

Logistics Gateways and Their Potential for Meeting the National Logistics Strategy: Evidence from the Sultanate of Oman

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ABSTRACT

Logistics gateways are backbone for a nation's trade and shape its economic prospects, yet whether the gateways a country already operates can deliver the targets of long-term logistics strategy remains unanswered. We examine that question for Oman, whose Sultanate of Oman Logistics Strategy 2040 (SOLS2040) aims to build a global logistics hub as part of the diversification from oil. Fifteen semi-structured interviews were conducted with senior figures from the maritime, aviation and land segments of the sector and from government. The transcripts were analysed in a documented and reproducible R pipeline that pairs dictionary-based coding with a structural topic model, and the analysis returned six themes. Stakeholders see firm government commitment and steady traffic growth at Sohar and Salalah. But, the dry ports at Al Mazunah and Khazaen is below capacity. Hinterland links and cold-chain facilities are thin. Regulation adds friction, and Jebel Ali and Hamad compete for the same cargo from a far larger base. Measured against the SOLS2040 target of forty million TEU by 2040, current capacity and utilisation fall short of projected demand. We argue that connectivity is the binding constraint, with technology and lighter regulation reinforcing it, and we close with policy steps that would bring the gateways in line with the diversification agenda.

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1. Introduction

Trade moves through gateways. Seaports, airports and the road and rail networks behind them decide how much it costs a firm to reach a foreign market, and cross-country evidence has tied better multimodal infrastructure to faster growth and higher foreign direct investment, with the strongest effects in emerging economies (Amankwah-Amoah et al., 2025; Rehman et al., 2023). A gateway does more than move cargo. Industrial clusters form around it, development spreads into the hinterland

behind it, and when a shock arrives a well-connected economy keeps its goods moving.

Oman is well placed to function as such a gateway. The country's position at the mouth of the Arabian Gulf on sea lanes that link Asia to Africa and Europe gives it an absolute advantage in maritime trade facilitation. Operationally, it ranks 14th in overall competitiveness, 9th in domestic opportunities, 23rd in international opportunities, 5th in business fundamentals, and 17th in digital readiness. This is one of the distinguishable balanced performance across all sub-indices of logistics performance achieved only by a very few emerging markets. The country demonstrated significant momentum by climbing five spots to rank 9th in domestic opportunities and rising three places to secure 5th in business fundamentals (Agility and Transport Intelligence, 2026). Short-term (Madhavan et al., 2023) and mid-term forecasting for international maritime trade projects an annual growth rate of 0.5 per cent in 2025 and 2 per cent during 2026-2030 while containerised trade is forecasted to rise at an

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average annual rate of 2.3 per cent over that same medium-term period (United Nations Conference on Trade and Development, 2025). These projections press the trading nations to keep their gateways ahead of demand.

Oman Vision 2040 establishes the comprehensive framework to transition from resource reliance toward a knowledge based economy built on innovation (Sultanate of Oman, 2020). Integrating into this national plan the Sultanate of Oman Logistics Strategy 2040 targets a top ten global logistics performance ranking and a fourteen percent GDP contribution (Abdul Rahman et al., 2021). Substantial infrastructure investments in gateways like the Duqm Special Economic Zone directly advance these ambitions for a competitive global hub (Sultanate of Oman, 2020; Abdul Rahman et al., 2021). Thus, the strategy treats logistics as a pillar of diversification away from oil and aims to make the country a global logistics hub. Oman is expanding its infrastructure gateways to achieve the national strategy's targets of creating three hundred thousand sector jobs and increasing the logistics contribution to fourteen percent of the gross domestic product by 2040 (Ministry of Transport, Communications and Information Technology, 2015)

Accordingly, this paper examines the alignment between Oman's air, land, and sea gateway infrastructure and the targets established under SOLS2040. The study pursues four research objectives:

1. To assess the current handling capacity of Oman's principal gateways and evaluate the headroom available for growth.
2. To analyse the volume and composition of demand that these gateways are likely to face over the strategy horizon.
3. To identify the infrastructure and operational requirements that projected demand will impose.
4. To examine the implications of divergence between gateway capacity and anticipated demand for national logistics policy.

The paper is addressed to policymakers and logistics operators who require a grounded assessment of where infrastructure gaps exist and what closing them would entail as Oman moves toward a post-oil economy. The remaining sections of the paper is structured as follows: (2) Literature review, (3) Methodology, (4) Results and Discussion, and (5) Conclusion and policy implications. The reproducible R script used for the thematic analysis is provided in Annexure A.

2. Literature Review

2.1. Logistics and the National Economy

The recent developments in academic literature treats logistics as a direct source of national competitiveness. An efficient logistics system reduces transport costs and raises production efficiency while expanding access to foreign markets, and the returns are proportionally greater in emerging economies where marginal improvements in logistics performance translate into comparatively large gains in trade volumes (Rodrigue, 2020).

The empirical record bears this out across regions. For EU member states, Puertas et al. (2014) estimated gravity models across 26 countries and found that logistics performance ranked third among determinants of export flows, behind importer GDP and geographic distance, and consistently mattered more to exporting economies than importing ones (Puertas et al., 2014). This pattern holds beyond Europe. Martí et al. (2014) applied the same gravity model framework to emerging economies across Africa, South America, the Far East and Eastern Europe, finding that each component of the Logistics Performance Index exerted a positive and significant effect on trade volumes, with customs efficiency and logistics competence carrying the greatest weight (Martí et al., 2014). In the Gulf and the wider MENA region, Saidi et al. (2018) confirmed a long-run positive relationship between transport infrastructure and economic growth, finding that well-developed transport systems raise economic activity, attract foreign direct investment, and support broader development across the region (Saidi et al., 2018).

Within this system the vital nodes are seaports and airports. Cargo transfers there and industry clusters there too, as gateway development draws logistics activity and manufacturing toward intermodal corridors while road and rail links extend these benefits inland and reduce spatial disparities between coastal and interior regions (Notteboom and Rodrigue, 2005; Wang et al., 2018). Resilience also runs through the same channels. They can also make the economy more resilient by absorbing the shocks from disruptions more effectively than less connected counterparts and returned to operational stability sooner (Notteboom et al., 2021).

2.2. Ports, Gateways and Competitiveness

Infrastructure policies and projects on expanding the Quay length is only part of the competitiveness. What sustains competitiveness is efficiency and the share of capacity actually used. Because a port that runs below its potential and efficiency may lose traffic to better-managed rivals (Chang and Talley, 2019). Port regionalisation theory extends this argument also to inland. A modern port is the end point of a inland logistics network, so the throughput efficiency also depends on hinterland connectivity and on how well its dry ports are integrated (Notteboom and Rodrigue, 2005). This is due to the fact that dry ports connected by rail to seaports relieve congestion at the quay and shift freight volumes from road to more energy-efficient modes and move customs clearance and consolidation closer to shippers in the hinterland (Roso et al., 2009).

The history of hub ports shows that capacity and policy must move together in a way that gateway status is built through sustained investment aligned with institutional support and integration into global shipping networks. But the competitiveness can be lost to competitors offering better connectivity or lower costs (Notteboom et al., 2021). The competitive frontier has since moved into technology. Port community systems, digital customs clearance and automated cargo handling reduce dwell time, cut documentation errors, and lower the transaction costs that shippers and shipping lines weigh when choosing between ports (Heilig et al., 2017). Cold-chain capability

belongs on the same frontier. A country that cannot offer reliable refrigerated storage and temperature-controlled transport capacity faces significant barriers to exporting perishable food competitively (Zhang and Mohammad, 2024).

2.3. Oman's Logistics Sector

Research on Oman's logistics sector is limited, though it is growing. Mishrif et al. (2024) found that logistics and supply chain activity makes a measurable contribution to Oman's trade performance, with the country's strategic position along major Indian Ocean trade routes providing a structural basis for further integration into global supply chains (Mishrif et al., 2024). The broader MENA evidence is consistent with this: transport infrastructure investment in the region has been shown to attract foreign direct investment and support long-run economic growth, pointing to the same policy lever that SOLS2040 seeks to pull (Saidi et al., 2018). What is missing from the literature is a direct, stakeholder-grounded assessment of whether Oman's gateways can meet the specific targets SOLS2040 has set. This study addresses that gap.

3. Methodology

3.1. Approach

We used a qualitative, interpretive design built on in-depth interviews. The question, how stakeholders read the capacity and prospects of Oman's gateways, is about meaning and judgement rather than measurement, and an interpretive approach is well suited to the rich, contextual detail that quantitative methods tend to miss (Creswell, 2014). The design lets us recover how port authorities, operators and regulators understand the gaps between current capacity and the SOLS2040 vision, and the reasoning behind their decisions.

3.2. Participants and Data Collection

We conducted fifteen semi-structured interviews with senior stakeholders at fifteen organisations, chosen by purposive sampling, a method suited to drawing on people with direct, specialist knowledge of the topic (Palinkas et al., 2015). Three interviews involved two participants each. The organisations spanned the maritime, aviation and land segments and both operational and policy roles, from seaports and dry ports to airports, air-cargo handlers, logistics firms and government bodies. Table 1 lists them by organisation and segment. The spread gives a view that runs from the quay to the cabinet. Fieldwork was carried out during 2022, and interviewing stopped once additional interviews were adding detail rather than new themes.

The interviews followed an open-ended guide covering infrastructure, capacity, future growth and the effect of government policy, with enough structure to keep the conversations comparable and enough freedom to follow new themes as they arose (DiCicco-Bloom and Crabtree, 2006). Interviews were recorded with consent and transcribed for analysis. Individual participants are not named and their job titles are anonymised. Each interview is given a respondent number, and quotations below are attributed to that number and to the organisation.

Table 1: Interview respondents by organisation and segment. Three of the fifteen interviews included two participants.

Segment	Respondent
Port 1 (maritime)	Respondent 1
Port 2 (maritime)	Respondent 2
Port 3 (maritime)	Respondent 3
Port 4 (maritime)	Respondent 4
Aviation 1	Respondent 5
Aviation 2	Respondent 6
Aviation 3	Respondent 7
Aviation 4	Respondent 8
Land transport 1	Respondent 9
Integrated Logistics company 1	Respondent 10
Rail	Respondent 11
Integrated Logistics Company 2	Respondent 12
Government 1	Respondent 13
Government 2	Respondent 14
Government 3	Respondent 15

3.3. Analysis

Transcripts were analysed thematically following the familiar sequence of familiarisation, initial coding, searching for themes, reviewing them, and defining and naming them (Braun and Clarke, 2006). We carried out these phases in a documented R script so the analysis can be repeated. The transcripts were read into a corpus with *quanteda* (Benoit et al., 2018). The initial codes became a dictionary of theme markers. The dictionary was then matched against every transcript. For each theme this gave the number of interviews it appeared in and how often its markers occurred. This count is the coding matrix behind Table 2. We used *tidytext* to find the vocabulary that distinguished each transport segment (Silge and Robinson, 2016). We then fitted a six-topic structural topic model with *stm* to the transcripts split into sentences (Roberts et al., 2019). The topics matched the six themes we had named by hand. The whole pipeline was scripted in R (R Core Team, 2026). The quotations reported below were found through keyword-in-context searches.

3.4. Ethics

Ethical approval was obtained before fieldwork. Participants were told the study's purpose, gave written informed consent, and were free to withdraw. Responses were kept anonymous and confidential, and recordings were stored securely and used only for research.

4. Results and Discussion

4.1. Thematic Findings

Six themes came out of the coding. Table 2 gives each theme with the number of interviews it appeared in and an exemplar quotation. Three themes appear in all fifteen interviews. Hinterland connectivity appears in thirteen. Transshipment exposure and the cold-chain deficit appear in eleven each. The structural topic model returned six topics that matched the themes

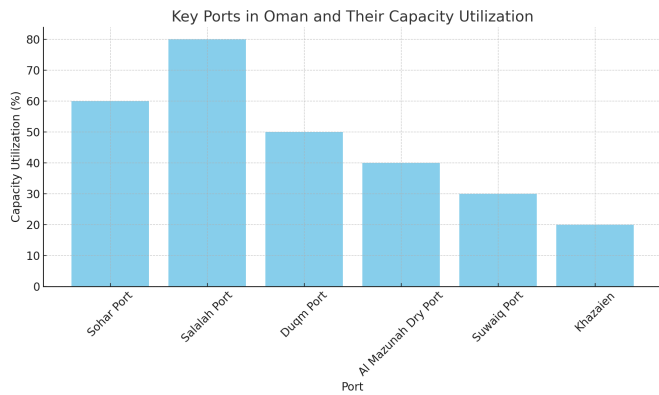


Figure 1: Port capacity utilisation. Indicative values compiled from participant accounts.

Source: Authors, from interview data.

we had named. The subsections below present them in the respondents' own words, attributed by respondent number and organisation.

Government commitment and the realism of SOLS2040:

Every interview affirmed strong state backing for gateway development under Vision 2040. Participants were less sure about the headline target. Respondent 1, called the strategy “very ambitious” and said the ministry needs “to make it more realistic,” adding that current growth “does not [achieve] the initial objectives of the strategy” and should “take the growth in previous years as a base line, otherwise it will be unrealistic.” Respondent 12, pointed to progress on the ground, citing a fastest clearance at Sohar Port of “21 minutes.” Participants asked for the target to be rebased on the ports' actual growth.

Capacity, scale and regional competition: Capacity across the network is uneven. The dry ports at Al Mazunah and Khazaen run well below their potential. Respondent 1 reported “900,000 [TEU] annually, but the capacity is 1.5 million,” and tied the shortfall to scale: “large shipping companies want volume, and the problem is that we are a small country, so it is now relied upon to become a commercial gateway to Saudi Arabia.” Participants repeatedly measured Oman against far larger neighbours, with cargo reaching Oman by road “from Jebel Ali” and alliance traffic concentrated at Jebel Ali, Hamad and Khalifa. Suwaiq is still building out from a small base, and the Khazaen dry port is positioning itself as the inland hub. Figures 1 and 2 show the contrast participants described: Salalah and Sohar near their operational ceilings while Al Mazunah and Khazaen sit well below capacity.

Transshipment dependence and the vessel-size squeeze:

Salalah depends on transshipment. That dependence is its main risk. Respondent 2, described transshipment as “a commodity, it is not a gateway” that “can move to any other part of the world,” naming Colombo, King Abdullah and Jebel Ali as substitutes. Larger vessels add to that risk: “the bigger the ship, the bigger we need to invest in our equipment,” and without that investment “they will divert their ships to another port.” The remedy, Respondent 2 argued, is to anchor a shipping line and grow gateway volume, not only transshipment, so the port

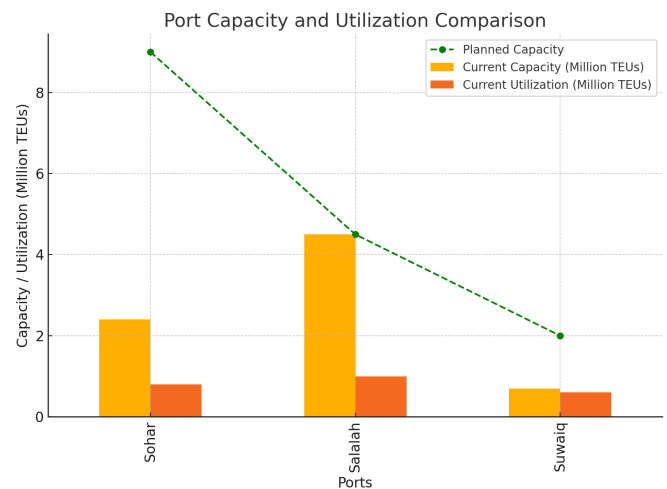


Figure 2: Port capacities and utilisation. Indicative values compiled from participant accounts.

Source: Authors, from interview data.

has cargo that “is coming for Oman.”

The hinterland gap (rail and dry-port integration): After capacity, inland connectivity was the weakness participants raised most often. Respondent 2 described “thousands of trucks going back and forth” over the seventy kilometres from the gypsum quarries, which “destroys our roads,” and saw clear gains from rail. Dry-port integration is incomplete. Respondent 9, said that between Salalah port and the dry port “there is no connection,” and traced the gap to governance: “In Oman, there is no state level towards this supply chain. There should be always somebody in the highest level supervising it.” Respondent 11, framed a planned 2000 kilometre network as “functional and service integration” with regional ports rather than “a competitive perspective.”

The cold-chain and specialised - infrastructure deficit: Food exports depend on cold storage. The country has not built it yet. Respondent 15, stated plainly that “We do not have a complete cold chain in the Sultanate,” and Respondent 10, judged that “the shortage is huge,” citing power and specification costs that deter private investment with no quick return. The current workaround shows the gap. Refrigerated trucks arrive “from Jebel Ali Port” and double as mobile cold storage. The deficit constrains the fish and produce exports that the diversification agenda depends on (Zhang and Mohammad, 2024).

The enabling layer (technology, regulation and human capital): Participants treated soft and regulatory infrastructure as seriously as quay capacity. On technology, Respondent 12, pointed to the Bayan single-window system that “connects all dealers” and a national port community system, with Sohar piloting drones for quay inspection (Heilig et al., 2017). On regulation, Respondent 2 pointed to friction: a one-stop shop that is in practice “with multiple stops,” and Omanisation rates that differ without clear reason, “in Sohar [it] is 15%, Duqm is 10%, Salalah [is] 20%, I do not understand why.” On skills, Respondent 2 captured the sector's youth: “in Oman, logistics is a new

Table 2: Themes, prevalence and exemplar voice.

Theme	n/15	Exemplar
Commitment and SOLS2040 realism	15	“very ambitious ... they must take the growth in previous years as a base line.”
Capacity, scale and competition	15	“we are a small country ... relied upon to become a commercial gateway to Saudi Arabia.”
Transshipment and vessel size	11	“a commodity, it is not a gateway ... can move to any other part of the world.”
Hinterland, rail and dry ports	13	“there is no state level towards this supply chain.”
Cold-chain deficit	11	“We do not have a complete cold chain in the Sultanate.”
Technology, regulation and skills	15	“a one stop shop ... with multiple stops.”

Source: Authors, from the coded interview transcripts.

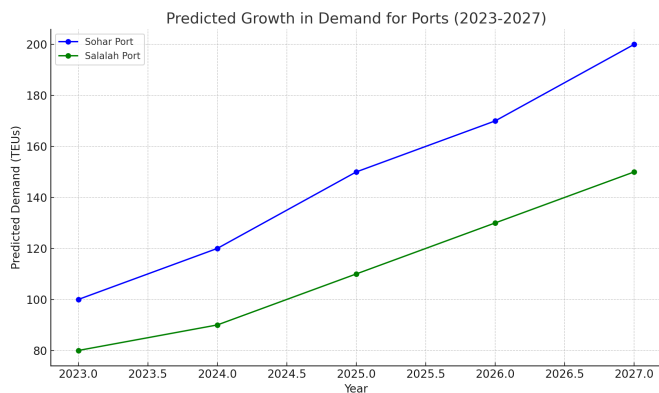


Figure 3: Projected growth in demand at Sohar and Salalah ports. Values are indicative indices compiled from participant accounts rather than measured throughput.

Source: Authors, from interview data.

thing. We are [newcomers], all of us.”

4.2. Projected Demand

Drawing on participants’ reading of historical trends and the recovery in global trade, Figure 3 sets out the expected growth in demand at Sohar and Salalah to 2027. Sohar is projected to rise fastest, in line with its role as the main import and export gateway, followed by Salalah on the strength of its transshipment traffic. Absorbing the projected container and bulk volumes will take added capacity at both ports, and capacity takes years to build, which is the argument for investing ahead of demand rather than chasing it.

4.3. Aligning Capacity with Demand

Behind the headline numbers the interviews keep returning to one difficulty. Capacity, connectivity and regulation have to move in step, and in Oman they have not. The obstacles participants named are gateways running below their potential on

weak supporting infrastructure, the friction that regulation adds, and the pull of larger regional ports, with the slow build-out of cold-chain logistics flagged as a specific gap. Read together, the accounts suggest the foundation is sound. What is missing is lighter regulation and investment aimed at these gaps, rather than more quay for its own sake.

4.4. Discussion

The findings sit comfortably within the wider literature. Competitiveness tracks how well a gateway is used rather than how large it is, which makes Oman’s underused gateways a competitiveness problem as much as a planning one (Chang and Talley, 2019). The hinterland findings bear out port regionalisation. How much throughput a gateway commands is settled inland, by rail links and dry-port integration, and that is why the rail and dry-port agenda matters as much as berth expansion (Notteboom and Rodrigue, 2005; Roso et al., 2009). The cold-chain and technology gaps confirm where the competitive frontier now lies. An economy that wants to export perishable goods and hold the custom of shipping lines has little choice about investing in port community systems, automation and refrigerated logistics (Heilig et al., 2017; Zhang and Mohammad, 2024).

Set against SOLS2040, the problem looks like one of sequencing more than ambition. Expanding Sohar and Salalah is necessary but physical expansion alone will not close the gap. The quay investment pays off only when connectivity and technology and a lighter regulatory environment move alongside it. That sequencing is the harder part of the problem because timing matters in both directions. Capacity built ahead of demand leaves assets underused while interest on the capital accumulates. Capacity that chases demand rather than anticipating it cedes market share to Jebel Ali and Hamad which are already better placed to absorb traffic at scale. The industries sitting behind the ports pay the knock-on price in either case: fish exporters waiting on cold storage and manufacturers waiting on rail connections. What this calls for is something the logistics sector rarely manages well which is sustained coordination between ministries and private operators over an investment cycle that runs well beyond any single budget year.

5. Conclusion and Policy Implications

Oman’s gateways can grow, and Sohar and Salalah will lead that growth, provided capacity and demand are kept aligned. Three priorities emerge from the interviews. Put the idle capacity at Al Mazunah and Khazaen to work by upgrading the two dry ports. Tie the network together with road and rail, above all through the Oman Rail project, so that seaports, dry ports and airports operate as a single intermodal system. And build the cold-chain and technology capability without which a modern trading economy cannot compete.

The policy implications follow directly. The regulatory environment needs to be easier for investors, with clearer and faster processes for developing logistics facilities and incentives for private participation, including a measured review of

Omanisation requirements where they slow capability building. Investment should be steered toward the underused gateways, toward connectivity between land, air and sea, and toward cold-chain logistics, the areas where the return in competitiveness is highest. Handled together, these steps would move Oman closer to the SOLS2040 goal of a globally competitive logistics sector and support the wider shift to a post-oil economy.

Limitations

The study is qualitative and based on fifteen interviews across Oman's logistics and port sector. The depth of the interviews is a strength, but the findings are not statistically generalisable, and a broader, cross-regional sample would allow Oman's gateways to be benchmarked against other global gateways. The capacity and utilisation figures are indicative, drawn from participant accounts rather than a single audited source, so they should be read as the shape of the problem rather than precise measurements. Future work could combine this stakeholder view with throughput and cost data to test the demand projections quantitatively.

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Annexure A: Reproducible analysis script

For traceability and reproducibility, the full R script that produced the thematic analysis is reproduced below (`thematic_analysis.R`). It converts the interview transcripts to text, builds the corpus, applies the theme dictionary that gives the coding matrix, derives the segment vocabulary, fits the structural topic model, and locates the quotations through keyword-in-context searches. The interview transcripts are confidential and are not distributed with this paper. Setting the transcript path and running the script against the .docx files reproduces every result reported in Section 4 and Table 2.

```

1  # thematic_analysis.R
2  # Reproducible thematic analysis of the Oman logistics-gateway interviews.
3  # Pipeline: pandoc (docx to text) -> quanteda (corpus, cleaning, dictionary
4  # coding, keyness) -> tidytext (distinctive terms by sector) -> stm (data-driven
5  # topic check). Implements the Braun and Clarke (2006) phases in an auditable,
6  # script-based form, replacing the manual NVivo workflow described earlier.
7  #
8  # The interview transcripts are confidential. They are NOT distributed with the
9  # manuscript. Point 'transcript_dir' at the local folder of .docx files to
10 # reproduce. Only aggregate outputs (theme prevalence, term lists) are written.
11
12 suppressPackageStartupMessages({
13   library(quanteda)
14   library(quanteda.textstats)
15   library(tidytext)
16   library(dplyr)
17   library(stringr)
18   library(tidyr)
19   library(stm)
20 })
21
22 set.seed(2024)
23
24 transcript_dir <- Sys.getenv(
25   "MS5_TRANSCRIPTS",
26   unset = "fwtheinterviewset"
27 )
28 stopifnot(dir.exists(transcript_dir))
29
30 # --- 1. Convert .docx to plain text with pandoc -----
31 docx <- list.files(transcript_dir, pattern = "\\\\.docx$", full.names = TRUE)
32 stopifnot(length(docx) > 0)
33 txt_dir <- file.path(tempdir(), "ms5_txt")
34 dir.create(txt_dir, showWarnings = FALSE)
35
36 read_docx_text <- function(path) {
37   out <- file.path(txt_dir, paste0(tools::file_path_sans_ext(basename(path)), ".txt"))
38   system2("pandoc", c(shQuote(path), "-t", "plain", "-o", shQuote(out)))
39   paste(readLines(out, warn = FALSE), collapse = "\n")
40 }
41 raw <- vapply(docx, read_docx_text, character(1))
42
43 # --- 2. Metadata: organisation and transport segment -----
44 # Anonymised at the individual level; organisation and sector are retained
45 # because the manuscript already discusses gateways by name.
46 # Patterns match the original .docx file names. Order matters: more specific
47 # patterns ("Airports") precede substrings ("Oman Air").
48 key <- tibble::tribble(
49   ~file_match,      ~org,                      ~sector,
50   "Sohar Port",     "Sohar Port",          "Maritime",
51   "Salalah",        "Salalah Port",        "Maritime",
52   "Suwaiq",         "Suwaiq Port",         "Maritime",
53   "Hutchison",      "Hutchison Ports Sohar", "Maritime",
54   "ASYAD",          "ASYAD / Oman Logistics", "Government",
55   "Mazunah",        "Al Mazunah dry port",  "Land",
56   "AlMadina",       "Al Madina Logistics",  "Land",
57   "Logistic Center", "Oman Logistics Centre", "Government",
58   "Port Development", "Ministry: Port Dev.",  "Government",
59   "Land transportation", "Ministry: Land Transport", "Government",
60   "Airports",       "Oman Airports",        "Aviation",
61   "Oman Air\\)",    "Oman Air",             "Aviation",
62   "Oman Rail",      "Oman Rail",            "Land",
63   "Transom",        "Transom",              "Aviation",
64   "CAA",            "Civil Aviation Authority", "Aviation"
65 )
66
67 match_org <- function(fname) {
68   hit <- which(vapply(key$file_match, function(p) grepl(p, fname), logical(1)))
69   if (length(hit) == 0) return(data.frame(org = NA_character_, sector = NA_character_))
70   key[hit[1], c("org", "sector")]
71 }
72
73 meta <- do.call(rbind, lapply(basename(docx), match_org))
74 if (anyNA(meta$org)) {
75   stop("Unmatched files: ", paste(basename(docx)[is.na(meta$org)], collapse = ", "))
76 }
77
78 doc_df <- data.frame(text = unname(raw), org = meta$org, sector = meta$sector,

```



```

76         stringsAsFactors = FALSE)
77 cat("Interviews read:", nrow(doc_df), "\n")
78 print(table(doc_df$sector))
79
80 # --- 3. Build and clean the corpus -----
81 corp <- corpus(doc_df, text_field = "text")
82 docnames(corp) <- doc_df$org
83
84 # Interview-protocol artefacts and domain-neutral fillers to drop
85 extra_stop <- c("q", "a", "yeah", "okay", "ok", "mr", "ms", "miss", "interview",
86               "introduction", "us", "can", "tell", "please", "thank", "think",
87               "know", "like", "just", "also", "now", "one", "two", "etc",
88               "oman", "omani", "sultanate", "port", "ports")
89
90 toks <- corp |>
91   tokens(remove_punct = TRUE, remove_numbers = TRUE, remove_symbols = TRUE) |>
92   tokens_tolower() |>
93   tokens_remove(c(stopwords("en"), extra_stop)) |>
94   tokens_keep(min_nchar = 3)
95
96 dfm_all <- dfm(toks)
97 cat("\nTop 25 terms overall:\n")
98 print(textstat_frequency(dfm_all, n = 25))
99
100 # --- 4. Dictionary coding: the six themes (auditable, reproducible) -----
101 themes <- dictionary(list(
102   'T1 Commitment and SOLS2040 realism' =
103     c("strategy*", "2040", "sols*", "vision", "ambitio*", "realistic", "target*",
104       "diversif*", "government"),
105   'T2 Capacity, scale and competition' =
106     c("capacity", "teu*", "throughput", "utilis*", "underused", "expansion",
107       "volume*", "scale", "compet*", "jebel", "hamad", "khalifa", "dubai",
108       "neighbour*"),
109   'T3 Transshipment and vessel size' =
110     c("tranship*", "transship*", "feeder", "vessel*", "ship size", "bigger ship*",
111       "maersk", "concession", "gateway"),
112   'T4 Hinterland, rail and dry ports' =
113     c("rail*", "railway*", "hinterland", "dry port*", "khazaen", "mazunah",
114       "connectivity", "road*", "truck*", "multimodal", "intermodal", "network"),
115   'T5 Cold chain and specialised infrastructure' =
116     c("cold chain", "cold", "refrigerat*", "reefer", "perishable", "fish*",
117       "warehouse*", "storage", "specialis*", "bulk"),
118   'T6 Technology, regulation and human capital' =
119     c("technolog*", "bayan", "community system", "blockchain", "automat*",
120       "digital*", "customs", "regulat*", "bureaucra*", "omanis*", "omaniz*",
121       "license*", "permit*", "training", "skill*", "graduate*", "fee*")
122 ))
123
124 theme_dfm <- dfm_lookup(dfm_all, dictionary = themes)
125 coding <- convert(theme_dfm, to = "data.frame")
126 names(coding)[1] <- "org"
127 cat("\nTheme mentions per interview (coding matrix):\n")
128 print(coding)
129
130 prevalence <- tibble(
131   theme = colnames(theme_dfm),
132   interviews_present = colSums(as.matrix(theme_dfm) > 0),
133   total_mentions = colSums(as.matrix(theme_dfm))
134 ) |>
135   arrange(desc(interviews_present))
136 cat("\nTheme prevalence (of", ndoc(corp), "interviews):\n")
137 print(prevalence)
138 write.csv(prevalence, "theme_prevalence.csv", row.names = FALSE)
139
140 # --- 5. Distinctive terms by transport segment (tidytext tf-idf) -----
141 tidy_terms <- tidy(dfm_all) |>
142   left_join(tibble(document = doc_df$org, sector = doc_df$sector), by = "document")
143 sector_tfidf <- tidy_terms |>
144   count(sector, term, wt = count, name = "n") |>
145   bind_tf_idf(term, sector, n) |>
146   group_by(sector) |>
147   slice_max(tf_idf, n = 8, with_ties = FALSE) |>
148   arrange(sector, desc(tf_idf))
149 cat("\nMost distinctive terms by segment (tf-idf):\n")
150 print(sector_tfidf, n = 40)
151
152 # --- 6. Data-driven topic check (stm on sentence units) -----
153 sent <- corpus_reshape(corp, to = "sentences")
154 sent_toks <- sent |>
155   tokens(remove_punct = TRUE, remove_numbers = TRUE, remove_symbols = TRUE) |>
156   tokens_tolower() |>
157   tokens_remove(c(stopwords("en"), extra_stop)) |>
158   tokens_keep(min_nchar = 3)
159 sent_dfm <- dfm(sent_toks) |>
160   dfm_trim(min_termfreq = 5, min_docfreq = 3)

```



```

61 sent_dfm <- dfm_subset(sent_dfm, ntoken(sent_dfm) > 2)
62 cat("\nSentence units for stm:", ndoc(sent_dfm), "\n")
63
64 stm_in <- convert(sent_dfm, to = "stm")
65 fit <- stm(documents = stm_in$documents, vocab = stm_in$vocab,
66           K = 6, max.em.its = 75, init.type = "Spectral",
67           verbose = FALSE)
68 cat("\nData-driven topics (FREX terms), as a cross-check on the six themes:\n")
69 print(labelTopics(fit, n = 8))
70
71 # --- 7. Concordances: locate representative verbatim quotes -----
72 quote_terms <- c("tranship*", "cold chain", "hinterland", "bayan", "ambitio*",
73                 "underused", "jebel")
74 for (q in quote_terms) {
75   cat("\n=== KWIC:", q, "===\n")
76   print(head(kwic(toks, pattern = phrase(q), window = 12), 4))
77 }
78
79 cat("\nDone. Wrote theme_prevalence.csv.\n")

```