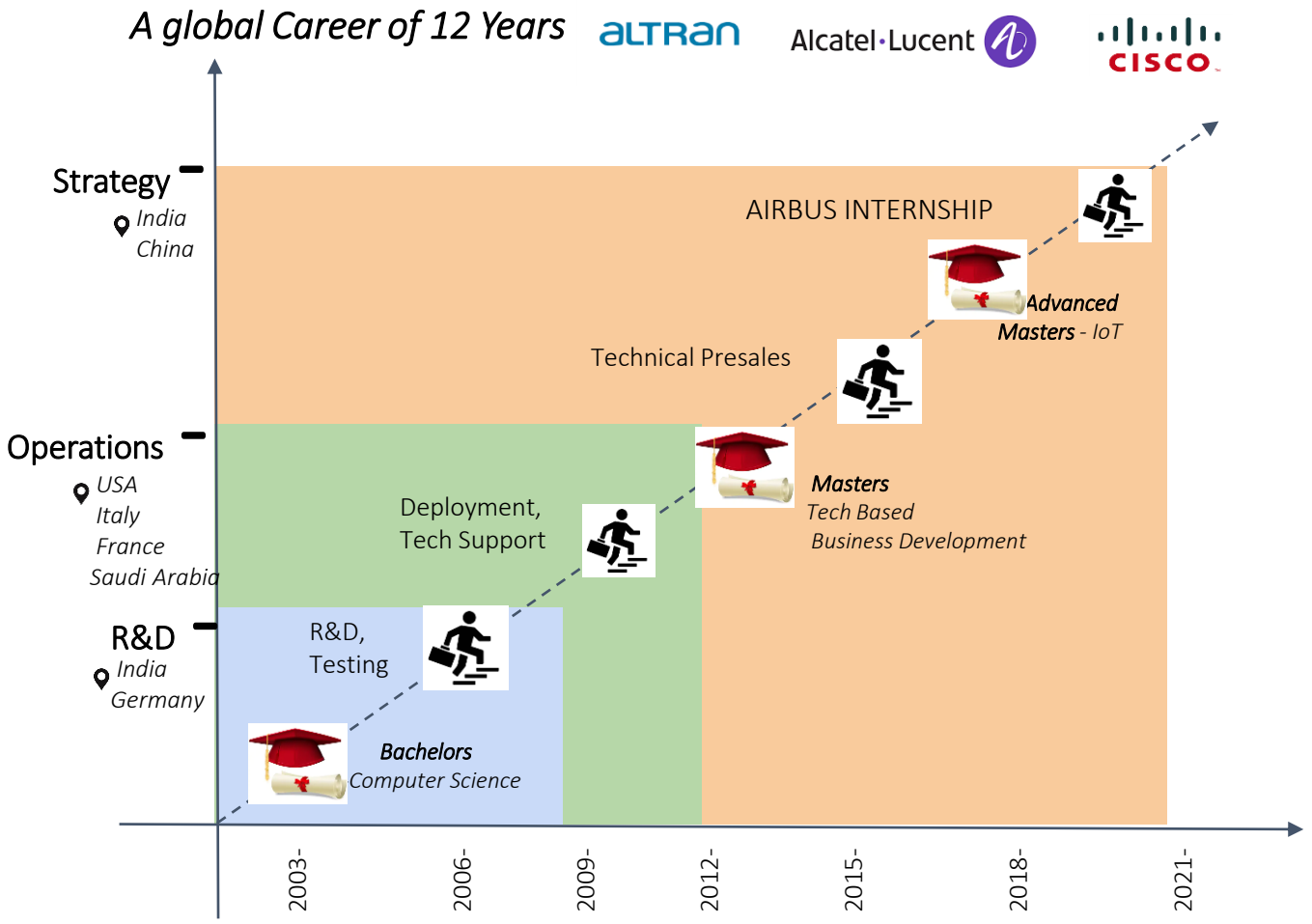
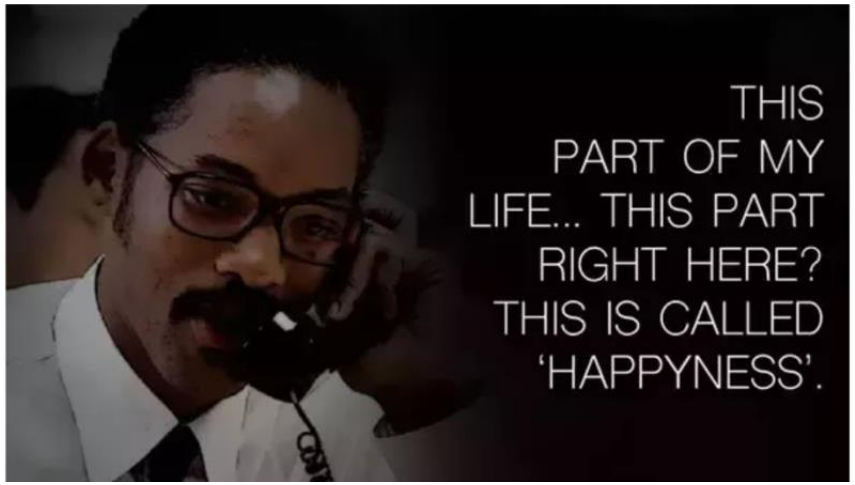
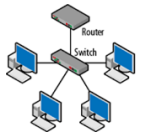
MOHAN PRABHU SELVARAJ

An Advanced Master Intern from **INSA**, Toulouse



Chris Gardner





Telecom Skills

IP/Optical Networks, Metro Ethernet, 3G/4G Backhaul, SDN/NFV, OSS, Network Management

IoT Skills

NB-IoT, LoRA, Embedded software, Sensors, Cloud & Analytics, AGILE

Strategy Skills

Bid Proposal, Tender compliances, Competition analysis, SWOT, Technology Intelligence, Go-To-Market, Business Model Innovation

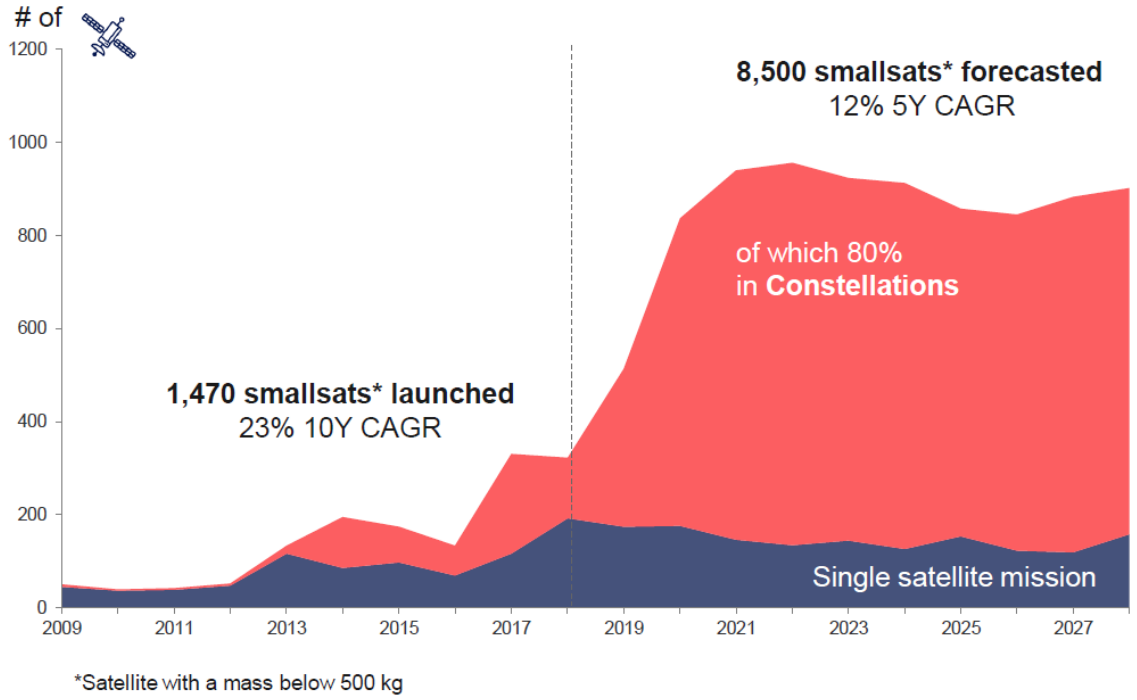
STARLINK

OneWeb

New Space Ventures

A Market & Tech Trend Analysis

THE NEXT 10 YEARS FOR SMALLSATS



*Satellite with a mass below 500 kg

Source: Space Tech Expo 2019

4 Sections

5 min

1. Data Sources, New Space actors – Who?
2. Analysis methodology – How?

10 min

3. Market and Tech Intel – What's going on?

20 min

4. Key Inferences – Where to focus?

10 min

5. Link to 1CTY Roadmap – How we do?
6. Discussions, Q&A

Data Sources used

- Online databases/interviews/blogs
- SATCOM Journals/Newsletters
- New Space Conference proceedings – 1
- New Space Expert Panel – 2 panels studied
- New Space Startups & VC-funds – 180 Constellations scanned
- Regulatory Outcomes (WRC, 3GPP, FCC, ESA)
- SATCOM Scientific articles

For Future

- Competitor Analysis
- Supplier Analysis
- Patent Analysis

New Space Actors

CATEGORY 01

Traditional

Telesat | SES | Iridium| Inmarsat | IntelSat

CATEGORY 02

Game-Changers

SpaceX | Blue Origin | OneWeb?

CATEGORY 03

Startups

Constellation | Ground |Software| Cloud | Analytics | Launch |Manufacturing

CATEGORY 04

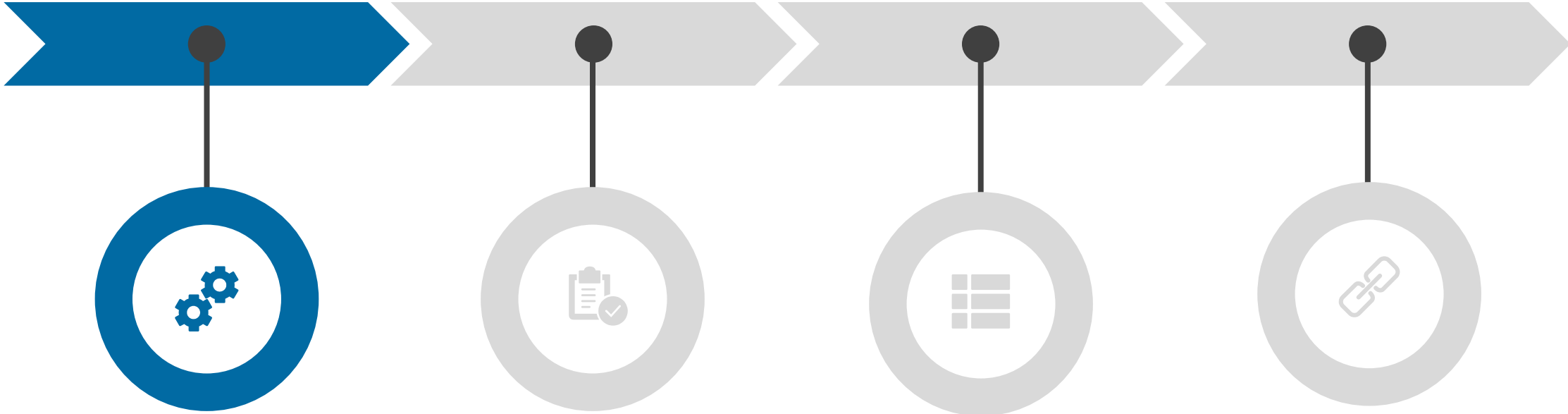
Competitors/ Suppliers/ Alliances

Thales I Cobham | Honeywell | Panasonic
IntelSat/OneWeb |
Iridium/AWS |Iridium/OneWeb

Their top Challenges

Problems	Number of SAT's, gateways, earth stations -> LARGE Life span -> SHORT, satellite size -> SMALL Ground systems (Antenna) -> NOT OPTIMAL price/performance
Complex issues	Spectrum Management & co-ordination with GEO/MEO
Work in Progress	Handover, QoS management, IP routing adaptation, Optical Inter Satellite Links, Integration into 5G and IoT/NB-IoT network
Major concerns	Debris/Space traffic/Collision management, no significant uptake in Pilot trials/contracts

SECTION-1



METHODOLOGY

2

Forecasting Methods

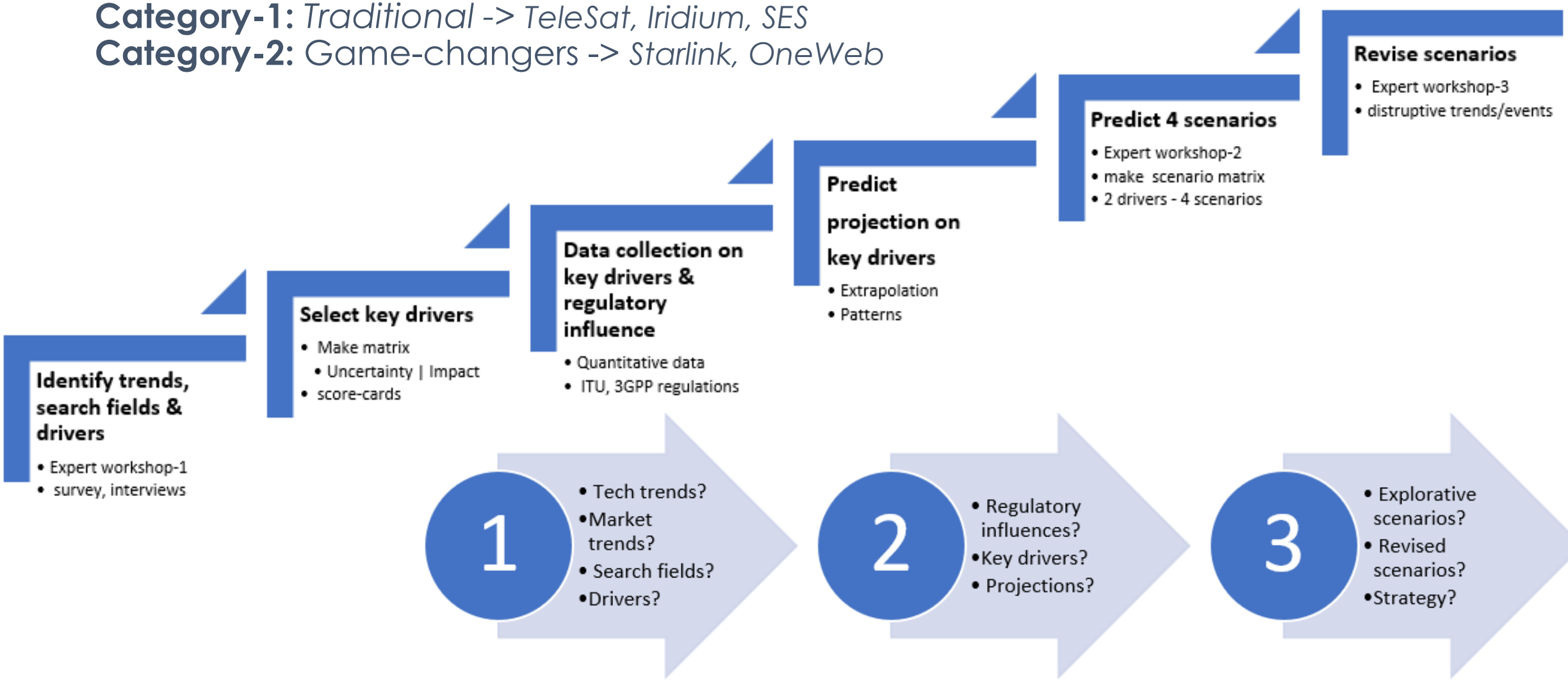
INTELLIGENCE

INFERENCES

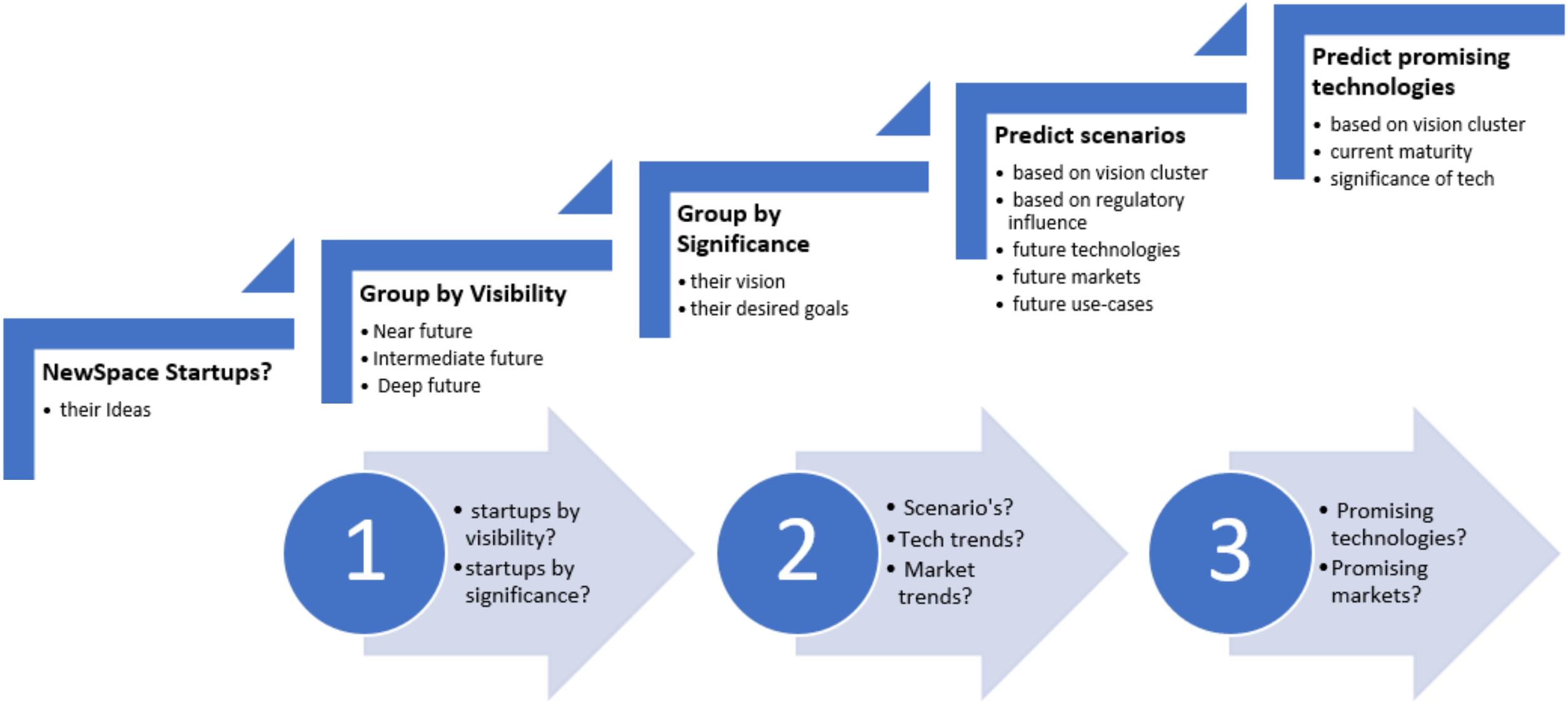
1CTY ROADMAP FOCUS

Methodology – Forecasting

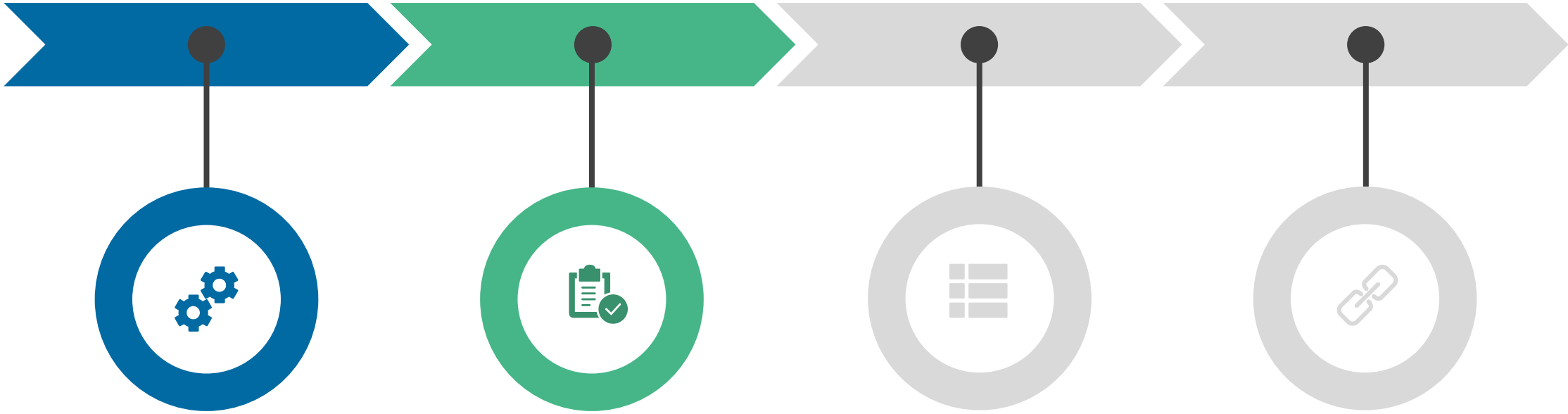
Category-1: *Traditional -> TeleSat, Iridium, SES*
Category-2: Game-changers -> *Starlink, OneWeb*



Methodology –- Forecasting | **Category-3:** Startups



SECTION-2



METHODOLOGY

2 Forecasting methods

INTELLIGENCE

4 Market Segments

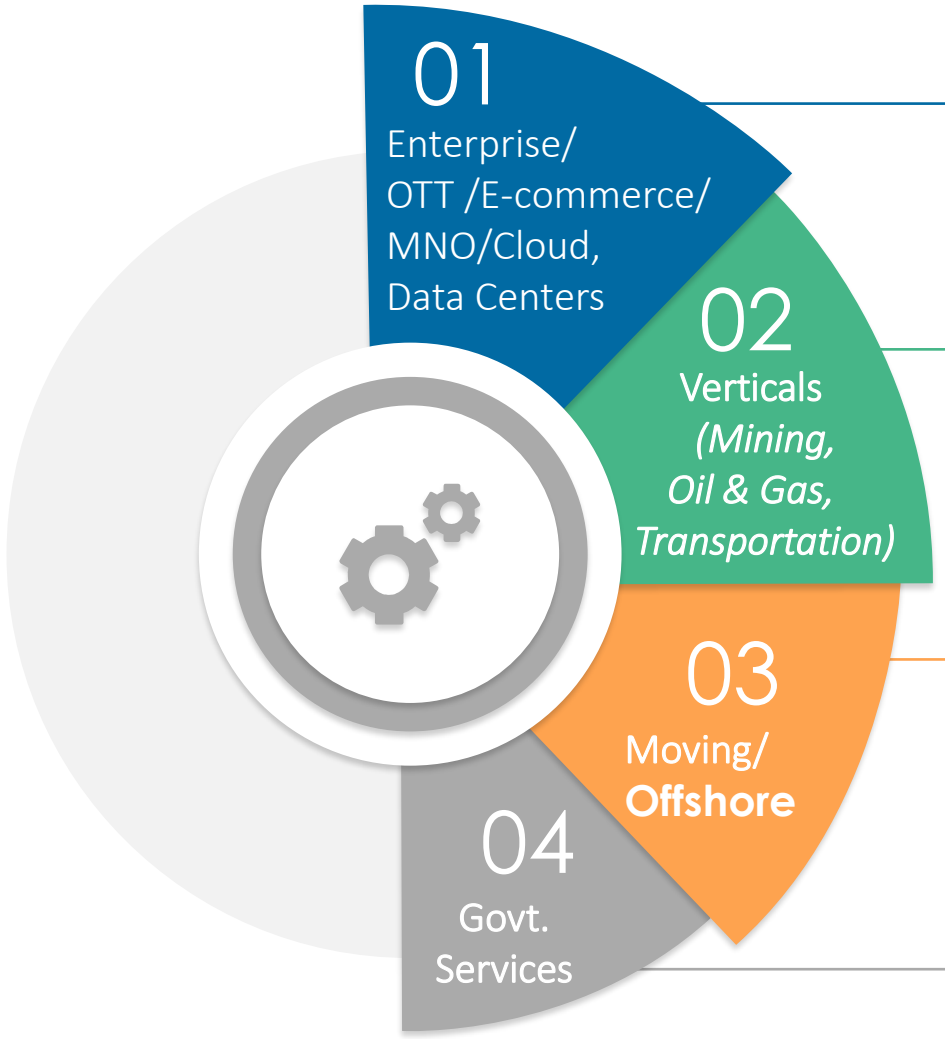
4 Tech Streams

INFERENCES

1CTY ROADMAP FOCUS

Market Intelligence

Emerging market-pull trends? Potential customers?



Consumer broadband, Mobile backhaul transport, Global Enterprise Connectivity, Substitute for submarine cable, Earth observation & GeoSpatial analytics

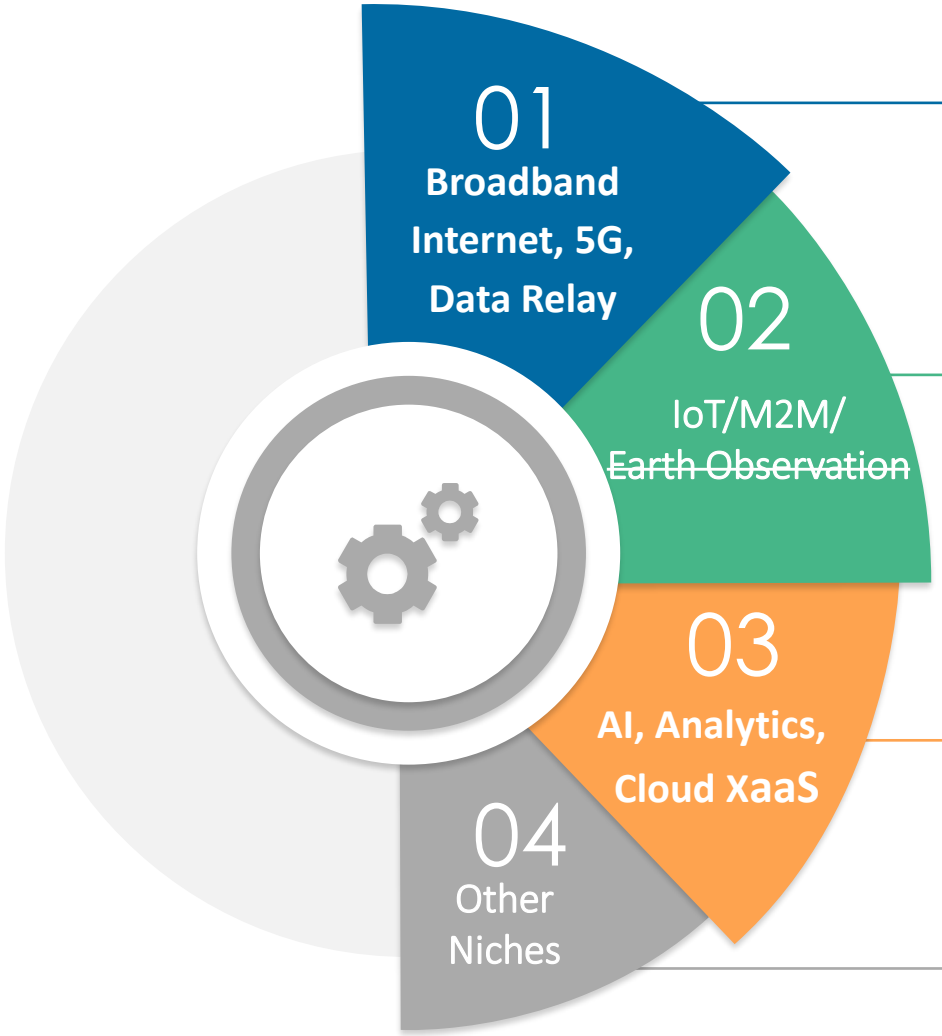
IoT monitoring/tracking & analytics, security, cloud compatibility, Earth observation & GeoSpatial analytics, Satellite imagery

Maritime cruise/commercial, Aircraft cockpit & Inflight connectivity, Trains, UAV, Drones, Earth observation missions

Digital Inclusion, Diplomatic comm, Border control & Protection, Military & Defence, Emergency services, Disaster recovery services

Technology Intelligence

Emerging tech push trends? Product functions as **Solution drivers?**



Space - Software defined Satellites, New Architectures (HTFS), In-orbit reconfigurations, Inter-Satellite Links | Ground - Agnostic ground systems, Diverse Antenna designs

Space & Ground - Dynamic Routing & resources management, QoS, MEF Switching, 5G SATCOM integration, Disruption tolerant network, Handover, Inter-Satellite Data Relay System (IDRS), SDN/NFV

IoT, M2M

SDR, ESMA, Protocols for Dynamic links & variable channel sizes, narrow band & wideband transmissions, connectivity-to-analytics, In-orbit reconfiguration, plug-n-play IoT device process

Space-to-cloud analytics in AWS, GroundStation-as-a-Service, Constellation-as-a-Service , AI Autonomy in mission control/navigation, RF Spectrum monitoring analytics

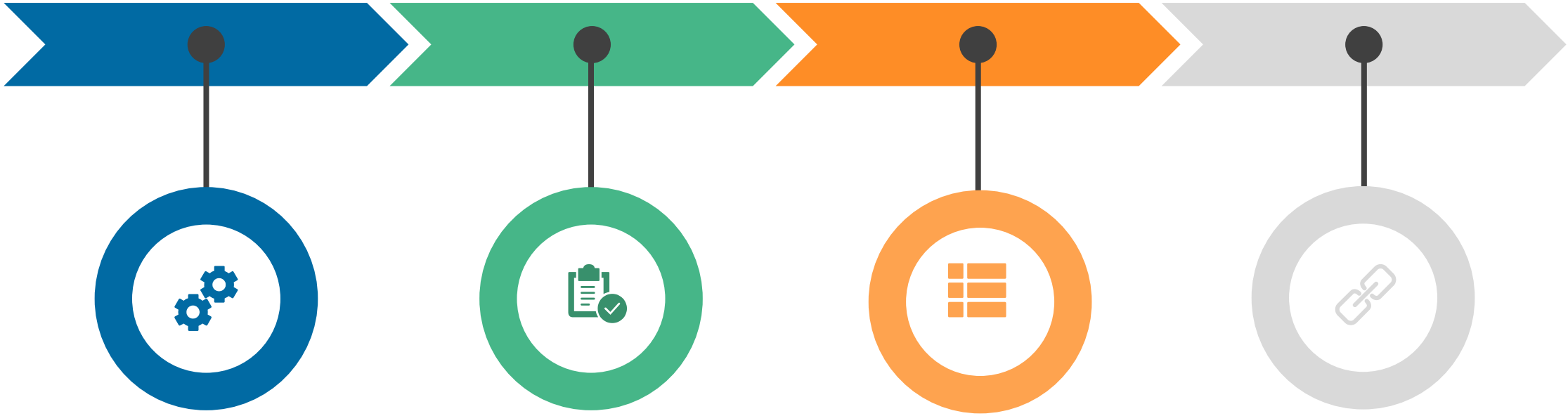
Manufacturing | Space Operations | Launch operations

AI, 3D printing, Additive manufacturing, Cyber security, Ride sharing/aggregation, Space inspection & maintenance Drones

Niche tech

Optical Wireless, Quantum key distribution, Direct-to-Phone, Optimization Satellite Swarms for SATCOM-5G integration

SECTION-3



METHODOLOGY

2 Forecasting methods

INTELLIGENCE

4 Segments

4 Streams

INFERENCES

8 Innovations

4 Opportunities

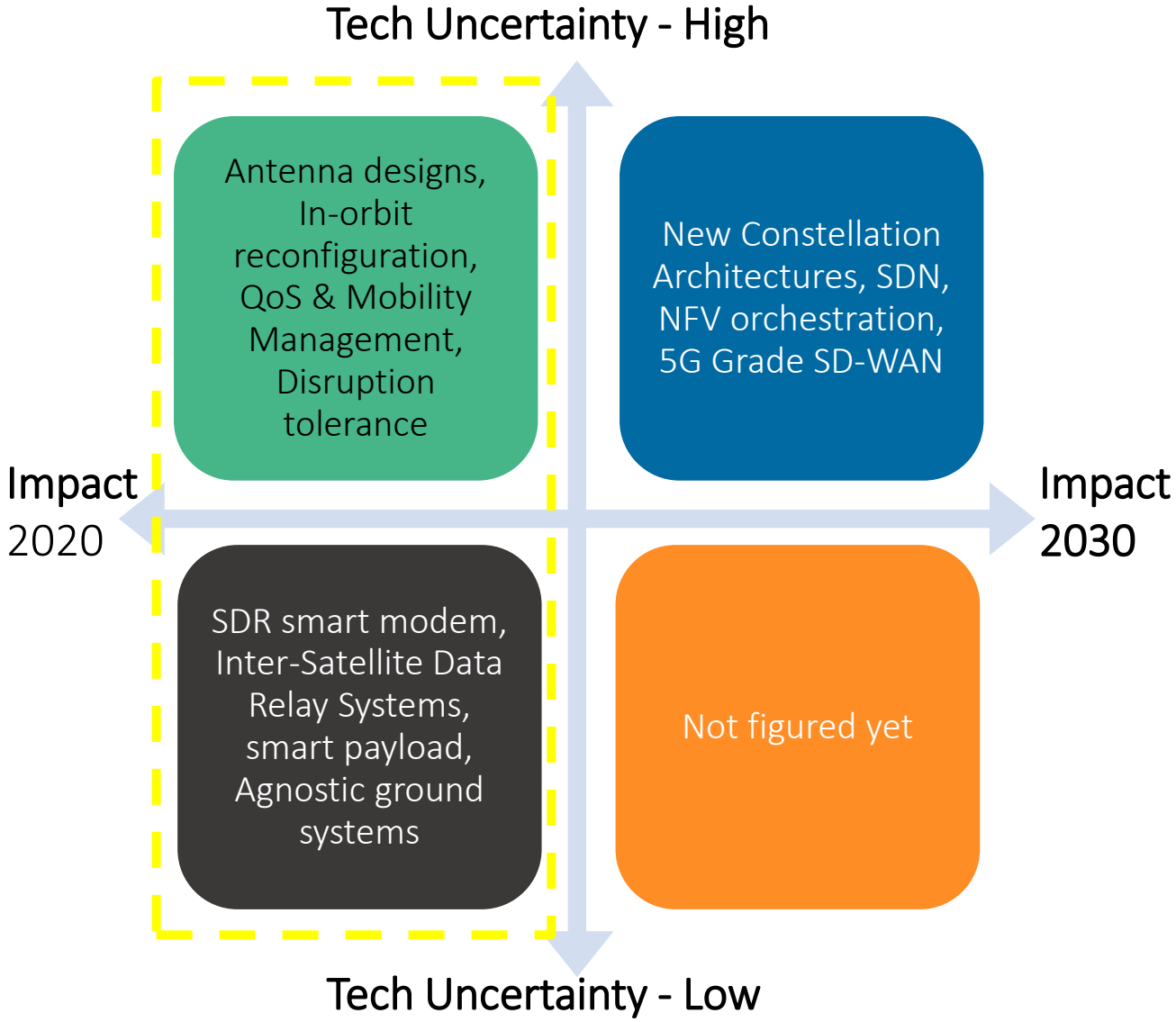
4 Threats

3 Scenarios

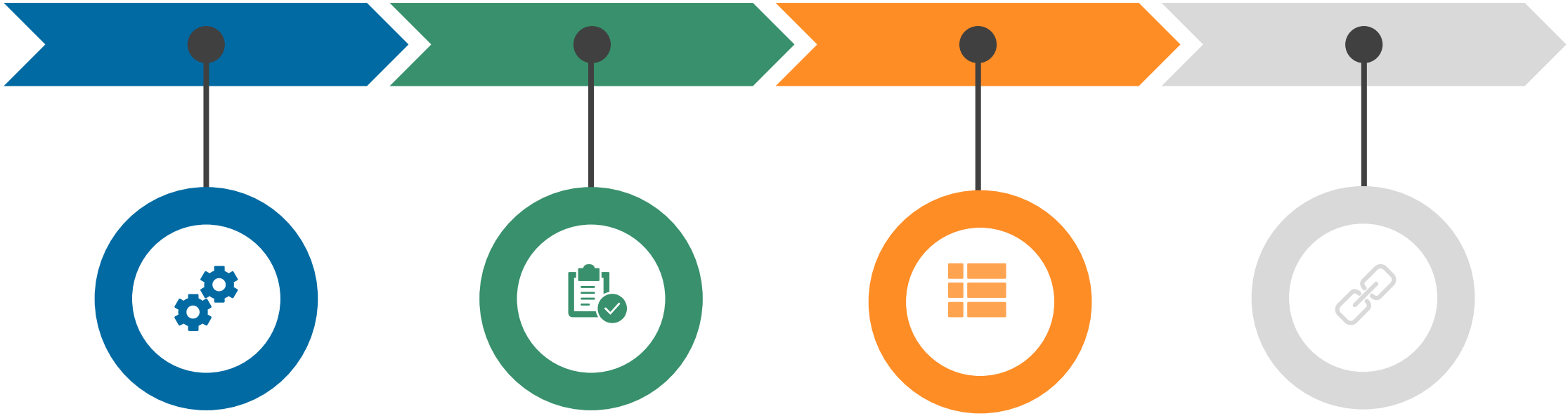
1CTY ROADMAP FOCUS

Innovations of Category-1 (Traditional) & Category-2 (Game Changers)

Key Solution drivers? Probable scenario's?



SECTION-3



METHODOLOGY

2 Forecasting methods

INTELLIGENCE

4 Segments

4 Streams

INFERENCES

3 Fields

10 Disruptions

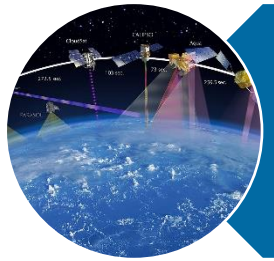
4 market attractions

6 high-potentials

1CTY ROADMAP FOCUS

Disruptions from Category-3 (StartUps as Catalysts)

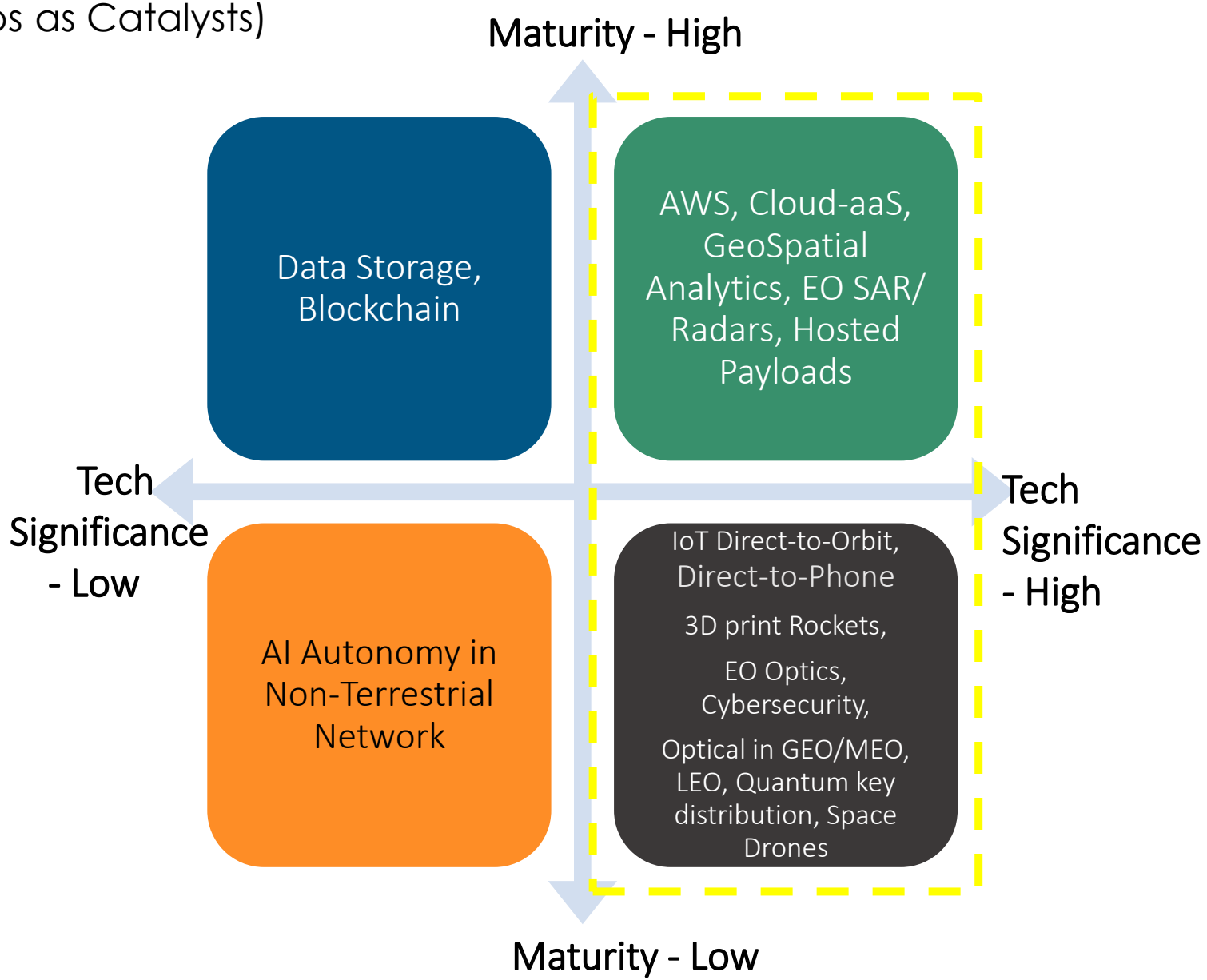
Key Disruptions identification



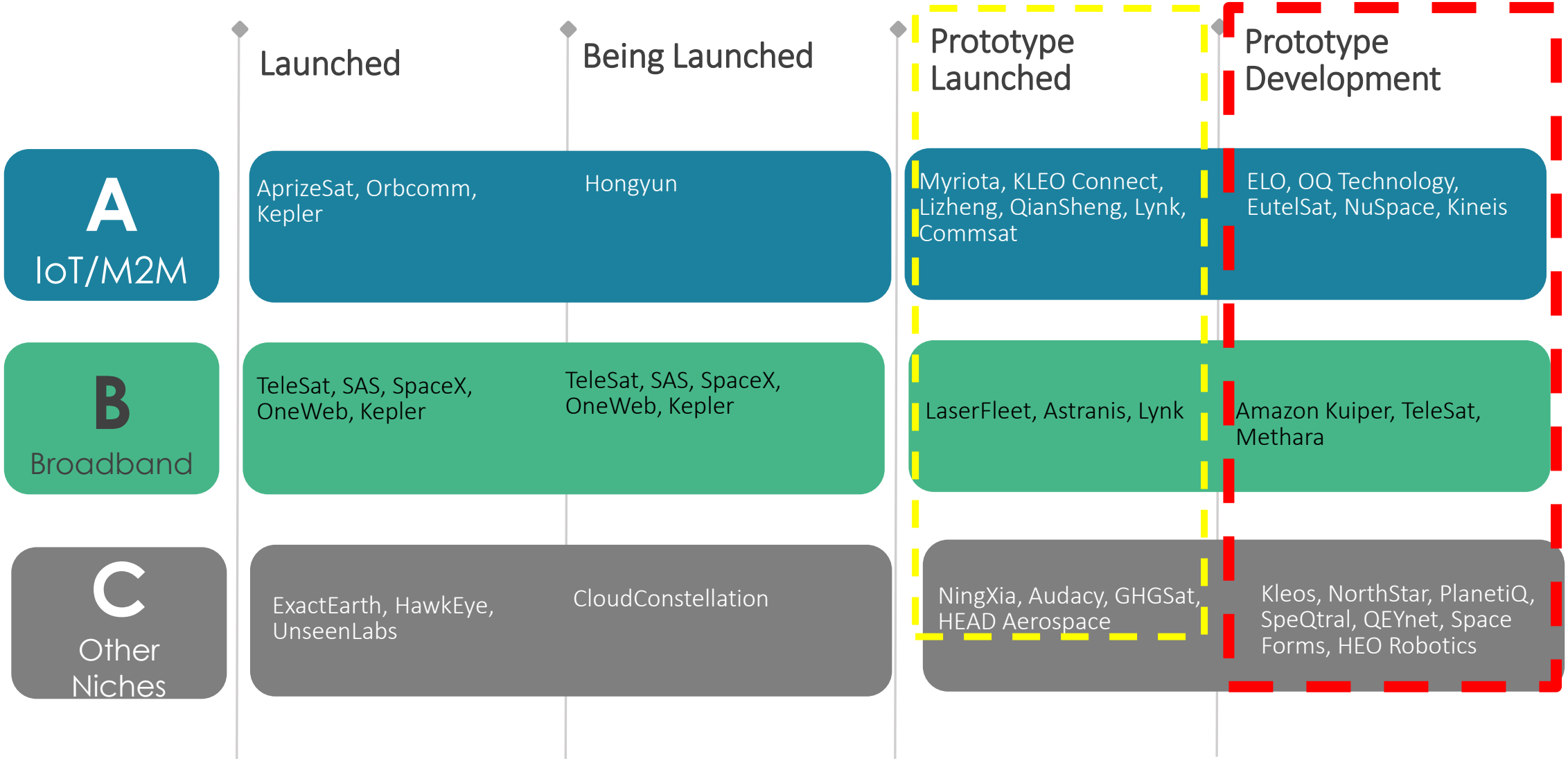
Earth Observation

IoT/M2M

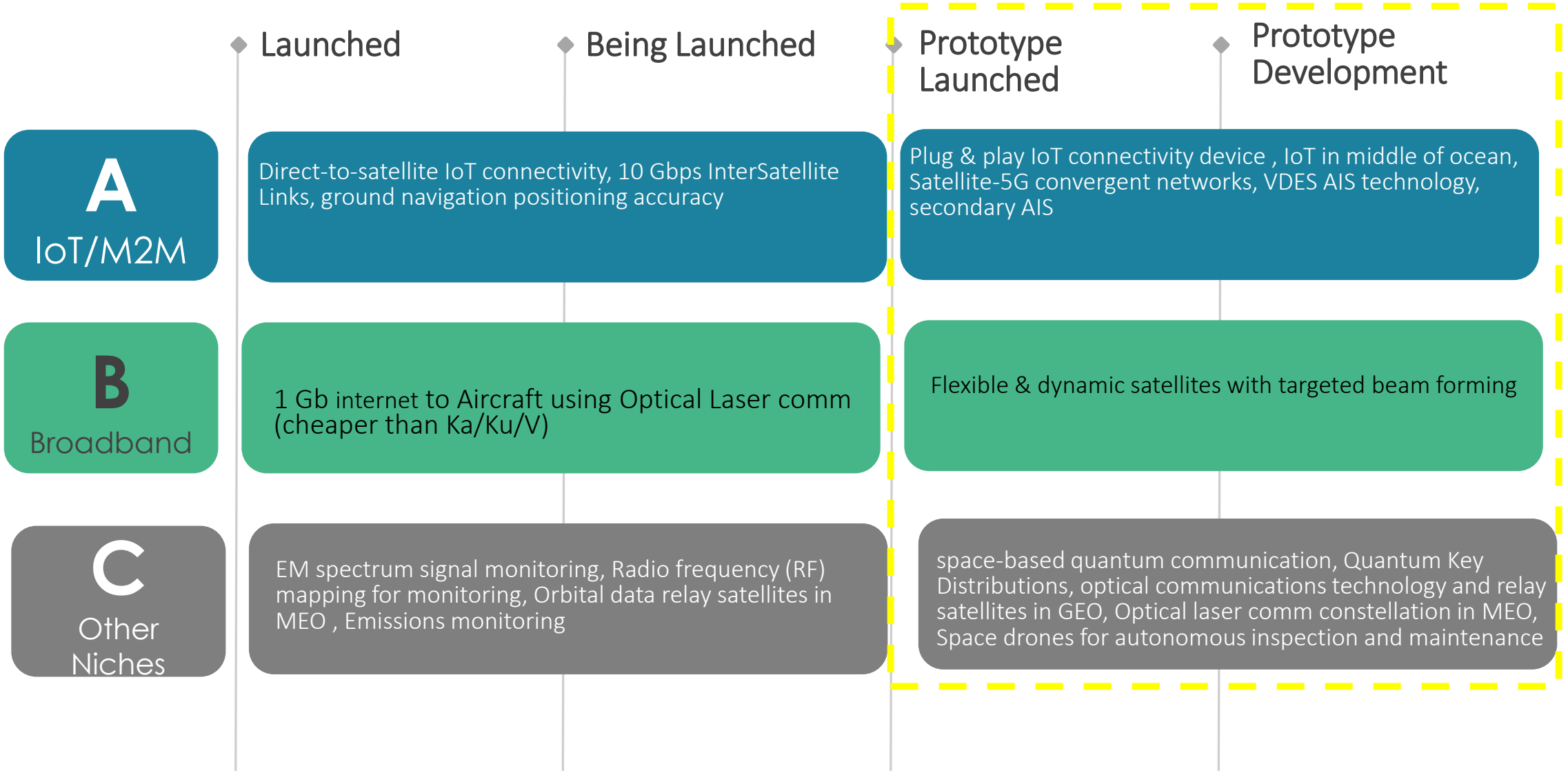
Broadband Telecom



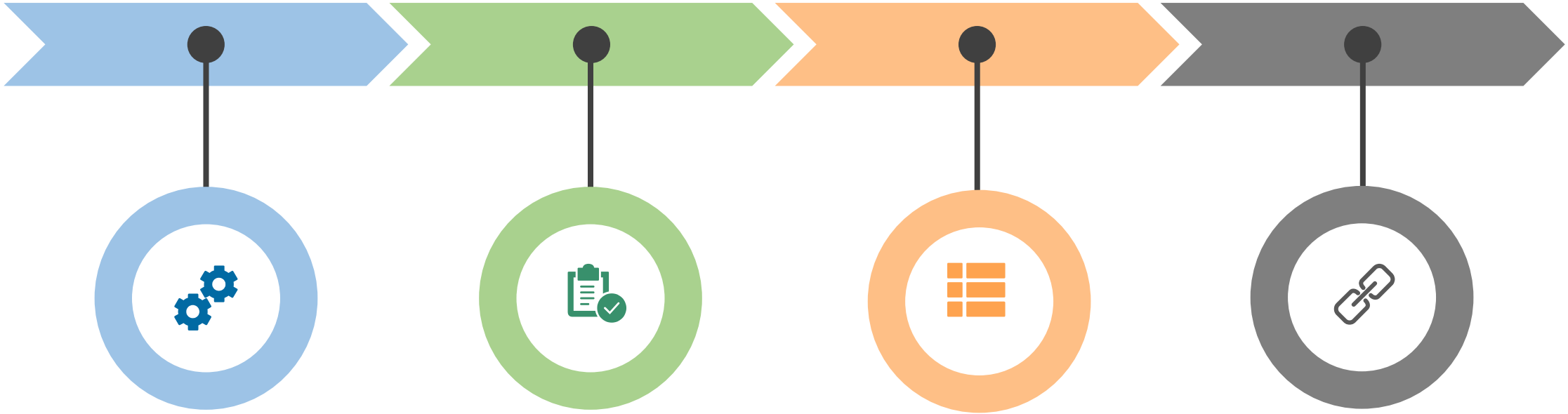
Disruptors (vs) COVID-19 – How many would make it?



Disruptions vs COVID-19 – How many would keep progressing?



SECTION-4



METHODOLOGY

2 Forecasting methods

INTELLIGENCE

4 Segments

4 Streams

INFERENCES

8 Innovations |
4 Opportunities | 4 Threats
3 Scenarios

3 Fields | 10 Disruptions
4 market attractions | 6 high-potentials

1CTY ROADMAP FOCUS

Thank you !

Questions are welcome!

Selvaraj.mohan-prabhu@airbus.com