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Systems Engineering approach and Space Technology Transfer: the role of International Relations and Public Policy

San Francisco, 6 October 2015

Veronica La Regina – Walter O. Piperno

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Concepts' Outline

- **Space Technology Transfer**
  - *without SE and*
  - *with SE*
- **Roles of**
  - *Market*
  - *Public policy and*
  - *International Relations*
- **Conclusions and Recommendations**

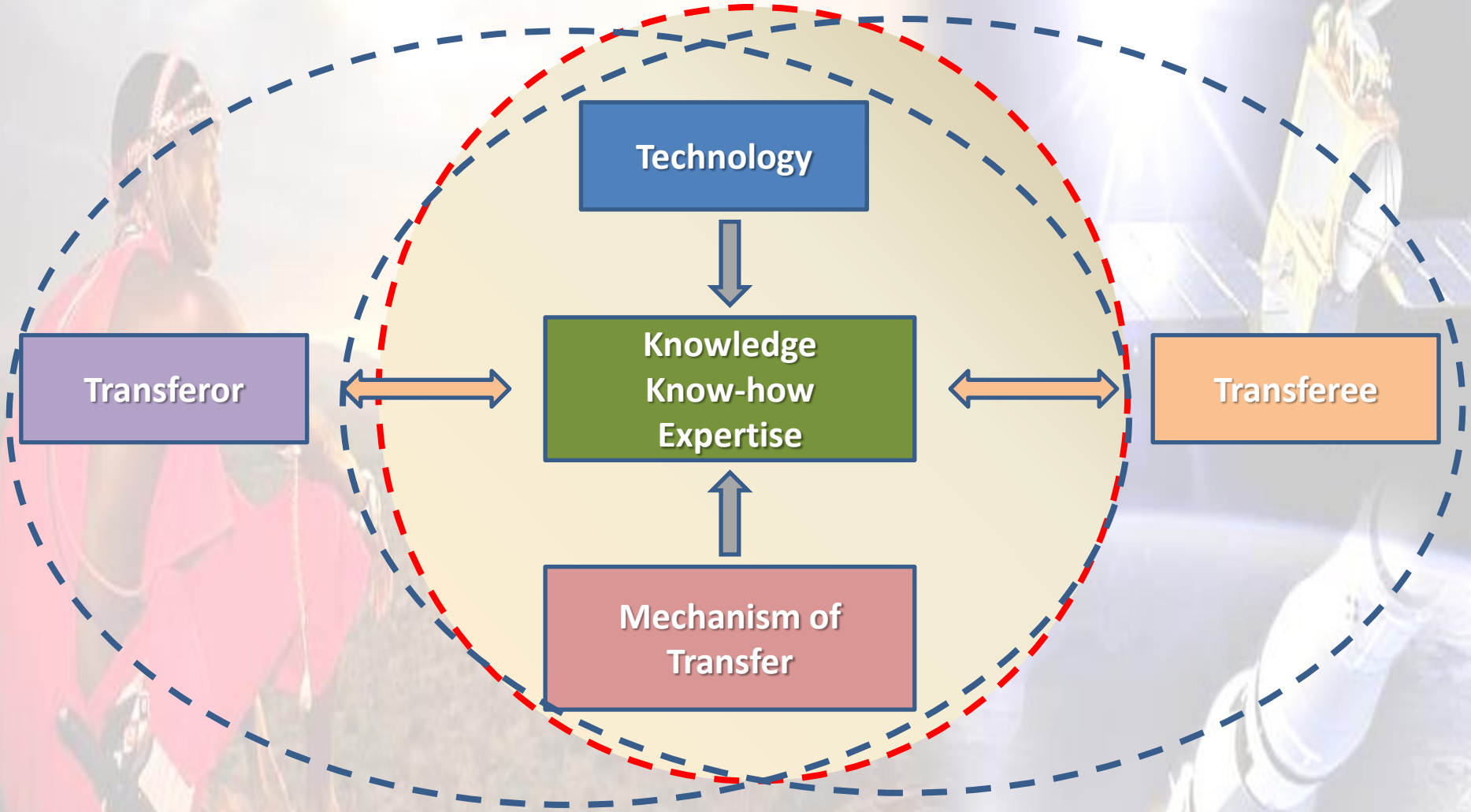
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Space Technology Transfer & SE

- Technology Transfer has manifold dimensions: it has often been used to describe the process through which:
  - ideas and concepts are moved from laboratory to marketplace (Phillips, 2002; Williams & Gibson, 1990),
  - the transfer of knowledge and concept from developed to less technologically developed countries (Derakhshani, 1983; Putranto et al., 2003) and
  - *the transfer of inventive activities to secondary users, the adaptation of innovative technology to a new use* (Van Gigch, 1978)

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Space Technology Transfer



Source: N. Khabiri, 2012 – Elaboration by author

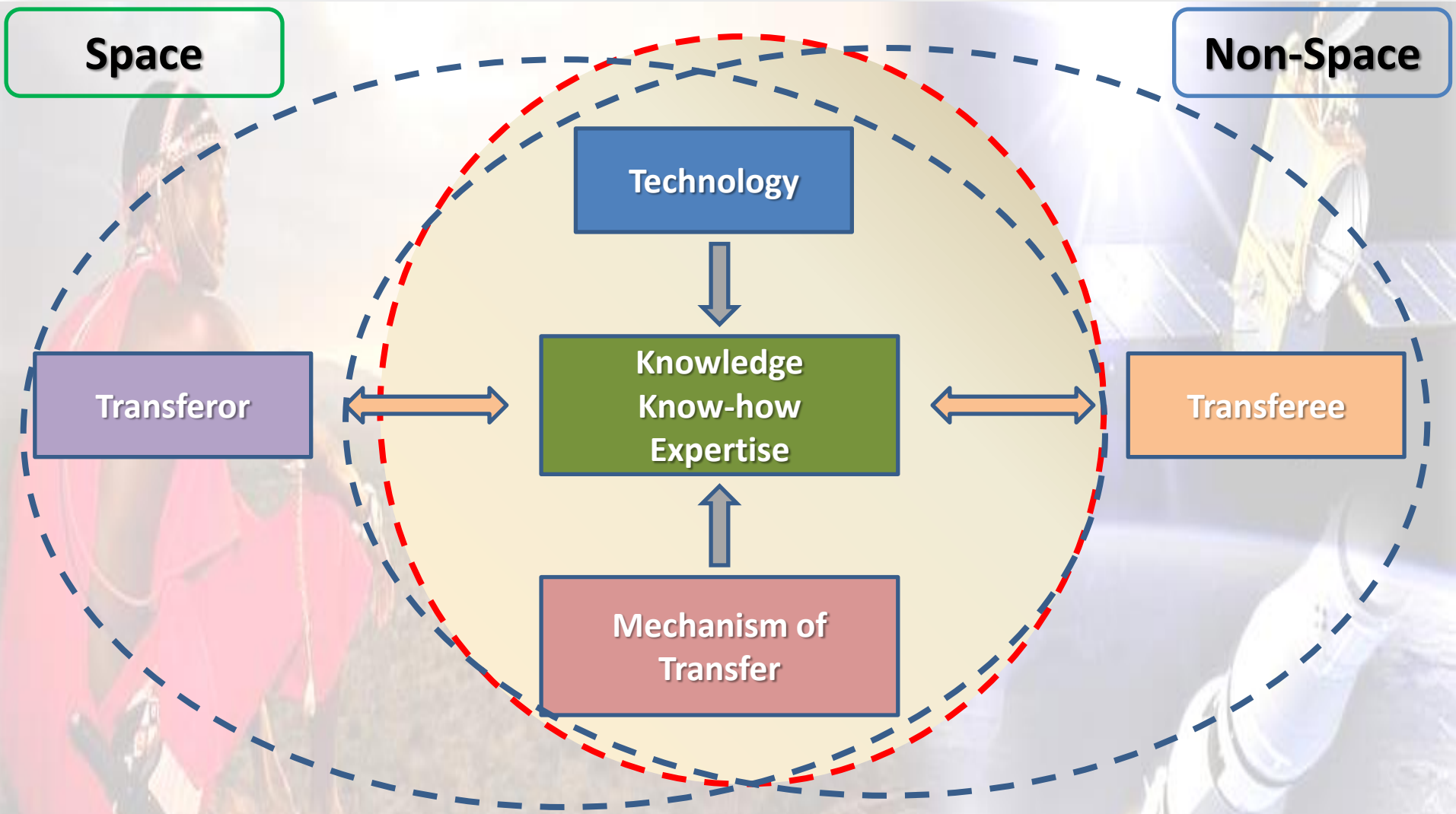
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Space Technology Transfer

- **Technology:** set of knowledge, know-how and expertise employed for provision of goods/services/systems
- **Mechanism of transfer:** set of channels in order to give technology from one to another one
- **Transferor:** owner of the knowledge
- **Transferee:** receiver of knowledge
- **The grater environment:** policy conditions

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Space Technology Transfer



Source: N. Khabiri, 2012 – Elaboration by author

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Space Technology Transfer & SE

Space

- Reliability in O-Space
- Redundancy
- Trade-off: mass/power
- Complexity
- Stand-alone production

Non-Space

- Re-usability
- Redundancy
- Interoperability
- Simplification
- Replication

- B2B Market
- Bilateral Relations

- B2C Market
- International Trade & Law

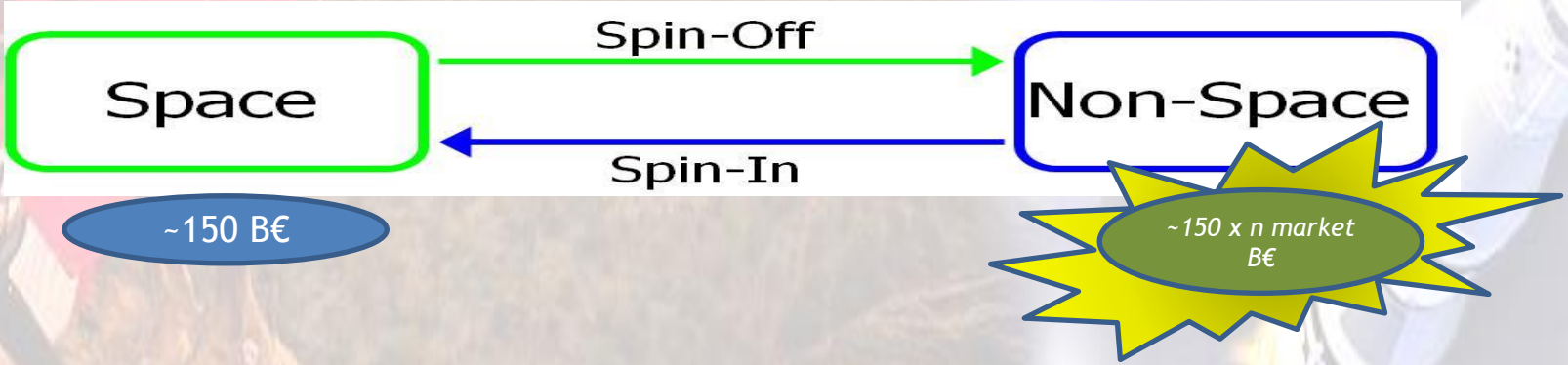


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SE & Space Technology Transfer

- **Systems Engineering** *is an interdisciplinary field of* ***knowledge*** *that focuses on how to design and manage complex* ***systems*** *over their life cycles*

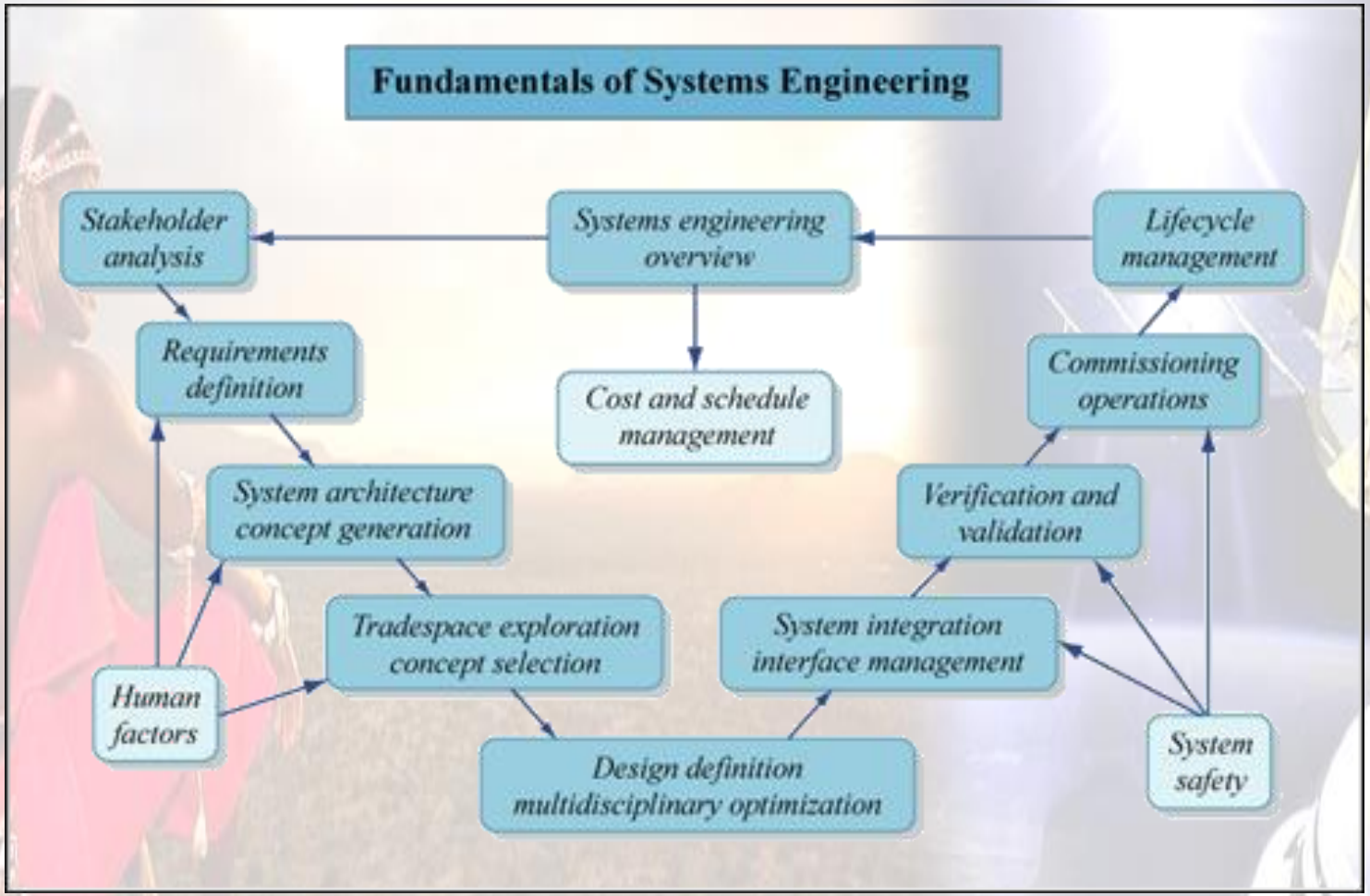
If **Space** *shall work even for* **Non-Space** *then…*

- **Reliability** in Outer Space shall be mitigatable to **redundancy**
- **Redundancy** shall be managed through **re-usability**
- **Trade-off between mass/power** shall pass the floor to **interoperability**
- **Complexity** shall be flexible adapt to **simplification**'s context
- **Stand-alone production** shall be simplified into a **replication** procedure

- **B2B Market** shall be a catalyzing leverage to **B2C Market**
- **Bilateral Relations** shall be supportive of **multi-lateral relations**

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SE & Space Technology Transfer



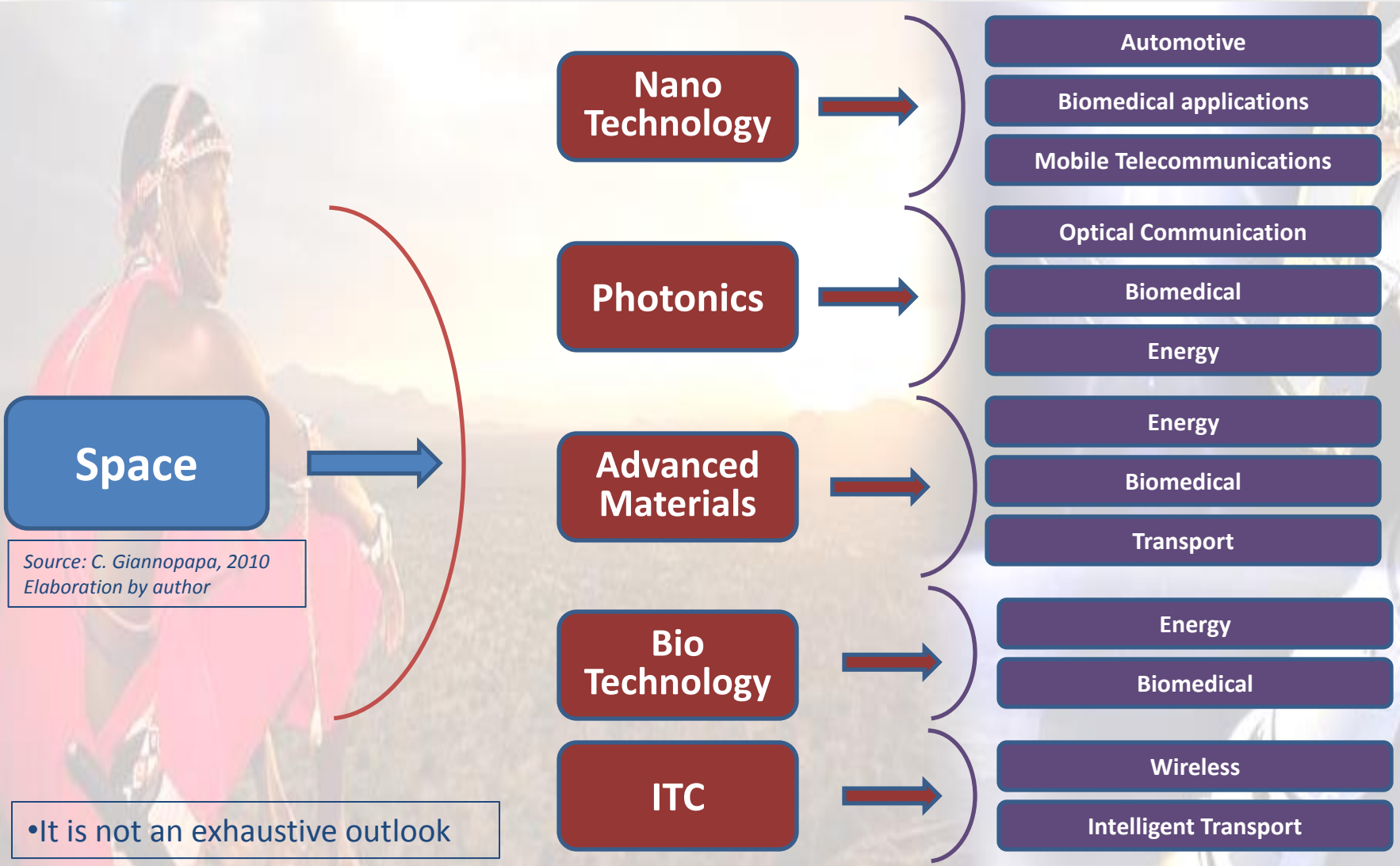
International Relations

Market

Public Policy

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Space Technology Transfer



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Space Technology Transfer

Institutional Case	Description
NASA (USA)	•*Commercial Technology Network* •*Small Business Innovation Research* • *Small Business Technology Transfer*
ESA (~ Europe)	• Technology Transfer Programme Office: Tech Brokers & BICs • ESA – Integrated Application Programme (AIP): user-drivers
European National Agencies *(e. g. ASI, CNES, …)*	• Past-time: Shareholders' corporations • Today: incubator approach, support for IP, innovation development
DLR (Germany)	• *Technology push*: risk sharing between private player and DLR through a company as special vehicle in order to reduce systemic financial risk
CSA (Canada)	• *Space Policy Framework*: marketing approach from space sector to other industrial sector

- *Examples of policy initiatives*

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Space Technology Transfer: ASI achievements

Start-up	Technology	Website
spaceexe	Monitoring Evolution with Soccer -Satnav Innovation High Precision	www.spaceexe.com
Survey Lab	Monitoring urban areas by means of long term DInSAR time series	www.surveylab.info
airgloss	Innovative Smart multi-sensor for indoor detection	www.airgloss.com
Biosensing Technologies	User friendly lab performing the microbiological analyses on bathing marine area	www.biosensingtechnologies.com
Smart Structures Solutions	Smart Base Transceiver Stations	www.smartstru.com
piezo T sensor / Str/o/N/GER	Self-powered piezoelectric temperature and humidity sensor	www.stronger2012.com
	Hyperspectral/multispectral satellite data based system to detect water leaks	www.neptunewaterleaks.com
CAPTIKS Capturing Kinematics	An integrated motion capture system with inertial sensors, GPS and 2 way wireless communication	www.captiks.com
Scooterino	Sharing Economy models for scooter's ride through apps	www.scooterino.it

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Conclusions and Recommendations

- Space technology transfer is a complex ecosystem and an holistic approach *(e. g. SE)* shall be adopted for achieving a more comprehensive outcome
- Space and no-Space ecosystems present different and peculiar business approaches (marketing policies and strategies, governance and international trades)
- If Space investments shall be exploited as much as possible for humankind then Space technology transfer is the right channel
  - no-Space requirements shall be included earlier
  - B2C market approach and international trade shall be encompassed into the initial design

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There is always space for Space!

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