

MAR Development

European Robotics Forum
12th March 2014 Rovereto

David Bisset iTechnic Ltd

Overview

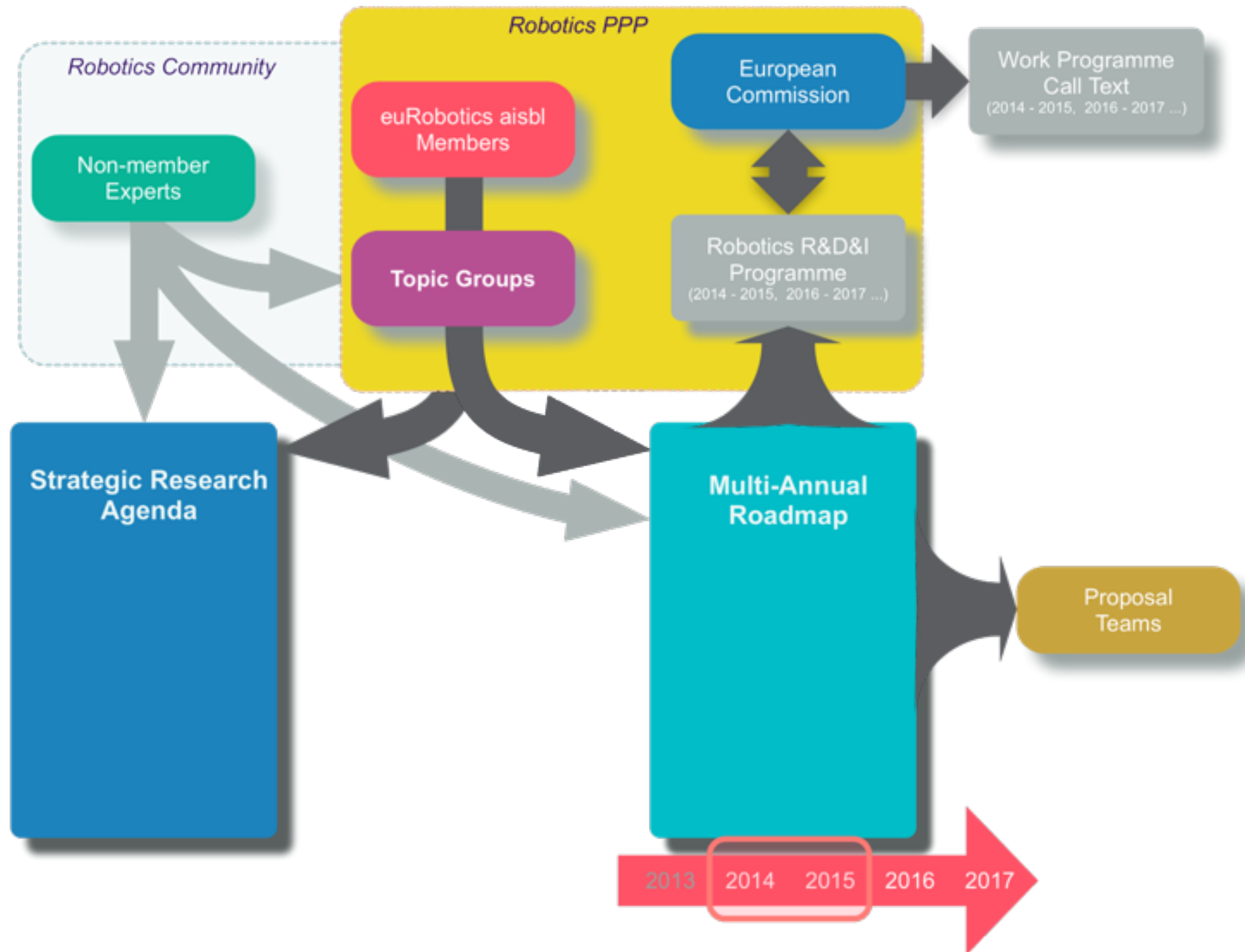
- Work from Jan 2013 to now.
- Understanding the MAR
- Future work
- ERF Workshops

What have we achieved?

One Year Ago...

- Last year in Lyon:
 - There was no PPP
 - The SRA was an early draft.
 - There was no MAR
 - There were no Topic Groups
 - The first H2020 Call text was unwritten
- This week:
 - The PPP is established and running.
 - The SRA is complete.
 - The first version is available for Call 1.
 - The General Assembly will be asked to approve 27 Topic Groups.
 - H2020 Call 1 will close in a month.
- It has been a successful year

Thank you!



Two Documents



SRA: High level document

- Wide readership
- Strategy and targets
- Framework of description



MAR: Technical detail

- Updated each year
- Context and detail
- Now available from...

www.eu-robotics.net

Roadmap Progression

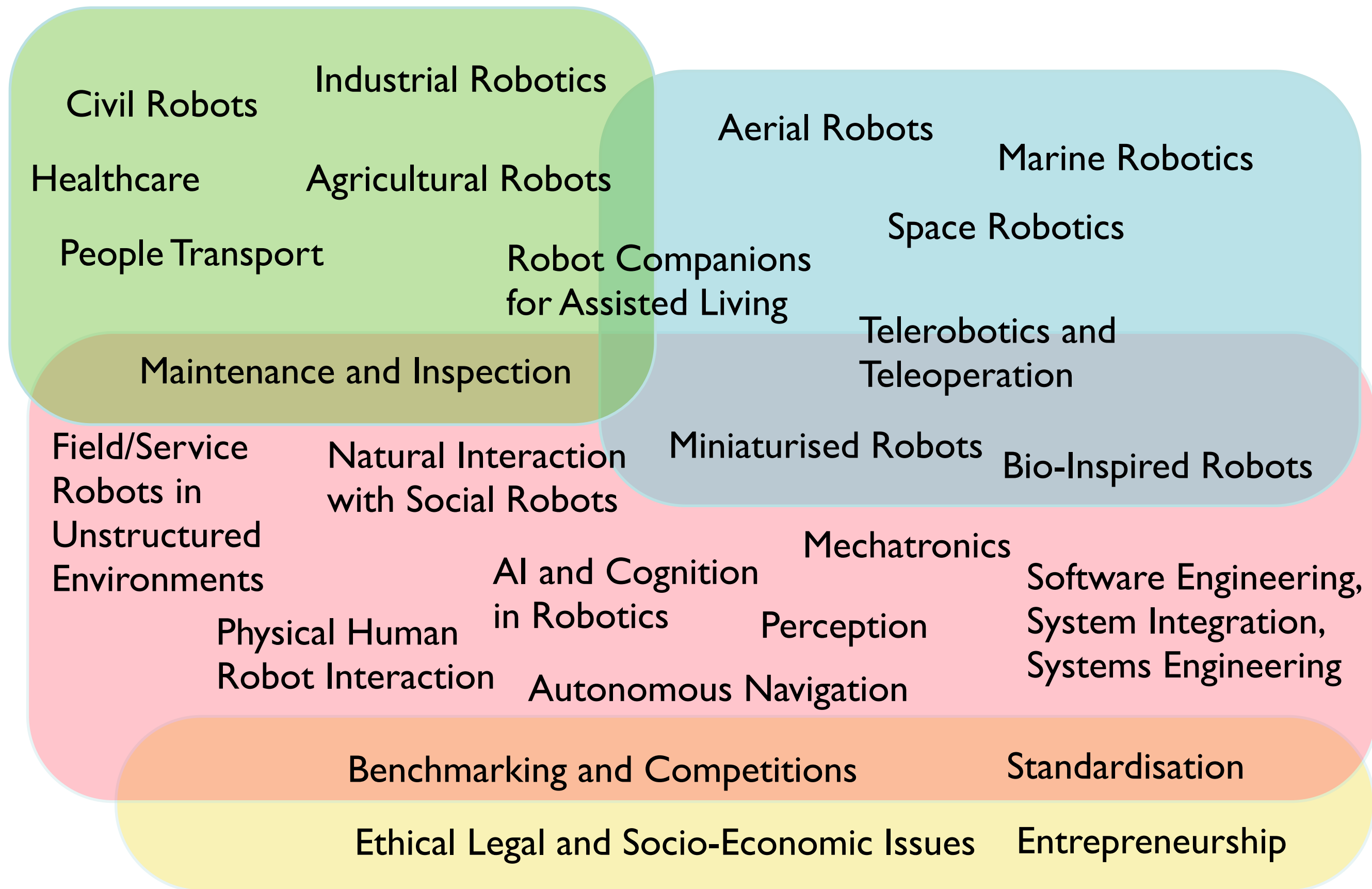
- First Workshop in Leuven (September 2012)
- SRA 0v2 released (February 2013)
- Workshops at ERF (Lyon) 2013 (March 2013)
- SRA 0v3 released (July 2013)
- MAR Workshop Frankfurt (September 2013)
- SRA 0v4 released (October 2013)
- MAR Workshop Brussels (October 2013)
- Initial release Call 1 MAR (January 2014)
- Topic Group Coordinators meeting (February 2014)
- ERF (Now)
- Review workshop (May/June 2014 TBD)
- Call 2 MAR Release (September 2014)

Topic Groups

Aerial Robots
Agricultural Robots
Autonomous Navigation
Benchmarking and Competitions
Bio-Inspired Robots
Civil Robots
AI and Cognition in Robotics
Robot Companions for Assisted Living
Field/Service Robots in Unstructured Environments
Healthcare
Industrial Robotics
Maintenance and Inspection
Marine Robotics
Mechatronics
Miniaturised Robots
Natural Interaction with Social Robots

Perception
People Transport
Physical Human Robot Interaction
Software Engineering, System Integration, Systems Engineering
Software Systems
Space Robotics
Telerobotics and Teleoperation
Entrepreneurship
Ethical Legal and Socio-Economic Issues
Standardisation

Socially Intelligent Robotics (Proposed)
Education (Proposed)



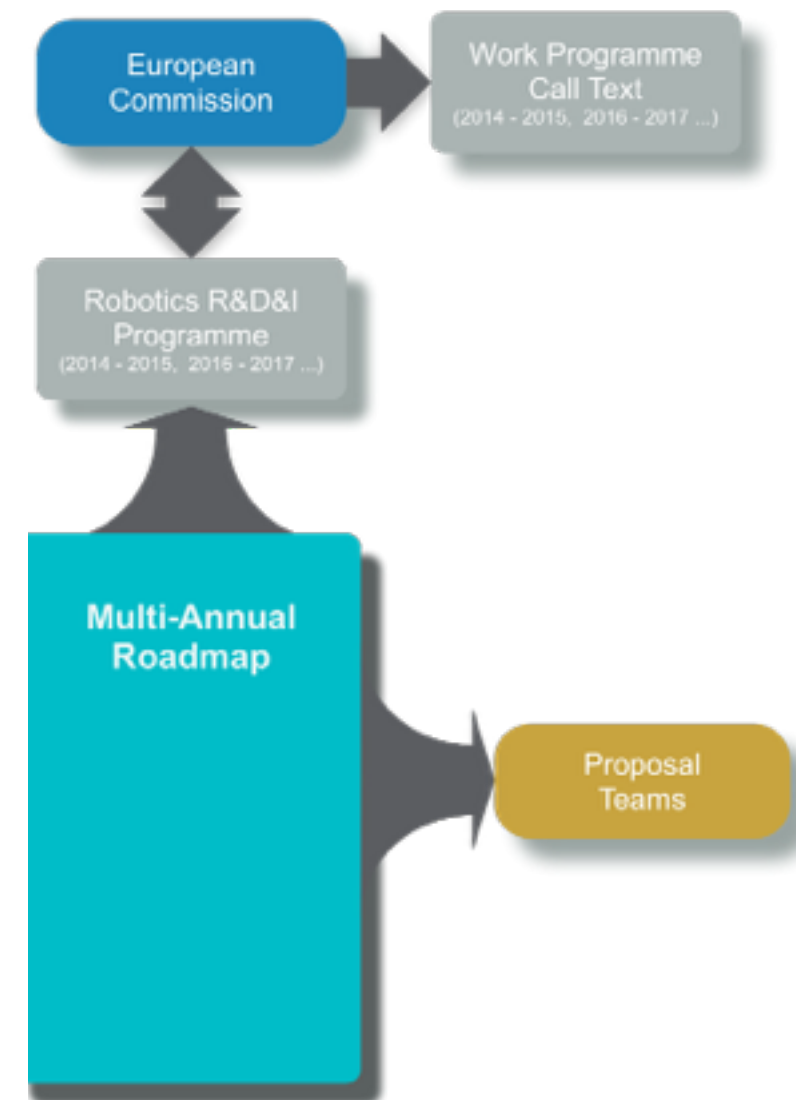
The Role of Topic Groups

- Topic groups provide the main input to the MAR.
 - They link the community to the MAR
- Topic Groups reflect all aspects of the community and market.
- You are encouraged:
 - To consider creating new Topic Groups where you can identify gaps.
 - To take an active role in topic groups to ensure the MAR represents the whole European robotics community.

MAR Impact

Use of MAR

- MAR is an integral part of the Call.
- Technical framework for proposers.
- Indicator of expected Targets and Step Changes.
- Reference:
 - e.g. description of TRLs
- SRA and MAR to be made available to evaluators before evaluation.
 - Currently treated as “Guide Lines”.



Call text...

RTD to advance **abilities** and **key technologies** relevant for industrial and service robotics

- In terms of **market domains**, the priorities are: **manufacturing, commercial, civil, agriculture**

- The primary goal is to significantly improve the level of industrial and service robotics **abilities** in the context of the above mentioned **market domains** by addressing: **adaptability, cognitive ability, configurability, decisional autonomy, dependability, flexibility, interaction capability, manipulation ability, motion capability, perception ability.**

- To reach this ambitious goal, **key robotics technologies** need to be advanced in the particular fields of **cognition, human-robot interaction, mechatronics, navigation, perception.** This includes **technology combinations** such as **grasping and dexterous manipulation, physical HRI, mobile manipulation, reactive planning** and other **combinations**, in particular those that connect the **key technologies** above.

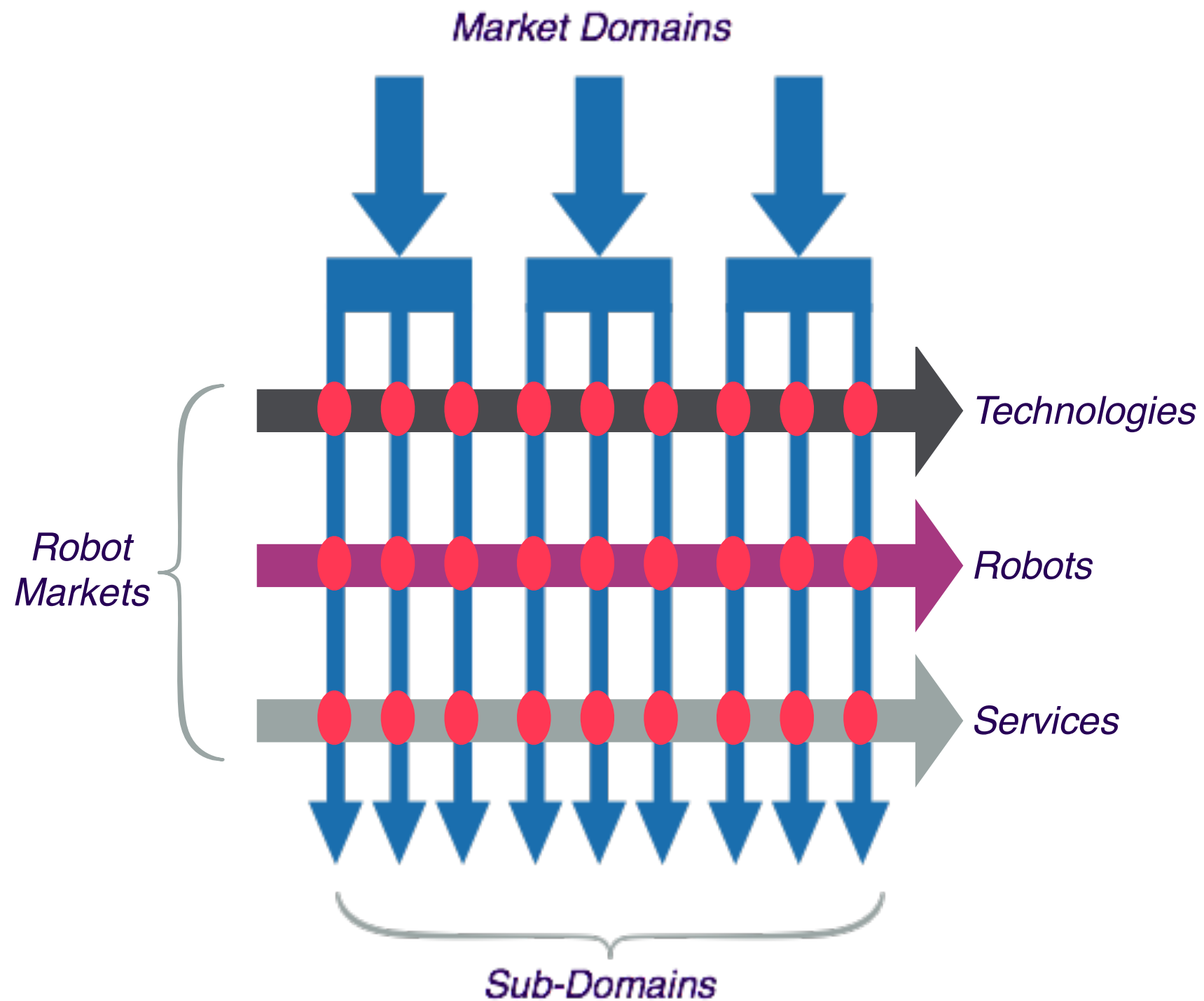
- To prove the exploitation potential of the results the project outcome is to be shown in **market domain-relevant** demonstrations proving an increased **TRL**.

- It will be essential for the deployment of robots to establish **systems development** processes (from requirement analysis to testing and validation) and to develop techniques and technologies for **system design, engineering, architecture, integration, system of systems, modelling and knowledge engineering** which are applicable across **market domains**.

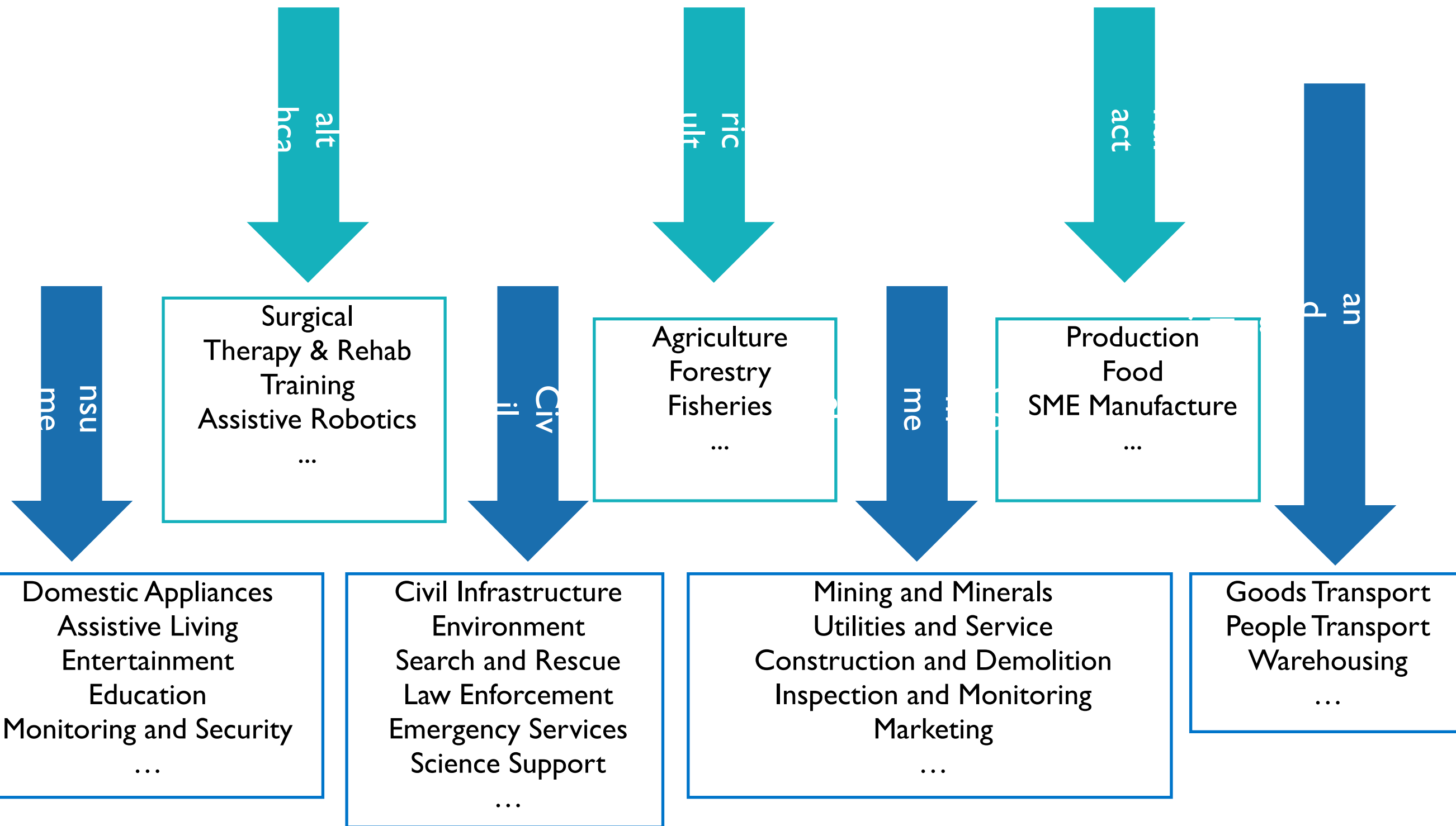
Understanding the MAR.

DOMAINS

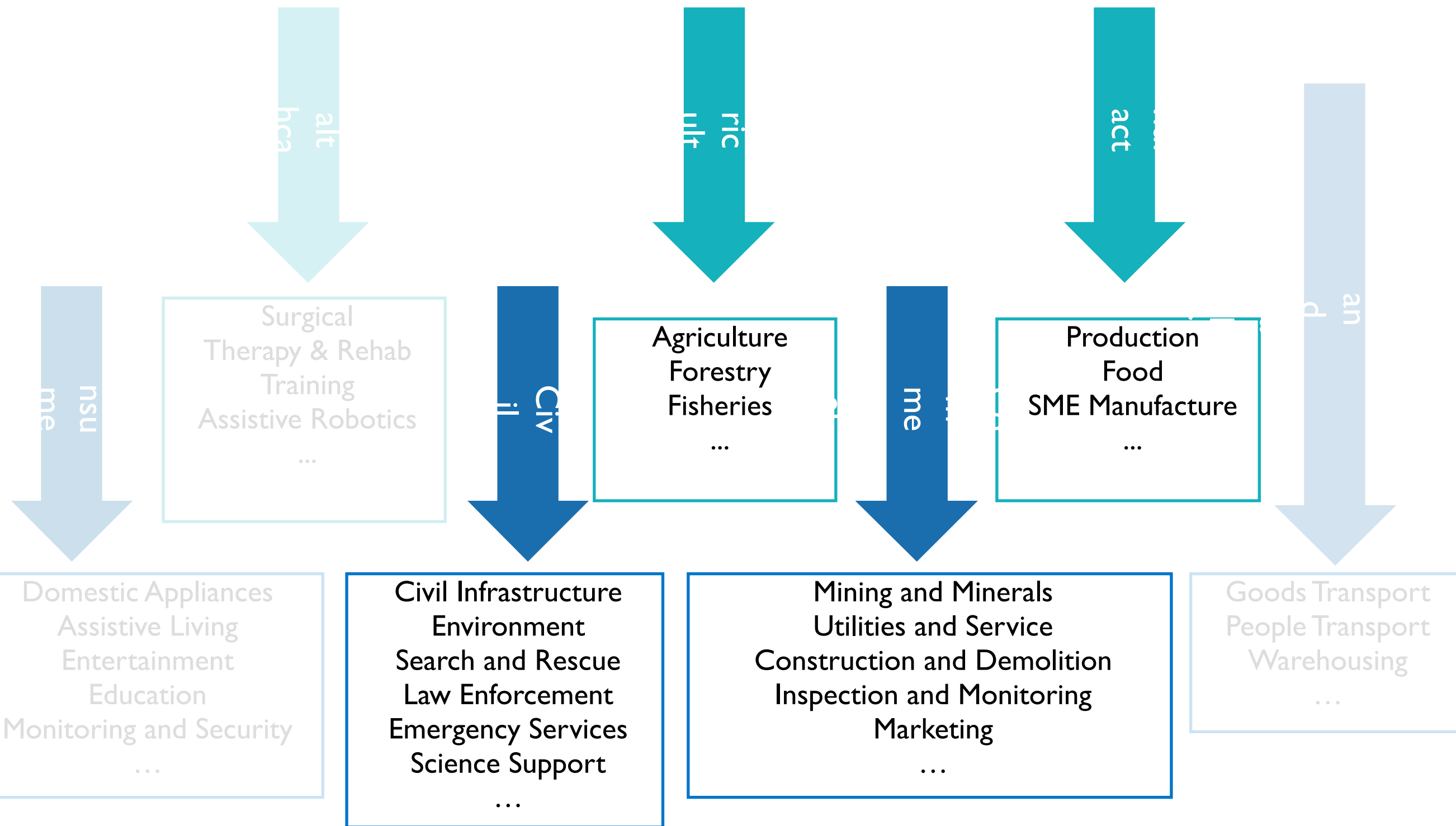
Market domains vs. robot markets



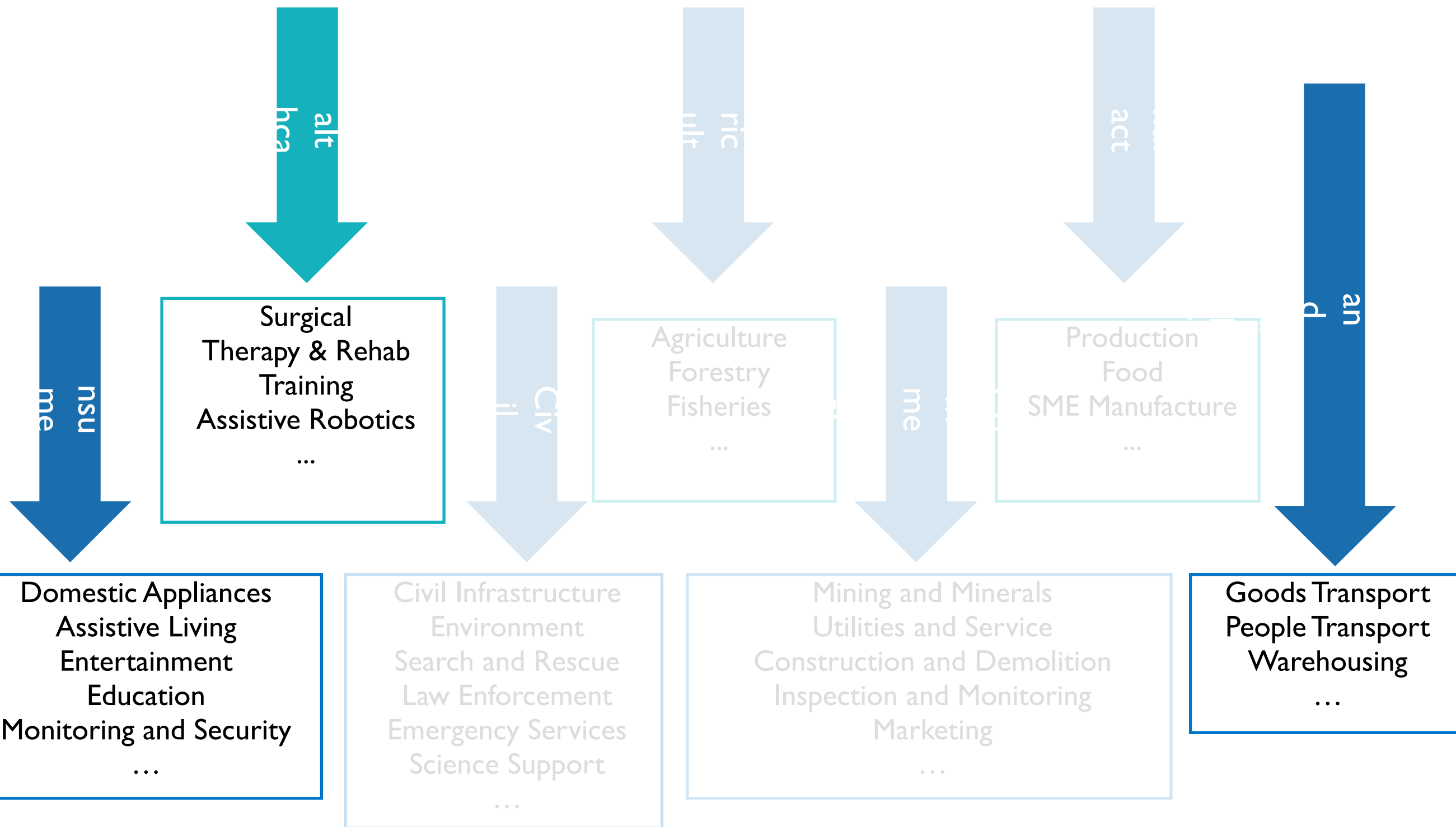
Domains



Domains in Call 1 (ICT23)

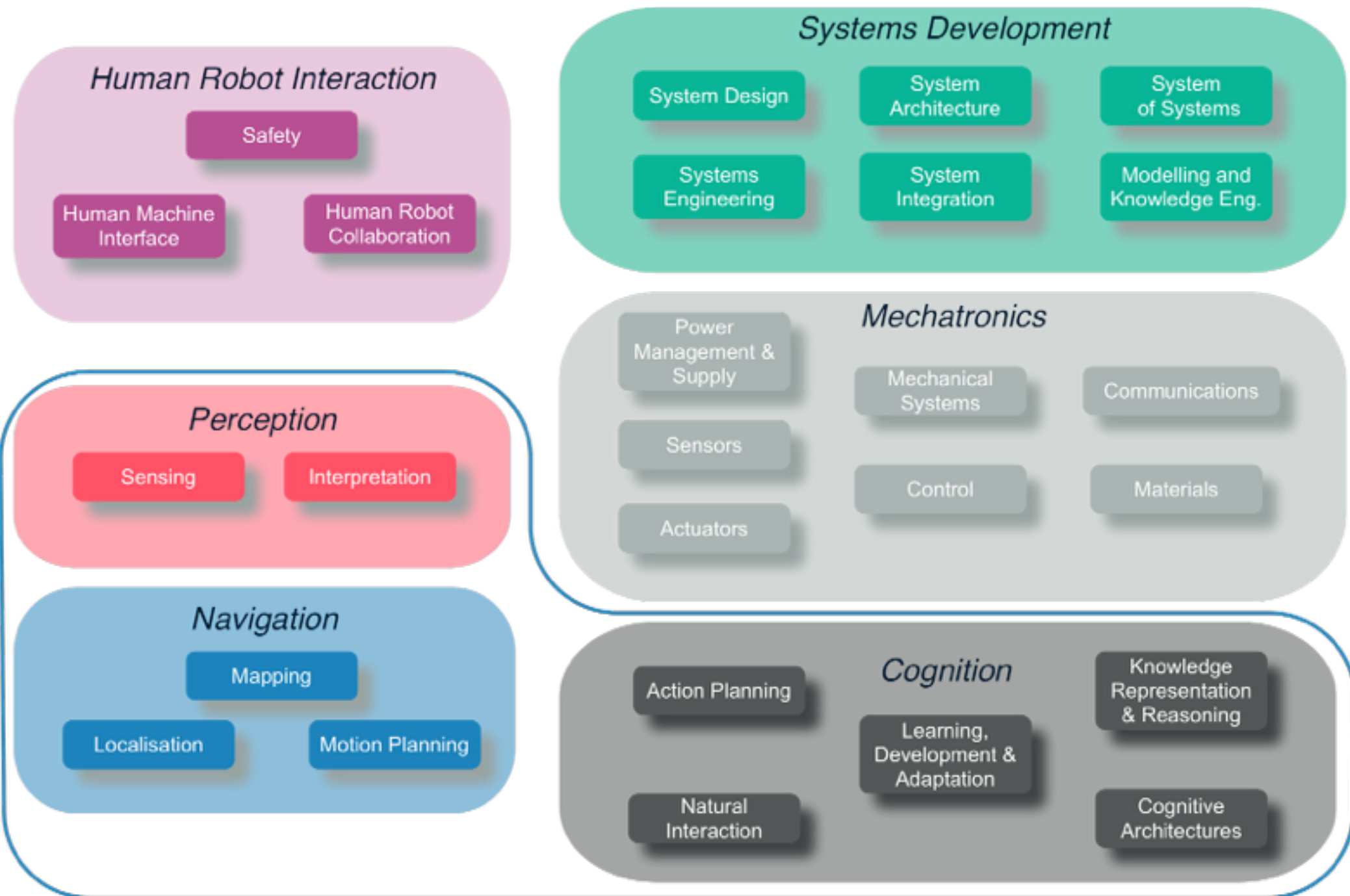


Domains in Call 2 (ICT24)

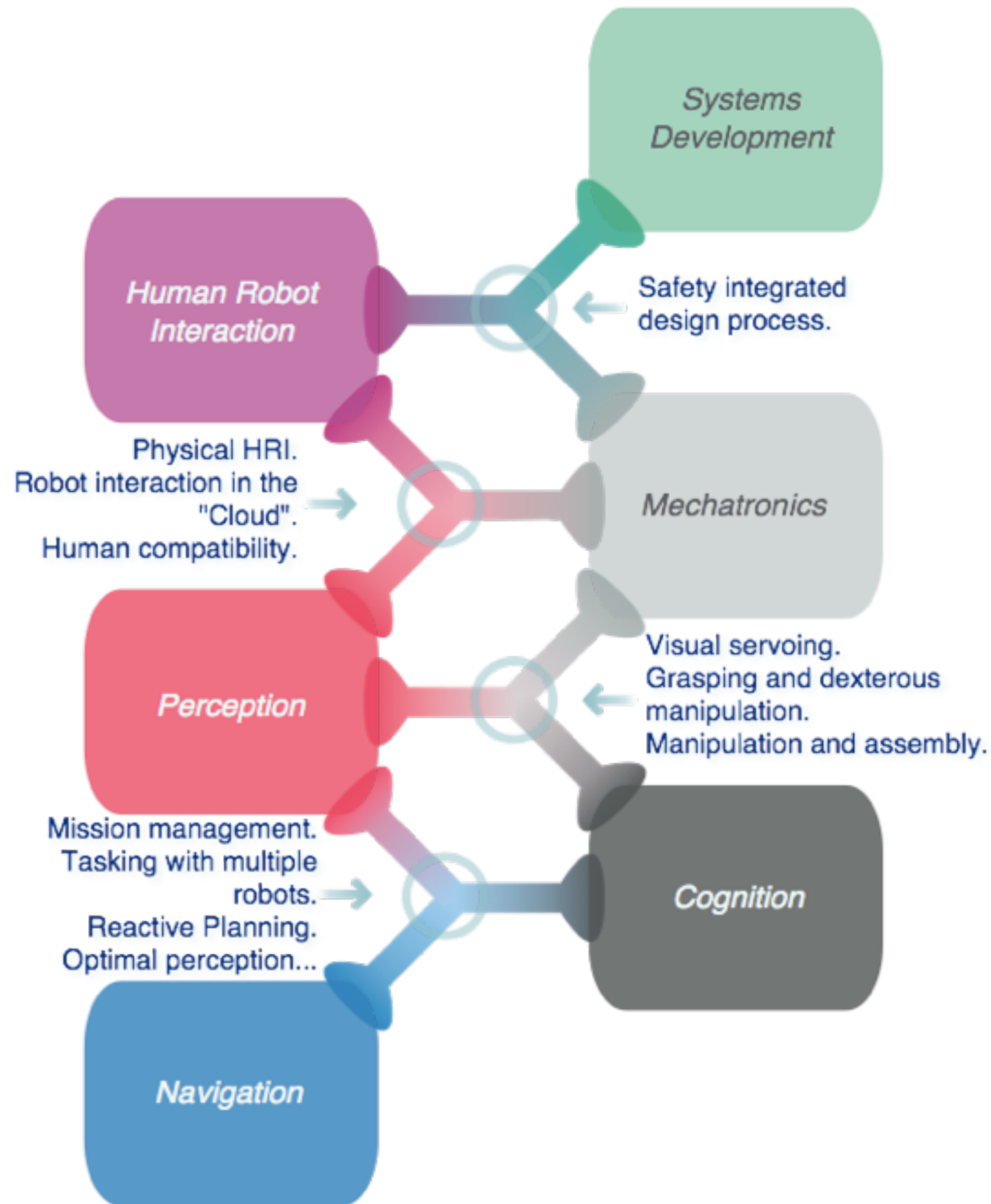


TECHNOLOGIES

Technology Clusters



TECHNOLOGY COMBINATIONS



The MAR Structure

Domains



Set

Requirements

Drive

Capability

Limits



Provide

Technologies

Purpose of the MAR

- The MAR scopes R&D&I activity within the PPP.
- H2020 is closer to market and roadmap driven.
- Therefore:
 - Need to be able to find “paths” linking technologies to applications.
 - to identify the impact of R&D&I actions.
 - Without defining the individual applications
 - their solutions.
 - or their implementations.

Domains

Requirements

Capability

Technologies

Domains



Requirements

System Abilities

Capability



Technologies

Understanding System Abilities

Domains



Requirements

System Abilities

Capability

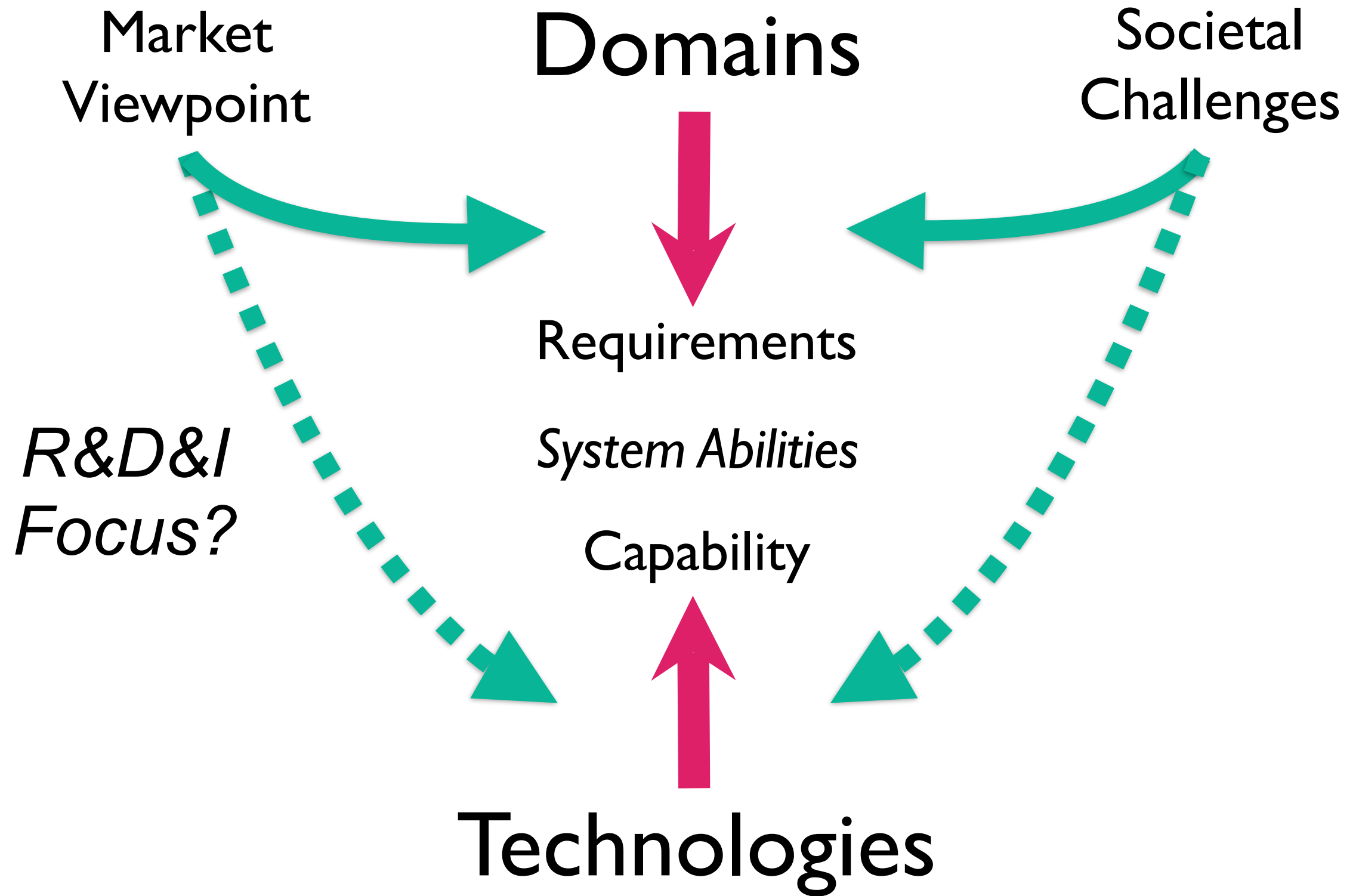


Technologies

Configurability
Adaptability
Dependability

Manipulation Ability
Motion Ability
Interaction Ability

Perception Ability
Decisional Autonomy
Cognitive Ability



From a Market Domain Perspective (Top down)

- Technical advances enable applications and markets.
 - BUT, it is difficult to identify exactly which technologies will enable an application.
 - Different combinations may work equally well
 - Or the key technology may not yet exist.
- It is easier to identify the relationship between application requirement and System Ability.
 - Makes specification “technology independent”
 - Allows for future novel and disruptive technical steps.

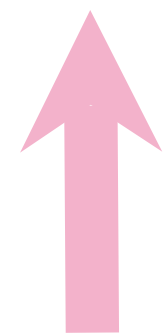
Domains



Requirements

System Abilities

Capability



Technologies

Domains



Requirements

System Abilities

Capability



Technologies

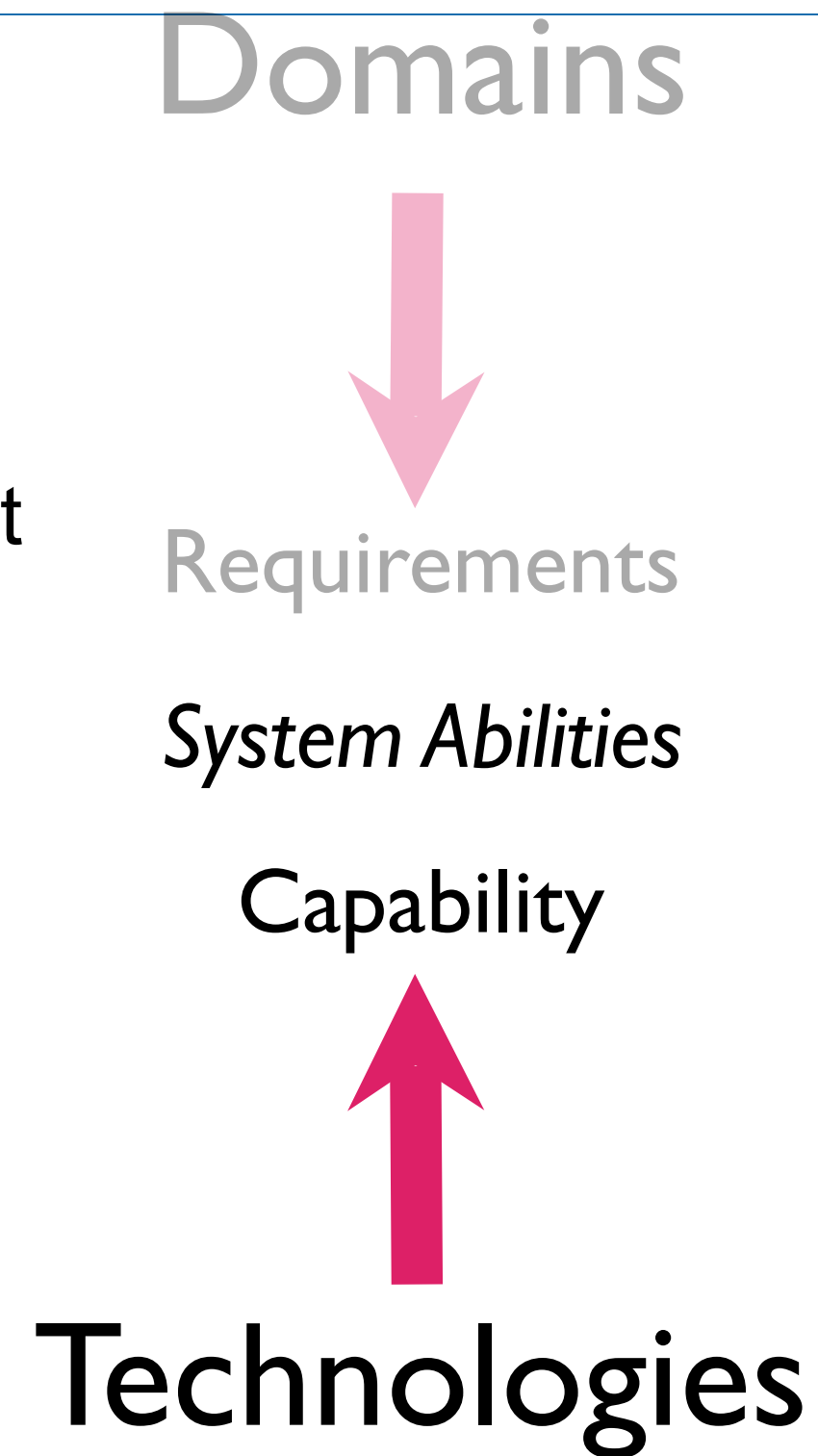
*Where is the
Impact?*

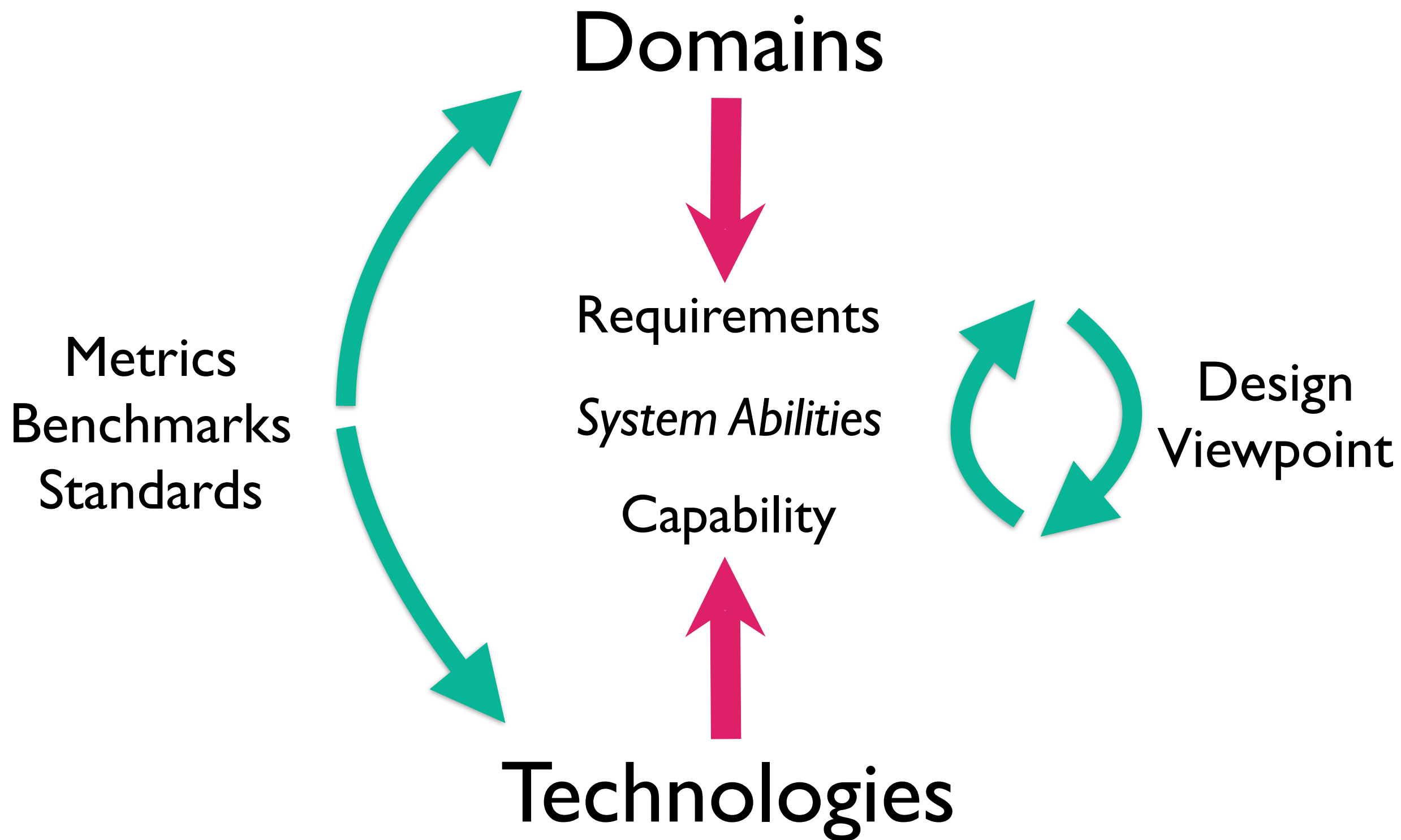


Technology
Viewpoint

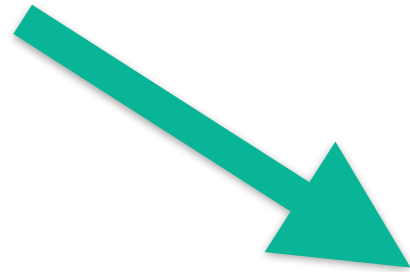
From a Technology Viewpoint (Bottom Up)

- It can be difficult to see how a technical advances impact on a market.
 - It may impact on many markets, unequally.
 - It may enable a market that doesn't yet exist or it may create a disruption (chaotic step) that is difficult to predict.
- By connecting technologies to System Abilities it is possible to see:
 - the impact of a a technical advance
 - in a domain independent way

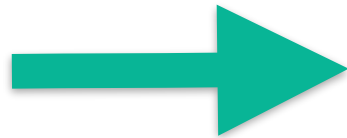




Market
Viewpoint



Metrics
Benchmarks
Standards



Technology
Viewpoint



Domains



Requirements

System Abilities

Capability

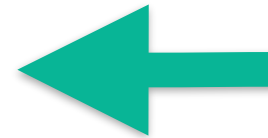


Technologies

Societal
Challenges

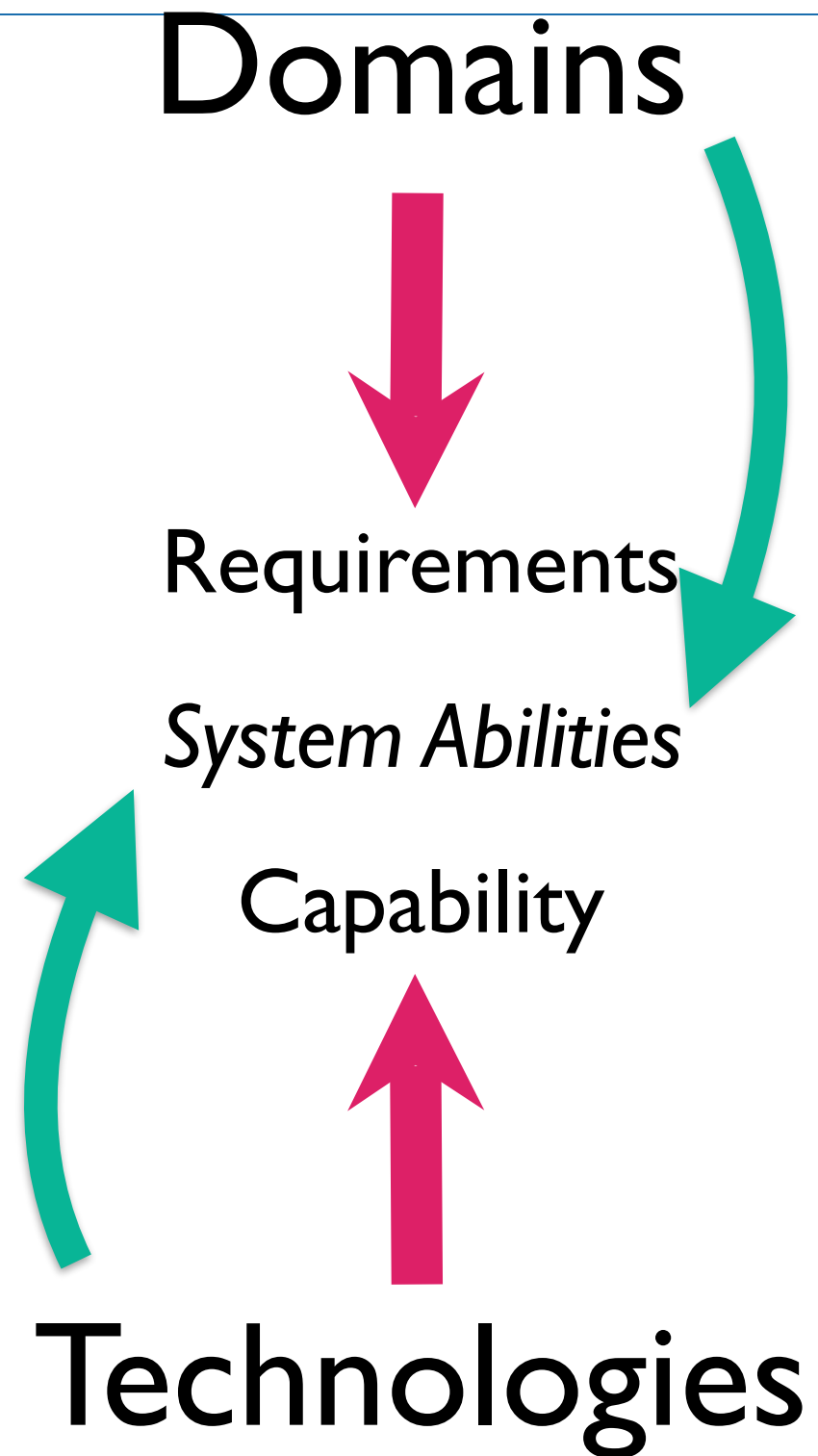


Design
Viewpoint

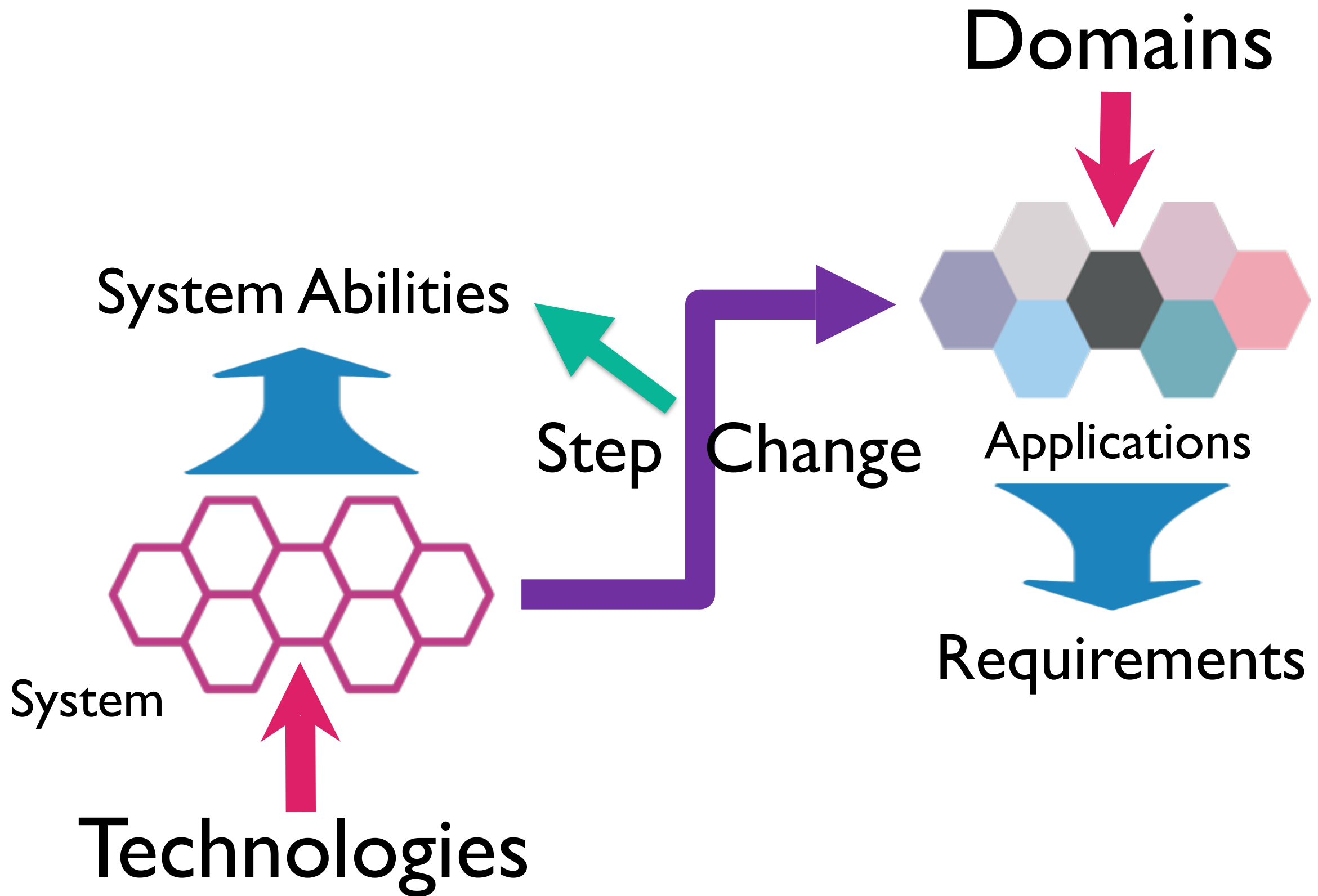


System Abilities

- A domain and technology independent way to characterise requirements and capability using the same terminology.
- By creating links between
 - application requirements and ability levels
 - technologies and ability levels
- Creates a rich set of links between Domains and Technologies
 - Without the need to define individual applications or implementations.



Advancing Technology: Step Changes



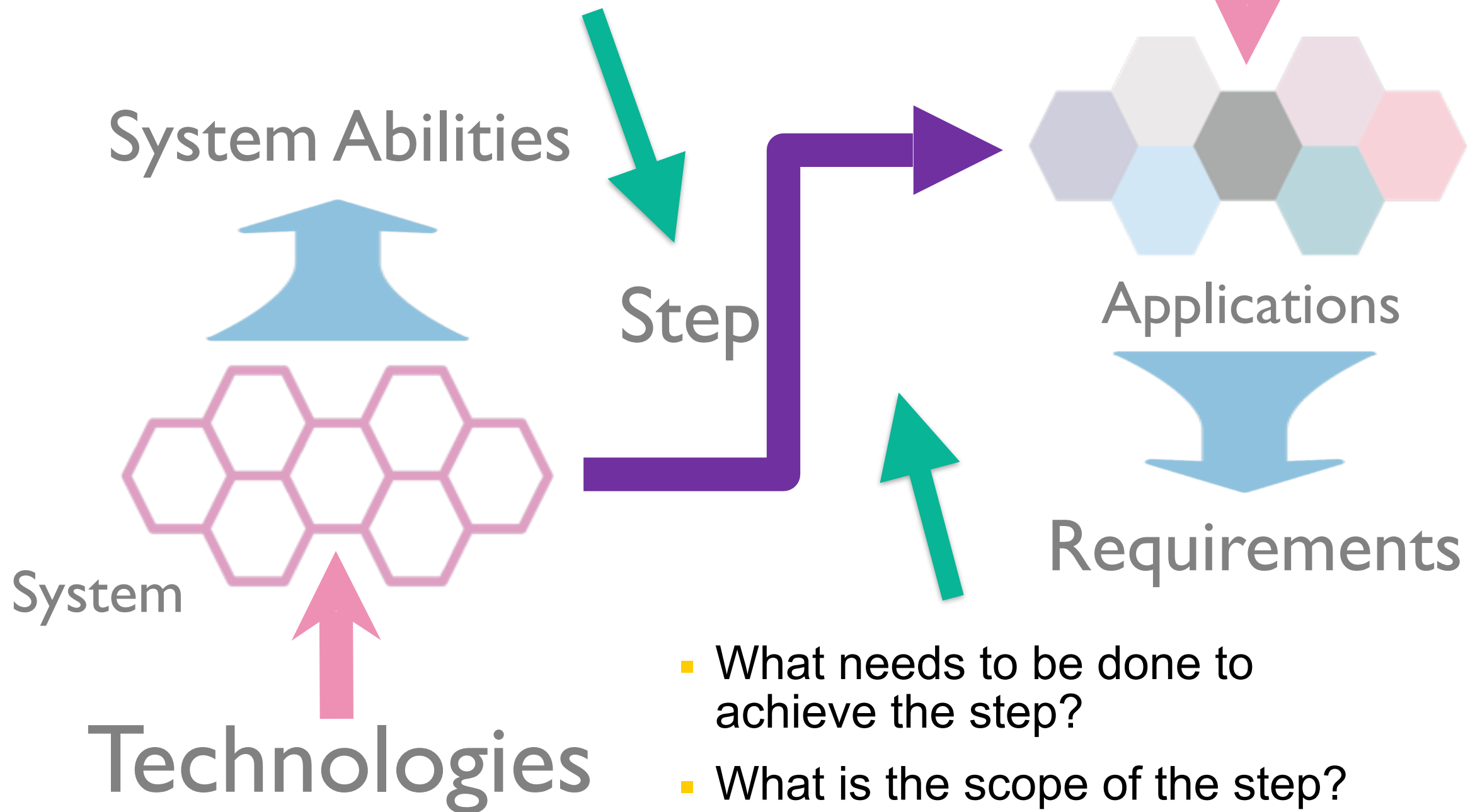
What is a Step Change?

- It is important to define what a “Step Change” is.
- It is **not** incremental improvement.
- A “Step Change” is a significant improvement.
- It enables new market opportunities.

Proposed Step Change Definition

- A Step Change is:
 - A multiplicative improvement. (x2 x5 x10)
 - cost reduction
 - parameter improvement
 - reduction in resource requirement
 - Or categorical step in capability
 - Moving from procedural to declarative controller
 - Specification developed by reasoning rather than hand construction
 - From rigid robots to joint compliant robots to segment compliant robots
 - Multi-scale integration of perception and control of base, arm, hand, finger systems.

- What step changes are needed to enable an application?
- How will the end user benefit?

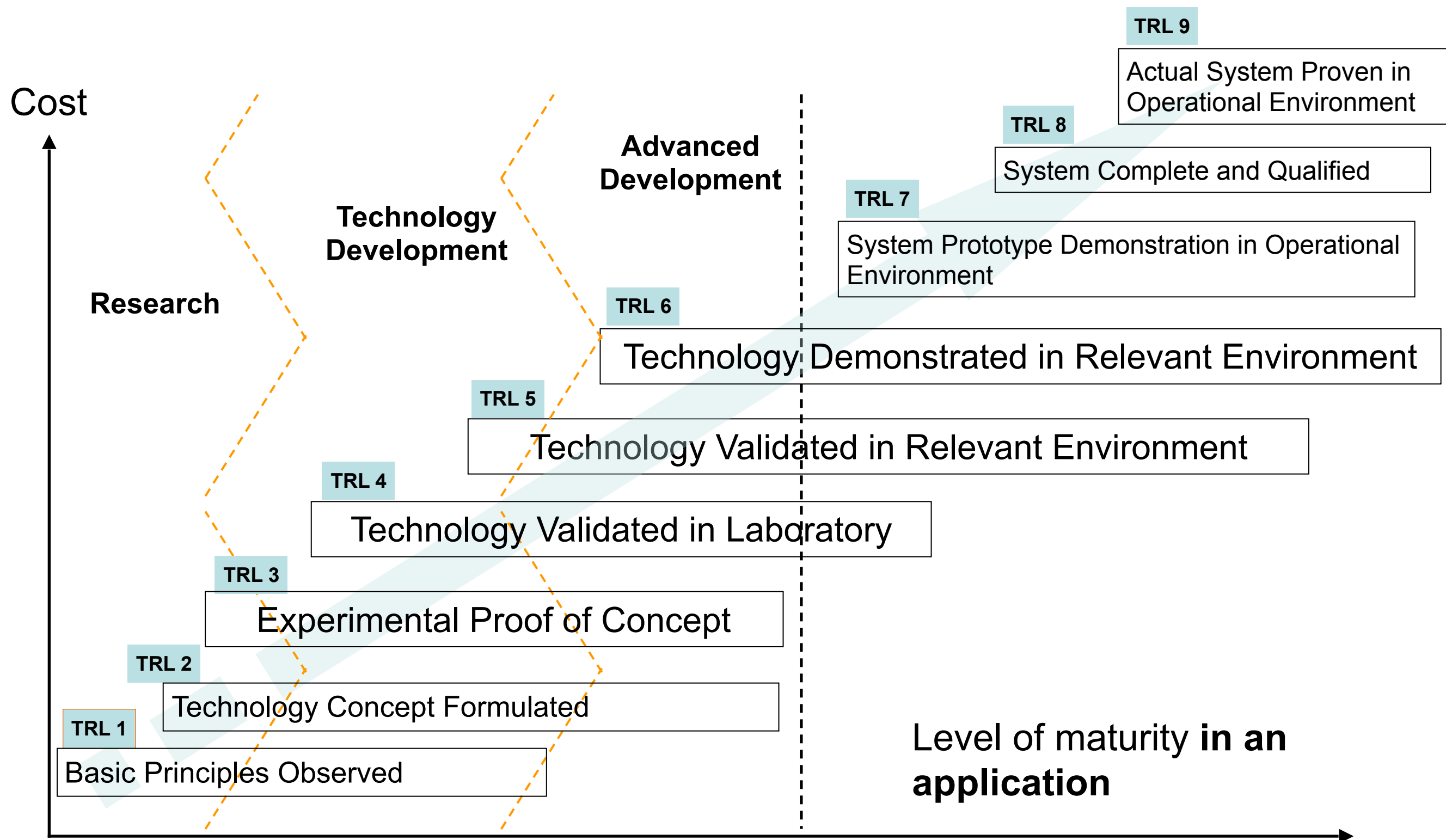


Technology Step Change Impact

- Identifying Technology Step Changes:
 - Defines the state of the art.
 - Identify difficult steps
 - Technical barriers
- It focuses R&D&I activity
- Step Changes are the “Dynamics” of the MAR.
- They are the disruptive drivers of change.

TRL Levels and how they work

Technology Readiness Levels (TRL)



Summarising TRL Usage

- TRLs plot the progression to market of:
 - A system
 - A sub-system
 - A technology applied to an application
- TRLs refer to a specific implementation and application
 - Not to a generic technology or method.
- The TRL of a whole system is typically the lowest TRL of the component parts.
- The cost of raising TRL levels is significantly greater for higher TRLs
 - Typically exponential.
- R&I actions typically concerned with TRL 3 to 6.
 - Use Case actions with TRL 5 to 7

TRLs are different from Step Changes

- TRL Steps are not the same as Technology Step Changes
- A Technology Step Change may only have been achieved at TRL 1.
 - Further R&D&I action is needed to bring it to market
- A Technology Step is independent of the techniques used to implement it.
 - The techniques may need to be refined before it can impact on applications.
 - TRL increments are about the journey to market.

Future work...

Future Work

- Glossy brochure
- MAR Development
- Closing the Loop
 - Post Call Data gathering
- Strategy and Orientation
 - Orientation development
 - Call 3 & 4 Text
 - Strategic priorities for Call 3 & 4.

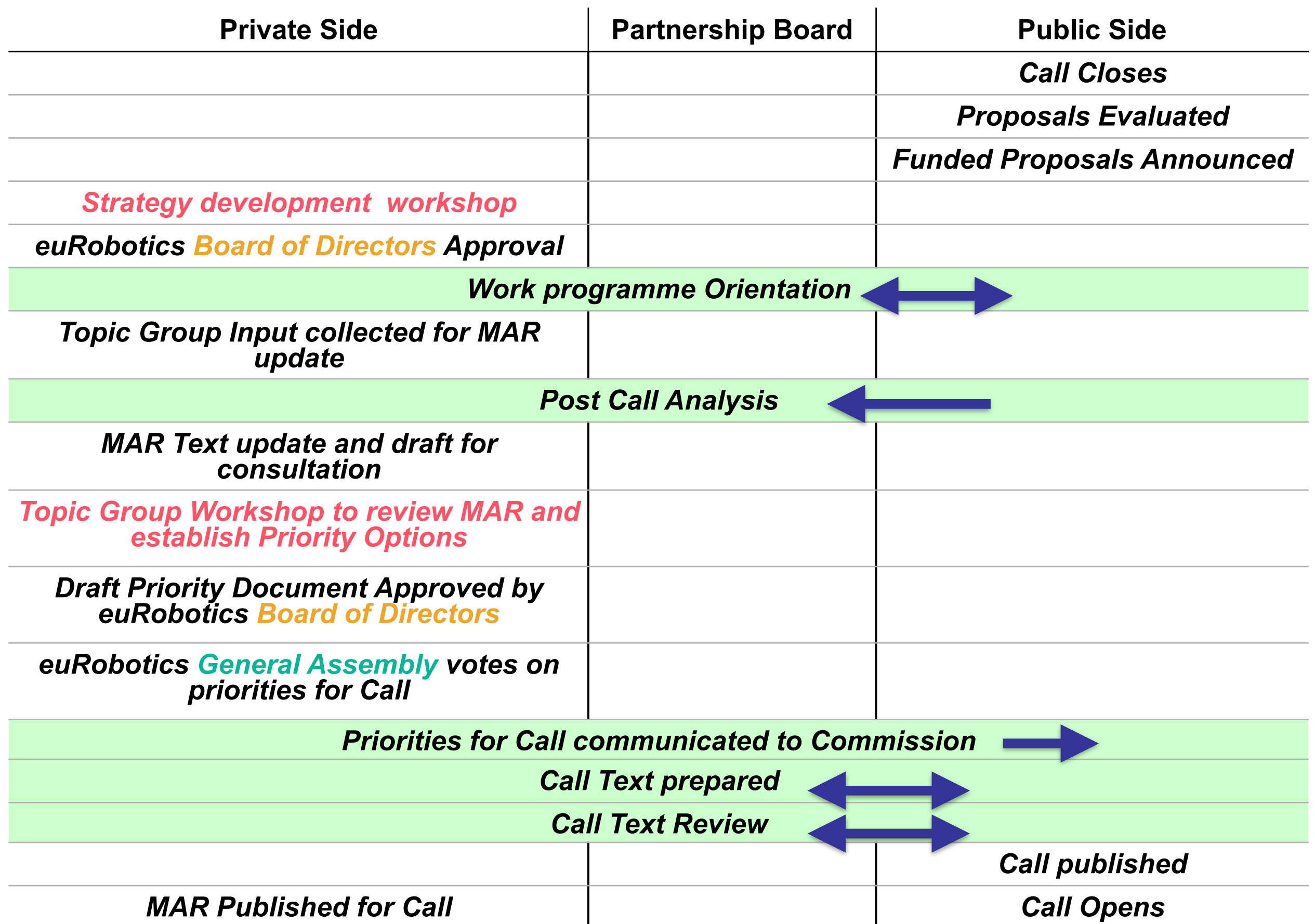
Glossy Brochure

- Short version of SRA
 - Reduced technical content
 - Target 30-40 pages (like SRA2009)
 - Professional graphics and layout
 - Planned for July 2015

MAR Development Cycle

MAR Development Cycle

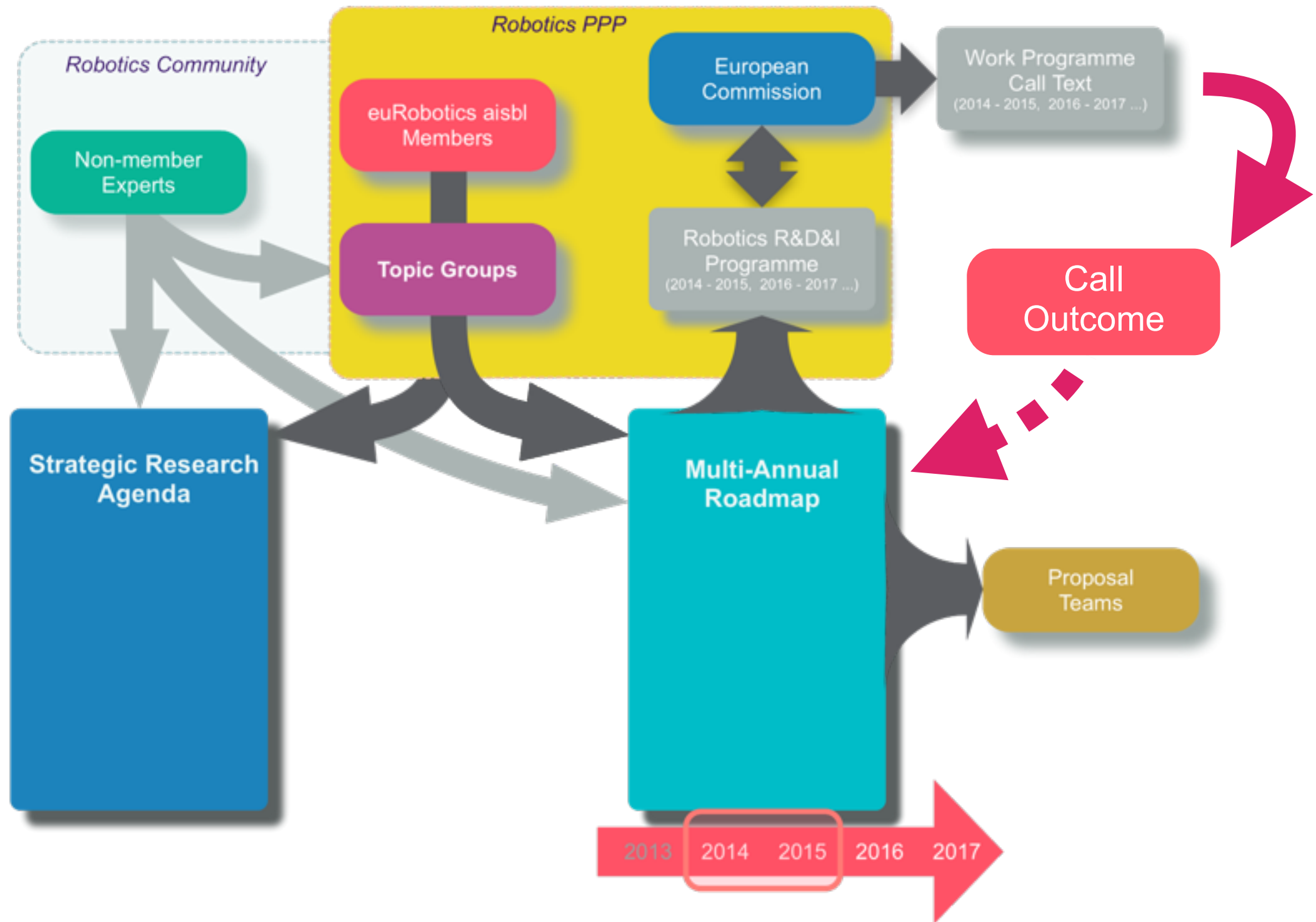
- Need to:
 - Map out the cycle.
 - Establish process validity.



Points of synchronisation

- Two separate cycles need defined synchronisation points.
 - Orientation Document.
 - Communicating Call priorities to Commission.
 - Call text review
 - Call outcome statistics.
- Need to:
 - synchronise with public side deadlines.
 - understand information flow at each synchronisation

Closing the Loop: MAR Impact Assessment.



Collecting Proposal Data

- Measuring the outcome of the Call is a critical part of PPP KPIs.
- It helps trace the impact of the SRA/MAR and Call text
- Public side of the PPP holds the data.

What data is needed?

- Main focus of the proposal:
 - Domain
 - Technologies
 - System Abilities
- Main impact of the proposal:
 - Specific Area of application
 - Development of a technology
 - Development of system ability
- It is important to collect this data for all proposals.
 - Mechanism to be agreed.
 - e.g. Proposers complete tick box form...

Strategy and Orientation

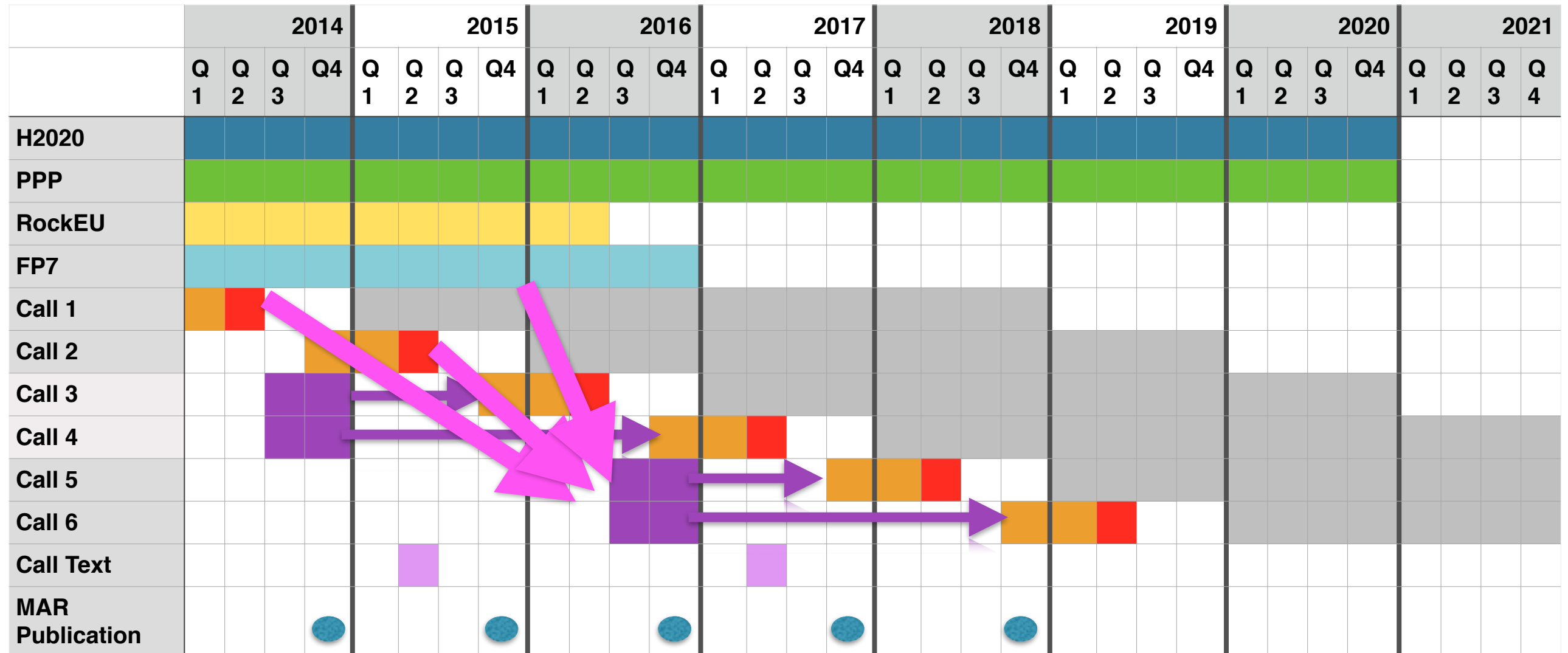
Call 3&4 Orientation Process

- What is the work programme Orientation?
 - Formal document internal to Commission.
 - Approved by national bodies.
 - Sets strategic direction for Call.
 - Call text must flow from Orientation document

Strategic Orientation

- Need to understand scope
 - What needs to be said.
- Need to establish balance of detail.
 - What should be said in the Orientation document
 - What should be said to the Call text
- Time line for Orientation...

H2020 Timeline



Current Tasks

	March	April	May	June	July	August	September	October	November	December
Call 1			Evaluation							
Call 2							Published		Open	
MAR Call 2	ERF		TG Review				Published			
Call 3 & 4 Strategy	Planning		Workshop	BoD	1st Draft		Final Draft	Published		

Call 3&4 Strategic Orientation Timeline

- Topic Group Coordinator Workshop (Feb)
 - Communication of process time scale and update cycle
- ERF (March)
 - MAR development and community awareness.
- Strategy workshop (May)
 - Who is involved?
- BoD Approval of initial strategy (June)
- Initial communication to Commission (July).
- Further refinement...
- Final Strategic Orientation Document (November)
- Call 3&4 Workprogramme document (March '15 TBD)

Current work...

Current work

- Creating and running Topic Groups
- Developing the MAR
 - MAR Call 2 development
 - SRA MAR overview document

Formal Creation of Topic Groups

- Terms of reference
 - Set out what Topic Groups should do.
- Topic Groups are about community building
 - They channel and focus activity
- Creation of Topic Group Technical Advisory Board.
 - TG-TAB
- Expected approval of first 26 Topic Groups at euRobotics General Assembly (Tomorrow).
- euRobotics Directors as Mentors.

The Role of Topic Groups

- Topic groups provide the main input to the MAR.
 - They link the community to the MAR
- Topic Groups reflect all aspects of the community and market.
- You are encouraged:
 - To consider creating new Topic Groups where you can identify gaps.
 - To take an active role in topic groups to ensure the MAR represents the whole European robotics community.

Topic Group Wikis

- Each Topic Group will be offered a wiki.
- These will be linked to the main Wiki.
- Membership can be controlled by the TG leader.
 - Open to anyone
- Topic Groups can use this space to develop their own material for integration into the MAR.

MAR Call 2 Update

- Add missing domain descriptions:
 - Healthcare
 - Logistics and Transport
 - Consumer
- Support for other call elements?
 - PcPs in healthcare
 - Call 1 vs Call 2 comparison document...

MAR Overview Document

- The MAR is a complex document.
 - 200 pages of technical detail
 - contains both a top down and bottom viewpoint
 - It does not concentrate on techniques and methods
 - Designed to support the calls
 - It should be useful across Horizon 2020
- Guidance needed on how to read SRA and MAR.
 - Commission may use this document during the evaluation process.

ERF Workshops

ERF Workshops

- Today: 16:00 to 18:30; Here.
- Attendance:
 - All Topic Groups working on MAR input.
 - Detailed review of Ability Levels
 - Detailed review of Step Changes
 - Creating cross links in the MAR.
 - The use of TRL levels.
- Friday: 08:30 to 10:30; Here.
 - Strategic Review
 - Non-Technical input to the MAR

Concluding...

Concluding

- It has been a successful year.
- Topic Groups are an essential part of what euRobotics and the PPP do.
- The MAR will be updated every Call Cycle
- It can only reflect the community if ***you*** get involved.