ENTERPRISE CYBER SECURITY

CYBER RISK MANAGEMENT

University of Glasgow

OVERVIEW

- principles of risk management, risk management framework and risk management process itself.
- refining the aforementioned to support cyber risk assessment.
- understand the difference between non-malicious and malicious risk.

RISK MANAGEMENT

RISK MANAGEMENT

- activities used to coordinate efforts and employees with regards to risk.

- risk management process should be built atop a framework and principles.

- framework should supporting integrating the risk management process itself in the management processes for an enterprise.

RISK MANAGEMENT

PRINCIPLES

FRAMEWORK

PROCESS

PRINCIPLES

PRINCIPLES OF RISK MANAGEMENT (ISO31000)

- **creates and protects value** by contributing to the objectives of the enterprise and improving processes.
- **part of all processes** and is the responsibility of every manager and employee, not a single individual.
- **integral to decision making** as it supports allocation of scare resources and prioritisation of efforts.
- **explicitly addressing uncertainties** an enterprise will encounter.

PRINCIPLES OF RISK MANAGEMENT (ISO31000)

- **systematic and structured process** to management to ensure consistent, comparable and reliable results.

- **based on strong evidence** and data drawn from multiple sources.

- strong evidence can include historical data, research papers, forecasts, observation, expert opinion and stakeholder feedback.

- **tailored to the enterprise** in terms of their risk appetite and external/internal considerations.

PRINCIPLES OF RISK MANAGEMENT (ISO31000)

- **consider human factors** and individual differences of employees.

- **transparent and inclusive** in terms of employee contracts, annual reviews and all stakeholders kept up-to-date.

- **responsive and iterative** to changes in environment and introduce of new avenues of risk.

- **support continual improvement** to ensure the risk management process remains effective and efficient.

FRAMEWORK

RISK MANAGEMENT FRAMEWORK

- purpose of the risk management process must be part of the **overall management of the enterprise**.

- risk management framework is designed to support **integrating risk management** into overall management.

- risk management framework should be built up on the **principles of risk management**.

- principle is to create and protect value, need to understand and appreciate the business objectives.

DESIGN

- understand the **external** forces on the enterprise in terms of stakeholders, influences and environment.
- understand the **internal** culture, governance, standards, procedures and stakeholders of the enterprise.
- formulate and define **commitment** to risk management and communicate direction or intention.
- determine **accountability** for risk and how performance will be measured and escalation handled.

RISK MANAGEMENT FRAMEWORK

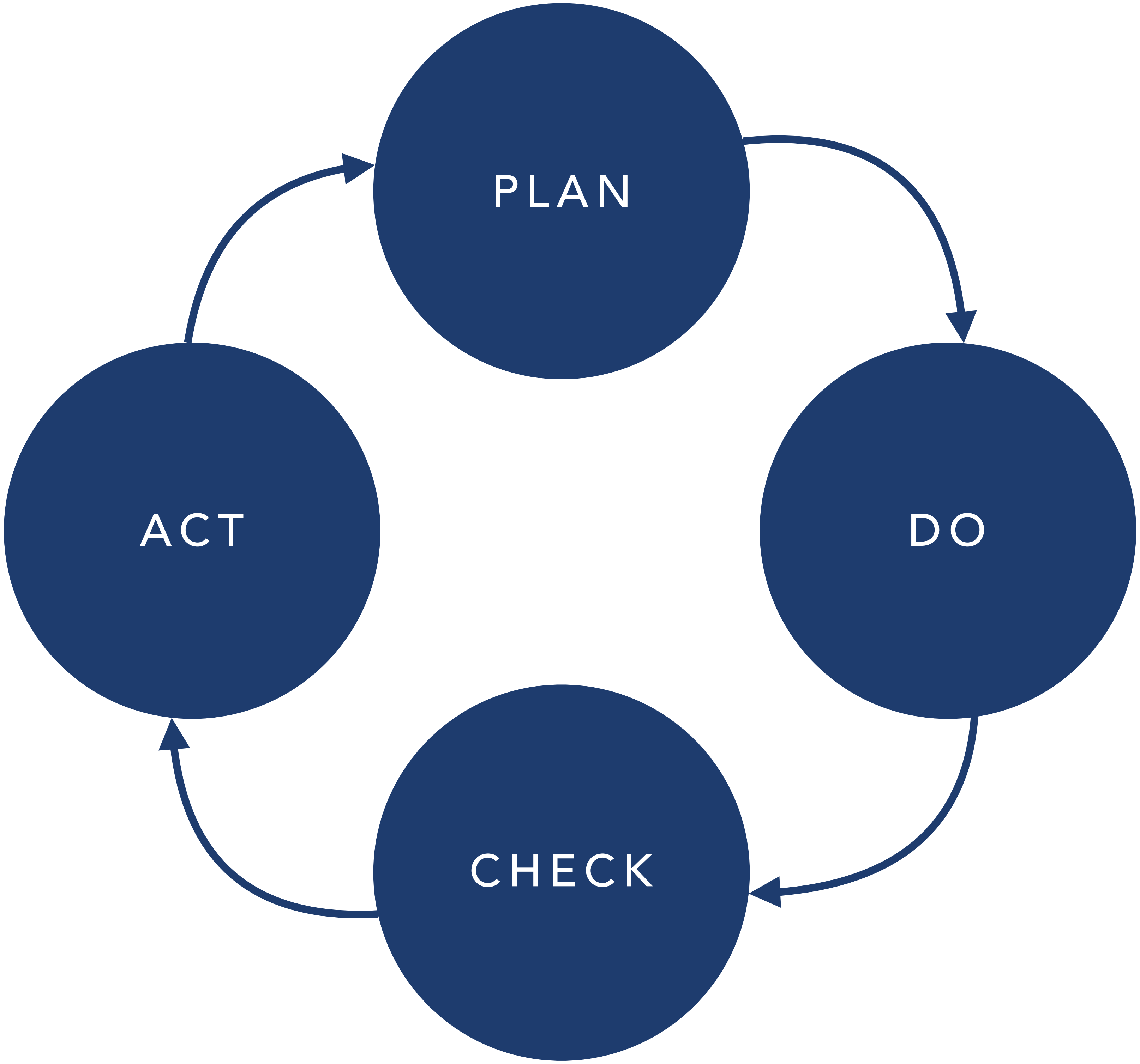
- allocate **dedicate resources** to the process of risk management to ensure it is effective.
- establish clear **communication mechanisms** for internal and external actors.
- **implement risk management** within the general management approach of the enterprise.

PLAN, DO, CHECK, ACT (PDCA)

PDCA

- proposed by Edwards Deming as an approach to improve effectiveness of business processes.
- understand the problem by collecting and analysing data, devise a plan to address it.
- develop a solution to the problem and deploy it, collect measurements to understand effectiveness.
- check that solution actually addresses the perceived problem.
- produce report, communicate changes and identify the next set of problems.

PDCA



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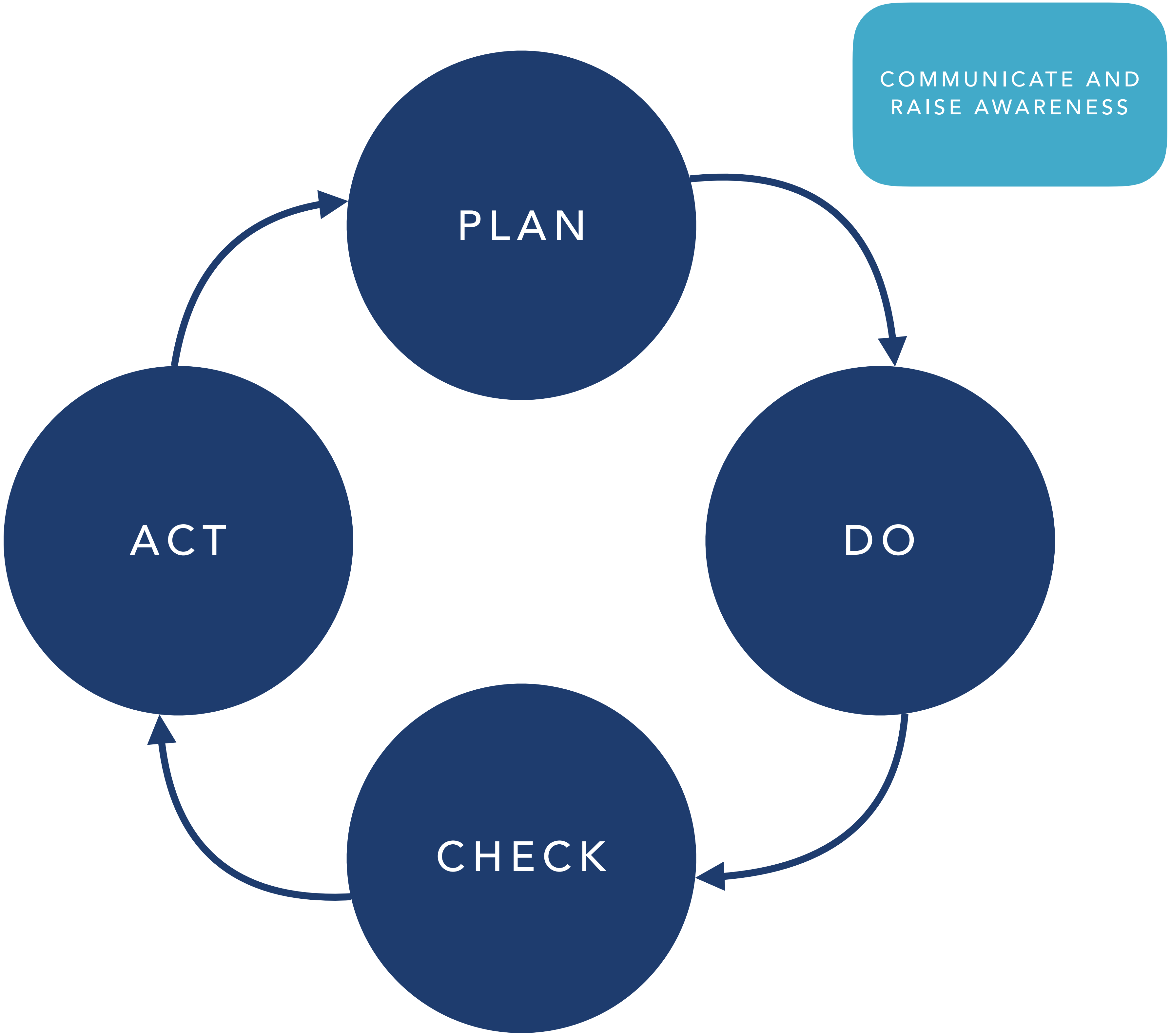

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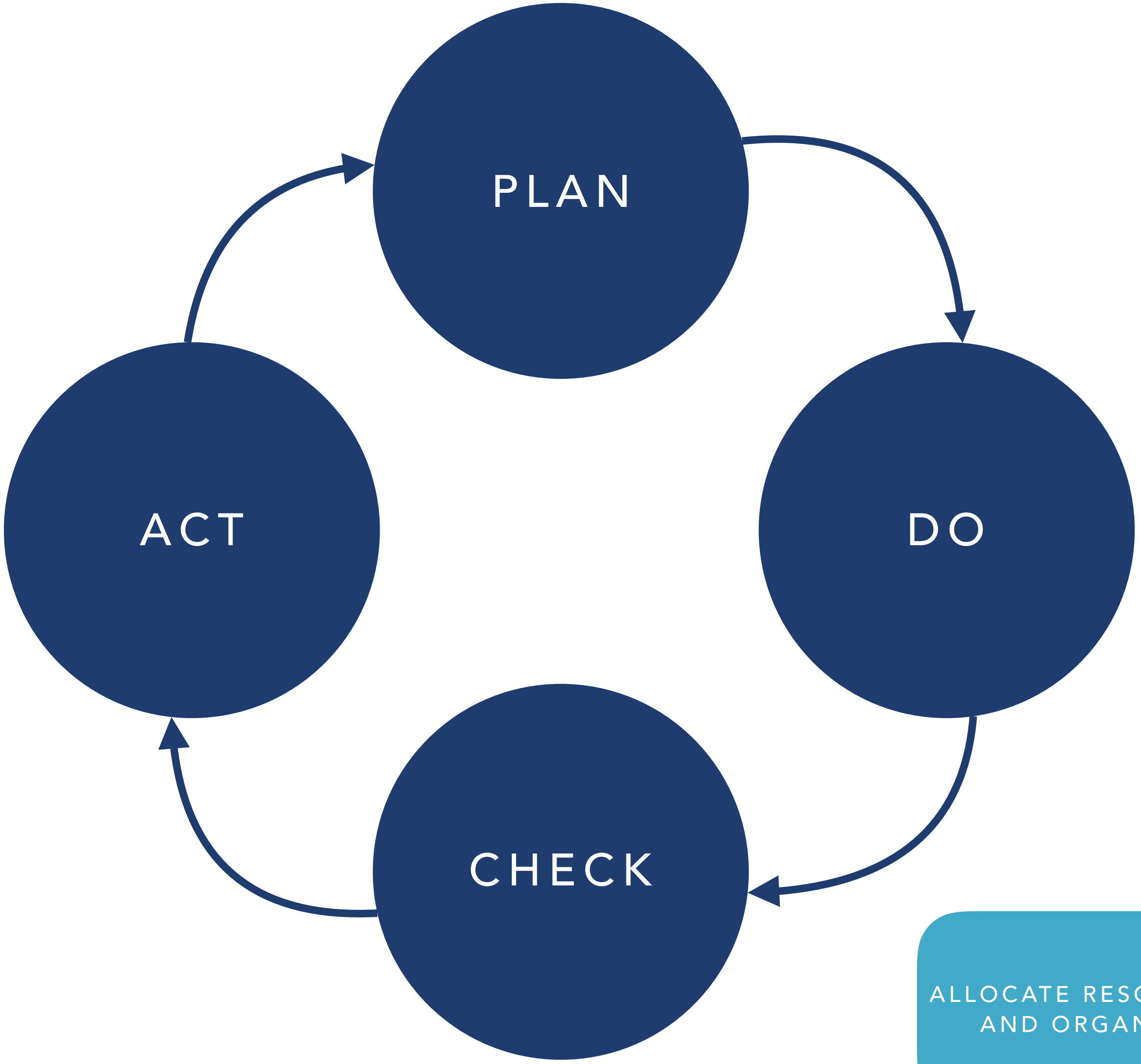
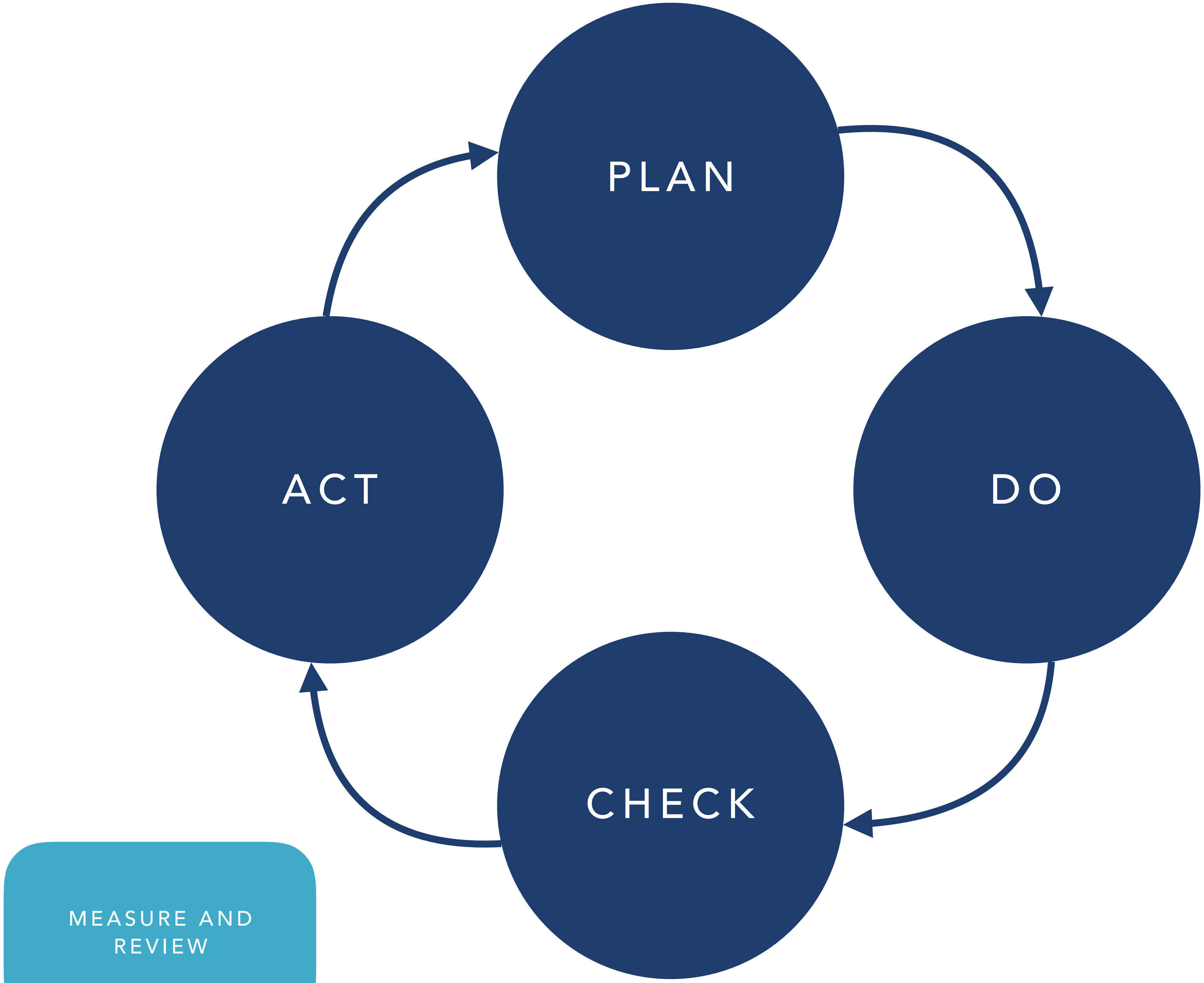


ALLOCATE RESOURCES AND ORGANISE

PDCA



PLAN

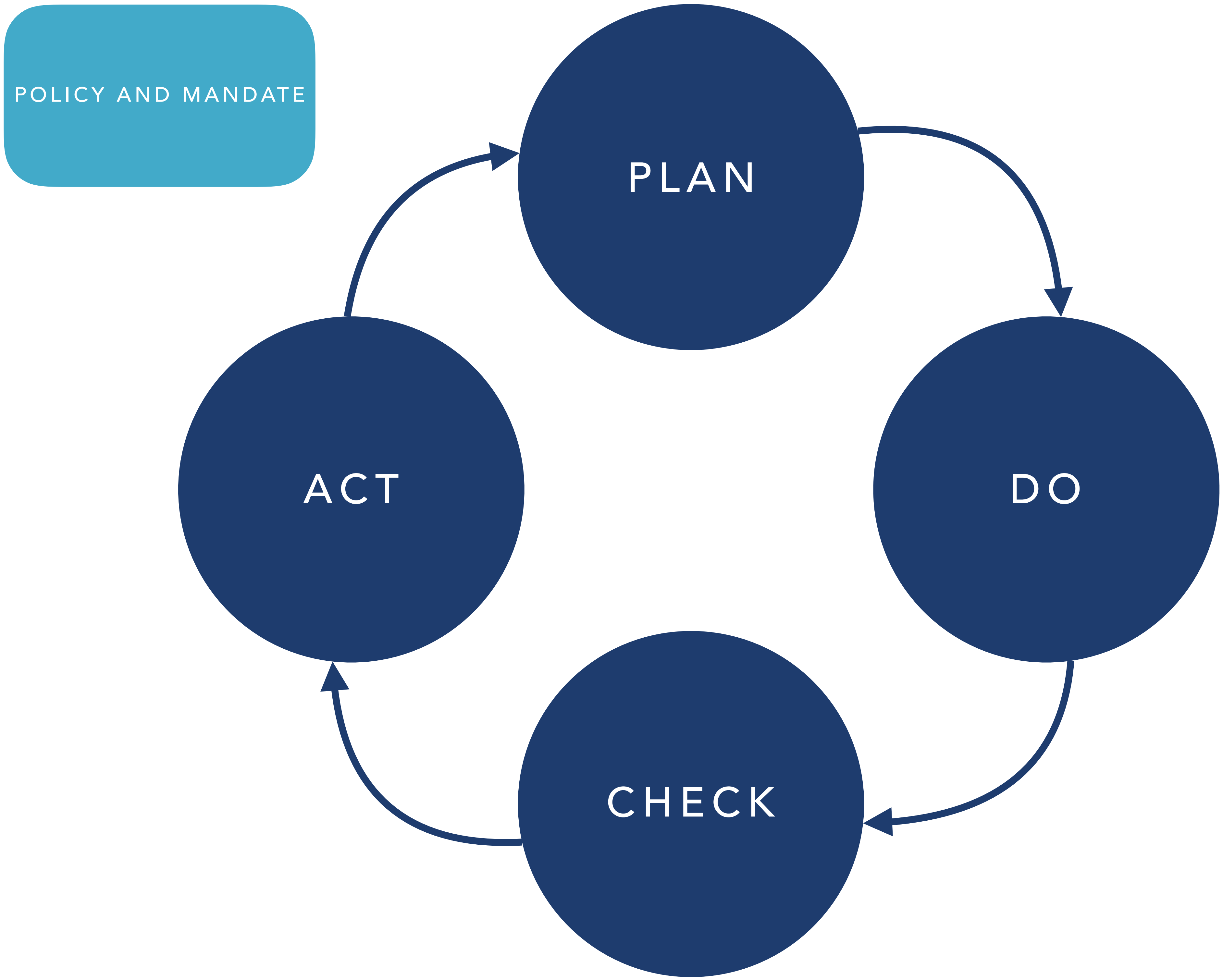
DO

CHECK

ACT

MEASURE AND REVIEW

PDCA



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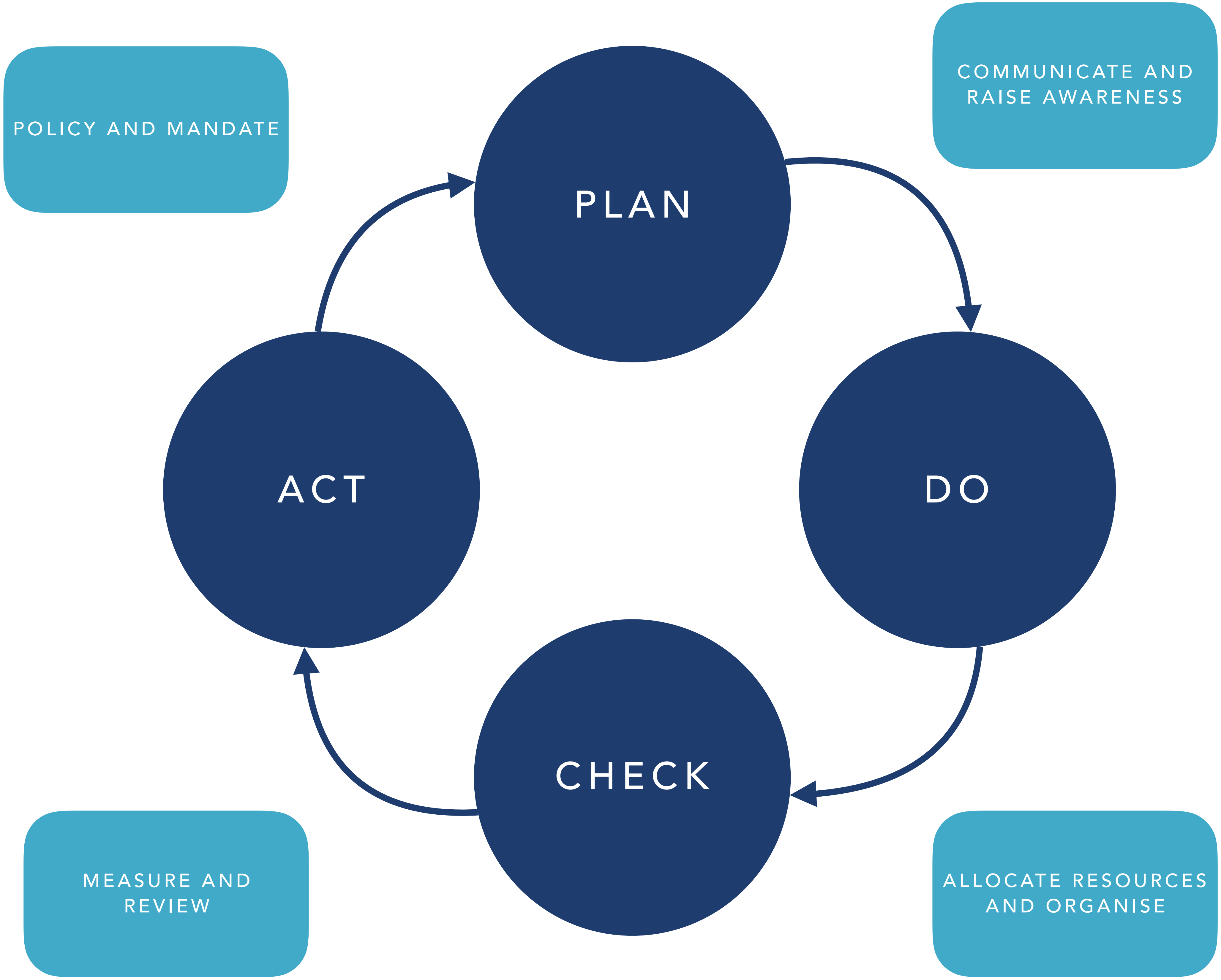


POLICY AND MANDATE

COMMUNICATE AND RAISE AWARENESS

PLAN

ACT

DO

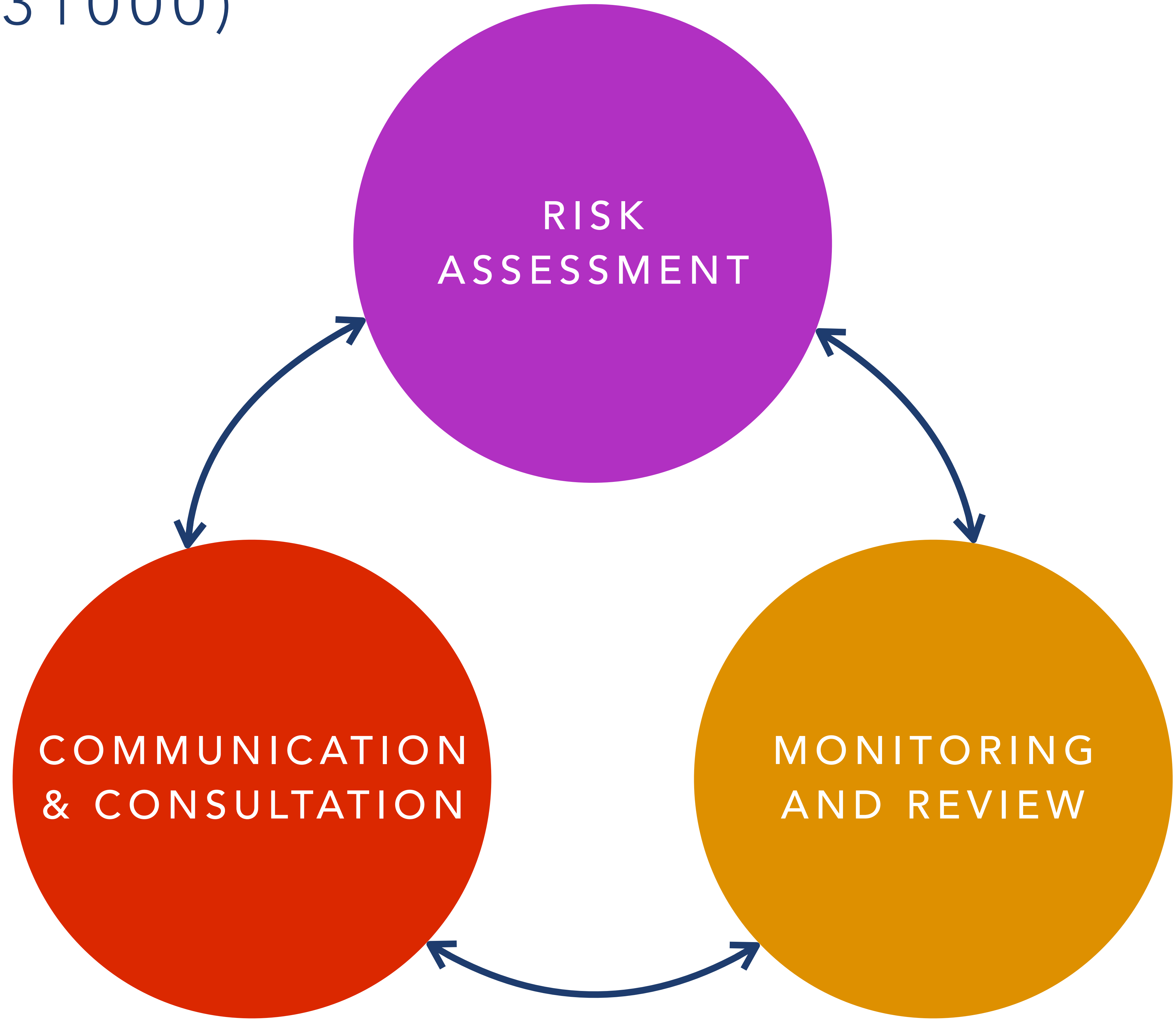
CHECK

MEASURE AND REVIEW

ALLOCATE RESOURCES AND ORGANISE

PROCESS

RISK MANAGEMENT PROCESS (ISO31000)



RISK ASSESSMENT

COMMUNICATION & CONSULTATION

MONITORING AND REVIEW

COMMUNICATION AND CONSULTATION

COMMUNICATION AND CONSULTATION

- processes that obtain, provide and share information pertaining to risk with stakeholders.
- information sharing should support decision making throughout the enterprise.
- communication of risk should be championed, planned and endorsed by management.
- management support for risk management is crucial in ensuring an effective and efficient process.

TEAM

- team tasked with obtaining and sharing information with internal and external stakeholders.

- effective communication of risk management process ensure responsibility is shared and understood throughout enterprise.

- team may comprise of internal and external stakeholders, key decision makers and knowledgeable staff.

- subsystems may option for a risk-lead rather than a team, focus is on communication and consultation not isolation.

PLAN

- perceptions may different within an organisation, between business units and other subsystems.
- such perceptions need to be considered when attempting to address risk within an enterprise.
- team should develop procedures and plans to support the overall risk management process.
- focusing on ensuring the relevant evidence is gathered and that important stakeholders are consulted.

ENDORSEMENT

- effective risk management requires key-decision makers and employees to proceed in the same way.

- communication of risk management process cements the importance within the organisation.

- consultation risk with essential employees and key-decision makes ensures they understand their responsibility for risk management.

MONITORING AND REVIEW

MONITORING AND REVIEW

- review the framework for risk management as well as the process itself.
- understand any legal or competition changes that may mean parts of either need to be reconsidered.
- review asset value, internal and external context changes that may introduce new threats as well as the possibility of new vulnerabilities.
- ensure the framework itself is compliment to the business objectives and policies.

RISK ASSESSMENT

CONTEXT

IDENTIFICATION

ANALYSIS

EVALUATION

TREATMENT

CONTEXT

- determine the goals as well as the **external** and **internal** factors that have influence.
- define the **target of assessment** in terms of the people and process that are of interest.
- understanding the target and assets we can develop **scales** and **evaluation** criteria.
- determine risk level from the output of considering likelihoods and consequences.

IDENTIFICATION

- documenting possible risks and risk sources.
- risks are always associated with an incident.
- risks can not exist if there is no asset, vulnerability and threat.
- aim is to understand threats, that exploit vulnerabilities that lead to incidents.

IDENTIFICATION

- need to consider what the sources of threats.
- threats could come from individuals or they could come from other sources, e.g. fire.
- threats sources can be tangible or intangible.
- identification of some threats or incidents may lead to the identification of others.

ANALYSIS

- determine the actual risk level from the identified risks.
- need to consider the consequences and likelihood together.
- consider that actual source of threats thoroughly and if they are likely to actually arise.
- determine the risk level using the functions determines during context definition.

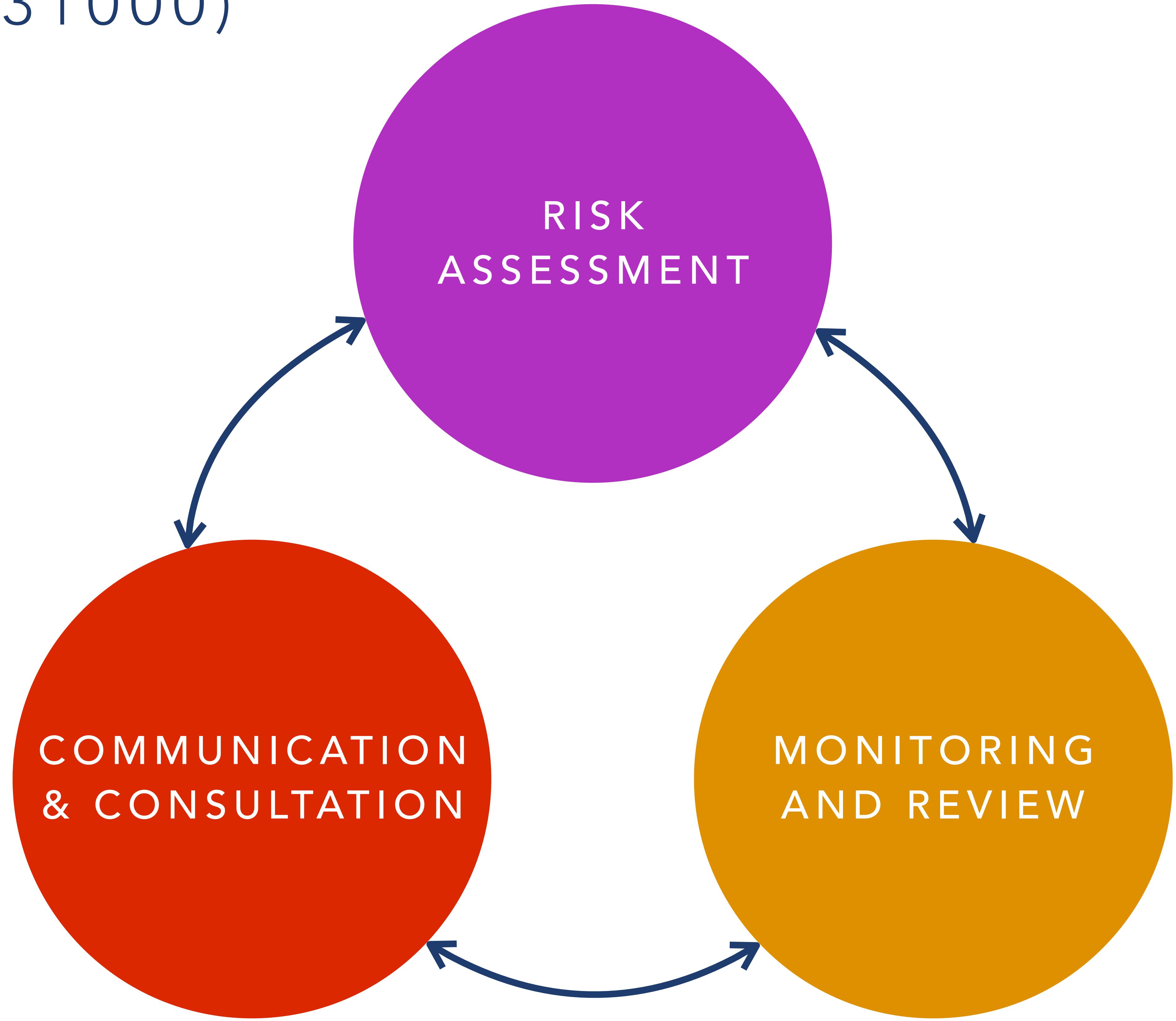
EVALUATION

- risks have been identified and throughly considered, the next step is determine the risks to receive treatment.

- consider the risks once again with stakeholders to be determine if original perception was accurate.

- consider grouping risks that share similar characteristics, for example threat source etc.

RISK MANAGEMENT PROCESS (ISO31000)



RISK MANAGEMENT

PRINCIPLES

FRAMEWORK

PROCESS

CYBER RISK MANAGEMENT

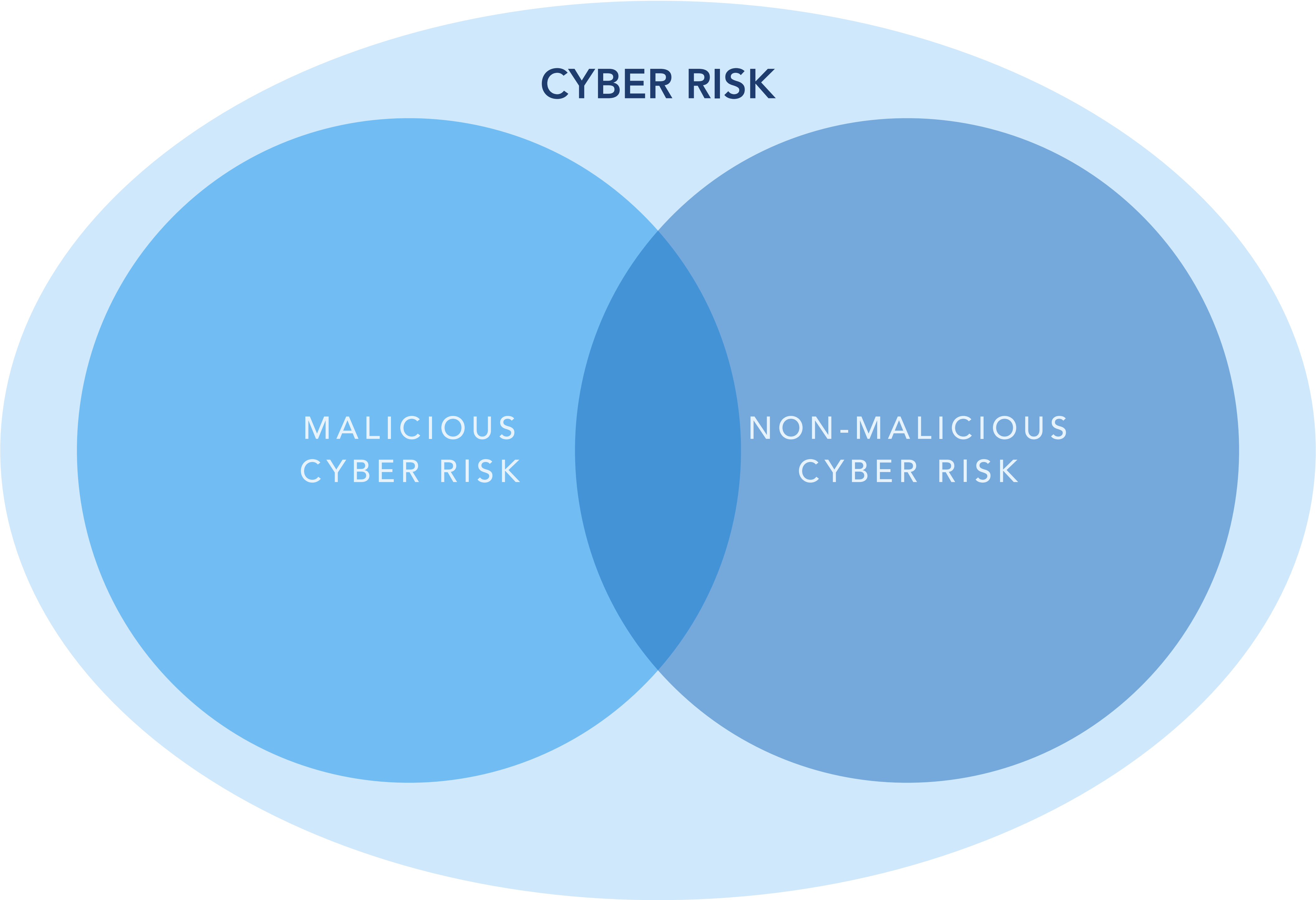
CYBER RISK MANAGEMENT

- cyber space does influence the threats and risks an enterprise has to consider.

- cyber space is so vast, expansive and connects so many subsystems, that sources of threats could come from many different places.

- cyber risk management is primarily concerned about cyber threats, threats exploiting cyber space.

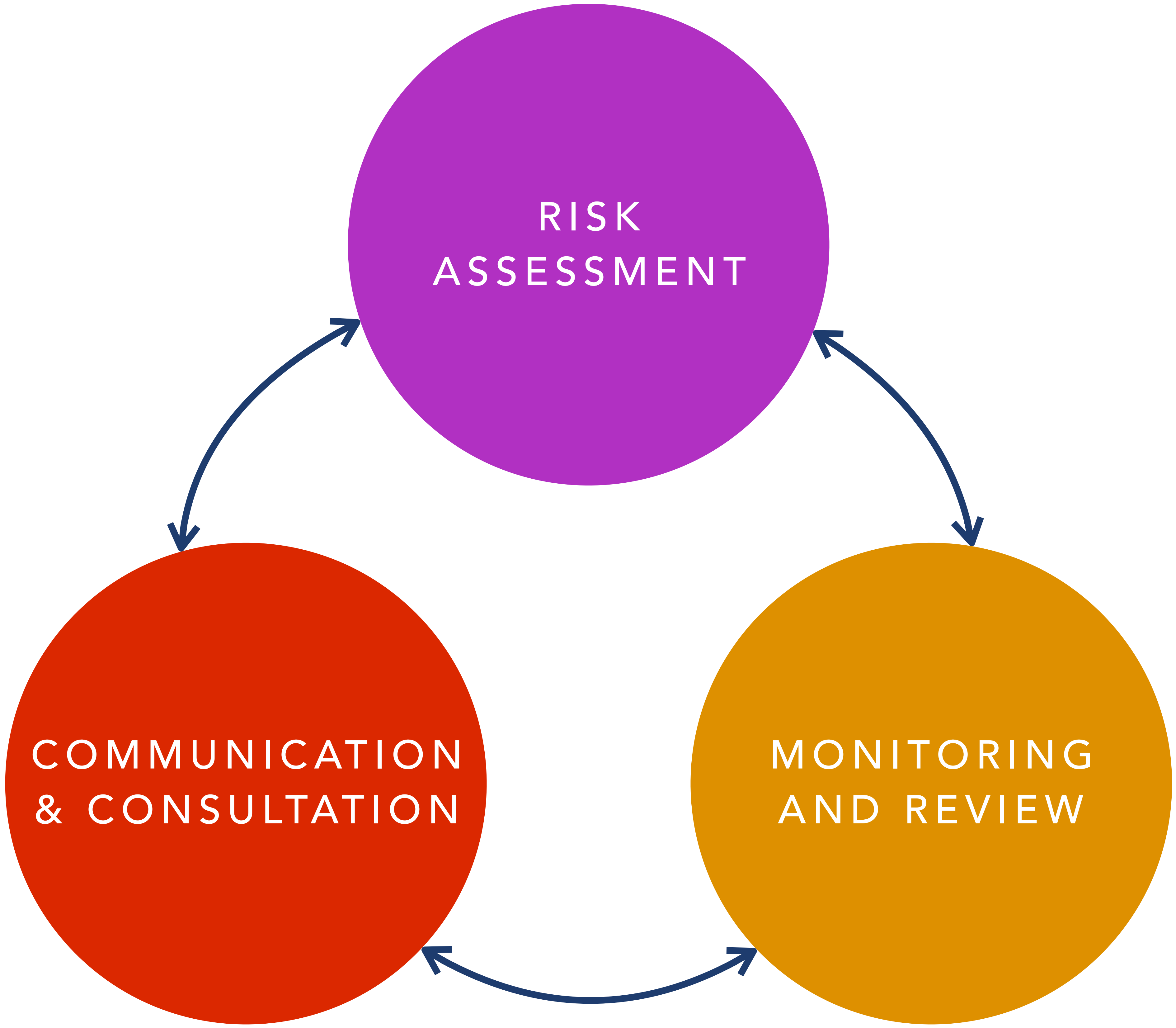
- cyber systems can be exposed to many threats, not all related to cyber space, floods and fires for example.


CYBER RISK
MALICIOUS CYBER RISK
NON-MALICIOUS CYBER RISK

CYBER RISK

- The nature of cyber risk can be categorised as **malicious** or **non-malicious**.
- Cyber-risk can also be considered both malicious and non-malicious.
- Cyber-risk could also be the product of both a malicious and non-malicious threat.

CYBER RISK MANAGEMENT PROCESS



RISK ASSESSMENT

COMMUNICATION & CONSULTATION

MONITORING AND REVIEW

COMMUNICATION AND CONSULTATION OF CYBER RISKS

COMMUNICATION AND CONSULTATIONS OF CYBER RISKS

- cyber systems ensures that stakeholders could come in many different forms and from many different places.

- consider the research, cloud service providers, customers, external clients.

- need to consider the optimal approach to communicate and consulate with these stakeholders.

- plans and procedures need to be developed and utilised to ensure a consistent approach in retrieving and sharing information.

COMMUNICATION AND CONSULTATIONS OF CYBER RISKS

- cyber space also ensures there potentially many more threats stemming from several different locations.

- consider the research, resources to utilise vulnerabilities and mount attacks is low.

- significant global events or incidents could have ripples across multiple organisations.

- also consider the research, in terms of the complexities introduced in certain deployments.

COMMUNICATION AND CONSULTATIONS OF CYBER RISKS

- wealth of data pertaining to numerous vulnerabilities, threats and incidents could be overwhelming to enterprises.

- establish categories and classifications to support better understanding and more informed decision making.

- recall the system attacking us, attackers are much better at sharing, disclosing and categorising information.

- employ standards, best practice as well as contribute and utilise repositories and stores of known information, e.g. Common Vulnerabilities and Exposures (CVEs) .

MONITORING AND REVIEW

MONITORING CYBER RISK

- able to keep many logs as well as gathering information from various other technical solutions, for example intrusion detection systems.
- develop internal **risk register** that compiles the known threats and vulnerabilities for stakeholders.
- develop and monitor important metrics relevant to cyber risk and use to have a clear illustration of overall cyber risk to the enterprise, for example failed authentication attempts.

CYBER RISK ASSESSMENT

CYBER RISK ASSESSMENT

- cyber space is **vast**, expansive and connects so many subsystems, that sources of threats could come from many different places.

- complexity associated with cyber space and systems ensures that there could be numerous **non-malicious** and **malicious** threats.

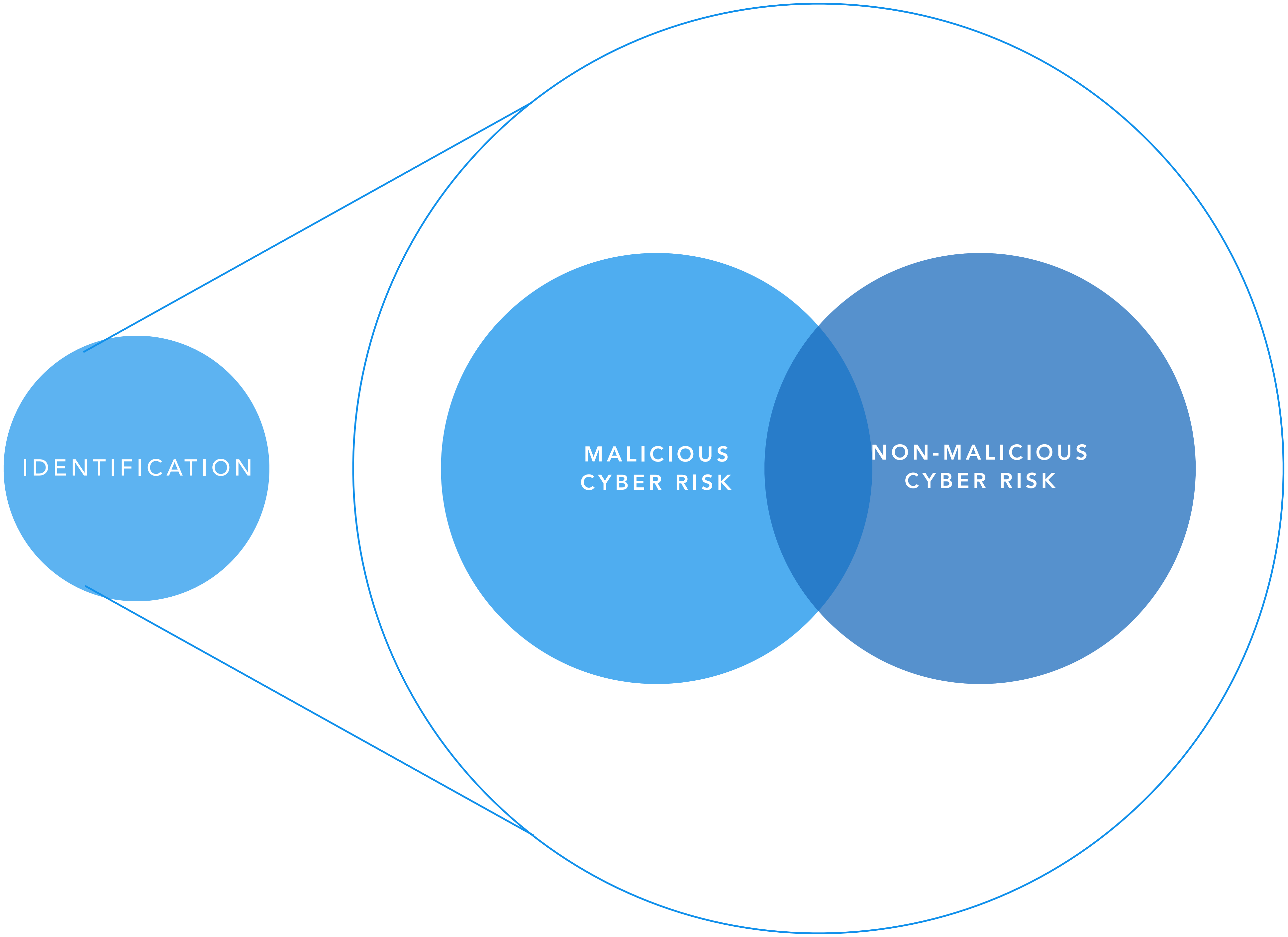
CONTEXT

IDENTIFICATION

ANALYSIS

EVALUATION

TREATMENT


IDENTIFICATION
MALICIOUS CYBER RISK
NON-MALICIOUS CYBER RISK

CONTEXT

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CONTEXT

- understand how the **cyber system interacts** with cyber space, including connections.
- need to consider the **attack surface** of the cyber system with cyber space, i.e. entry and exit points for threats and data.
- connection of cyber system to cyber space helps informs identification of risk.
- also need to appreciate the wider implications from exploitation of threats, reputation for example.

IDENTIFICATION

- consider the research, cyber risks to the enterprise can be non-malicious and/or malicious.

- it is an important aspect of the identification stage within cyber risk assessment.

- non-malicious risk could give rise to a malicious risk.

MALICIOUS INTENT

- adversaries in a game, the aim is to win the game by predicting the moves of our adversary.
- risk assessment is observing the game and furnishing our opponent with guidance.
- adversarial attack strategies are constrained in terms of strengths and weakness.
- understand the adversaries and document the threats, then they can be subsequently analysed.

NON-MALICIOUS INTENT

- no attack strategy, no malicious intent or any real motive in attempting to cause harm to the enterprise.

- influences the approach to determine the different risks.

- understand the assets, incidents that could involve these assets.

- leading to understanding the vulnerabilities, threats and sources that can allow the incident to occur.

ANALYSIS

- cyber systems afford enterprise significant insight in terms of testing, monitoring and logging that can greatly enhance analysis of the risk identified.

- malicious threats that are derived by individual intent can be incredibly difficulty to properly assess in terms of likelihood.

ANALYSIS

- MITRE corporation manages the **Common Vulnerabilities and Exposures (CVE)** reference system for known issues in general release software.

- includes consideration of typical consequences and the impact from exploit of vulnerability.

- **National Vulnerability Database (NVD)** is a repository for issues, also attempts to quantify risks in CVE.

- **Open Web Application Security Project (OWASP)** issues charts about common vulnerabilities for various applications.

EVALUATION

- differences emerge because of the presence of malicious and non-malicious risks.
- consolidation of cyber risk needs to consider the likelihoods for both non-malicious and malicious risks.
- integrity, for example, through disruption of data - determine the likelihood by combining malicious and non-malicious risks.

TREATMENT

- cyber systems are technical in nature, often resulting in the risk treatment in many cases being technical.
- differences between malicious and non-malicious risks has impact on the treatment of risks.
- treatment of malicious risks is challenging, focus may be on the interaction with cyber space.
- non-malicious treatment can be also addressed through training and policies but must ensure we do not introduce problems.

SUMMARY

- principles of risk management, risk management framework and risk management process itself.
- refining the aforementioned to support cyber risk assessment.
- understand the difference between non-malicious and malicious risk.