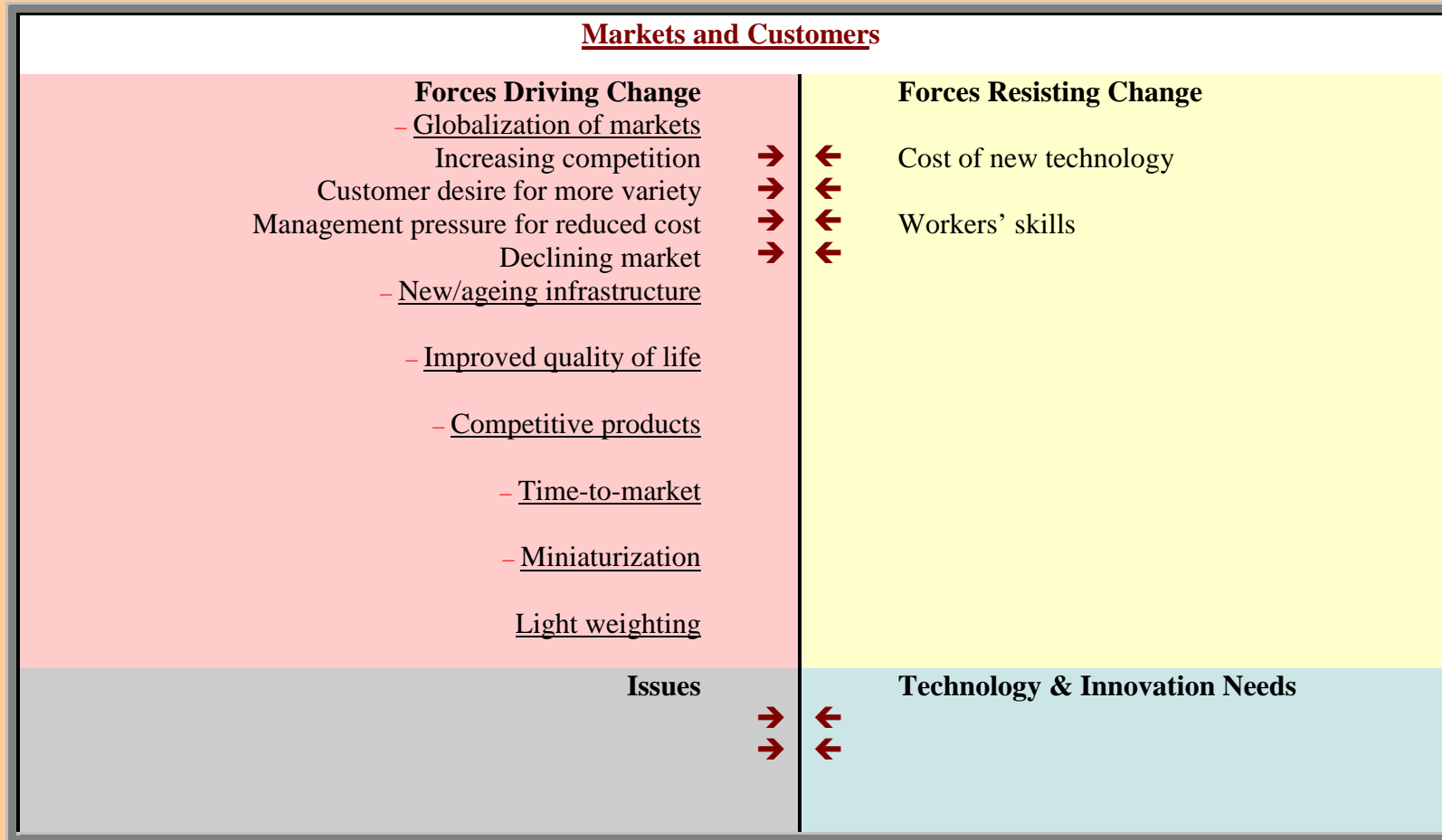


1. Force Field Analysis for the Aerospace Sector [Example of Format]



2. Examples of Forces, Issues and Needs

Forces Driving Change	Forces Resisting Change
<ul style="list-style-type: none"> * Terotechnology, LCC, lifing, RAM, health monitoring, reparability, end-of-life recovery/recycling, disassembly <ul style="list-style-type: none"> * Quality, reliability and durability: fitness-for-use <ul style="list-style-type: none"> * End-of-life vehicle directive * Quality of life: quality of working life * Environmental protection: climate & fuels, climate change, energy efficiency <ul style="list-style-type: none"> * Environment changes – increased UV * Sustainability – living lightly, recycling * Tax incentives, grants & inward investment <ul style="list-style-type: none"> * Devolution of design responsibilities <ul style="list-style-type: none"> * Innovative design * Faster product to market * Constant cost-cutting * Virtual – reality, research, group, company <ul style="list-style-type: none"> * Knowledge technology, IPR * New concepts (advanced materials, intermetallics, biomaterials, biomimetics, nanostructures, nanotechnology, nanotubes, memory materials, micro-electromechanical systems, knowledge-based systems) * International standards: environment protection, product safety, re-cycling, certification for safety <ul style="list-style-type: none"> * Ethics * Crime * Framework 6 & EPSRC Landscape <ul style="list-style-type: none"> * Extreme environments * Diagnostic on-line control – smart, intelligent, adaptive sensor/actuators 	<ul style="list-style-type: none"> * Use change * Cultural changes * Time * Public understanding of science * Science/technology/engineering/user interfaces * Environmental and legal * Infrastructure development: education & science parks/clusters * Demographics * Out sourcing * Changed Government priorities * Economic down-turn * Infrastructure inheritance and retrograding * Finance: prices increase/decrease * OEM reluctance to pay change costs * Accidents * Linked supply chains <i>vis-à-vis</i> E-commerce * Fibre-optic infrastructure * Technology & knowledge transfers * “Market-pull” vs “science push” * Stable socio-political environment * Market signals * Price competitiveness in marketplace * Funding needed for R&D * Training and maintaining skilled personnel * Shortage and supply of trained personnel

<ul style="list-style-type: none"> * Business environment: sustained competitive advantage; legislation; costs * Market intelligence: innovation, creativity, new opportunities – disruptive technologies <ul style="list-style-type: none"> * De-emphasis on manufacturing <ul style="list-style-type: none"> * Productivity pressures * Cost reductions * Distributed manufacturing * Lean manufacture & “twenty-four seven” working environment <ul style="list-style-type: none"> * Global support : customer connectivity <ul style="list-style-type: none"> * Cost competitiveness * Borderless economy * Intensification of international science and technology <ul style="list-style-type: none"> * Science and technology for human coexistence * Science and technology for enriching life and society <ul style="list-style-type: none"> * Industry-led partnership * Regional alliances * Corporate consolidations: commercial technology acquisition * From producing to thinking organizations – the intelligent enterprise <ul style="list-style-type: none"> * & others * ?? 	<ul style="list-style-type: none"> * Skill upgrading facilities * Cost & complexity of equipment * Design to overtake empiricism * Availability of technology * Stable SET policy – promotion of SET in Regions * Human mobility – workforce diversity * & others * ??
<p style="text-align: center;">Issues</p> <ul style="list-style-type: none"> * Conservation, energy efficiency, strategic materials <ul style="list-style-type: none"> * Reduce emissions of future aircraft <ul style="list-style-type: none"> * Renewables: PV * Combined heat and power * RAM: retrograding, interoperability <ul style="list-style-type: none"> * H&S&E * Resources: people, cash, equipment, land 	<p style="text-align: center;">Technology & Innovation Needs</p> <ul style="list-style-type: none"> * Holistic education systems – learning on the job, NVQs, CPD * Multi-skilling (inter-/multi-disciplinary); life-long learning * Process technology * Surface engineering and underpinning sciences * Quality * Transference from other industries * Spin-offs

- | | |
|--|---|
| <ul style="list-style-type: none"> * Simulating/modelling: atomistic accelerated testing, materials, stress, thermal, diffusion, process <ul style="list-style-type: none"> * Arts & aesthetics * Remote monitoring in real-time * Value: investment appraisal, RoI * Strategic management systems/tools: road maps, organization [flat] structure, change management <ul style="list-style-type: none"> * Hybridization of processes * Quality evaluations in the management of basic and applied research <ul style="list-style-type: none"> * Managing & leveraging professional intellect * Management competences * World class practice – delivery; benchmarking, audit, JIT, supply chain <ul style="list-style-type: none"> * Methodology tools – Taguchi, Latin squares, SWOT, PEST * Rapid prototyping: time compression * Alliances: joint ventures – connectivity/networks * Digital futures: E-commerce and sustainability: Internet-enabled solutions <ul style="list-style-type: none"> * Growth of Internet/Grid * Environmental degradation of materials * Biocompatibility and lifetime of prosthetic devices <ul style="list-style-type: none"> * Enabling technology * Commercial product development * Dual-purpose technology development <ul style="list-style-type: none"> * Small business development <ul style="list-style-type: none"> * Crosscutting processes * Excellence & integrity * & others * ?? | <ul style="list-style-type: none"> * KBSs: expert systems, AI, LIMS * Computational materials science for advanced materials * ITC – wide band, wireless application protocol (“Bluetooth”) * Combinatorial chemistry * Materials characterization * Performance metrics * Leadership * Risk assessment * Efficiency & effectiveness * & others * ?? |
|--|---|

3. Sectors

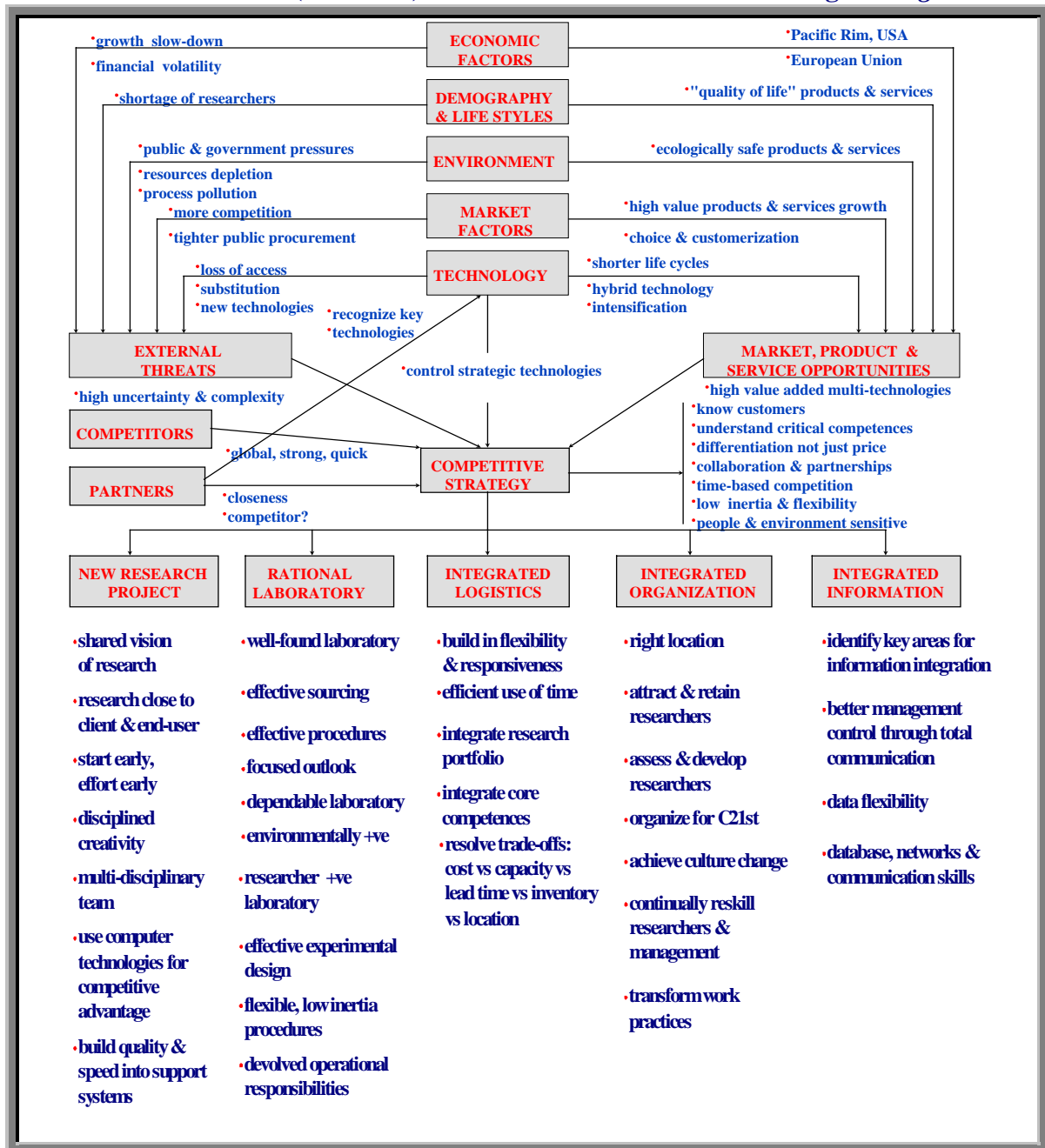
Primary Sector	Secondary Sector	Tertiary Sector
<ul style="list-style-type: none">➤ Fuel Extraction & Power Generation [inc Offshore]➤ Infrastructure➤ Agriculture➤ Mining	<ul style="list-style-type: none">➤ Aerospace➤ Automotive, Land & Marine Transportation➤ Packaging & Food Processing➤ Pharmaceutical and Fine Chemicals➤ Defence➤ Architectural	<ul style="list-style-type: none">➤ Health➤ IT & Communications

Institute of Materials's Corrosion Committee
 Foresighting Document **DRAFT**

4. Corrosion Issues by Industry

Fixed & Portable Assets In ⇒ Area ↓	Aerospace	Automotive	Tooling	Power generation	Architecture	Transportation	Construction	Packaging	Health	Miscellaneous
High Temperature/"Dry"										
Clean coal technologies				✓						
Biomass technologies				✓						
Nuclear waste storage				✓						
Refuse/sludge incineration				✓						✓
Combined heat & power				✓						
High temperature semiconductors – engine managers	✓	✓		✓						
Ambient/"Wet"										
Non-toxic anti-fouling paints						✓			✓	
Bio-sciences – materials for systemic (smart) drug delivery (controlled corrosion!!), biocompatible coatings/materials, longevity of implants									✓	
Nanotechnology – materials for systemic (smart) drug delivery									✓	
Desalination							✓		✓	✓
Testing and protection of new coins										✓
Storage and pipeline monitoring							✓			✓
Document/artefact protection and preservation								✓		✓
Cross-Cutting Issues										
Knowledge-based systems – expert systems, data mining and smart/adaptive coatings/structures/materials – coatings as sensors/actuators	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Modelling accelerated ageing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Life-time modelling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Outreach, training and education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

5. Factors from the (Research) Business Environment Influencing Foresight



6. Abbreviations

AI	Artificial intelligence	LIMS	Laboratory information management system
CPD	Continuing professional development	NVQ	National Vocational Qualification
H&S&E	Health, safety & environment	PEST	Politics, environment, social, technology
IPR	Intellectual property right	PV	Photovoltaics
ITC	Information technology & communications	RAM	Reliability, availability, maintainability
JIT	Just in time	RoI	Return on investment
KBS	Knowledge-based system	SET	Science, engineering & technology
LCC	Life cycle cost	SWOT	Strengths, weaknesses, opportunities, threats