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OPEN STANDARDS, MULTI-DOMAIN INTEGRATION AND THE NATIONAL PROSPERITY AGENDA

FOREWORD

In this era of persistent competition and rapid technological change we find ourselves in, new and improved approaches to military capability development, generation, and operation are required. Western military organisations are looking to increase integration at all levels of warfare and across all operational domains, known as multi-domain integration, as a key model for addressing this need. Technical solution providers will play a critical role in the development of such integrated capability as a result. Industry must continue to innovate faster, and collaborate more closely, to enable the technological evolution of the integrated "Whole Force" (Defence, pan-Government organisations and industry) at the speed of relevance.

As well as underpinning the continued success of our military organisations in competing with our adversaries, the UK defence industry's contribution to our national prosperity is significant. The Defence and Security Industrial Strategy sets out Government's intention to invest in the right equipment, not only to ensure our military is ready to rise to the challenges of the threats we face, but also as a lever to continue to grow the prosperity of the United Kingdom. Investing in the right equipment, developed with a focus on future innovation and attractiveness to our allies and partners, will increase the UK defence industry's contribution to national prosperity.

This white paper illustrates why we believe embracing a truly open standards approach to capability development provides a force multiplier in the race to achieve MDI and grow national prosperity.

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INTRODUCTION

In our industry, the term "open standard" is becoming increasingly commonplace, as is the focus on mission agility, but what does being truly open and agile look like and how can you best achieve this across multiple operational domains?

More importantly, how can we as a nation capitalise on our sovereign capabilities to deliver the agility and interoperability made possible by open standards in line with the Government's national prosperity agenda?

In this paper, we explore how embracing open standards and unlocking greater agility is a critical stepping stone towards realising our national prosperity and resilience ambitions.

The paper has four main sections:

Open Standards: Introduces open standards and their benefits to Defence and the defence and security industry

Multi-Domain Integration (MDI): Introduces the MDI concept and explores how adopting open standards is vital to realisation of the vision

National Prosperity: Discusses the defence and security industry's contribution to national prosperity, examines how this can be greatly enhanced by harnessing open standards, and identifies how Defence can maximise the benefits by adopting a truly open approach

Open Standards: A Force Multiplier: Illustrates how truly open standards are a force multiplier in Defence's implementation of MDI and a growing contribution to national prosperity

OPEN STANDARDS

The use of open standards has long been promoted in government and Defence. Governments have written many publications on open standards policy, mandating their implementation and defining suites of standards for use in the architecture of defence and security solutions. But what is an open standard?

There are many definitions, each of which includes variations on the openness of the drafting process, the availability and completeness of the standard, and usage rights. The UK Government Open Standards Policy[1], created through public consultation with a wide range of subject matter experts, states that a truly 'open' standard should have the following characteristics:

> Developed through collaboration between all interested parties, not just individual suppliers

> Developed using a transparent and published decision-making process that is reviewed by subject matter experts

> Developed using a transparent and published feedback and ratification process to ensure quality

> Well-documented, publicly available, and free to use to provide fair access

> Mature, unless they are in the context of creating innovative solutions

> Supported by the market to demonstrate the independence of platforms, applications and vendors

> Released for use with a royalty free licence which is irrevocable unless there is a breach of conditions

1 Policy paper: Open Standards principles, 5 April 2018, www.gov.uk

OPEN STANDARDS: THE BENEFITS

If a standard possesses all of these characteristics then it will unlock a range of benefits for Defence and the 'Whole Force':

Reuse Efficiency: Components, subsystems and systems can be reused across products, solutions and capabilities with through-life cost benefits

Increased Innovation: Greater market competition and diversity drives new and improved systems and services

Flexibility: Architectures based on open standards allow specific components to be interchanged and upgraded with ease

Avoid Vendor Lock-in: Flexibility coupled with greater market competition creates vendor choice

Reduced Integration Risk: Collaboratively and transparently developed, mature standards ease integration between components, systems and 'systems of systems' to achieve desired behaviours

Improved Interoperability: Barriers to free flow of data and information between systems and operational partners are removed
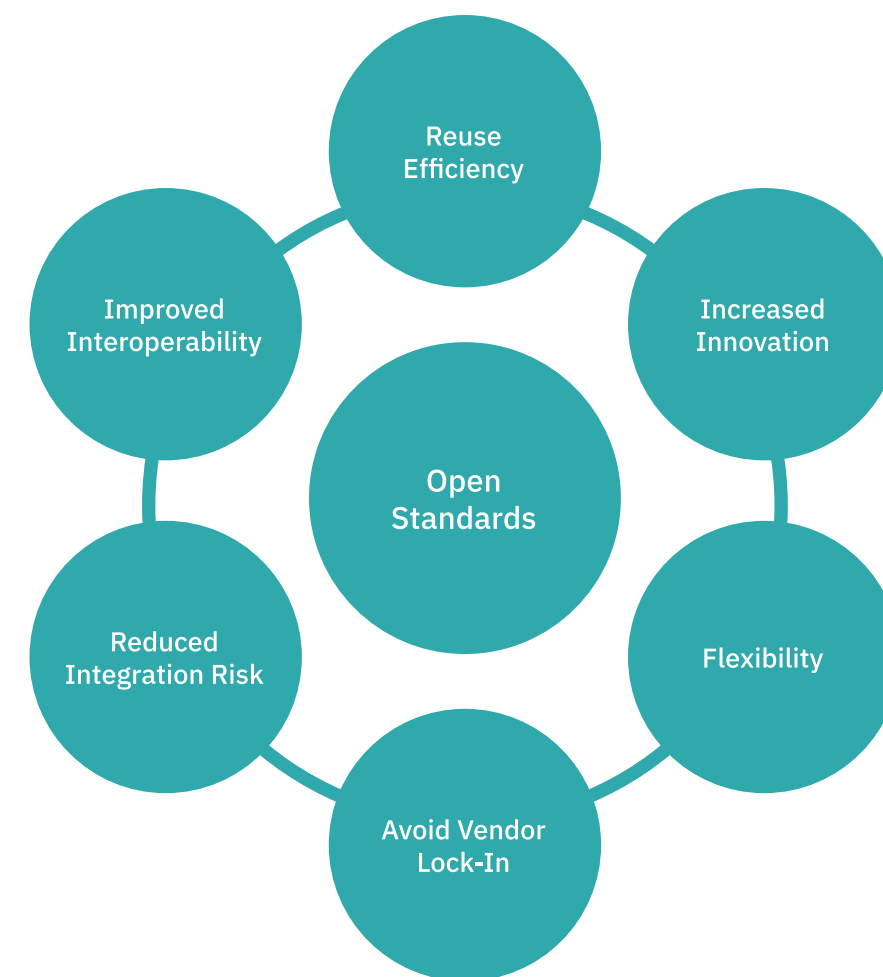

Figure 1: Benefits of Open Standards

The pervasiveness of information and the pace of technological change in the modern world is having an increasing impact on the ability of existing military systems to keep up with or outpace adversary capability. Defence recognised this in the publication of the Integrated Review in March 2021 and the resulting Integrated Operating Concept 2025.

Looking again at the benefits in light of the changing character of warfare, it becomes clear that open standards and architectures are a key enabler of the rapid capability development needed to address this continuously evolving threat landscape. The re-use efficiency, flexibility, and reduced integration risk that open standards provide align perfectly to the need to develop new systems and solutions at speed.

MULTI-DOMAIN INTEGRATION

Multi-Domain Integration (MDI) is UK Defence's response to the changing character of warfare brought about by the Information Age (the pervasiveness of information and technological change mentioned earlier) as well as a new era of persistent competition with our adversaries. It is a military concept that seeks to change the way Defence operates and war fights, from joint operations to integration across all three levels of warfare (strategic, operational and tactical), across all five operational domains (maritime, land, air, space, and cyber and electromagnetic), and across the 'Whole Force'.

Implementing the MDI concept requires a significant change programme for Defence. This paper does not attempt to address all the details of this, however, a crucial enabler to the delivery of MDI is technological development. Continued development of new systems and solutions is vital to help generate the capability required for MDI to succeed.

To gain the required mission agility, the 'Whole Force' must achieve:

Technical Innovation at Pace: New technologies are identified and matured faster, not only to keep up with but outpace our adversaries and gain advantage. New capabilities leveraging these technological possibilities are developed, delivered, generated and accepted into service at the pace of relevance.

Capability Integration Agility: Integration in a much more agile and adaptable way to enable leveraging of capabilities across levels of warfare and domains, and with allies.

Freedom of Action: Control over what changes are made, when they are made, and by whom provides the ability to operate, repair, assure, update and share capability at will.

- Benefits of Open Standards
- Enablers of MDI

Reduced Integration Risk

Improved Interoperability

Technical Innovation at Pace

Increased Innovation

Multi-Domain Integration

Avoid Vendor Lock-In

Freedom of Action

Capability Integration Agility

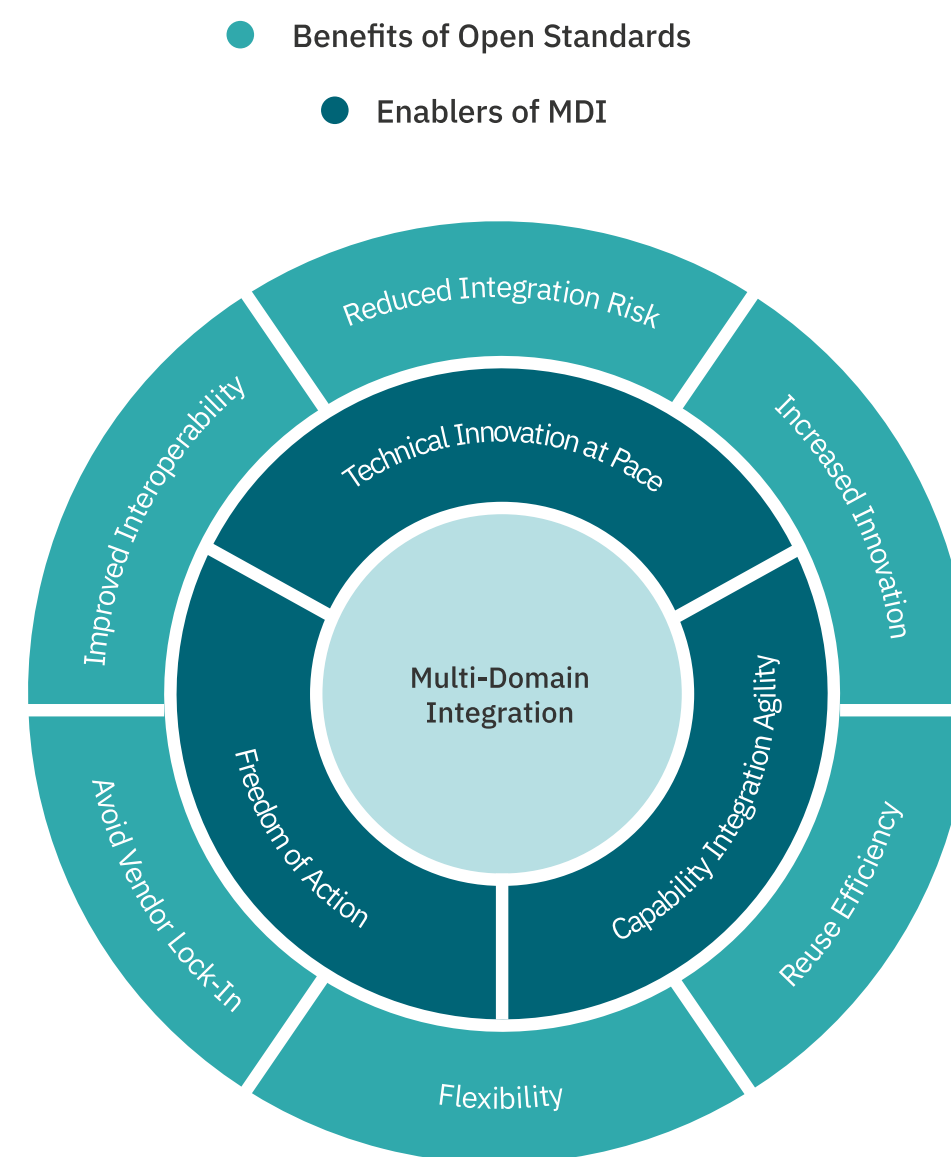Reuse Efficiency

Flexibility

Figure 2a: Open Standards Benefits as Enablers of MDI Overview

EMBRACING OPEN STANDARDS FOR MULTI-DOMAIN ADVANTAGE

Although implementing the MDI concept may sound daunting, the journey to a successful model can be made considerably easier. By embracing open standards and the many benefits it makes possible, MDI becomes instantly more achievable:

Technical Innovation at Pace: Open standards provide more opportunities for competition and innovation through broader involvement of industry and academia as they reduce reliance on monopoly suppliers and improve access for Small to Medium-sized Enterprises (SMEs) throughout the system's lifecycle. Programme durations to generate new or upgraded capability are reduced through a lack of vendor lock-in, ready availability, interoperability of Commercial-off-the-Shelf (COTS) solutions, and reduced integration risk for new aspects of development.

Capability Integration Agility: The flexibility, reduced integration risk, and improved interoperability offered by open standards enable modification of capability for different operational roles or to adapt to changing Defence needs with agility.

Freedom of Action: The avoidance of vendor lock-in and the flexibility inherent in the use of open standards provides Defence with freedom of action.
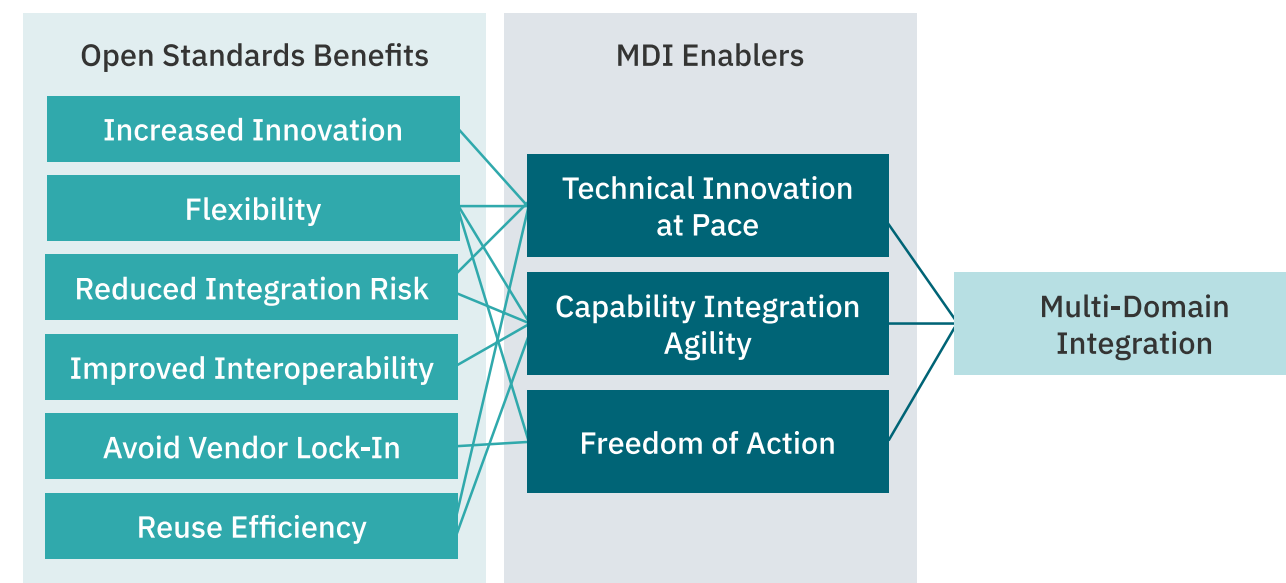

Figure 2b: Breakdown of Open Standards Benefits as Enablers of MDI

Considering the points explored, it is clear that now more than ever the 'Whole Force' must embrace open standards to truly achieve the vision of MDI. However, although Defence is aware of this, the use of all of the characteristics of truly open standards is not being maximised, and their benefits therefore not fully realised.

The final section of this paper explores lessons learned from the application of open standards within Defence and suggests improvements to maximise the benefits they offer, not only towards achieving MDI, but also the Government's national prosperity agenda.

But first, what is the national prosperity agenda, why should it be a key consideration for both Defence and industry, and what is the link to open standards?

NATIONAL PROSPERITY AGENDA

The national prosperity agenda is a UK Government intention to promote the economic wellbeing of the United Kingdom and its people. Increasing national prosperity has been an explicit objective for Government since the 2015 Strategic Defence and Security Review. An emphasis on the nation's recovery from the COVID-19 pandemic has boosted the priority of this objective.

The 2020 Integrated Review of Security, Defence, Development and Foreign Policy sets out a Government vision to "build back better" so that Britain is stronger, safer, and more prosperous than before, placing Science and Technology at the heart of this.

Further, the Defence and Security Industrial Strategy (DSIS) makes it clear that ensuring "the UK continues to have competitive, innovative and world-class defence and security industries" is a key enabler to the national prosperity agenda as they "underpin our national security, drive investment and prosperity across the Union, as well as contribute to strategic advantage through science and technology".

It is great to see continued recognition of the importance of the defence and security industry to national prosperity at the highest levels of Government, but how can Defence turn this strategic imperative into firm action?

THE ROLE OF OPEN STANDARDS IN NATIONAL PROSPERITY

The publication of DSIS sets out a range of commitments which it believes will contribute significantly to enhancing the UK's defence and security industry and its share of national prosperity. When outlining these commitments, DSIS frequently refers to open standards, open architectures, and open systems as valuable enablers for realisation of its strategy. The publication highlights the same benefits of open standards as discussed in the first section of this paper as reasons to embrace them within defence and security systems,

this time as benefits to industry and national prosperity:

Incentivises Investment: The enhanced speed of technical innovation and capability development, integration agility, and freedom of action encourages spiral development of systems. Regular upgrade of systems, rather than one-off procurements, and the reuse of the same component solutions across multiple capabilities incentivises businesses to invest with a greater chance of success across more programmes.

Long-term Savings for Reinvestment: The reuse efficiency also contributes to savings for both defence and industry which can be reinvested, further contributing to economic growth and national prosperity.

Unlocks International Markets: The freedom of action afforded to Defence through the use of open standards is also appealing to partner nations. The use of open standards to build open architectures allows them to tailor solutions to their specific needs while capitalising on improved integration, opening up international markets for industry solutions.
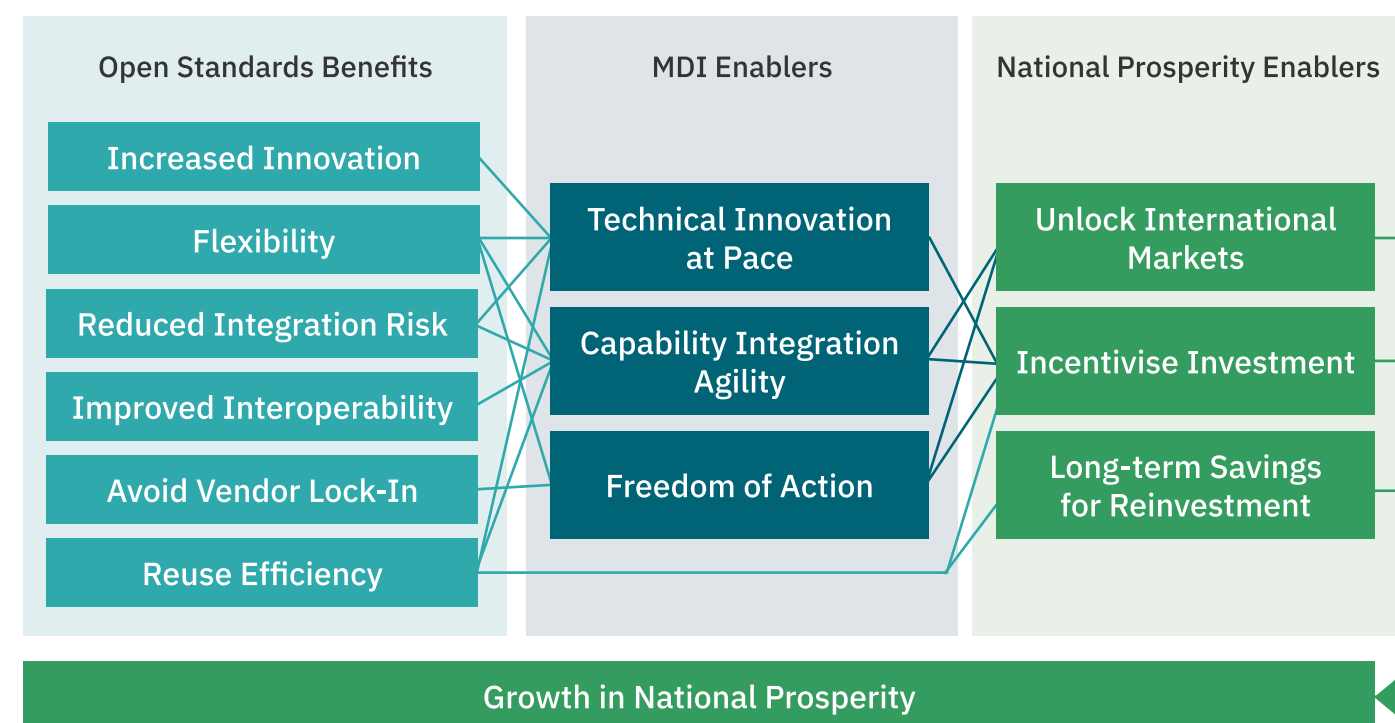

Figure 3: Open Standards Benefits as Enablers to National Prosperity

As we have seen, the benefits of open standards massively contribute to the success of both MDI and national prosperity. There are some really good instances of the application of open standards within Defence for these purposes.

For example, the Generic Vehicle Architecture (GVA) initiative resulted in a range of open standards developed in collaboration with industry and is seeing realisation of:

Unlocking International Markets: Adoption of GVA into NATO and Australian GVA standards for future programmes

Incentivised Investment: Subsystem and component suppliers are investing in developing GVA compliant products in the knowledge that future programmes present a real opportunity

Long-term Savings: Defence is capitalising on previous programme investment in subsystems and components now seeing reuse across multiple programmes (Foxhound, Ajax and Challenger 3).

This said, it remains the case that wider Defence often does not maximise on the benefits made possible by open standards.

MAXIMISING THE BENEFITS OF OPEN STANDARDS

In high-level policy, concept, and strategy terms, Defence has recognised the benefits stated. In the process of implementation, however, Defence forgets that an open standard is most successful, not only by having appropriate intellectual property rights (IPR) to prevent vendor lock-in and appearing 'open', but when the definition laid out in the first section of this paper is properly embraced. To maximise all of the benefits discussed, Defence must:

Collaborate Extensively: Develop standards and future architectures through collaboration between as many, and ideally all, interested parties as possible, not behind closed doors or through closed contracts with a few commercial entities. Industry would welcome the opportunity to co-develop and co-invest in solutions with Defence's capability architects.

Disseminate Transparently and Proactively: Publicise ongoing standardisation and architecture development work and publicise early drafts of standards. Make this information easily available to all interested parties. Early insight allows industry to take an informed view as to where to target their investments, understanding that they cannot then be too critical when standards and architectures change.

Select Mature Standards with Market Traction: Select mature, well-understood standards wherever possible. Standards with existing market support reduce barriers to entry for SMEs, maximise innovation and development pace, and incentivise investment due to reuse and export opportunities. It is recognised that Defence often has specialist requirements, however, in the Information Age where commercial technology is frequently the driving force behind technological progress, looking at these requirements from a different perspective will often expose existing commercial or open source opportunities.

OPEN STANDARDS:
A FORCE MULTIPLIER

It's clear that national prosperity and national security are mutually reinforcing. Likewise, open standards are consistently proving to be a critical stepping stone towards achieving the dual visions of MDI and national prosperity.

As such, open standards are therefore a force multiplier in the drive to "build back better" to be a stronger, safer and more prosperous nation than ever before. They should be embraced by Defence and industry alike.

An era of **persistent competition** demands **persistent collaboration** between Defence and industry to truly maximise the benefits of open standards, accelerate the implementation of MDI, and drive national prosperity.
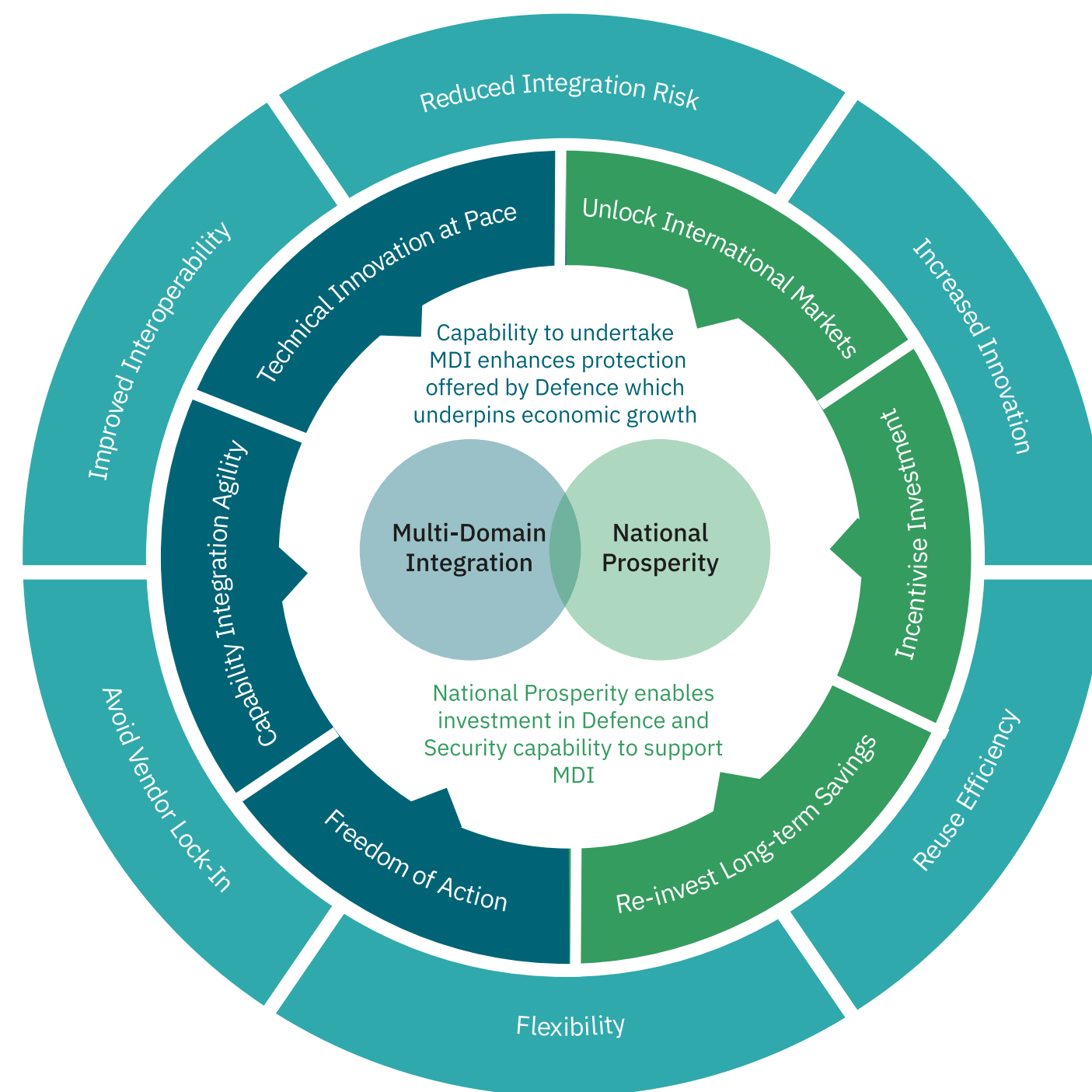

Figure 4: Open Standards, Multi-Domain Integration and National Prosperity

L3HARRIS EMBRACES
OPEN STANDARDS

L3Harris Technologies is committed to accelerating innovation by creating multi-role systems that employ open standards, addressing the battlespace challenges of today and the mission requirements of the future. If you'd like to find out more about how we can help you maximise the benefits of open standards, we'd love to hear from you.

When the freedom to do more and do it faster is key, L3Harris helps you unlock mission agility. We think differently, pioneering next-generation security and defence solutions that are made for the mission and span all domains. Collaborative inside and out, we strive to make the world a safer place.

FURTHER INFORMATION:

To learn more about how L3Harris can help you stay ahead of the curve please get in touch:

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L3Harris Technologies is an agile global aerospace and defence technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defence and commercial technologies across air, land, sea, space and cyber domains.