Final evaluation of the Global Supply Chains Intelligence Pilot (GSCIP) and identification of potential future impacts

Independent Evaluation Report

June 2023

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Contents

1 Key messages for policymakers

This report contains a Key Messages for Policymakers section at the start to provide a more detailed summary than would normally be provided via an Executive Summary. This reflects the importance of the findings to the future roll-out of semi-automated global supply chain data mapping and analysis across government. **At this point, GSCIP is providing the UK with world-leading AI/Machine learning capability in supply chain mapping. Consequently, retaining and further enhancing this advantage is an important opportunity for HMG.**

1.1 The Global Supply Chains Intelligence Pilot – rationale and background

The Global Supply Chains Intelligence Pilot is an innovative programme that aims to map global supply chains at a product, and potentially component, level to understand the risks and opportunities associated with certain products, suppliers and geolocations.

The need for HMG to have a better understanding of global multi-tier supply chains has been recognised for a number of years, with Brexit, COVID-19 and Russia/Ukraine further illustrating how important this is from a national security and economic perspective.

The historical approach to conducting an analysis of multi-tier supply chains has largely been by commissioning an “ad hoc consultancy exercise”, that is, a combination of external consultants or contractors used alongside internal HMG analysts. These exercises were largely manual and often took several months to complete, and due to their static nature and long lead times, had limited long term value in the context of globally evolving supply chains.

Those involved in those initial supply chain mapping exercises have pointed out many limitations from a user experience perspective, and in terms of effectiveness and efficiency of the methodology being used in several areas - such as the significant time taken to map supply chains, sharing data and improving data interoperability.

Consequently, the Global Supply Chains Intelligence Pilot (GSCIP) was set up in May 2021 to transform our understanding of supply chains by developing a digital prototype which uses data driven approaches to combine commercial and HMG data to quickly derive new insights into supply chains for HMG policy and operational priorities. In addition, GSCIP aims to reduce commercial data acquisition costs for HMG by procuring data through a single HMG licence procurement exercise, therefore reducing costs to individual departments who might be thinking of buying commercial supply chain data separately. The programme also aims to further standardise and streamline existing processes for HMG data sharing through the development of standardised MoU’s and data sharing agreements so that HMG data can be shared more easily with departments leading to better data interoperability.

This pilot is an HMT funded, shared outcomes project involving several government departments (DBT, HMRC, ONS, UKEF, GCO/CO, MoD, HMT), together with support and funding from the National Security Strategic Investment Fund (NSSIF). Each department has submitted use cases detailing the products and companies they are interested in mapping the supply chains of. The alpha phase of GSCIP ended in March 2023. The team were then successful in bidding for continuation funding for a further two years – through to March 2025. The pilot has also now upped its status to a programme.

1.2 Why the artificial intelligence and machine learning based supply chain analysis capability is potentially so important to HMG

Global supply chains are critically important to UK prosperity, health, environmental sustainability and national security. Better and timely intelligence on these highly complex systems of inter-firm links helps us to anticipate problems and to exploit opportunities. This type of intelligence is particularly important for reducing risks and boosting resilience in the face of shocks and 'nasty surprises' that may catch us out if we are not well-prepared. We face many uncertainties over our dependency on global supply chains. The Global Supply Chains Intelligence Pilot (GSCIP) aims to translate many of these uncertainties into quantifiable risks by providing HMG with data and insights not previously available and/or over a timeline not previously possible.[1]

Improved intelligence capability is important because causes and effects are uncoupled in supply chains. Events that manifest themselves at a particular time in a specific UK industry or activity can have causes far removed both geographically and industrially. These relationships can be complex, hard to trace and anticipate meaning that traditional data is not fit-for-purpose. The same principles apply in national and economic security. The threats we face, and require better intelligence on, are best grasped by developing data integration, analysis and visualisation capabilities that can cope with high levels of complexity. Artificial Intelligence (AI) and Machine Learning (ML) provide the tools for integrating and analysing disparate data sources. As with many areas of cutting-edge technology, these methods can analyse information at a speed and sheer scope that many human beings cannot. GSCIP is being developed to provide this capability to HMG. Other governments, notably the US, are investing heavily in the application of new AI/ML capabilities for supply chain analysis.[2] Consequently, peer-to-peer intelligence sharing will only be possible if appropriate AI/ML tools are available to HMG. Thus, continuing with GSCIP after 2025 will be essential for geo-strategic engagement and intelligence sharing (for Five Eyes in particular).[3]

In software development terms, the **GSCIP Prototype Stage** involved a mix of *alpha* and *beta* phase work (system definition, development, and user testing). The next phase, perhaps best described as the **Enhanced Beta Phase**, will involve broader user testing, expanded datasets and deeper/more detailed work addressing technical refinements required by HMG users. The Enhanced Beta Phase will provide a key stepping-stone to any full roll-out.

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[1] See for example the Cambridge Institute for Manufacturing report on the importance of global supply chains to the UK, available at: https://www.ciip.group.cam.ac.uk/reports-and-articles/why-manufacturing-supply-chains-matter/

[2] For example this press release last year: "WASHINGTON and NEW YORK, August 4, 2022 – Exiger, a leading global risk and compliance SaaS company, announced today that they have been awarded a "first of its kind" contract by the U.S. General Services Administration (GSA) as a trusted partner to deliver a supply chain risk management (SCRM) and third-party risk management (TPRM) enhanced capability made available to the entire U.S. Federal Government. The multi-year, $74.5 million, contract award builds on Exiger's SCRM work with the Department of Defence (DoD) that has been tested and proven across multiple scenarios. GSA will now expand access to Exiger's SCRM solutions and allow all government agencies to share risk insights and consistently manage supplier risk and health across the U.S. Federal Government enterprise. This enterprise solution enables significant efficiencies including volume discounts, cross-enterprise data sharing, improved collaboration, and development of supply chain risk mitigation strategies."

[3] 'Five eyes' refers to a long-established international treaty facilitated security intelligence sharing network comprising the UK, USA, Canada, Australia and New Zealand.

1.3 The current status of GSCIP and the purpose of this evaluation

The Global Supply Chains Intelligence Pilot (GSCIP) has completed a key prototype phase aimed at demonstrating the benefits of faster and better intelligence on supply chains. This is the final evaluation of this prototype. The report also covers a forward-looking appraisal of the nature and extent of likely future benefits to HMG if/when GSCIP is rolled-out at scale across HMG.

In methodological terms, the evaluation of any prototype differs from a standard evaluation because the focus is on how a prototype reveals evidence on what works well, and what does not, and highlights the technical challenges that need to be resolved to maximise future benefits when the system is rolled-out. This means that the focus is on reducing risks for funds invested and future benefits maximisation. The outputs from prototypes are usually data and technical reports, and the outcomes are Financial Investment Decisions (FIDs). Long-term impacts stem from situations in which a subsequent investment go-ahead generates benefits that are unlikely to have been achieved if the prototype had not helped to give the investment go-ahead. In this sense, the *evaluation of a prototype is an evaluation of a means to an end*, not an evaluation of outcomes and impacts in the usual sense.

1.4 GSCIP's Value-for-Money

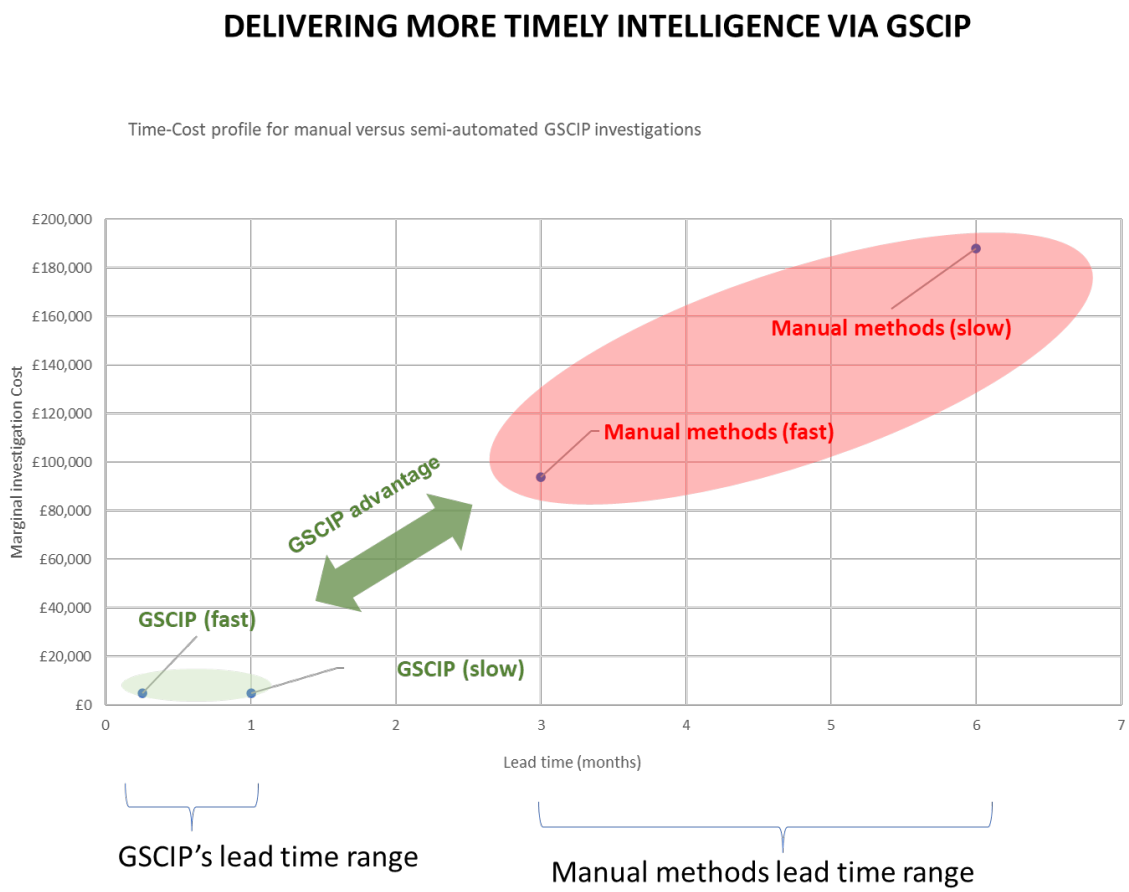
This evaluation has been structured around answering a set of research questions designed to provide a rounded picture of the benefits generated by GSCIP and how these benefits are generated based on use case experiences to date. A summary table containing the answers to these research questions can be found at the end of this *Key Messages for Policymakers* section. Given the importance of Benefit-Cost Ratio (BCR) aspects of this evaluation (just one aspect of these research questions), these findings are presented first as they are of key interest to senior officials.

GSCIP'S TIME AND COST ADVANTAGES

Figure 1, sets-out the GSCIP advantage in terms of intelligence access lead times and the costs of delivering this intelligence. As is clear, these advantages are substantial. Both fast and slow response time ranges for GSCIP and manual intelligence gathering are provided based on the use case provided evidence.

The key finding here is that **GSCIP has vastly superior combination of more timely and (in marginal cost terms) cheaper intelligence capability over traditional manual methods**. This reflects the ways in which **AI/Machine learning capability can collate and filter data at a scale and speed that teams of people cannot match**.

Figure 1



Source: Ipsos

Note: in this particular context, current concerns over the regulation of generative AI are not directly relevant because GCSIP's functionality rests on the large scale and high speed of data capture, data linking and knowledge-graph generation (a method for identifying links between complex entities and issues of interest). GSCIP does not involve generative AI activity.

WHY GSCIP'S FAST RESPONSE TIMES MATTER

Figure 2 contains a simple equation that shows why more timely intelligence is important - and how its value can be calculated. This equation combines a 'risk' element (the probability of damage eventuating and the cost of this damage if it does eventuate) together with an 'urgency' element (the ratio of the threat reaction time to the intervention time to avoid a bad outcome).

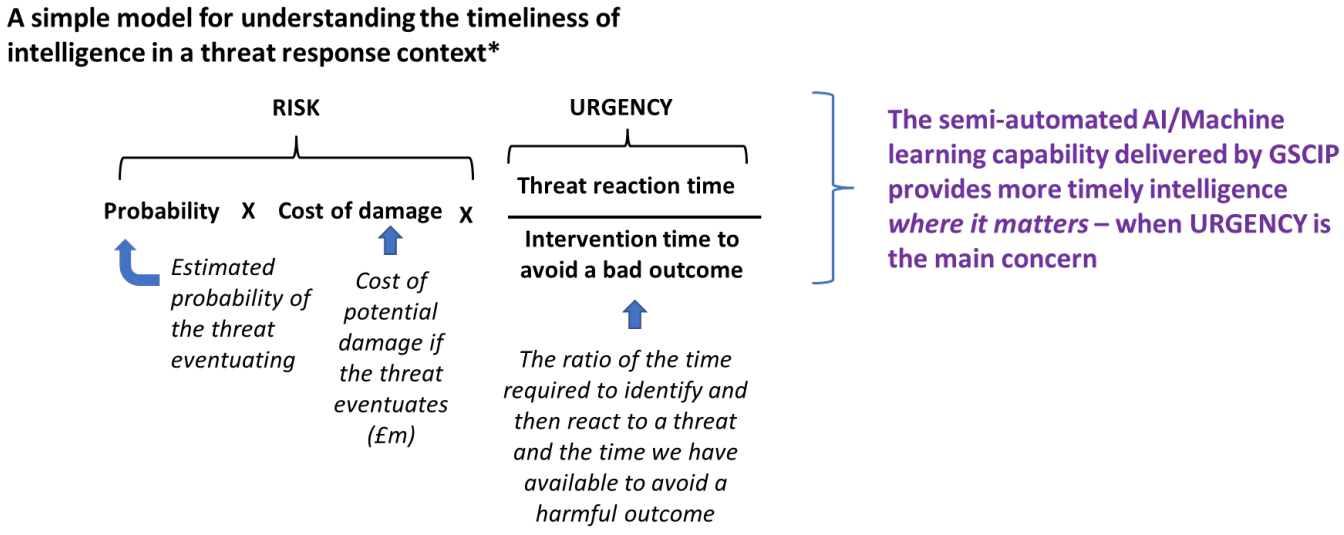
In effect, this combines an insurance industry perspective (risk) and an air traffic control angle (urgency in addressing potential problems before they escalate). The faster the threat reaction time (which reflects how long it takes to identify a threat and how long it takes to plan and deliver a response) the lower the cost of the damage that will be sustained. Whilst the underlying threat reaction processes are more complex, this simple equation, in which the urgency component acts to decrease or increase the costed risks depending on the timeliness of the intelligence relative to the particular threat context, provides a useful summary.

The same equation can also be used to characterise the importance and value of 'upside' opportunity-based uses of GSCIP in assisting industrial competitiveness. This is because, both for government and industry, identifying and acting on new competitive opportunities also benefits from more timely intelligence.

Consequently, this evaluation recommends that this type of framework be used as part of future monitoring GSCIP's impacts in the post-prototype phase. It was not appropriate to apply estimates of this type at this point in GSCIP's development because the required evidence is not currently available.

Figure 2

THE BENEFITS OF MORE TIMELY INTELLIGENCE



* Adapted from Lenton et al (2019) Climate tipping points – too risky to bet against. *Nature Comment*. Vol 575. 27 November.

Source: Ipsos

GSCIP'S BENEFITS AND COSTS COMPARED TO ALTERNATIVES

A fast representative supply chain investigation using manual methods will take three months and have a marginal activity cost of £94,000, GSCIP has a major advantage. In some cases, 6 months may be required for manual methods at a cost of £188,000. In contrast, GSCIP's automated capability can achieve this in a month (or less) for a marginal activity cost of £5,000.[4]

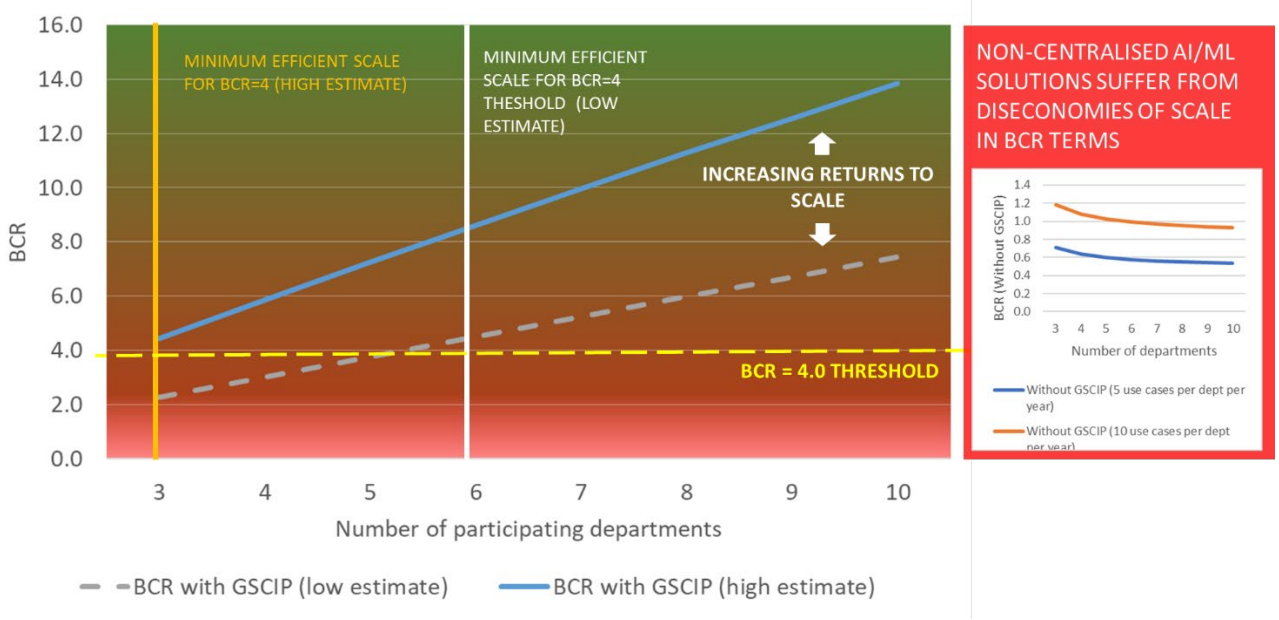
The chart in Figure 3 below, draws-out the scale dimension to GSCIP's cost advantage by plotting an upper and lower estimate of the GSCIP BCRs by the number of participating

[4] These estimates originated in the GSCIP Interim M&E Report prepared by the Department and have been checked and validated in this study.

departments. It also includes a revealing comparison with the 'saleability' of distributed AI/Machine learning solutions – which suffer from dis-economies of scale in BCR terms because costs start to exceed benefits without the savings created by GSCIP's centralised solution. Note: we have not included a similar scale-based comparison of BCRs for manual versus semi-automated methods because the use cases highlighted that timelines and costs are too high for at-scale applications. GSCIP allows intelligence to be collected not otherwise possible at this scale.

The lower estimate assumes that each participating department will run 5 use cases per year and the upper estimate assumes 10 use cases per year. These estimates are based on the findings to date on uses of the GSCIP prototype (very broadly that a department may want to run a new use case every six to eight weeks). The vertical lines indicate the number of participating departments required to deliver the (high) threshold BCR of 4.0 for the lower and upper boundary estimates.

Figure 3



Source: Ipsos

The BCR range generated is between 4.5 and 8.5 for 6 participating departments through to between 7.43 and 13.8 for ten participating departments. Hence, **under very conservative assumptions this is a very strong return-on-investment**. These would be viewed as exceptionally good BCRs in other areas of government, for example in transport infrastructure investments. The very strong scale effect on these BCRs points to the importance of maximising the number of participating departments and these departments making effective use of the new capability in order to deliver overall Value-for-Money for HMG. Of course, these BCRs will be significantly higher in situations in which users rely on timely intelligence to address threats and opportunities of major significance.

The core driver of these very high returns-on-investment is the way in which GSCIP delivers a major reduction in the cost of delivering valuable supply chains intelligence – intelligence that is valuable because it assists HMG to act faster and more effectively in response to a range of threats. GSCIP's value-for-money contribution is greatest

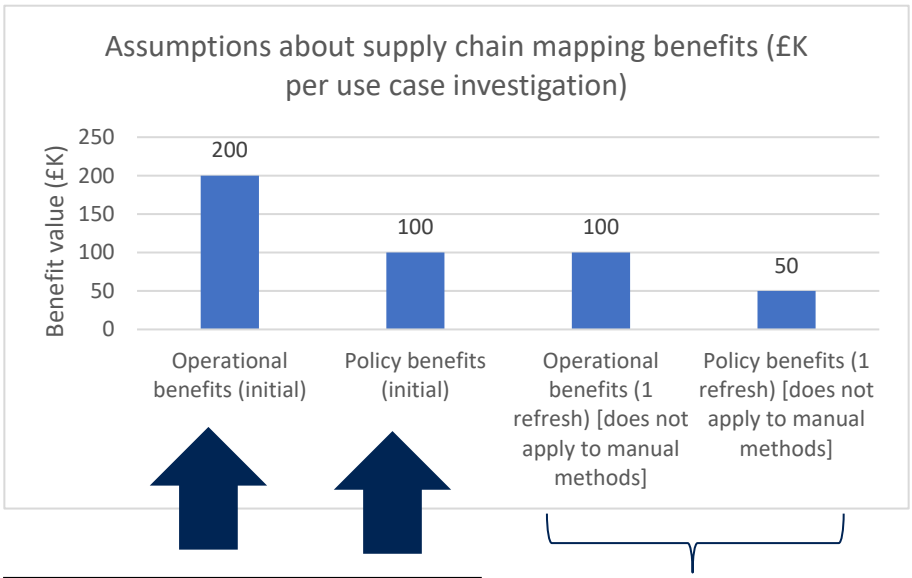
when it allows urgent and potentially very damaging threats to be handled via faster policy responses that also benefit from more accurate data due to fewer blind spots ('the unknown unknowns').

Details of how we calculated these Benefit-Cost Ratios (BCRs) for GSCIP can be found in the main body of the report. We used the conservative estimates provided in the Interim M&E report as these are a credible starting point for low-end benefit values (and are considered in more detail in a subsequent infographic). The advantage of using this cautious approach is that it avoids the risk of over-estimating what could be very substantial benefits generated by GSCIP – if the BCRs look compelling under such assumptions, then the achieved BCRs will be significantly better.

Figure details these assumptions. Operational uses are valued at £200K per investigation (a given use case can in principle involve more than one investigation if different aspects of a challenge or opportunity are involved). Policy uses are valued at £100K. As GSCIP is so much faster in delivering intelligence compared to manual methods, the estimates factor-in one additional operational and one additional policy use 'refresh'. That is to say, updating data and analysis to look for any changes that have taken place and/or respond to intelligence user requests for more detail or other aspects to be examined. These intelligence refreshes are valued at half the original value. This is, by necessity, a simple 'rule of thumb' assumption that assumes that a subsequent intelligence update will be less valuable than the initial analysis in terms of threat/opportunity monitoring and any decisions to be made. Of course, if fast developing (urgent) and high damage (risk) threats are faced then these intelligence refreshes can be more valuable than the initial analyses – especially if decisions with potential unwanted consequences need to be made. Manual methods are too slow to allow for such refreshes in many circumstances, so this refresh value applies only to GSCIP. In practice, GSCIP will allow for a series of these intelligence refreshes, hence further increasing the GSCIP advantage over manual methods. This refresh aspect can be valued more accurately in the post-prototype phase using the 'risk x urgency' framework summarised in . The high 'clock speed' of a GSCIP intelligence cycle (how fast the response is to requests for intelligence) is far more fit for purpose than the clock speed of manually dependent intelligence cycles – where intelligence delivery can be too late as the threat has already arisen.

These refresh value estimates are comparable to those used in the Interim M&E Report but have been set slightly lower, and are broken down into both an operational and a policy use element. This disaggregation will be useful for monitoring actual GSCIP performance moving forward (as different use cases can involve different mixes of operational and policy uses). To re-stress a point made earlier, given the substantial value of more timely intelligence these estimates of the benefits value are very conservative and do not factor-in situations in which GSCIP's superior timeliness allows a low probability but fast-developing and very damaging threat to be handled in ways that manual methods would be too slow to do. In such situations, GSCIP can avoid considerable damage costs to industry, government and the general public.

Figure 4



For both operational and policy benefits, as this independent evaluation of the GSCIP prototype has highlighted, much of the benefit value stems from revealing major data 'blind spots'.

GSCIP's semi-automated AI/Machine learning capability decreases the probability that we will fail to identify threats and opportunities – especially when timeliness is important.

Reduced intelligence blind spots and much faster access to the intelligence have major benefits likely to greatly exceed these conservative estimates.

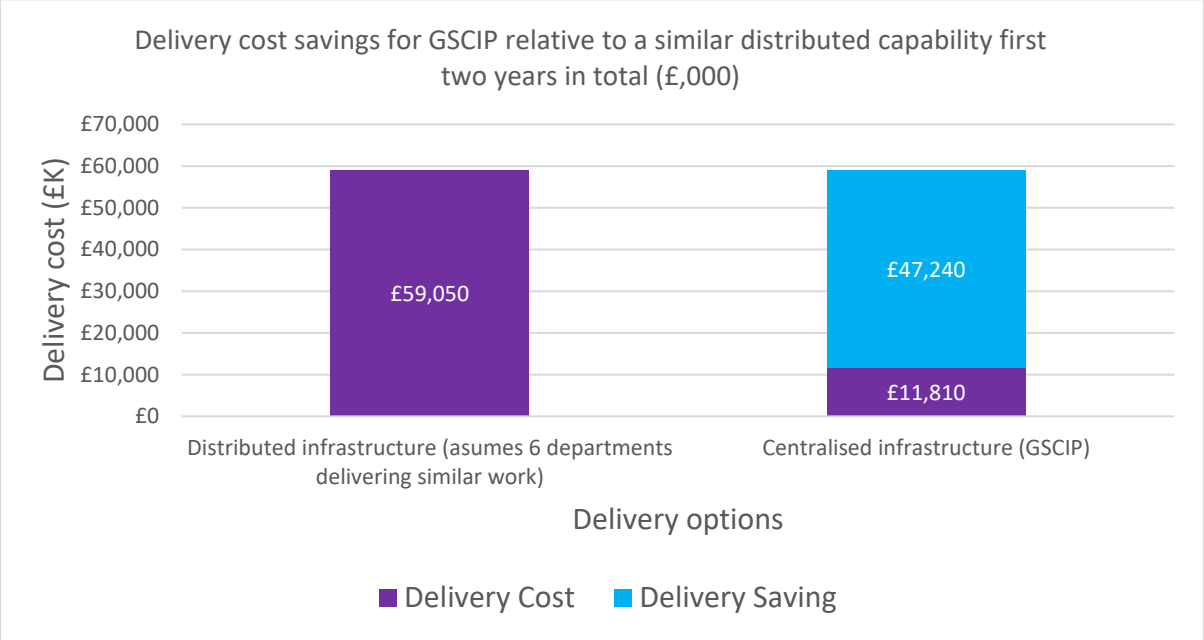
These estimates are in line with the GSCIP Interim Evaluation, and as the preceding discussion of the value of more timely intelligence in an urgent threat response context makes clear- are very conservative estimates.

GSCIP intelligence is fast enough to allow for refreshes (responding to queries, updating the assessment etc), manual methods are too slow to allow this.

Figure 4 details the nature and significance of the infrastructure and data license savings that GSCIP delivers and Figure provides a more detailed breakdown of these estimates.[5] The principle here is that the scenario in which each department that needs to map global supply chains does so separately means that the economies of scale created by GSCIP's centralised solution are not available. This assessment covers two years to capture the savings associated with reduced infrastructure development costs saved in the first year. The dominating cost saving ('economy' in Value-for-Money terms) is from the recurring data licence costs. Interestingly, recently concluded commercial contracts support the case for assuming that these major savings in data licence costs are sustainable as GSCIP is rolled-out (this independent evaluation did challenge the credibility of this assumption). Part of the reason for HMG being able to conclude such favourable contractual terms may be the 'smart customer' aspect of GSCIP. This reflects GSCIP's profile as a cutting-edge capability in global terms (most likely only matched by US national security tools as applied to global supply chains). As a result, commercial providers are able to learn and focus their own R&D using insights derived from their engagement with sophisticated HMG users.

[5] These estimates are taken from the checked numbers in the Interim M&E Evaluation report, except for the estimates for data licence savings, which assumed that a thirty percent discount applies to GSCIP. This assumption was challenged by Ipsos on the basis that such a discount cannot be assumed to apply in the future (post prototype phase). When this adjustment to the data licence aspect of the interim M&E Evaluation report was addressed, this aspect became the dominating aspect of cost savings for GSCIP.

Figure 5



Delivery savings over two years (6 departments)		
Infrastructure development	£3,200	7%
Data integration	£1,440	3%
Administration, infrastructure maintenance and data engineering	£1,200	3%
Data sharing agreements	£1,600	3%
Annual data acquisition	£360	1%
Monitoring and Evaluation costs	£960	2%
Data licence cost	£38,480	81%
Total	**£47,240**	**100%**

Figure 6

GSCIP'S SUBSTANTIAL DELIVERY COST SAVINGS: DETAILS

£ '000	**Distributed infrastructure (asumes 6 departments delivering similar work)**	**Centralised infrastructure (GSCIP)**	**Difference**
Year 1			
Initial infrastructure development (one off cost)	£4,000	£800	£3,200
Data integration	£900	£180	£720
Administration, infrastructure maintenance and data engineering	£750	£150	£600
Data sharing agreements	£1,000	£200	£800
Annual data acquisition	£225	£45	£180

Monitoring and Evaluation costs	£600	£120	£480
Data licence cost	£24,050	4,810	£19,240
Year 1 total	**£31,525**	**£6,305**	**£25,220**

£ '000	**Distributed infrastructure (assumes 6 departments delivering similar work)**	**Centralised infrastructure (GSCIP)**	**Difference**
Year 2			
Data integration	£900	£180	£720
Administration, infrastructure maintenance and data engineering	£750	£150	£600
Data sharing agreements	£1,000	£200	£800
Annual data acquisition	£225	£45	£180
Monitoring and Evaluation costs	£600	£120	£480
Data licence cost	£24,050	£4,810	£19,240
Year 2 total	**£27,525**	**£5,505**	**£22,020**
Total	**£59,050**	**£11,810**	**£47,240**
Average annual cost over two years	£29,525	£5,905	£23,620

Figure 7

BENEFIT-COST RATIOS FOR GSCIP

GSCIP's Value-for-Money has been assessed by considering the scale of departmental participation together with the use cases per department.

Three participating departments with five use cases each per year (low estimate) £m

3 participating departments	**Without GSCIP**	**With GSCIP**
Cost of delivering the supply chain intelligence	12.66	5.95
Benefits generated by supply chain intelligence	9.00	13.50
BCR	**0.71**	**2.27**

Six participating departments with five use cases each per year (low estimate) £m

6 participating departments	**Without GSCIP**	**With GSCIP**
Cost of delivering the supply chain intelligence	31.2	6.0
Benefits generated by supply chain intelligence	18.0	27.0
BCR	**0.6**	**4.5**

Ten participating departments with ten use cases each per year (high estimate) £m

10 participating departments	**Without GSCIP**	**With GSCIP**
Cost of delivering the supply chain intelligence	64.4	6.5
Benefits generated by supply chain intelligence	60.0	90.0
BCR	**0.9**	**13.8**

Consequently, the GSCIP prototype represents strong Value-for-Money to HMG via: (a) demonstrating the technical superiority of automated over manual methods across a range of use cases, (b) identifying technical aspects able to maximise the advantages of moving forward post-prototype phase, and (c) identifying the long-term transformational potential for HMG once the capability is rolled-out at scale that the prototype has made possible. Indeed, enhanced inter-departmental collaboration on key policy challenges is viewed by HMG stakeholders as a key future benefit (which is not valued here)

1.5 What this evaluation tells us about the future potential of GSCIP for HMG – and the nation

Over the long-term, GSCIP promises to play a transformative role in HMG access to intelligence on global supply chains. The key advantages are a step change in the quality and timeliness of intelligence on threats and opportunities:

- dramatically reduced 'blind spots' in data coupled with much faster access to intelligence;
- given that blind spots ('false negatives') impact on the utility of the intelligence – this is the major benefit to HMG;

At present, a range of technical 'de-bugging' work is underway via close collaboration with Altana (one of the commercial data providers) in particular – this is inevitable in a formative stage and not an issue of concern – it just needs ongoing management and oversight.[6] GSCIP data reliability is, at the current prototype stage, a 'work-in-progress', especially in terms of the potential for data harvesting at scale to generate many false positive 'hits'. The ability to use algorithm training via feedback loops is currently constrained by reliance on commercial contractors (it is inappropriate to use such HMG data feedback to train algorithms used by commercial providers). Bringing this part of the GSCIP capability in-house over the longer term would therefore boost this aspect of AI/ML capability – driving a powerful combination of decreasing analysis lead times and increased data accuracy and reliability.

The potential future advantage of moving to an in-house infrastructure is that is partly addresses concerns over future reliance on one or more commercial data providers over the long-term (as these data analytics firms can commercially exploit advances being made via GSCIP).

The under-pinning capability being tested and developed via GSCIP has the potential for more general application across HMG – beyond supply chains per se, specifically:

- handling large, complex datasets at speed and at scale
- facilitating inter-departmental collaboration

[6] Care needs to be taken because individual data providers can change as GSCIP evolves, yet each stands to benefit commercially from HMG feedback that allows them to improve their data/analysis products and services. In effect, commercialising the fruits of HMG feedback on technical aspects. This is effectively an R&D subsidy.

GSCIP in particular, and advanced AI/Machine Learning capabilities in general, have the potential to dramatically reduce the intelligence blind spots we face in identifying and assessing potential threats to UK supply chains – and can do this faster than before. This capability boosts rapid risk/threat identification and resilience across a wide spectrum of concerns – the earlier we know of the threat, the more we can do about the potential problems it can cause. **National preparedness and resilience capability for dealing with global supply chain related threats will be significantly transformed as GSCIP's superior rapid intelligence delivery is rolled out.**

HMG stakeholders must recognise that GSCIP's value stems from its dynamic potential as an evolving toolkit that will continuously improve through AI/machine learning – especially if/when trained algorithms are implemented 'in-house'. An 'evolving' capability ethos, and suitable programme management architecture, may be best placed to deliver this highly dynamic evolving capability – GSCIP functionality will never be ''complete'/frozen in design terms.

In terms of programme architecture in the post-prototype phase, AI/machine learning advances are best supported by adopting a cyclical 'plan-do-check-adjust' ethos (which can be thought of as 'capability sprints'). Each capability sprint would address a new aspect of GSCIP functionality (e.g., exploiting a new component dataset or analytical tool) or a new departmental use case – potentially beyond supply chain analyses (given the general advantages of these cutting-edge semi-automated methods to handle large datasets). These capability sprints would usually operate at a fast pace, so it would make sense to organise the next phase of GSCIP's development around a standard monthly developmental cycle. In defence and aerospace this is knows as Rapid Spiral Development programme management, and represents the state of the art in fast systems development.[7] Cyclical capability sprints are ideally suited to situations, such as GSCIP, in which alpha and beta phase activities happen in parallel rather than sequentially.

Given the significance of the parallel operation of *alpha phase* (software development) and *beta phase* (user testing to drive high-priority functional improvements) in this cyclical architecture, it would be appropriate to refer to the current post-prototype stage of GSCIP as the 'Enhanced Beta Phase'. This description highlights the importance of user-driven functional improvements in boosting GSCIP's accuracy, reliability and timeliness. The proposed Capability Sprint programme architecture is well-suited to delivering this 'Enhanced Beta Phase'. In-house algorithm training will be central to boosting GSCIP's accuracy and reliability (the superior timeliness is already well established by the prototype).

The evaluation approach used in this assessment of the GSCIP prototype, and in particular the proposed future use of the Risk and Urgency framework for capturing preparedness and resilience related benefits, is well-suited to use as an implementation monitoring framework. This could be achieved by arranging for all use cases to report on benefits achieved and the costs of delivering these benefits, via a suitable GSCIP use reporting template.

Given the importance of more timely, accurate and reliable intelligence on global supply chains it will be useful to 'market' GSCIP within HMG in order to alert potential users to the potential

[7] Rapid Spiral Development originated in software development but has now become more generalised.

importance of the new transformational capability. For example, via a series of lunchtime seminars covering relevant use case experiences. These seminars could be delivered during the Enhanced Beta Phase.

Finally, as with any new technology, effective adoption and productive use does not always take place. For GSCIP, as the prototype demonstrates, much of the use-value stems from the much faster pace of analysis that semi-automated methods based on AI/Machine learning provide. This means that the greatest benefits for departments in real policy uses will be in situations in which fast analysis is required. This, in turn, means that the policy use systems will benefit most when they are optimised to exploit GSCIP's superior timeliness. If they are not optimised in that way, then the speed advantage of GSCIP may be lost because 'traditional' policy uses are outpaced by the new technology. This is a familiar challenge in organisational design when transformational innovations take place. Consequently, it would be useful if the next phase of GSCIP's development addressed optimal GSCIP use challenges and developed best practice policy use cases based on real examples.

1.6 What this evaluation discovered via answering the specific research questions

The following table summarises the conclusions reached on each of the stimulated research questions to be addressed in this study. The main body of the report and the Annexes provide more detail on the ten use cases and survey work upon which these findings are based.

Table 1: Summary of findings on the research questions

EFFECTIVENESS **What was achieved under each performance metric?**	The consolidated performance metrics (accuracy, reliability, and timeliness) treat depth and comprehensives as part of accuracy (reflecting a conclusion from the focus group discussions). The ten use cases assessed in this evaluation demonstrated that **the GSCIP prototype experienced major improvements in accuracy, driven largely by better depth in supply chain data with large reductions in data blind spots.** Crucially, these data blind spots only became apparent when GSCIP was used, revealing hits not visible using manual methods, therefore highlighting the risks faced in relying on baseline capability for 'high value' intelligence uses. The strongest example (surgical robots use case) demonstrated an increase from 50 to 1,450 true positive hits of businesses of interest, when using GSCIP.
How do achieved results compare to the baselines?	At the prototype stage, the overall conclusion is that **GSCIP provides greater accuracy, reliability and timeliness in data provision when compared to baseline capabilities**. These advantages are created by reductions in data blind spots (generating more accurate intelligence), and more timely intelligence (including faster intelligence refresh rates for assist in investigations via the intelligence cycle). **The use of semi-automated large-scale data science methods using diverse datasets spanning commercial and HMG sources are the central driver of this advantage**.
How effective was the pilot prototype in addressing emergent use cases from late-joining departments (HMT & MoD)?	HMT experience of GSCIP is, to date, too limited to draw any conclusions on this aspect. The MoD experience was very positive and points to substantial advantages in using GSCIP over baseline approaches, mainly due to reducing data blind spots. GSCIP generated actionable intelligence for MoD.
What are the conclusions we can draw about the effectiveness of the pilot overall?	**The GSCIP prototype has been highly effective in: (a) highlighting the importance of resolving some technical challenges (inherent in any prototype) prior to roll-out, (b) setting-out the parameters of the long-term advantages that GSCIP can create for HMG**, especially if some core aspects are delivered in-house and (c) highlighting the importance of avoiding reliance on particular commercial providers.
IMPACT AND ADDITIONALITY **What were the benefits of the prototype?**	The **GSCIP prototype has been highly effective in: (a)** by providing more timely, accurate and reliable intelligence, and (b) emphasising GSCIP's potential to facilitate inter-departmental collaboration addressing global supply chain related opportunities and threats/risks.

For each use case, what (if anything) can they now do, due to the pilot, that they couldn't do before?	Summary details for each use case are provided in the main body of the report with additional details in the Annex. The main conclusion is that **GSCIP is increasing HMG capability in participating departments by providing a focus for advanced data science software coding using integrated HMG and commercial data sources**. As a result, GSCIP is **catalysing a cross-Whitehall effort to develop new semi-automated fast-response analyses of large-scale datasets**. This capability is useful for both assessing global supply chains and more general uses of advanced data science capabilities with the potential to modernise analysis in the civil service. GSCIP does not involve using the generative AI capability that is currently raising major regulatory concerns.
Were there any unintended effects?	The focus group discussions revealed that, across all use cases, **what amounts to a collaborative R&D activity has been taking place**, specifically for engagement with the commercial contractor Altana. This involves HMG prototype **users identifying technical limitations to the data and analyses which are being fed-back to be addressed** by this key provider. Whilst this collaborative R&D aspect was anticipated (as this is prototype development work) **what was not anticipated by HMG users was that they were insufficiently briefed by commercial data providers on planned upgrades to the data and data analysis tools; the developmental process was not as clearly signposted as they would have liked**. In other words, they found the software development process to be rather *ad hoc*. This was mainly because the commercial provider was responding to, rather than anticipating HMG technical requirements (reactive and not so pro-active). In effect, **this aspect of the prototype reflects a mix (in software development terms) of 'alpha' phase (systems development) and 'beta phase' (systems user testing) happening simultaneously.** Moving forward, optimising this mix of alpha and beta phase work will require the unintended lack of software development roadmaps (sequencing, prioritisation etc) to be addressed. This report makes some suggestions as to how this challenge could be addressed by using cycles of capability development 'sprints'.
Is there evidence of increased capacity or practices that would have not happened without this pilot? To what extent would	GSCIP's ability to make major reductions in data blind spots, including some early uses as actionable intelligence provides evidence of efficacy. However national security considerations limited access to verifiable evidence on these aspects. In general, **the various use cases do demonstrate that GSCIP is increasing capacity and practices in participating departments by providing a focus for advanced data science software coding using integrated HMG and commercial data sources**. As such, **both these practices and the resulting outcomes would not have happened anyway** (for global supply chains work), as these behaviours are integral to the use of advanced semi-automated data science methods.

the same outcomes have happened anyway?	
EFFICIENCY **What are the potential benefits of the pilot, and can they be quantified?** **What was the aggregate benefit cost ratio for the pilot?** **Is it Value-for-Money for DBT to scale this up to more departments or priority areas?**	The evaluation of the GSCIP prototype tells us **that there are substantial net benefits for HMG that stem (in particular) from the combination of time and cost savings that semi-automated supply chain investigations** can deliver compared to manual methods. These benefits can be quantified, albeit (as this is only pilot work) in an indictive manner using plausible assumptions. Using checked assumptions based on the Departmental Interim Monitoring and Evaluation Report for GSCIP submitted in 2022, **GSCP's Benefit-Cost Ratio (BCR) range is** between 4.5 and 8.5 for 6 participating departments through to between 7.43 and 13.8 for ten participating departments**.** This very high estimated BCR range means that there are strong net benefits to be obtained from GSCIP when rolled-out at scale. **As a potentially transformational capability, the future 'as delivered' BCR could be substantially higher** if GSCIP is able to deliver major reductions in potential damage to the UK by providing more timely, accurate and reliable intelligence on global supply chains. The report highlights how future monitoring and evaluation activities can track and demonstrate benefits versus costs during delivery. On the basis of the evidence and insights gathered in this evaluation, **scaling-up and rolling-out GSCIP will represent good Value-for-Money for HMG**. This is because: (a) GSCIP provides a **centralised technical capability with associated economies of scale**, (the advantages of shared resources) (b) it also **generates economies of scope** (the advantages created by a greater breadth of activities in addressing supply chain challenges that may be inter-relationships between them) by facilitating cross-department collaboration, and (c) the advanced AI/Machine learning capability can potentially generate a future stream of **improving intelligence timeliness and quality by bringing the core algorithm training functions in-house**. A reliance on commercial data providers does not allow these core algorithm training functions to be exploited – thus limiting overall Value-for-Money potential for HMG.

Given the explicit consideration of timeliness, this type of framework can also be applied to the ‘upside’ business opportunity aspect of GSCIP’s capability (amplifying socio-economic benefits generated rather than reducing damage inflicted) - thus providing a balanced approach.[8]

[8] A more versatile and potentially more accurate representation of these damage limitation benefits could use an analysis of a real and counterfactual ‘disturbance pathway’ that eventually return to a new equilibrium state after a shock, and in which GSCIP’s potential impacts are treated as a faster return to future equilibrium situation and/or a lower damage inflicted.

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Published 2024 by Department for Business and Trade