# Rapid Evidence Review guidance

These Rapid Evidence Reviews are the result of findings from individual reviewers, followed by a collaborative moderation process with technology experts and the horizon scan team. This page contains the guidance given to reviewers for each field contained within the review, as well as a brief overview of the metrics A (+) denotes a quantitative score as part of the technology assessment process.

## Overview

A high-level overview of how this technology is developing and the key considerations, applications, and risks.

## Summary of time to market

An overview of the Technology Readiness Level (TRL) for this technology.

## Potential types of Hazards

A list of hazard types which may be presented by this technology, using the PRISM list of common product safety hazards.

## Summary of potential harms and benefits

A summary of the key potential harms and benefits this technology may present to the user or consumer.

## Summary of non-physical risks

An outline of the potential harms and benefits this technology may present in relation to non-physical aspects such as psychological, financial, reputation, privacy, data loss, and wider cyber-security issues, such as DDOS attacks.

## Technology readiness level (+)

Selected from this defined scale of technology readiness: 1 – Basic principles observed; 2 – Technology concept formulated; 3 – Experiment proof of concept; 4 – Technology validated in lab; 5 – Technology validated in relevant environment; 6 – Technology demonstrated in relevant environment; 7 – System prototype demonstrated in operation environment; 8 – System complete and qualified; 9 – Actual system proven in operational environment.

## Information availability score (+)

Selected by the reviewer based on the amount of information available on the technology: 1 – No or very little information; 2 – Limited/insufficient information; 3 – Information available to partially complete review; 4 – Information available to cover and respond to all metrics; 5 – A large amount of highly relevant information.

## Information quality score (+)

Selected by the reviewer based on the reviewer's confidence in the range of sources: 1 – None or irrelevant sources; 2 – Mostly google search, other journalistic outlets, or sponsored information; 3 – Other grey literature; 4 – Established technology sources; 5 – Predominantly peer-reviewed sources.

## OPSS remits score (+)

A score which corresponds to the number of relevant OPSS roles and cross-cutting activities selected from a list provided to each reviewer: 1 – < 4; 2 – 4 to 7; 3 – 8 to 11; 4 12 to 21; 5 – > 21.

## Scale and ubiquity score (+)

A score comprised of one-third of the market size score, one-third of the CAGR score, and one-third of the enabled technologies score. The scales are as follows:

Market size score (USD): 1 – < $1 billion; 2 – $1 to $5 billion; 3 – $5 to 50 billion; 4 – $50 to $300 billion; 5 – > $300 billion.

CAGR score: 1 – < 9%; 2 – 9-15%; 3 – 15-25%; 4 – 25-42%; 5 - >42%.

Enabled technologies score (the number of additional technologies from the longlist that are enabled by this technology): 1 – 0 technologies; 2 – 1 to 5 technologies; 3 – 6 to 15 technologies; 4 – 16 to 35 technologies; 5 - >35 technologies.

## Summary of scale and ubiquity

Description of the current and projected future scale and ubiquity of this technology.

## Summary of relevance to OPSS

Outline of how this technology may relate to or impact on OPSS's roles and responsibilities.

## Summary of macro-scale impacts

Outline of any potential harms and benefits this technology may present at a macro-scale, across STEEP (social, technological, economic, environmental, and political) fields, for example the environmental or social impact. Additionally, this section contains any potential harms and benefits this technology may present in relation to end-to-end product lifecycle, for example during manufacture, retail or recycling and disposal.

## Estimated market size (USD)

Details of any available estimate in market size, in any geography at any time, offered in the literature. In some cases, the reviewer made a judgement call to which is the most robust market size given conflicting estimates, or extrapolated to make a current global market estimate in USD.

## Estimated CAGR

Details of any available estimate in compound annual growth rate (CAGR), in any geography at any time, offered in the literature. In some cases, the reviewer made a judgement call to which is the most robust given conflicting estimates, or extrapolated to estimate.

## Level of harm (+)

The most relevant consumer harm severity level for this technology, based on the PRISM framework, from this range: 1 – No harm; 2 – Minor harm requiring basic treatment/first aid; 3 – A visit to A&E may be necessary with short term rehabilitation; 4 – Hospitalisation and long-lasting or permanent impacts; 5 – Potentially fatal or severe loss of function.

## Time to market score (+)

A score which correlates to the TRL, based on the following scale: 1 – TRL 1-3 (research); 2 – TRL 4-6 (development); 3 – TRL 7-8 (prototyping, demonstration); 4 – TRL 9 (market ready); 5 – TRL 9+ (already widely available in market).

## Harms and hazards score (+)

A score comprised half of the level of harm (described above), and half the number of potential types of hazards (described above) using the following scale: 1 – 0 (no hazard); 2 – 1 hazard; 3 – 2 to 3 hazards; 4 – 4 to 7 hazards; 5 – more than 7 hazards.

## Benefits and impact score (+)

A score comprised half of the macro-scale drivers score and half of the consumer-scale benefits score, using the following scales:

Macro-scale drivers (the number of the pre-identified contextual factors that the technology may impact on, selected from a list): 1 – 0 factors; 2 – 1 to 2 factors; 3 – 3 to 5 factors; 4 – 5 to 8 factors; 5 – >8 factors

Consumer-scale benefits score: 1 – No benefit; 2 – Minor benefit (e.g. greater ease of use); 3 – Benefit (e.g. cost or efficiency savings); 4 – Significant benefit (e.g. significant improvement to quality of life); 5 – Great benefit (e.g. life0saving)

## Total score (+)

The sum of the following scores, each out of 5, to give a final score out of 25: time to market, harms and hazards, benefits and impact, OPSS remits, scale and ubiquity. Higher scores indicate a higher impact technology for OPSS, while lower scores indicate a lower impact technology.

# Smart technology and IOT

## Internet of things

The Internet of Things (IoT) refers to networks of physical objects, sensors and devices (things) that contain embedded technology which connects them in a network, allowing real-time data from the physical world to be shared and analysed. The IoT is constantly evolving because learning from, and reactions to, this shared data are fed back into the network. IoT networks can process data either in a decentralised fashion or, more typically, in cloud-based centralised servers. Connected devices can range from wearables to appliances to sensors to vehicles.

### Overview

The Internet of Things is one of the foundational pillars of ‘Industry 4.0’, or the fourth industrial revolution, and will have resounding impact across industry, manufacture, and consumer products. As IoT is fundamentally a technology to support data collection and sharing from connected devices, it has an enormous range of potential applications and uses dependent on the type of devices connected and the way the data is used to generate insight. The growth in the Internet of Things is rapid and accelerating, both in terms of investment and in terms of the projected growth in the number and ubiquity of connected devices. Key applications include the use of IoT in smart homes and cities, applications in the sustainability, energy and environment field, e-health and assisted living systems, and IoT in transport and low-carbon products. The wide application of IoT relates to the fact that the connected devices which make up IoT networks can have virtually any capability. A significant risk associated with IoT is its vulnerability to cyberattack and the potential insecurity of data transmitted, and the difficulty of maintaining and monitoring networks.

### Summary of time to market

The Internet of Things currently has a large market size, and connected devices are available on the market. Future applications of IoT have yet to be developed, and some uses are still in the research and development stage.

### Summary of scale and ubiquity

The number of connected devices worldwide is projected to grow from an estimated 10 billion today to over 25 billion in 2030. While annual revenue is estimated at over $250 billion in 2022 for the IoT alone, the estimated economic impact of the technology on various sectors is estimated to be closer to $3.5 trillion. This economic value extends across industries from factories to cities, work sites and retail environments, homes, transport and people (with human-health driven IoT tech around wearables, personal devices and biometric monitoring, for example). While estimates for the total CAGR are around 7-10%, this rate is significantly faster in some sectors and industries - for example, the smart homes market is expected to grow at a faster rate, around 12.47%.

### Summary of relevance to OPSS

The IoT relates to a wide range of OPSS responsibilities, linking devices and products available to consumers to the operation of industrial machinery and equipment, the use of online marketplaces through smart homes and devices, and a wide range of potential fields utilising sensors, meters, energy, environmental monitoring and metrology. IoT sensors and devices can be used for the remote monitoring and inspection of products and equipment throughout the production and manufacturing process and once products are in use. Consumer products in this category (or utilising such technology) would fall under the remit of the PSTI bill in that they connect to or are intended to connect to the internet or other networks. OPSS will be enforcing act 1 of this bill on behalf of DSIT. The aim of the act is to minimise harm (data, financial, psychological etc) to the consumer from use of these products by ensuring minimum cybersecurity standards are met.

| Estimated market size (USD) | Estimated CAGR | Technology readiness level | Level of Harm (/5) |
| --- | --- | --- | --- |
| Total global revenue estimate: $251.6 billion, Market size, industrial IoT: $323.62 billion | Statista Technology Market Outlook 2022: 8% Statista 2023 projection: 10.04% | 9+ | 5 |

# Smart technology and IOT
## Internet of things

### Summary of potential harms and benefits

There are basic risks associated with the failure / malfunction of electronic devices connected to an IoT network, for example due to short-circuit/overheating, as IoT will mean a greater number of electronic and digitally-enabled devices in human environments. Implementation of IoT has a wide range of potential benefits to users, ranging from increased safety in manufacturing and industry (e.g. by facilitating remote inspection and predictive maintenance) through to direct improvements to individual's physical wellbeing (e.g. through monitoring of environmental conditions or e-health applications). However, the cybersecurity vulnerabilities present some new associated physical risks. Data breaches in IoT systems could allow manipulation of safeguards in product production, for example, by spoofing test results or altering machine settings, with potential safety impacts once products are in use.

### Summary of non-physical risks

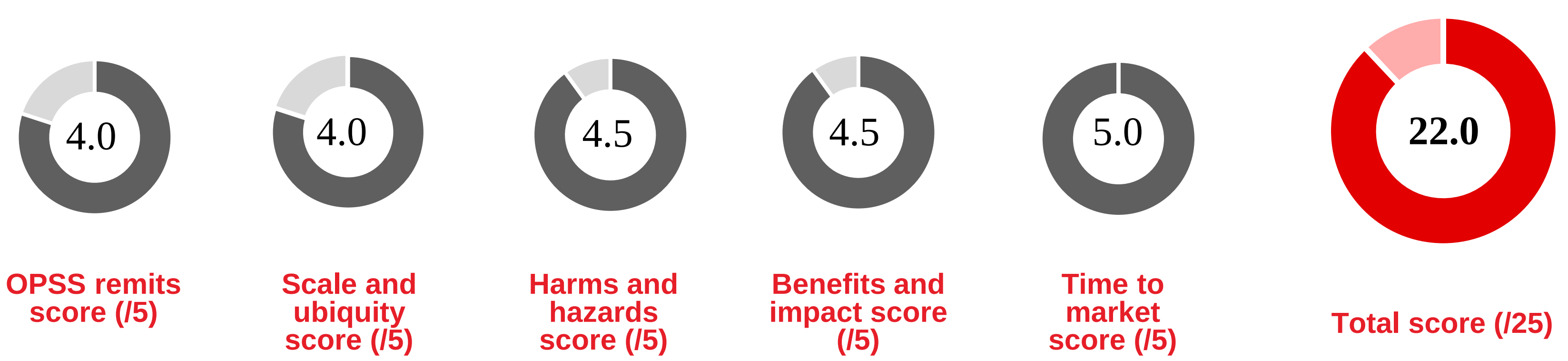
The principal risk associated with IoT arises from the security challenges inherent in increasingly large networks of digitally-connected devices. IoT has cybersecurity vulnerabilities beyond traditional web systems, as it arises from isolated hardware that could be compromised in unforeseen ways, and because the relatively limited computing power of most IoT devices limits the complexity and effectiveness of cybersecurity that can be implemented, and because the devices are connected not just to a central server but to each other, increasing the number of interactions that could be vulnerable to attack. Today's IoT systems are vulnerable to attacks. Consumer products in this category (or utilising such a technology) would present possible data, financial or psychological harm to the consumer from their connected nature.  based on object identity, manipulation, services, or cryptanalysis. In addition, as IoT devices often collect information directly from users and environments, they may deal with large amounts of personal and sensitive data, increasing the risks related to cybersecurity vulnerability. Consumer products in this category (or utilising such a technology) would present possible data, financial or psychological harm to the consumer from their connected nature.

### Summary of macro-scale impacts

IoT is an enabling technology across the field of smart technology, from smart cities and transport systems to advanced manufacturing. It could have large-scale social impact on the management of health and wellbeing through the rise of e-health and health monitoring. In addition, IoT technology can be applied to make processes more efficient, potentially reducing emissions and waste, and allowing more accurate real-time monitoring of environmental conditions. However, the number of IoT connected devices is projected to rise rapidly and this has knock-on environmental impacts in relation to both the production of e-waste and the energy required to supply IoT production lines. IoT will have large-scale impact on production and manufacture through the 'Industrial Internet of Things' (IIoT), a branch of IoT that includes connected devices for smart manufacturing and human-machine interaction in industrial settings. IIoT has been applied to fault diagnosis. IIoT also has application in the retail and purchasing phase of the product lifecycle, whether through smart devices facilitating online payments or as a tool in fraud detection in e-commerce. In both cases, IoT represents an opportunity for significant benefits to efficiency and effective monitoring and control. The associated risks relate to cybersecurity vulnerabilities that could cause faults or issues, for example in fault diagnosis of machinery in the event of malicious cyberattack.

### Potential types of hazards

Electrical, Thermal, Lack of protection, Non-physical



# Smart technology and IOT
## Internet of things

### References

Summary references

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Time to market references

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