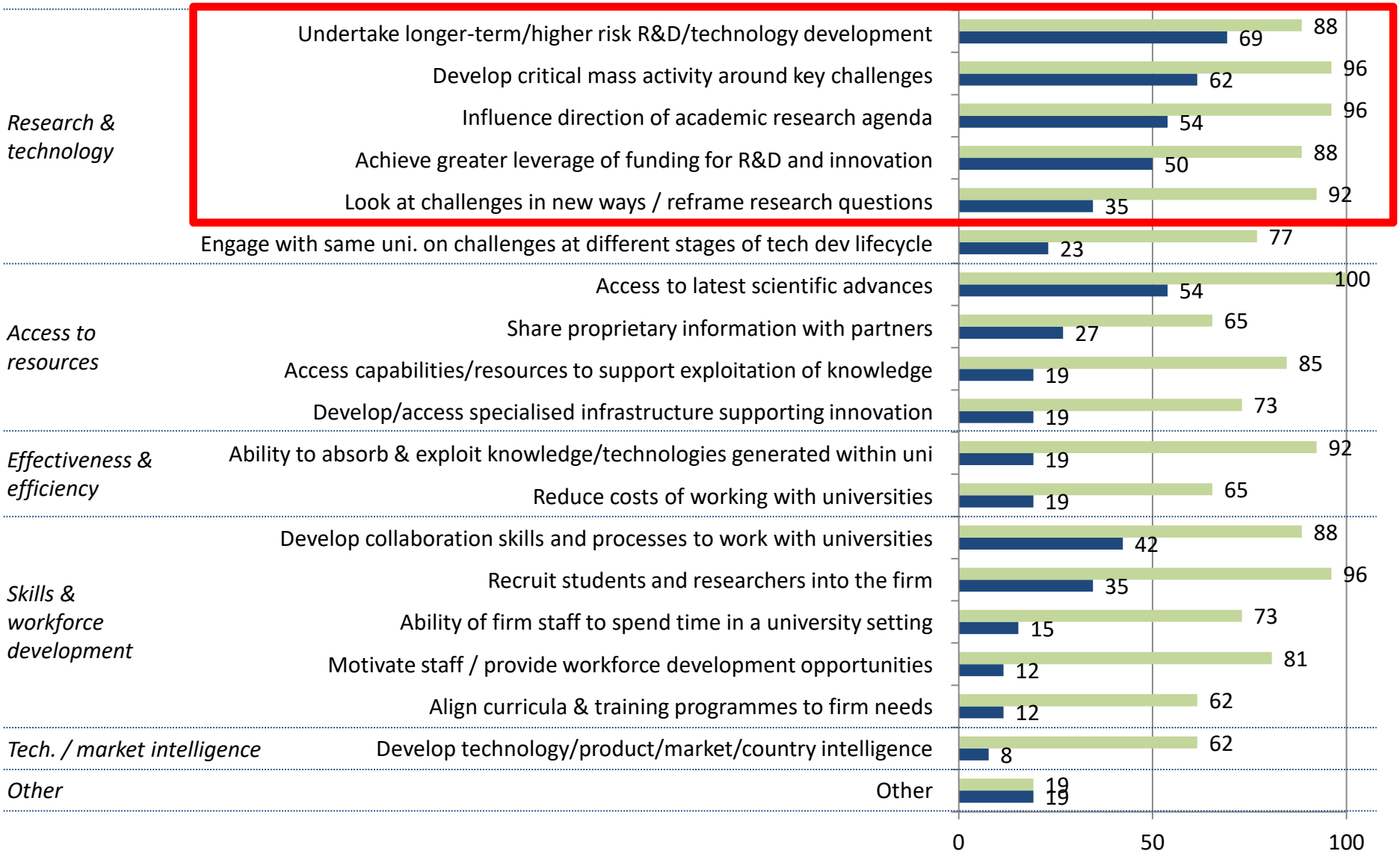

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Discussion

Features of UISPs revealed by 'framework' analysis

- Support development of 'technology innovation infrastructure'
  - platform technologies
  - production technologies
  - infratechnologies
- Can contribute to organisational innovation (e.g. related to supply chains)
- Focus on next gen technologies / incremental innovation (rather than radical)
- Benefit firms further along innovation chain than might have been anticipated
  - As well as important contributions to early stage innovation activities (idea generation, internal R&D activities) results suggest significant contribution to technology validation and demonstration
- Make variety of distinct enabling contributions to how firms do innovation, e.g.:
  - provide firms with spaces where they can undertake R&D that is longer-term and higher risk than is possible internally;
  - develop critical mass of activity in key areas;
  - leverage additional funds for R&D;
  - and influence the direction of academic research.

Summary & conclusions

Merits of technology innovation perspective on characterising university-industry partnerships

- Framework helps more effectively characterise features and benefits realised by firms from university-industry partnerships
  - reveals varieties of technological and organisational innovations being strengthened through the strategic partnerships
  - highlights the importance role of UISPs in developing the 'technology infrastructure' underpinning innovations
  - reveals where along the innovation process UISPs contribute, and the types of innovation enabling factors being enhanced, and suggests contributions
  - reveals *how* these benefits are being realised (the immediate 'mechanisms of action')
- Insights and approach should help partners more effectively frame and explore value propositions, understand how partnerships deliver benefits
- Provide more detailed understanding of *where*, *how* and *when* strategic UI partnerships contribute to technological innovation within firms

Thank you

Dr Eoin O'Sullivan
eo252@cam.ac.uk

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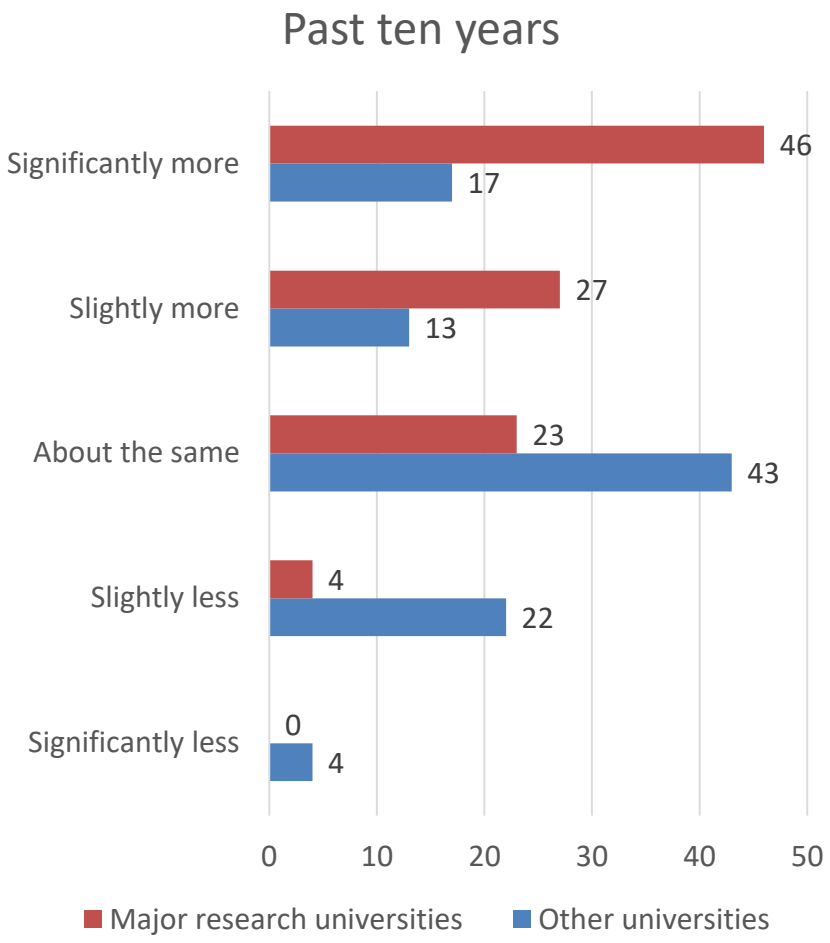
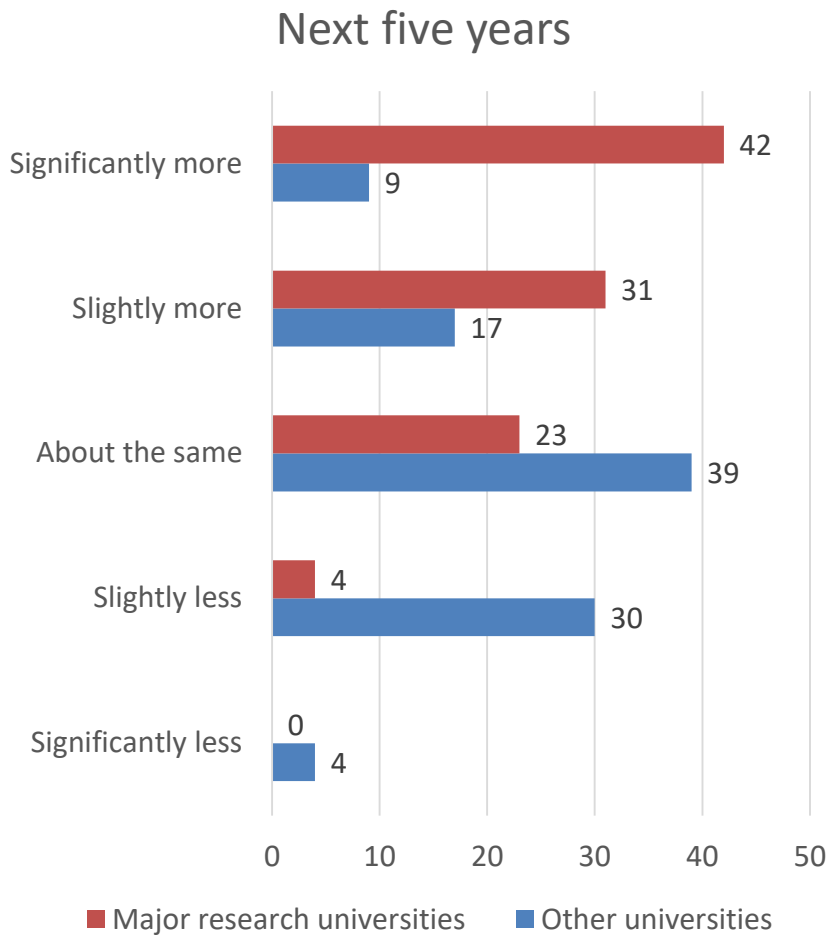
Key trends

Over the next five years, do you believe that the amount in university-industry activity involving your organisation channelled through strategic partnerships relative to other forms of university-industry engagement will change?





Sample characteristics

- Following US-UK focus of workshop, targeted large, research-intensive product driven multinational firms with experiences developing UISPs with UK / US universities
- Success of survey required effective targeting to specific senior individuals within company with responsibility for / involved in developing strategic partnerships with universities
- Firm sample constructed from following sources:
  - UIDP membership
  - EPSRC business partners
  - GSK-PraxisUnico 2013 What Industry Wants event
- 95 target firms identified
- Worked with key organisations to access right individual
- 26 responses (27% response rate)
  - R&D expenditure (2014) of responding companies: ~US$ 33B
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Defining and characterising
University-Industry Strategy Partnerships

Strategic partnerships include those higher value partnerships that typically have most or all of the following features:

- Are for the longer term (beyond the lifetime of a typical project with no intended end date / planned “sunset”)
- Transcend any one project
- Transcend any one individual
- Exhibit some degree of selectivity on the part of the leadership of the firm and university (not just bottom-up repeat business)
- Involve investment / commitment to, developing deeper, stronger and longer term relationships between partners
- Aim to achieve greater return on each partners’ investment of resources (financial and non-financial)

University Objectives

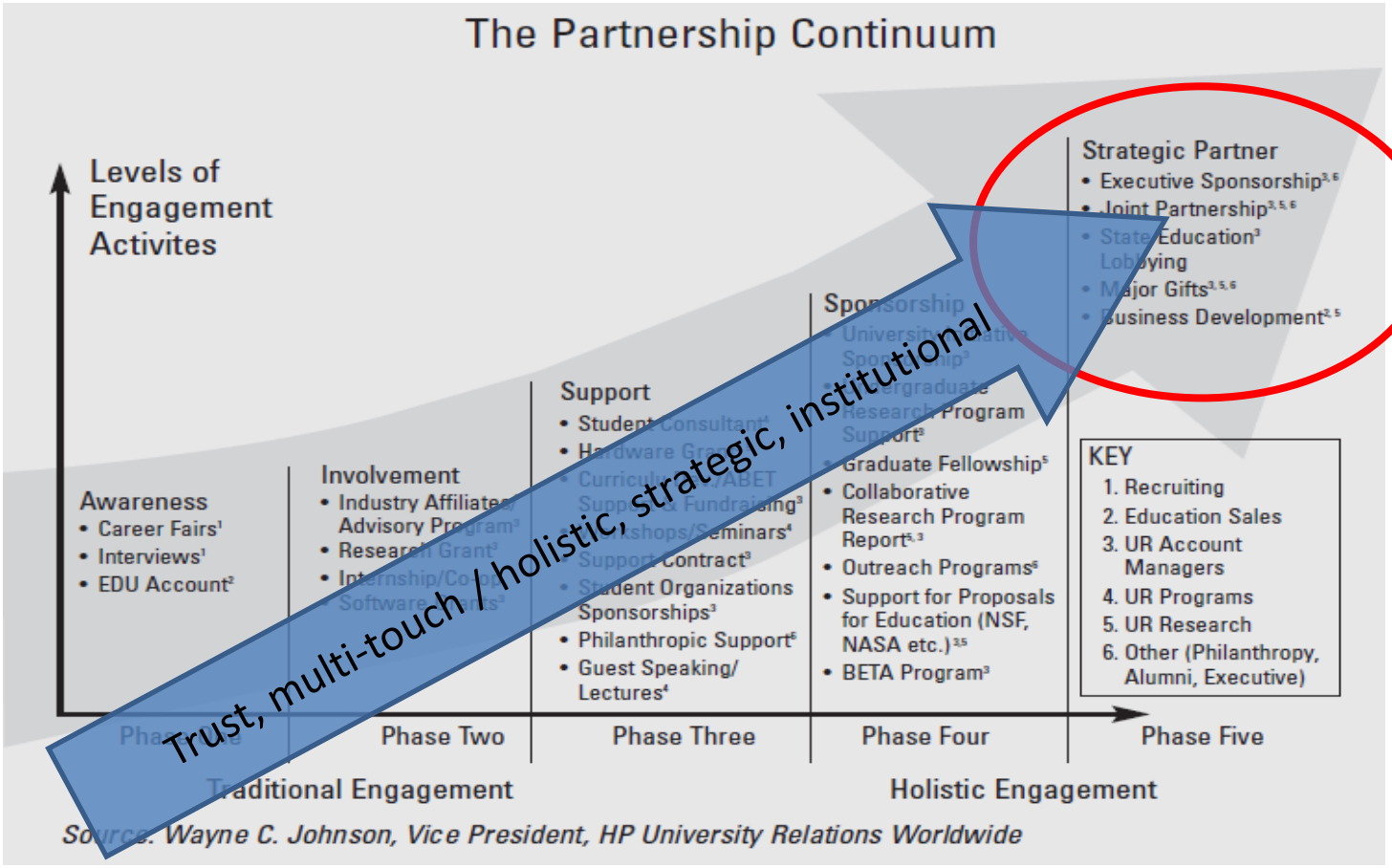
- Provide a focal point around which to **develop and coordinate critical mass**, often interdisciplinary, resources to address major innovation challenges
- Work with industry to identify, and secure funding to **explore hard industrial technology and innovation challenges**
- Develop / enhance **routes to exploitation for research outputs**
- **Shape research directions**, not least through a greater understanding of industrial innovation needs and the pathways to exploiting research
- **Access to specialised infrastructure** in industry (e.g. facilities, equipment, materials databases and other resources)
- **Enriching the student experience** and recruitment opportunities
- **Strengthen capabilities of researchers and build effective routines** for working effectively across the interface
- **Support local economic development**, not least the attraction of what are often sustained, multi-million pound R&D investments.

Industry Objectives

- Support technological development, particularly **addressing longer term, larger scale innovation challenges** too risky to undertake internally, or where critical mass activity is required
- **Develop technologies further** along the innovation value chain
- **Leverage complementary research capabilities**, infrastructure and, importantly additional R&D funding
- **Enhance the efficiency** and effectiveness of identifying, accessing and absorbing knowledge from within the university base
- **Develop talent, workforce skills and capabilities**, both in specific technical and managerial areas as well as for working effectively across the interface with universities
- Enable **access to specialist resources and infrastructure** that would be hard in the absence of long term commitments and trust
- Facilitate **entry into new national or regional innovation systems** where the firm has limited prior understanding of the landscape
- Strengthen **policy engagement and development of institutions** supporting technology emergence

Source: For the full list of benefits, see Coates Ulrichsen and O'Sullivan (2014) *Building Long Term Strategic Partnerships: Lessons and Effective Practices from UK and US Experiences*, Workshop report

What are University-Industry Strategic Partnerships?



Source: UIDP (2012) *Partnership Continuum: Understanding and Developing the Pathways for Beneficial University-Industry Engagement*

Research design

- **Exploratory phase:** Workshop & preliminary scoping interviews – explored how companies benefited from strategic partnership among other issues
- **Framework development:** Evidence from exploratory phase combined with insights from literature to develop conceptual framework
- **Survey:** Dimensions of conceptual framework tested through a **structured survey of firms** engaged with universities in both UK and US
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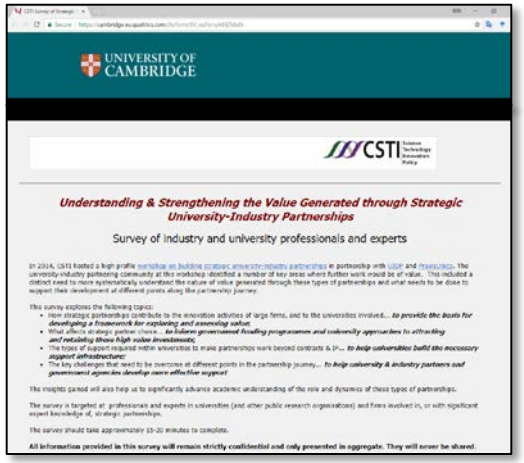

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