CBRN Weapons

Challenges in controlling dual-use technology transfers

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Part 1

THE ‘DUAL-USE’ CONCEPT

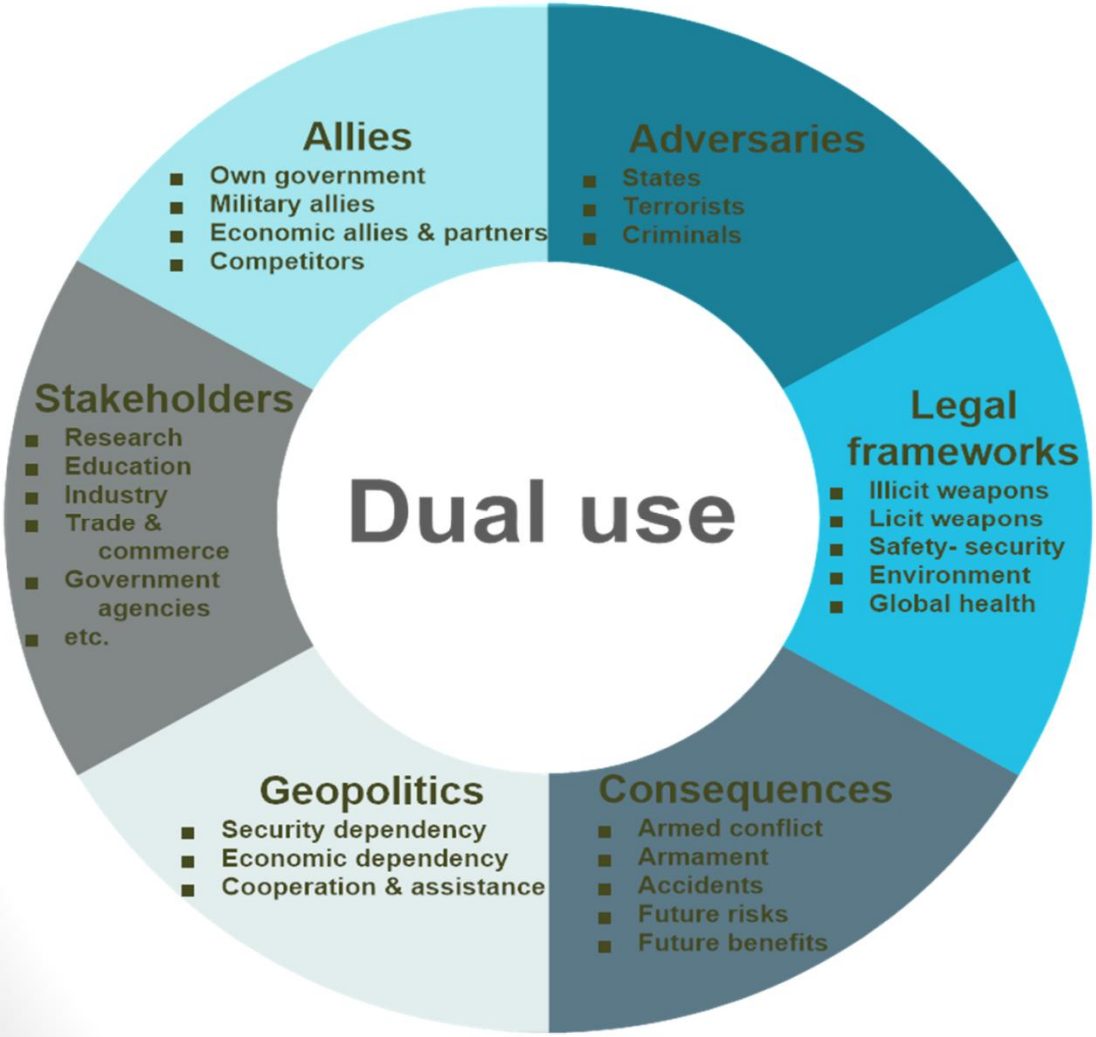
How do you conceive of ‘dual use’?

- The ‘dual use’ concept suggests a duality in the application of technology
  - In the 1970s and 1980s, e.g.
    - A ‘dual-use bomber’
    - A ‘dual-use artillery piece’
    - Meaning: Having the capability of launching *both* conventional and nuclear munitions
  - Today, the concept more often suggests the possibility of conflicting end goals, one of which is considered less or undesirable depending on circumstances
    - Military vs. civilian applications
    - Harm vs benefits
- ‘Dual use’ rests on multiple subsidiary concepts
  - Often associated terms include *technologies*, *goods*, *exports*, *transfers*, etc.
- Context is crucial to the consideration of implications of the ‘dual use’ concept
  - Example of the ‘carving knife’.

How does perspective affect the conception of ‘dual use’?

- Negative associations
  - An adversary state, a terrorist entity, a criminal motivated to cause maximal harm
  - A rogue scientist, a greedy business entrepreneur, a crooked trader, a corrupt official
  - Doomsday scenarios involving heightened security risks, wars with cataclysmic consequences
  - Contribution to the development and acquisition of illicit weaponry
  - Proliferation of ‘dual-use’ technologies to entities posing security threats should be countered
  - Heightened anxieties about the consequences of scientific and technological advances, including risks associated with accidents or possible future applications
- Positive or neutral perceptions
  - A less salient matter when pursued by one’s own government or allied countries
  - A cost-beneficial characteristic a state should actively pursue for both military and civilian applications, especially for the development and acquisition of licit weaponry
  - Not considered an issue when end goals benefit society or humanity

‘Dual use’ in a multi-faceted environment



Policy Mix (sample)

- International security
  - International treaties & norms
  - Non-proliferation policies; sanctions
- Prevention
  - National laws and regulations
  - Export and transfer controls
  - Intelligence & dialogue with stakeholders
  - International cooperation
  - Institutional policies and individual responsibilities
- Education & Outreach
  - Awareness-raising among stakeholder communities
  - Educational programmes
  - Training programmes
- Risk mitigation
  - Security & safety
  - Ethics & professional codes
  - Risk analysis
  - Foresighting

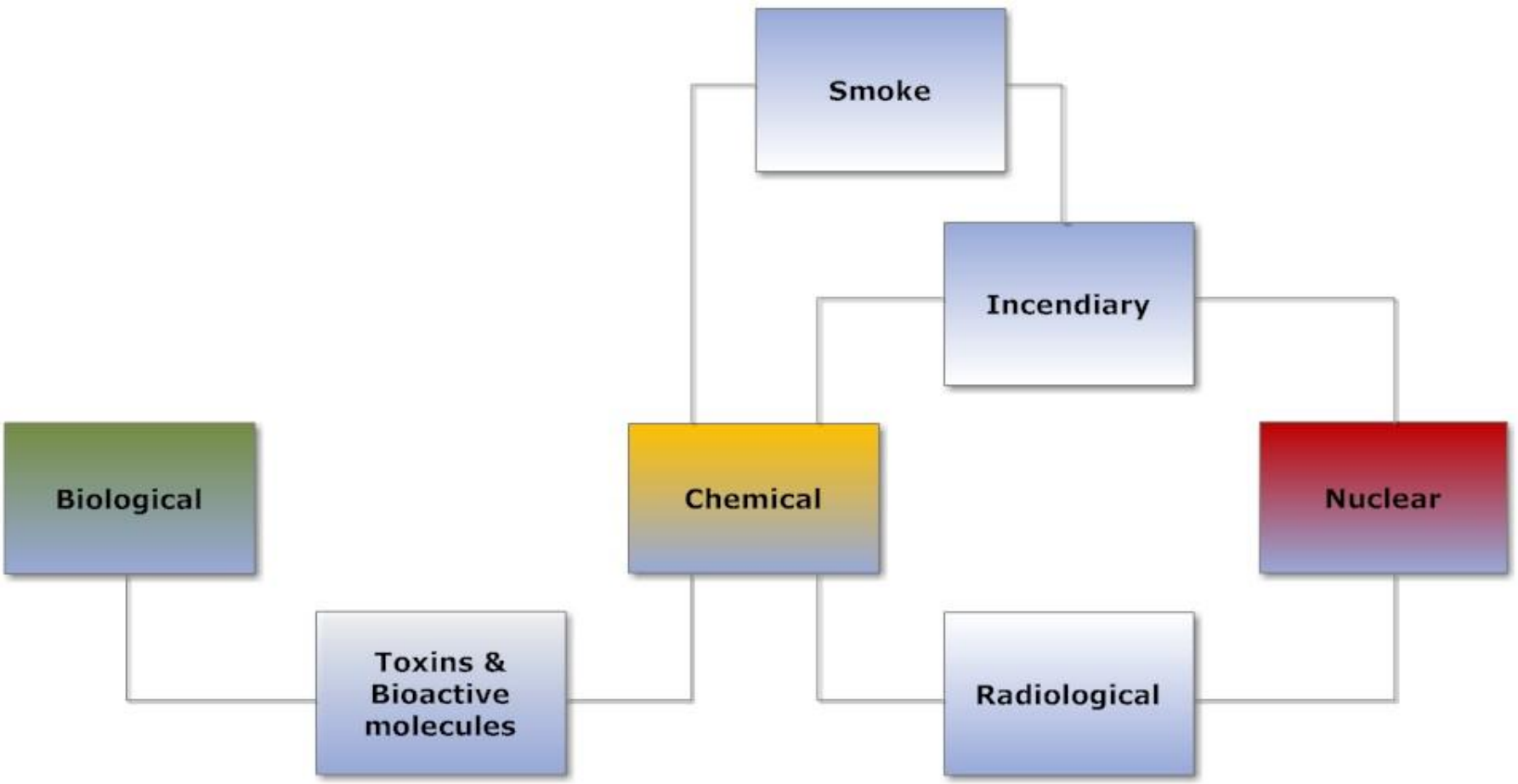
Part 2

CBRN WEAPONS AND *DUAL-USE* TECHNOLOGY

CBRN weapons or non-conventional weapons

- *Non-conventional weapons* habitually comprise 4 distinct weapon categories:
  - Chemical Weapons
  - Biological weapons
  - Radiological weapons
  - Nuclear weapons
- 'Weapons of Mass Destruction' versus 'non-conventional weapons'
  - 'WMD' has no internationally accepted legal definition
    - Each weapon category falls under a different (type of) legal regime
  - The respective legal regimes determine the *formal scope* of the weapon category
    - CW and BW formally defined in treaties (CWC; BTWC)
    - RW and NW lack universally accepted legal definitions
  - 'WMD' does not differentiate between types of weapons within a single arms category
  - 'Non-conventional weapons' focusses on status in national security policies and military doctrine rather than on the consequences of their use
- 'Non-conventional weapons' versus 'conventional weapons'
  - Use of '*non-conventional weapons*' is authorised by the highest political or military decision-makers; authorisation of use of '*conventional weapons*' is pre-delegated depending on circumstances
  - Distinction is reflected in 'proliferation' [prohibited] versus 'arms trade' [authorised].

The CBRN spectrum



CBRN weapons & technology transfers

- There is no or hardly any trade in CBRN weapons
  - Extremely dangerous for the people involved in trafficking
  - 'Weapons' are bulky (munitions; storage containers) and therefore difficult to move
    - Requires specialised equipment
    - In some instances, large volumes would have to be transported (e.g. CW)
  - Complex & highly specialised networks required
    - Unusual requests become visible to intelligence agencies
    - Activities at weapon research, production and storage sites are under observation (e.g. satellites)

- Transfers therefore mostly involve technologies *underlying* CBRN weapons
  - Materials: toxic agents & their precursors, pathogens, radioactive sources, …
  - People: scientists, engineers, technicians, students, … (education, experience & expertise)
  - Research: equipment, software, methodologies and results
  - Production: equipment and processes

- Consequently, there are many dimensions to controlling technology transfers

Our challenge with dual-use technologies

- As noted,
  - There is no or hardly any trade in CBRN weapons
  - Transfers therefore mostly involve technologies *underlying* CBRN weapons
- However, most of those technologies have legitimate non-military purposes

- These observations raise several complex questions for technology transfer controls
  - Certain technologies contribute directly to the development of the weapon in question
  - Other technologies contribute indirectly to weapon development
  - Acquisition of certain types of technology are of immediate relevance to weapon development
  - The relevance of other technology acquisitions for weapon programmes may only become clear over many years or decades

- For these reasons, it is necessary to have some understanding of weapon acquisition processes

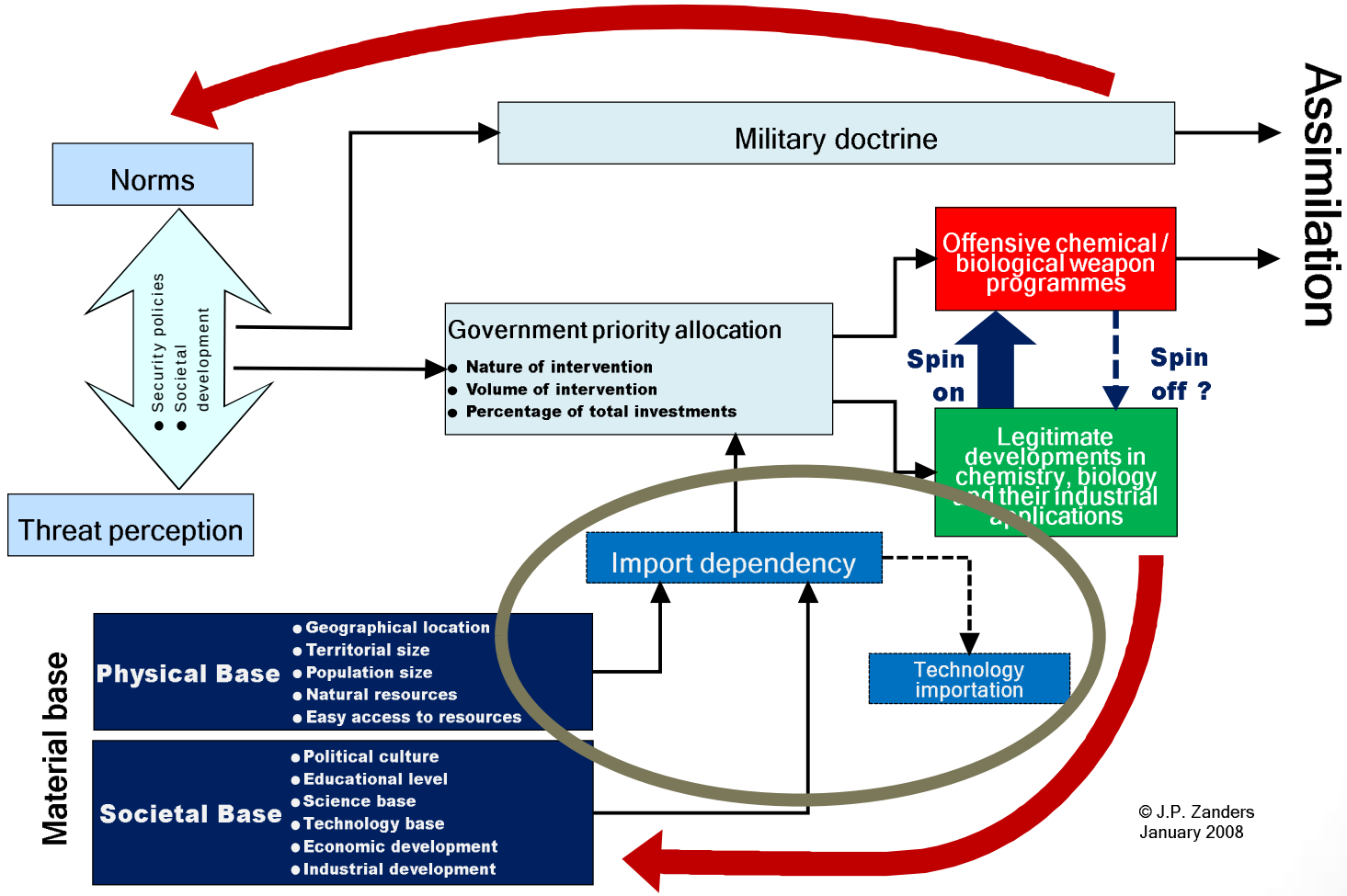
Basic elements of arms acquisition

- Initial decision to acquire a particular type of weaponry
- Parallel dual-track progression:
  - Political decision-making: Mobilisation and allocation of resources
  - Military decision-making: Doctrine / operational guidance formulation
- Basic stages:

Own development	*Acquisition*
• Weapon design • Weapon development • Weapon testing • Upscaling production • Production and stockpiling • Training	• Purchase full weapon (system) *or* • Purchase underlying technology • Importation equipment, knowledge & expertise • Testing • Production and stockpiling • Training

- Assimilation:
  - Weapon must meet demands formulated on both political and military decision-making tracks
- Preparation of use, including training and deployment

Place of technology transfers in the armament dynamic (Demand side)



Part 3

DEFINING TECHNOLOGY AND *DUAL-USE* TECHNOLOGY

What is '*technology*'?

'Technology comprises

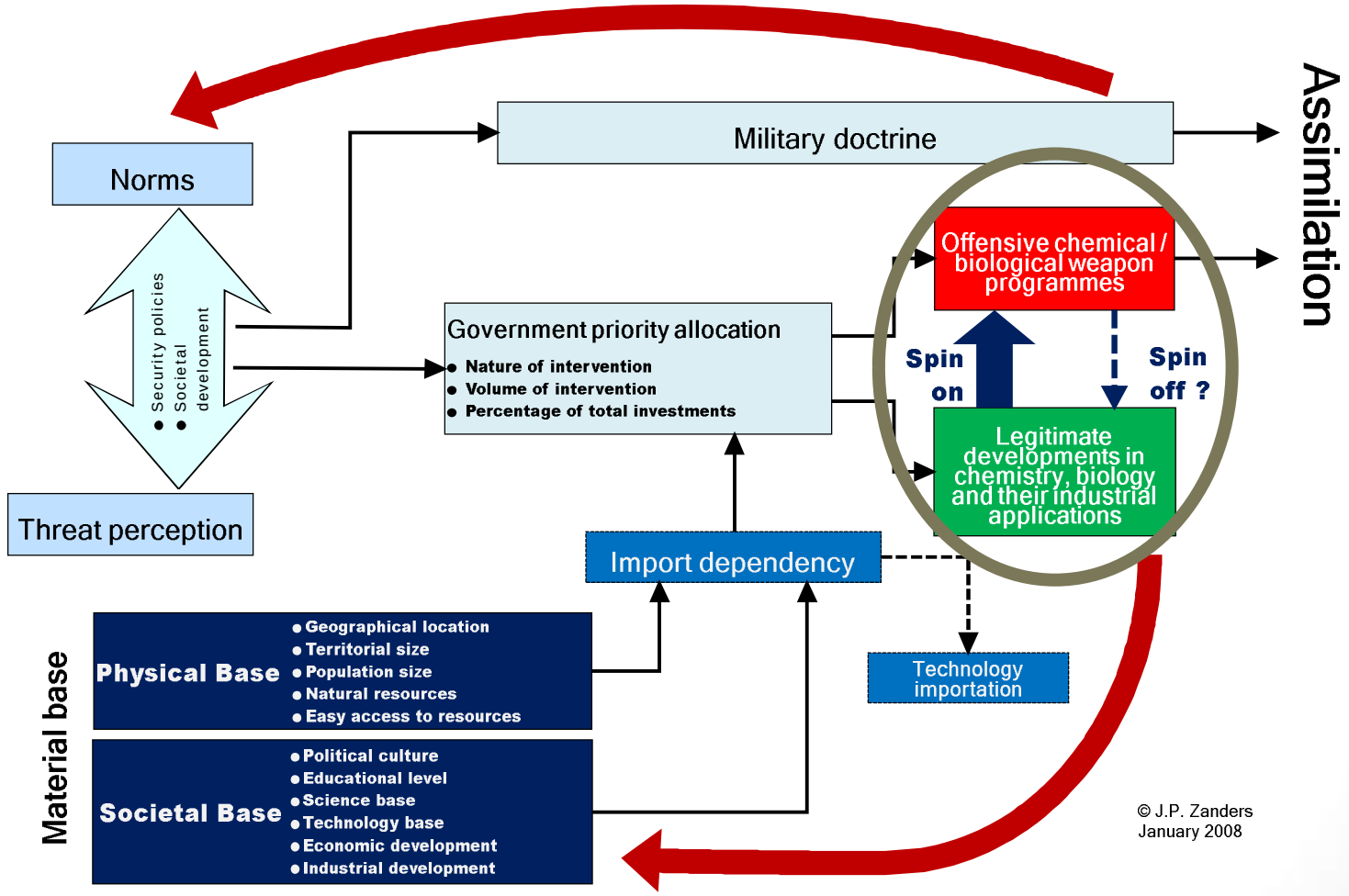
- the *ability* to recognise technology problems,
- the *ability* to develop new concepts and tangible solutions to technical problems,
- *the concepts and tangibles* developed to solve technical problems, and
- the *ability* to exploit the concepts and tangibles in an effective way.'

Errko Autio and Tomi Laamanen, 'Measurement and evaluation of technology transfer: Review of technology transfer mechanisms and indicators', *International Journal of Technology Management*, Vol. 10, Nos. 7/8 (1995)

What is '*dual-use*' technology?

- Dual-use technology: a technology that has the *potential* to be applied for a *purpose* other than the one for which it was originally intended
  - *Spin-on*: military application of technology originally intended for civilian purposes
  - *Spin-off*: civilian application of technology originally intended for military purposes
- Single-use technology: a technology that lacks such potential
  - e.g. the weapon itself

Long-term technology transfers in the armament dynamic



Weaponisation of consumer technology

- Customisation of off-the-shelf, commercial technologies for use
  - As a weapon in combat or terrorist operations
  - In support of warfare or terrorist operations
- Is a spin-on process

- Consumer drones adapted to deliver weapon payloads
  - Major development in the Ukrainian war
- Also possible with improvised CBRN weapons

Tangible and intangible technology

- Tangible objects or artefacts (also often called ‘goods’)
  - Pathogens, chemicals (including precursors), toxins, radioactive sources
  - Laboratory equipment
  - Fermenters, centrifuges, production equipment, installations and facilities
  - Delivery systems, and special equipment associated with weapon use
  - Etc.

- Intangible technologies
  - Data
  - Patents
  - Processes
  - Knowledge
  - Expertise and skills
  - Etc.

Knowledge and expertise

- Academia
  - Universities
  - Research institutes and think tanks
  - Students
- Scientists and engineers
  - Research institutes
  - Laboratories and testing facilities
- Professionals
  - Technology experts
  - Technicians
- Civil society
  - Expertise in various areas, including assistance in treaty implementation, etc.

Part 4

CBRN WEAPONS AND *DUAL-USE* TECHNOLOGY

CBRN weapons & dual-use

- A CBRN *weapon* is a ‘single-use’ technology
  - It has no other purpose than being a weapon
- CBRN weapon *development* often rests on ‘dual-use’ technology
  - Materials
  - People: scientists, engineers, technicians, …
  - Research equipment, methodologies and results
  - Production equipment and processes
- The core question is: *when is the ‘single-use’ stage reached* in weapon development?

Reaching the single-use stage

- Chemical weapons
  - Agents in bulk or filled in munitions, delivery systems; specialised equipment (CWC definition of a CW)
  - However, *CWC* places certain toxic chemicals and their precursors in Schedule 1, meaning that in essence, they have *no other purpose than being a CW* (= single use)
    - But what about other precursor chemicals or past warfare agents such as chlorine and phosgene?
- Biological weapons
  - In contrast, the *BTWC* faces the problem that BW are the only arms category in which the active ingredient can be used for *both attacking and defending* the target
    - Activities in BW defence, protection and prophylaxis are permitted, but hardly distinguishable from BW offence
  - Raises questions about activities that may inadvertently contribute to BW development in the present and the future
- Radiological weapons
  - When a radioactive source is fixed to an explosive device or upon release?
- Nuclear weapons
  - When enrichment of nuclear fuel exceeds 20%?

Summary of ‘dual-use’ debate

- Dual-use issues arise when the attempts to control a particular technology confront the non-military commercial and scientific interests in such technology

- Disarmament
  - Total ban on the development, production and possession of *a weapon* and preparations for *its* use in warfare (BTWC, CWC)
  - ‘Dual-use’ issue emerges when
    - Civilian facilities and installations need to be verified
    - Need to prevent the (inadvertent) assistance to the development of a banned weapon by another state or non-state entity
  - Ban of weapon (= single-use technology) is central; control of dual-use technology supports that central goal

- Non-proliferation
  - Control of access to technologies that may contribute to undesired weapon development in another state or non-state entity
  - Primary policy tool for weapon categories whose use in war or possession *has not been wholly delegitimised* (e.g., nuclear weapons, ballistic missiles)

Part 5

CHALLENGES IN MANAGING DUAL-USE TECHNOLOGY TRANSFERS

Nature of technology transfers

- Commercial transactions
  - Trade
  - Assistance
    - Technology may be free for recipient
    - Nevertheless, transfer involves many commercial trade-related activities
- Business decisions
  - Mergers and acquisitions
  - Divestiture of business activities
  - Friendly/hostile company takeovers
  - Corporate breakups
- Undesired technology transfers
  - Theft
    - Propriety information
    - Research, production, process or product data
    - Tangible technologies
    - Hacking
  - Espionage
    - Industrial espionage
    - Government-initiated espionage

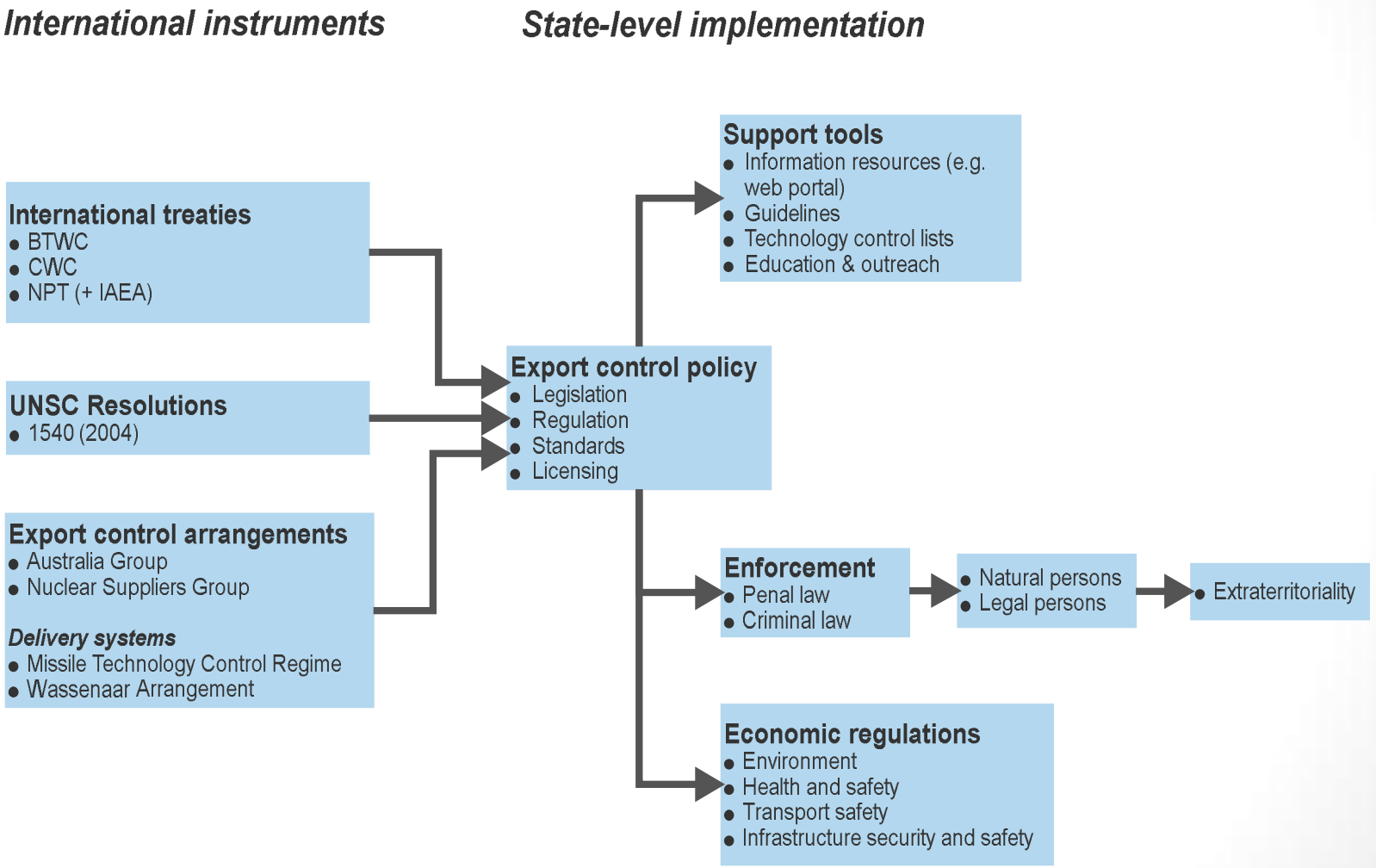
Company interests

- Desire to have commercial relations as free as possible
  - Maximise opportunities for technology development and production
  - Maximise profit generation through sales
  - Minimise cost and impediments that could increase cost
- Transfer controls
  - Interfere with free commercial relations
    - Restrictions on customer selection
    - Administrative burden
      - Administrative requirements
      - Additional staff or outsourcing of administrative requirements
      - Risk assessments
    - Time delays
  - Increase cost

New security actors

- Intent on harm
  - Criminals & terrorists
  - Have potential interest in CBRN materials
- Economic imperatives have replaced security imperatives
  - Sub-state economic units.
    - Industry, shipping agencies, etc.
    - Research institutes
    - Researchers, students, etc.
  - Transnational economic units
    - Multi-national corporations
  - State (agencies)
  - International organisations

Legal foundations of an export control system



A dynamic environment

- Treaties govern inter-state behaviour; new dynamics in CBRN weapons prevention are less state-centric
  - Impact on verification requirements in international treaties
  - New forms of technology transfers
    - Difficult to capture under current transfer control regimes
  - Emphasis on *national* implementation

- Individualisation of threats and threat perceptions
  - A major consequence of terrorism
  - Increasingly, governments frame *responsibilities for individual economic actors and professionals*
    - Functions through national legislation and regulations
    - Companies, universities, research institutes and professional associations adopt regulations, professional codes and ethical guidelines

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