



AIPCN Section française



Journées Méditerranéennes de l'AIPCN et Assises du port du futur du Cerema 25 au 27 octobre 2023 à Sete France

Container ports' planning – key factors to boost resilience

Rita Pombo¹, Carlos Coelho¹, Hugo Lopes²



¹ RISCO & Department of Civil Engineering, University of Aveiro (Portugal)

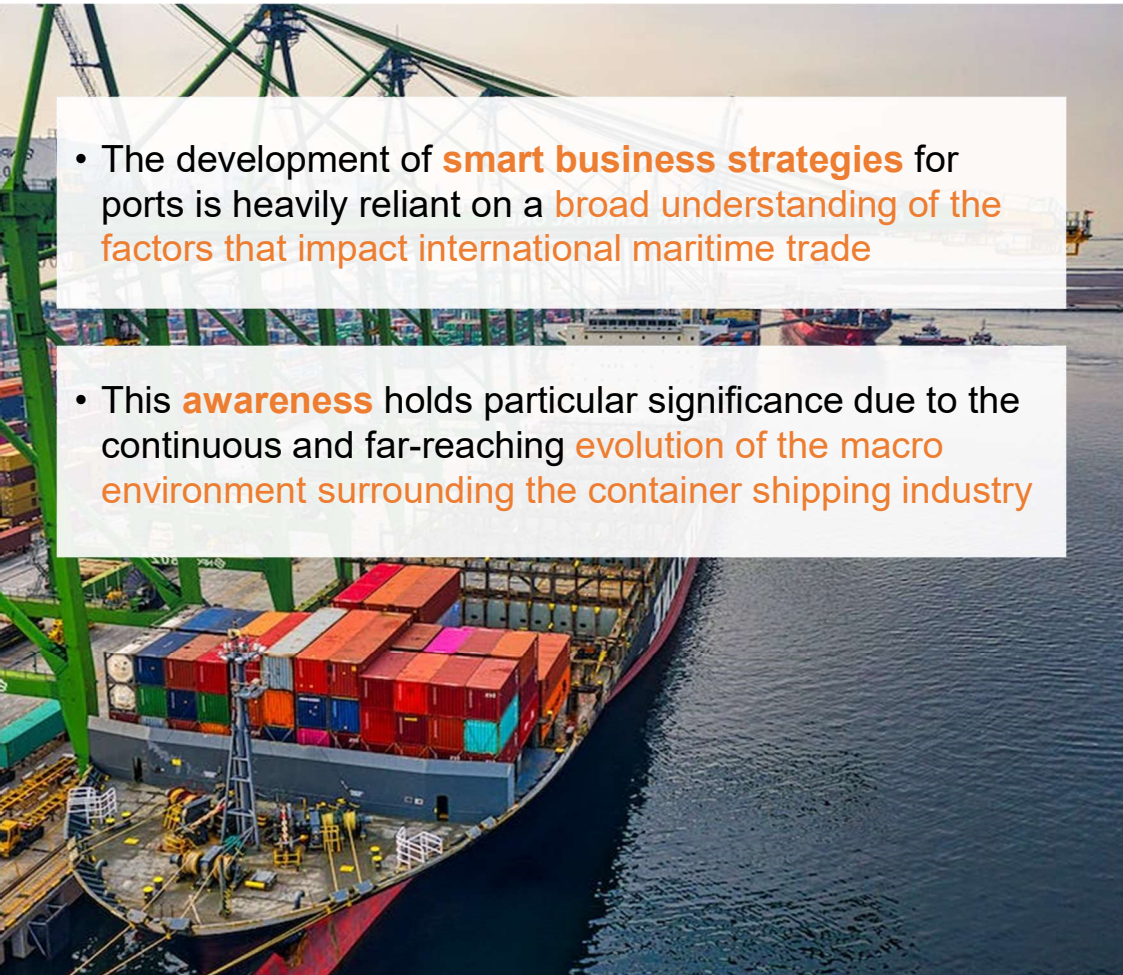
² Port Authority of Douro, Leixões and Viana do Castelo, SA (Portugal)

Context:

- The development of **smart business strategies** for ports is heavily reliant on a **broad understanding of the factors that impact international maritime trade**
- This **awareness** holds particular significance due to the continuous and far-reaching **evolution of the macro environment surrounding the container shipping industry**

Aim:

- Given this, an **integrative investigation** of the various factors involved was conducted in order to deliver a **holistic action framework**
- And **20 key strategies** that help **enhance ports’ resilience and competitiveness** considering current market trends are provided

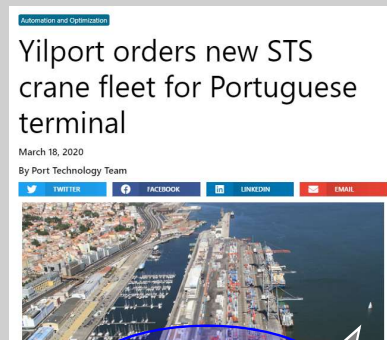


Methodology: How to analyse the macro environment revolving around container ports’ business?

Internal (ports can manage and influence)



- Cooperative initiatives



Strength

- Advanced technology and infrastructure



Weakness

- Labour strikes and disputes

External (beyond direct control but can affect its performance)

- Disruptions from political instability

Threat

Invasion of Ukraine Caused Steep Drop in Black Sea Container Traffic



- Capital infusion

Opportunity

Portugal: EIB grants €60 million loan to Port of Leixões to improve maritime accessibility



- Changing legal landscapes

News / New EU law 'marks the beginning of the end of dirty fuels in shipping'



Methodology: How to analyse the macro environment revolving around container ports’ business?

Domains of analysis:



• Environmental



• Technological



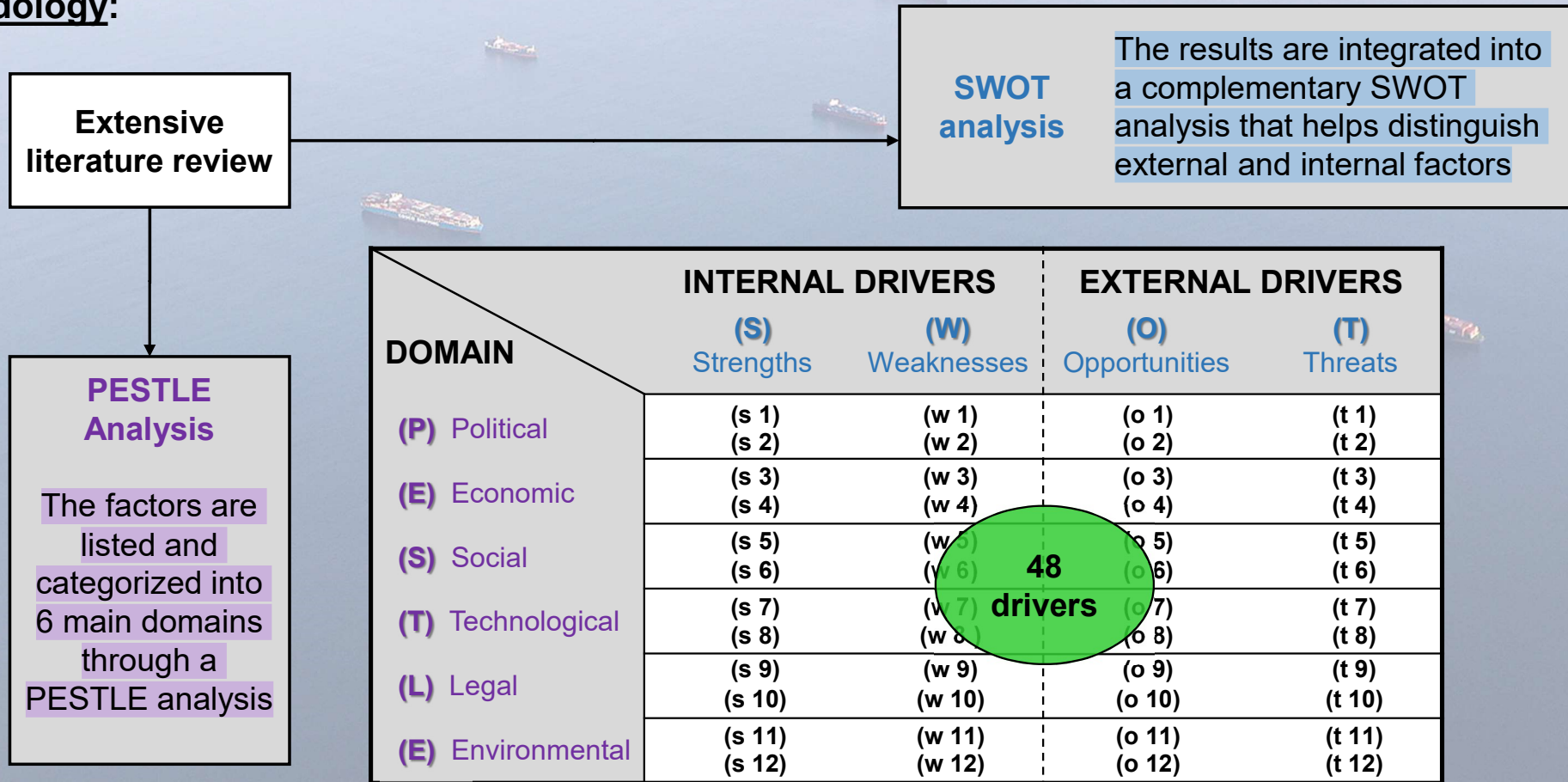
• Social



• Political



Methodology:



PESTLE/SWOT Matrix

Results:

DOMAIN	INTERNAL FACTORS		EXTERNAL FACTORS	
	(S) Strengths	(W) Weaknesses	(O) Opportunities	(T) Threats
(P) Political	(s1) Attractiveness to government (s2) Strong political relationships	(w1) Lack of political advocacy and lobbying (w2) Sensitivity to political stability	(o1) Government support and incentives (o2) International trade agreements	(t1) Unfavourable commercial policies (t2) Disruptions from political instability
(E) Economic	(s3) Agile financial strategies (s4) Stakeholder confidence	(w3) Infrastructure limitations (w4) Competitive pricing pressure	(o3) Global trade growth (o4) Capital infusion	(t3) Financial market fluctuations (t4) Economic downturns
(S) Social	(s5) Highly skilled workforce (s6) Community engagement	(w5) Labour strikes and disputes (w6) Community environmental concerns	(o5) Workforce development and just transition measures (o6) CSR initiatives	(t5) Emergence of niche markets (t6) Supply and demand fluctuations
(T) Technological	(s7) Advanced technology and infrastructure (s8) Innovation culture	(w7) Lack of technological expertise (w8) Outdated IT infrastructure and systems	(o7) Creation of smart facilities (o8) Technological skills development and training	(t7) Rapid technological obsolescence (t8) Cybersecurity risks
(L) Legal	(s9) Commitment to legal and regulatory compliance (s10) Contractual expertise and risk management skills	(w9) Legal compliance costs and complexity (w10) Antitrust and competition challenges	(o9) Ethical business practices (o10) Data privacy compliance	(t9) Legal disputes and litigation processes (t10) Changing legal landscapes
(E) Environmental	(s11) Energy efficiency and sustainable practices (s12) Cooperative initiatives	(w11) Sustainability implementation challenges (w12) Climate change vulnerability	(o11) Global decarbonization goals (o12) Renewable energy integration	(t11) Environmental compliance challenges (t12) Critical resource shortages

Results:

DOMAIN	INTERNAL	EXTERNAL
	(S) Strengths	
(P) Political	<ul style="list-style-type: none"> (s1) Attractiveness to government (s2) Strong political relationships 	<ul style="list-style-type: none"> (t1) Unfavourable commercial conditions (t2) Options from political decisions
(E) Economic	<ul style="list-style-type: none"> (s3) Agile financial strategies (s4) Stakeholder confidence 	<ul style="list-style-type: none"> (t3) Global financial market downturns (t4) Economic downturns (t5) Scarcity of niche services
(S) Social	<ul style="list-style-type: none"> (s5) Highly skilled workforce (s6) Community engagement 	<ul style="list-style-type: none"> (t6) Changing labour requirements (t7) Demographic shifts
(T) Technological	<ul style="list-style-type: none"> (s7) Advanced technology infrastructure (s8) Innovation culture 	<ul style="list-style-type: none"> (t8) Rapid technological change (t9) Cybersecurity risks
(L) Legal	<ul style="list-style-type: none"> (s9) Commitment to legal and regulatory compliance (s10) Contractual expertise and risk management skills 	<ul style="list-style-type: none"> (t10) Disputes and litigation processes (t11) Changing legal requirements
(E) Environmental	<ul style="list-style-type: none"> (s11) Energy efficiency and sustainable practices (s12) Cooperative initiatives 	<ul style="list-style-type: none"> (t12) Environmental change challenges (t13) Limited natural resources

Strengths in the Political domain

(s1) Container terminals that promote economic stability and job creation hold a favourable position for governments, since they can be perceived as valuable contributors to the local economy or national trade, and become more likely to receive support from government bodies.

(s2) Building robust relationships with political authorities and municipalities can streamline bureaucratic processes, facilitate the acquisition of permits, land access, and infrastructure development approvals, which are vital to ensure smooth terminal operations and securing opportunities for growth.

vulnerability

integration

shortages

Results:

DOMAIN	EXTERNAL FACTORS	
	(O) Opportunities	(T) Threats
<p>(P) Political</p> <p>(E) Economic</p> <p>(S) Social</p> <p>(T) Technological</p> <p>(L) Legal</p> <p>(E) Environmental</p>	<p>Opportunities in the Economic domain</p> <p>2024</p>	
	<p>(o3) Global trade growth presents an opportunity for <u>expanding operations, attract more shipping lines, and increase cargo throughput</u>. Particularly, terminals strategically positioned along major trade routes can benefit from <u>increased flow of goods, leading to higher revenue and market share</u>.</p>	<p>(t1) Unfavourable commercial policies</p> <p>(t2) Disruptions from political instability</p>
	<p>(o4) Access to capital infusion opportunities provides container terminals with pathways to <u>secure financial resources from global financial institutions, investors, and various funding sources</u>, which can be strategically allocated for infrastructure development, expansion, and key investments.</p>	<p>(t3) Financial market fluctuations</p> <p>(t4) Economic downturns</p>
		<p>(t5) Emergence of niche markets</p> <p>(t6) Supply and demand fluctuations</p>
		<p>(t7) Rapid technological obsolescence</p> <p>(t8) Cybersecurity risks</p>
		<p>(t9) Legal disputes and litigation processes</p> <p>(t10) Changing legal landscapes</p>
		<p>(t11) Environmental compliance challenges</p> <p>(t12) Critical resource shortages</p>

Results:

DOMAIN		AL FACTORS	
		(T) Threats	
(P) Political	(s1) Attraction of government	(t1) Unfavourable commercial policies	
	(s2) Strong relationships	(t2) Disruptions from political instability	
(E) Economic	(s3) Agile	(t3) Financial market fluctuations	
	(s4) Stakeholder	(t4) Economic downturns	
(S) Social	(s5) High	(t5) Emergence of niche markets	
	(s6) Com	(t6) Supply and demand fluctuations	
(T) Technological	(s7) Advanced infrastructure	(t7) Rapid technological obsolescence	
	(s8) Innovation	(t8) Cybersecurity risks	
(L) Legal	(s9) Com	(t9) Legal disputes and litigation processes	
	(s10) Com and risk	(t10) Changing legal landscapes	
(E) Environmental	(s11) Environmental sustainability	(t11) Environmental compliance challenges	
	(s12) Cooperative initiatives	(t12) Critical resource shortages	

Threats in the Technological domain

(t7) Rapid changes in technology can render existing systems obsolete very quick, so it is important to maintaining a vigilant stance towards technological advancements and a continuous adaptation to remain relevant.

(t8) The increasing reliance on digital systems exposes terminals to cybersecurity threats, highlighting the critical importance of robust security measures in order to avoid data breaches, operational disruptions, and reputational damage.

vulnerability | integration

Strategic framework:

Strategies:

SO - aim to leverage internal **Strengths** to capitalize on external **Opportunities**

ST - aim to utilize internal **Strengths** to counteract external **Threats**

WO - focus on mitigating internal **Weaknesses** by taking advantage of external **Opportunities**

WT - focus on improving internal **Weaknesses** to minimize the impact of external **Threats**

	(S) Strengths	(W) Weaknesses	(O) Opportunities	(T) Threats
(P) Political	(s1) Attractiveness to government (s2) Strong political relationships	(w1) Lack of political advocacy and lobbying (w2) Sensitivity to political stability	(o1) Government support and incentives (o2) International trade agreements	(t1) Unfavourable commercial policies (t2) Disruptions from political instability
(E) Economic	(s3) Agile financial strategies (s4) Stakeholder confidence	(w3) Infrastructure limitations (w4) Competitive pricing pressure	(o3) Global trade growth (o4) Capital infusion	(t3) Financial market fluctuations (t4) Economic downturns
(S) Social	(s5) Highly skilled workforce (s6) Community engagement	(w5) Labour strikes and disputes (w6) Community environmental concerns	(o5) Workforce development and just transition measures (o6) CSR initiatives	(t5) Emergence of niche markets (t6) Supply and demand fluctuations
(T) Technological	(s7) Advanced technology and infrastructure (s8) Innovation culture	(w7) Lack of technological expertise (w8) Outdated IT infrastructure and systems	(o7) Creation of smart facilities (o8) Technological skills development and training	(t7) Rapid technological obsolescence (t8) Cybersecurity risks
(L) Legal	(s9) Commitment to legal and regulatory compliance (s10) Contractual expertise and risk management skills	(w9) Legal compliance costs and complexity (w10) Antitrust and competition challenges	(o9) Ethical business practices (o10) Data privacy compliance	(t9) Legal disputes and litigation processes (t10) Changing legal landscapes
(E) Environmental	(s11) Energy efficiency and sustainable practices (s12) Cooperative initiatives	(w11) Sustainability implementation challenges (w12) Climate change vulnerability	(o11) Global decarbonization goals (o12) Renewable energy integration	(t11) Environmental compliance challenges (t12) Critical resource shortages

TOWS Matrix

Strategic framework:

Strategies:

SO } How can ports make the most of their **strengths**?

ST }

WO } What’s the best way to overcome their **weaknesses**?

WT }

	(S) Strengths	(W) Weaknesses	(O) Opportunities	(T) Threats
(P) Political	(s1) Attractiveness to government (s2) Strong political relationships	(w1) Lack of political advocacy and lobbying (w2) Sensitivity to political stability	(o1) Government support and incentives (o2) International trade agreements	(t1) Unfavourable commercial policies (t2) Disruptions from political instability
(E) Economic	(s3) Agile financial strategies (s4) Stakeholder confidence	(w3) Infrastructure limitations (w4) Competitive pricing pressure	(o3) Global trade growth (o4) Capital infusion	(t3) Financial market fluctuations (t4) Economic downturns
(S) Social	(s5) Highly skilled workforce (s6) Community engagement	(w5) Labour strikes and disputes (w6) Community environmental concerns	(o5) Workforce development and just transition measures (o6) CSR initiatives	(t5) Emergence of niche markets (t6) Supply and demand fluctuations
(T) Technological	(s7) Advanced technology and infrastructure (s8) Innovation culture	(w7) Lack of technological expertise (w8) Outdated IT infrastructure and systems	(o7) Creation of smart facilities (o8) Technological skills development and training	(t7) Rapid technological obsolescence (t8) Cybersecurity risks
(L) Legal	(s9) Commitment to legal and regulatory compliance (s10) Contractual expertise and risk management skills	(w9) Legal compliance costs and complexity (w10) Antitrust and competition challenges	(o9) Ethical business practices (o10) Data privacy compliance	(t9) Legal disputes and litigation processes (t10) Changing legal landscapes
(E) Environmental	(s11) Energy efficiency and sustainable practices (s12) Cooperative initiatives	(w11) Sustainability implementation challenges (w12) Climate change vulnerability	(o11) Global decarbonization goals (o12) Renewable energy integration	(t11) Environmental compliance challenges (t12) Critical resource shortages

TOWS Matrix

Strategic actions (examples):

SO :
 Incorporate energy-efficient and sustainable practices (s11) to align with global decarbonization goals (o11) and enable renewable energy integration (o12)

WO :
 Counteract sensitivity to political stability (w2) by capitalizing on international trade agreements (o2)

ST :
 Employ agile financial strategies (s3) to steer through financial market fluctuations (t3), economic downturns (t4) and unfavourable commercial policies (t1)

WT :
 Upgrade outdated IT infrastructure and systems (w8) to steer through supply and demand fluctuations (t6)

	(S) Strengths	(W) Weaknesses	(O) Opportunities	(T) Threats
(P) Political	(s1) Attractiveness to government (s2) Strong political relationships	(w1) Lack of political advocacy and lobbying (w2) Sensitivity to political stability	(o1) Government support and incentives (o2) International trade agreements	(t1) Unfavourable commercial policies (t2) Disruptions from political instability
(E) Economic	(s3) Agile financial strategies (s4) Stakeholder confidence	(w3) Infrastructure limitations (w4) Competitive pricing pressure	(o3) Global trade growth (o4) Capital infusion	(t3) Financial market fluctuations (t4) Economic downturns
(S) Social	(s5) Highly skilled workforce (s6) Community engagement	(w5) Labour strikes and disputes (w6) Community environmental concerns	(o5) Workforce development and just transition measures (o6) CSR initiatives	(t5) Emergence of niche markets (t6) Supply and demand fluctuations
(T) Technological	(s7) Advanced technology and infrastructure (s8) Innovation culture	(w7) Lack of technological expertise (w8) Outdated IT infrastructure and systems	(o7) Creation of smart facilities (o8) Technological skills development and training	(t7) Rapid technological obsolescence (t8) Cybersecurity risks
(L) Legal	(s9) Commitment to legal and regulatory compliance (s10) Contractual expertise and risk management skills	(w9) Legal compliance costs and complexity (w10) Antitrust and competition challenges	(o9) Ethical business practices (o10) Data privacy compliance	(t9) Legal disputes and litigation processes (t10) Changing legal landscapes
(E) Environmental	(s11) Energy efficiency and sustainable practices (s12) Cooperative initiatives	(w11) Sustainability implementation challenges (w12) Climate change vulnerability	(o11) Global decarbonization goals (o12) Renewable energy integration	(t11) Environmental compliance challenges (t12) Critical resource shortages

TOWS matrix

20 key strategic actions

⇒ 5 for each pair of factors

- all the 48 drivers identified in the PESTLE/SWOT analysis were cross-referenced to formulate these 20 strategic actions;
- and some strategies address multiple drivers simultaneously, which builds a more **effective, holistic approach**.

	Strengths	Weaknesses
Opportunities	SO :	WO :
	1) Incorporate energy-efficient and sustainable practices (s11) to align with global decarbonization goals (o11) and enable renewable energy integration (o12)	6) Reduce legal compliance costs and complexity (w9) through the utilization of government support and incentives (o1)
	2) Harness the power of strong political relationships (s2) and attractiveness to government (s1) to take advantage of government support and incentives (o1)	7) Address the lack of technological expertise (w7) by investing in technological skills development and training (o8)
	3) Leverage community engagement (s6) and a highly skilled workforce (s5) to enhance CSR initiatives (o6)	8) Address infrastructure limitations (w3) by investing in the creation of smart facilities (o7) and take advantage of global trade growth (o3)
	4) Utilize commitment to legal and regulatory compliance (s9) along with contractual expertise and risk management skills (s10) to ensure ethical business practices (o9) and data privacy compliance (o10)	9) Mitigate labour strikes and disputes (w5) by supporting workforce development and just transition measures (o5) and CSR initiatives (o6)
Threats	5) Enhance agile financial strategies (s3) and stakeholder confidence (s4) to attract capital infusion (o4)	10) Counteract sensitivity to political stability (w2) by capitalizing on international trade agreements (o2)
	ST :	WT :
	11) Employ agile financial strategies (s3) to steer through financial market fluctuations (t3), economic downturns (t4) and unfavourable commercial policies (t1)	16) Address the lack of political advocacy and lobbying (w1) to navigate changing legal landscapes (t10) and manage disruptions from political instability (t2)
	12) Engage in cooperative initiatives (s12) to address critical resource shortages (t12) and adapt to the emergence of niche markets (t5)	17) Upgrade outdated IT infrastructure and systems (w8) to steer through supply and demand fluctuations (t6)
	13) Leverage commitment to legal and regulatory compliance (s9) to address environmental compliance challenges (t11)	18) Mitigate community environmental concerns (w6), address sustainability implementation challenges (w11), and tackle climate change vulnerability (w12) to prevent environmental compliance challenges (t11)
14) Invest in contractual expertise and risk management skills (s10) to mitigate potential legal disputes and litigation processes (t9) and monitor changing legal landscapes (t10)	19) Proactively manage antitrust and competition challenges (w10) to reduce the likelihood of legal disputes and litigation processes (t9)	
15) Leverage advanced technology and infrastructure (s7) and innovation culture (s8) to counteract rapid technological obsolescence (t7) and cybersecurity risks (t8)	20) Mitigate the impact of competitive pricing pressure (w4) to navigate supply and demand fluctuations (t6)	

Conclusions:

SWOT analysis:

• *Strengths*

internal
advantages and
core
competencies
that provide a
competitive edge

• *Weaknesses*

internal
limitations or
shortcomings
that hinder
performance or
competitiveness

• *Opportunities*

external
factors or
conditions that
can be
exploited for
benefits

• *Threats*

external
factors or
circumstances
that pose risks
or challenges to
the wellbeing

PESTLE analysis:

- *Politic*
- *Economic*
- *Social*
- *Technological*
- *Legal*
- *Environmental*

Conclusions:

	(S) Strengths	(W) Weaknesses	(O) Opportunities	(T) Threats
(P) Political	(s1) Attractiveness to government (s2) Strong political relationships	(w1) Lack of political advocacy and lobbying (w2) Sensitivity to political stability	(o1) Government support and incentives (o2) International trade agreements	(t1) Unfavourable commercial policies (t2) Disruptions from political instability
(E) Economic	(s3) Agile financial strategies (s4) Stakeholder confidence	(w3) Infrastructure limitations (w4) Competitive pricing pressure	(o3) Global trade growth (o4) Capital infusion	(t3) Financial market fluctuations (t4) Economic downturns
(S) Social	(s5) Highly skilled workforce (s6) Community engagement	(w5) Labour strikes and disputes (w6) Community environmental concerns	(o5) Workforce development and just transition measures (o6) CSR initiatives	(t5) Emergence of niche markets (t6) Supply and demand fluctuations
(T) Technological	(s7) Advanced technology and infrastructure (s8) Innovation culture	(w7) Lack of technological expertise (w8) Outdated IT infrastructure and systems	(o7) Creation of smart facilities (o8) Technological skills development and training	(t7) Rapid technological obsolescence (t8) Cybersecurity risks
(L) Legal	(s9) Commitment to legal and regulatory compliance (s10) Contractual expertise and risk management skills	(w9) Legal compliance costs and complexity (w10) Antitrust and competition challenges	(o9) Ethical business practices (o10) Data privacy compliance	(t9) Legal disputes and litigation processes (t10) Changing legal landscapes
(E) Environmental	(s11) Energy efficiency and sustainable practices (s12) Cooperative initiatives	(w11) Sustainability implementation challenges (w12) Climate change vulnerability	(o11) Global decarbonization goals (o12) Renewable energy integration	(t11) Environmental compliance challenges (t12) Critical resource shortages

	Strengths	Weaknesses	
Opportunities	SO : 1) Incorporate energy-efficient and sustainable practices (s11) to align with global decarbonization goals (o11) and enable renewable energy integration (o12) 2) Harness the power of strong political relationships (s2) and attractiveness to government (s1) to take advantage of government support and incentives (o1) 3) Leverage community engagement (s6) and a highly skilled workforce (s5) to enhance CSR initiatives (o6) 4) Utilize commitment to legal and regulatory compliance (s9) along with contractual expertise and risk management skills (s10) to ensure ethical business practices (o9) and data privacy compliance (o10) 5) Enhance agile financial strategies (s3) and stakeholder confidence (s4) to attract capital infusion (o4)	WO : 6) Reduce legal compliance costs and complexity (w9) through the utilization of government support and incentives (o1) 7) Address the lack of technological expertise (w7) by investing in technological skills development and training (o8) 8) Address infrastructure limitations (w3) by investing in the creation of smart facilities (o7) and take advantage of global trade growth (o3) 9) Mitigate labour strikes and disputes (w5) by supporting workforce development and just transition measures (o5) and CSR initiatives (o6) 10) Counteract sensitivity to political stability (w2) by capitalizing on international trade agreements (o2)	
	Threats	ST : 11) Employ agile financial strategies (s3) to steer through financial market fluctuations (t3), economic downturns (t4) and unfavourable commercial policies (t1) 12) Engage in cooperative initiatives (s12) to address critical resource shortages (t12) and adapt to the emergence of niche markets (t5) 13) Leverage commitment to legal and regulatory compliance (s9) to address environmental compliance challenges (t11) 14) Invest in contractual expertise and risk management skills (s10) to mitigate potential legal disputes and litigation processes (t9) and monitor changing legal landscapes (t10) 15) Leverage advanced technology and infrastructure (s7) and innovation culture (s8) to counteract rapid technological obsolescence (t7) and cybersecurity risks (t8)	WT : 16) Address the lack of political advocacy and lobbying (w1) to navigate changing legal landscapes (t10) and manage disruptions from political instability (t2) 17) Upgrade outdated IT infrastructure and systems (w8) to steer through supply and demand fluctuations (t6) 18) Mitigate community environmental concerns (w6), address sustainability implementation challenges (w11), and tackle climate change vulnerability (w12) to prevent environmental compliance challenges (t11) 19) Proactively manage antitrust and competition challenges (w10) to reduce the likelihood of legal disputes and litigation processes (t9) 20) Mitigate the impact of competitive pricing pressure (w4) to navigate supply and demand fluctuations (t6)

• Holistic overview of **48 factors** that must be controlled • and **20 strategic actions** that can be implemented in order to:

✓ boost resilience

✓ promote competitive advantages

✓ develop sustainable business models

References:

- Alessandrini, M., Bettini, C., & Iacobucci, E. (2022). New trade and economic relations between EU-UK: the impact on regions and cities. European Committee of the Region. <https://doi.org/10.2863/59463>
- Becker, A., Ng, A. K. Y., McEvoy, D., & Mullett, J. (2018). Implications of climate change for shipping: Ports and supply chains. *Wiley Interdisciplinary Reviews: Climate Change*, 9(2), 1–18. <https://doi.org/10.1002/wcc.508>
- Colibășanu, O. A. (2022). The Geopolitical Power of EU in the Making (?): A Question of the War in Ukraine. *Romanian Journal of European Affairs*, 22(1), 24–34.
- Guo, W., & Chen, Z. (2023). China–US economic and trade relations, trade news, and short-term fluctuation of the RMB exchange rate. *Review of International Economics*, 31(1), 180–203. <https://doi.org/10.1111/roie.12622>
- Nezhyva, M., & Mysiuk, V. (2023). Global economic consequences of the military-political crisis in Ukraine. *Foreign Trade: Economics, Finance, Law*, 126(1), 4–12. [https://doi.org/10.31617/3.2023\(126\)01](https://doi.org/10.31617/3.2023(126)01)
- Roshanaei, N., & Khoramshahi, N. (2020). Government intervention in free markets: The shipping industry. 8(1), 180–203.
- Rožić, T., Naletina, D., & Zajac, M. (2022). Volatile Freight Rates in Maritime Container Industry in Times of Crises. *Applied Sciences*, 12(17), 8452. <https://doi.org/10.3390/app12178452>
- Shao, S., Tan, Z., Wang, T., & Liu, Z. (2023). Configuration design of the emission control areas for coastal ships: A Stackelberg game model. *Transportation Research Part E: Logistics and Transportation Review*, 172(February), 103072. <https://doi.org/10.1016/j.tre.2023.103072>
- UNCTAD. (2022). *Review of Maritime Transport 2022 - Navigating Stormy Waters*. United Nations Publications - United Nations Conference on Trade and Development, 195 p. ISBN: 978-92-1-113073-7
- Whelan, K. (2022). The past, present and future of euro area monetary-fiscal interactions. *International Economics and Economic Policy*, 19(3), 557–579. <https://doi.org/10.1007/s10368-022-00531-y>



AIPC� Section française



Thank you for your attention!

Rita POMBO, ritanovo@ua.pt

Funding:



MIT Portugal