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Geopolitical Taxonomies on Airline Websites

Abstract

This study examines how corporate taxonomies on airline websites represent contested geopolitical entities, with a focus on Taiwan and nearby East Asian locations. We collected and analyzed country taxonomy data from 55 airline websites, transforming drop-down menu structures into hierarchical taxonomic models. We identified six distinct taxonomies and validated them through an annotation process with high inter-coder reliability ($\kappa \cong 0.80$). In this paper, we highlight three out of six representative taxonomies that vary in how they frame contested entities either as a standalone entity, as part of a regional group, or nested under China. These findings reveal how design choices in website interfaces can encode different geopolitical assumptions. In future work, we will study how users interpret these models to explore the possibility of presenting multiple geopolitical perspectives.

1. Introduction

Classifying the world's knowledge based on a majority's perspective can perpetuate biases in knowledge organization systems (KOSs) (Olson, 2009). KOSs such as taxonomies, subject headings, and classifications are oftentimes encoded with a dominant worldview that can lead to the omission or erasure of other important viewpoints. In this research, we aim to explore critical knowledge organization at the intersections of geopolitics and taxonomies. We extend these discussions by analyzing how corporate taxonomies encode contested geopolitical entities.

Extant research in critical knowledge organization has extensively explored subject misrepresentations in bibliographic classifications through the lenses of gender (Olson, 2001; Dobreski et al., 2022), race (Adler and Harper, 2018; Bowker and Star, 2000), and ethnicity (Higgins, 2016; Littetree and Metoyer, 2015). To our knowledge, however, topics such as geographic representations in vocabularies are underexplored from a knowledge organization lens. Our own series of studies on conflicting geographic entities is among the few projects that explore the intersections of geography and knowledge organization (Cheng and Ludäscher, 2019, 2020; Cheng, 2025). Practitioners such as Danley (2023) also examined named authority records and found that, even with shared cataloging codes, representing all historical and sociocultural perspectives is challenging. Not only is work on the geographic KOS limited, but the possibility of representing *multiple* knowledge infrastructures instead of a *unitary* representation (Bowker and Star, 2000) has yet to be explored in our field.

In this study, we define a geopolitical entity as a region, area, territory, or zone that is viewed by different people as contested in terms of its ruling, administration, nationality, or sovereignty. We examine country taxonomies used on the websites of the world's top 100 airlines. The goal of this paper is to identify commonly used country taxonomic models across corporate websites' drop-down menus.

2. Background

Researchers in critical cartography started conversations on geopolitical entities long ago (Crampton, 2001; Harley, 1988, 1992) in geography-related fields. These conversations usually center around how international relations oppress minority values, and how power dynamics are asserted on maps because certain discourses are shaped by

a dominant or elite group (Callahan, 2009; Rundstrom, 1995). For instance, recent discourses surrounding the United States' new administration's insistence on using "Gulf of America" instead of "Gulf of Mexico" have struck a nerve among people familiar with the India-Pakistan-Kashmir border conflicts, or the differing perspectives from Japan and South Korea on the "Sea of Japan" versus the "East Sea" (Campbell, 2025; Fowler, 2020). Empirical studies such as Soeller et al. (2016) designed tools to detect border changes in these contested areas based on a user's location, but the user still only sees a single view of the map. Though these studies have shown the geopolitical implications of maps and developed potential empirical tools, little research has examined how geopolitical entities are represented within KOSs.

Our previous study (Cheng and Ludäscher, 2019) analyzed international or federal-level organizations' country codes (e.g., the ISO 3166 standard). As an extension to our prior work, in this study, we focus on the Taiwan-China case with private organizations' country taxonomies. Taiwan has long been a contested geopolitical entity. It has its own administration, president, government, and democratic society, and it is often viewed as an independent entity (Taiwan.gov.tw, n.d.). Due to historical factors, however, the Chinese government also asserts a strong claim over Taiwan's sovereignty (Sullivan, & Nachman, 2024). As a result, travel booking websites have implemented creative solutions for the representation of Taiwan and China (Wee, 2018). Rowen (2023) discussed the "battlefields" of how Taiwan is represented on travel booking portals; we study the same contexts but through a knowledge organization lens with airline websites' taxonomies. Further, airline websites provide a unique context for studying geopolitical taxonomies because they serve a global audience and must navigate competing national policies, customer expectations, and economic interests.

3. Method

We used the list of world's top 100 airlines in 2023[1] to find the airline websites. We collected country taxonomy data from each of the airlines' websites from September to November 2023. The data are openly accessible web pages in JSON or JavaScript formats, encoding the country or destination lists on the drop-down menu search bar. After data preprocessing, we excluded 45 airline websites that either did not have Taiwan as a destination or did not list Taiwan or Taipei in the drop-down menu searches, leaving a total of 55 websites.

For the 55 websites, we then leveraged critical data modeling method (Wickett, 2025) to identify possible data models used to represent geopolitical entities. Critical data modeling is a method and analytical approach that investigates data structures to uncover implicit assumptions embedded in information systems. In her work, Wickett (2025) used a specific model (i.e., Basic Representation Model) to unpack the symbols and relationships used in datasets. In this study, we conducted a "critical" close reading of the geopolitical taxonomies to summarize shared and distinct taxonomic models used on the 55 websites.

In total, we found six co-existing taxonomic models representing Taiwan and nearby entities (Figure 1). To establish credibility of the six models found, two independent annotators coded a randomly selected subset of 12 airline websites (~21%

[1] https://www.worldairlineawards.com/worlds-top-100-airlines-2023/

of the data) and classified each website by its model. We used Cohen's Kappa (κ) to measure the inter-coder agreement between the two coders' annotation task (McHugh, 2012). The two coders reached a substantial agreement on this subset of data with $\kappa \cong 0.80$.

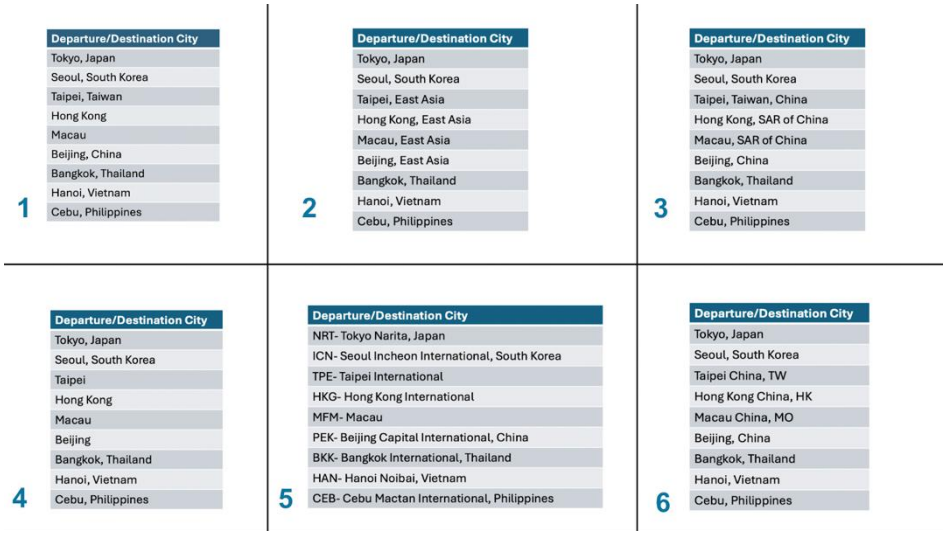

Figure 1. Six taxonomies of how Taiwan and nearby entities are represented on major airline websites

4. Findings

Figure 1 shows the six models we found on how Taiwan and nearby East Asian entities are represented on the 55 websites. This figure demonstrates the drop-down menus of these East Asian locations. We focused only on a selected number of East Asian entities, including some locations that may also be considered as Northeast Asia or Southeast Asia. At first glance, the drop-down menus may appear to be a flattened list rather than hierarchical. To better interpret the drop-down menus, we transformed them into hierarchical taxonomies, as shown in Figure 2.

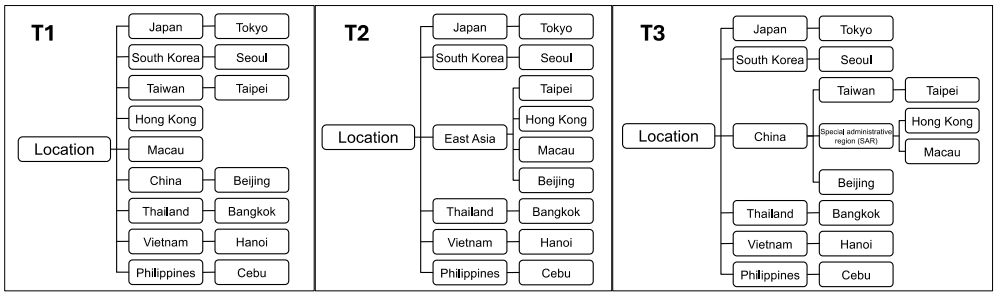

Figure 2. Three of the six taxonomies representing locations in East Asia

Given space restrictions, we highlight in this paper only three of the six taxonomies summarized from the 55 websites (Figure 2). Taxonomy *T1* is a three-level taxonomy, with "Location" as the root node, countries as the second-level nodes, and cities as the leaf nodes. At the country-level, there are nine nodes in total. Taxonomy *T2* is also a three-level taxonomy, with the six second-level nodes having a mixture of countries and a region "East Asia". The entities that are supposedly contested are all grouped as the leaf nodes of East Asia, namely Taipei, Macau, Hong Kong, Beijing. Note that all four of these entities are cities, not countries. Taxonomy *T3* has four levels, containing six second-level nodes at the country-level: Japan, South Korea, China, Thailand, Vietnam, Philippines; and a mixture of cities and contested entities at the third level. *T3* groups Taiwan under China, while Hong Kong and Macau are nested as Special Administration Regions.

These three taxonomies reflect distinct geopolitical modeling. *T1* treats these East Asia countries and cities as clearly delineated levels without explicit regional groupings. *T2*, by introducing "East Asia" as a second-level node and placing contested entities under it as cities, deflects questions of sovereignty over these entities. *T3* nests contested entities under China, asserting direct sovereignty over these entities. Together, these taxonomies reveal how technical structures such as website drop-down menus can encode implicit assumptions and send different geopolitical messages. That said, to interpret these taxonomies more precisely, further qualitative studies are needed to identify the extent to which different people's perspectives are represented in each taxonomy.

5. Discussion and Conclusion

The findings of this study include the six major taxonomic models used to depict Taiwan-China relations on corporate websites. The contributions of this work are two-fold: (1) we uncover the embedded geopolitical taxonomic models used on major airline websites; and (2) we present an innovative approach to inferring and validating taxonomic models through critical data modeling and systematic data annotation.

This study is a work in progress for a larger project that surveys U.S- and Taiwan-based participants to explore how people perceive contested geopolitical classifications. In the next phases of our project, given the high inter-coder reliability of the models, we will incorporate the six taxonomic models in our survey and interview instruments. Ultimately, this project seeks to advance critical knowledge organization by co-presenting multiple geopolitical taxonomies, moving beyond unitary representations of KOSs, and demonstrating the complexity of geopolitical perspectives in KOSs.

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