

Evolving Customized Service Models and the Role of Dynamic Capabilities in Global National Meteorological Services: A Systematic Literature Review

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ABSTRACT

National Meteorological Services (NMSs) are increasingly moving beyond their traditional role as publicly funded providers of weather and climate information to deliver customized meteorological services tailored to specific sectors and users. This shift is driven by rising demand for sector-specific climate information, fiscal pressures on public funding, technological advancements, and the growing presence of private weather service providers. This study conducts a systematic literature review to examine how NMSs are evolving their service business models and to analyze the role of dynamic capabilities—specifically sensing, seizing, and transforming—in enabling these organizations to adapt effectively. Following the PRISMA 2020 guidelines, relevant studies published between 2015 and 2025 were identified through Scopus and Google Scholar and analyzed using bibliometric techniques and integrative qualitative synthesis. In addition, a comparative content analysis of official NMS websites across developed, developing, and least developed countries was undertaken to capture real-world service delivery models. The findings reveal that while most NMSs continue to prioritize public service mandates, a growing number are adopting hybrid business models—such as cost-recovery schemes, public–private partnerships, and state-owned enterprise structures—to support customized services. The literature further indicates that dynamic capabilities play a critical role in this transition by enabling NMSs to identify emerging user needs, mobilize organizational and technological resources, and reconfigure service delivery arrangements under regulatory constraints. However, empirical research explicitly linking dynamic capabilities to business model adaptation in NMSs remains limited. This review contributes by synthesizing fragmented insights across public sector, digital government, and service innovation literature, and by highlighting key gaps for future research on strategic transformation in public meteorological institutions.

Keywords: Dynamic Capabilities; Business Model; National Meteorological Services; Customized Services; Systematic Literature Review

INTRODUCTION

The global meteorological landscape is undergoing a paradigmatic shift. National Meteorological and Hydrological Services (NMSs), historically established as publicly funded entities mandated to provide weather and climate information as free public goods, are increasingly expected to operate as hybrid organizations that balance public service obligations with commercial agility. This transformation is not merely operational but structural, demanding fundamental changes to the business models that underpin service delivery. Driven by factors such as increased demand from diverse economic sectors, governmental pressures for efficiency and revenue generation, rapid technological advancements, and the rise of a

vibrant private weather industry, NMSs worldwide are becoming more involved in delivering commercial and customized meteorological services. The United Kingdom's National Meteorological Service, the Met Office (MO), is one example of a national meteorological service that has transformed into a commercial provider of weather and climatological services in the United Kingdom (Carminati et al., 2018; Hall, 2015; Hewitt, 2020; Kain et al., 2017; Ross & Packman, 2025). The World Meteorological Organization (WMO), as the UN's specialized agency for climate, weather, and water, has also facilitated this transformation through its programs—such as the Public Weather Services Programme—by providing mechanisms for data exchange and capacity-building initiatives to enhance the capabilities of its members.

The traditional perception of NMSs as providers of free public goods is increasingly outdated. Various factors have driven a shift toward a more diversified range of services offered by NMSs. These include constraints on public funding, governmental reforms promoting commercially oriented approaches, the demonstrated economic benefits of tailored weather information in sectors such as agriculture, energy, and transportation, as well as advancements in observation technologies, modeling, and data dissemination. Bruno Soares et al. emphasize that accessible and actionable climate information is vital for helping communities prepare for and adapt to the impacts of climate change. Reliable climate data play a crucial role in supporting decision-making across climate-sensitive sectors, and tailoring this information to user-specific needs is equally essential. Numerous industries—including transportation, agriculture, and mining—depend heavily on accurate weather and climate data. For instance, meteorological information is critical for aviation, where adverse weather conditions can disrupt both ground and in-flight operations. Similarly, Diaz et al. highlight that mining operations use meteorological data not only for daily management but also to improve ventilation system efficiency and guide long-term planning.

Climate change has led to significant shifts in global weather patterns, intensifying the need for reliable weather and climate information—particularly in climate-sensitive sectors. Data from BMKG illustrate this trend: a marked transition from cooler tones in the 1980s and early 2000s to warmer tones from 2013 onward. This visual evidence is reinforced by temperature records, with 2024 recorded as the hottest year on record, showing a +0.8°C anomaly above the 1991–2020 average. Furthermore, the increasing frequency of extreme events—such as floods, storms, and other weather-related disasters—over the past 15 to 20 years reflects an upward trend in climate-related risks. The United States has recognized that as much as one-third of its gross domestic product depends on accurate weather and climate information. These developments underscore the growing importance of accessible and reliable meteorological data to support planning and risk management across vulnerable sectors, including agriculture, transportation, mining, and public health.

This shift necessitates a review of NMS operating models and strategic orientations. It is crucial to understand how NMSs navigate this evolving environment to deliver customized services through various models, including direct provision, cost-recovery mechanisms, and Public–Private Partnerships (PPPs). Furthermore, the ability of NMSs to adapt and innovate within this dynamic context is pivotal. Customized services in this context refer to non-public meteorological products specifically designed to meet the specialized needs of private companies or industries.

This research gap is both academically significant and practically urgent. The World Meteorological Organization (WMO) has actively encouraged its 193 member states to develop sustainable service delivery models but provides limited guidance on the organizational capabilities required to implement such strategies (WMO, 2021). Consequently, NMS leaders are navigating complex transformations without a robust evidence base. The increasing presence of private-sector weather service providers further complicates this landscape, creating competition in areas such as data monetization, talent acquisition, and even public trust (Agenda, 2015; Florio, 2023; Michael, 2024; Pennington, 2024; Stankovich & Neftenov, 2022).

The development or renewal of an organization's business model can be interpreted through the lens of Dynamic Capabilities, which refer to its capacity to identify emerging opportunities and threats, act upon them decisively, and reorganize its resources to maintain relevance. Within this framework, shaping or adjusting a business model is not a one-time decision but an ongoing, capability-driven process aimed at keeping the organization's value-creation system aligned with technological and market changes (Chitamba, 2025; Eisner & Ranåsen, 2025; Henry-Machame, 2023; Larabi, 2025; Wraae, 2025). Scholars have introduced the notion of "business model innovation capability" to describe this ability, emphasizing its importance in enabling organizations to continually refine their value propositions and revenue structures in turbulent environments. Such renewal often relies on iterative cycles of experimentation, learning, and the strategic coordination of complementary assets—echoing the sensing–seizing–transforming mechanisms proposed within the Dynamic Capabilities framework (Sheng, 2017; Teece, 2019; Zungu & Laryea, 2025). Empirical evidence shows that organizations proficient in these capabilities are more effective at crafting, adapting, and expanding innovative business models, thereby strengthening their competitive advantage under volatile conditions.

This literature review aims to synthesize current knowledge on two interconnected themes: (1) the evolving business models through which NMSs deliver customized meteorological services, and (2) the role of Dynamic Capabilities—specifically an organization's ability to sense, seize, and transform in response to environmental changes—in enabling NMSs to develop and adapt their business models effectively. This review explores the changing landscape of service provision by examining the types of customized services offered across selected NMSs and analyzing how dynamic capabilities underpin strategic adaptation within these institutions. Finally, it discusses prevailing challenges and identifies directions for future research on strategic transformation in public meteorological organizations.

METHOD

This study employs a Systematic Literature Review (SLR) approach. Data were collected by selecting relevant journal articles based on the following inclusion criteria: (1) published between 2015 and 2025; (2) published in reputable, Scopus-indexed international journals; and (3) focused on the topic of evolving customized service business models and the role of dynamic capabilities within global National Meteorological Services (NMSs). Sources were identified primarily through searches in the Scopus database. Relevant literature from Google Scholar was also reviewed to provide additional insights. The literature search in

Scopus was conducted on 24 June 2025 using predefined search terms related to the topics of interest—such as “dynamic capability/ies,” “business model,” and “government”—within the article title, abstract, and keywords fields. Boolean operator “AND” was applied to refine search queries and ensure comprehensive coverage of relevant literature.

The data extraction process included collecting relevant bibliographic information from the selected publications, such as citation details (author(s), document title, year, EID, source title, volume, issue, pages, citation count, source and document type, publication stage, DOI, and open-access status). Additional bibliographical information—such as affiliations, serial identifiers (e.g., ISSN), PubMed ID, publisher, editor(s), language of the original document, correspondence address, and abbreviated source title—was also recorded. Abstracts, author-provided keywords, indexed keywords, and reference lists were likewise extracted and systematically organized in a structured database or spreadsheet in CSV format.

This study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure a transparent, replicable, and methodologically rigorous review process. Figure 1 illustrates the PRISMA flow diagram representing the study’s screening process, based on a Scopus search using the keywords “business model” AND “dynamic capability/ies” AND “government.” An integrative literature review approach was employed to synthesize and critically evaluate existing knowledge, aiming to develop a conceptual framework that explains the interaction between business models, dynamic capabilities, and government (public institutions) in service delivery.

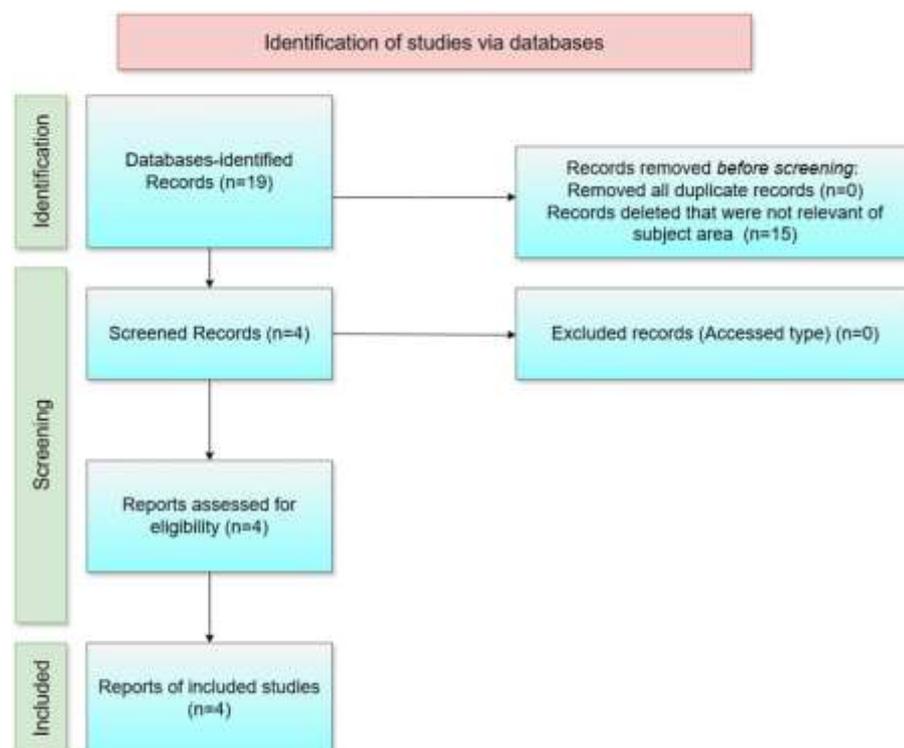


Figure 1. The PRISMA flow diagram of the Study

An advanced bibliometric software, VOSviewer, was employed to visualize and analyze the data effectively. VOSviewer constructs and displays bibliometric-based networks, allowing researchers to explore relationships among authors, keywords, and publications. Through

cluster analysis and temporal mapping, it becomes possible to identify emerging research areas and shifts in scholarly focus over time. The network visualization feature also highlights key authors and contributors within a specific field. As a widely adopted tool for bibliometric analysis, VOSviewer facilitates the exploration of scholarly relationships, the identification of influential works, and the detection of emerging or underexplored areas in the literature.

In addition to academic sources, a content analysis of official NMS websites and relevant articles was conducted to examine customized service business models adopted by national meteorological agencies worldwide. The organizational structures and service delivery models of several National Meteorological Services (NMSs) across various regions were reviewed. Data were collected from the official websites of selected countries, representing least developed, developing, and developed economies.

RESULTS AND DISCUSSION

The findings showed the conclusions of a combined analysis of the four chosen studies. The important concepts or earlier theoretical frameworks that have been employed by other academics were described. The review outcomes of the publications selected using the inclusion and exclusion criteria were displayed in Table 1.

Table 1. Selected Articles

No	Title	Author	Method	Data collection and Analysis Method	Key Finding
1	Passengers, citizens, customers: London transport transformed 1977–1987 [14]	James Fowler (University of Essex Business School, Colchester, UK) Roy Edwards (University of Southampton Business School, Southampton, UK)	Qualitative case study Based on historical narrative analysis Supported by archival research and interviews Framed conceptually using business model and dynamic capabilities theories	Primary sources: - Transport for London archive (annual reports, consultancy reports, strategy documents) - London Metropolitan Archive (minutes from Transport Committee, planning documents) - National Archives (ministerial briefings, financial data, performance indicators) - Hansard and national newspapers (external perspectives) - Semi-structured interviews with	Transformation succeeded through: - Shifting from enterprise-level planning to product-level sensing of demand - Introducing market mechanisms and commercial imperatives within a public monopoly Passengers began to be seen as customers rather than just citizens The transformation was shaped both by political changes (e.g., Thatcher government, GLC leadership

No	Title	Author	Method	Data collection and Analysis Method	Key Finding
				former London Transport managers (arranged via Friends of the London Transport Museum) Triangulation: - Compared different sources and perspectives (documentary evidence vs interviews) - Used this to reconstruct “thick” historical description and test against theoretical models (e.g., dynamic capabilities, utility vs. cost minimization)	shifts) and internal management adaptation
2	Governing digital platform power for industrial development: towards an entrepreneurial-regulatory state [15]	Antonio Andreoni – SOAS University of London, and University of Johannesburg Simon Roberts – University of Johannesburg; Centre for Competition, Regulation and Economic Development	theoretical and conceptual, supported by: - Extensive literature review - Analytical framework development - Theory-building rather than data-driven hypothesis testing It also contains a policy-oriented application of the framework (e.g., in the context of South Africa), but this is illustrative — not based on empirical case	No primary data collection Data sources: Extensive literature review, including: - Theories of monopoly capitalism - Digital platforms and market power - Industrial and competition policy Analysis: - Conceptual development of a triangular framework linking platform functions, power, and value creation/capture - Policy-focused application, particularly in	Digital platforms concentrate power due to: - Network effects, data aggregation, and global reach Middle-income countries face a "middle-income technology trap" without proactive state involvement Traditional competition policy is insufficient; instead: - States must shape markets and regulate platforms - Policy must be dynamic, cross-sectoral, and

No	Title	Author	Method	Data collection and Analysis Method	Key Finding
			study data or field research.	middle-income countries - Uses the South African case to illustrate framework application	development-focused Only through strategic alignment of industrial and competition policy can local capabilities and value capture be supported
3	Digital Government: Business Model Development for Public Value Creation – A Dynamic Capabilities Based Framework [16]	Bernd W. Wirtz Paul F. Langer Florian W. Schmidt	Conceptual / theoretical study Not empirical; based on synthesis of literature and theoretical reasoning	Collected and reviewed existing conceptual studies and theoretical frameworks in: - Business model theory in the public sector - Dynamic capabilities (sensing, seizing, transforming) - Public value creation Analyzed by integrating and mapping these concepts into a new conceptual framework Developed a step-by-step process for business model development in digital government	Applying business model thinking and dynamic capabilities in public sector context helps: - Align digital services with changing user expectations - Increase operational readiness - Focus government digital transformation on public value, not just efficiency
4	Dynamic capabilities in e-health innovation: Implications for policies [17]	Niels Frederik Garmann-Johnsen (University of Agder & Agderforskning Research Institute, Norway) Tom Roar Eikebrokk	Mixed method study: Extensive literature review to identify critical success factors (CSFs) in collaborative e-health BPM	Literature review: - Searched multiple databases → 50 articles identified; extracted 36 CSFs grouped into 8 main concepts Operationalized concepts using	Bottom-up learning in local e-health pilots is essential but must be combined with structured top-down governance to scale and sustain innovation

No	Title	Author	Method	Data collection and Analysis Method	Key Finding
		(University of Agder, Norway)	Qualitative cross-sectional case study through semi-structured interviews	dynamic capabilities view (DCV) and process orientation framework Conducted semi-structured interviews with managers from 3 Norwegian municipal e-health networks (Easttowns, Fjordbanks, Rivervalley) Transcribed, coded (using NVivo10), and analyzed interviews both top-down (predefined concepts) and bottom-up (emergent codes) Developed and validated a conceptual performance model for e-health collaborations	The national government must provide clear policies, financing models, and digital infrastructure to enable success Process orientation and alliance orientation, supported by organizational learning, enhance dynamic capabilities and performance Larger networks have more resources and higher innovation capacity, but effective inter-municipal collaboration can partly substitute for size

The bibliometric analysis using VOSviewer on Scopus literature from 2015 to 2025 provides a comprehensive view of the evolving research landscape on “business models” and “dynamic capabilities” (figure 2). While much of the research is centered around private-sector innovation, sustainability, and digital transformation, this body of literature offers valuable insights for public sector application. The centrality of “dynamic capabilities” and “business model innovation” in the network indicates a robust foundation for understanding how organizations can adapt, learn, and reconfigure resources in response to changing environments—principles that are equally relevant for government institutions facing pressures for reform, efficiency, and digital governance. Clusters such as “digital transformation,” “innovation,” and “sustainable performance” reflect themes increasingly important in the public sector, particularly as governments strive for improved service delivery and transparency. Although direct studies on government settings may be limited, the theoretical frameworks and practical approaches discussed in this literature—especially those involving strategic flexibility, data-driven transformation, and cross-sector innovation—can be adapted

to the context of public institutions. This analysis highlights an opportunity to bridge the current knowledge gap by applying dynamic capability theory to redesign or innovate government business models, especially in areas such as smart governance, citizen-centered services, and sustainable policy implementation.

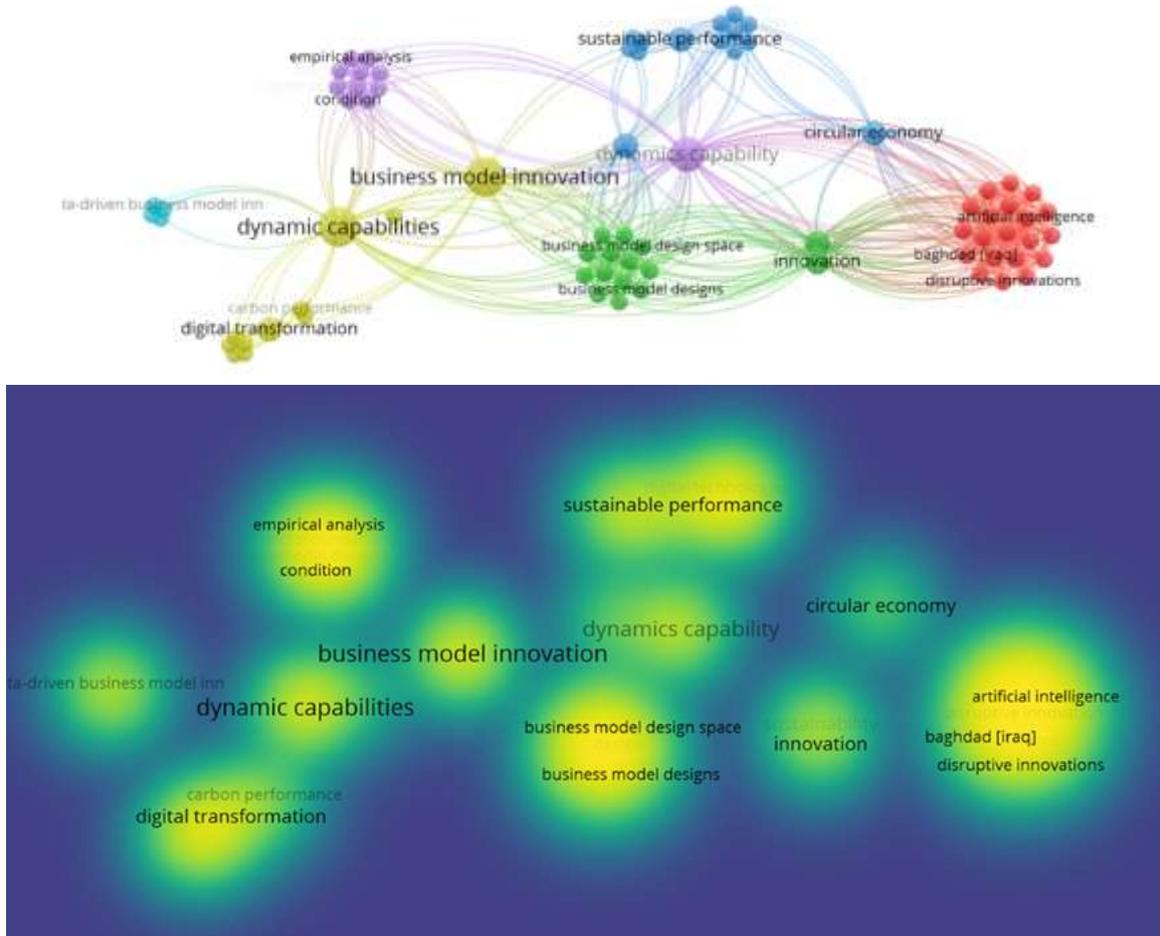


Figure 2. Co-occurrence by All Keyword – using Two Keywords

The VOSviewer analysis of Scopus literature (2015–2025) on “business model” and “dynamic capabilities,” with the addition of “government,” reveals a growing but still limited focus on public sector applications (figure 3). While clusters around dynamic capabilities, digital transformation, and business model innovation remain central, government-related terms are more peripheral, indicating an emerging but underdeveloped research area. Connections to themes like entrepreneurship, business development, and monopoly suggest interest in applying private-sector models to public institutions. However, the fragmented presence of government topics highlights a gap and opportunity to further explore how dynamic capabilities can support innovation and transformation in the public sector.

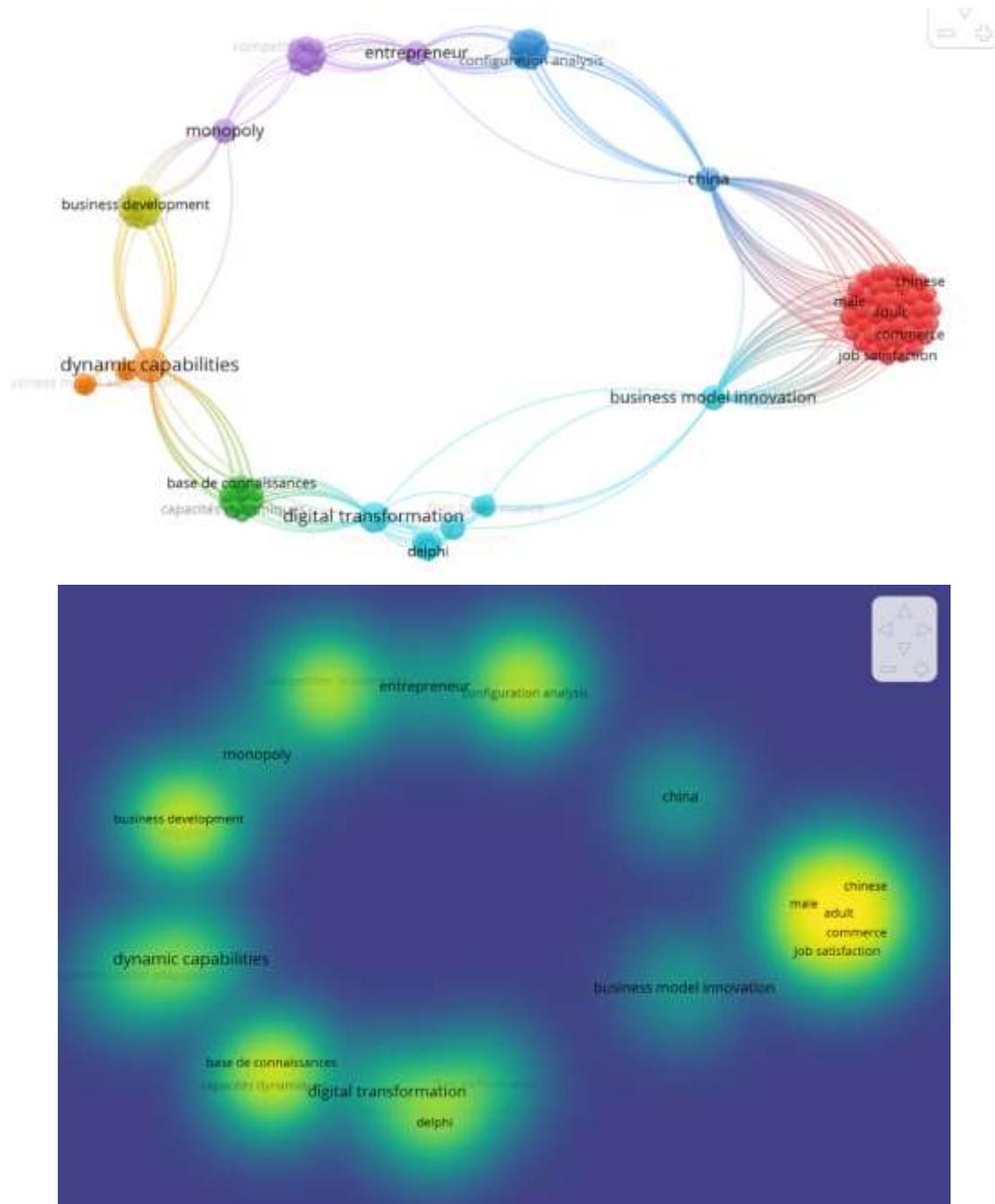


Figure 3. Co-occurrence by All Keyword – using Three Keywords

In many cases—such as Indonesia’s BMKG—the NMS operates as the sole provider of public weather information. However, the scope of customized services differs among countries. In Indonesia, BMKG is authorized to provide both public and customized services, but only on a cost-recovery basis and not for profit, unless otherwise regulated by law. Similarly, in Japan and China, the Japan Meteorological Agency and China Meteorological Administration are restricted from offering commercial weather services and may only provide tailored services under cost-recovery frameworks. In contrast, NMSs in developed countries such as the United Kingdom and New Zealand function as state-owned enterprises and are permitted to offer commercial services. Table 2 outlines the organizational setups and service approaches of selected NMSs. Additionally, countries like Japan, China, and the United States

allow private sector companies to freely engage in commercial meteorological activities, creating a clearer distinction between public and private service roles.

Table 2. Organizational Setups and Service Approaches of Commercial Meteorological Activities

	Mozambique Institute of Meteorology (https://www.inam.gov.mz/)	Solomon Islands Government Meteorological Services Division (http://www.mecdm.gov.sb/about-us/divisions/meteorological-services.html and https://met.gov.sb/)	BMKG Indonesia (https://bmkg.go.id/)	Japan Meteorological Agency (https://www.jma.go.jp/ and https://www.jmbasc.or.jp/)	China Meteorological Administration (https://www.cma.gov.cn/)	New Zealand Met Service (https://abouthowmet.nz/)	UK Met Office (https://www.metoffice.gov.uk/)
Organizational Setup	The Minister in charge of meteorology supervises the National Institute of Meteorology, or INAM for short, a public technical-scientific organization with administrative autonomy and legal identity. INAM functions with three Regional	A division of the Solomon Islands Government of Environment, Climate Change, Disaster Management and Meteorology is the Solomon Islands Government Meteorological Service Division. Operated by the Meteorolog	The Republic of Indonesia's Agency for Meteorology, Climatology, and Geophysics (Badan Meteorologi, Klimatologi, dan Geofisika/BMKG) is a non-ministerial government agency tasked with carrying out government responsibilities in the domains of meteorology	Direct supervision of JMA is administered by the Minister of Land, Infrastructure, Transport and Tourism. The government entirely funds the functioning of JMA.	China Meteorological Administration (CMA) is a direct department of the State Council of the People's Republic of China and has long been a public service organization. Under State Council approval, CMA has been in charge of	Established under the State-Owned Enterprises Act 1986 (SOE Act), MetService was incorporated under the Companies Act 1993. The Crown, Ministers of Finance and State-Owned Enterprises, is the sole shareholder in MetService. For	Owned by the Department for Science, Innovation and Technology, the Met Office is a government trading fund agency. They offer services to both the business and the public sectors. Delivering the Public Weather Service (PWS) for the United Kingdom is

Forecasting Centers in Nampula, Sofala, and Gaza, all of which are technically, financially, and administratively dependent on the headquarters. Its headquarters are located in the city of Maputo.	ical Act 1985, the SIMS is designated as an essential service under the Essential Services Act. Providing pertinent meteorological information about all facets of national progress, daily activities, and security to the government, private sector, and general people of the Solomon Islands is one of SIMS's main responsibilities. These tasks are carried out by SIMS's function structure under these service components :	, climatology, air quality, and geophysics in compliance with relevant laws and regulations.	the overall organizational and operational management of the national meteorological services. All meteorological institutions within the CMA framework adhere to the administrative system of hierarchical administration and the dual leaderships exercised by the CMA and local governments, with the former serving as the core, under the unified directives.	carrying out the duties assigned to them by the SOE Act, each Minister answers to the House of Representatives. The MetService Board, in turn, answers to the Shareholding Ministers for guaranteeing efficient corporate governance throughout the MetService Group. The 'Owner's Expectations Manual' (available on the Treasury website) and the annual letters of expectations delivered to each SOE include the expectations of the Ministers.	their primary responsibility. Their Public Ask as the National Meteorological Service of the United Kingdom is fulfilled through the PWS.
	1. Technical and Instrumentation;		Operating as the competent agency for meteorology under the State Council of the People's Republic		

		2. Policy and Administration;					of China, CMA is a regulator, service-provider, and operator in weather and climate information and warning services areas
		3. Observations and Monitoring					
		4. Predicting					
		5. Ocean and Climate Services					
		6. The training					
Product	Seasonal climate forecast; public, naval, aeronautics, and other related services weather/meteorological forecast; monthly certificates and time attestations issued; meteorological bulletin production and distribution ; gathering and making available meteorological data for various uses; calibration and measurement of meteorological equipment;	Within the services are: 1. Warnings : tropical cyclone, tsunami, strong wind, heavy rain, surge advise 2. Forecasts of the weather: weekly outlook, marine and public forecasts 3. TAF3/TAF, ARFOR, sigmet, WAF – ICAO Area F, Solomon Area QNH 4. Weather observation services:	Information Services and Other Services are the two categories of BMKG Services. Information services include customised information services and public information services; consultation and calibration services are other offerings. Routine Information: a. Weather forecasts; b. Seasonal forecasts; c. Sea wave height forecasts; d. Forecasts of possible	Public Services: Land, sea, and aviation observations and forecasts; tropical cyclones; earthquakes ; tsunamis; volcanoes. Additional services (with the cost recovery tariff which makes the tariff essentially free): 1. All JMA data, products, and information (including the gridded data of NWP	Including sky-, space-, and ground-based subsystems , an integrated atmospheric monitoring system encompassing comparatively comprehensive meteorological elements, including regionally balanced station sites, has been established in China. The meteorological service system of CMA comprises	Public Services: MetService offers publicly available marine forecasts together with alerts of dangerous weather that may impact land areas, including mountain forecasts and short forecasts for New Zealand. Commercial Services: MetService offers businesses in the energy, media, transport, industry, infrastruc	Operational forecasts, statistics, research, and consultancy services are offered by the UK Met Office. Protection of life, infrastructure, and the environment depends on their services. Government, transportation, business sector, data, consultancy and research, insight, and training services are among its offerings.

and consulting in the various meteorological disciplines and applications are among the services offered.	pilot briefing, metar/speci, automatic weather station (AWS) report, weather update 5. Climate and ocean services: early action rainfall, ENSO forecast, malaria early warning, three months rainfall prediction, climate data portal, climate trends – data portal link, airport climatology, traditional knowledge, climate information; SI climate in brief	forest or land fires; e. Information on air quality; f. Information on tectonic earthquakes g. Information on earth magnetic; h. Information on time signals; and i. Information on air electrical. Early Warning: Tsunami; extreme weather; extreme climate; dangerous sea waves. Customized Information Services include: a. weather information for aviation; b. weather information for shipping; c. weather information for offshore drilling; d. climate information for agro-industry;	created by JMA) are transmitted to customer s in real time, within seconds, by JMBSC's 24/7 dissemination services to the commercial sector. The mass media, commercial organizations across a range of industries, research communities, and approved forecast service providers are among the main customers of the distribution services. In 2014, there were more than 300 users of the data distribution	of the following: weather forecast, climate prediction, weather modification, monitoring and forecasting of drought and floods, lightning and thunderstorm prevention, agro-meteorology and eco-meteorology, exploitation of climate resources, etc. Among the many industries or agencies that CMA serves are agriculture, fisheries, commercial business, energy, transportation, building industry, water conservancy, land and natural resources, oceanography, salt-	re, and retail sectors a competitive advantage with its commercial weather solutions, which are supported by meteorological knowledge, technical innovation, and operational excellence. Products and services offered by MetService support: 1. Airlines and transportation authorities in maintaining safe roads and aircraft in the sky. 2. Energy suppliers in guaranteeing that families and businesses have access to electricity
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e. climate information for energy diversification;	services. The data are all offered free of charge in theory (a small data handling fee is applied to cover actual dissemination costs).	making industry, environment protection, tourism, aviation, telecommunication, insurance, fire control, etc.	y all year round.
f. industry air quality information;			3. TV networks in creating precise, eye-catching, and understandable weather bulletins.
g. seismicity map information for building planning; and		Together with the socioeconomic expansion and scientific and technical advancements of recent years, the meteorological service has been extended to include other fields including, to mention a few, space meteorology, sand/dust storm monitoring and forecasting, testing and design of lightning devices, health meteorology, and	4. Retailers in scheduling logistics and stock levels well in advance of consumer demand.
h. meteorological, climatological and geophysical information for insurance claim purposes.	2. The national certification examination for meteorologists and the verification of meteorological equipment are two other primary services that JMA has recognized or authorized. About 250 out of the more than 6,000 candidates who sat the national exam in 2015 passed.		5. Regional councils in managing water resources. 6. Farmers arranging when to shift stock to shelter and cultivate and harvest crops. 7. Enterprises in handling their daily operation

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3. Instrument manufacturers/companies (30 to 40) are major customers of the official verification services. JMBSC certifies about 12,000 meteorological instruments annually.
4. JMBSC also supports PPP by means of seminars and training sessions to improve the skills and services of certified weather forecasters and the private sector.
5. JMBSC works with JMA to advance international cooperation
- emergency response to unanticipated public events. The meteorological services have up to now encompassed practically every aspect of national economies, social communities, and national securities.
- The 1 to 40 ratio of the input to output of meteorological services can represent the social and economic advantages derived from them.
8. Energy traders in moving quickly and profitably ahead of the market.
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through initiatives financed by JICA and other sources.

JMBSC receives all of its income from the private sector. Nearly seventy percent originates from JMA-approved and/or mandated marginal costs for allowed services including instrument inspection, national forecaster assessment, and data distribution. Financial statements of JMBSC are published for service transparency and reported to JMA.

Business Unit	Customers can be contacted by visiting the institute, by companies	Not very well defined. It appears that the units of Forecasting and Ocean	One-Stop Integrated Service (Pelayanan Terpadu Satu Pintu/PTSP)	Some fundamental services, such as those pertaining to the	Department of Emergency Response, Disaster Mitigation and Public	The National Forecast Centre of the NZ Met Service	Two categories of clients are distinguished by the Met Office's business
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<p>looking to install stations or learn about products and services, by cooperation with other official bodies, by contracts of a mandatory nature, particularly in the field of civil aeronautics, or by prospecting and dissemination. INAM offers marketing services that address customer needs.</p> <p>Within the framework of the development and research process for new applications, the convenience of providing a different service that is desired yet falls within the purview of the Institute is assessed.</p>	<p>and Climate Services handle the customised services.</p>	<p>is the unitary entity in charge of managing the services offered by BMKG. All BMKG customised information services and other services are coordinated from this section. Once a customer contacts PTSP to seek services, PTSP arranges for the internal departments of BMKG to provide the services. Though the back office activities are still dispersed among technical divisions inside several BMKG units, PTSP serves as both the front office and the back office of the BMKG.</p>	<p>interface with commercial activities and observations other than JMA, to open data distribution, and to instrument verification, have been moved to the Japan Meteorological Business Support Center (JMBSC), an authorized body of non-profit foundations under JMA supervision. It offers a wide range of services: distributes JMA data, products, and information to the private sector; administers the national exam for certified weather forecasters; verifies meteorological instruments officially;</p>	<p>Services is the services unit of CMA.</p>	<p>employs 60 people (at the end of 2022, the total employees of NZ Met Service is 305 people). Operating as a commercial company under the Companies Act, MetService is managed by its Board or under its direction or supervision. This covers oversight of the strategic orientation of the company with the ultimate goal of raising shareholder value.</p>	<p>model and accounting system: government agencies needing services that are not reasonably competitively, and services offered commercially, typically to clients both inside and outside government. When it comes to potential cross-subsidies, this distinction helps the Met Office show that it is compliant with competition law. The Public Weather Service Customer Group, MoD, BEIS and Defra are the primary clients of non-competed services to central government. Prices for interdepartmental services</p>
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<p>Customers may request certified data and research in person, by letter, by email, or through the National Institute of Meteorology website. The order form, model R72.01, is given to the customer for completion when placing in person orders. In other cases, the customer's submitted paperwork suffices to initiate the procedure.</p>	<p>cooperates internationally to support official development assistance (ODA) and other pertinent activities; and provides other services pertinent to the promotion of private meteorological industry, such as education and training, publication, and consulting services.</p>	<p>must in certain instances be determined at a level that complies with Treasury advice on the cost of capital. With every relevant client, the Met Office must keep up Customer Supplier Agreements that specify the outputs and related costs in detail and, if at all feasible, offer incentives for cost-cutting and/or service improvement.</p>
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CONCLUSION

A business model that NMS can use to provide tailored meteorological services can still offer both public and customised services, but only on a cost-recovery basis and not for profit, unless otherwise regulated by law, as in Japan and China. However, options similar to those used in developed countries like the United Kingdom and New Zealand are also possible, including models where state-owned enterprises are permitted to offer commercial services.

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