# Lost in Visualization:
# Using Quantitative Content Analysis to Identify, Measure, and Categorize Political Cartographic Manipulations

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## Dedication

This dissertation is dedicated to Birgit Muehlenhaus. If it were not for her friendship, motivation, patience, and willingness to put up with me even when I scarcely deserved it, this project would never have come to fruition.

This dissertation is also dedicated to my dear daughter, Svenja Muehlenhaus, who has given me a renewed passion for living life to the fullest and exploring the world around us.

I love you both.

## Abstract

All maps are biased. Yet, some maps appear more biased than others. Though we have enough research to answer *how* and *why* maps can be used as tools for political argumentation, geographers have been remiss in scrutinizing *how* and *why* some maps are presumed to be more biased than others. I argue the reason for this lapse is *primarily* due to methodological shortcoming. This dissertation is an attempt to establish a new methodological framework with which we can begin answering fundamental questions that have been ignored thus far in the literature on politically motivated cartography. *First*, is it possible to quantify and compare different map manipulations found on overtly political maps? *Second,* are there any techniques of cartographic and visual manipulation that make maps produced for political purposes appear more subjective or objective? If so, how do these techniques correlate or cluster with one another on maps? *Finally,* can we establish a non-anecdotal categorical framework that will allow us to compare the type of cartographic manipulations found in a sample of maps with those found in other maps? I use quantitative content analysis to answer these research questions while testing the method's applicability to increasing our understanding of how maps are used to make political arguments.



## Keywords

political cartographic manipulation (PCM), political cartography, quantitative content analysis, propaganda maps, cartographic representation, map categorization

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*(Figures in italics are maps)*

# Chapter One

*Maps as Instruments of Political Rhetoric*

"Maps Are Liars! … There are really no honest flat maps;
the point is important for the study of war maps."
– Otis Starkey, October 11, 1942,
*New York Times Magazine*

All maps are biased. Yet, some maps are more biased than others. Though we know *how* and *why* maps are used as political tools, geographers have been remiss in scrutinizing *how* and *why* some maps are more politically motivated, or propagandistic, than others. The reasons for this lapse in research may be manifold but I argue it is *primarily* due to one factor – a methodological shortcoming.

This dissertation establishes a new methodological framework with which we can begin answering a multitude of fundamental questions that have been ignored thus far in the literature on maps and power. *First,* how might we move beyond merely using descriptive methods of map analysis and instead establish a method that allows for the reliable classification, quantification and comparison of different map manipulations found in overtly political maps? *Second,* are there techniques of cartographic and visual manipulation that make some maps produced for political purposes appear more biased, or conversely, substantially more accurate? If so, how do these techniques correlate or cluster with one another on maps? *Finally,* can we establish a non-anecdotal categorical framework that will allow us to systematically compare the type of cartographic manipulations found in a sample of maps with those found in other maps, as well as critique and compare additional maps to those previously analyzed?

I begin by briefly analyzing the connection between maps and political rhetoric. Then, I illustrate why current methods are incapable of answering the significant questions I have posed. Next, I will establish an analytical framework based on quantitative content analysis – a systematic, quantifiable, comparable, and replicable method – that will help analyze the characteristics and rhetorical nature of politically oriented maps in the future, as well as allow us to compare a map's level and type of bias to that found in other maps.

## Maps as Media

Media come in a variety of guises – verbal, written, and visual. As spatially referenced images, maps are primarily visual (Vasiliev et al. 1990). Successfully interpreting a map from your automobile's glove compartment is as much a process of interpretation as reading a magazine on the tram. Every map is a form of communication, and one needs a certain level of visual literacy to understand what any given map communicates – similar to how one needs to understand a certain amount of grammar and words in English to read this paragraph (Pinker 1999).

In addition to being a form of visual communication, it has also been argued that all maps are arguments (Koch 2004). Every map is biased in the sense that it is a form of rhetoric espousing a particular interpretation of a spatial situation. How we interpret a map – both its argument and its reliability – is partially dependent on how it was composed (i.e., designed). Just as a written argument can be made using a variety of different rhetorical cues and tactics (some of which are more articulate, impassioned, and persuasive than others), a map can be used to make an argument using a variety of visual and cartographic techniques. In fact, different maps discussing the same places and themes, but employing different visual grammars and lexicons, result in antithetical arguments. For example, take the following two perspectives on the Gaza Strip lying between Israel and Egypt (Figures 1.1 & 1.2).

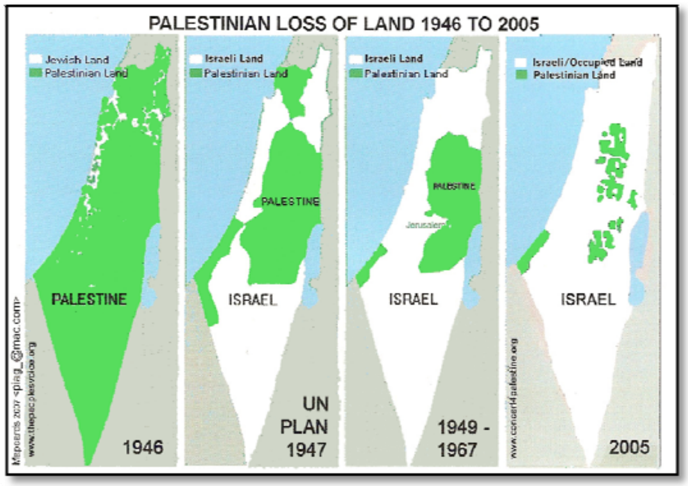



**Figure 1.1** – This map has been circulated for some time by numerous pro-Palestinian groups in the US. This particular map was picked up as a postcard at the Association of American Geographers Annual Conference in 2008. The Gaza Strip stands out as one of but a few remaining contiguous vestiges of Palestinian national territory (Palestinian loss of land (1946-2005) 2005).


**Figure 1.2 –** This map is one from a series of printable maps produced by the Anti-Defamation League (ADL) in 2008 (Range of Hamas Missiles (New York City) 2009). Both of the maps in Figure 1.1 and 1.2 are attempting to illustrate the Palestinian-Israeli conflict, albeit one would struggle to come to the same conclusion about "justness" depending on which map one looks at.

Another way we can tell that maps are a form of visual communication is by comparing two maps communicating the same argument using different visual techniques. Just as grammatically correct and verbose term papers are often perceived to be of higher quality than those written in text-shorthand, well articulated maps will often look more “reliable” and “accurate” than those that fail to utilize *standard* visual and cartographic techniques (see Figures 1.3 & 1.4). The techniques used and combined to construct a map will impact an audience’s perception of how reliable the information being communicated is regardless of the true accuracy of the underlying data. Looking at the two following maps is akin to listening to two speakers espousing similar messages in very different ways. One speaker offers a clear argument and delivers her message in a crisp voice; the second presents the message in an illogical order, using poor grammar, overly simplistic vocabulary, and stammers. Just as some speaking techniques more convincingly communicate a message than others, some mapping techniques are also more convincing. The framework I propose later in this dissertation will allow us to quantify the nuances of such rhetorical differences stemming from different visual techniques.

**Figure 1.3 –** Both this map and that in Figure 1.4 were published in the Weimar Republic. These two maps represent different ways of communicating the same message – i.e., Germany lost territory in the Treaty of Versailles in 1919 and its sovereignty is continually threatened by its neighboring countries. The map in this figure illustrates this by boldly contrasting the lands lost in a saturated black (Springenschmid 1935a). Arrows are added, emphasizing an unidentified pressure on the sovereignty of the *Heimat.*

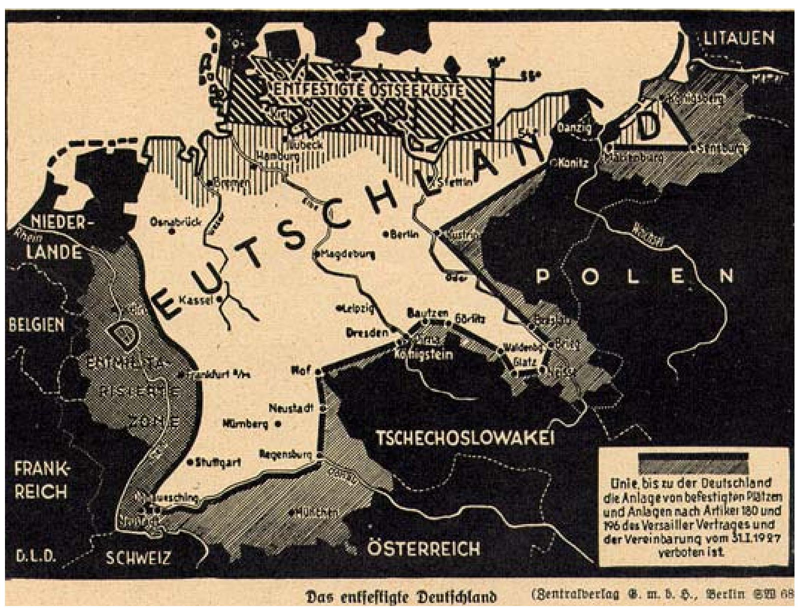



**Figure 1.4 –** Whereas the map in *Figure 1.3* is simplistically communicated with arrows thrusting like spears at the heart of the Fatherland, for many map readers the map in *Figure 1.4* may appear more convincing due to its more complex levels of data organization and more professional presentation (Wirsing et al. 1943: 10). Regardless of how the information was interpreted by German audiences, the same message is being communicated in both of these maps, only with different rhetorical flair.

### Previous Attempts to Understand the Rhetorical Nature of Maps

It has long been known that map manipulation can both forge and change people's understanding of the world. The debate over how this is done has consumed cartographic analysts since the Second World War. During that conflict both the Axis and the Allied nations began using maps for the express purpose of propaganda. A very real fear began to arise among politicians and Anglo-American academics that if populations were untrained in reading maps, they might easily be misled into believing the "other side's" version of reality. Thus, throughout World War II, articles discussing the dangers of map illiteracy began appearing in popular magazines (Starkey 1942; Quam 1943).

There was good reason to fear cartographic manipulation during this era. The amount of blatant and barely disguised propaganda mapping during the first half of the twentieth century was immense. A majority of maps used for political argumentation were not being created by governments directly, but instead were being produced by the popular media. In the United States, *Time, Life*, *Look*, and *Fortune* magazines offered some of the most intricate pieces of jingoist cartography ever produced. Several cartographers, such as Richard E. Harrison (*Look*), Robert M. Chapin Jr. (*Time*), and Boris Artzybasheff (*Fortune*), became famous for their masterful cartographic work during this time. Their maps often vividly portrayed, and frequently embellished, the onslaught of armed forces swooping unopposed across large swaths of territory.

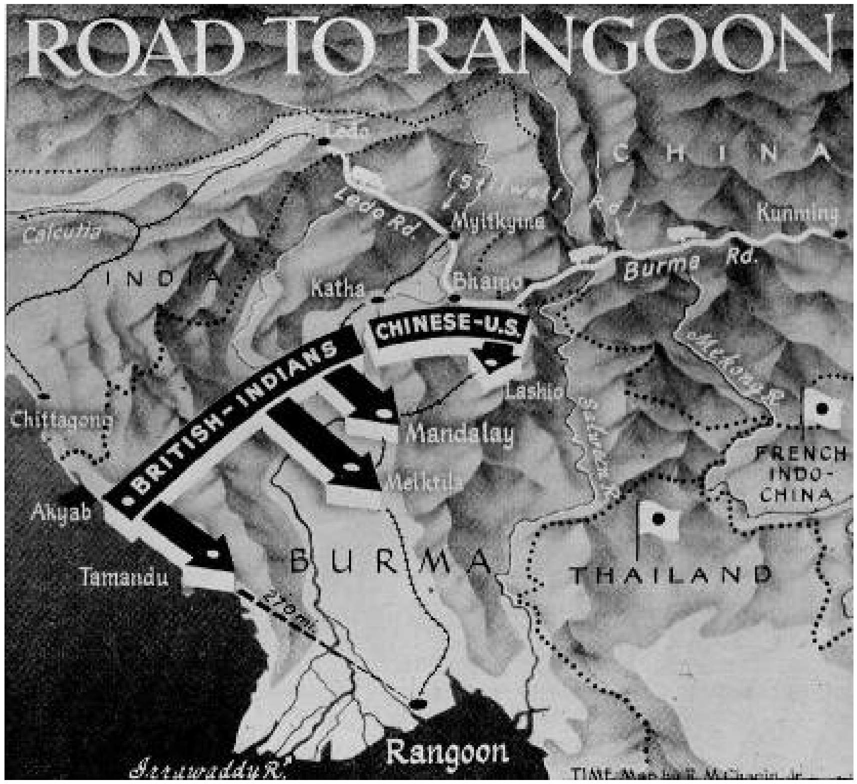
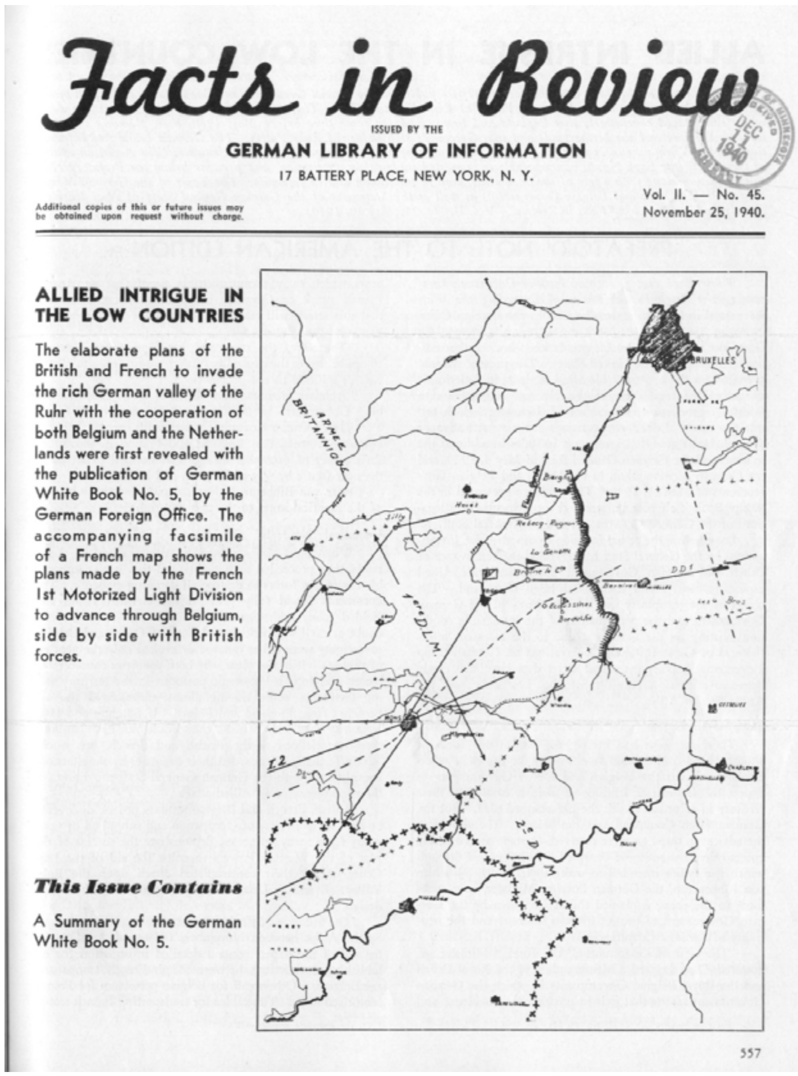



**Figure 1.5 – The Road to Rangoon.** A map by Chapin Jr. (1944) showing Allied advances in Southeast Asia during the Second World War in *Time Magazine*. Looking at this map, it would be difficult to imagine the Allies not taking over French Indo-China very quickly, when in reality, the battles were relatively slow to unfold.

Germany was also a center of propaganda map production during this time. The Nazi government manufactured, or oversaw the production of, maps specifically meant to help persuade its citizens of the need for preemptive war, as well as to influence audiences overseas (Pickles 1992; Monmonier and Schnell 1988; Monmonier 1996). Numerous atlases were produced in Germany throughout the 1930s (Springenschmid 1935b; Harms and Eberhardt 1937) illustrating to the German people just how much of its territorial integrity had been stripped away by the Treaty of Versailles following World War I (see Figures 1.3 & 1.4 above for example). These atlases also tended to emphasize how many Germans were now forced to live just beyond the protective borders of the Third Reich. An example of how audacious German cartographers could be is evident in the map below (Figure 1.6), purporting to show Allied aspirations to invade and occupy Germany!



Facts in Review

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17 BATTERY PLACE, NEW YORK, N. Y.

Additional copies of this or future issues may be obtained upon request without charge.

Vol. II. — No. 45.
November 25, 1940.

ALLIED INTRIGUE IN THE LOW COUNTRIES

The elaborate plans of the British and French to invade the rich German valley of the Ruhr with the cooperation of both Belgium and the Netherlands were first revealed with the publication of German White Book No. 5, by the German Foreign Office. The accompanying facsimile of a French map shows the plans made by the French 1st Motorized Light Division to advance through Belgium, side by side with British forces.

This Issue Contains

A Summary of the German White Book No. 5.

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**Figure 1.6 –** Allied Intrigue in the Low Countries. The *Facts in Review* newsletter was a publication that came out biweekly in the United States. It was printed by the German Ministry of Information in New York City beginning in the mid-1930s until the attack on Pearl Harbor. It made extensive use of maps to lend legitimacy to Germany’s geopolitical actions. The above map, largely unintelligible at the size it was reproduced in the newsletter and likely a complete fabrication, helps build the case that Germany must invade preemptively for self-defense (Allied intrigue in the low countries 1940).

In hindsight, the maps were brilliant rhetorical devices establishing the “justness” of a future war to liberate German populations (O'Tuathail 1996). These maps, tied to the environmentally deterministic and Darwinist theories espousing that states were living entities that needed to expand or eventually be devoured by other nations (Blouet 2001; Polelle 1999; Ratzel 1903), helped the Nazi government rally its people around the cause of national purification and state expansion.

The German Reich understood geopolitics well enough to realize that it would also be beneficial to influence non-German populations around the world of the inherent necessity to reunite the German nation (Mayer 1976). This propaganda effort became particularly acute after the Second World War began in earnest. Germany hoped to keep the United States and other nations in abeyance. Thus, in 1940 Germany began publishing one of its more successful propaganda publications – *Signal Magazine.* Made to look and feel like its popular U.S. counterpart, *Life Magazine, Signal* was full of photography and colorful illustrations of everyday living in Germany and occupied Europe – *sans* ghettos and concentration camps. The magazine was published in 20 languages and had a circulation of 2.5 million by 1943 (Mayer 1976). Unlike *Life Magazine*, however, *Signal* was entirely produced by the *Wehrmacht* (German military). A key component of this magazine was the cornucopia of maps sprinkled throughout most issues (Figure 1.7 below).


**Figure 1.7 –** Aircraft Carrier Italy. An example of cartography from *Signal Magazine (Mayer 1976).*

On many occasions, the maps were used as the chief illustrative supplement to the biased articles themselves. They were often used to lend scientific legitimacy to otherwise dubious arguments. For example, the map in Figure 1.8 accompanied an article entitled: *What we are fighting for: for Europe's liberty and the end of its continual fratricidal warfare* (Mayer 1976). As outlandish as this claim may be, the map itself uses visual evidence to show that the battles raging across Central Europe at the time, battles initiated by Germany, were merely a continuation of historical conflicts occurring over several thousand years. According to the article, Germany was attempting to occupy these lands not for conquest, but to unite Europe as a whole so that these battles would cease in the future. It is no accident that the map is much larger than the article itself. The map *is* the argument. It graphically communicates a message that might not otherwise be taken seriously no matter how many words are used. The article is merely a wordy caption accompanying the map.


What we are fighting for:

For Europe's liberty and the end of its continual fratricidal warfare

For many centuries past Europe has been torn by the wars of its peoples. Actually there have never been any long periods of peace on our Continent. An unfortunate policy of coalitions resulted in the European peoples taking up arms against one another and mutually slaughtering the flower of their youth at frequent intervals. An end must be put to that now and an end can be put to it.

Europe is no longer today the uncontested centre of world power as it was a century ago. Vast power complexes have developed outside Europe in the Soviet Union, in the United States and also in Asia. Were the peoples of Europe to continue annihilating one another, they would in turn finally fall an easy prey to these powers outside Europe. Until now there has not been any real opportunity to put an end to these internal European wars because the destiny of whole continents outside Europe also depended upon their outcome. Today the situation is simply that either Europe unites in combating these extra-European power complexes or that it is gradually undermined country by country and destroyed by them. "Hereditary enmities" dating from former centuries cannot and must not be of any importance in view of this world situation.

In former epochs nobody would have believed that a time would come in which one town would no longer fight against another and one small principality against another. It did nevertheless come about on the formation of the various national states in Europe. Today we are faced by the necessity of reaching the next stage, that of the unification of Europe.

The establishment of this final European peace is our greatest and most important war aim and it is combined with Germany's struggle against the extra-European powers.

→

**Transferred to a map, the adjoining sketches show where the centres of European warfare lay during the period from 1100 to 1900. Whilst the world was being partitioned, Central Europe served throughout the centuries as a Continental battlefield**

**Figure 1.8 –** Central European Invasions. A map based on dubious and highly generalized data found in *Signal Magazine.*

Due to the overt use of maps as rhetorical devices in both *Signal* and other such German publications (e.g., *Facts in Review*), the Nazis are often flagged as the exemplars of the cartographic abuse for political gain. Yet, this label has as much to do with Germany's defeat in the Second World War as it does with the map abuse itself. For if one looks both prior to and after the demise of the Third Reich, it becomes obvious that many others have just as ubiquitously and persuasively used maps to promote political agendas. Maps have been used to assert a country's claim to independence, new territories, and the right for preemptive war (Buisseret 1992; Monmonier and Schnell 1988; Zeigler 2002). Maps have historically supplemented political arguments in newspapers, magazines, and articles, often informed by the prejudices of the authors themselves (Monmonier 1989). Maps can function as much as a political tool and rhetorical device as any written text or speech (Boggs 1947).

Though they were not alone, the Nazis' use of maps for overt manipulation of audiences fueled a new field of research – the role and utility of maps in propagating political messages. Beginning in the late-1980s and early-1990s, geographers and cartographic historians became increasingly interested in the rhetorical or propagandistic qualities of maps (Monmonier 1996, Black 1997). This is the field that my research builds upon.

As our understanding of politically motivated representations grew, so too did the lexicon of labels used to identify them. Propaganda cartography is now more commonly referred to as "suggestive," "persuasive," or "manipulative" mapping (Monmonier 1988; Black 1997; Zeigler 2002). These contemporary terms are more inclusive of nongeopolitical maps, such as maps used to sell products, though the meanings of such terms remain relatively open to interpretation.

Unfortunately, theoretical quarrels over how to define the rhetorical nature of maps have come at the expense of actually analyzing and comparing the cartographic techniques used to make these maps. The prime shortcoming of modern academic approaches is that the debate concerning political rhetoric and maps has largely coalesced around a relatively narrow and potentially unanswerable research question. *How do we determine which maps are intentionally suggestive and which are accidentally manipulative?* By focusing so much energy on potentially unanswerable questions of intention, we have been distracted from other more relevant questions (e.g., how do these maps compare to one another in content). We have also been prevented from setting up a framework to analyze the rhetorical power of maps over time.

I deliberately avoid devolving into the debate about the intentions and objectivity of maps. Maps are *never* objective, regardless of the intention of the map creator. That being said, I argue that we can still successfully measure and compare the ways and extent to which maps are comprised of different manipulations used for rhetorical purpose in politics.

## Goal of This Research

Although past research has attempted to explain the idiosyncrasies of individual map elements that, when working in conjunction with one another, comprise the rhetorical power of a map, thus far no research has systematically analyzed hundreds of maps together to evaluate what techniques and methods are most commonly used on overtly suggestive maps. One reason such an endeavor has not occurred, is that the methods used thus far have been purely descriptive – there is no basis by which one can compare and contrast the results of one map to another in a precise way.

I argue that it is possible to systematically break maps down in a quantitative manner so that they can be compared to one another for political innuendo, as well as be measured for the types and levels of rhetorical manipulation found within them. This can be done using a different method of analysis that allows for comparisons among different maps. The method I build off of that will allow us to do this is *quantitative content analysis* (a detailed explanation of which begins in chapter three).

My goal is to establish a system of political map analysis that quantifies the types and levels of cartographic manipulation being used in a large sample of maps. To demonstrate that quantitative content analysis is a viable tool for the study of political maps, I use this method to answer three broad questions, each question demanding different computations from the method – description, correlation, and clustering. I outline these three questions here, but I will elaborate on them in more detail in chapter three and beyond.

### Question #1

*Have techniques of cartographic manipulation found in politically motivated maps evolved over time and does the evolution depend on different geopolitical context and the producer? If so, how have they evolved?*

Question #2

*Are there any significant relationships among different techniques of political cartographic manipulation? If so, what are they? Are there techniques that we have thought are important, but really are not?*

Question #3

*Can we create some broad categories of political maps based on the different types of cartographic manipulation discovered? If so, what are the different categories of maps and how do they differ from one another?*

This new approach to analysis will be useful for the evaluation of how maps are constructed to make visual arguments. Furthermore, and more dangerously perhaps, knowledge of the utility of different manipulative techniques could prove useful for practicing cartographers who hope to gauge and improve the rhetorical efficiency of their own visualizations. Though this project explicitly analyzes what are deemed to be undeniably political maps (as will be explained shortly in chapter two), a long-term outcome of this research is to establish a quantitative method for researchers to use in comparing large samples of all types of maps – benign, banal, or political.

The chapters proceed as follows. I begin **chapter two** by operationalizing political maps – or what I call *Political Cartographic Manipulations (PCMs)* – and provide a comprehensive overview of common techniques of map manipulation that are known to be used. Next, in **chapter three**, I review what quantitative content analysis is and the processes I went through to create the structural framework necessary to answer the three questions I have posed. In **chapter four** I review the descriptive statistics and characteristics of the maps in my sample. **Chapter five** analyses and discusses the historical evolution of political cartographic manipulation and the different techniques that various producers employ. **Chapter six** shows which techniques of map manipulation seem to be used with one another and commonly occur together. In **chapter seven** I draw upon all of the previous analysis to create a taxonomy of four types of politically motivated maps. I tie all of the results together in **chapter eight,** present caveats, and conclude with suggestions for future research.

## Chapter Two

*Techniques and Processes of Political Cartographic Manipulation*

The goal of the forthcoming chapter is threefold. First, I will explicitly operationalize what I mean by *political maps* and *political cartographic manipulation.* Second, I will review the different techniques of generic cartographic manipulation that literature has shown are often used in political maps. Finally, throughout this chapter I will be building and reiterating the rationale for this dissertation – i.e., *to establish a systematic method of quantifying and comparing the rhetorical techniques used in political maps.*

## Cartography and Political Argument

Maps and politics are intrinsically linked in myriad ways. This research is interested in a particular link – *how maps are crafted to be used as overt tools for political persuasion.* As is clear from the previous chapter, a multitude of descriptive research exists examining how maps have been used by politicians for a variety of purposes. None of it, however, *systematically analyzes* what techniques are used to make the spatial data tell the desired political story.

From this perspective, there can be little debate that maps have played a prominent role in political and economic endeavors. Pickles (2004) argues that beginning with the advent of capitalism, maps have been used by states and other political entities to "geocode" the planet and create a structured and stable environment for property ownership. Building off of arguments that capitalism continually creates new spaces (Smith 1991), Pickles believes that maps have played a central role in making capitalism possible, because as an economic system, market processes are dependent on property ownership. As capitalism continues to expand and commodify new spaces and new markets, maps are crucial in allowing core agents to construct and audit the organization of capitalism and political agency.

Taking a more postmodern approach, others argue that maps are indeed political tools, but not merely for capitalistic purposes (Wood and Fels 1986, 1992). Instead, they can be effective devices for reifying dominant opinion about what is of value and importance in society. In a now famous example, Wood and Fels (1986) use semiotics to analyze a highway map of North Carolina. They note that the highway map does not include bike trails, visually reinforcing the hegemony of the automobile over other types of transportation for map readers. They also point out that the map is laden with political symbols and references to North Carolina, including pictures of state birds and state flags (Wood and Fels 1986). The highway map is a political tool for both state legitimacy and the normalization of automobile use.

Though Pickles (2004) and Wood and Fels (1986) present fascinating arguments, their approaches to understanding linkages between maps and politics are of tangential significance to this dissertation. I *am not* attempting to tie maps to political processes but, instead, I am looking at *how* maps help communicate overtly political messages. There is no denying that all maps act as political devices in the sense that they help promote a particular perspective or meaning over alternative ones. This research will help us better understand *the techniques of manipulation that political actors have at their disposal to shape their cartographic representation of reality*. To be clear: this research does not work against postmodern approaches to understanding political role of maps, but rather, hopes to build off of such work and offer an alternative, quantifiable approach to studying the same topic.

## What Makes a Map Political?

Though all maps are inaccurate and misrepresent reality, not all maps are politically motivated tools. To narrow the focus of my research, the word "political" needs to be defined. My research is *not* concerned with maps used merely for any banal purpose or by any political figure. For example, it may be popular legend that U.S. General Patton used a *Michelin* guide to navigate the roads of post D-Day France. Assuming this is true, there is no doubt that his road atlas had serious political ramifications for the population of Europe and America at the time. Nevertheless, the maps in this atlas were produced for navigational purposes. They were utilized by a politician to help wage warfare, but it was not disseminated to the public for that purpose.

*I am interested in maps that were created with the express purpose of communicating a political, social, or economic message to a public audience.* Many call such cartographic representations propaganda maps (Harvey 2008b; Pickles 1992). Harvey defines propaganda "as the systematic manipulation of information to fit particular ideological, political, or social goals" (2008: 227). I add *economic goals* to this list, as most often economics are entwined within ideological, political, and social debates (e.g., market protectionism versus liberalism). Propaganda can take many rhetorical forms; however, its goal is always to manipulate information to promote a particular viewpoint. In this sense, Patton's road guide does not qualify as propaganda – nor would a map being used by Hitler and his generals (as shown in Figure 2.1). Like all maps, the maps in Patton's Michelin guide were bending the truth (e.g., either via generalization, projection distortion, or symbolization), but not to promote a particular viewpoint or ideology. Rather, the maps necessarily distorted reality to present navigational data in a clear and readable manner.


**Figure 2.1 –** Using Maps to Kill People. This map is definitely being used for purposes of warfare but would not necessarily fulfill the "political" requisite for my research here, as for all we know, it is merely a reference map of the region.

One method of gauging whether a map falls under the classification of political propaganda is to examine the context of its production and diffusion. Often propaganda maps are assumed to be the product of governments, but this is not always the case. Such examples have merely come to dominate our imagination of what propaganda maps are due to a variety of social factors, including a public weariness of "Big Brother" and the tendency for academics, including myself in the first chapter, to focus on a number of infamous examples (i.e., Nazi maps). In reality, many maps used in everyday advertising or to inform the public about certain social issues might appropriately be considered propaganda as well, in the sense that they are propagating an economic argument (for example, see Figure 2.2 below).

To determine what does and does not qualify as propaganda, one must first start with what the map is attempting to communicate. Sometimes the title gives this away immediately – e.g., *Antarctic Meltdown* or *Der Krieg in Karten* (translation: *The War in Maps*). In other cases one must carefully analyze the graphic language and symbology being used on the map itself, or in the supplemental material accompanying the map (e.g., an article or supplemental text).

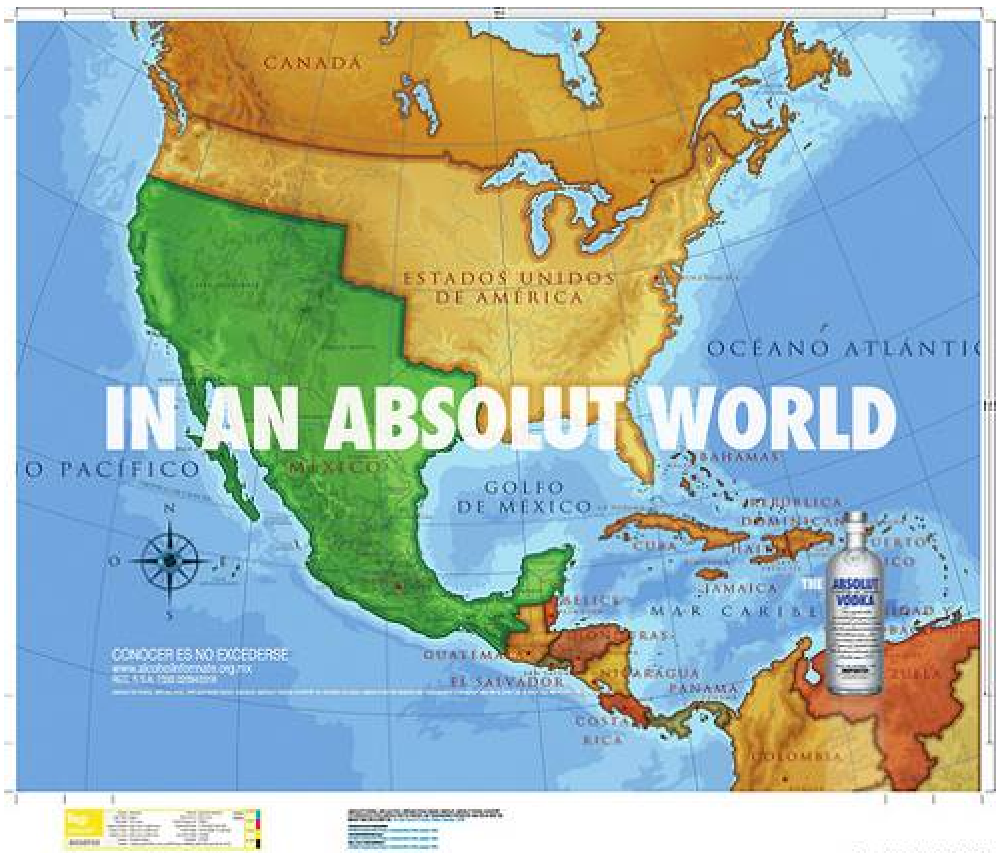



**Figure 2.2 –** This map was distributed as an ad campaign across Mexico (In an Absolut world 2008). The map's title is tongue-in-cheek and does not make sense until one analyzes the data shown. By associating its product name with the rectification of a perceived national injustice occurring back in the 1840s, this company is more likely to warm itself to the Mexican population.

It is important to note that determining whether or not a map is propaganda has nothing to do with determining the *effectiveness* of the message it is communicating. It is highly unlikely that Mexicans viewing the above advertisement every morning at a bus stop are going to choose vodka over another beverage after work. To be included in my forthcoming dataset and analysis, it only matters whether or not a map concentrates on communicating overtly political, social, or economic positions. If a map is used to espouse rhetoric with a political, social, or economic purpose given its context of production and diffusion, then I label it a ***political cartographic manipulation.***

### Political Cartographic Manipulation (PCM)

I define political cartographic manipulation (PCM) as the manipulation of cartographic data and graphics carried out *for explicitly persuasive purposes of communication or information dissemination.* In one sense, this is a more specific term for the production of propaganda maps. However, the definition of political cartographic manipulation adds some important specifications. First, *PCM maps are created by organizations or individuals with the potential to influence popular or organizational opinion regarding political, social, or economic realities.* The intent of the organization creating PCMs is less important than the message the maps convey, the context in which they are produced, and the potential impact they may have when and where they are diffused. Maps that have been designed with at least some element of politically motivated cartographic communication are the focus of this dissertation's research question.

Data and graphic manipulation are integral parts of the communicative process in all cartographic production. Political cartographic manipulation is best viewed as a voluntary extension to the same process in order to enhance the rhetorical potency of a map. As such, we can break down our analysis of political cartographic manipulation following the same outline that is used to study the process of map production in general.

### Identifying Techniques of Political Cartographic Manipulation

In *How Maps Work* (1995: 351), MacEachren argues that maps can communicate their messages in two ways – *connotatively* and *denotatively*. Connotative communication is that which is largely subliminal – messages communicated by what is left unmentioned. Denotative communication is information which is readily available for interpretation via the graphics and symbology presented on the map itself. Every map uses both methods of communication, he argues, and thus, understanding maps requires a holistic analysis of both.

MacEachren's (1995) breakdown of maps into two forms of communication is useful, but is largely geared toward understanding how we interpret maps, rather than focusing on the cartographic techniques and processes behind map creation. Thus, I adapt his broader argument concerning these connotative and denotative communications and rearticulate them differently to better express processes of designing PCMs. The first of these categories, connotative, I call *Data Model Manipulation*; the second denotative category I call *Graphic Manipulation.*

Data model manipulation (or Data Manipulation for short) is often difficult to observe from merely looking at the map itself, because the representation of data is not what is biased, but rather the mathematical models upon which the representations depend. Often times techniques of model manipulation can only be realized with the advantage of hindsight (MacEachren 1995), although there are warning signs and indicators that such manipulation is occurring – e.g., lack of a data source, data values that are too neatly rounded, or projections that promote the prominence of certain places over others (Monmonier 1996).

The second category, what MacEachren (1995) terms denotative communication, I relate to *Graphic Manipulation.* This is the manipulation that captures the most attention in literature and in popular cultural references. It manifests itself visually and is always observable if one is trained to look for it. Most of the propaganda maps discussed thus far have traits that fall into the graphic category – e.g., the use of bright or mimetic symbology to illustrate movement or threats to parts of the world.

Just as MacEachren (1995) notes that all maps possess both connotative and denotative communication traits, I argue that all political maps are comprised of both data model and graphic political cartographic manipulations. The rest of this chapter will review these two categories of political cartographic manipulation. I will start with *Model Manipulation* and conclude the chapter by focusing on *Graphic Manipulation.* For those already knowledgeable about cartographic theory and process, you may want to move ahead to Chapter 3, where I explain what quantitative content analysis is and outline my methodology for analyzing political cartographic manipulations.

## Data Model Manipulation

Data model manipulation occurs before anyone has seen the map. It happens entirely in the private sphere and at the behest of the cartographer or producing institution. As such, it is often difficult to detect or classify even when one knows it must be there. Though determining the intent of a cartographer is impossible, we can systematically search for known techniques of data model manipulation found in maps made for political purposes.

## Data: Sampling, Collecting, and Measuring

Data collection is always based upon the sampling of real world phenomena (MacEachren 1992). Maps never show the real world; they are merely snapshots. Thematic maps are only ever as accurate as the data sample upon which they are based (Peuquet 2002). Yet, the general public typically views maps as absolute representations of reality; which makes collecting accurate data all the more imperative for cartographers concerned with scientific representations.

Data collection dependent upon national governments remained the norm for almost two hundred years. However, since the end of the Cold War, data collection and sampling methods have undergone rapid changes. Increasingly, we are seeing the privatization of data collection (Goodchild 2007). Computer and network technologies, as well as the deregulation of the US military's GPS system for private use, has resulted in an abundance of digital data (Dobson and Fisher 2003; Elmes et al. 2004; Onsrud 1998, 2003; Pickles 1995). Most of this data is stored in networked, online databases and often cheaply exchanged. Though this has been beneficial for the masses embracing online mapping software, and independent cartographers with limited resources of their own, it has also resulted in some predictable data reliability issues, as very few people take the time to write metadata after collecting waypoints on their handheld GPS unit. Moreover, state sovereignty and rights to privacy are increasingly being challenged by commercial services offering satellite imagery and aerial photography to anyone interested in making a map (Economist 2007).

One primary method of manipulation is to *weed out data* that does not support your rhetorical argument. Thus, it is during the data collection phase that model PCM begins.

A prime example of this can be found in the Agence France-Presse's (AFP's) contemporary representation of Iran's nuclear capabilities. The AFP is akin to Reuters or the Associated Press – one of only a handful of gargantuan international news organizations dispensing news to subscribing media outlets (e.g., newspapers and magazines). The following maps (Figures 2.3 & 2.4) from the AFP were produced and distributed to thousands of newspapers, magazines, and other media outlets within one month of each other.

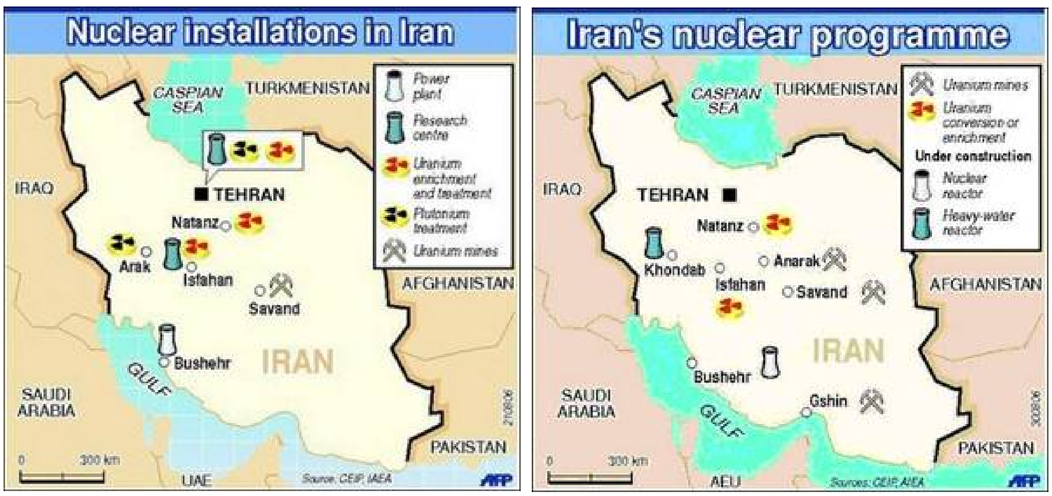



**Figure 2.3 & 2.4** – Nuclear Installations in Iran and Iran's Nuclear Programme (Nuclear installations in Iran 2006; Iran's nuclear program 2006).

Though these two maps do show some different information, much of the data they present should be exactly the same. Yet, when you compare the symbology of the two maps, only one icon matches – the uranium enrichment facility to the east of Natanz. The map is small scale, obviously, but many of these icons vary by over 200 kilometers. What is most confounding is how Iran has only one uranium mine in the first map but three in the second, none of which are in the same place. Perhaps most disturbingly, the city of Arak on the first map (found in western Iran) is symbolized as a place of plutonium enrichment; yet, on the second map the same place is named Khondab, and it is now the site of a heavy water reactor. Someone viewing both of these maps over the course of a month may be inclined to interpret Iran as brimming with nuclear technology. In reality, there are simply data reliability issues.

## Projections

The irrefutable truism that all maps misrepresent by necessity can most easily be linked to the concept of cartographic projections (Starkey 1942). The fact is: one cannot project the spherical Earth onto a flat piece of paper or a computer screen without distorting some spatial properties. Each method of projecting the Earth onto a flat surface preserves different spatial properties.

There are many different types of projections used by cartographers, but each can be categorized into one of a handful of categories based on what spatial properties it maintains. There are three principal spatial properties: size, shape, and direction; yet, when transforming the Earth from its three-dimensional state to a two-dimensional map, it is impossible to preserve all three properties. Typically only one of the three is preserved, sometimes two. Thus, cartographers have developed innumerable types of projections to maintain different spatial properties depending on the purpose of a map. The projection types of particular importance to this research are: (1) equivalent; (2) conformal; (3) azimuthal; (4) equidistant; and (5) compromise.

Thematic maps should *almost* always use an equivalent projection. Equivalent projections preserve the “area” of the Earth’s surface. However, they rarely do. When it comes to showing global data, conformal projections are more typically employed, even though they merely preserve shape and not area. One conformal map originally developed for navigational purposes became infamous during the Cold War – the Mercator projection (please see Figure 2.5) The Mercator projection progressively expands areas located farther from equator – emphasizing the poles.

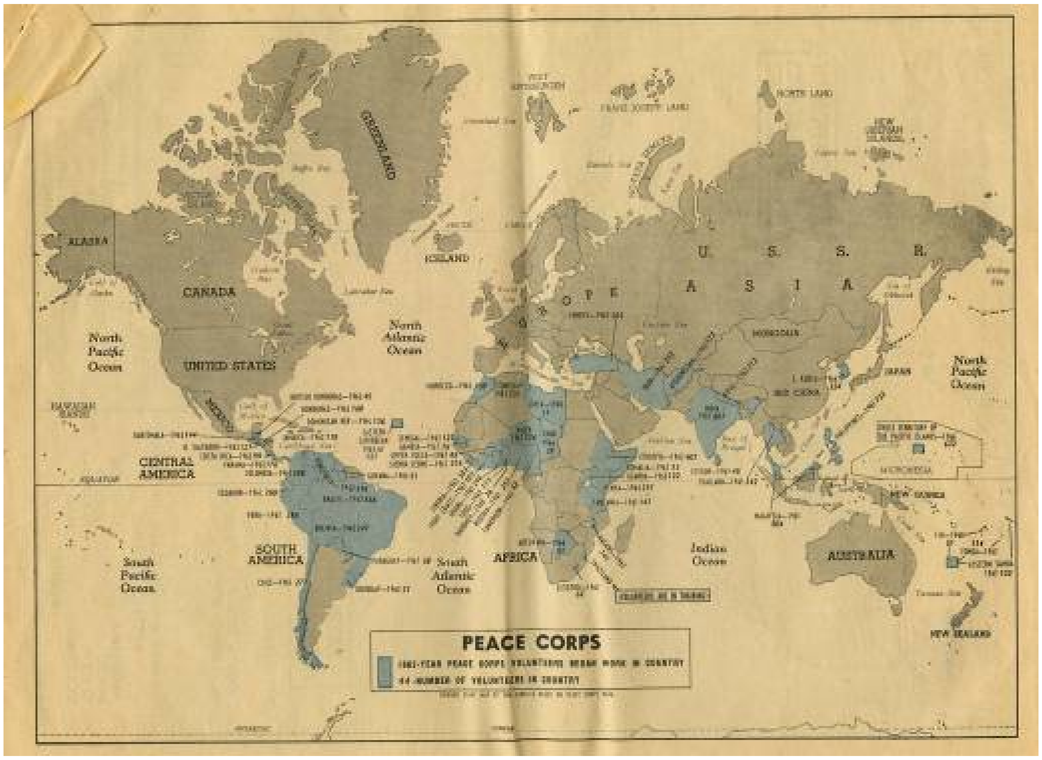



**Figure 2.5 –** Peace Corps. A map showing the extent of the US Peace Corps on a Mercator projection – quite inappropriate for the purpose (United States in the world: Peace Corps 1968).

In some cases it is prudent to preserve direction or distance over area and shape. Equidistant maps preserve the distance from one or two places on a map to all other places. Other than for accurately representing distances, equidistant maps should not be used for thematic cartographic purposes, as they typically distort the shape and area of the places being mapped. Their use can make for a persuasive argument, however (Figure 2.6)!


**Figure 2.6 –** Cuban Ballistic Missile Ranges. CIA map of purported Cuban missile ranges during the Cuban Missile Crisis of the early 1960s (Cuban missile crisis 1963).

The impact of projections on the outcome of a map cannot be overstated. A cartographer must make a decision when making any map about which spatial properties are most desirable to preserve and which are not. Outside of academia, this decision is not likely to be based on accuracy alone but also on the desired argument of a map and the intended audience. A prime example of the difference a projection can make in how data will be displayed is shown in Figure 2.7. Notice how the shape, size, and orientation of the former-Soviet Union are different in each representation. All four of these projections are global, with a line of tangency based on the equator and a central meridian of 10°E. They were all produced at the same exact scale of 1:150,000,000 (though they have been resized to fit the page here). Though officially all of these projections are "accurate," the non-equal area projections magnify the former-Soviet Union monstrously. The appropriateness of each depends on the purpose of the map.

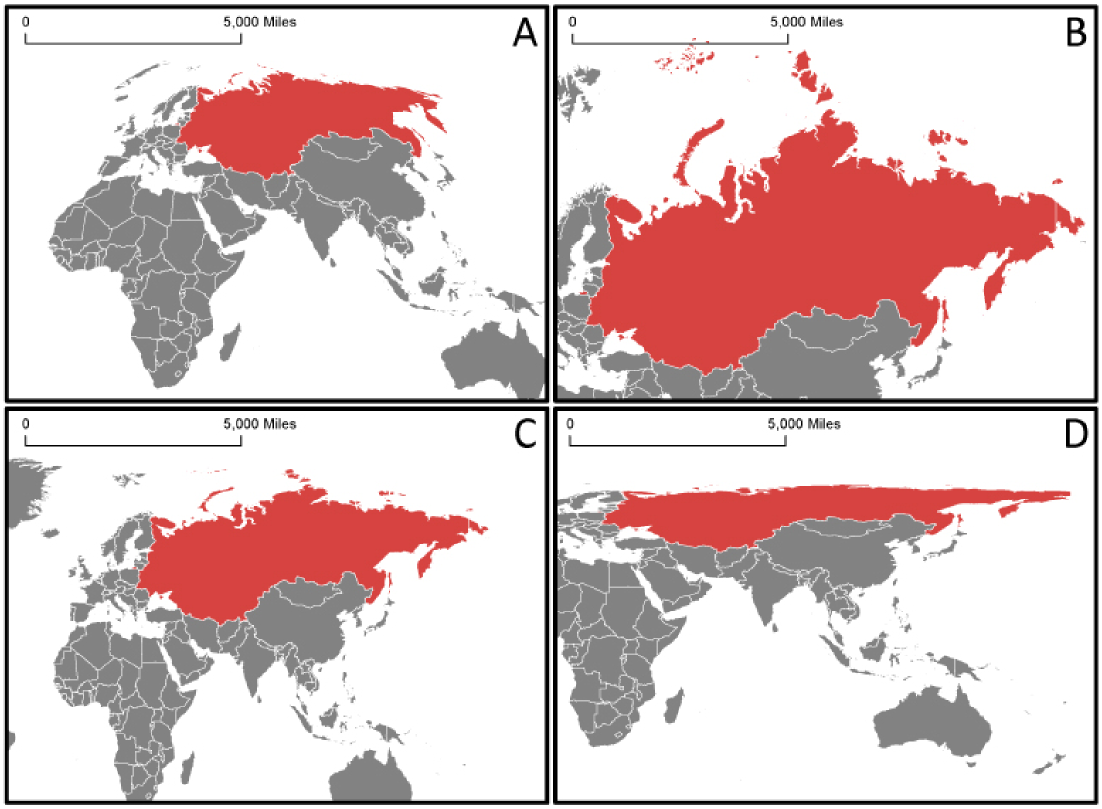



**Figure 2.7 –** The Soviet Union. These four representations were produced at the same scale using different projections with a line of tangency at the Equator (Reprojecting the Soviet Union 2009).

## Cartographic Scale

Cartographers flatten their representations of Earth into two dimensions so that they can look at a particular part of the Earth's surface in far greater detail than would otherwise be possible with a globe. Thus, the first thing any cartographer must do after projecting the Earth is decide at what scale she wants to present the data to her audience. Scale is simply the mathematical relationship between the map distance and the commensurate earth surface distance.

One can manipulate the message a map communicates in a variety of ways by choosing a scale that either excludes outlying information of relevance – e.g., nuclear missiles just beyond the border of the map – or envelops relevant data in a sea of banality – e.g., using a world map to show the extent of the Ruthenian nation in Central Europe. Scale is generally dependent upon two things: the purpose of the map and the intended map audience. If an audience is not overly familiar with a place, a cartographer may provide some spatial context by using a smaller scale than necessary to show some nearby landmarks. If an audience is presumed to be more familiar with an area, often one can use a larger scaled representation with more detail and less generalization. In turn, if the purpose of the map is to show how a place fits within a broader context, a small scale map is ideal; alternatively, if the goal of the map is to focus on a certain area for in-depth areal analysis, a larger scale will be necessary. *Maps are often produced with inappropriate scales for communicating the message of the map.* In addition to the scale of the base map itself, *data resolution* can also play an insidious role in the rhetorical efficacy of one's visualization (Buttenfield and Beard 1994). Just as thematic data can be collected in a variety of ways, it can also be collected at a variety of scales, or data resolutions, to manipulate its eventual portrayal on the map.

### Scale and Data Representation

Real world geographic phenomena come in one of four geometric shapes – points, lines, polygons, or volumes. Two dimensional map representations can only visualize these objects using three types of geometries – points, lines, and polygons. Determining which cartographic geometry to use to illustrate a feature is often dependent upon the scale of the map. The geometric visualization of one's data is scale dependent. Take, for example, the war maps from an Israeli atlas below. These three maps all deal with the Arab-Israeli war of 1948 (Figures 2.8 & 2.9). However, because of their different scales, they use completely different geometries to show similar data. In the first, dots represent settlements of some sort. Polygons represent zones of territorial control. Lines represent the movement of armed forces. In the second map, dots represent the location of individual mortar explosions. Polygons are skewed to look three-dimensional and represent individual community dwellings and walls. A larger scale allows the second map to show far more detail, but at a cost. Anyone unfamiliar with the War of 1948 that does not read Hebrew will have a difficult time placing the second map into context.

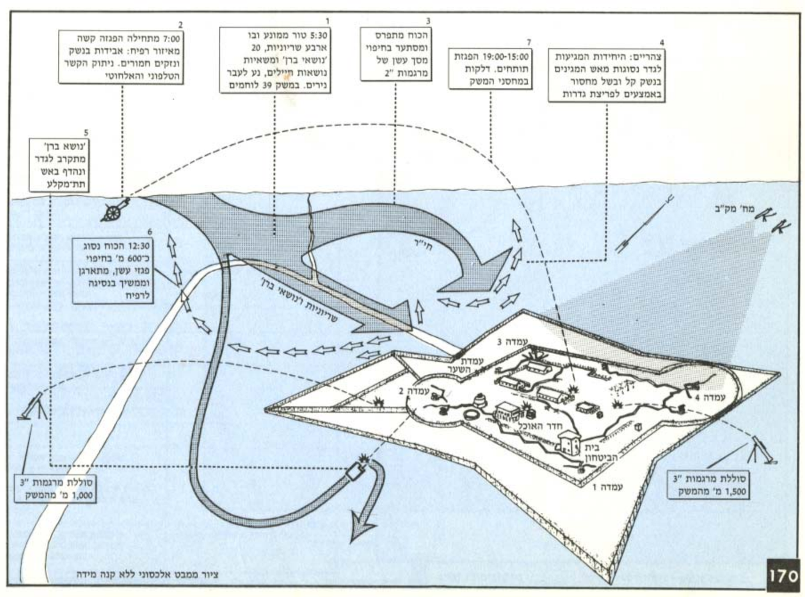



**Figure 2.8 –** Different objects are presented as points, lines, and polygons from versus the map in Figure 2.11 due to differences in the scale of the two maps. Also, certain data is necessarily excluded from the map in Figure 2.10 that appears on the map in Figure 2.11 (Carta's historical atlas of the 'Haganah' 1991: 170).

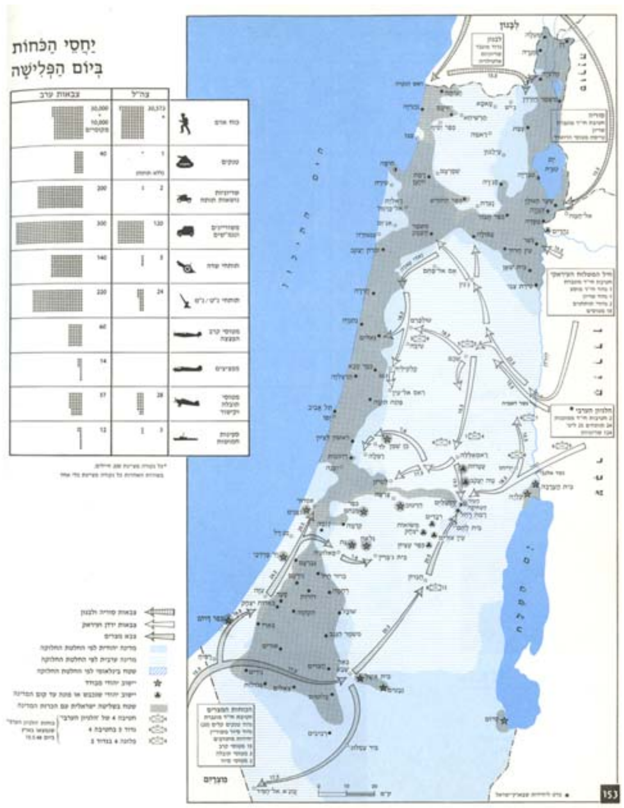


**Figure 2.9 –** A cartographic illustration of conflict in 1948 throughout modern day Israel (Carta's historical atlas of the 'Haganah' 1991: 153).

## Database and Cartographic Generalization

Every map uses generalization to present data in an intelligible and graphically legible manner. Generalization is the simplification of certain spatial data to de-clutter a map and allow a clear presentation of a map's message. Whereas at first this may seem a "graphic" form of manipulation, it is in fact quite the opposite. Generalization occurs while the map is being produced, and when done well is rarely thought about by the map reader. It is during the process of generalization that certain variables that deflect from the message of the map or are deemed less than necessary for the task of communication may be expunged from the map entirely or altered to suit the cartographer's purpose. As humans often take maps at face value as true representations of reality, this means that generalization is indeed one of the most insidious forms of data manipulation in the entire cartographic process.

As illustrated in Figure 2.10 below, the level of generalization needed to communicate a message is always dependent upon scale. If the purpose of the thematic map is merely to show broader spatial patterns, then the accuracy of the base map itself may not be of primary concern, but the resolution and accuracy of the data will be important. Following map purpose, a second factor typically influencing generalization is the intended audience. Simplicity is often used to promote a particular message over alternative ones; excessive detail often lends credence to the argument being made – if so much is on the map, it must accurately represent reality. Both too much and too little generalization can be useful for the political manipulation of spatial information – it depends on the map audience and purpose.

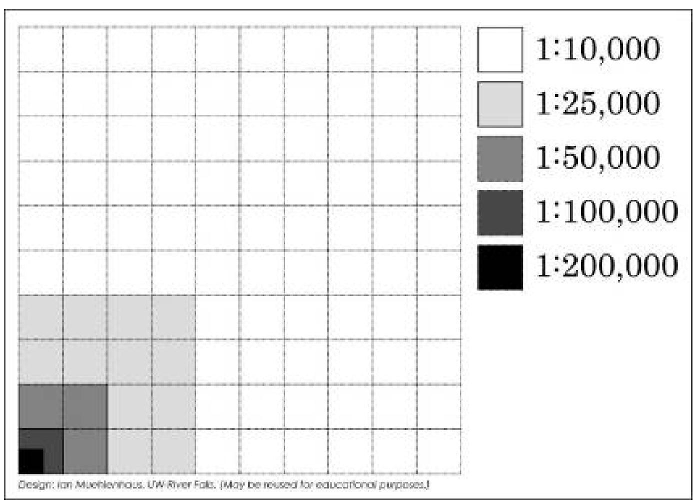



**Figure 2.10 –** The impact of cartographic scale on space for symbolization. This graphic illustrates the dearth of space a cartographer has as the scale of a map decreases. At 1:10,000, a cartographer has the entire graphic box in which to symbolize his map. At 1:25,000, this space drops exponentially. At 1:200,000, the cartographer must represent the same data in the space of the tiny black-box in the lower left-hand corner, necessitating an extreme use of cartographic generalization.

## Data Classification and Generalization

Data classification is the mathematical organization of numerous data observations into a limited set of groups (or classes). For example, in the *Distribution of Economic Freedom* map below (Figure 2.11), states scoring within a certain range on the Heritage Foundation's "economic freedom" statistic are visually grouped together with the same symbology. Thus, we cannot tell if Canada, the US, or Ireland is more *laissez-faire*, we only know that each of these states lies somewhere between 80- and 100-percent "free."

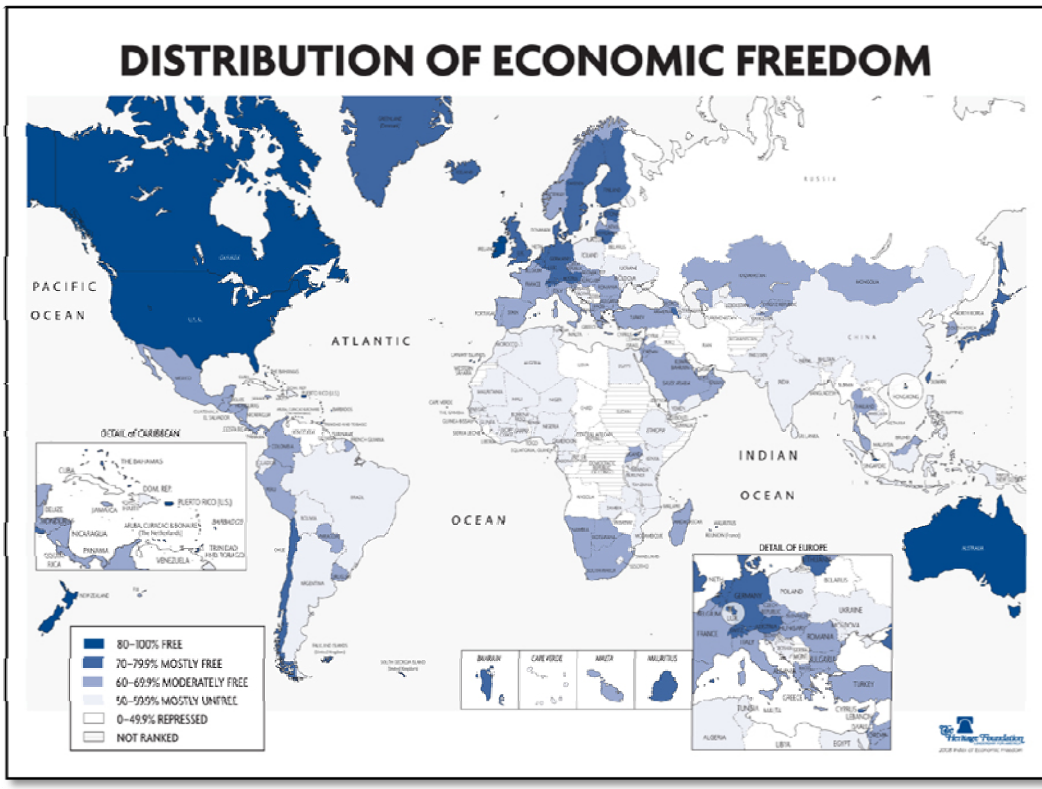



**Figure 2.11 –** Distribution of Economic Freedom. Countries are classified into groups based on their percentage of "economic freedom." Notice how the projection used emphasizes the freedoms enjoyed in Canada and Greenland and diminishes the lack of freedom in Africa. Also, how these measurements were taken is not clear. What does "80-100% Free" even mean (Distribution of economic freedom 2007)?

The key issue surrounding data classification is that different methods of classifying data will yield extremely different visual representations and impact how a map is interpreted. Thus, it has long been hypothesized that this area of cartography is one ripe for politicians to manipulate (Monmonier 1996). The Heritage Foundation (in the map above) chose what appears to be an unconventional classification.

### Summary of Data Model Manipulation

Data model manipulation occurs before a map is ever displayed or put into print. Data acquisition, projection, scale, and generalization are processes that affect the final map product but remain largely invisible to map readers. Though such connotative manipulation is often overlooked as a necessary evil – or what Monmonier (1996) refers to as "telling white lies" – it also affords ample opportunity to manipulate maps for political purposes. Thus, to analyze political cartographic manipulation one must spend as much, if not more, time combing for techniques and methods of model manipulation than more obvious graphic ones. The above sections have expounded upon the realms of data model manipulation that are found on all maps, but are particularly important to analyze when looking at political cartographic manipulations. In the next chapter I review specifically how I code for and analyze such manipulation. First, however, we need to review the second category of manipulation – graphic.

## Graphic Manipulation

Depending on a map's intended audience and a cartographer's abilities, visual cartographic manipulation will typically result in extremely obvious propaganda or, when done masterfully, subtle and insidious "truth." Overt manipulation is the type of visual manipulation that goes for the jugular – often using highly sensational or flamboyant symbology to catch the map reader's attention and elicit an emotional response. Covert manipulation is by its very nature much more subdued. It is best epitomized by maps that appear to be objective or merely reference maps, but upon closer inspection contain numerous idiosyncrasies and nuances placed on the map to promote a certain perspective and understanding over alternative ones.

An example of an overt visualization would be the map of the US invasion of Iraq in 2003 (Figure 2.12). This map from the *Washington Post* uses bright contrast, arrow-tipped lines, mimetic symbols, photographs, illustrations, tables, and graphs to make its argument. From the looks of it, everything was going well; though, history shows the situation was different (Woodward 2002; Wright 2005). The use of the color red is also telling; as in the West this color is generally associated with aggression (Tufte 1991; Madden, Hewett, and Roth 2000; Valdez and Mehrabian 1994).

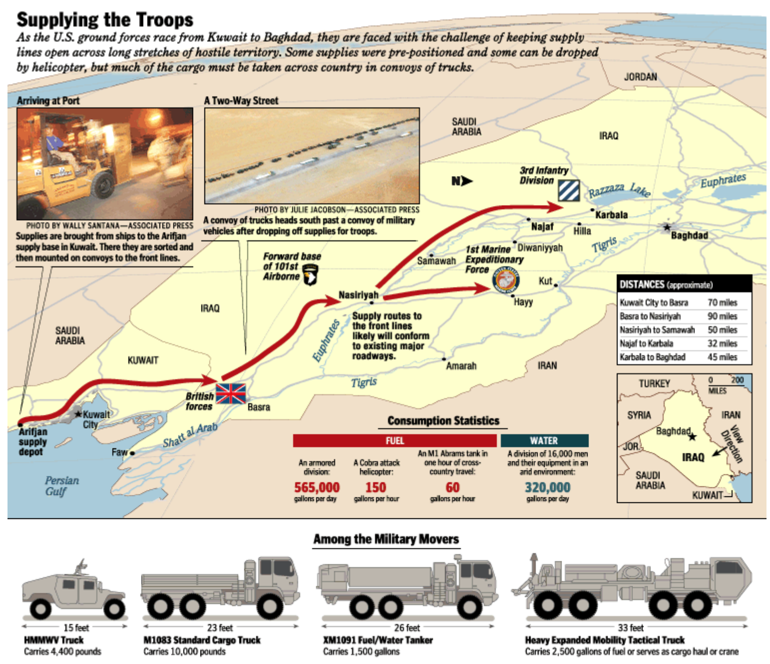



**Figure 2.12 –** A map that is eerily similar in enthusiasm to representations found in Nazi literature during the initial Russian front (Supplying the troops 2003).

In contrast, a prime example of covert manipulation would be the following *Weapons of Mass Destruction in Iraq* map (Figure 2.13). On this map, the pictorial symbols seem fairly legitimate for what they are mapping and the coloring is red enough to make the points stand out. Only after inspection does one realize that many of the most violent looking mimetic symbols on the map represent weapons *known to have been destroyed*, and the location of the remaining weapons is largely speculative.


**Figure 2.13 –** Iraq: Declared Biological Weapons-Related Sites. Notice how there is also model PCM occurring here too. The scale is large, focusing just south of Baghdad, but the title prominently displays “Iraq” (Biological weapons 2002).

Regardless of the tactic of graphic manipulation employed, PCMs always utilize visual signifiers to *enhance or change* an audience's presumed position regarding a rhetorical message. In the first map, graphic signifiers are useful for a casual overview that the invasion of Iraq is going exceedingly well. (Indeed, at the time of the map's publication most would have argued it was.) In the second map, placing symbols all over the maps helps to *cover up the lack of data* regarding the danger of Iraq's weapons – particularly since most of the dangerous symbols represent already destroyed weapons!

Cartographers have spent years scrutinizing what representational techniques can be used to emphasize and mimic certain spatial data (McMaster and McMaster 2002). The categories of graphic manipulation are numerous, but for simplicity's sake can be broken down into four areas: (1) thematic symbolization; (2) visual variable selection; (3) visual hierarchy; and (4) map layout. I review these processes with a focus on how they are applicable to political cartographic manipulation.

## Visual Variables, Symbolization, and Thematic Map Type

*Visual variables* are the modification of geometric symbols to establish hierarchies of information and graphical legibility. Like projections, these variables may distort one's perception of the data if not used correctly. Beginning with Bertin's *The Semiology of Graphics* (1983), designers and cartographers began analyzing how certain visual variables are more suitable for representing particular types of data. It was quickly noted that it was impossible to visualize certain data levels with some of the visual variables (Figure 2.14 for example). The human brain is preconditioned to view certain graphic manipulations as quantitative and others as qualitative. Thus, the misuse of a visual variable – e.g., using hue to show ratio data – can lead to people misinterpreting the meaning of the data.

Bertin's (1983) work also induced cartographers to begin exploring additional visual, and other sensory, variables. Since Bertin's text, numerous scholars have modified his original definitions and debated the utility of particular visual variables in different circumstances. By and large, consensus has emerged around nine variables (MacEachren, 1995): size, orientation, shape, arrangement, texture, focus, and color hue, value, and saturation. (These are defined in Chapter 3.)

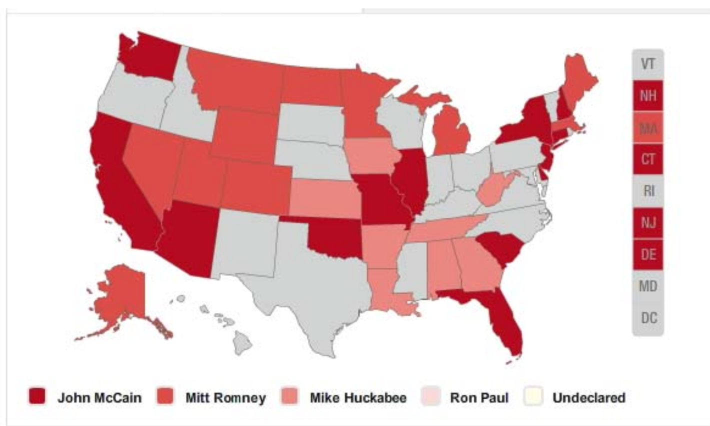



**Figure 2.14 –** Republican Primary & Caucus Map (2008). This map uses the visual variable of "color value" (i.e. red shading). Universally, humans view darker areas as denser or of higher number, and lighter areas as less dense and lesser. This visual variable is useful for showing quantitative differences among enumeration units. However, CNN misused this visual variable. This is an election map showing who won which states – a nominal level of measurement (The delegate race 2008).

*Certain visual variables should never be used for certain types of data, because humans are bound to misinterpret them.* Just as any language is unintelligible if a speaker has a verbose vocabulary but cannot follow a modicum of grammar, a map will not accurately communicate the data it is representing if a cartographer incorrectly uses visual variables.

## Thematic Representations of Data

Though visual variables are used to illustrate all types of spatial data, specific techniques of representing thematic data have been developed over the past 200 years. Below I review the most common thematic representations used in PCMs and discuss which visual variables these techniques often embrace to communicate their message.

### CHOROPLETH MAPS

There are several absolute rules for choropleth maps that are frequently ignored by politically motivated and amateur cartographers. First, choropleth maps may only be used to map derived, or standardized, data (Slocum et al. 2005). Second, choropleth maps should portray classified data, unless there are merely a handful of enumeration units in the sample. Humans cannot view more than three items in their visual field at once (Ware 2008). Humans are also incapable of differentiating among more than two handfuls of color values. When data isn't classified into similar groups sharing the same symbology, humans are unable to make sense of the difficult patterns that emerge (Dobson 1979). This can work to the advantage of a cartographer trying to persuade an audience. An example of a choropleth map is shown in Figure 2.15.

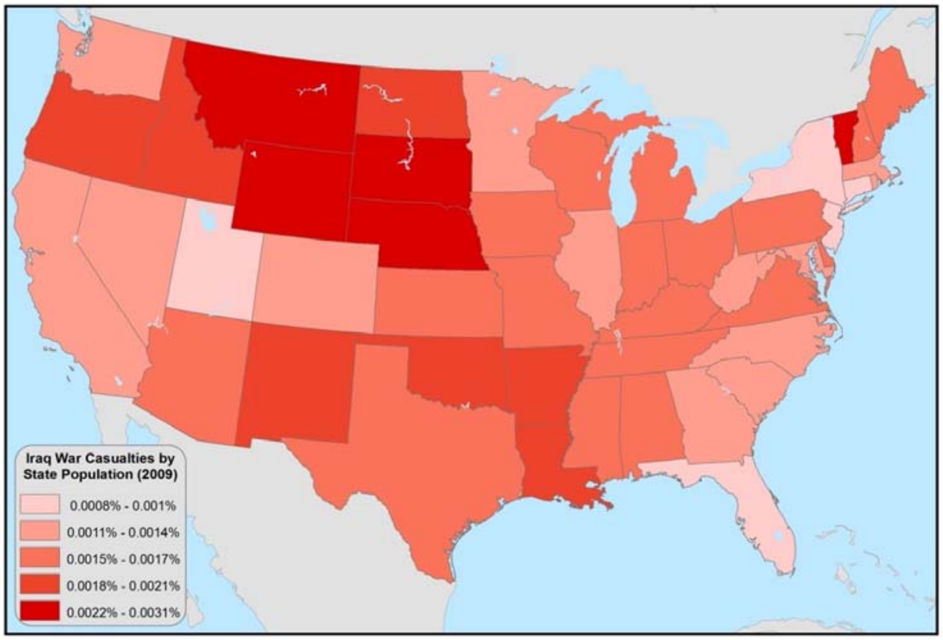



**Figure 2.15 –** Iraq War Casualties by State Population. A choropleth map illustrating the percent of each state's population that has been killed serving in the Iraq War (as of February 2009). Please note that standardizing by state population makes Montana and several other low population states stand out (Iraq war casualties by state population 2009).

DOT MAPS

Dot maps better facilitate the representation of data within their respective enumeration units. Dot maps use individual point symbols to represent a certain number of data. For example, in Figure 2.16 below, each point represents a single casualty in the Iraq War. Dot maps are very powerful tools for showing density and distribution. When coupled with large scales, they can be used to make it appear as though there is far more of something than there actually is. When used at small scales, they can manipulate the map reader into thinking that there is less of something than there is.

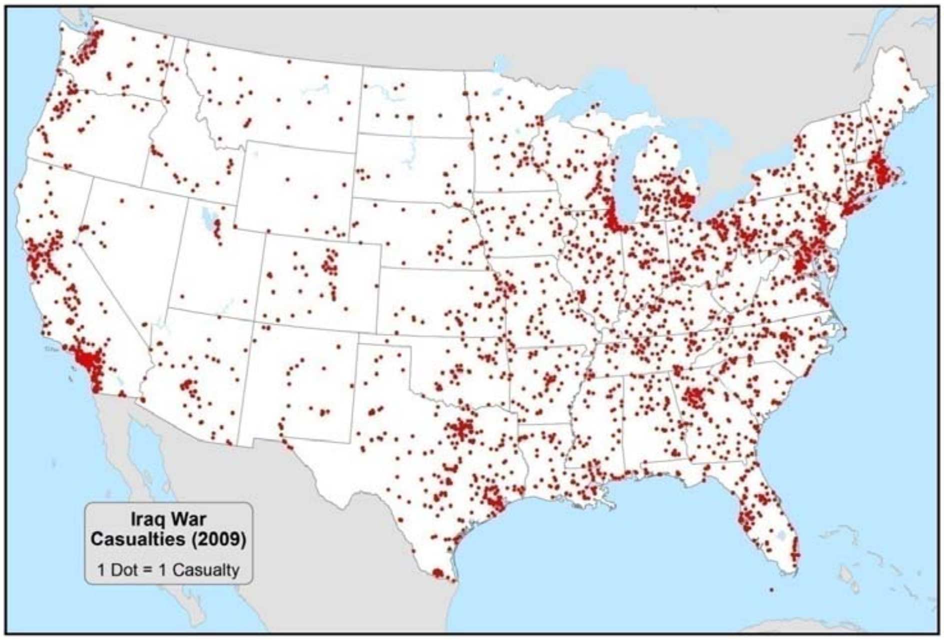



**Figure 2.16 –** Iraq War Casualties (2009). This dot map represents the number of US casualties in Iraq and marks each death by placing a dot in the soldier's hometown. This map better illustrates the spatial pattern of US casualties than the choropleth map above. Notice how Montana does not stand out on this map (Iraq war casualties (dot map) 2009).

PROPORTIONAL/GRADUATED SYMBOL MAPS

Proportional symbol maps are excellent for representing high, raw data values in a tight area – for example, the east coast area in Figure 2.17. Proportional circles use the visual variable of *size* to differentiate values among enumeration units or data points. The symbol can be purely *geometric* (e.g., a circle) or it can be *mimetic/pictorial* (e.g., a picture of a tombstone). Proportional symbols have been critiqued for their inaccuracy, as research has shown that humans are notoriously bad at determining the difference in size between two shapes, particularly when there are many on a map (MacEachren 1994a). A common PCM technique is to inappropriately use proportional symbols to make something look larger or more common than it really is.

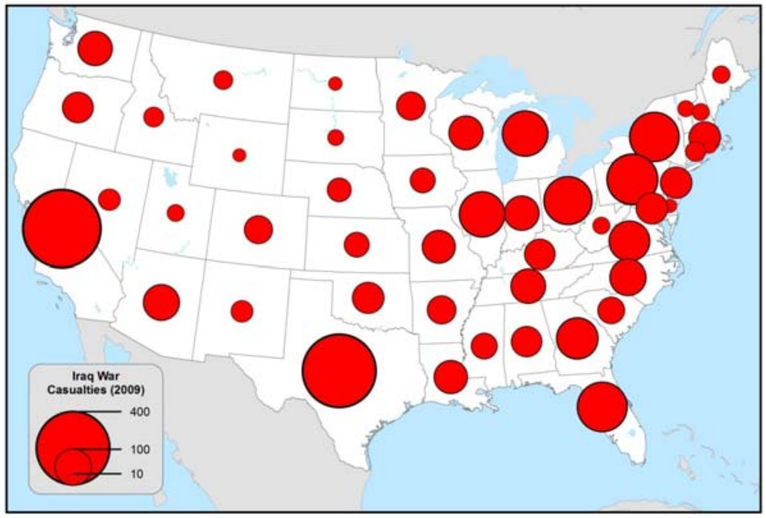



**Figure 2.17 –** Iraq War Casualties (2009). A proportional symbol map showing the number of casualties in the Iraq War by state. Notice how California stands out on the West Coast, largely because it is surrounded by states with relatively smaller symbols (Iraq war casualties (proportional symbol) 2009).

FLOW MAPS

Flow maps are often more difficult to make with digital cartographic software, but they were once the hallmark of political cartographic manipulation (particularly up through the middle of the Cold War). Flow maps are still largely unsurpassed as mechanisms to instill excitement among map readers. The most common and communicatively powerful flow maps mimic proportional symbols. By changing the thickness of a line in proportion to other lines, one can visually quantify the amount of interaction between two places (see Figure 2.18 below). Depending on what one decides to be the starting thickness of the line, flow maps can often deceive a map reader into thinking that there is more or less interaction between places than there really is.

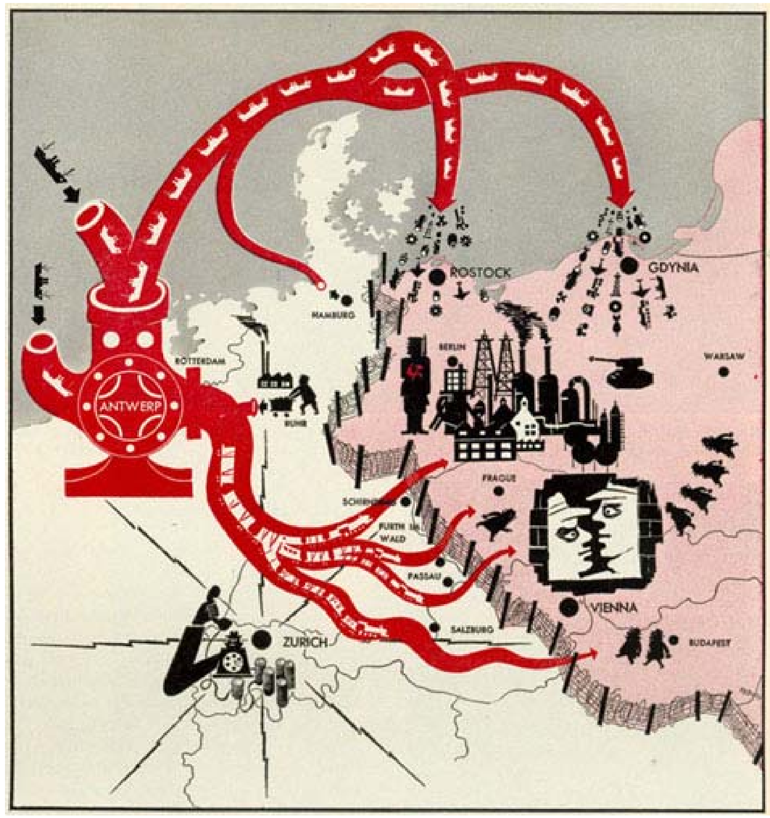



**Figure 2.18 –** One of the more infamous flow maps ever produced, this map purports to show the siphoning of Western materials through the Iron Curtain to be used for industrial and military purposes against the Western powers (Antwerp 1953). Though more cartoonish than many other maps appearing in *Time* and *Life Magazines*, it illustrates the dynamism and graphic effectiveness of flow lines. It also illustrates the power of mimetic point symbols as well!

## MULTIVARIATE MAPS

Multivariate maps are those that modify existing thematic designs to present more than one variable per location. Most typically, multivariate maps use two or more thematic representations at the same time to combine several different themes into one map (see Figure 2.19). For example, chorodot maps mix both the concept of dot and choropleth maps into one so that the cartographers can show two quantitative values with one symbol (MacEachren and DiBiase 1991). Another example would be the use of pie charts within graduated circles to allow the illustration of both a count value and a breakdown of that count value into different percentages. Multivariate maps are useful tools for displaying more than one type of data on a single map – something that Tufte (1991) argues should be of paramount importance when designing information displays. The more information one can place in an image, the more likely a map reader may be to accept the information as official. However, including too much thematic information can also overwhelm and disguise spatial trends that might otherwise be readily apparent; this is a useful technique of manipulation.

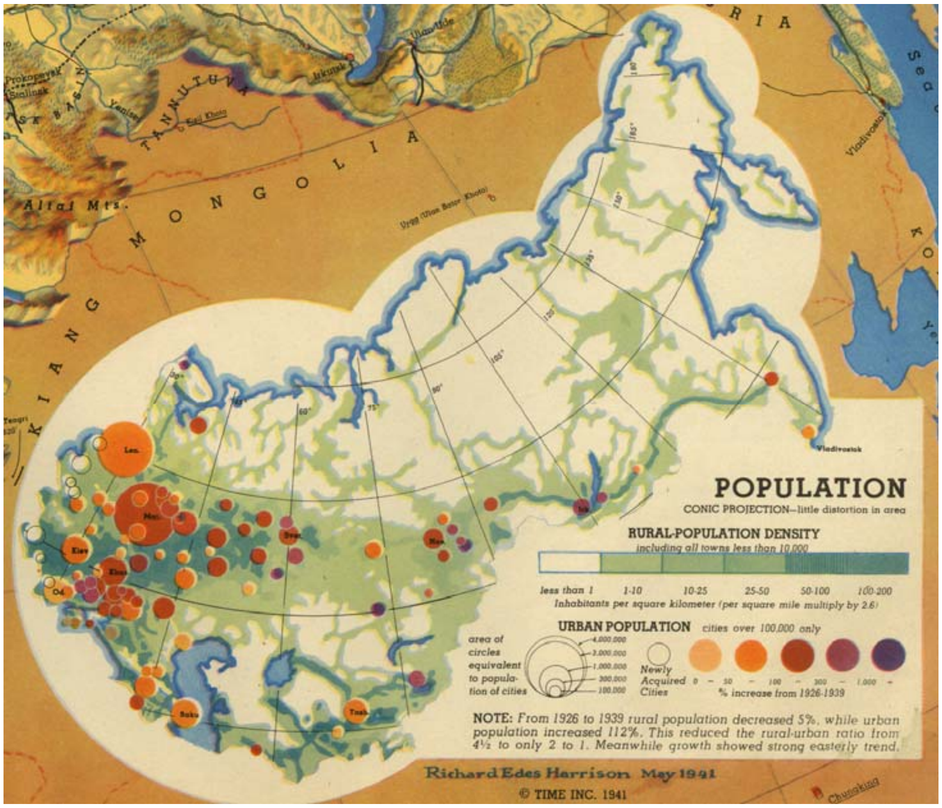



**Figure 2.19 –** The Soviet Union (inset map). This map shows three variables on a single map. It uses proportional symbols to show the population of cities. It uses a choroplethic scheme on proportional symbols to map percent increase in urban population over time, and it uses either a choropleth or isarithmic method to color in the rural population density of different areas of the Soviet Union (Harrison 1944: 37).

## Graphical Hierarchy

Just because data appears on a map does not mean it cannot be shrewdly hidden. Every map, indeed every image, has a graphical hierarchy that establishes a figure-ground relationship and emphasizes certain visual elements over others. Discerning a map's figure-ground and levels of graphic hierarchy can both be simplified and complicated via cartographic manipulation. Thus, beyond merely how data are symbolized, it is during the final process of designing the map that cartographers can most effectively disguise information they do not want the public to notice easily.


**Figure 2.20 –** Red China. PCMs frequently bury data that does not support an argument into the lower visual levels. This map uses a variety of techniques to make Communist China look quite menacing to the rest of Asia, including atypical orientation and projection. Obviously, China is the figure and dominates the visual hierarchy, but notice that other communist states are prominent too. Interestingly, Mongolia has been blurred into the Soviet Union to more heavily emphasize just how communist Asia was becoming. This map also deemphasizes information pertaining to US military interests in the region. The US flag and non-communist states are both blended in with the background data and ostracized at the bottom of the map – not exactly the optical center that most people will look at (Red China 1955).

Dent (1999) argues that depending on the purpose of the map, certain elements should be marked with higher graphic contrast and emphasis so that they stand out as figures. When a map fails to do this, the data become difficult if not impossible to discern. Alternatively, a cartographer may only emphasize the thematic data of her liking and blend data that do not support her argument in with the ground. This is a common technique of map deception; for no one can accuse the cartographer of leaving pertinent data off the map, only of faulty graphic hierarchy. The map entitled *Red China* offers a prime example of this type of manipulation (please see Figure 2.20).

## Map Layout Manipulation

Not only may graphic hierarchy be manipulated to a cartographer's purpose, but the entire layout and design of a map can be changed as well. Map layout is most simply described as the design of all map components for final display to an audience. More graphic design than cartography, map layout allows the cartographer a final opportunity to enhance or hide any political subjectivity behind a cartographic argument. A map layout is comprised of arranged elements. There are some generally agreed upon norms of presentation for individual map elements (Dent 1996; Monmonier 1993; Peterson 2009; Slocum et al. 2005). I will review these norms now before segueing into more specific discussions on concepts of graphic presentation that all maps share.

### Map Titles

The style and placement of map titles often tell us as much about the message of a political cartographic manipulation as any other cartographic element. The verbal nature of the title will often tell us about the rhetorical stance of the map's creator. For example, the map in Figure 2.21 is overtly caustic and confrontational. Without even looking at the map, the map reader can deduce that the map is not an attempt at "fair and balanced" coverage. Titles also shed light on a map's intended audience.


**Figure 2.21 –** A British poster concerning Nazi Germany's aspirations to gobble up Europe (Nazi war aims 1939).

## Map Scale

Map scale is almost always an integral component to the accurate interpretation of a map. Scales are often hidden or made difficult to decipher in order to make something look larger or smaller to the map reader.

## Mapped Area & Orientation

There are a variety of techniques for arranging the mapped area of your map. One thing that has remained relatively constant in modern times, however, is that north is always *assumed to be* at the top of the map unless otherwise clearly stated. Although there is much debate concerning the unjustness of promoting the northern hemisphere over the southern, this is simply a cartographic convention in economically developed societies.

North *does not* have to be at the top; it is just assumed to be. Sometimes cartographers will manipulate the spatial data being presented by tilting the mapped area in a certain direction to create an image that seems to imply that one part of the map is on top of, or about to crush, another part. This was a particularly dominant tactic among magazine cartographers during World War II and the Cold War. After this brief spate of cartographic vertigo, north has secured its perch atop the world again in most cases, although maps are reoriented for rhetorical emphasis (Figure 2.22).


**Figure 2.22** – The cartographers at MSNBC surely had fun reorienting the entire Western Hemisphere to highlight the political argument (Leftward tilt 2008).

## Supplemental Material

Supplemental material includes extraneous textboxes, the north arrow or graticule, cartographer credits, company or government logos, and other miscellaneous details that may, or may not, be of use to the map reader. Generally, supplemental material should be suppressed in the graphic hierarchy – it should only be noticeable if the map reader actively looks for it (Dent 1999). Nevertheless, many cartographers do not heed this wisdom. Though every map utilizes supplemental materials to some degree depending on its context and needs, observing the role that this material plays in the display of the map can highlight what it is either attempting to distract from – i.e., the mapped area itself Figure 2.23 – or accentuate – i.e., added details that are not easily communicated on the map itself Figure 2.24.

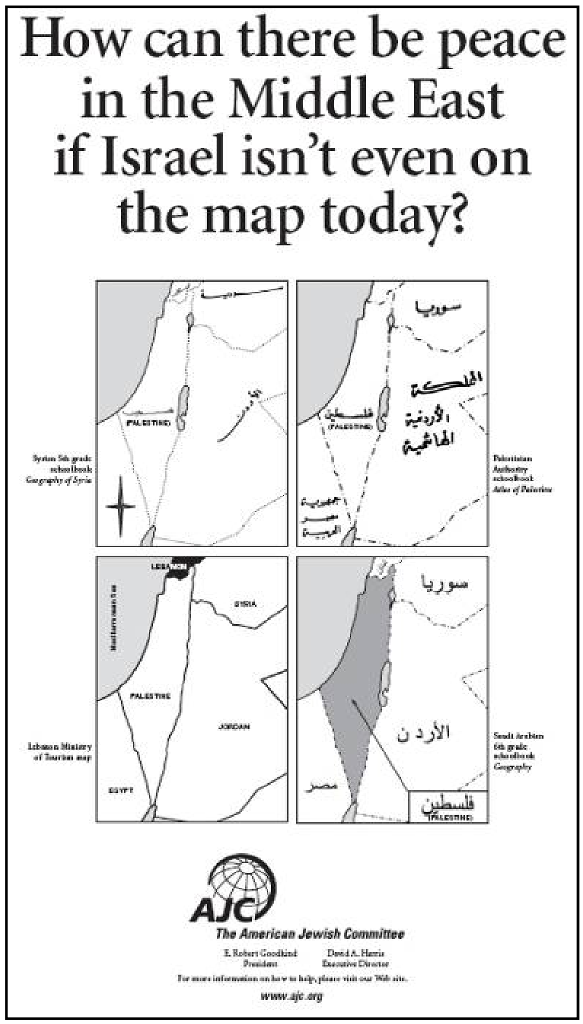



**Figure 2.23 --** This map presentation does a good job of distracting from the fact that these maps were seemingly fabricated in the same GIS package and may not be true replicas of maps found in textbooks throughout the Middle East. The maps seem to serve as caption for the argument, rather than the other way around (How can there be peace in the Middle East? 2004).

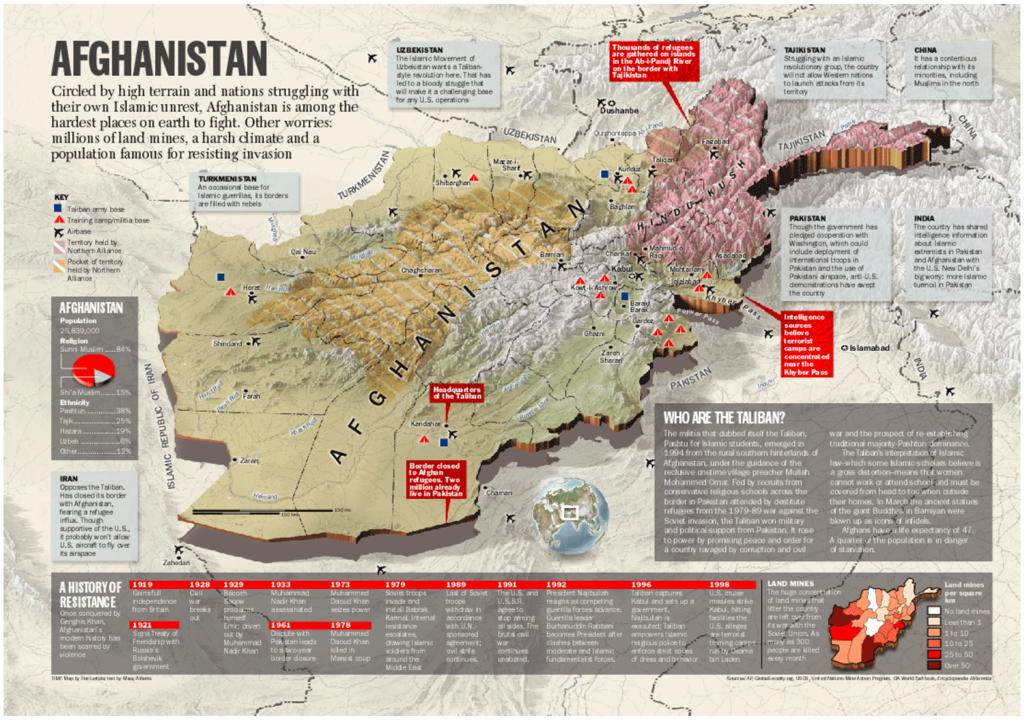



**Figure 2.24 –** Afghanistan. The supplemental information provided on this map is meant to contextualize information for the data on the map itself. However, it might be argued that the sheer amount of supplemental information seems to bury the mapped area itself.

### Maps as Rhetorical Images

As should now be apparent, maps are more than objective models of space; they are designed representations. Maps are merely images representing spatially significant information in a manner that is, though typically standardized, entirely subjective (Lloyd 1982). Data are collected, organized, and then stylized to eventually promote particular perspectives about the way the world is or could be. Sometimes the biased perspectives emanating from maps are seemingly banal. As I define political maps in this study as maps used for overtly political arguments, we must analyze the manipulations found in maps from more than a cartographic perspective alone. We need a method of analyzing the holistic design of maps to promote an argument. In essence, we need to be able to analyze what a map's design tells us about its rhetorical nature.

An image's layout is one of the most potent components behind projecting its message (Dondis 1973). Though there are no concrete rules behind visual communication, there are culturally established norms that largely influence how an image will be interpreted. These norms are evident in every image's layout; they are what allow us to interpret images – a visual grammar. In *A Primer of Visual Literacy* (1973), Dondis notes that all graphic images can be broken down and analyzed by the design techniques used to make them. I argue that maps can be as well.

Dondis (1973) argues that particular communication techniques exist that offer the creator of an image the capability to manipulate the data graphically in order to increase the odds of it being interpreted in a particular way. Yet, as is the case with my research on PCMs, she is *not* interested in analyzing *how* images are interpreted. Instead, she is interested in how images are composed. In order to analyze this, she breaks all images down into 18 distinct continuums of graphic manipulation (Dondis 1973). She argues that these dimensions are not exhaustive – there are additional types of manipulation that can be defined depending on the images one is attempting to dissect. Each of Dondis' 18 techniques of graphic manipulation is comprised of an axis with two extremes – one representing harmony and the other contrast. She proposes that, although we cannot understand the intent of the designer or the interpretation of the recipient, by dissecting images and determining where they fall on these design continuums *we can understand the techniques and levels of graphic manipulation a designer used to craft the message.*

Dondis (1973) refers to her original 18 layout continuums as "visual techniques" or "communication strategies." Obviously, not every image is affected by all of the graphic manipulations equally. In some cases, images are largely neutral – falling equidistant between the polar opposites of harmony and contrast. Her use of a Likert-type scale for image deconstruction can be used on numerous images so that one can compare different cartographers' methods of communication with one another. In the following chapter, I illustrate how Dondis's method can be used to deconstruct the rhetorical nature of maps into quantifiable elements that can be compared to one another and to the manipulations found on other maps.

## Conclusion

The argument that every map is manipulated in a particular way to convey a limited perspective or message is not new. Indeed, cartographers have been arguing this about maps for centuries (Lloyd 1982, 2000; MacEachren 1995; Mark and Frank 1991; Montello 2002; Ware 2008; Wood 1994). This chapter has reviewed many of the techniques used during the cartographic design process to manipulate maps. Researchers have classified and defined many different data model and graphic techniques of manipulation allowing for spatial data to be rendered in cartographic form (Bertin 1983; MacEachren 1994a, 1994b, 1995; Slocum et al. 2005). Post-modern cartographers have gone even further in their analysis – beyond visual technique into the realm of intention. They argue that all maps are inherently political, i.e., all maps are the product of some power attempting to shape our vision of reality through representation. There is no evidence that such assertions are incorrect. However, unlike the cartographers before them who conducted numerous studies on map communication in the attempt to find cognitive or physiological patterns, post-modern arguments fail to look at universal, or at least recurring, patterns in map manipulation. *My work bridges the gap between these two approaches – the communication approach and post-modern deconstruction. As I will explain further in Chapter 3, I believe that Dondis' technique of analyzing how map layout helps communicate a message acts as a potential bridgehead between the two.*

By synthesizing her holistic method of image interpretation with aspects of data model and graphic map interpretation, I can now systematically compare and contrast many different maps based on the techniques of cartographic and layout manipulation they use. The next chapter will explain how I will: (1) analyze multiple maps at once and longitudinally; and (2) count and quantify political cartographic manipulations found in individual maps.

# Chapter Three

## *Measuring Political Cartographic Manipulation*

The main shortcoming of previous approaches to understanding map manipulation is that studies thus far have been both extremely time consuming and typically non-cumulative. Regardless of whether you attempt to deconstruct a map using Foucault (Harley 1989), semiotics (Wood and Fels 1986), or a purely hermeneutic approach (Pickles 1992), you will be conducting your lengthy analysis on one map, or at most a handful of maps, at a time. The research questions that can be answered using these methods have, by and large, already been answered in the literature. Thus, when you are done your results will likely show the already well-established fact that every map is, in a sense, “biased,” but due to the fact that you have not used a systematic or replicable approach, the analysis will likely be incompatible for comparison with other map studies.

Thus, the primary goal of my research is to establish a method of map analysis that will allow us to ask new research questions about map manipulation well into the future and compare our analytical results with those of other researchers dissecting different maps. I propose an analytical framework that is both longitudinal in its potential, expansive by design, and compatible for future individual or comparative analysis of any type of PCM. Moreover, this framework must be designed so that it can eventually incorporate new alternative types of cartographies such as dynamic maps and Web mash-ups into the mix. The method chosen must be systematic in its evaluation of maps and able to quantify the results for comparison between map sets. One method that can achieve all of these goals is quantitative content analysis.

## Quantitative Content Analysis

Content analysis was originally designed for use with texts; however, it is now widely accepted as a valid methodology for dissecting visual messages, particularly when looking for patterns in a large sample (Rose 2007). As opposed to other methods of deconstruction, which often concentrate on uncovering different contested meanings and representations in a single visual image (Harley 1992; Pickles 1992; Piper 2002; Wood and Fels 1992), content analysis is useful for answering predefined research questions about the nature of many images at once (Rose 2007). Rose (2007: 59) notes that this form of qualitative analysis follows the rules of quantification and natural science methodology. By and large, quantitative content analysis is a technique that allows for the statistical analysis of qualitative data.

There are two broad types of content analysis – qualitative and quantitative. Qualitative content analysis is less concerned with counting differences within data samples and more interested in drawing parallels between objects (Krippendorff 2004). It may use count data to compare different members of a sample to one another, but that is about as mathematical as it gets (Riffe, Lacy, and Fico 1998). Quantitative content analysis (QCA) is a particular method of content analysis that explicitly emphasizes the quantification of qualitative data analysis (Riffe, Lacy, and Fico 1998). Whereas different types of content analysis may be used in a variety of fields, quantitative content analysis has found a home in media studies and is most suitable to help answer the research questions I propose. Riffe et al. (1998: 20) provide evidence for why this is, when they define quantitative content analysis as:

> *"[T]he systematic and replicable examination of symbols of communication, which have been assigned numeric value according to valid measurement rules, and the analysis of relationships involving those values using statistical methods, in order to describe the communication…"*

There are two key concepts in the above definition that illustrate why this is the appropriate method for my research, which I will review now, before proceeding to describe the exact techniques used for my study.

### Systematic and Replicable

Unlike many other approaches to qualitative or descriptive research, when using quantitative content analysis the research questions must drive the analysis, i.e., the analysis cannot end up defining the hypotheses as it does in grounded theory, for example. Before analysis begins, one must be able to operationalize what it is that is being sought in the data sample (Krippendorff 2004; Riffe, Lacy, and Fico 1998). In the present instance, I must have firm definitions about what image elements will qualify as different types of "political manipulation" within the maps I am sampling. This is achieved through coding – creating a set of operational rules that specify the meanings and degrees or intensities of different elements.

Content analysis is based on a system of predetermined codes (or categories). The goal of using codes is twofold: (1) to systematically evaluate and analyze each sample in the exact same manner so that the results can be compared, and (2) to allow for a replicable analysis by other researchers in the future. Whereas most qualitative approaches are non-replicable due to the subjective nature of their qualitative descriptors (e.g., what one person labels "provocative" someone else may deem "tame"), content analysis defines, identifies, and quantifies (or operationalizes) the attributes of nominal data (i.e., in this case political maps). For this system to work, one must explicitly develop and apply a series of codes (i.e., labels describing characteristics of the map image) relevant to the research questions being asked. Once these codes are established, one can go through a series of images or texts and analyze each one systematically using the same, pre-defined codes that will help answer the research questions. With well defined codes, anyone trained in the coding should, theoretically, be able to replicate the results of the original analyst. In the end, one can perform statistical analysis on the different images using the codes as the variables of analysis. (This map was created using technique A but not B or C. Which other maps were also created using technique A? Which maps used techniques B and C but not A?)

### The Goal of Quantitative Content Analysis

The second section of Riffe et al.'s (1998) definition deals with the purpose or intended outcome of using quantitative content analysis. Accordingly, there are two achievable objectives that are identified: (1) *to create descriptive statistical analysis of a large dataset* and (2) *to draw inferences from the data to its context of production or consumption.* Riffe et al. (1998) note that the purpose must be clear in the researcher's hypotheses or research questions before analysis is conducted. The purpose of my research should now be clear: to systematically analyze the different PCMs found in maps created with a political purpose.

## Critiques of Content Analysis

Although it is a wonderful tool to use in the analysis of many images, content analysis has been the subject of several critiques. First and foremost, some argue that content analysis is fixated on the image itself at the expense of everything else. This is true. Much to the chagrin of cognitive scientists, content analysis cannot explain or predict the response of individuals looking at an image. It has no method of analyzing different people's reactions. Though a lack of concern for the receptor of an image (i.e., the subject looking at a map) has led to the withering and demise of many research agendas in the cognitive sciences (for example the early work on spatial cognition of Downs and Stea (1973)), this will have no effect on my study and therefore cannot be used to rule content analysis out. I am interested in the manipulations of spatial data as found in the map itself. Certain presumptions can be made, based on the cartographic and graphic design theory reviewed in the previous chapter, as to how the "average" map reader will interpret certain manipulations, but such presumptions are beyond the scope and interest of this research. Others have already written about the effectiveness of map manipulation (e.g., Monmonier's *How to Lie with Maps* (1996) and Wood's *The Power of Maps* (1992)). My research deals with the *visual techniques* of manipulation comprising different types of politically manipulated maps.

A second critique of content analysis is that it will not help us discern much about the *processes of map creation.* Using this method we can see what graphic elements and data components a map is comprised of, but we *cannot* determine the intended message of the cartographer, nor can we necessarily identify the specific cartographic decisions and processes that influenced the appearance of a map's final draft. This would be a serious drawback in methodological design if this research were interested in measuring the *intent of manipulation*. Fortunately, I am using content analysis to interpret images via the visual and cartographic techniques used in their construction, without regard to cartographer intent or issues of map reader cognition. I am curious about how these maps are made only to the extent that such information can help me understand the visual and data components comprising them. Whether or not they were intentionally made a particular way or are actually interpreted in a particular manner is irrelevant to the goals of this research.

What content analysis *does allow* for, however, is the contextualization of different types of political manipulation. If we sample a large number of maps from a variety of different political eras, we may end up seeing trends in the characteristics of cartographic manipulation that change depending on a variety of factors (e.g., geopolitical context, technological development, etc.). This *is* one goal of this research.

### Data Collection & Sampling

For my analysis I collected over 250 maps containing some form of political cartographic manipulation. It was a convenience sample, with maps selected from map libraries that I had access to, map bibliographies dealing with political maps, and online databases. Though there are limits to the reliability of convenience sampling (Creswell 2003), the long term goal of this research is to build a framework within which additional maps will continually be added to the sample; thus, any such limitations should dissipate over time.

To limit the scope of my project, I chose to primarily analyze thematic maps, as most often thematic maps are the ones used for political manipulation. However, there are numerous reference and "non-cartographic" maps (Ager 1977; Monmonier and Schnell 1988), those found as supplements to a larger image in advertisements and spin pieces, included in the sample as well. All maps selected for my sample (*N* = 257) were created after 1750, as this is when thematic cartography began to form as a subfield of cartography (MacEachren 1979; Robinson 1982). No more than 10 maps could be from the same cartographer or publisher. The maps were categorized into three themes based on the characteristics of the producer – 1) *government maps;* 2) *popular media and publication representations;* and 3) *non-government / non-corporate maps*. I attempted to find approximately the same number of maps created by these different categories of institutions for comparative purposes. The maps were also selected and categorized by *geopolitical era.* These eras were: *Pre-1914 (Classical Period); 1914-1945 (World War Period); 1945-1990 (Cold War Period);* and *after1990 (Post-Cold War Period).* Approximately equal numbers of maps were selected from each time period, with the exception of the pre-1914 period, which had fewer maps. The following chapter will review the descriptive statistics of the sample in detail.

For these research questions, I chose to limit the breadth and style of maps analyzed. This being said, the resulting methodological framework may be useful for understanding the composition of many types of print maps, not merely political ones. For this sample, the scope of *political cartographic manipulation* (PCM) was limited in two ways. (Again, *political cartographic manipulation* is the model and graphic manipulation of maps created by institutions for explicitly persuasive purposes of communication or information dissemination.) First, the maps in my sample were only produced by established institutions or by identifiable politically active groups. My sample includes maps created by or in conjunction with (a) national governments, (b) national or global scaled conglomerates and publishers, (c) international non-government organizations, and (d) social movements. (Please see Figure 3.1 – 3.3 below for examples.) Obviously, not all maps created by such organizations fell under the categorization of political cartographic manipulation. Thus, the *second* prerequisite for maps in my sample was that a map fulfill a threshold of manipulation in one or more of the following realms:

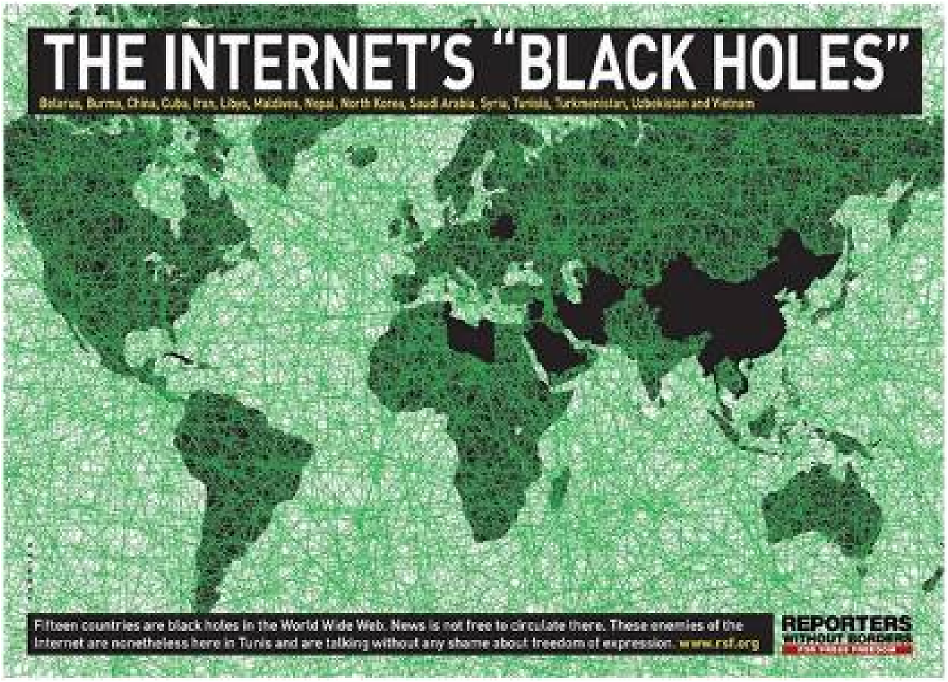
(1) *Historical hindsight*, a map that purposefully espoused what is *(now) known* to be a falsehood (as shown in *Figure 3.1*);

(2) *Asserted intention*, a map created by an institution priding itself on a persuasive political agenda such as Greenpeace or state institutions during times of conflict (as shown in *Figure 3.2*); and/or

(3) *Cartographic conventions,* a map that patently ignores cartographic standards, whether intentionally or not, and therefore is more likely than others to misrepresent the spatial data being mapped (as shown in *Figure 3.3*).


**Figure 3.1 –** JVI Ministries Map. This map comes from Jack Van Impe Ministries International and purports to show a battle leading to the apocalypse and Rapture. Note that Russia has very little influence in the parts of Africa that this map argues they do. Indeed, if anything China should appear on the map, seeing as it is heavily invested in Sudan. This is an example of a battle that did not come to fruition (Invasion N/A).


**Figure 3.2 –** A Vulture's View. This map from *Fortune* magazine in the 1930s purported to show Italy's vested interest in invading Ethiopia. Though Italy did eventually invade, this map is full of dubious data. Moreover, it marginalizes the people actually living in the area the map is showing, the Ethiopians, by merely divvying up their land into sections of interest for the Italians – as though there is no one living there already. The feral animals promote a sense of exotic danger (A vulture's view 1935).




**Map 3.3 – *The Internet's "Black Holes."*** Who said only sinister organizations use PCMs? An example of a political cartographic manipulation by an international non-profit organization, Reporters without Borders. Looking at this map you *would not* surmise that China has more Internet users than any country in the world. This is blatant cartographic manipulation, as the lines and their arrangement (one of the visual variables) have no quantitative value whatsoever (The Internet's 'Black Holes' 2007).

## Map Coding

The success of any content analysis rests on the legitimacy of the codes (Rose 2007: 64-67; Riffe et al. 1998). In order for the research to be successful, codes must exhibit three traits. First, they must be ***exhaustive***. Every aspect of the sample (i.e., series of maps) that is of relevance to the research must have an identifying code. There is a caveat, however. The second rule of coding is that each code must be ***exclusive***. That is, codes cannot overlap in definition or confusion is sure to result in the final analysis. If coding categories overlap, then valid quantitative analysis is impossible, as some map techniques may be counted twice, whereas others will only be represented once. Finally, and most importantly for anyone spending months analyzing maps, the coding categories must be ***enlightening.*** Breaking down imagery in and of itself is not that interesting; people have been doing it in the arts for centuries. What was crucial was that my codes deconstructed the sample maps in a way that would be analytically relevant and interesting. To ensure that this happens *codes should be based on previously established norms in the literature* (Riffe et al. 1998). It is not enough for them to be based on literature, though; the codes must also be relevant to the research questions being asked.

As will be shown, and as the previous chapters have foreshadowed, I have done this in several ways. The first step was reviewing the literature by others studying politically motivated cartography. I created codes from known techniques as developed by my predecessors in this field of inquiry (Black 1997; Boggs 1947; Monmonier 1989, 1996, 2001, 2002; Pickles 1992, 2004; Wood and Fels 1992). The second step was to review *theories of cartography* (i.e., representing the earth on a two dimensional surface) and *graphic design* (i.e., maps as images). I developed a series of codes via three pilot tests on 30-50 different maps. These tests allowed me to weed out codes that were redundant, develop codes to cover all cases, and satisfy the requirement that the codes be exhaustive, and running simple tests to see if the codes held any promise of potentially being enlightening. After all of this, I operationalized the codes that I will spend the rest of this chapter reviewing. In order for this research to be of value in the future, the codes were based on already recognized techniques of visual manipulation discussed in the previous chapter.

## Map Context Codes

Before beginning analysis of more nuanced methods of cartographic manipulation, I would always analyze each map based on its contextual and thematic characteristics. Thus, the first thing I did was sort maps by their dates of production. The four broad eras I placed maps in were: (a) Pre-1914; (b) 1915-1945; (c) 1945-1989; and (d) 1990-present. These roughly correlate to major geopolitical epochs and events throughout history, including: (a) pre-World War I; (b) the world wars and inter-war period; (c) the Cold War; and (d) the post-Cold War/Unipolar world. The rest of this subsection offers a review of the other contextual and archetypal attributes I coded for as well.

The ***intended audience*** of the map was broken down into eight types.

| **INTENDED AUDIENCE CODES** | |
|---|---|
| Education/Schools | Other Organization(s) |
| Government | Opposing Organization(s) |
| Intra-Organization | Media Organization(s) |
| Mass Public | Unknown |

**Table 3.1 –** Intended audience codes.

Maps were also coded for their ***role*** or ***purpose*** in society. As with the audience codes, maps were often deemed to have more than one purpose and were coded for each purpose they fulfilled. The 12 purpose codes were:

| **MAP PURPOSE CODES** | |
|---|---|
| Advertising | Post-Secondary Education |
| Everyday Reference | Public Announcement/Information |
| Government Sanctioned: Reference | News/News Supplement |
| Government Sanctioned: Rhetorical/Policy | Political Group Tool/Policy |
| K-12 Education | Public Announcement & Information |
| Post-Secondary Education | Unknown |

**Table 3.2** – Map purpose codes.

Maps were coded for the scale of their original and/or ***intended geographic diffusion:***

| **INTENDED GEOGRAPHIC DIFFUSION CODES** | |
|---|---|
| Local Audience | State/National Audience |
| Regional (sub-state) Audience | Global Audience |

**Table 3.3 –** Intended geographic diffusion codes.

Maps were also coded for the scale of their ***intended social diffusion***. These codes were:

| **INTENDED SOCIAL DIFFUSION CODES** | |
|---|---|
| Less Educated Class (K12 Schooling Only) | Particular Economic Class |
| More Educated Class (College or Higher) | Citizens of a Particular Country |
| Ethnic Minority/Group | Unknown |

**Table 3.4 –** Intended social diffusion codes.

Maps were coded for the original ***medium*** on which they first appeared as well. These categories were broken down as follows:

| **MAP MEDIUM CODES** | |
|---|---|
| Book/Atlas | Folded Map / Wall Map/Poster |
| Magazine | Other Printed Medium |
| Mailing (including Postcards) | Television |
| Newspaper | World Wide Web / Internet |

**Table 3.5** – Map medium codes.

Finally, when possible each map was coded based on who was behind, or responsible for, the ***production*** of the map. These codes were:

| **MAP PRODUCTION CODES** | |
|---|---|
| Corporation | Media: Publishing |
| Individual (No Group Affiliation) | Government: National Branch |
| Lobby/Policy Group | Government: Sub-National Branch |
| Media: News | Non-Government Organization |

**Table 3.6** – Map production codes.

## Coding Map Elements

Maps were also coded from top-to-bottom based on how well they incorporated different map elements. These map elements were broken down into a variety of sub-categories, including: (a) title; (b) legend; and (c) supplemental information categories.

TITLE STYLE, MESSAGE, AND RHETORICAL CHARACTER

As mentioned in the literature review, the title plays an important role in all maps, but particularly in political mapping. By looking at a title one can often predetermine whether a political cartographic manipulation is going to use subtlety or boldness in proposing its argument. Thus, map titles were coded in three separate ways.

First, titles were coded for how and where they appeared on the map. The potential codes a map title might receive for **style** were: (a) no title; (b) caption; (c) regular (largest type on map); (d) regular (not largest type on map); (e) title is in the legend; and (f) other.

Second, each title was coded for the **directness** of its message. Directness was broken down into three realms: (a) direct and clear; (b) ambiguous and unclear; (c) neither direct nor ambiguous; and (d) no title. Many titles are often direct and clear. Some are a little more tongue-in-cheek and do not state what is being shown on the map – these were considered ambiguous. Maps that described the map but did not appear to make a direct or sly argument were considered neither direct nor ambiguous.

Finally, titles were broken down by their **rhetorical** style. Originally, I had three categorizations for this: (a) formal; (b) informal; and (c) other. However, after my pilot studies I realized that these codes were not detailed enough; so I added several more to better accentuate differences among maps. The codes used for rhetorical style were: (a) belligerent; (b) critical; (c) formal/official; (d) headline/announcement; (e) satirical; (f) other; (g) no title. Needless to say, most state produced maps used formal titles. Many advertising maps use informal, even satirical titles. Media companies largely use headlines. NGOs used a mix, depending on the intended audience.

MAP ELEMENT CODES

Finally, maps were coded for both what they had and what they lacked when it came to the inclusion of various supplemental data and elements. Maps were tested via the following codes in a binary fashion – either they received each of the following codes or they did not:

| **MAP ELEMENT CODES** | |
|---|---|
| Charts: Around Mapped Area | Charts: Over Mapped Area |
| Non-Photo Graphics: Around Mapped Area | Non-Photo Graphics: Over Mapped Area |
| Photos: Around Mapped Area | Photos: Over Mapped Area |
| Tables: Around Mapped Area | Tables: Over Mapped Area |
| Text/Quotes: Around Mapped Area | Text/Quotes: Over Mapped Area |
| Other Items: Around Mapped Area | Other Items: Over Mapped Area |
| Inset Maps: 1-2 | Inset Maps: 3-4 |
| Inset Maps: 5 or More | Publisher/Cartographer Unknowable |
| Data Source: Unclear | Data Source: Completely Missing |
| Date of Data: Missing | Date of Map Publication: Missing |
| Scale: Unclear | Scale: Missing |
| Orientation: Unclear | Orientation: Missing |
| Orientation: Unconventional | Orientation: Incorrectly Presented |

**Table 3.7** – Map element codes.

LEGEND

Map legends were coded for their level of detail. Legends are often left vague to avoid having a critical map reader make too much sense of data. Alternatively, legends can be overloaded with detail to promote a sense of detail and accuracy or, in certain circumstances, to overwhelm a map reader. Thus, legends were not coded for what they contained but for how much detail they provided to map readers. The codes were based on a seven-point Likert system: (a) legend not available but originally existed; (b) no legend; (c) completely ambiguous; (d) ambiguous; (e) somewhat vague; (f) about the standard amount of detail; (g) slightly more info than necessary; (h) very detailed; and (i) excessively detailed.

### Data Model Manipulation Codes

Thus far we have only spoken about coding supplemental information. Now the interesting process begins – mapping political cartographic manipulation. As already discussed in detail, one type of manipulation found on most maps and yet often overlooked is what I call *data model manipulation. Data model manipulation* refers to both (1) the manipulation of spatial data before it appears on a map and (2) the inappropriate use of visual variables to map certain data. Manipulating data before it appears on the map often requires playing with levels of measurement, data classification, and/or the rounding of numbers. The inappropriate use of visual variables is more closely related to map design than data crunching. For simplicity's sake, I categorize my codes for invisible manipulation into three broad categories: *Projection and Scale; Blind Data Manipulation;* and *Visual Variable Manipulation.* I explain each below.

#### PROJECTION AND SCALE MANIPULATION

All maps distort reality. Often this occurs as soon as a map is projected, particularly when maps are produced at a small scale. Map projection aside, cartographers are forced to generalize reality so that they can model spatial data on a sheet of paper. Determining an appropriate scale and projection with which to represent your spatial data is an integral part of the cartographic process.

Projection was coded in a variety of ways. First and foremost, if the projection was readily available in the supplemental information, it could be coded directly as: (a) azimuthal; (b) compromise; (c) conformal; (d) equidistant; or (e) equivalent. If the projection was unspecified, I either tried to discern what it was by analyzing an accompanying graticule, or I coded it as *Unspecified and Unknown.* If I could discern what the projection was, it would be coded as *Unspecified but Azimuthal,* and so forth.

Finally, I also coded for the appropriateness of projections. Maps were coded in one of three ways – (a) *appropriate projection;* (b) *neither noticeably appropriate or inappropriate;* or (c) *inappropriate projection.* In general, nearly all thematic maps should use equal area projections (Robinson et al. 1995; Slocum et al. 2005). If I was unable to determine a projection, which occurred quite often, but it did not appear to distort size or shape to an excessive degree, then it was coded as (b) *neither noticeably appropriate or inappropriate.*

The scale of the map was also coded in conjunction with the projections. These codes were called "scale coverage" – this referred to the scale of the mapped area of the main map (not the scale of any insets). At first I was going to use representative fractions to code scale, but I soon realized that this was not always easy to discern, particularly with non-cartographic and highly generalized maps. Thus, I devised a scheme based on political land area covered. Though I admit that the following codes are vague, they seemed to offer the most inclusive typology for scalar analysis. The codes were: (a) *global;* (b) *hemispheric;* (c) *continental;* (d) *regional (sub-continent);* (e) *country-wide;* (f) *regional (sub-country);* and (g) *local scale.*

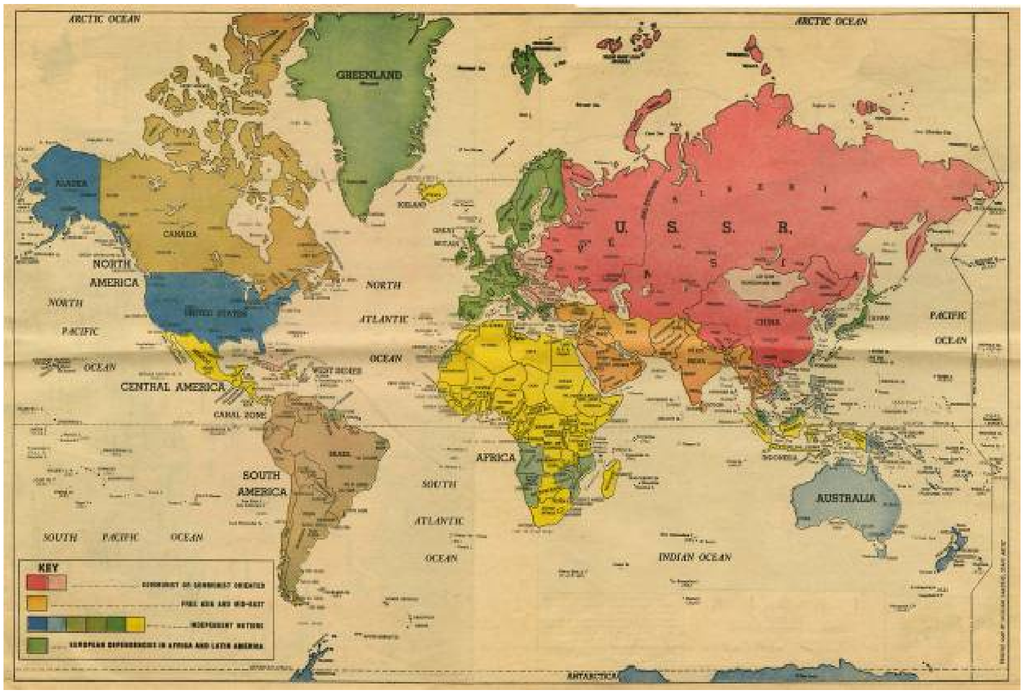



**Figure 3.4 –** The use of a conformal projection here may be misleading (Democracy in the world 1968). In general, thematic maps should use an equivalent projection so that spatial values can be compared to one another equally. To give you some reference, Mexico and Greenland are approximately the same size on the earth's surface. At first glance, the world comes off as extremely communist!

## DATA MANIPULATION

Refashioning data to prove one's argument is as old as collecting data itself. As covered in the preceding chapter, data manipulation can have incredible consequences on how one views the part of the world under examination. Thus, coding the type of data on a map and what is done with it is crucial to accurately understand the role of data manipulation in political maps.

## INVISIBLE DATA MANIPULATION CODES

After reviewing the literature and running pilot studies, I established codes for data manipulations that are not discernable from merely viewing a map. As quantifying the level of these manipulations would be near impossible, these too were coded in a binary fashion – a map did or did not fulfill the criteria for each code. These included: ***data rounding*** (e.g., rounding numbers in a non-conventional manner); ***not providing a reliable data source*** (either on the map or in any accompanying literature with the map); including ***hypothetical or future places / territories*** (e.g., showing future/proposed areas of service on an advertising map boasting a broad service area); the ***exclusion of places*** that could be, and perhaps should be, included to better inform the map reader (e.g., leaving off Superior, Wisconsin, on a tourist map of Duluth, Minnesota); and the ***exclusion of peoples*** who obviously occupy a space (e.g., Figure 3.2, outlining Italy's pre-Second World War ambitions in Ethiopia without illustrating a single Ethiopian on the landscape).


**Figure 3.5 –** While the French Foreign Legion soldier dominates this map, the indigenous population is completely left off (La guerre à Madagascar 1895).

## DATA CLASSIFICATION

Data classification is one of the major methods with which cartographers can trick their audiences into seeing spatial patterns that do not necessarily exist (Monmonier 1996, 2001). Thus, for each type of quantitative data being mapped, I attempted to discern what type of classification scheme was used to present the data. When I was unable to discern a map's data classification it was coded as *Unknown* and if the primary map data was nominal in nature, the map was coded as *Not Applicable.* The other codes were: (a) natural breaks; (b) equal intervals; (c) quantiles; (d) standard deviation; (e) temporal/chronological (in rare circumstances); (f) unclassified; or (g) other.

## LEVEL OF MEASUREMENT

Maps were also coded for the types of thematic data being mapped. The nature of each type of data being shown was broken down into one of four types – *nominal, ordinal, interval, or ratio* – or if it was unclear what level of measurement the data belonged to, it was coded as *Unclear.* Though other levels of measurement have been identified, it was determined that less detail was more fruitful for analytical purposes.

## APPROPRIATENESS OF VISUAL VARIABLES FOR DATA TYPE

As reviewed in the previous chapter, *not all* visual variables are suitable for the visual communication of all types of data (MacEachren 1994a, 1995; Monmonier 1993; Slocum et al. 2005). There are well established rules for how to best represent certain data using visual variables. I tested the coded visual variables using the chart in Figure 3.7 – originally proposed by MacEachren (1994) and adapted by Slocum et al. (2004) – to see if any cartographic rules were ignored while mapping the data. My hypothesis was that some political cartographic manipulations would use the wrong type of visual variables for the data measurements being displayed.

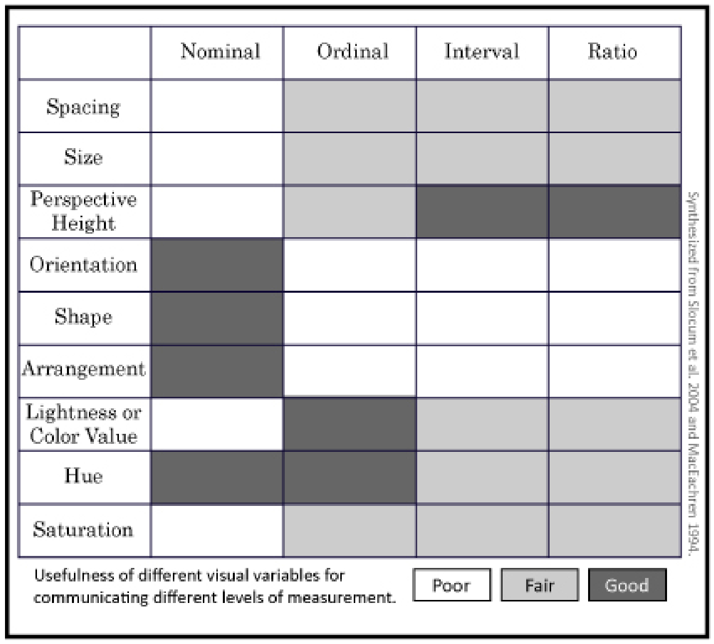



**Figure 3.6 –** The visual variables and their appropriateness (from Slocum et al. (2004)).

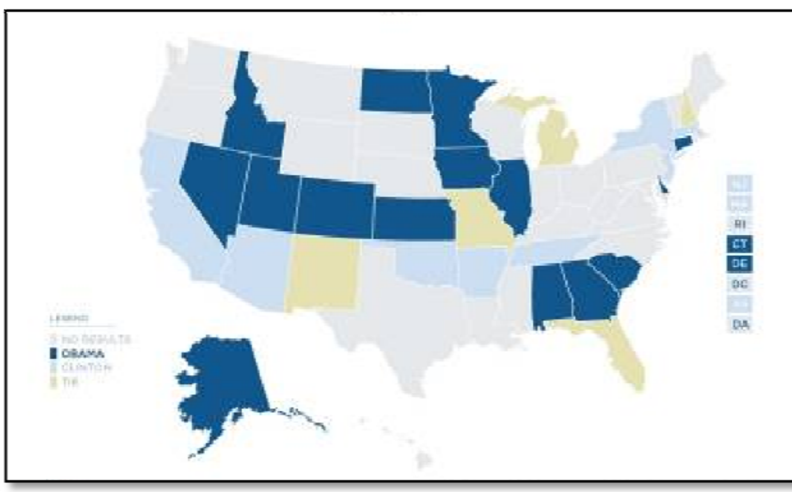



**Figure 3.7 –** Misuse of Color Value. *A campaign map from the Barack Obama web site during the Democratic Party Primary of 200 . The map represents nominal data. The dark blue states won by Barack Obama stand out in contrast to Hillary Clinton's states (shown in light blue). The khaki colored states are ones that either do not count or were considered tied. Using different hues of the same Color Value would result in less bias (Democratic primary election [sic] 2008).*

TEXT HUE AND SIZE CODES

I coded for overt misuse of text hue or size to draw attention to certain places, or make them appear more vividly, at the expense of other places on the map. The use of text to only highlight one or two places was accounted for using the two codes -- *Inappropriate: Text Color* and *Inappropriate: Text Size*. An example of this would be the use of bright red text to highlight an enemy or large text to make an area stand out in the visual hierarchy much more than similarly sized areas.

## Graphic Manipulation Codes

> "Every map has a suggestive force! Man is an ocular creature.
> He reacts to that which he sees and can take in at a glance."
>
> *– Dr. K. Frenzel, German Cartographic Society,*
> *October 22, 1938 (Boggs 1947: 472)*

Without a doubt, the most powerful component of PCM lies in the visual realm. Like all images, maps have the power to communicate complex ideas, emotions, and ideologies in a manner that is readily believed due to our species' frequent trust of what we see over what we hear or read (Newcombe and Huttenlocher 2000). Knowledge of this human shortcoming has been intentionally manipulated by cartographers and graphic artists for decades. In this section I will review the codes I devised for analyzing graphic PCMs found in my sample. The literature pertaining to these codes was discussed in the previous chapter.

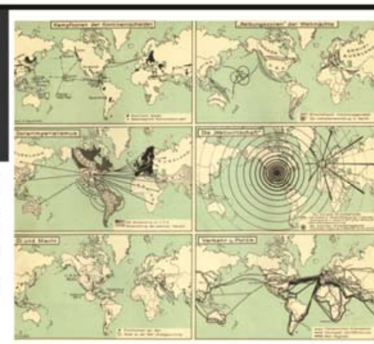
## Maps as Images: Using Dondis to Map Layouts

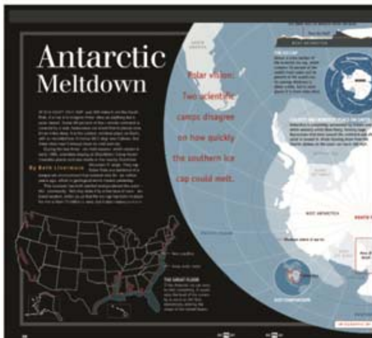
Amazingly, many of the codes Dondis proposed (as briefly reviewed in the last chapter) paralleled ones I had developed on my own. Thus, I borrowed heavily from Dondis's original 18 continuums and began to analyze maps and other images using them. They proved highly effective. However, some of them came dangerously close to breaking one of the cardinal rules of content analysis – codes must *not* overlap. Thus, while conducting my pilot studies, I weeded out and combined several of the codes that appeared to be redundant. The codes that overlapped were either combined into one continuum under a broader definition or eliminated entirely (the latter only if it was determined that the code would not help me answer my research questions). As I modified Dondis's codes during the pilot tests, I also began defining them in reference to maps and using cartographic terms. She argues that the researcher can create her own continuums and definitions depending on the goals of the analysis (Dondis 1974). Thus, I tweaked several of her definitions to more clearly define the codes for dissecting maps.

After conducting the third pilot study, I broke Dondis's codes down into 14 continuums dealing directly with the visual layout of the map as an image. I then conducted several more coding tests on different types of maps in my sample to concretely define each code and make sure that the definitions were neither too ambiguous nor restrictive. The specific codes and definitions for each Likert score can be found in the Appendix 1, but the code spectrums are listed below and cursorily defined.


**Single Map**
A map that shows everything in a single representation.

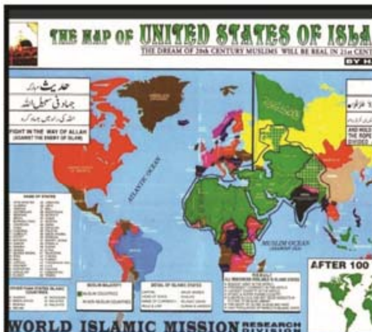
**Map Series**
A map that unifies its message via a series of maps placed next to one another or using a variety of map insets.






**Uneven Layout**
A map that is not well focused around the optical center of the map.

**Balanced Layout**
A map that concentrates the core of the mapped area around the optical center.




**Fragmented Layout**
A map comprised of many components that stand out as individual entities.

**Fluid Layout**
A map comprised of compo-nents that blend together very well and do not visually distract from the spatial data.



**Complex Hierarchy**
Comprised of many interde-pendent symbols and graph-ics across numerous levels of the map's visual hierarchy.

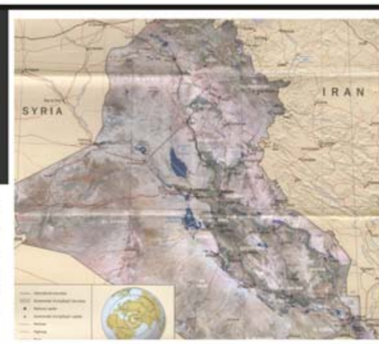
**Simple Hierarchy**
A map with few layers of visual hierarchy, offering a simple data representation.

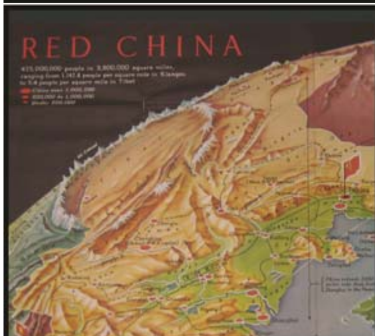

**Dynamic/Active/Movement**
A map that visually implies change, motion, and/or movement of certain spatial variables.

**Stable/Static**
A map that visually implies permanency of what is shown through visual concretization of spatial variables.


**Non-Cartographic Style**
A map with unconventional layout that does not emphasize the accurate location of data over the Earth's surface.

**Cartographic Style**
A map with a conventional layout that emphasizes the accurate location of its spatial over the Earth's surface.



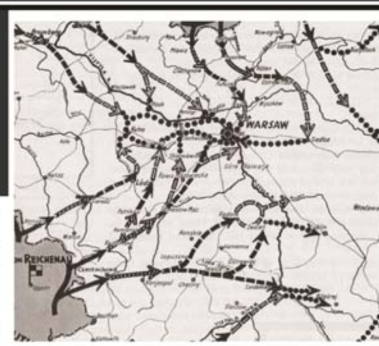

**Oblique Perspective**
A map that illustrates multidimensional spatial data or spatial perspective.

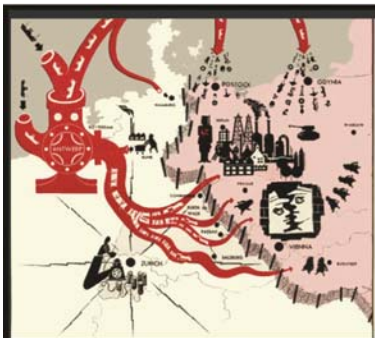
**Top-Down Perspective**
Representing data from a vertical perspective. Mapped objects are sandwiched flat on top of one another.



**Emotive/Representational**
A map comprised of many graphically designed or mimetic, rather than simply shaped symbols.

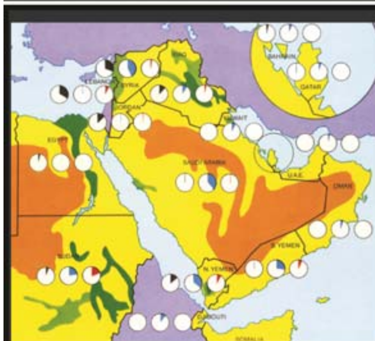
**Simple Geometric**
A map comprised of generic components, representing using simple representations.





**Random Symbolization**
A map using symbolization that is episodic or changes across the map.

**Repetitive Symbolization**
A map using symbolization that is systematic and does not deviate anywhere throughout the map.



**Multivariate Symbolization**
A map that uses a combination of visual variables to show multiple types of data at single collection points.

**Univariate Symbolization**
A map illustrating only one primary data type for single collection points.



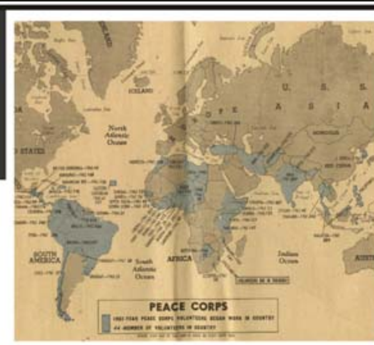
Hierarchical Accenting
A map promoting certain spatial data over other spatial data in the visual hierarchy.

**Hierarchical Flattening**
A map that flattens spatial data so that it all appears on a single, flat hierarchy.



**Embellished Contrast**
A map using extreme contrast to present different types and values of data.

**Minimized Contrast**
A map that uses minimal contrast among different types and values of data.



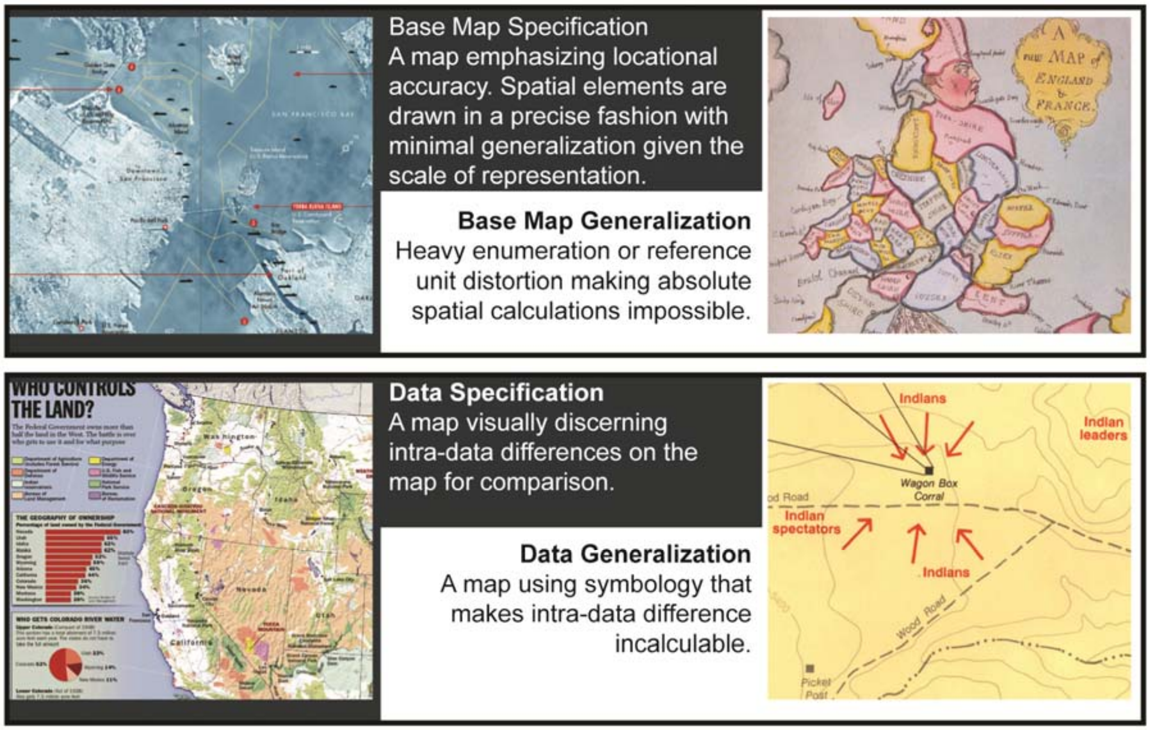



**Figure 3.8 – 3.11 –** Map layout continuums. Developed from Dondis (1974) and pilot studies.

## Layout Codes Using Likert-Scales

Though all maps fall somewhere on the spectrum of each of these pairings, a crucial aspect of Dondis's argument is that these differences are ordinal in nature – either more extreme in harmony or contrast, or lying somewhere in the middle. Taking this shifting characteristic into consideration, we can use a seven-step Likert scale to code how close a map lies to either extreme of each variable.

Perhaps most importantly, by using an ordinal system of coding, I am able to cross-tabulate which types of political cartographic manipulations are tied to certain techniques. I can use certain non-parametric statistics (i.e., Chi-square, Cramer's V, and Somers' d) to test the strength of these relationships. Moreover, I can also check for similarities among map products produced by era (e.g., World War Two maps make extensive use of generalization compared to their post-Cold War counterparts), institution type (e.g., non-profits tend to use *instability* and *boldness* more often than states do), or any other contextual variable of relevance. Again the benefits of using content analysis as opposed to semiotics or anecdotal description is that the data is quantifiable, and statistically comparable. Therefore, the research is cumulative; maps can be analyzed and added to the database in the future.

In content analysis using quantitative levels of measurement to review an image is not only possible but desirable. In fact, the more you can quantify your codes, the more pertinent the results will be (Riffe, Lacy, and Fico 1998). Ideally, I would have collected interval or ratio data when coding the images, but with maps this would be extraordinarily difficult and time consuming. Some maps are so complex that this may be impossible to do accurately. Moreover, one of the goals of this research was to establish a system that allowed for relatively quick analysis of many maps at the same time. It was not my goal to make map deconstruction more arduous than it already is!

### Coding for Graphic Manipulation

Of central importance to this research is the cartographic science behind each map in the sample. Thus, I looked at the cartographic techniques employed in each map's design (i.e., the scientific decisions made by the cartographer). Whereas Dondis's codes largely dealt with what cartographers call *visual hierarchy* – the overall emphasis and layout of a map in its entirety – I was also interested in spatial data representation. Specifically, I wanted to scrutinize what was manipulated within the mapped areas themselves. To clarify: I used Dondis's codes of visual manipulation to analyze the *rhetorical or* *communicative style* of the maps in their entirety (as complete images); whereas, I analyzed the maps' composite parts (including visual variables and other cartographic operations) to understand the specific visual structures comprising a map's broader representation.

## THEMATIC REPRESENTATION CODES

The first thing I coded each map for was the method of thematic representation used to visualize the data. Sometimes this was a little trickier than expected. Does a reference map, for example, using mimetic symbols to show the location of military brigades lining up to do battle constitute a dot map? After several pilot studies, I came up with one nonconventional thematic representation that I called "Mimetic." Mimetic representations are a cross between dot maps – which are primarily concerned with showing the distribution of a spatial variable – and reference maps – which are primarily concerned with showing locations of spatial variables. The other thematic representations were culled from several cartographic textbooks as reviewed in the last chapter (Slocum et al. 2005; Robinson et al. 1995; Muehrcke and Muehrcke 1992; Dent 1996). Again, a map could have more than one type of representation and all maps were coded as either using or not using each representation. The representations were: (a) choropleth; (b) dot; (c) proportional symbols; (d) flow; (e) isarithmic; (f) mimetic; (g) other; and (h) none/reference map.

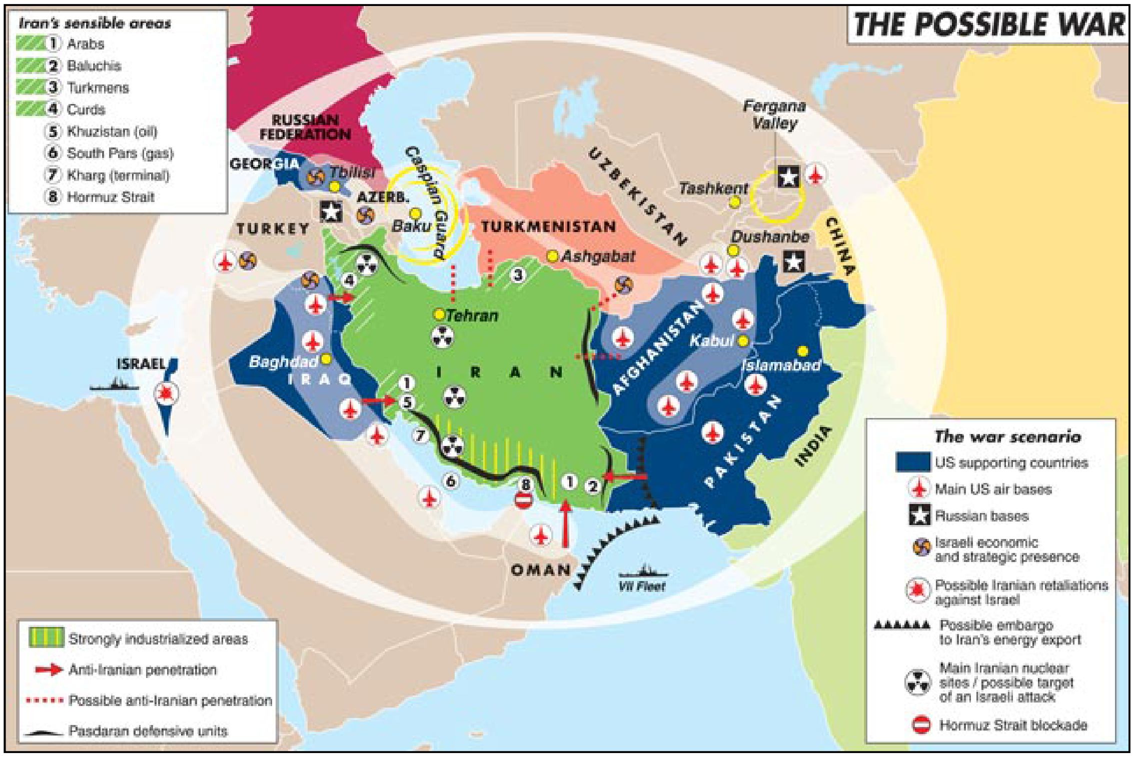



**Figure 3.12 –** *This is a map purporting to outline a potential conflict between Israel and the United States and Iran (The Possible War 2005) . This map would be coded as both Choroplethic (color-filled enumeration units) and Mimetic (symbolically shaped point symbols).*

COLOR CODES

The ability to utilize color is one thing that has changed over time and with technological developments. Mass producing color images was once cost prohibitive, and thus many older media maps were printed in black and white. Many of these maps used patterning to denote spatial differences. Often, however, color is used to promote certain meanings over others. Thus, each map was coded regarding its use of color into one of five camps: (a) Multi-colored; (b) Achromatic; (c) Monochromatic; (d) Black/White with Patterning; and (e) Black/White with one additional color.

VISUAL VARIABLE CODES

All symbols representing spatial data on the map (i.e., area inside the neat line) were analyzed for the type of visual variables comprising them. Supplemental objects such as legends, titles, and inset text boxes, were not coded using cartographic codes but rather were dealt with using the aforementioned *supplemental codes.* The coding was done for the map in its entirety, not just for particular variables. For example, let’s hypothesize that we have a map representing five spatial variables. It illustrates two of the variables by using points and differentiating the points by hue. Thus, the map would be coded as “Visual Variable: Hue.” To represent areal data this same map presents a choropleth technique using saturation. The map would also be coded “Visual Variable: Saturation.” Finally, it also maps two different types of roads using different line thickness. The map will be coded “Visual Variable: Size.” In the end, the map only has three visual variable codes, even though it has mapped five spatial variables.

As already mentioned, the visual variables I coded for were borrowed from MacEachren (1995: 279). As the maps I looked at did not have sound or animation, I left out haptic, audio, and dynamic variables that have been, or are in the process of being, established in the literature (MacEachren 1994b, 1995; MacEachren and DiBiase 1991). Suffice to say, however, that I believe these variables should be added in the future so that dynamic and animated maps can be analyzed as well. The nine visual variables I coded for were:

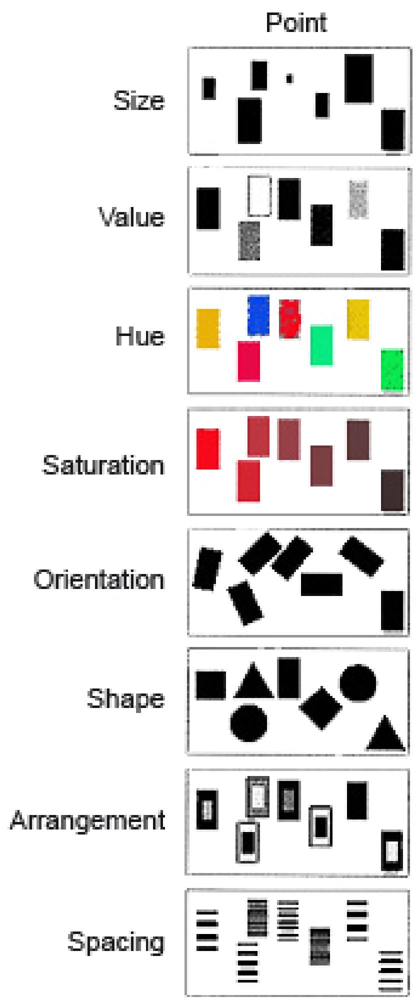



**Figure 3.13 –** MacEachren's (1995) eight visual variables.

TYPOGRAPHY CODES

Typography is also considered a visual variable in this research. Thus, maps were coded for (a) *text hue* and (b) *text size*. These were established as separate visual variable categories, because often maps (particularly maps created prior to the World War Two, see Figure 3.15) may not use visual variables directly, but they will use different text sizes or colors to emphasize or deemphasize particular data.


**Figure 3.14 –** Pro-German Propaganda Map. *This "non-cartographic" map exemplifies the use of text size as a visual variable* (Data source unknown).

LABELING CODES

In addition to using high contrast visual variables to draw a map reader's attention to a particular object at the expense of other objects, different labeling techniques can also be used to promote an object's position in the visual hierarchy (as Figure 3.16 demonstrates). The necessity for codes dealing with labels was not originally foreseen until the first pilot study. The following codes – (a) *callouts;* (b) *halos;* and (c) *other unconventional* – were created to allow for the coding of maps that use labels to manipulate spatial data on the map.

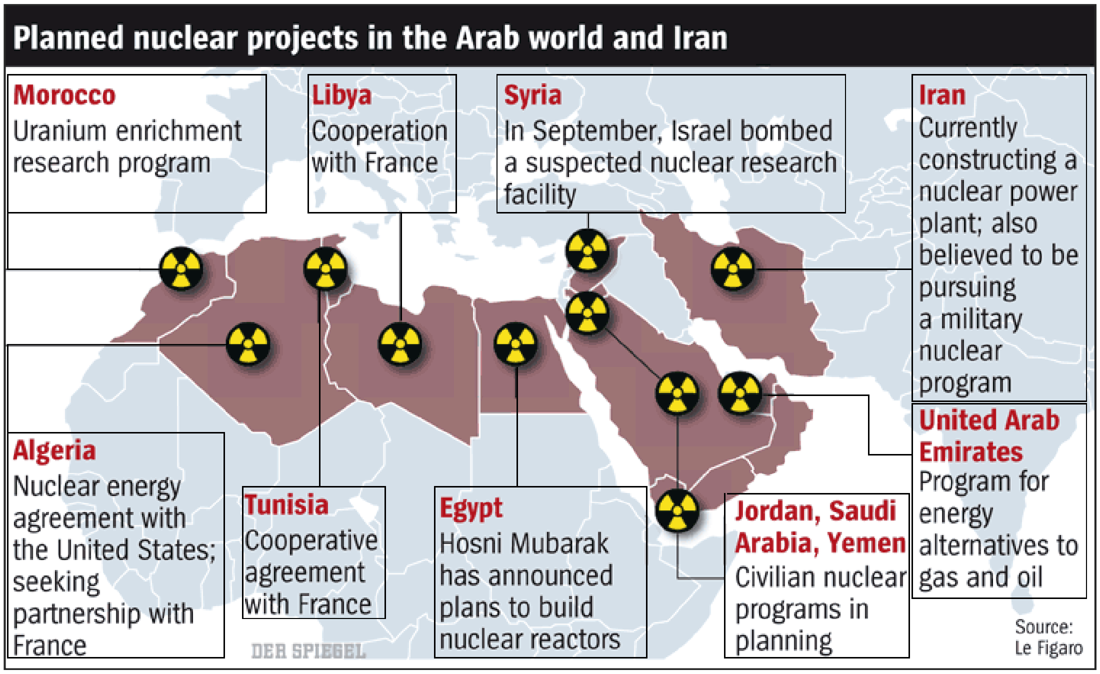



**Figure 3.15 –** This map is manipulative in a variety of ways (Planned nuclear projects in the Arab world and Iran 2008). It utilizes a dramatic form of labeling (callouts) to draw a map reader's attention away from the complete irrelevance of the visual variables used on the map. What is fascinating about this map is the discrepancy between the title and the data – if you read the text carefully it becomes evident that many of these countries, visualized in the same exact manner as Iran, have abandoned their nuclear projects and are working with the UN. Yet, they are given a nuclear symbol and colored the same as states that are not. An irresponsible representation indeed – particularly concerning the United Arab Emirates and Libya. Israel is conveniently excluded from the map, even though it is the only country in the region to currently possess nuclear weapons.

COLOR CONTRAST CODES

In addition to analyzing typography separately, it also became apparent that above and beyond the simple us of color, some maps used high contrast to emphasize or emotively ostracize certain types of spatial data. Thus, during the pilot studies the most frequent type of color contrasts were discerned and coded. The following *Color: High Contrast* categories were created: (a) *black;* (b) *blue;* (c) *green;* (d) *red;* (e) *white;* and (f) *other* *color.* Obviously, contrast requires two colors or drastic value differences (as illustrated in Figure 3.17 below) – if you only have one color, there is no contrast. For these definitions, the color coded for was the color that stood out from others. Thus, a map coded as having *Color High Contrast – White* would be a map that shows one or two places in white while the rest of the map is covered with darker colors.


**Figure 3.16 –** This is a map using the color orange for contrast (Greater Albania 2006).

### Code Summary

The above codes have allowed me to conduct the first systematic analysis of map manipulation on a large sample of maps. Every map in the sample was systematically analyzed utilizing the codes discussed in this chapter. As should now be clear, the codes have been developed from literature on political and cognitive cartography, geovisualization, and graphic design. The codes were tested and refined via three pilot studies. The codes meet the criteria set forth in quantitative content analysis literature (Krippendorff 2003; Riffe, Lacy, and Fico 1998; Rose 2007); the codes are exhaustive, exclusive, and enlightening. Moreover, they should be replicable.

At this point, I would like to refocus the attention of this dissertation on the research questions I will answer in the following chapters using the method and codes outlined in this chapter. Specifically: (1) *What is unique and significant about these research questions compared to previous research?;* and (2) *How do these codes specifically address my research questions?*

## Quantitative Content Analysis Data Validation

One of the central benefits of quantitative content analysis is the replicability of one's results. Preferably, this is done by having two people code the datasets concurrently. When two people code the sample at the same time, you are able to test differences between the coders. Preferably, there are no differences. If the differences are less than 25% of all codes, then the codes are typically considered "replicable" (Krippendorff 2003; Riffe, Lacy, and Fico 1998). Throughout coding, I enlisted the advice of a research associate with a Masters degree in Geography. However, due to the large sample size, I was unable to solicit a secondary coder. Thus, it was doubly necessary to ensure coding consistency throughout the entire dataset (i.e., ensure my definitions did not change as time went on).

Approximately one week after coding a set of maps, I would randomly select two out of ten of those maps to recode. I always left at least seven days between the two analyses, so that I would not bias the results due to memory recall from how I coded it the first time. Again, the codes had to have an overlap of at least 75%. Out of the 50 maps I coded a second time, only two failed to meet the 75% threshold. The codes with which there were discrepancies were reviewed and these maps were coded a third time the following week from the second coding. One of the maps was deemed replicable after the third coding – the third coding was inserted into the database. The other was rejected after the third analysis did not correlate by at least 75%.

### Significance of Using Quantitative Content Analysis

The significance of my research lies in the fact that no one has attempted to collect a large sample of political cartographic manipulations and analyze them individually in the same exact, replicable, and quantifiable manner, so that cartographic techniques can be compared and contrasted, and contextual patterns of political cartographic manipulation can emerge. Up to the is point, researchers have either (1) analyzed one map at a time, using relatively complex and time consuming methods of descriptive analysis; or (2) analyzed a handful of maps of the same genre, era, or cartographer and analyzed the types of manipulation found on them. Either way, analysis up until now has been anecdotal and lacked structure. This has resulted in a series of studies that are insightful but largely non-cumulative when it comes to knowledge production.

Quantitative content analysis allows for the quantification, comparison, and longitudinal analysis of a series of data. Moreover, it has been adapted for use in media studies and is therefore ideally situated for use with cartographic images (i.e., maps). It is replicable and builds off of established theory, thereby avoiding the creation of additional episodic work. In a nutshell, quantitative content analysis is the perfect method with which to overcome the dearth of research comparing types of political cartographic manipulation. Only one question remains: can it help answer specific questions regarding PCMs?

## The Research Questions within the QCA Framework

The rest of this dissertation will test the research questions put forth in the first chapter. I will outline the forthcoming chapters here, reviewing what specific research questions each will address.

*Chapter 4: What types of cartographic manipulation are found in the sample, and which are most common?*

> This chapter will review the dataset and the frequencies of different variables among different maps. It will provide a normative, sample-wide context against which additional analysis can be compared.

*Chapter 5: Has political cartographic manipulation changed over the past century? If yes, in what ways? Does political cartographic manipulation vary by producer? If yes, in what ways?*

> It is hypothesized that the techniques of PCM have evolved over time and changed depending on geopolitical context, technological advances in cartography, and the methods of data collection. Using this large, longitudinal dataset, Chapter 5 examines whether any patterns of manipulation appear based on era, technology, or the map producer.

*Chapter 6: Do certain techniques of manipulation correlate and appear with other techniques? If so, which ones and to what extent?*

A key question underlying this dissertation is whether there are any observable relationships among the misrepresentative techniques used to make political cartographic manipulations. This chapter will also review whether technology has played a role in facilitating the development of new methods of political manipulation.

*Chapter 7: Can a framework be created within which one can analyze and label different techniques of cartographic manipulation found on political maps?*

Using the sample in this study, I will explore whether it is possible to categorize political maps based on their characteristics. By clustering maps based on certain techniques of manipulation, perhaps we can come up with taxonomy of "political maps."

## Conclusion

In this chapter I proposed a methodological departure from previous attempts to analyze political maps. Unlike previous descriptive approaches, I argue that I can quantify the nature of the manipulations comprising the political cartographic manipulations in my dataset, compare these manipulations to one another, and to a lesser degree draw inferences about the context in which they were produced. I can also use this quantified knowledge to see if any rhetorical clusters of political cartographic manipulation exist. In essence, a quantitative content analysis provides a perfect method with which to answer the above questions I propose.

# Chapter Four

*Dataset Frequencies*

Beginning in early February 2009, analysis was conducted using *SPSS 17* – a statistical application. All of the coded maps (257) were exported from *AtlasTI* and *Microsoft Excel* into *SPSS*. The data were organized and given descriptive labels within *SPSS* to make the tabular output of the program more intuitive to interpret. Data was checked in SPSS for errors that may have occurred during data transfer. Several discrepancies were double-checked and, when necessary, corrected before statistical analysis began.

Due to the qualitative nature of my analysis, the measurement levels of the collected data were entirely nominal and ordinal. Though this prevented the use of parametric analysis, non-parametric tests were still possible. Running these tests is not only typical of quantitative content analysis but accepted methodology (Riffe, Lacy, and Fico 1998). The first step in my analysis was to scrutinize frequency tables. I combed the data for consistencies *and* inconsistencies across the entire dataset of PCMs. Cross tabulations were run among all of the different variables to look for significant relationships between individual variables found within PCMs. Once relationships were determined among different variables of the PCMs, further cross tabulations and relevant statistical tests were conducted to test my hypotheses and answer my research questions as outlined at the end of the previous chapter.

The purpose of this chapter is to provide a comprehensive description of the political cartographic manipulations found in this data sample and to provide an overview of what traits the maps largely shared and did not share. The chapter will be organized in similar fashion to the methodology chapter. First I will review the data model manipulations found in the sample. This will be followed by graphic manipulations. The chapter will end with a summary of the interesting findings before segueing into analysis that will shed light on my research questions.

## General Characteristics of Political Cartographic Manipulations

In the end, 256 maps were coded that fulfilled the definition of being political cartographic manipulations. Maps were evenly distributed among the final three phases of analysis (post-1914). There was a dearth of sample maps from pre-1914, but this did not impact the results of the research, as it is still a sufficiently sized sample. It should be noted that the smaller sample size does not necessarily reflect that there were fewer political cartographic manipulations being produced before 1914, but rather that those that exist are far more difficult to get a hold of today.

| | **Frequency** | **Percent** |
|---|---|---|
| **Pre-1914** | 38 | 14.8 |
| **1915-1945** | 73 | 28.4 |
| **1946-1989** | 77 | 30.0 |
| **1990-Present** | 69 | 26.8 |
| **Total** | **257** | **100** |

**Table 4.1 –** Number of maps analyzed by era.

As for map production, it proved more difficult than originally envisioned to find maps that were produced by non-profit organizations as compared to other producers. Thus, the distribution of maps by producer was less balanced than by era, and only a handful of maps were created by non-government organizations that did not also double as lobby groups. A majority of the maps came from mass media groups (including both news and publishing), followed by maps produced by national governments.

| | Frequency | Percent |
|---|---|---|
| Corporation (Non-Media) | 8 | 3.1 |
| Individual | 6 | 2.3 |
| Lobby Group | 12 | 4.7 |
| Media: News | 46 | 17.9 |
| Media: Publishing | 62 | 24.1 |
| National Government | 86 | 33.4 |
| NGO | 3 | 1.2 |
| Sub-state Government | 2 | .8 |
| Unknown | 32 | 12.5 |
| **Total** | **257** | **100** |

**Table 4. 2 –** Number of maps analyzed by type of producer.

| | Frequency | Percent |
|---|---|---|
| Advertising | 6 | 2.3 |
| Announcement | 6 | 2.3 |
| Editorial | 14 | 5.4 |
| Education - Continuing | 40 | 15.6 |
| Education - K12 | 7 | 2.7 |
| Everyday Reference | 23 | 8.9 |
| Gov Sanctioned - Official | 11 | 4.3 |
| Gov Sanctioned - Rhetorical | 56 | 21.8 |
| National Pride | 13 | 5.1 |
| News Supplement | 48 | 18.7 |
| Other | 2 | .8 |
| Policy Shaping | 27 | 10.5 |
| Unknown | 4 | 1.6 |
| **Total** | **257** | **100** |

**Table 4.3 –** Role of Map Frequencies.

The primary purposes for the PCMs were largely split among four categories: (1) government sanctioned rhetoric, 21.8%; (2) supplement to the news, 18.7%; (3) adult education and reference, 15.6%; and (4) policy shaping, 10.5%. The rest of the sample was scattered among a variety of other purposes.

As for the medium of publication across all four eras, atlases contributed nearly 25% of the maps in the sample, magazines an additional 21%, unknown print sources 16%, wall maps 14%, newspapers 9.7%, and static maps from the Internet 9.3%.

| | **Frequency** | **Percent** |
|---|---|---|
| Atlas | 62 | 24.1 |
| Book | 10 | 3.9 |
| Magazine/Journal | 54 | 21.0 |
| Mailing | 4 | 1.6 |
| Newspaper | 25 | 9.7 |
| Poster/Wall/Folding Map | 37 | 14.4 |
| Print (Unknown) | 40 | 15.6 |
| Television (Originally) | 1 | .4 |
| Web (Originally) | 24 | 9.3 |

**Table 4.4 –** PCM medium frequencies.

Intended map audience was more difficult to discern, and thus proved quite benign as a coding category. Nearly all maps were created for a single language group – meaning, most maps were not bilingual, with the notable exception of several maps from Canada. Some maps were overtly meant to be distributed to people of a particular ethnic group or nationality, particularly those maps created during moments of national and international conflict. As for distribution, by far most of the maps were created to be diffused to the public at large, not to be confined to a particular group with narrow interests. Though some maps were meant to reinforce a particular argument within a community, more often than not, they were meant to have a persuasive effect on those outside of the community as well. Thus, this category of coding proved particularly unreliable; yet, at the same time it reinforces the aforementioned futility of attempting to discern the intent of PCMs using content analysis, including the "intended diffusion" of a map.

| | Frequency | Percent |
|---|---|---|
| Education (Lower) | 3 | 1.2 |
| Government | 5 | 1.9 |
| Mass Public | 236 | 91.8 |
| Members of Organization | 8 | 3.1 |
| Opposing Organization | 3 | 1.2 |
| Other/Unknown | 2 | .8 |

**Table 4.5 –** Map Audience Frequencies.

The areal coverage of the maps sampled was remarkably balanced considering no special attention was paid to this aspect when selecting maps. The only outliers were local and provincial areas, which were less represented than sub-national and national level coverages. Nearly 25% of the maps in the sample had sub-continental coverage.

| Map Coverage | Frequency | Percent |
|---|---|---|
| Continental | 31 | 12.1 |
| Global | 37 | 14.4 |
| Hemispheric | 20 | 7.8 |
| Local | 11 | 4.3 |
| Provincial | 7 | 2.7 |
| Regional (Sub-Continent) | 63 | 24.5 |
| Regional (Sub-Country) | 41 | 16.0 |
| Country-Wide | 45 | 17.5 |

**Table 4.6 –** Map Coverage Area.

## Trends in Data Model Manipulation among PCMs

The most pronounced characteristic of PCMs in the sample is that these maps typically illustrate nominal level data. In fact, many times nominal data is mapped when it seems likely that a quantitative level of measurement would be more suitable or desirable for interpretation. In essence, *there is evidence that data may often be generalized to the nominal level of measurement.* When data is nominally represented, data classification becomes irrelevant. Thus, of the 256 maps analyzed, only 28 maps had a classification scheme at all. Of those 28, eight (29%) possessed an unknown classification scheme. Seven maps had a temporal scheme, based on arbitrary periods of time; three used equal intervals; one was determined to use natural breaks; and six used other types of classification schemes.

| | Frequency | Percent |
|---|---|---|
| Nominal | 169 | 65.8 |
| Ordinal | 15 | 5.8 |
| Ratio | 42 | 16.3 |
| Temporal | 13 | 5.1 |
| Other & Mixed | 17 | 6.6 |

**Table 4.7 –** Frequency of different levels of measurement found in map sample.

## Data Reliability Frequencies

Of all the PCMs, 25.7% had what I refer to as "severe data reliability issues," meaning they had two or more types of the invisible manipulation I coded for. Overall, however, 37% of the maps had only one form of invisible manipulation. A slim plurality of 38% did not have any detectible forms of invisible manipulation.

## Projection and Orientation Frequencies

Only 13 of the maps (5%) had their projection listed either on the map or in the accompanying literature. By far, most maps were of an indecipherable projection (160 maps or 62.2% of the sample). Of those projections that were listed or could be determined via analysis of the graticule, equivalent maps (equal area) were most frequent (seven listed, 27 determined via coder work), followed by conformal ones (three listed, six determined via coder work). Other types of projections were extremely underrepresented. By far, most map projections were indeterminate in appropriateness, due to the fact that so few were decipherable. However, an interesting finding was that more maps used appropriate projections than blatantly inappropriate ones (62 versus 28 maps or 24% versus 11% of the sample). Just over 70% of maps did not display the orientation of the map via either a north arrow or graticule. More surprisingly, given the propensity of cartographers to put north arrows on maps to fill empty space, *only 51 maps (19.8%) had an arrow or graticule to help depict orientation.*

### Legend Frequencies

Many of the maps did not have a legend. Some maps were too simple to require a legend; others were extremely complex but simply did not provide one for interpretation. In the end, 126 maps (49% of the sample) had no legend on them or in the accompanying text. When legends were present, there was *very little evidence of manipulation* of the legends themselves. Legends were coded based on an ordinal scale dealing with the level of detail found in the legend. Analysis shows that the PCMs in the sample largely followed a standard curve, with a vast majority of maps having an adequately detailed legend.

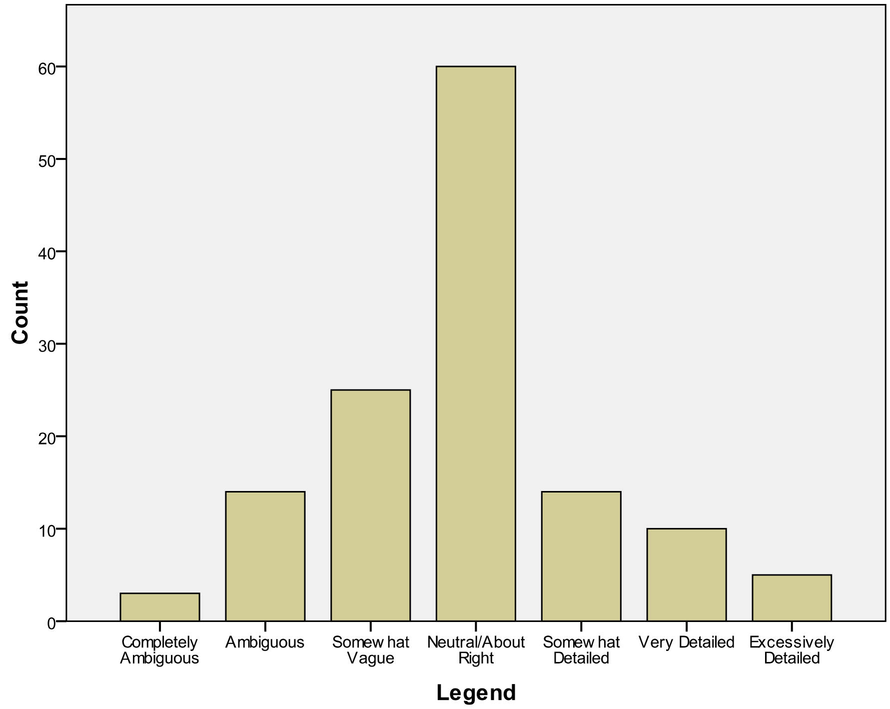



**Figure 4.1 –** Frequency of different legend types.

## Other Data Model Manipulation Frequencies

A variety of alternative model manipulation frequencies were coded for as reviewed in the last chapter.

| Model Manipulations | Frequency | Percent |
|---|---|---|
| Data Source Completely Missing | 120 | 46.7 |
| Data Source Unclear | 18 | 7.0 |
| Date Missing | 63 | 24.5 |
| Cartographer Missing | 25 | 9.7 |
| Scale Missing or Unclear | 146 | 56.8 |
| Inappropriate Use of Visual Variables | 25 | 9.7 |

**Table 4.8 –** Other data model manipulation frequencies.

Data sources were missing from nearly half of the maps analyzed (Table 4.8). The *date of production* was also missing from 24.5% of the maps sampled. Few of the maps offer the map reader a scale with which to interpret the map. Two maps had an unclear scales, but 144 (56%) were lacking a scale altogether. Few maps used inappropriate visual variables. However, 9.7% of all maps sampled misused more than three visual variables. The single most misused visual variable was color value, as 3.3% of the maps misused this and only this variable.

## Trends in Graphic Manipulation among All PCMs

Graphic manipulation tended to more closely follow the types of manipulation already written about in the literature (Monmonier 1996, 2001; Wood and Fels 1986, 1992). However, there were a few unexpected results.

### Color Schemes

Three out of every five maps were full-colored (meaning two or more colors in addition to gray scale). 17% of the sample maps were gray scale with one additional hue. Monochromatic and achromatic maps combined for 23% of the sample.

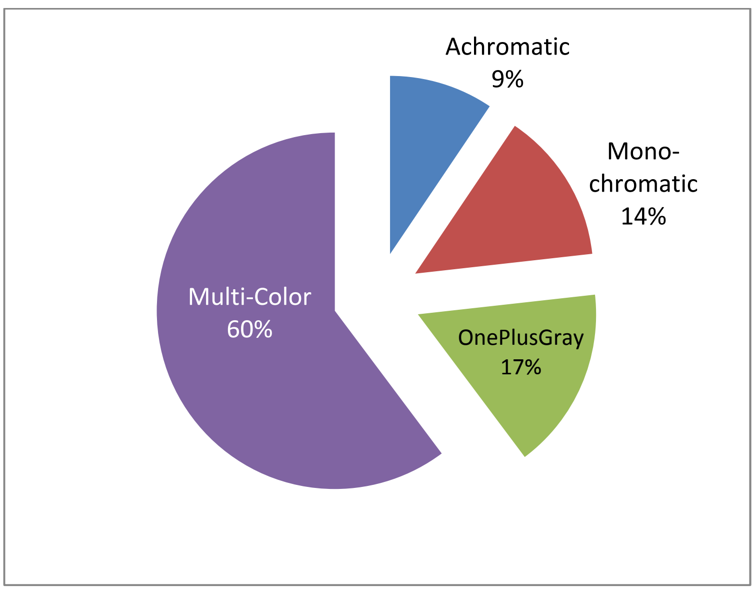



**Figure 4.2 –** Frequency of different map coloring techniques.

## High Contrast Colors

Regardless of era, red has been and remains the most commonly used color to show marked contrast within the mapped area itself. The second most common color is black – the most inexpensive color to produce. White and yellow are the next most common colors used to accentuate certain symbols or areas of the map, whereas blue is used less on its own but often in combination with one or two other high contrast colors.

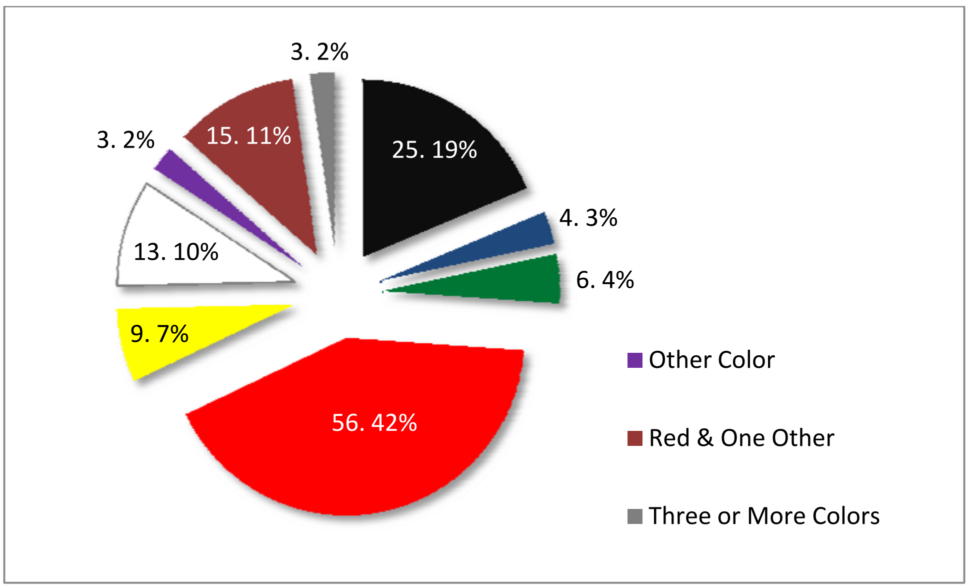



**Figure 4.3 –** Colors in the chart above correlate to the same colors used for high contrast.

## Thematic Representations

As shown in Figure 4.4 below, a plurality of the maps (n=83) in the sample were choroplethic. Second to choroplethic representations were reference maps (n=56), which were maps that were thematic in convention but did not fall under one of the common representational themes (e.g., maps showing historic battlefields; though not a dot map, still thematic in a sense). Flow maps were the third most common type of map (n=50). Proportional symbol maps were the least frequent thematic representation (n=12).

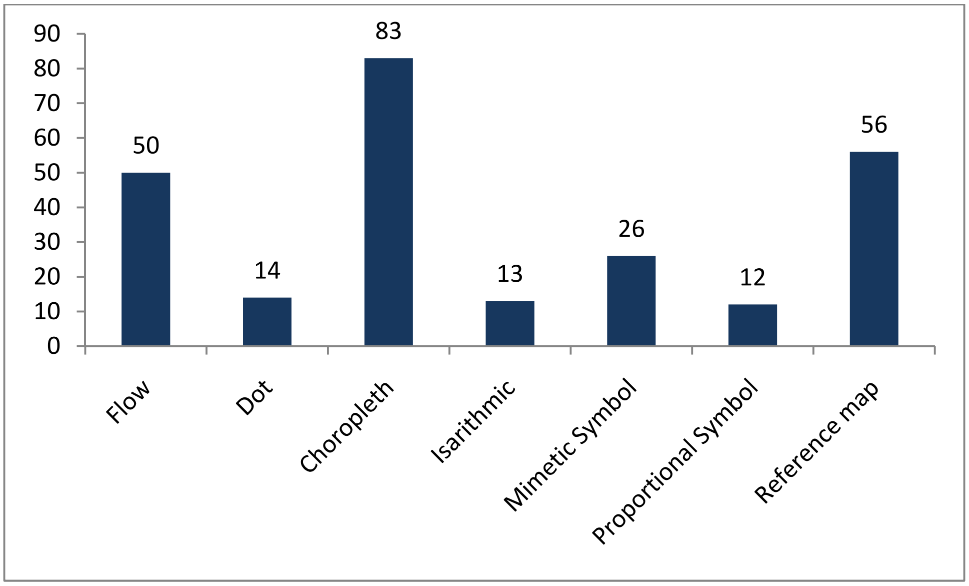



**Figure 4.4 –** Frequency of different map types.

## Visual Variables

As reviewed in Figure 4.5 below, each map in the sample was coded for the types of visual variables that were used to represent the data thematically. Maps could have more than one visual variable – though a vast majority  (245) used three or fewer visual variables. Color hue was the most common visual variable used (117), followed by shape (93), spacing (45), lightness (29), and size (24). Arrangement and Orientation both came in at well under 5% of maps. Nearly 20% of the maps were coded as "reference" maps lacking a thematic use of visual variables.

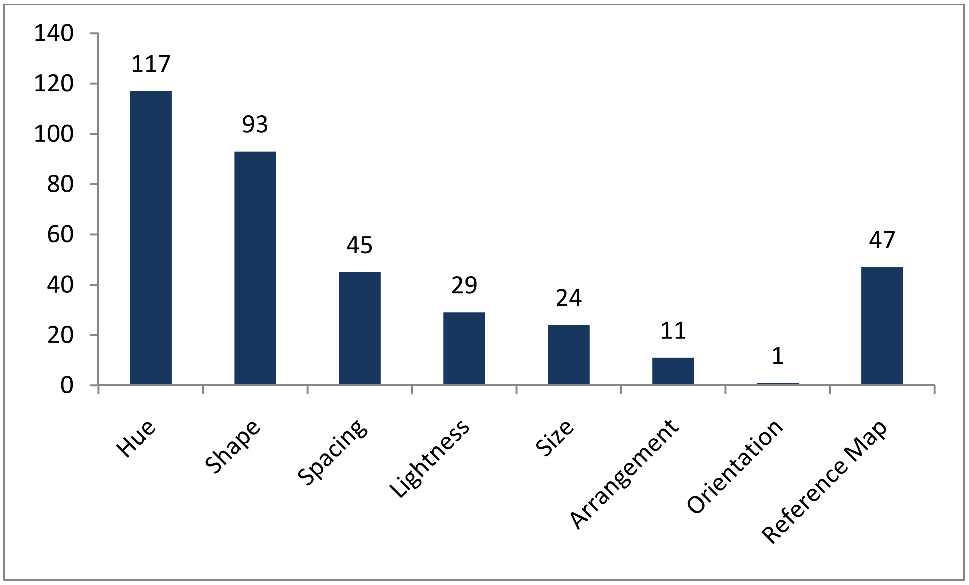



**Figure 4.5 –** Frequency of visual variable use.

## Feature Labels

Far more maps had conventional labeling (183) – labels right on the map as a layer of data – than specialized or stylized labeling (74). Of the 74 maps in the sample that did have specialized labeling, callouts were in use over 50% of the time.

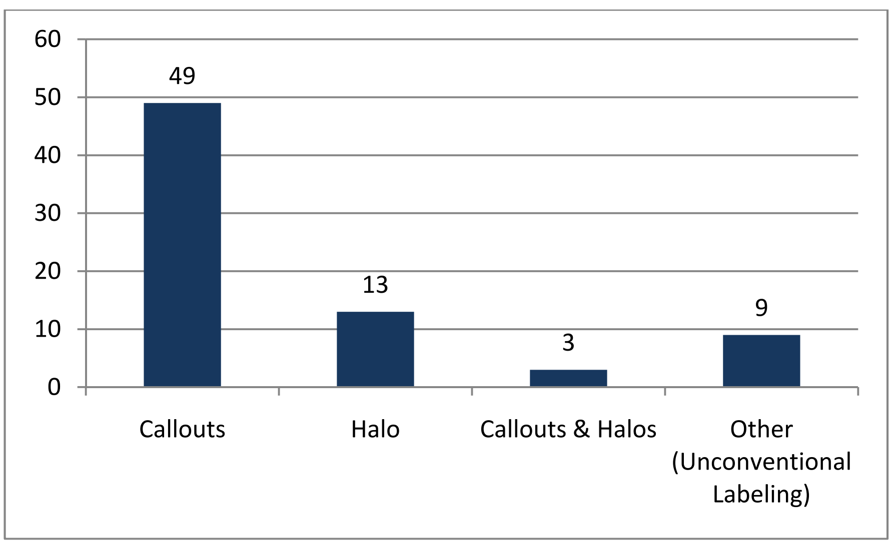



**Figure 4.6 –** Frequency of alternative labeling techniques found on maps.

### Style and Nature of Titles

Though it is a standard cartographic guideline that a title should generally be the largest print anywhere on your map, this was not typically the case with PCMs. In fact, though 69% of the maps had prominent titles, only 8% of the sample gave their titles the largest type size. This was definitely a surprise, as *caption titles* and *titles in the legend* were coded for separately; so it was to be expected that most titles would be the largest type, as is often presumed in the literature. 11% of the maps did not have a title at all.

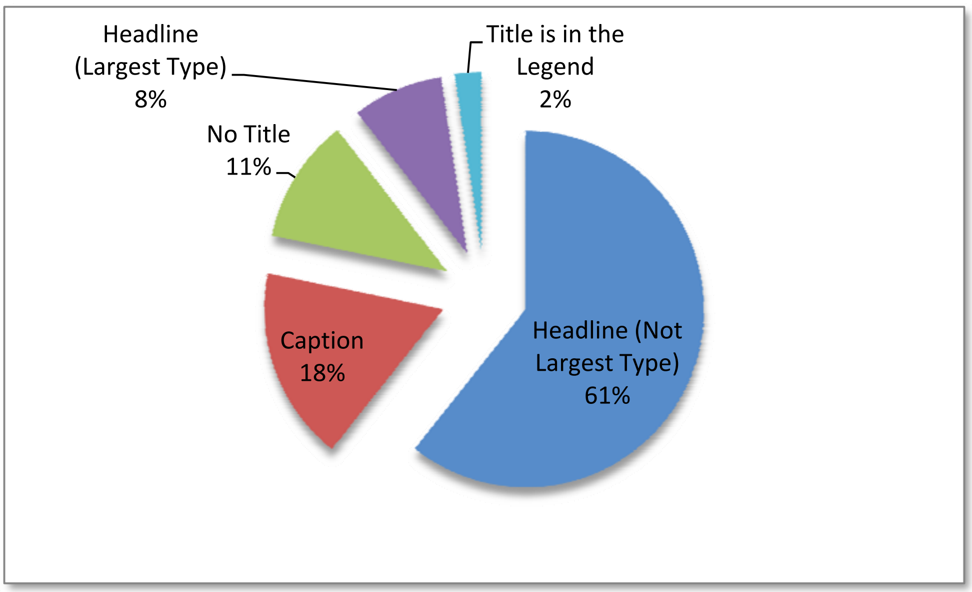



**Figure 4.7 –** Frequency of different title styles.

The rhetorical nature of the titles was surprisingly civil. Most of the maps had technical titles that were formal. Overtly confrontational titles equaled less than half of those that were formal (n=43 and n=109, respectively). Headline news and sensationalized titles were utilized on 33 maps. Critical and satirical titles were used on a combined total of 35 maps, far fewer than expected. Concerning descriptive characteristics of the titles, by far most titles were direct and to the point; only 34 were coded as “ambiguous”.

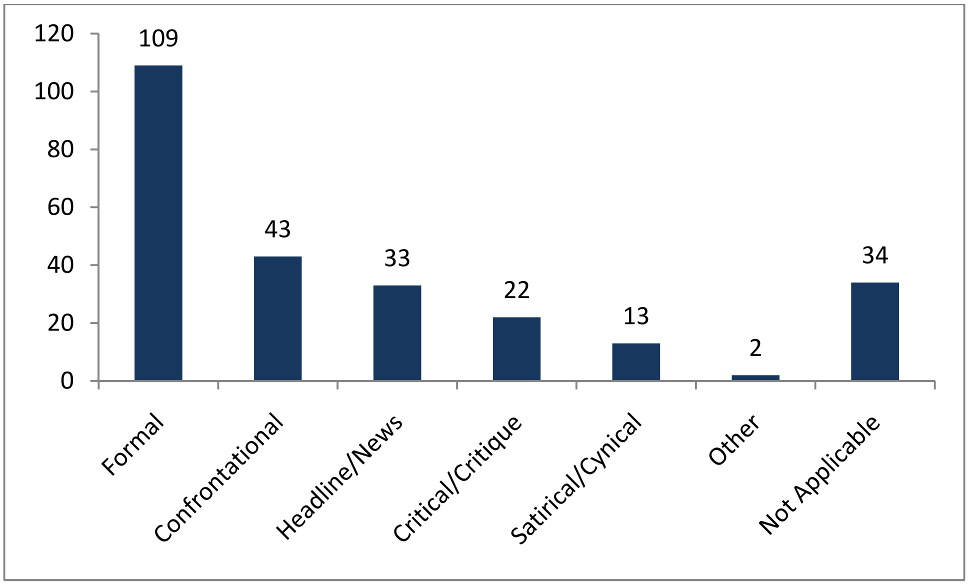



**Figure 4.8 –** Frequency of different title rhetoric.

## Supplemental Features

Of the supplemental map features coded for, the most common features were text boxes over and/or around the map (Table 4.9). Illustrations and inset maps were second and third most frequent, respectively (Table 4.9). A vast majority of the sample had no inset maps (73%, Figure 4.9). Just over one-in-ten maps had charts included with them and only one-in-twenty had photographs or tables adjacent to or over the map (Table 4.9).

| Features Around and Over the Map | Percent |
|---|---|
| Charts | 12% |
| Inset Maps (at least one) | 27% |
| Illustrations (non-photo) | 28% |
| Photographs (non-illustrations) | 6% |
| Tables | 6% |
| Text Insets and Boxes | 30% |

**Table 4.9 –** Types and frequencies of features found around and over the mapped area.

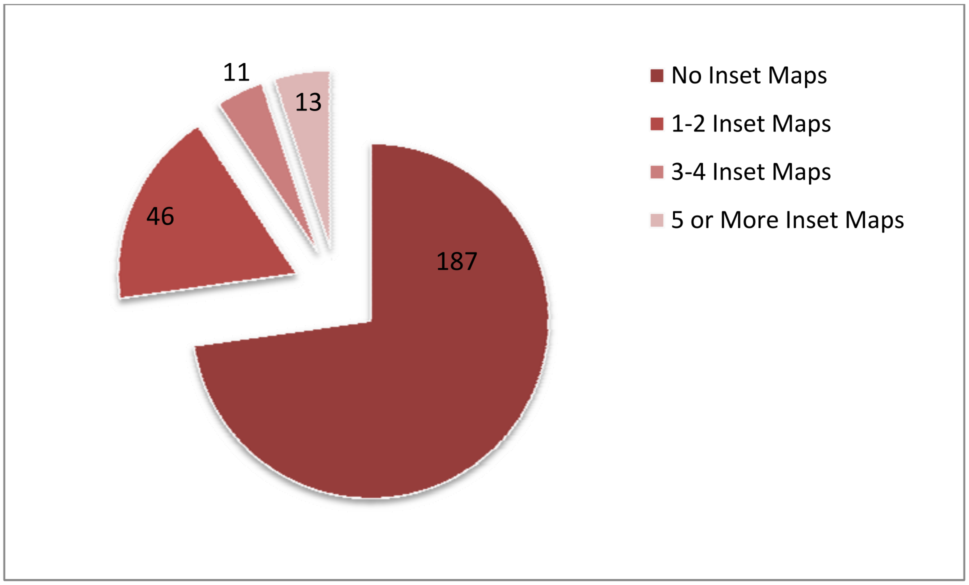



**Figure 4.9 –** Frequency of PCMs with inset maps.

### Summary of Graphic Manipulation

When it comes to graphic manipulation, there were few surprises in the frequencies. Photography appeared on fewer maps than non-photographic illustrations – given that photography was expensive to reproduce until recent years, this is unsurprising. The amount of maps with prominent titles that were not the largest typeface found on the map was interesting, as most cartography texts instruct that the title should be the largest type. More maps had formal, non-confrontational titles than otherwise, which given the purpose of many of these maps was of interest. Callouts were used more often than other stylized labeling methods. Throughout time, callouts have been easier to produce on maps due to the fact that they can often be draped over everything else in the map hierarchy. The dominant use of red to create contrast on the map was notable. Though, given the emotive nature of red in Western society (Kaya and Epps 2004), it is not necessarily unexpected.

### Trends in Layout Manipulation among PCMS

The results for the different manipulation codes dealing with layout were quite telling. Median scores were taken for the entire dataset, as the measurement level of the data was ordinal and therefore means are inappropriate (see Figure 4.10). In five realms, the medians were entirely unipolar – meaning they were heavily weighted toward harmony (five areas) or toward contrast (one area). In most cases, the median scores for the sample littered the middle of the range.

PCMs in the sample tended to: 1) not be part of a map series, 2) be well balanced on the page, 3) have relatively simple hierarchical structure, 4) have neutral, though slightly fragmented layouts; 5) have a slightly more scientific than non-cartographic appearance; 6) be neutral in oblique perspective; 7) use geometric symbology more than emotive; 8) use symbols systematically and repetitively, rather than randomly; 9) use multiple symbols more than just single ones; 10) have slightly dynamic representations; 11) accent certain parts of the map's hierarchy; 12) use embellished contrast; 13) have about average base map detail; and 14) about expected data detail.

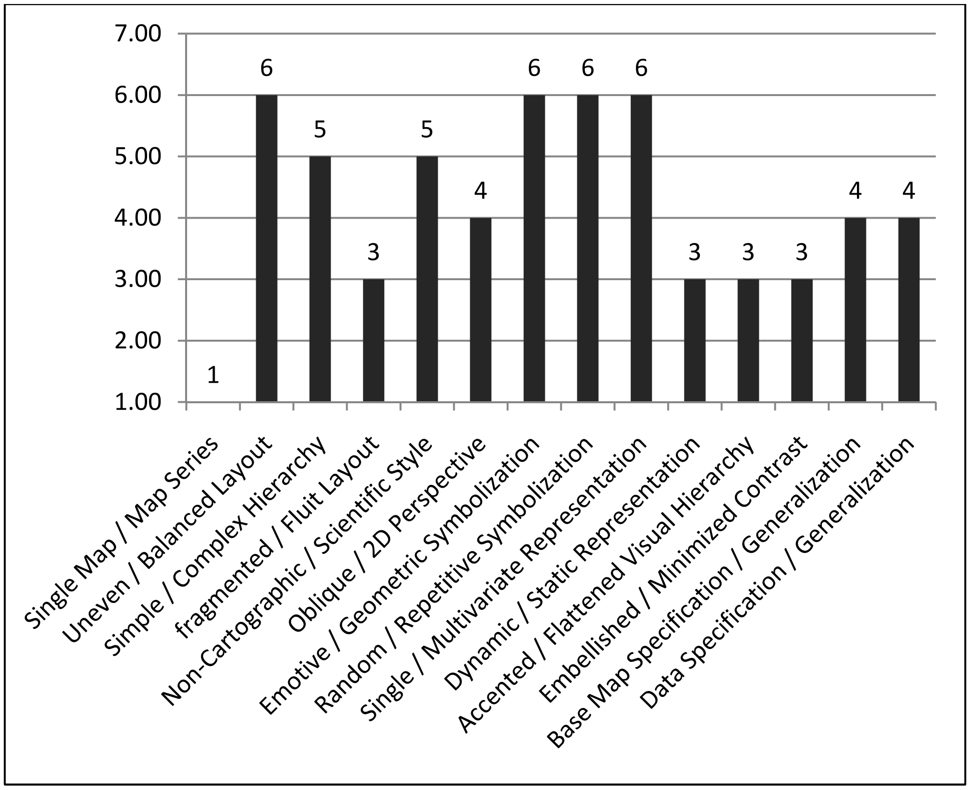



**Figure 4.10.** Median scores of different Likert codes. Codes go from 1 to 7, with a score of <4 relating to the first variable in each pairing and a score of >4 relating to the second variable in each pairing.

## Summary of Overall Characteristics of PCMs

Taken as a whole, most of the data acquired from the dataset is fairly mundane in content and frequency. However, this is not necessarily a bad thing. The nature of this dataset implies that a wide spectrum and variety of PCMs were sampled, not just egregiously rhetorical ones. The dataset is reliable enough to begin testing the research questions presented at the ends of Chapter 1 and 3. Thus, the next step is to test some general characteristics of the dataset to see if the map producers and era of production are at all related to the types of cartographic manipulations found in these maps.

## Chapter Five

*The Role of Era and Producer in Political Cartographic Manipulation*

## RESEARCH QUESTION 1

*Have techniques of political cartographic manipulation evolved over time and changed depending on different geopolitical contexts and producers?*

A central question of this project is to determine whether the style and techniques of political cartographic manipulation have changed, evolved, or remained consistent throughout time and regardless of map producer. With the continuous and unabated development of cartography, as well as changes in methods of map production and distribution, I believe that PCMs from different eras should differ in some regards. Additionally, I am interested in answering two sub-questions:

1. Are there any techniques that have fallen by the wayside over time?
2. Are certain manipulations more commonly embraced by particular types of publishers than others?

In order to answer these questions, I ran a series of cross-tabulations and statistical tests between the era and producer variable and all others. Most of the variables did not show a correlation or dependency upon either era or producer. However, more than a handful did. The rest of this chapter will review the significant variables and conclude with a discussion regarding the results.

### The Significance of Era in Political Cartographic Manipulation

By and large, era had a far smaller impact on the composition of political cartographic manipulations than I believed it would. The number of variables that changed by era were few, and in most cases, the changes relatively minor. The context variables that shifted were: *Medium* and *Role of Map.* The data model variables were: *Data Source Availability*, *Map Coverage*, *Date Availability*, and *Orientation.* Significant graphic variables included: *Coloring, Illustrations, Textboxes, Inset Maps, and Title Style.*

## Context Variables

### MEDIUM AND ERA

Because the sample was not random, correlation statistics between map medium and era were not reliable – e.g., perhaps my sampling method resulted in far more newspaper maps than otherwise. However, as Figure 5.1 demonstrates, certain trends have emerged. Before World War I, PCMs were often printed independently from publications – as wall maps, postcards, or large sheets. During the first half of the twentieth century, thematic and news maps began to more regularly be conglomerated into atlases. National governments were often the producers of these atlases. The United Kingdom, Germany, and Spain each produced a variety of atlases during this period of time, often with a national theme (the United Kingdom glorifying the largeness of the Commonwealth (*Sixty million of us: the colonies at war* 1944); Germany deriding their losses from World War One (Springenschmid 1935a); and Spain showcasing the greatness of Imperial Spain in the past (Menéndez Pidal 1941), as they recovered from a grueling civil war). During the Cold War, political cartographic manipulations began turning up more regularly in private newspapers, magazines, and other periodicals. During the Red Scare, the US government did not have to drive jingoistic rhetoric, as the press did it much more efficiently, regularly, and subliminally than a government atlas could. During the current era, map production has devolved even further. As the publication and news industry has come to compete with self-publishers on the Internet, more and more print maps are being produced by individuals and non-profit organizations for distribution via the Internet. Without editorial oversight, the room for political cartographic manipulation is potentially much larger than it once was, as anyone with limited training and minimal ethical consideration can produce and distribute embellished or outright disinformation. This will be demonstrated further when we look at how data model and graphic manipulation has shifted by era.

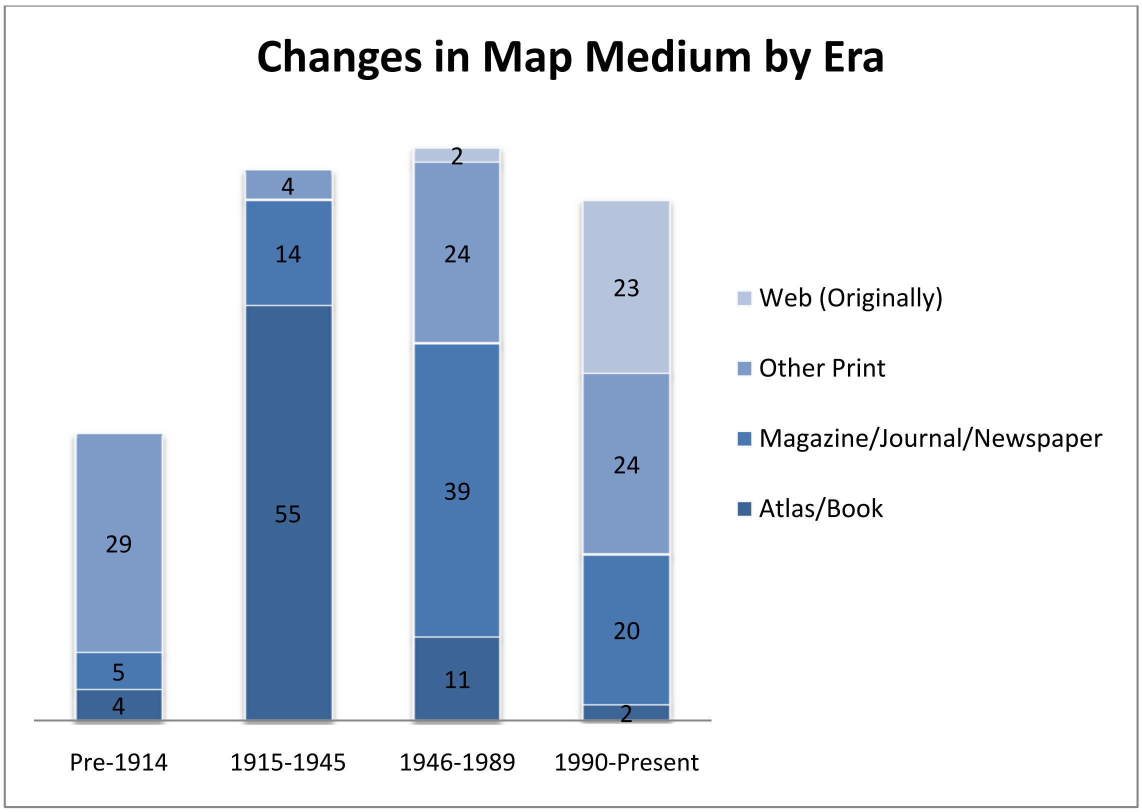



**Figure 5.1 –**Map Medium by Era of Production.

ROLE OF MAP AND ERA

Though the cross-tabulation results in Figure 5.2 are limited by the fact that this study is not comprised of a random sample, the results lend credence to the fact that cartographic devolution is occurring – i.e., overtly nationalist maps are becoming less dominant among political maps broadly, as national governments lose their market share as producers of maps. This downward trend in maps used for national rhetoric is paralleled by a marked increase in the number of maps created to highlight particular policies or political issues. On the other hand, PCMs meant to supplement the news, or current events, seem to be a mainstay.

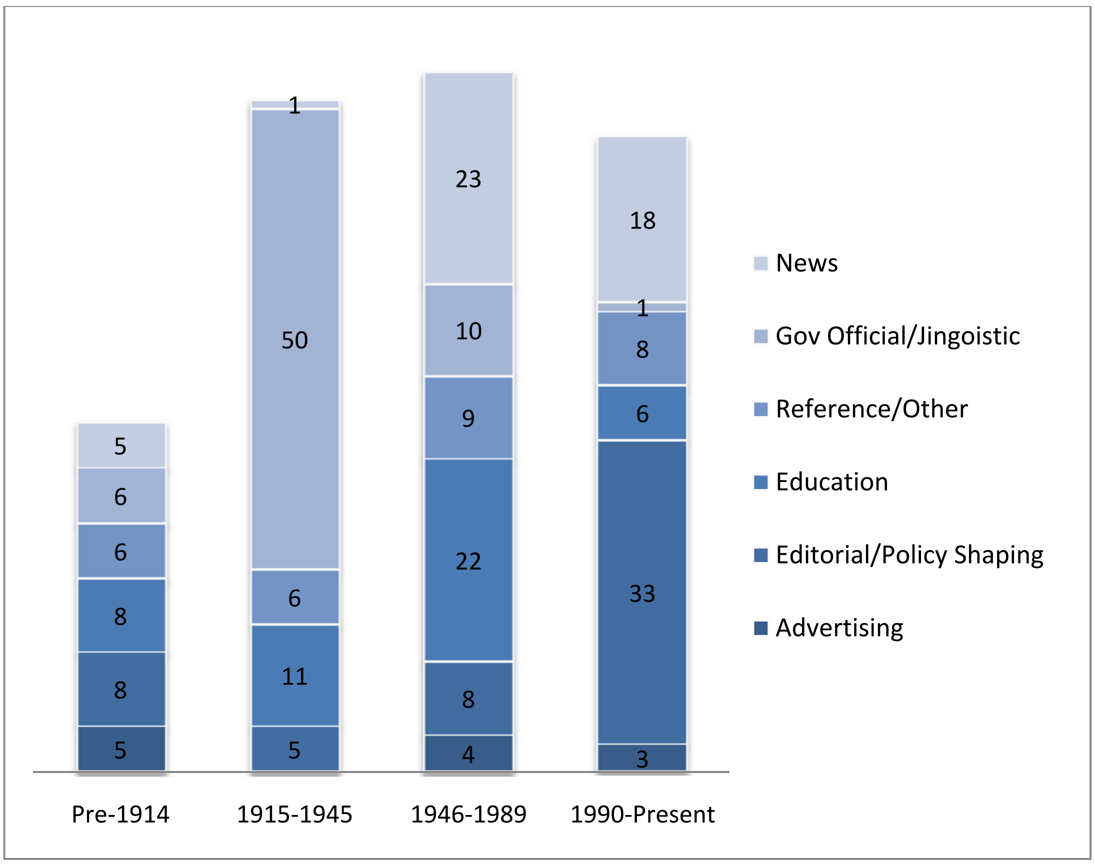



**Figure 5.2** – Role of Map by Era (frequencies).

## Data Model Manipulation

### DATA SOURCE AVAILABILITY AND ERA

It takes little imagination to realize that one of the simplest methods of data model manipulation is to completely avoid attributing the data shown on a map. It makes it far easier to make up data when you do not have to tell anyone where the data come from. Yet, this tactic seems to be era specific (Figure 5.3). A trend is clear. Prior to 1915, data sources were commonly referred to on maps. During the first half of the twentieth century, it behooved producers of politically manipulated maps to ditch data sources altogether. During the Cold War period, data source inclusion on maps became prevalent again. Again, this is likely linked to the rise of the quantitative revolution, and the West's fixation on science during the arms race with the Soviets – data sources relate to data reliability, which in turn help assess scientific accuracy.  Since the Cold War ended, data sources have begun to fall by the wayside again.

During the first half of the twentieth century, maps were frequently produced by national governments to galvanize the public. The data was often completely fabricated, as few possessed the capability to audit a government's accuracy. During the Cold War, newspapers, magazines, and periodicals gained supremacy over using maps to inform the public. However, the news media prides itself on editorial integrity and proper citation. It thus comes as little surprise that data sources would be more consistently referred to during this era. Finally, as individuals and non-profit groups begin to create more maps to promote their causes, it might be opined that editorial integrity and attention to accuracy may be beginning to decline again.

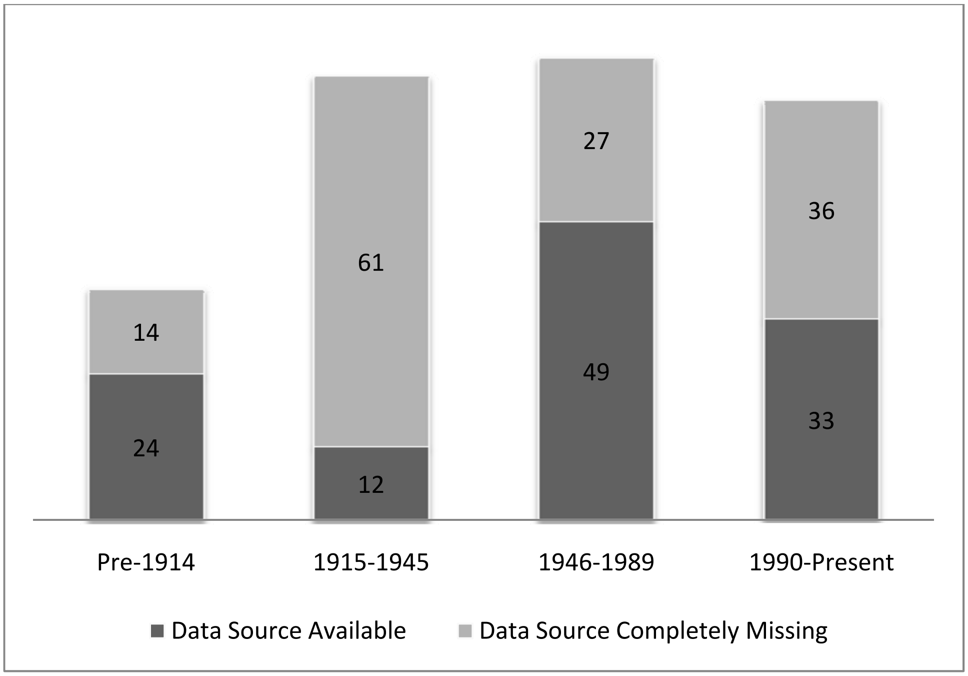



**Figure 5.3 –** Frequencies of data source availability by era.

Further analysis bore this out, as when I tested map producer categories with the data source variable, the relationship between the availability of the data source and the type of producer proved fairly substantial (see Figure 5.4).

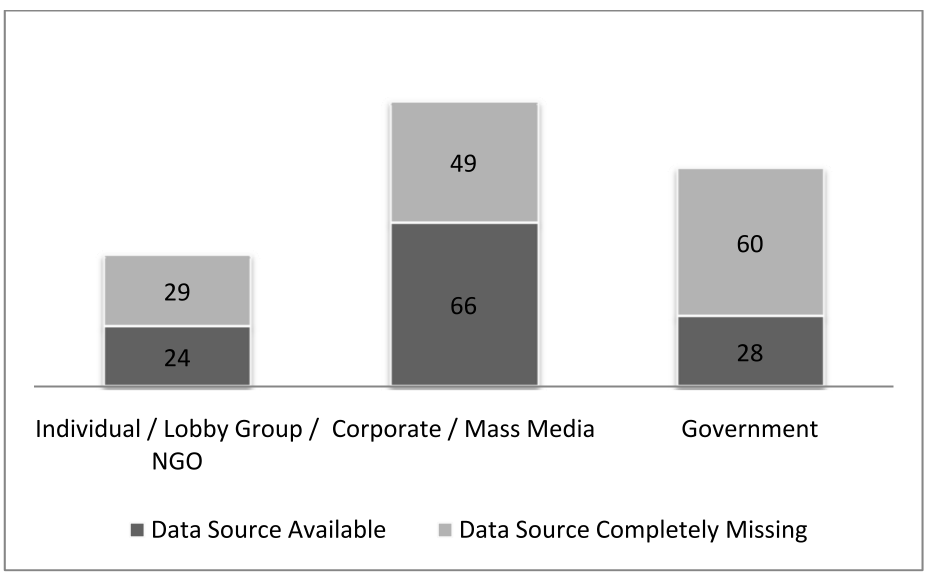



**Figure 5.4 –** Data Source Availability by Producer (frequencies).

MAP COVERAGE AREA AND ERA

Most likely due to the different geopolitical conflicts of each era, the areal extent of maps – i.e., the amount of space a mapped area represents – changed quite significantly depending on the timeframe one was selecting maps from. During both of the World Wars and the Cold War, global and sub-continental regional maps were far more ubiquitous than they are today or were prior to World War One (Figure 5.5).

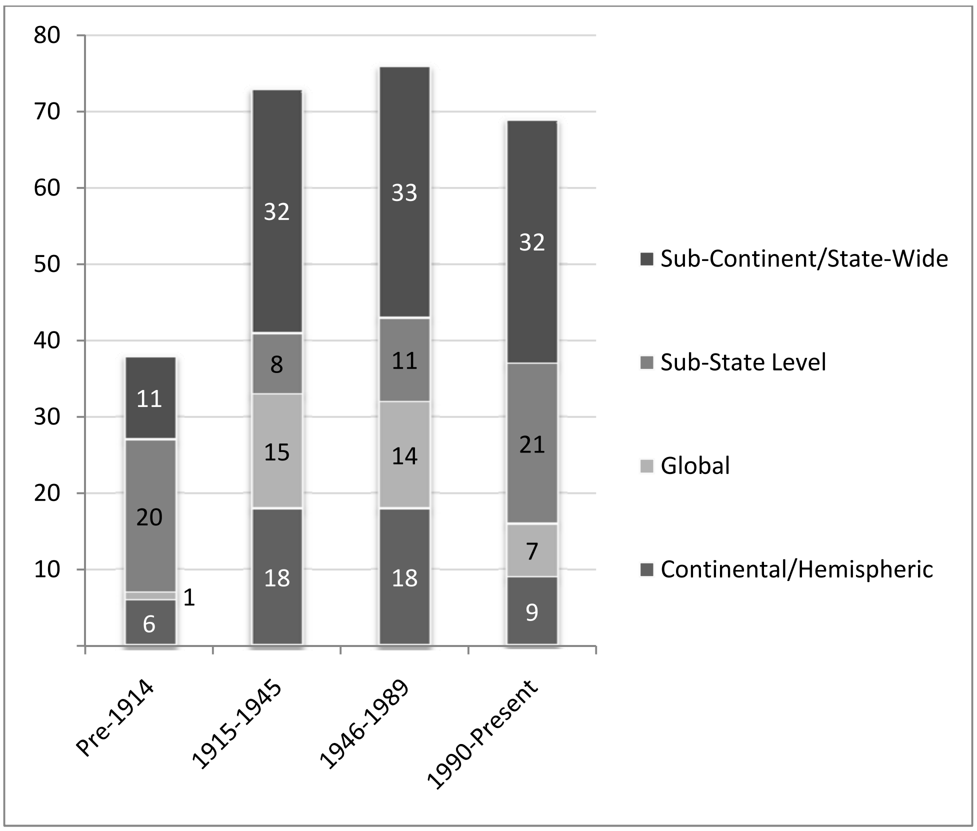



**Figure 5.5 –** Map Coverage Area by Era (frequencies).

MAP DATE AVAILABILITY AND ERA

By far most maps, or the publications in which they appear, provide a date of publication or data acquisition to allow a map reader to discern if the map itself may contain old data. However, over the past several decades providing a date has become increasingly arbitrary (Figure 5.6). Many of the PCMs created since 1994 are placed online and exist in near perpetuity – dateless and unchanging. Figure 5.7 illustrates that the trend has become pronounced with Web PCMs. Though the Internet works as a cartographic tool allowing disenfranchised groups to create and distribute their own maps cheaply and quickly, it also seems to be facilitating cartographic manipulation.

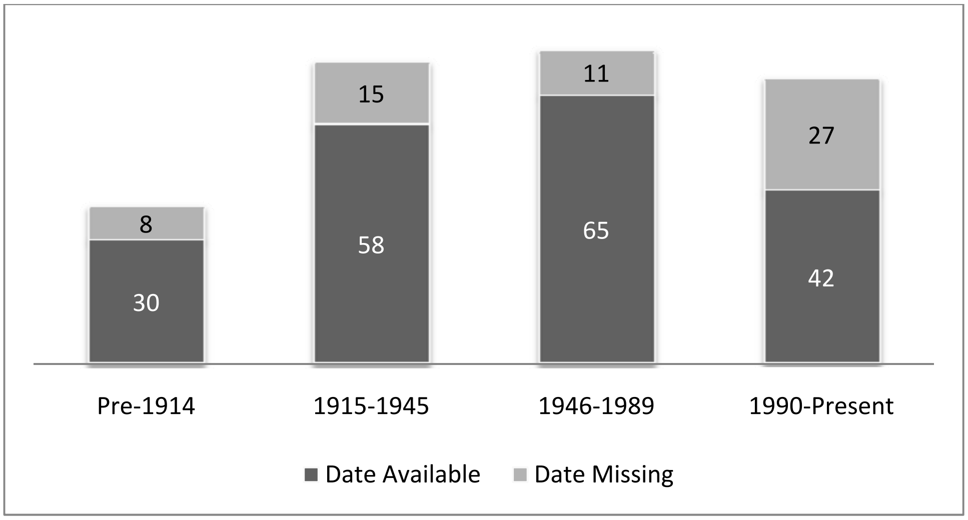



**Figure 5.6 –** Map Date Availability by Era.

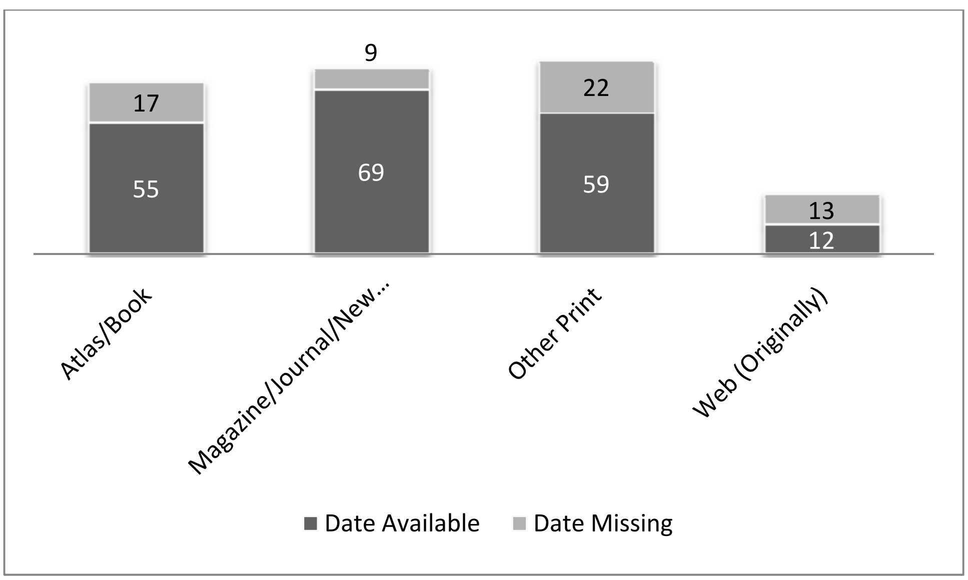



**Figure 5.7 –** Date Availability by Medium.

## GRAPHIC MANIPULATIONS

Four graphic manipulation variables were also linked to era: map coloring; illustration inclusion; supplemental text and textbox inclusion; and inset map inclusion.

## COLORING AND ERA

The number of colors found on PCMs has increased over time (Figure 5.8). There was a significant increase in the number of color maps over time. This can be directly related to technological development in both map creation and publishing. The technology to produce color maps has declined rapidly in price with the arrival of the personal computer and home printing software.

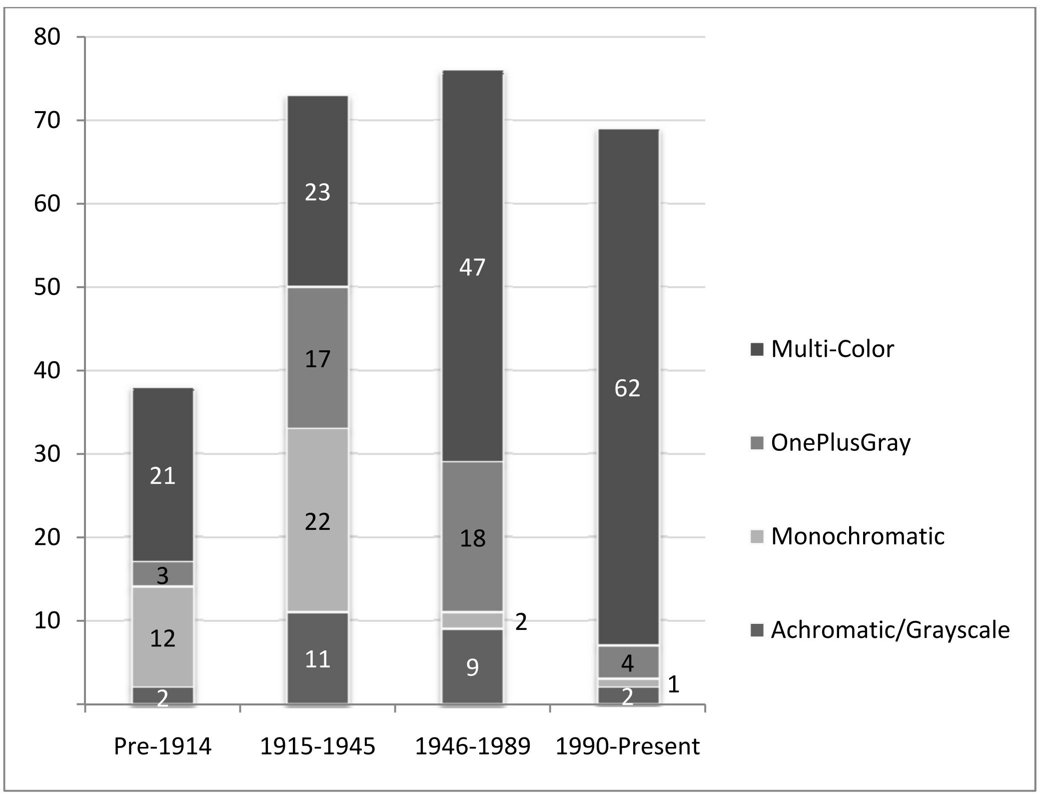



**Table 5.8 –** Type of Coloring used by Era.

ILLUSTRATIONS, TEXTBOXES, AND ERA

As the charts below show (Figure 5.9 & 5.10), the use of *illustrations* and *text boxes* found on PCMs were both significant. After the Second World War, there was an increase in the use of textboxes with maps. In the nineteenth and early twentieth century, illustrations were used extensively on maps before falling in use during the first half of the twentieth century. They have picked up again since, appearing on roughly 35% of maps regardless of the era.

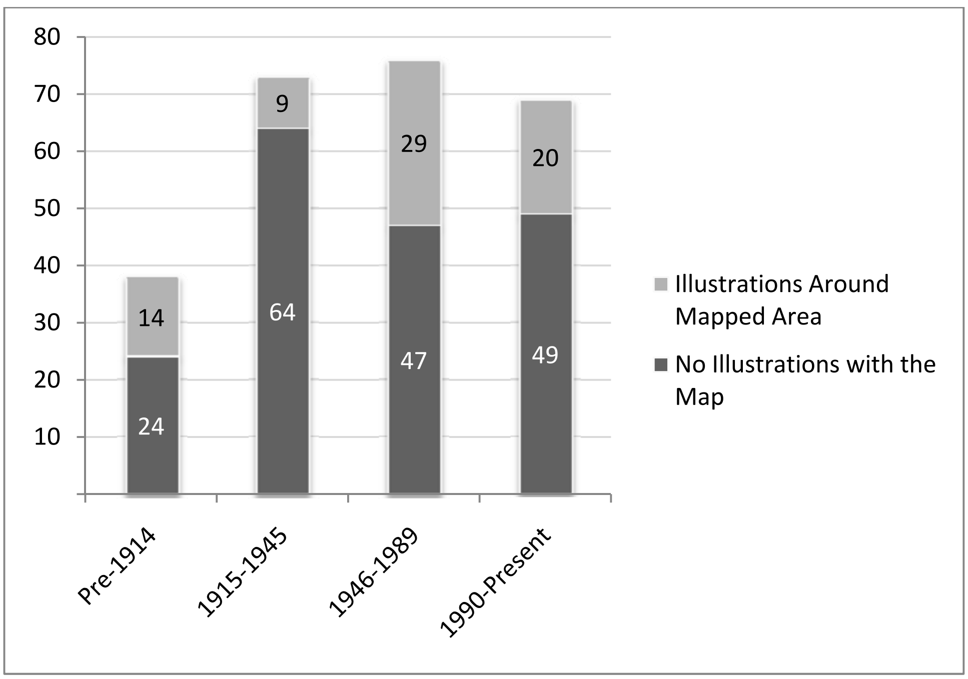



**Figure 5.9 –** Use of Illustrations by Era (frequencies).

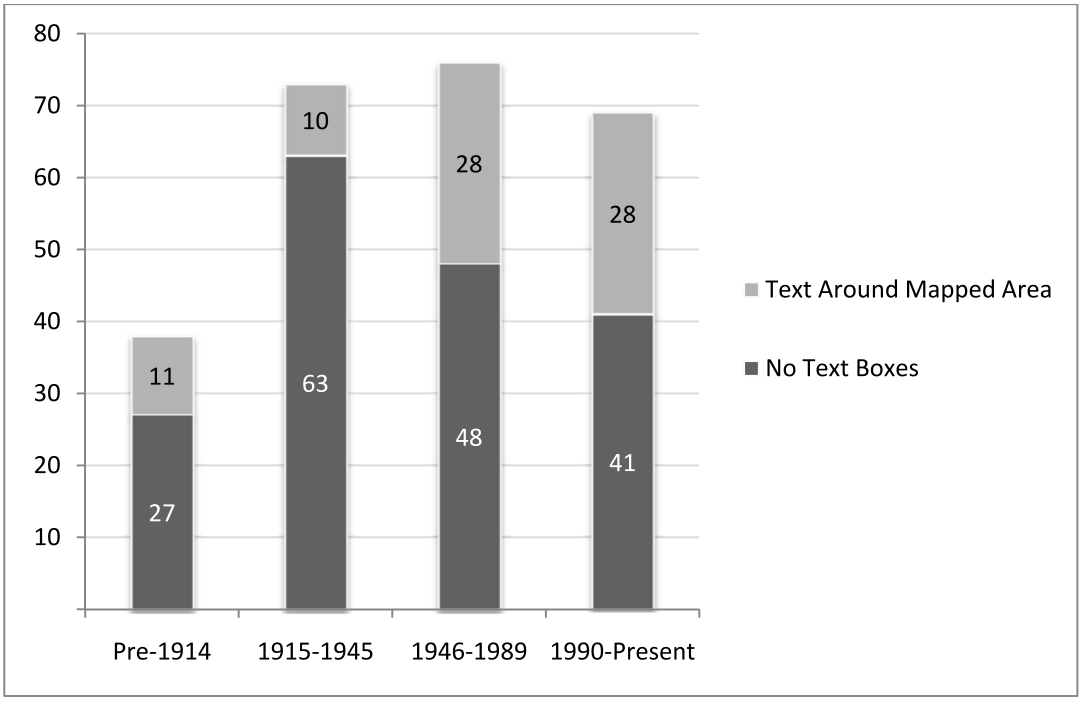



**Figure 5.10 –** Use of textboxes by era (frequencies).

INSET MAPS AND ERA

A majority of the maps in the sample did not have any inset maps accompanying them. Of those that did, in most eras (excluding the early twentieth century) it was typical to have two or less insets. The pre-1914 era was the least likely to have inset maps (Figure 5.11), which may be attributable to technological limitations in both production and printing. The creation of a single map at this time was difficult enough; insets providing context or detail appear to have been a rare treat.

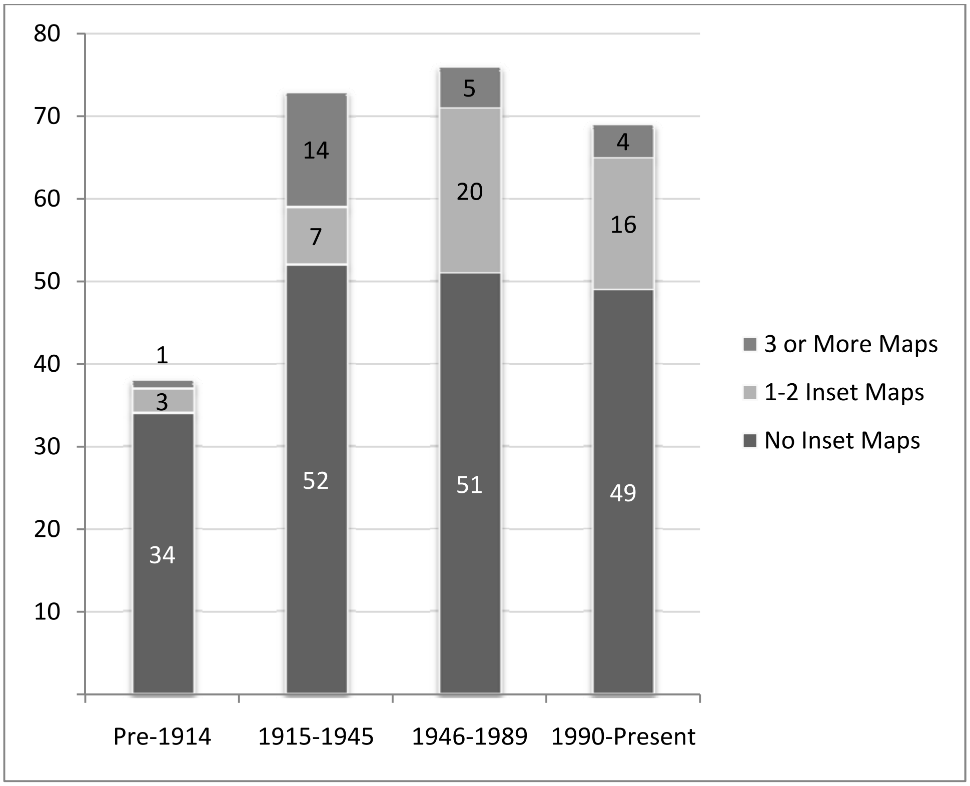



**Figure 5.11 –** Number of Inset Maps by Era (frequencies).

### Rhetorical Layout Variables

None of the Dondis variables had strong relationships with map era. One variable stood out, however. Since the end of the Second World War, maps have become increasingly fragmented – meaning they are less fluid in their appearance and more modular with inset maps, textboxes, illustrations, and other elements competing with the mapped area itself (Figure 5.12).

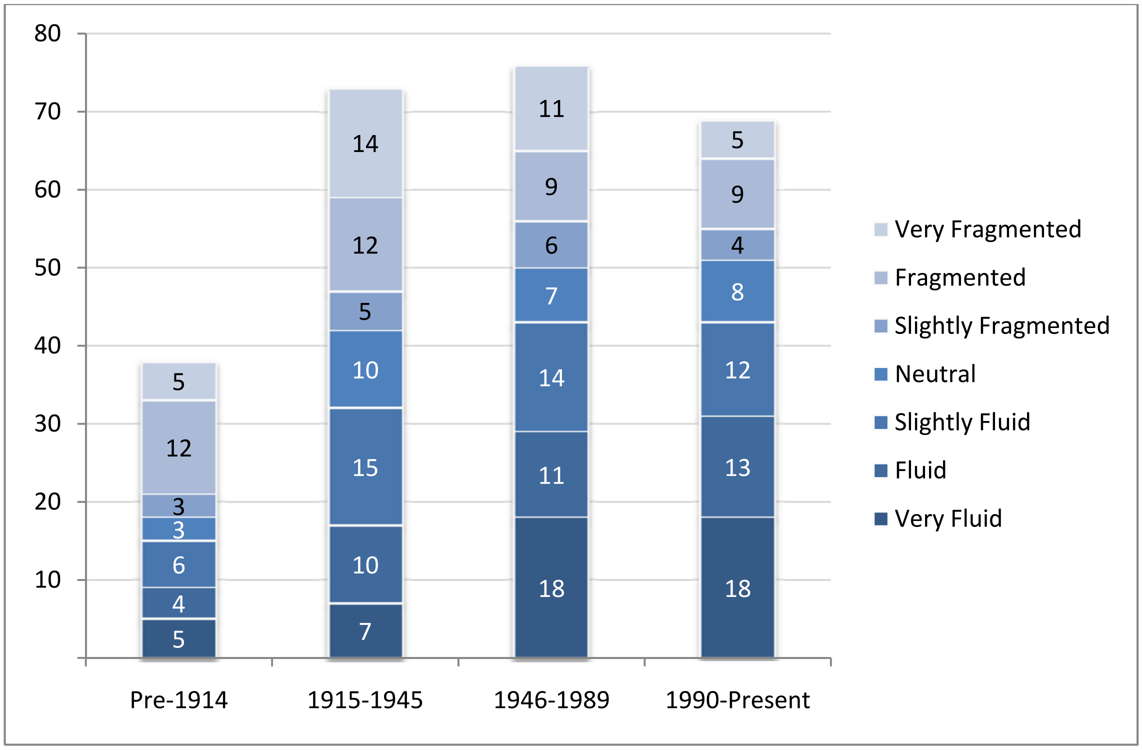



**Figure 5.12 –** Level of Map Fragmentation by Era.

### The Impact of Geopolitical Era on Political Cartographic Manipulation

The aforementioned data demonstrates that as the science of cartography has evolved, so too have the tendencies and techniques of political cartographic manipulation. Though the above results are not as extreme as might have been feared by those currently concerned with data reliability and the ethics of mapmaking in the digital era, there is evidence that political cartographic manipulation is diverging quite significantly in the twenty-first century from the past. By and large, ***data model manipulation has changed the most over time,*** with other types of manipulation remaining relatively consistent.

Of greatest significance, in the opinion of this author, is that data is increasingly being mapped without any source information to let the map reader know about the significance and reliability of what is being illustrated. Though this is not a new technique in and of itself, the frequency of this technique has seen exponential growth since the dawn of the Internet. One can only presume that with online mapping quickly displacing paper maps, this trend will continue to speed up.

In this vein, the lack of a production date on most maps these days is also disconcerting. Static maps represent a snapshot of a phenomenon. Without a date, one cannot be sure of when this snapshot was taken. Moreover, as maps are increasingly distributed online and posted for months or years at a time, the room for misinterpretation of a current phenomenon increases.

Thus, a change in the medium of static map distribution throughout time is also very important to note. Technology has largely diffused the capability to produce maps loaded with political cartographic manipulations to new types of producers. This media devolution, particularly since the dawn of the Internet, is evident in society and politics at large, not just in cartography (Oas 2002). States were once more capable of controlling media diffusion. Technology has begun to chip away at states' ability to do this. Today, not only can someone produce an album, podcast, television show, or film, they can also create persuasive and politically motivated maps and diffuse them widely via the Internet. Editorial and state sanctioning are no longer parts of the map production process in a majority of cases. This represents a brave new world for political cartographic manipulation. To investigate such changes further, as well as completely answer this chapter's research questions, I also analyzed and tested whether the type of producer is significant in determining what cartographic manipulations are likely to be used.

## The Impact of Producer on Political Cartographic Manipulation

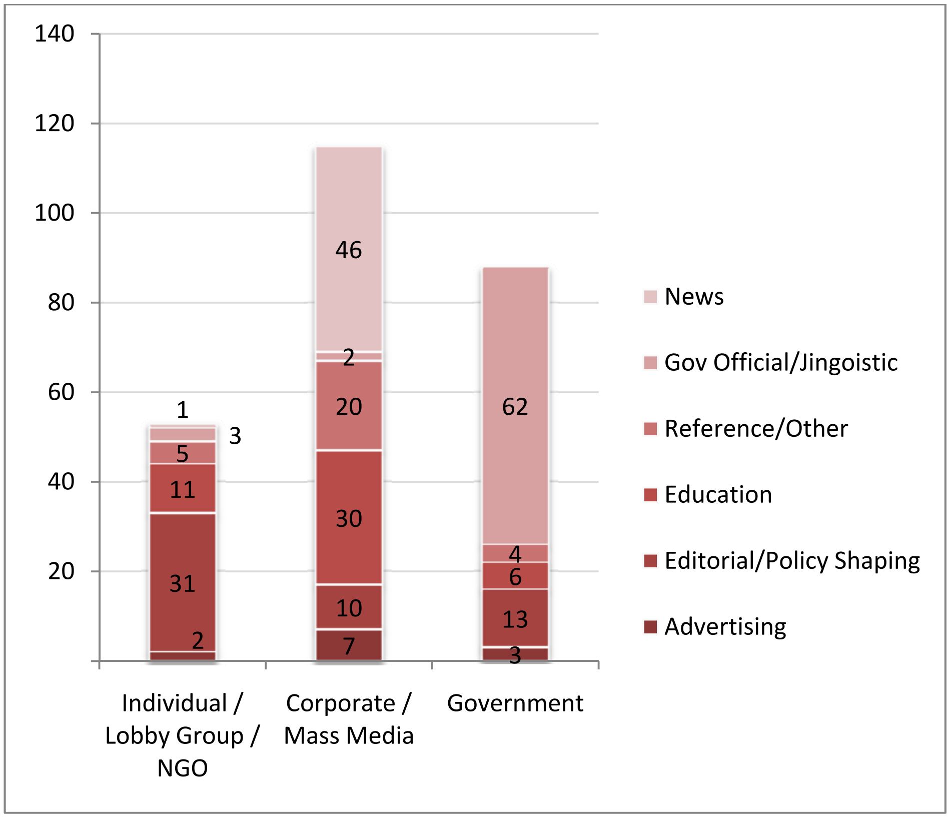
Of primary interest in this research is whether or not certain types of manipulation are related to particular map producers. As has been alluded to already, it seems that there may be a type of map devolution occurring – at least as pertains to who is making political maps and how they are distributed. What, if any, variable frequencies differ based on who is producing a map?

Far more variables correlated with the producer of a map than with the era of its production. As for contextual variables, the *role of the map* and *medium of the map* were related to the producer. Linked data model manipulations included: *data source availability, date availability, cartographer availability,* and *scale availability*. Graphic manipulations linked to the producer were the *number of inset maps, illustrations, thematic representation, labeling method,* and *level of contrast.* Finally, graphic layout variables included *contrast embellishment* and *map perspective/obliqueness.*

### Contextual Variables

#### ROLE OF THE MAP AND PRODUCER

A strong correlation existed between the role of the map and the map producer (Figure 5.13). Most government producers used their maps in sanctioned publications for purposes of persuasion or to solidify an already established opinion. Roughly 12% of government maps were also used for policy shaping. Most of the corporate maps found were used to educate an audience or for reference purposes. Maps produced by the media were overwhelmingly used to supplement current event stories. National governments are increasingly being supplanted by independent lobby groups and non-corporate organizations when it comes to making maps that promote policy or editorialize on political issues.




**5.13 –** Role of Map by Producer.

## MAP MEDIUM AND PRODUCER

A strong link existed between the *Medium* used and the *Map Producer* (Figure 5.14). As mentioned in the previous section on the role of era in political cartographic design, medium is inherently linked to the technologies available by era. Individuals and NGOs proliferate as map producers online, particularly now that network technologies have opened mapmaking to more types of producers. Mass media producers tended to distribute PCMs via periodical literature. Governments frequently diffused their political ideology via atlases – particularly during times of international conflict.

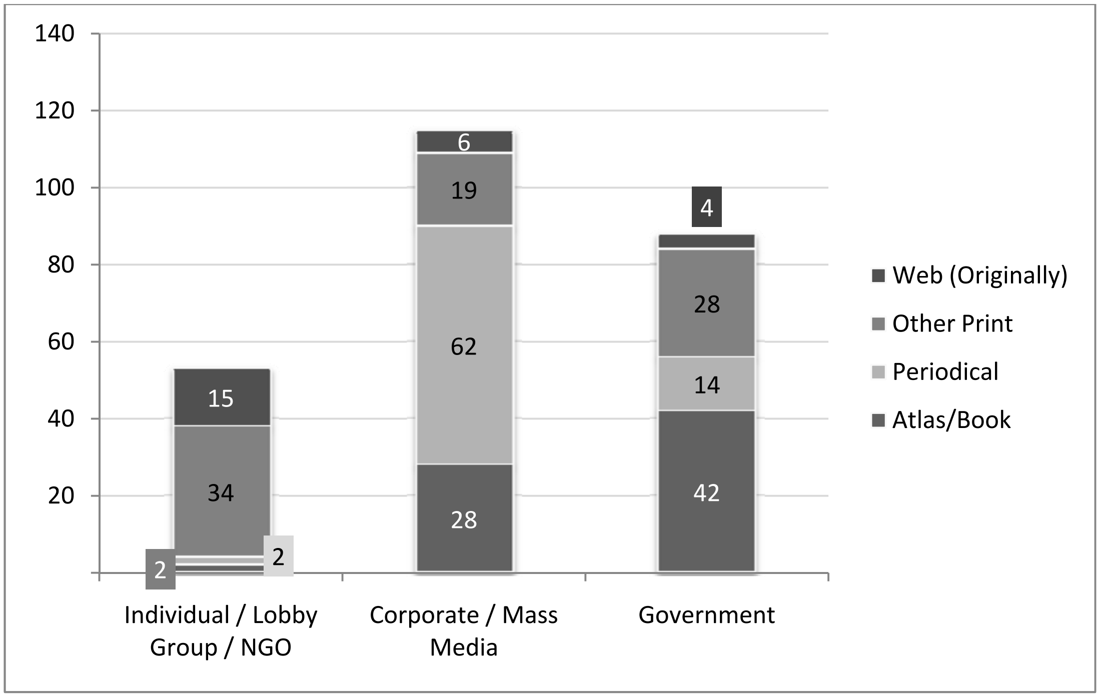



**Figure 5.14** – Map Medium by Producer.

## Data Model Variables

### DATA SOURCE AVAILABILITY AND PRODUCER

News media and corporate producers were the most reliable when it came to citing the sources of their data (Figure 5.15). Non-government and non-corporate groups were second most attentive to this detail, and government produced maps the least so (Figure 5.17). One might think that governments would be more concerned about providing data sources, but for purposes of persuasion, it is likely *best not to list the sources* and hope that map readers assume the maps are based on "accurate" government data.

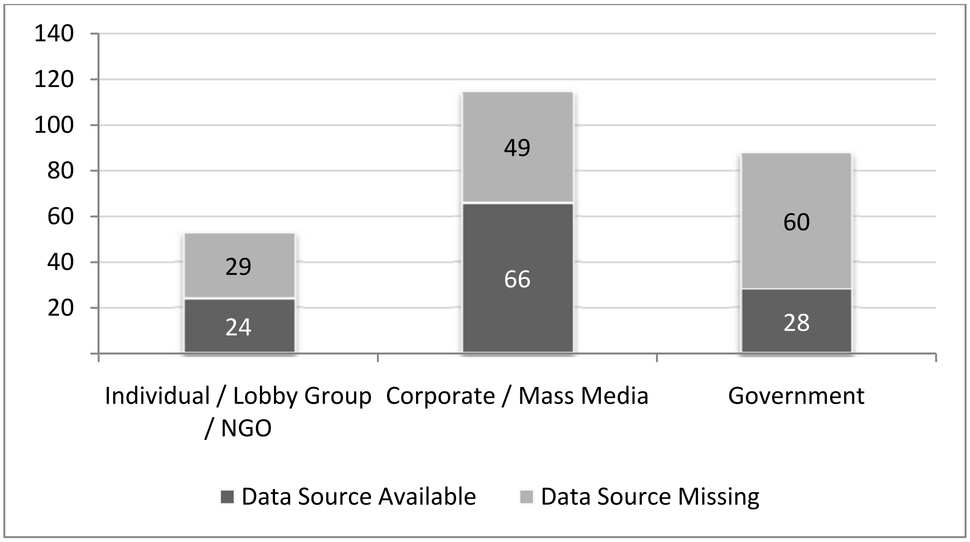



**Figure 5.15** – Data Source Availability by Producer.

DATE AVAILABILITY AND PRODUCER

As Figure 5.16 below illustrates, a date of production was included most regularly on maps produced by corporations and mass media outlets (42.6%). This was to be expected, as often the maps were published in periodicals, which by default have a date included on the cover. Individuals, lobby groups, and NGOs included a date nearly as regularly (39.6% of maps). Government maps were *the least likely* to include a date (68.2%).

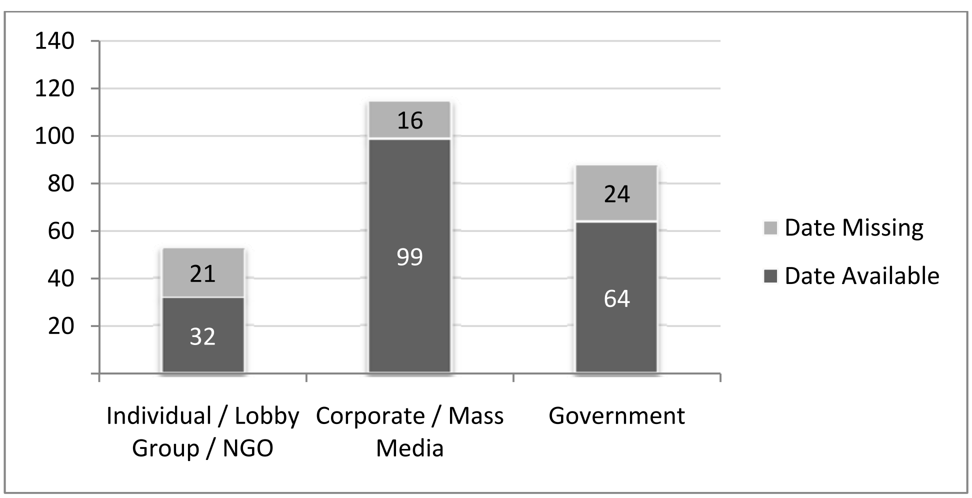



**Figure 5.16** – Date Availability by Producer.

CARTOGRAPHER/PUBLISHER AVAILABILITY AND PRODUCER

Only very rarely was the cartographer or producer of a map unacknowledged (Figure 5.17). By far the most likely producers to avoid putting their logo or names on a map were non-government and non-corporate producers (28.3%). This showed a marked difference from maps produced by corporations (only 3.6% failed to identify themselves) and maps by governments (only 7.3%).

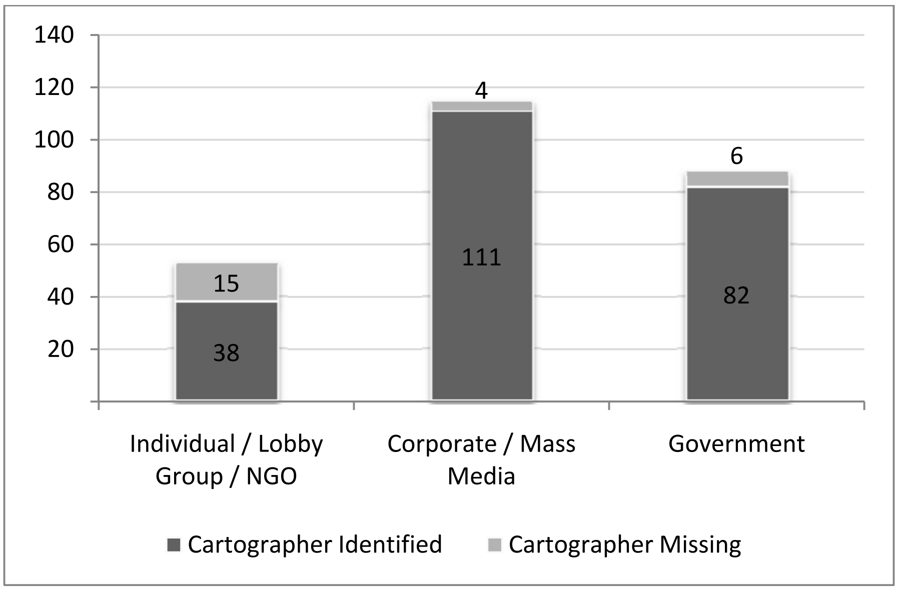



**Figure 5.17** – Cartographer/Publisher Availability by Producer.

SCALE AVAILABILITY AND PRODUCER

Among all producers except the news media, it appears that it is socially acceptable to leave scale off of a politically manipulated map. Whereas corporate and mass media maps left map scale off 44.4% of the time, governments left it off in 65.9% of the their cases, and individuals, lobby groups, and NGOs left it off 67.9% of the time (Figure 5.18).

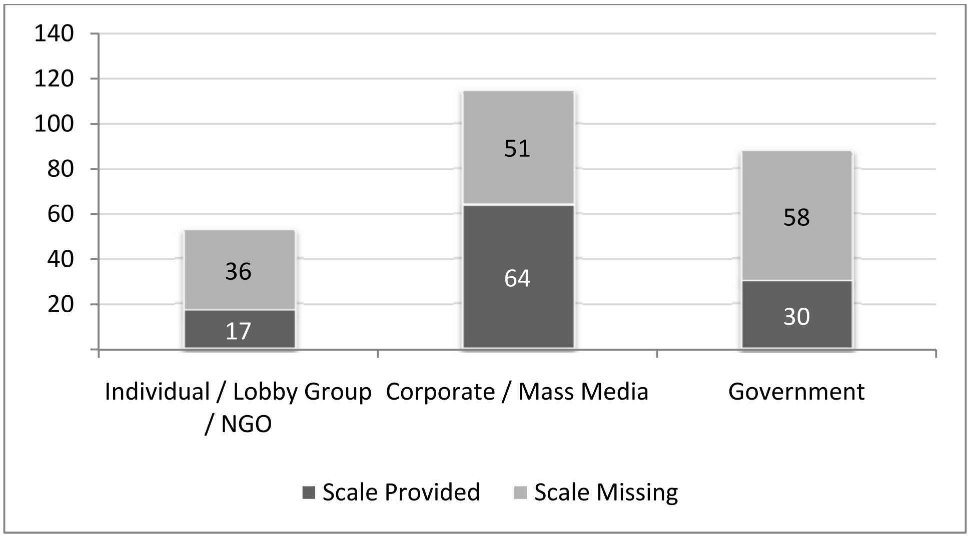



**Figure 5.18** – Map Scale Availability by Producer.

## Graphic Manipulations

Four graphic variables were related to the map producer: (1) *the number of inset maps;* (2) *the inclusion of illustrations;* (3) *unconventional labeling methods;* and (4) *the colors used to establish contrast.* Each is reviewed briefly below.

### INSET MAPS AND PRODUCER

A significant but relatively weak relationship existed between map producer and the number of insets found on a map. Government maps were more likely to have inset maps included (36.4%), particularly more than two at a time (Figure 5.21). Corporate and media maps, however, were more likely to have only one or two insets than government maps. Lobby groups, NGOs, and individual map producers in this sample did not regularly make use of inset maps – only six maps (11.3%) produced by this group had insets (Figure 5.19).

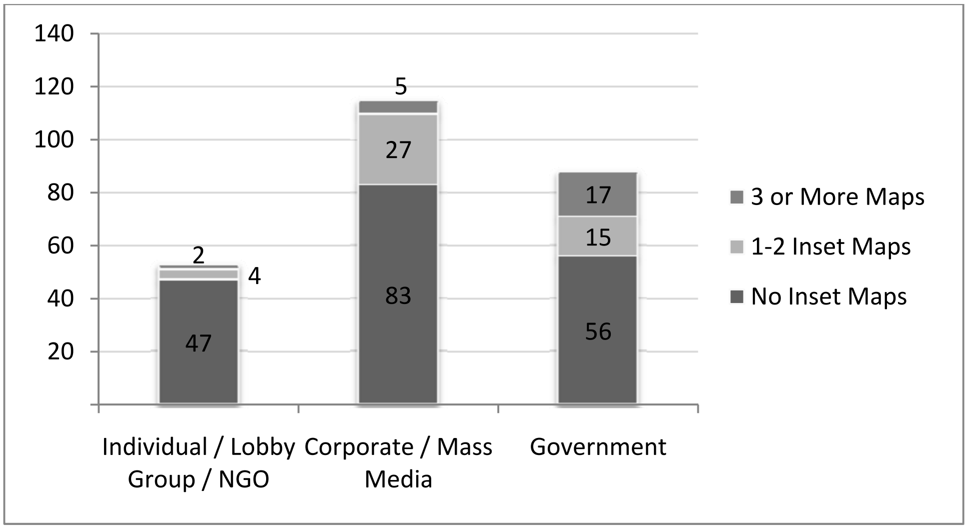



**Figure 5.19** – Number of Inset Maps by Producer.

## ILLUSTRATIONS AND PRODUCER

A weak relationship existed between the producer and the use of non-photographic illustrations. In general, illustrations were not used very frequently. However, corporate and media maps more regularly employed at least one illustration over or adjacent to the map (38.3% of maps had accompanying illustrations). Other producers were more likely to avoid using pictures, government maps doing so only 21.6% of the time, and NGOs, individuals, and lobby groups only 17.0% of the time (Figure 5.20).

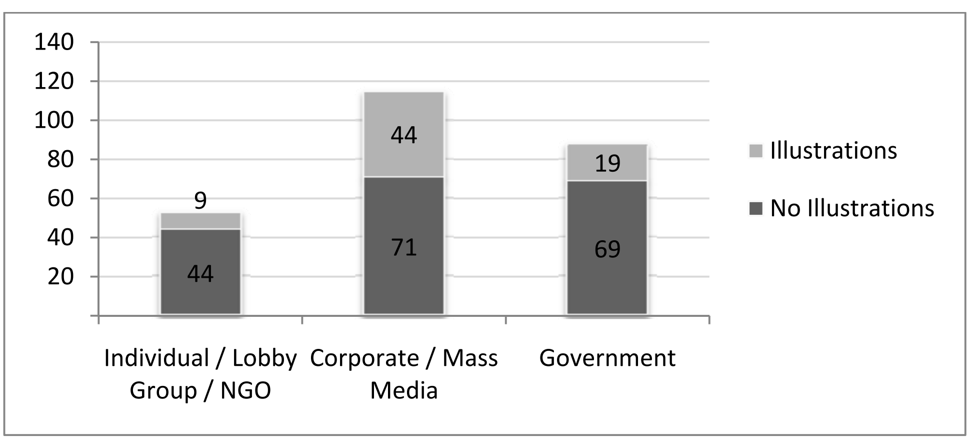



**Figure 5.20** – Illustrations by Producer.

LABELING TYPE AND PRODUCER

There was a statistically significant relationship among producers and use of certain labeling techniques (Figure 5.21). Most maps used standard labeling procedures, but media maps often used callouts (32.2% of these maps, as compared to 11.3% for NGOs, and 6.8% for government). This makes sense, as often media maps are limited in the amount of color they can use to differentiate labels (e.g., newspapers).

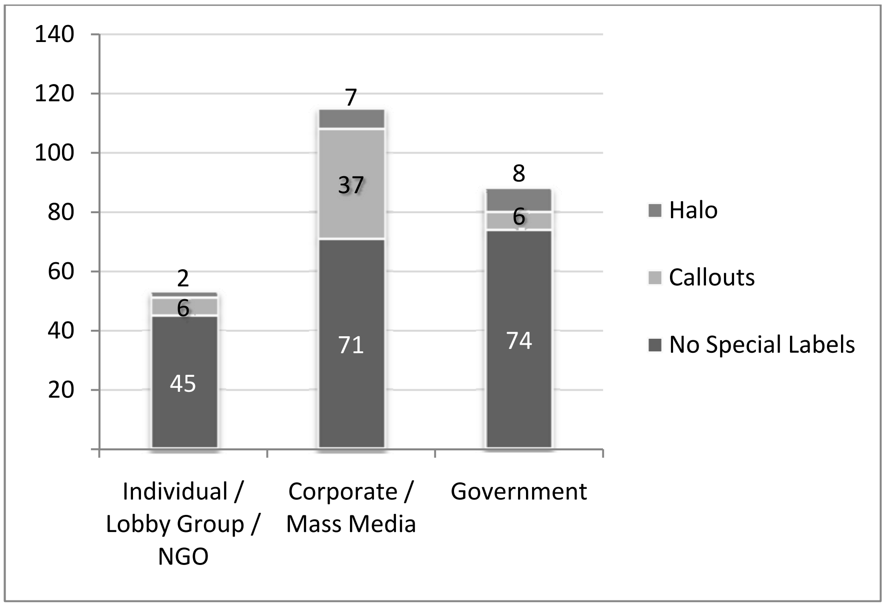



**Figure 5.21** – Labeling Techniques by Producer.

CONTRAST AND PRODUCER

Over half of the maps in the sample contained at least one hue that contrasted with surrounding colors quite pronouncedly (Figure 5.22). By and large, red has the preferred color of choice for establishing contrast, except for on individual, NGO, and lobby group maps. These maps most regularly used different colors (in particular yellow, orange, and purple). Government maps far more typically used a hue to establish contrast or used two or more colors of contrast on the same map (71.6% of government maps established contrast, compared to 45.3% of individual, NGO, and lobby group maps, and 40.9% of corporate maps).

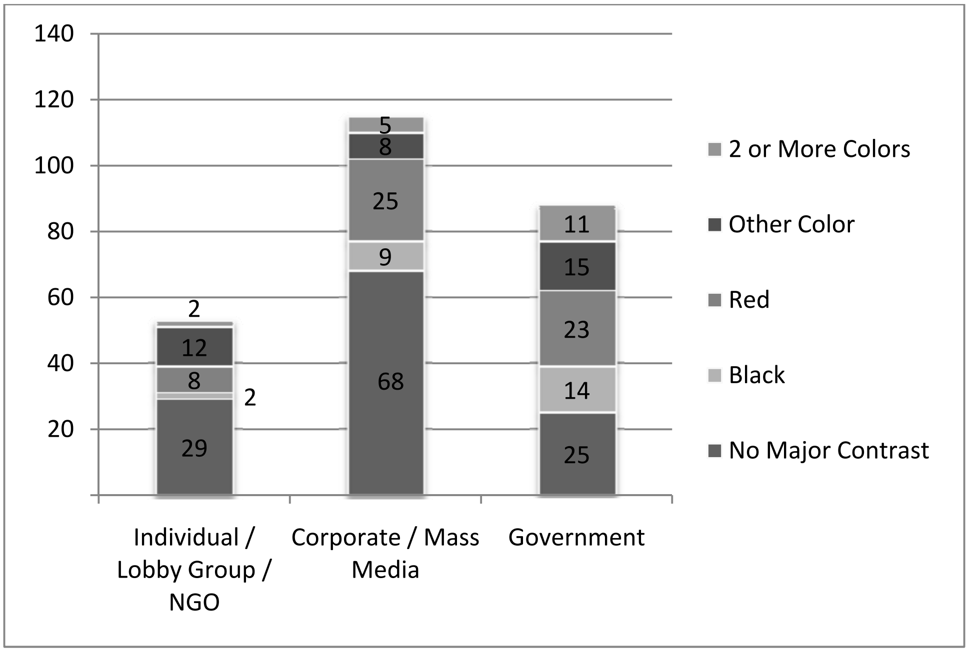



**Figure 5.22** – Level of Contrast by Producer.

## Layout Manipulations

### OBLIQUENESS OF PERSPECTIVE AND PRODUCER

The angle and depth of perspective found on maps in this sample varied quite significantly depending on who produced the maps (Figure 5.23). Media groups were responsible for the most oblique and three-dimensional maps found in the sample (77.3% of all). Cross-tabulating for era illustrated that this has not changed over time. The media has typically offered perspectives that spin, angle, and illustrate in ways that offer map readers an exciting view of the data. Government maps are much more restrained when it comes to doing this. Aside for a brief period of time before and after World War II, when governments produced many oblique angled maps, Western governments seem to have shied away from this technique. Interestingly, NGOs, individuals, and lobby groups use slightly oblique views more than the other groups (50.9% of the time), but very rarely go to the extreme that media producers do.

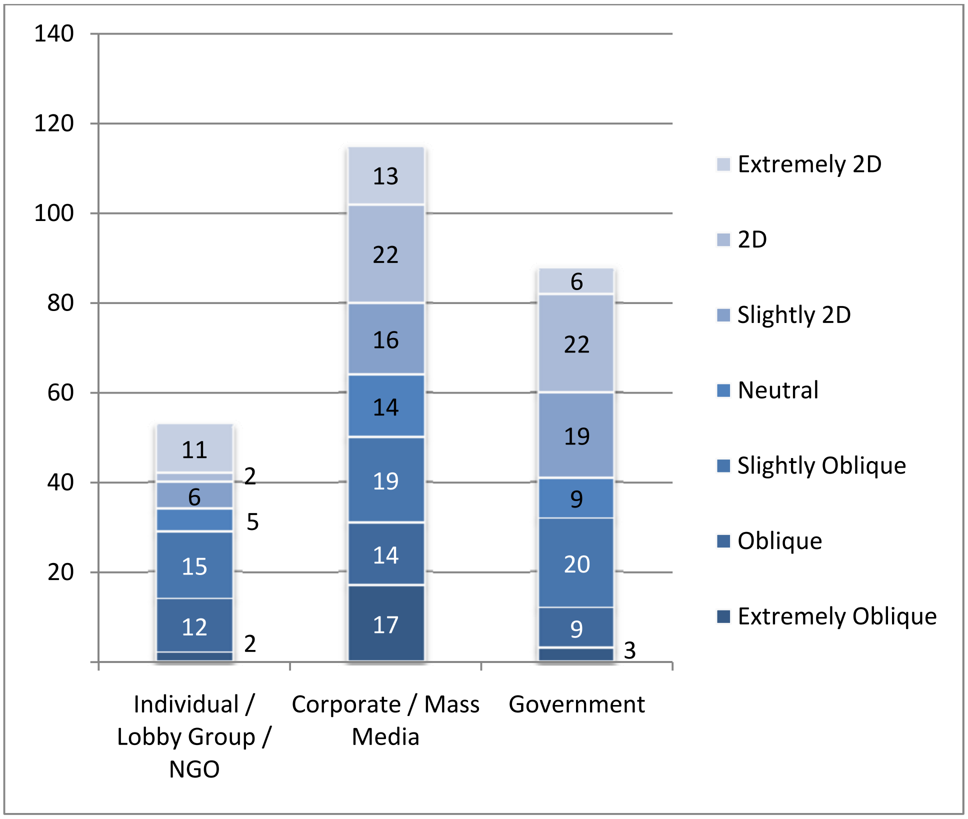



**Figure 5.23** – Map Perspective / Depth by Producer.

EMBELLISHED CONTRAST

As already mentioned in the previous discussion of the overall characteristics of the sample, the PCMs in this sample tended to use extreme contrast (Figure 5.24). Nearly as many maps scored the maximum contrast ranking as scored the lowest three ranks of contrast combined. Governments used contrast most regularly, followed by the media and corporations. Non-government and non-corporate producers were less likely to make heavy use of contrast.

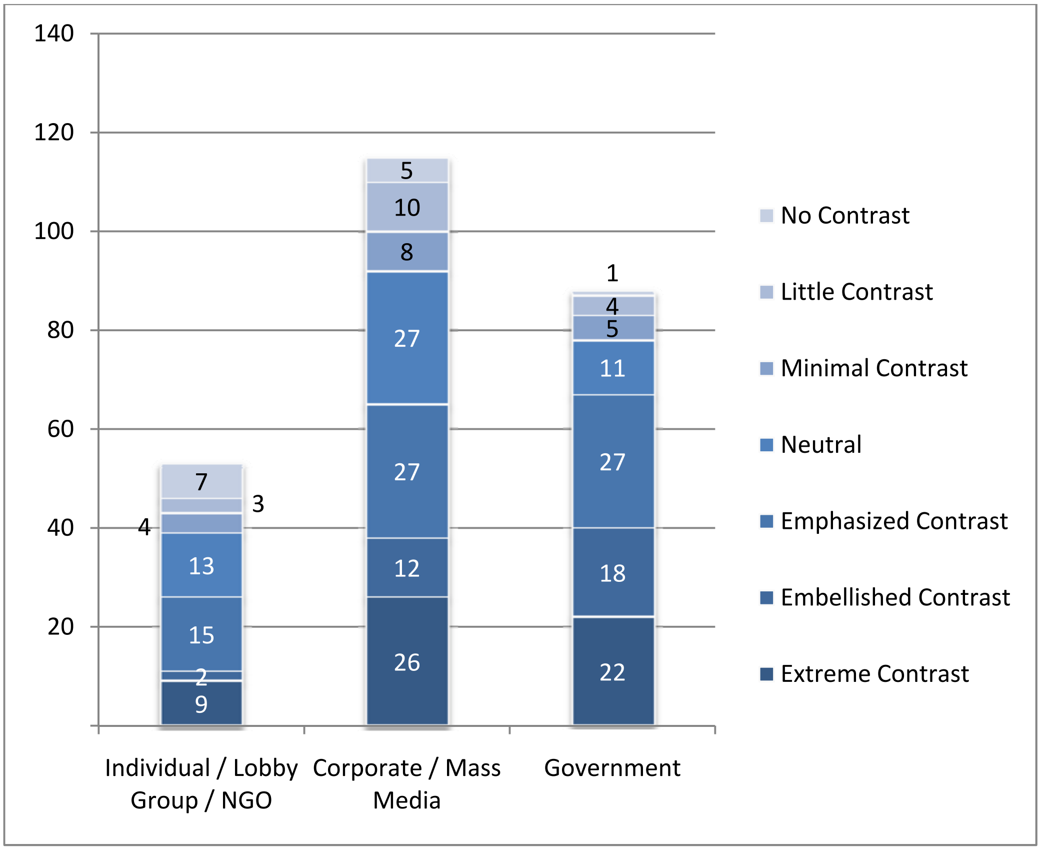



**Figure 5.24** – Embellished and Minimized Contrast by Producer.

## The Role of Producer in PCM Style

As the above data demonstrates, certain types of cartographic manipulation found on politically motivated maps correlate with map producers. It seems that *who* produces a political cartographic manipulation is more influential in predicting what types of techniques are used than *when* the map is produced. Specifically determining why some of these correlations are so strong is above and beyond this research, but some assumptions can be made.

PRODUCERS USE SOME DIFFERENT TECHNIQUES

Media organizations and corporations making maps for mass dissemination use data model manipulation *far less* than other producers. There is a good possibility that this is due to attempts by journalists and professional cartographers hired by corporations to strive for a certain amount of scientific integrity, or at least data accuracy. This is not to say that the PCMs produced by the media and corporations do not go out of their way to promote a particular viewpoint. Like all of the maps in this sample, maps that do not possess an abundance of data model manipulation may still be comprised of many graphic and layout variations. For example, it turns out that media maps typically offer engaging perspectives (i.e., oblique instead of two dimensional) and are far more likely to be illustrated than other types of maps.

Government maps serve a variety of purposes. They can be used to inform audiences of policy decisions, persuade opponents to perceive a conflict a particular way, or reinforce constituents' already entrenched beliefs. Nonetheless, several techniques shone through when governments produced these maps. Data model manipulation was found on government produced maps far more regularly than on maps produced by others. Data sources were most often missing from government maps; this is somewhat odd given the amount of public data sources most governments have to pull data from. During periods of conflict, many of the maps in this sample that lacked a data source were based on data of dubious origin and accuracy. Scale bars were more frequently excluded by governments than when maps were designed by the media or corporations. Government maps were also more likely to be part of a series of maps, rather than one-time representations. This makes sense in many ways, as commercial and media periodicals often use specific maps to help readers understand current events or stories. On the graphic side of things, government maps were more likely to employ high levels of contrast.

Perhaps the most unpredictable map producers are those that work for non-profits, independent cartographers, and lobby groups. More often than not, the maps these groups produce were outliers. Part of this has to do with the fact that the intended audiences for these producers are all unique and frequently changing. Governments generally have a continual and predictable audience. Media maps are often created as news supplements for a particular audience that is likely to consume the map being produced.

## Conclusion

After all of this analysis of era and producer, what conclusions can be made about PCMs? Do these two variables operate as indicators as to what types of techniques are likely to be employed in the creation of PCMs?

With regards to whether political cartographic manipulation techniques have evolved over time and changed depending on different geopolitical contexts, the answer is yes but *only slightly.* The techniques used on PCMs have not changed in a linear manner and *most have not changed at all.* However, statistically speaking at least, there appear to be temporal shifts that correlate with geopolitical episodes. In particular, as technology has advanced, so too has the amount of color used for contrasting purposes. Moreover, as more people are able to produce and distribute maps since the privatization of Internet access in 1994, we see that data model manipulation is particularly acute among non-profits, individuals, and lobby groups making their own maps. Whether this is due to a lack of cartographic training or not is irrelevant; the point is, there is more room for misrepresentation and less accountability with an increase in data model manipulation.

A tertiary question regarding era was raised earlier in this dissertation: *Have any previously used techniques of political cartographic manipulation fallen to the wayside throughout time?* The answer to this question appears to be no, but the data collected in this sample did not offer a definitive answer. There is little doubt that techniques used for political rhetoric on maps have and continue to evolve, but like clothing fashions, they tend to reappear with slight modification. The idea for this research question stemmed from the fact that MacEachren (1979) has argued that certain thematic techniques of representation have disappeared over the years and are no longer being used. I presumed that this may be the case for certain techniques of cartographic manipulation as well. This research *has not* provided a conclusive answer to this question.

What is certain is that political cartographic manipulations change more noticeably via map producer than era. Certain producers and publishers typically use different types of cartographic techniques from one another. Government maps tend to use more contrast and data model ambiguity. Maps produced by the media are more likely to use oblique angles and illustrations, perhaps to elicit more of an emotional response from the map reader.

More interesting than the producers' differences in PCM production are their similarities. All used emotive symbology with regular frequency. Dynamic looking maps were produced at the same rate among all types of producers. Base map and data generalizations were not producer specific. The producers used most map manipulation techniques with similar regularity.

Thus, though differences exist, most mapping techniques are remarkably consistent regardless of the era or producer. How, though, might these techniques of political cartographic manipulation be combined to effectively communicate and propagate a message? Are any of these techniques used in conjunction with one another to produce highly effective, emotive, and persuasive representations? The next chapter will go beyond merely describing *when* and *who* uses certain political cartographic manipulation techniques, and delve into the relationships among the variables of manipulation themselves.

# Chapter Six

## *Relationships among Different Techniques of Political Cartographic Manipulation*

## RESEARCH QUESTION

*Are there any significant relationships among different techniques of political cartographic manipulation? If so, which techniques?*

Can political cartographic manipulations can be analyzed by their data model, graphic, and layout attributes? I argue they can be. Having systematically analyzed and counted the techniques of manipulation found in overtly political maps, in this chapter I use QCA to determine which types of manipulation tend to occur with others. This chapter reviews the relationships that exist among the different techniques, which will facilitate the categorization of PCMs in the chapter seven.

To test this research question, statistical tests and cross-tabulations were run among all of the variables to find any existing relationships. The following sections will review those variables found to be related by breaking the correlations down into two broad sections – (1) *Data Model and Graphical Variables* and (2) *Layout Variables*.

### Data Model & Graphical Variable Relationships

#### MAP SCALE AVAILABILITY

The inclusion or exclusion of a map scale was linked to more variables than any other coded for, including the following: (a) *map orientation;* (b) *map title rhetoric;* (c) *complexity of map visual hierarchy;* (d) *base map generalization;* (e) *data generalization;* and (f) *legend detail*.

(a) A moderate strength relationship existed between the inclusion and exclusion of both map scale and map orientation (Figure 6.1). If a map scale was excluded so was map orientation 64% of the time. Conversely, when a map scale was included, only 19.5% were missing an orientation.

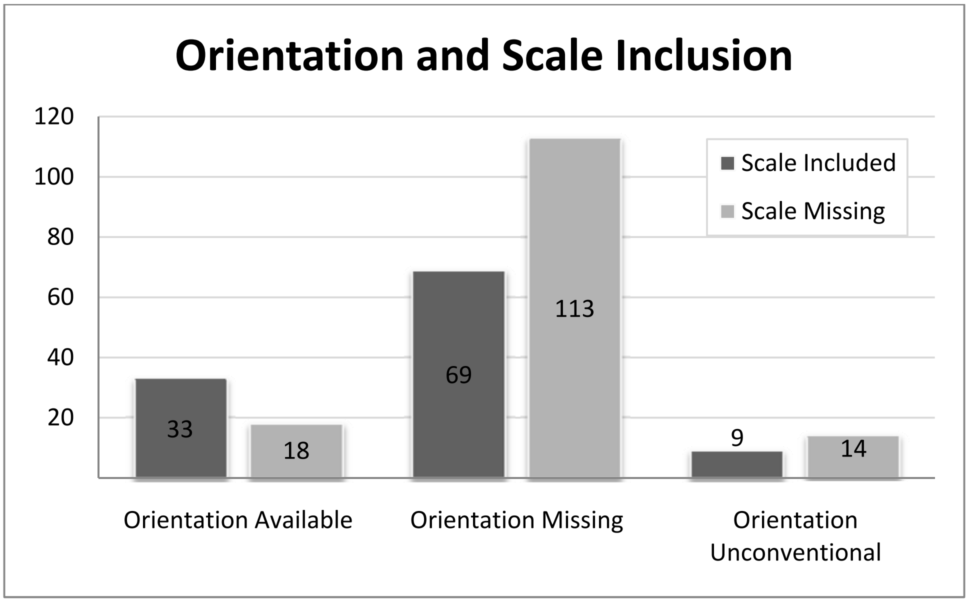



**Figure 6.1** – Scale inclusion and orientation (frequencies).

(b) When a scale was not included with the map, the map's visual hierarchy was far more likely to be simple (Figure 6.2).

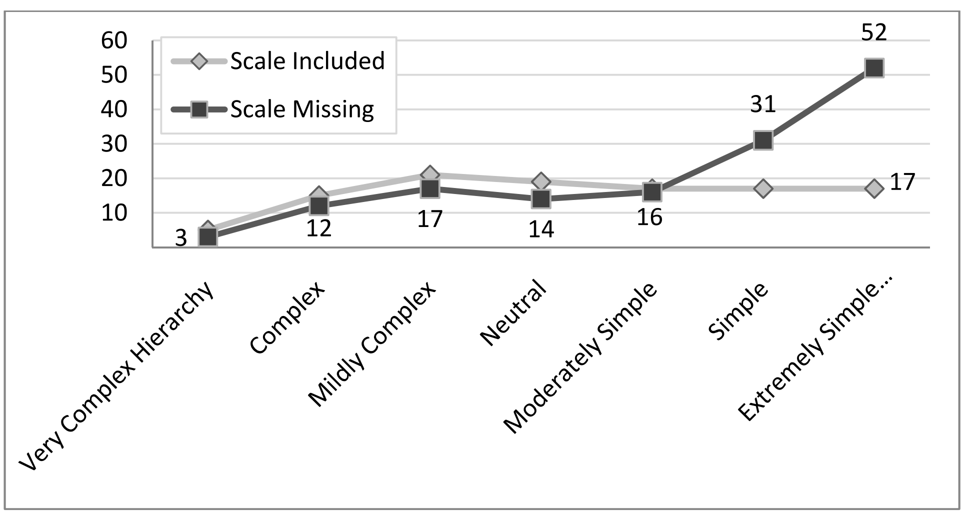



**Figure 6.2** – Scale inclusion and complexity of visual hierarchy (frequencies).

(c) Base maps were more likely to be generalized when map scale was excluded (Figure 6.3).

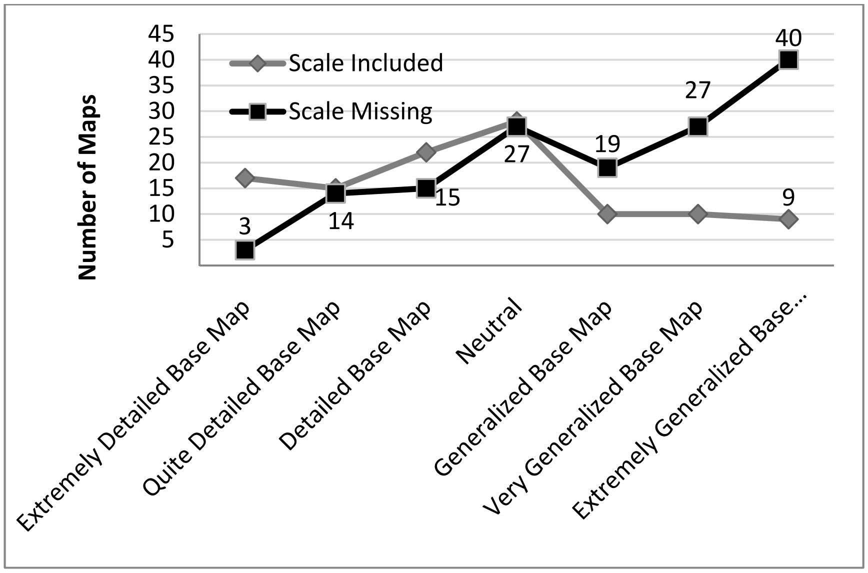



**Figure 6.3** – Scale inclusion and base map specificity (frequencies).

(d) When map scale was missing, a map's data was more likely to be extremely generalized (Figure 6.4).

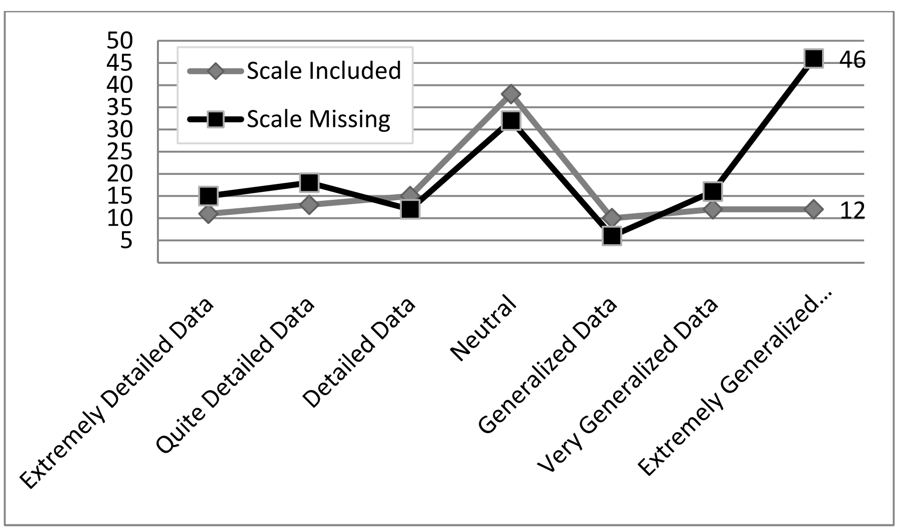



**Figure 6.4** – Scale inclusion and data detail (frequencies).

(e) When map scale was missing, they were lacking a legend 15.1% more often than otherwise (Figure 6.5).

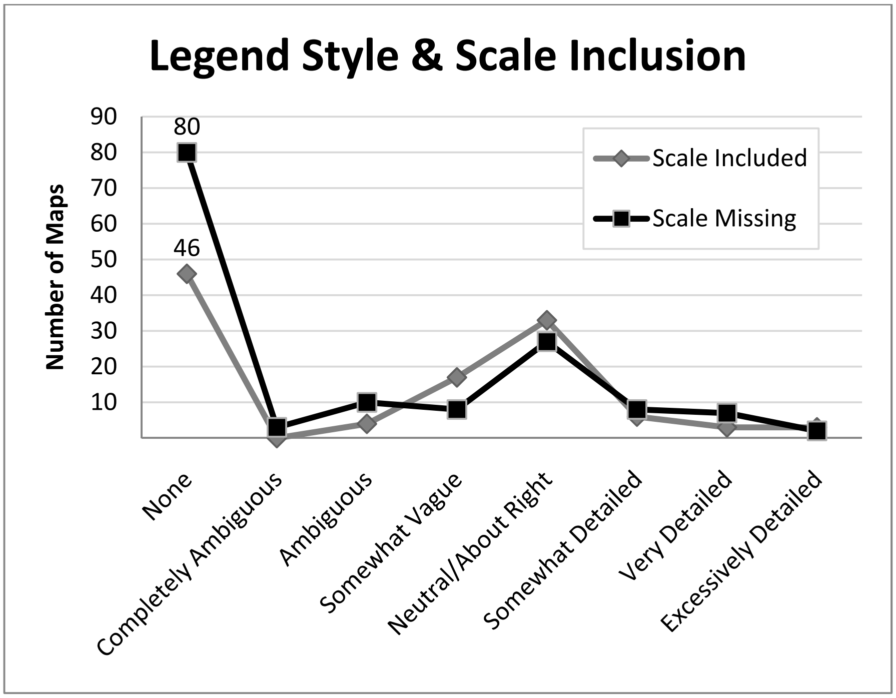



**Figure 6.5** – Scale inclusion and legend inclusion and level of detail (frequencies).

SUPPLEMENTAL ILLUSTRATIONS WITH THE MAP

The inclusion of non-photographic illustrations over or around the mapped area resulted in more relationships than any other manipulation. Maps that included illustrations were more likely to:

(a) Use mimetic symbology than geometric symbology (Figure 6.6).

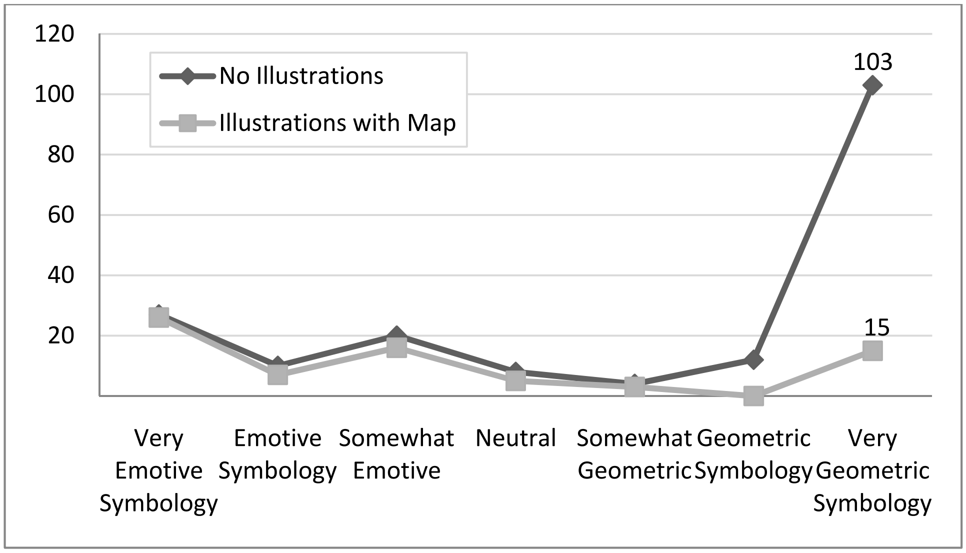



**Figure 6.6 –** Symbology type and illustration inclusion (frequencies).

(b) Be "non-scientific" in appearance (Figure 6.7).

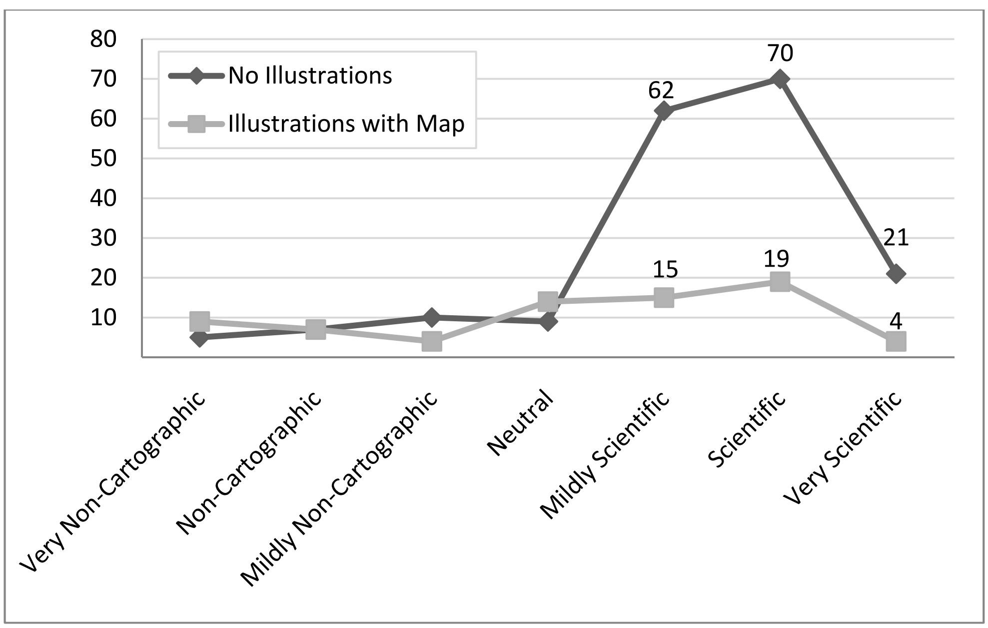



**Figure 6.7 –** Scientific appearance and illustration inclusion (frequencies).

(c) Be broken into multiple parts, leading to a more fragmented layout (Figure 6.8).

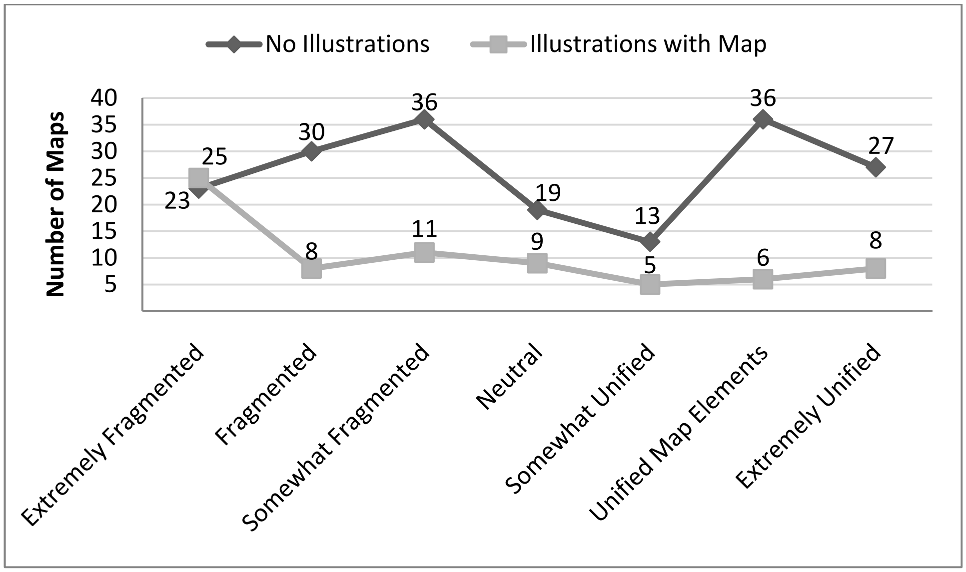



**Figure 6.8 –** Illustrations and map fragmentation (frequencies).

(d) Represent more active and dynamic data (Figure 6.9); and

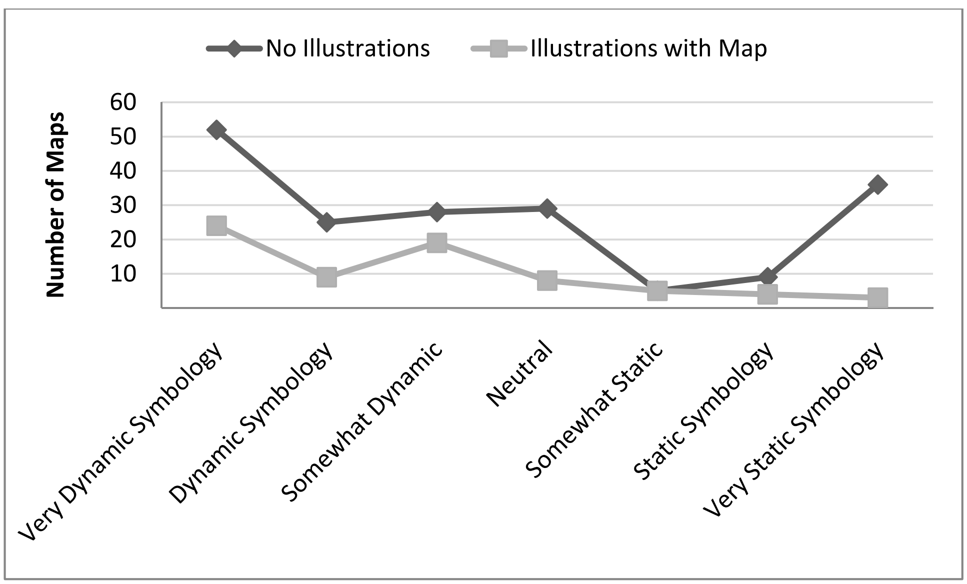



**Figure 6.9 –** Illustration inclusion and map dynamism.

(e) Be multicolored (62.5% of maps with illustrations were multicolored).

THE USE OF SUPPLEMENTAL TEXT AND TEXTBOXES

Three manipulations had significant relationships with textboxes, including: (a) *map fragmentation;* (b) *labeling techniques;* and (c) *the number of inset maps*.

(a) Text boxes over and around the mapped area appear to play a role in making a map's layout appear more fragmented (Figure 6.10).

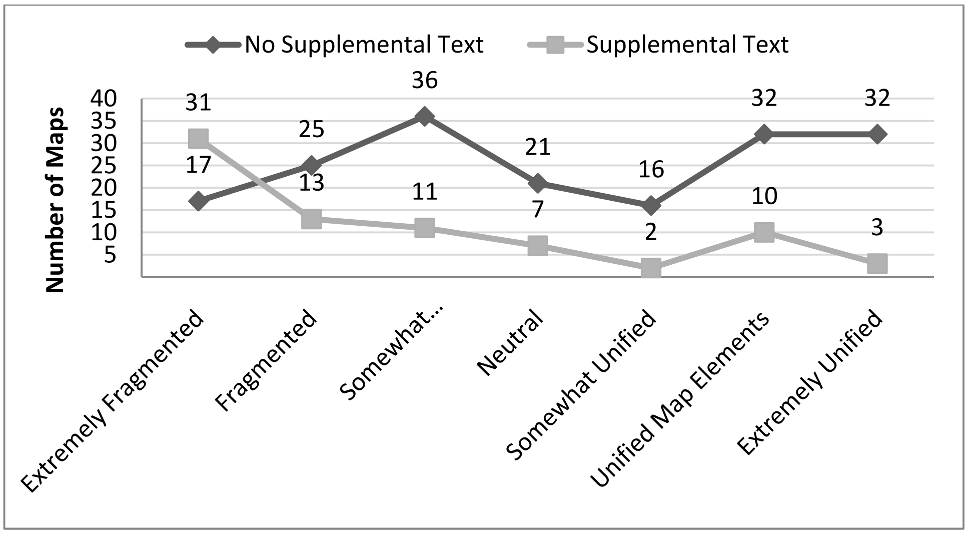



**Figure 6.10 –** Supplemental text inclusion and map fragmentation.

(b) Textboxes were linked with callout labels – a higher percentage of maps with callouts also had textboxes (Figure 6.11).

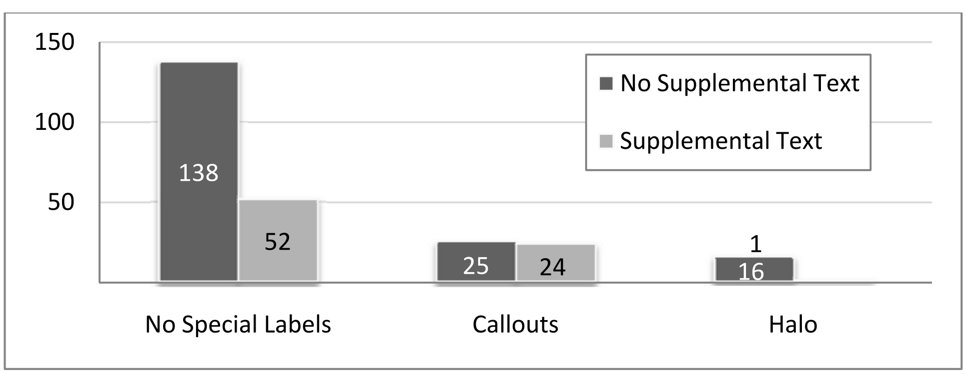



**Figure 6.11 –** Supplemental text inclusion and labeling.

Maps with textboxes also had more inset maps – 42.8% of those with inset maps had textboxes, compared to 20.6% of those sampled without inset maps.

MAP DATE AVAILABILITY

The inclusion or exclusion of a map date – either publication or data acquisition date – was linked to the following variables: (a) *map producer availability;* (b) *base map generalization;* and (c) *data generalization.*

(a) A medium strength relationship existed between the inclusion and exclusion of the *map date and map producer*. Maps that excluded one of these excluded the other 64.0% of the time (Figure 6.12).

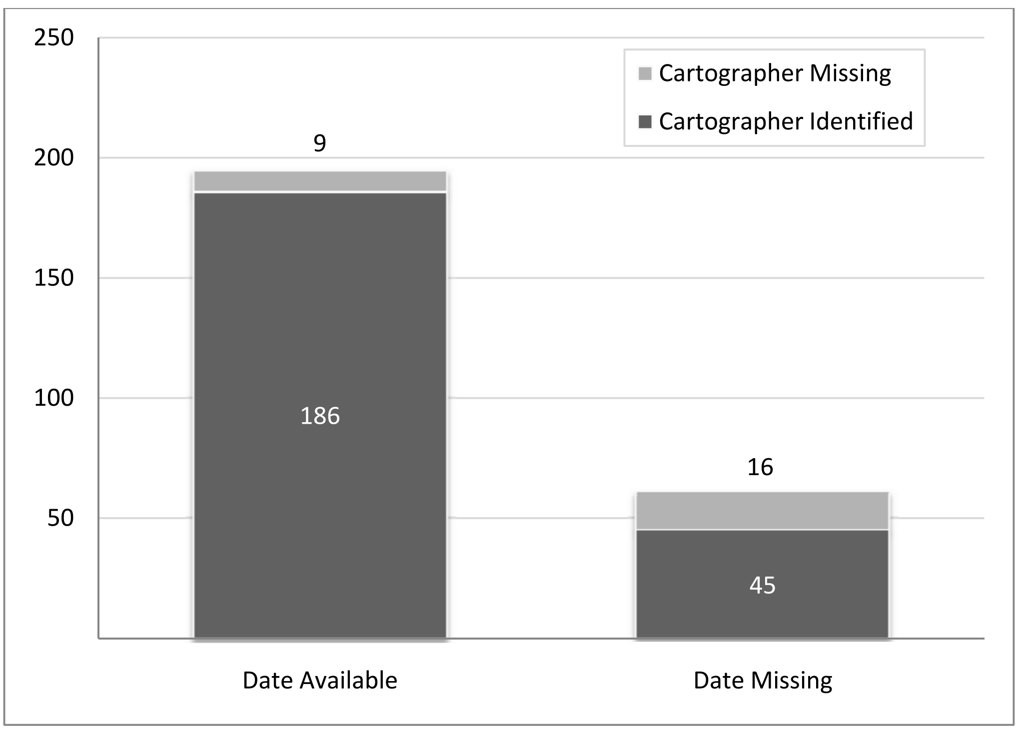



**Figure 6.12** – Date and producer/cartographer name inclusion on the map (frequencies).

(b) Base maps were more detailed when maps included a date (Figure 6.13).

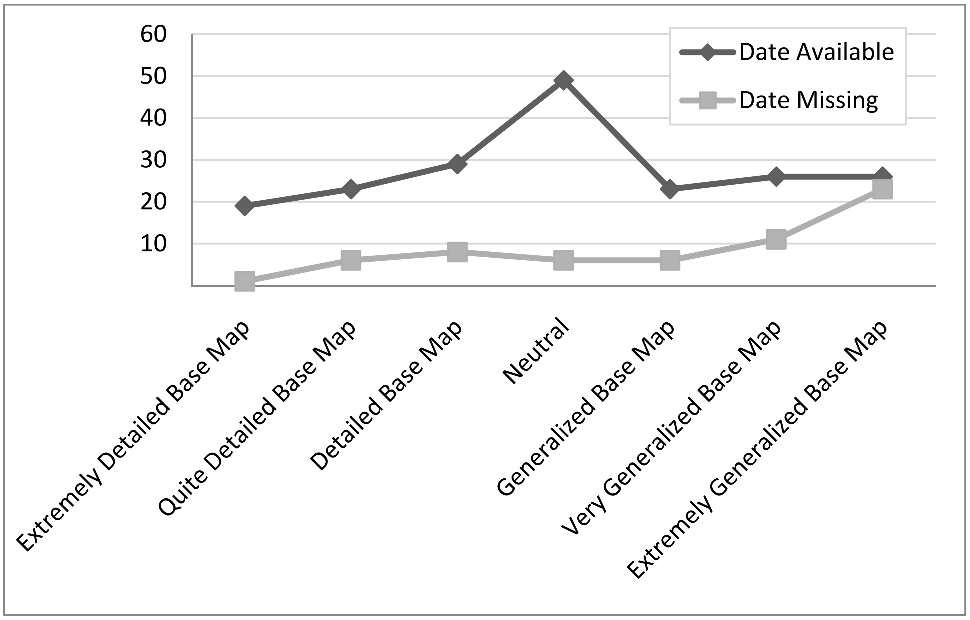



**Figure 6.13** – Date and base map specificity.

(c) Data were more detailed when maps included a date (Figure 6.14).

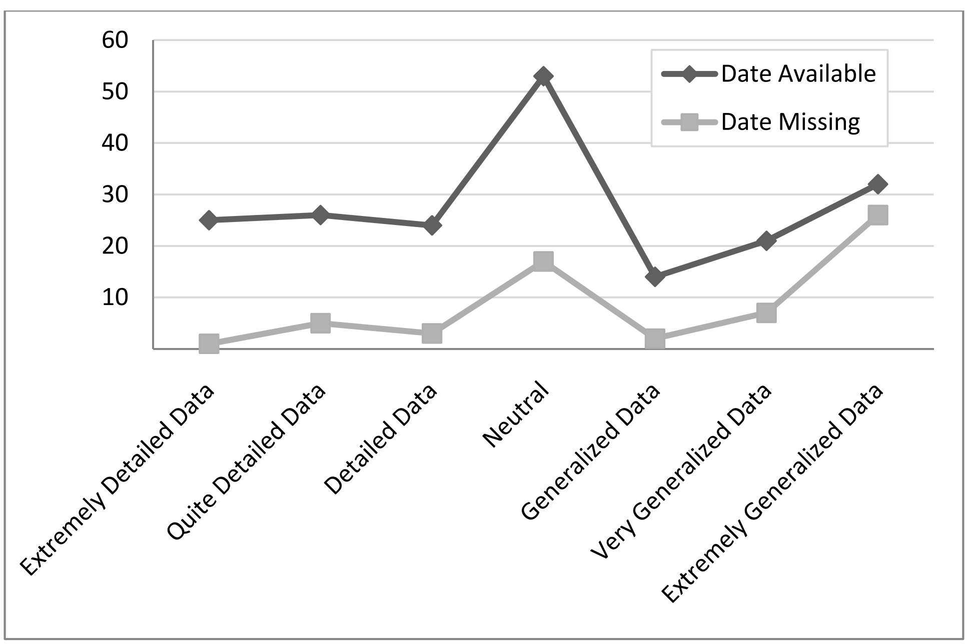



**Figure 6.14** – Date and data detail.

MAP ORIENTATION

Maps with *unconventional orientations* were more likely to possess:

(a) *Generalized base maps* (Figure 6.15). Maps with unconventional orientations had "extremely generalized" base maps 30.4% of the time, versus 11.8% of maps that included an orientation.

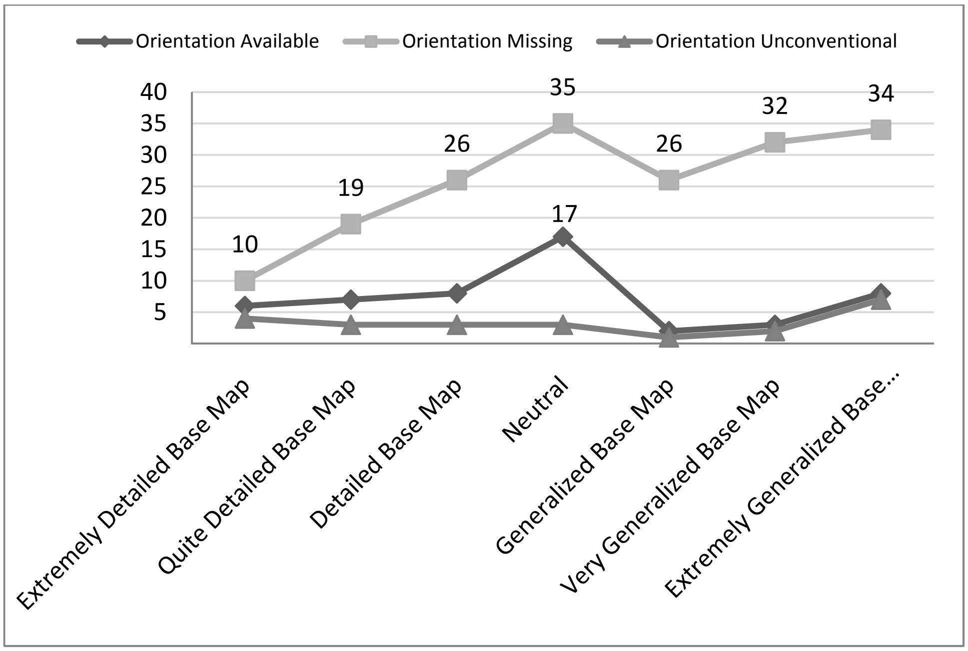



**Figure 6.15 –** Base map detail and orientation (frequencies).

(b) Simplified visual hierarchies (Figure 6.16). Maps with an unconventional orientation had extremely simple visual hierarchies (39.1% of the time) versus those with an orientation (11.8% of the time).

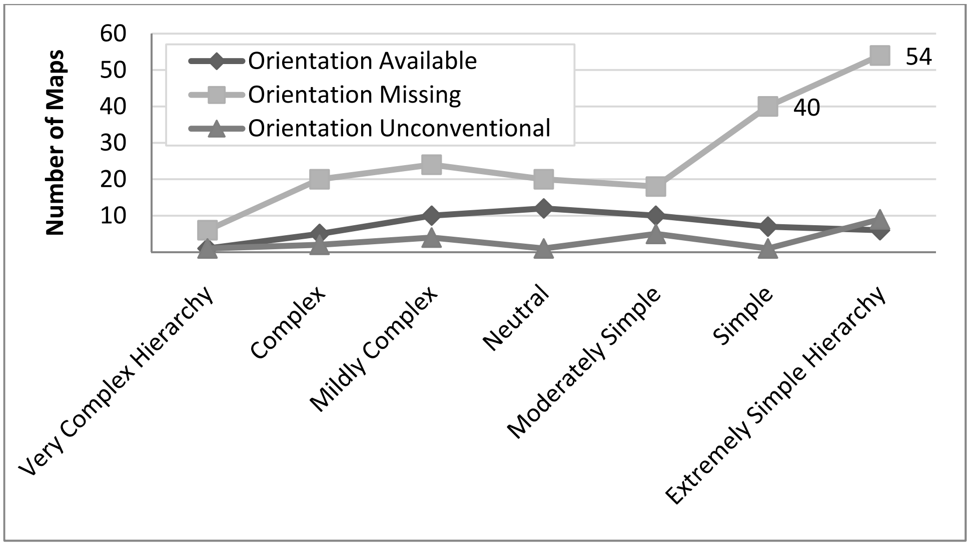



**Figure 6.16 –** Visual hierarchy and orientation (frequencies).

APPROPRIATENESS OF MAP PROJECTION

Most maps in the sample had appropriate or at least acceptable projections for the data they were highlighting. Only two variables correlated with projection appropriateness.

(a) As shown in Figure 6.17, when a *scale* was included with a map, the map's projection was significantly more likely to be appropriate (96.4% versus 83.5% of the time without a scale). Conversely, it was far less likely to be inappropriate (only 3.6% of maps with a scale versus 16.5% of those without a scale).

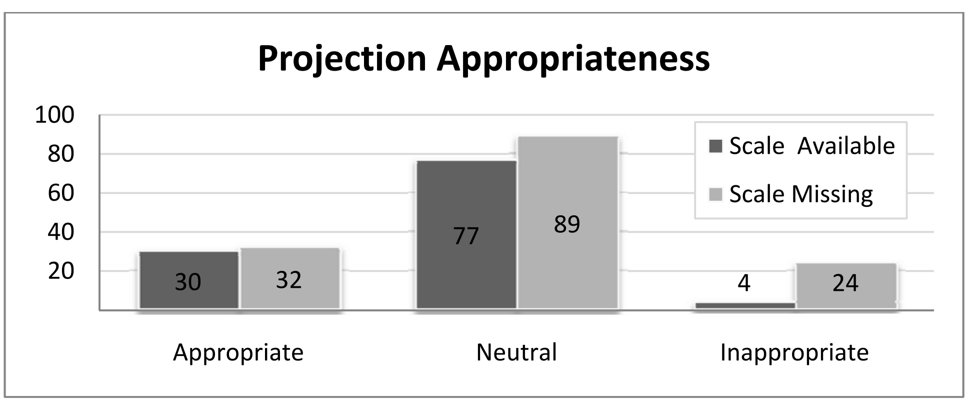



**Figure 6.17 –** Maps with and without scale by projection appropriateness (frequencies).

(b) Regardless of their thematic representation, most maps used appropriate or at least acceptable projections (Figure 6.18). *Choropleth maps were more likely than other types of thematic representations to have an inappropriate projection* (20.6% had inappropriate projections versus an average of 8.4% for other representations). One reason for this may be that many choropleth maps have been, and continue to be, created using Mercator or other conformal projections.

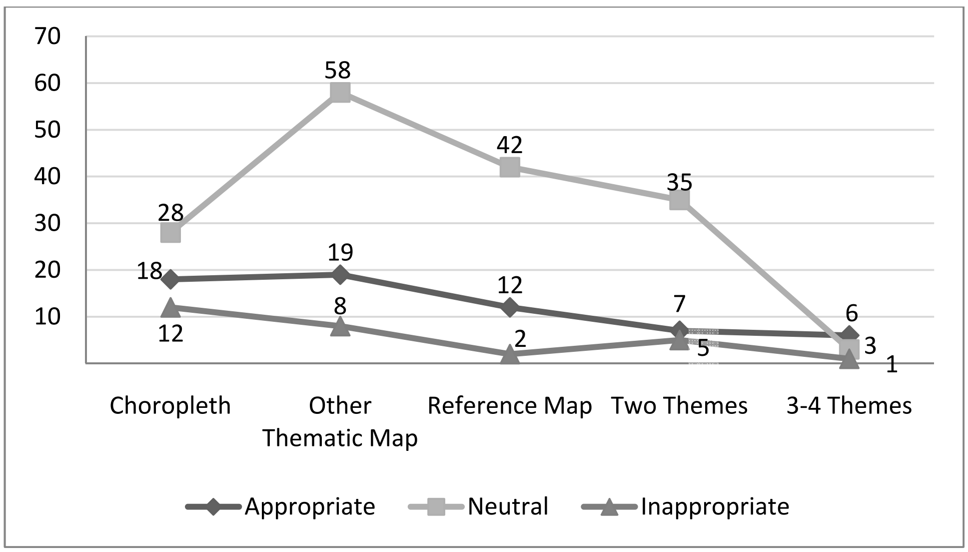



**Figure 6.18** – Map projection appropriateness by map type (frequencies).

LEVEL OF CONTRAST AND COLORS OF CONTRAST

There was a *relationship between high visual contrast and the use of colors to establish visual contrast* (Figure 6.19). The data correlated to what had already been opined in previous descriptive studies – red and black are the most often used colors for creating extreme contrast, followed by yellow, orange, and purple.

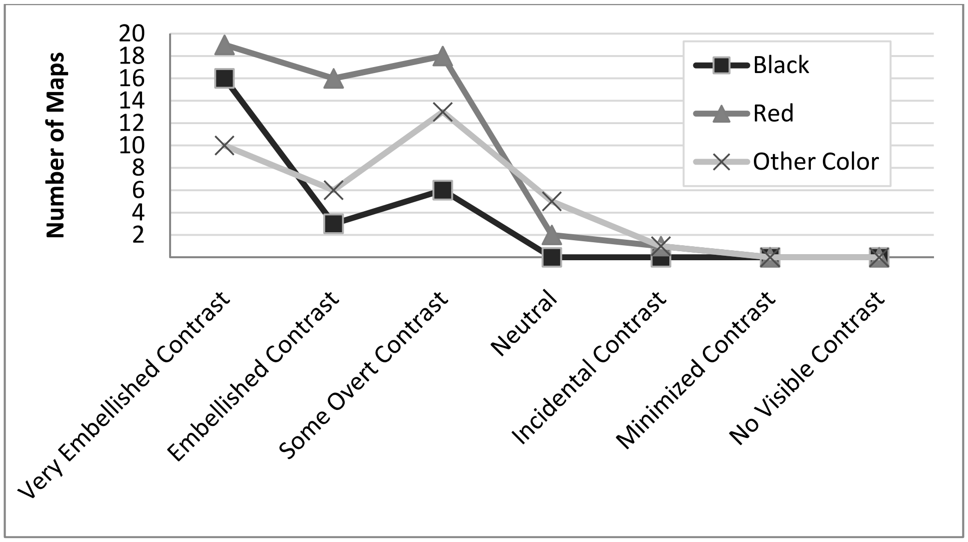



**Figure 6.19 –** Level of map contrast and hue of contrast.

MAP COLORATION AND TYPE OF COLOR CONTRAST

As already noted in chapter four, if a cartographer uses color contrast to highlight a specific part of the map, the choice is most typically red, followed by a very saturated black. Thus, it comes as no surprise that on maps that could use only one color in addition to gray, red was used most frequently (Figure 6.20).

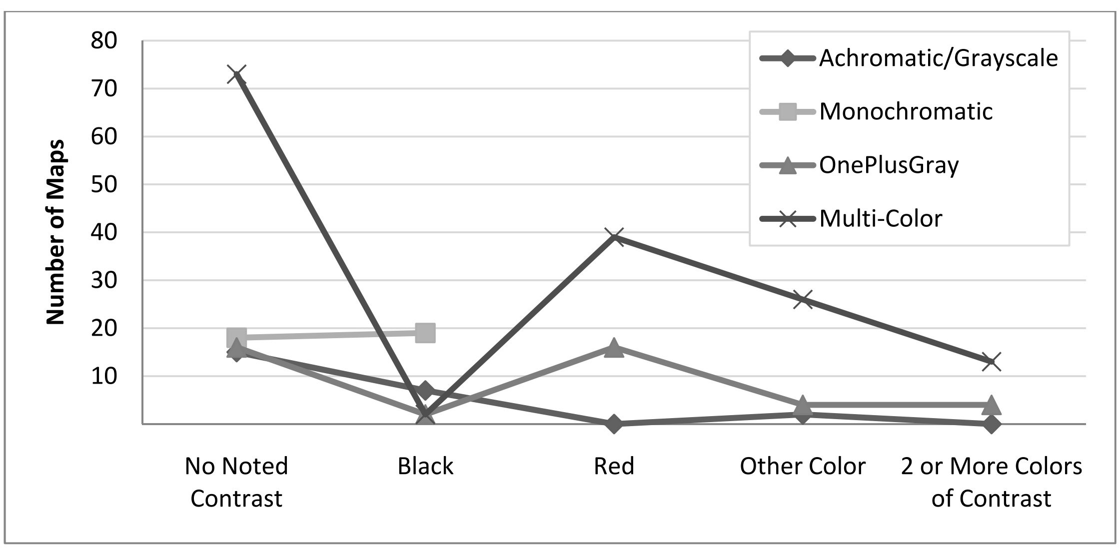



**Figure 6.20 –** Color on maps and colors used for contrast.

NUMBER OF INSET MAPS

Having numerous inset maps generally meant that the map was more fragmented than otherwise (Figure 6.21).

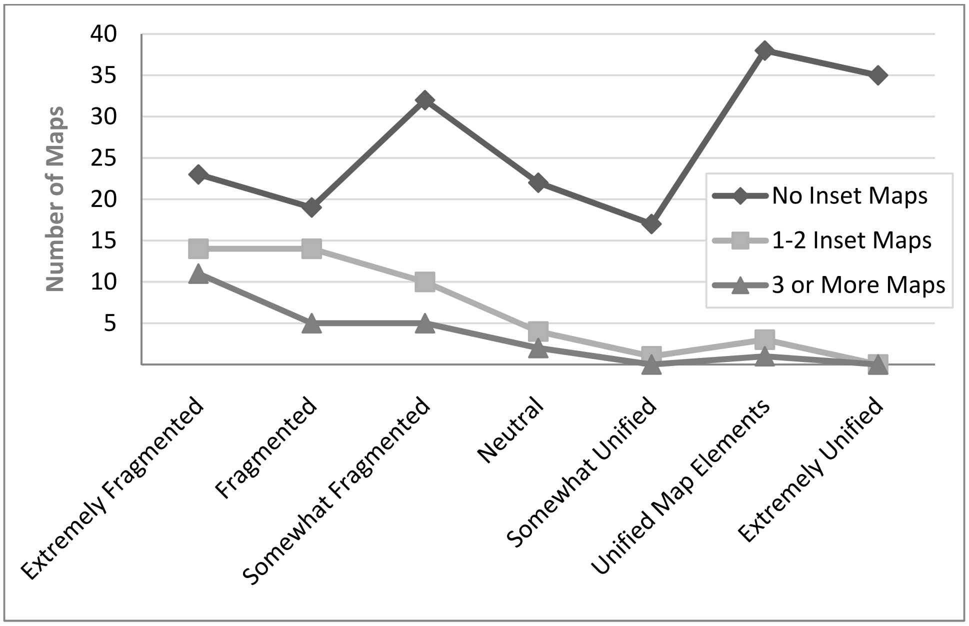



**Figure 6.21 –** Inset maps and map fragmentation (frequencies).

## Summary of Data Model and Graphic Manipulations in PCMs

Numerous relationships exist among the different types of manipulations coded for. However, some were stronger than others. In general, relationships were relatively weak (with a Cramer's V value above 0.2 but less than 0.3), but interestingly, particular variables were linked to many others (e.g., map scale and illustration inclusion).

In fact, several variables appear to act as warning signs that a map is likely to contain other types of cartographic manipulation. Generally, when a map left off certain details about the map producer, scale, date, or data source, it left off details about most of those elements – not just one. Maps sans any one of these variables were also far more likely to have a generalized base map and, to a lesser but still significant extent, generalized data.

The appropriateness of map projections was also linked with many other variables. Choropleth maps were more likely to use inappropriate projections, as were maps with generalized base maps. If a map had an appropriate projection, the odds that the map was encumbered with many other types of data model manipulation dropped precipitously.

Ironically, one of the most harked upon misdemeanors of scientific cartography – i.e., inappropriate use of visual variables – was a non-issue in this sample. Only 7.4% of all maps used inappropriate visual variables. This small group of maps did not correlate with any other variable. It seems that, in general at least, the misuse of visual variables is more often the result of poor cartographic planning, rather than any overt political calculation. There were some notable exceptions, however (for example see Figure 3.8).

As for graphic indicators, whether or not a map possessed illustrations, textboxes, charts, and inset maps had a variety of influences on the nature of the map. Illustrations were the most interdependent variable, but all of the above traits made maps appear more fragmented. The thematic representation of a map had fewer relationships than the supplemental map items. The only significant correlation with thematic representation was that choropleth maps were almost exclusively two-dimensional, whereas other thematic maps were more likely to use oblique perspectives.

These cross-tabulations of categorical map variables tell us much, but they do not convey the entire picture when it comes to understanding the types of manipulation found in these maps. Not only are PCMs often missing an orientation or omitting the name of the cartographer – many maps are. It is impossible to analyze PCMs based solely on the existence or lack of cartographic map elements. Fortunately, I also coded for the style and rhetorical nature of the map layout using the continuum-codes based on the work of Dondis (1973). Testing for relationships among these layout variables sheds more light on how different political cartographic manipulations were designed to communicate rhetorically. Moreover, coupling layout relationships with what we know about data model and graphic manipulations above, we should be able to construct categories of PCMs based on hard data for future analysis.

### Relationships among Layout Variables

The most interesting interrelated variables were those dealing with map layout – the ones based off of Donis Dondis's theory of image manipulation. Many of these ordinal variables related to one another in interesting ways. Below I review the most pertinent ones, before concluding this chapter with some thoughts on why certain variables ended up related to one another.

HIERARCHICAL ACCENTING / FLATTENING

EMBELLISHED / MINIMIZED CONTRAST

The less pronounced a map's contrast the less likely certain levels of the visual hierarchy are going to stand out. Conversely, the more pronounced a map's contrast, the more likely it will be embellishing a certain component of the mapped area (Figure 6.22).

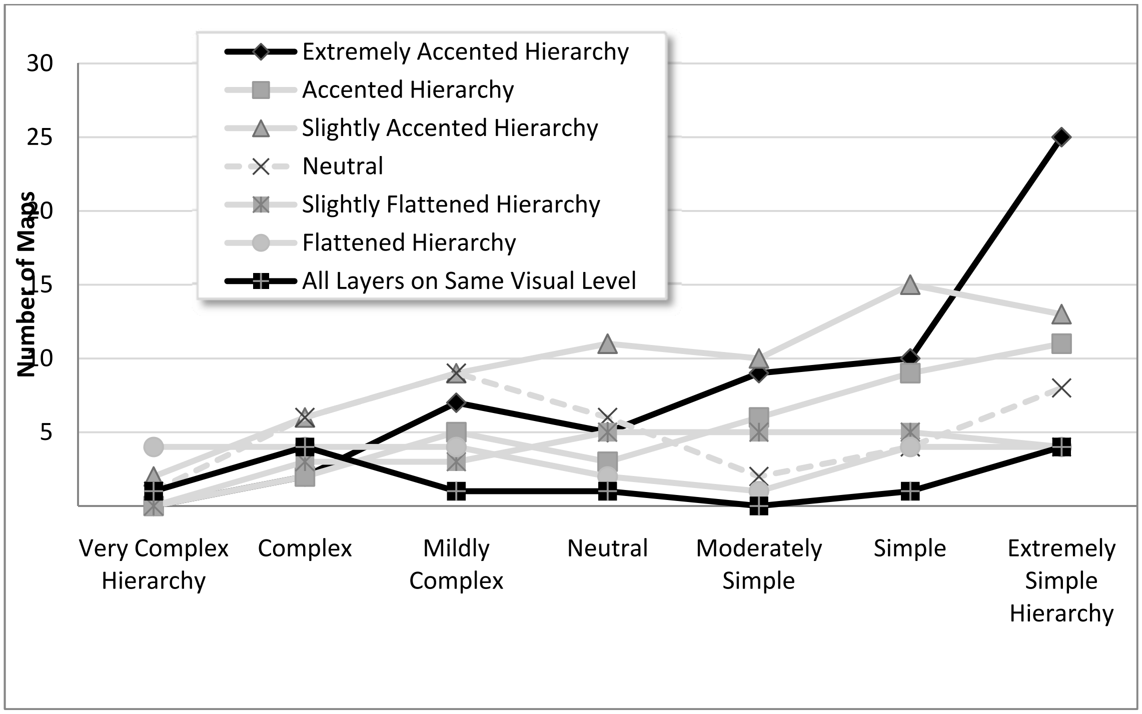



**Figure 6.22 –** Visual Hierarchical complexity and hierarchical accenting.

NON-CARTOGRAPHIC / SCIENTIFIC

DATA SPECIFICATION / GENERALIZATION

Maps were more likely to appear scientific when the data represented was specific. Maps using heavily generalized data were more likely to be non-cartographic in appearance. This made sense, as data specificity often made maps look more objective and fool-proof.

LEVEL OF BASE MAP GENERALIZATION

NON-CARTOGRAPHIC / SCIENTIFIC REPRESENTATION

There is a strong relationship between the level of base map generalization found on PCMs and the scientific nature of a map's cartographic representation. Non-cartographic maps have far more generalization than scientific maps (Figure 23).

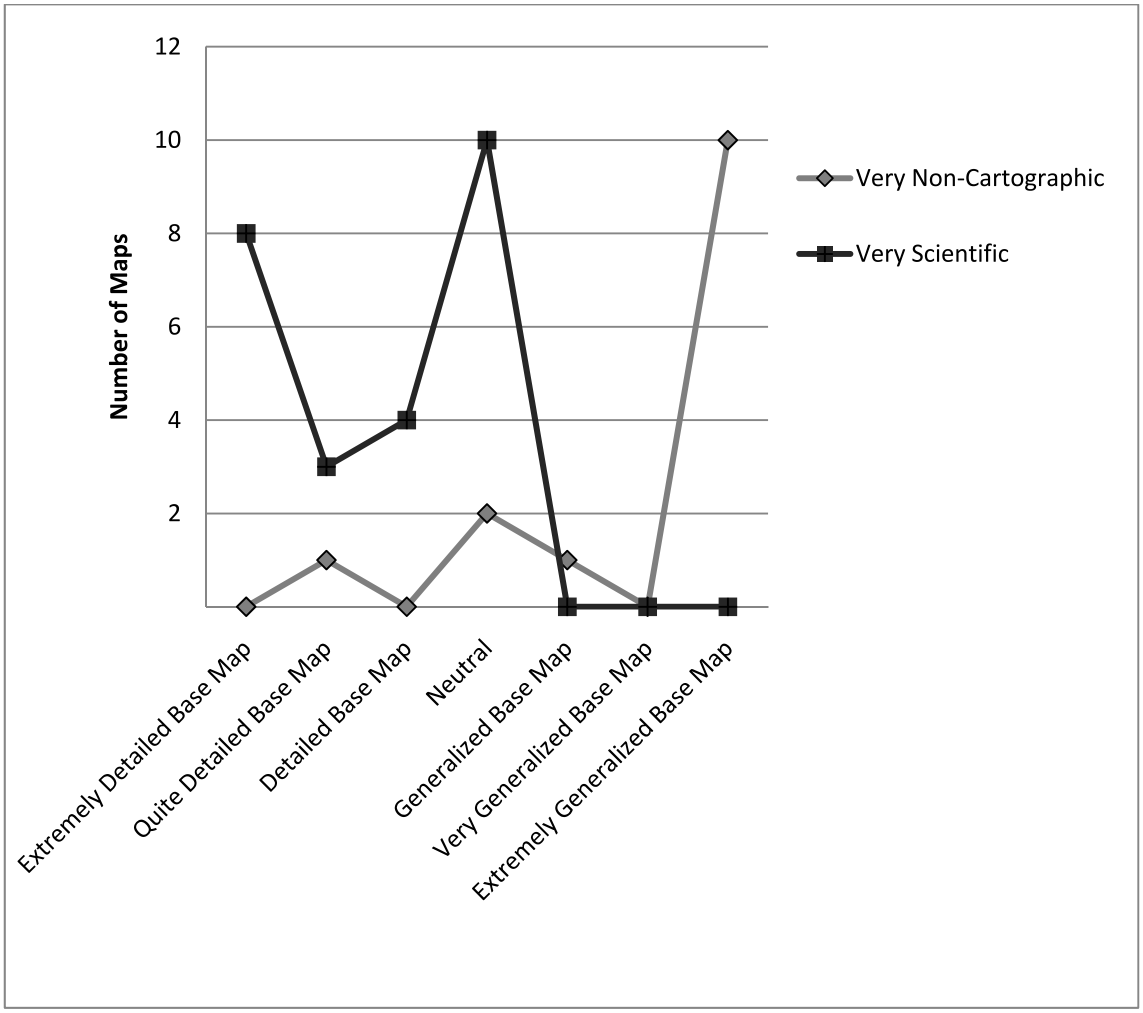



**Figure 6.23 –** Base map specificity and scientific appearance.

LEVEL OF BASE MAP GENERALIZATION

COMPLEX / SIMPLE HIERARCHY

The more detailed the base map, the more complex the visual hierarchy typically was.

Vice-versa, maps with generalized base maps had simpler hierarchies (Figure 6.24).

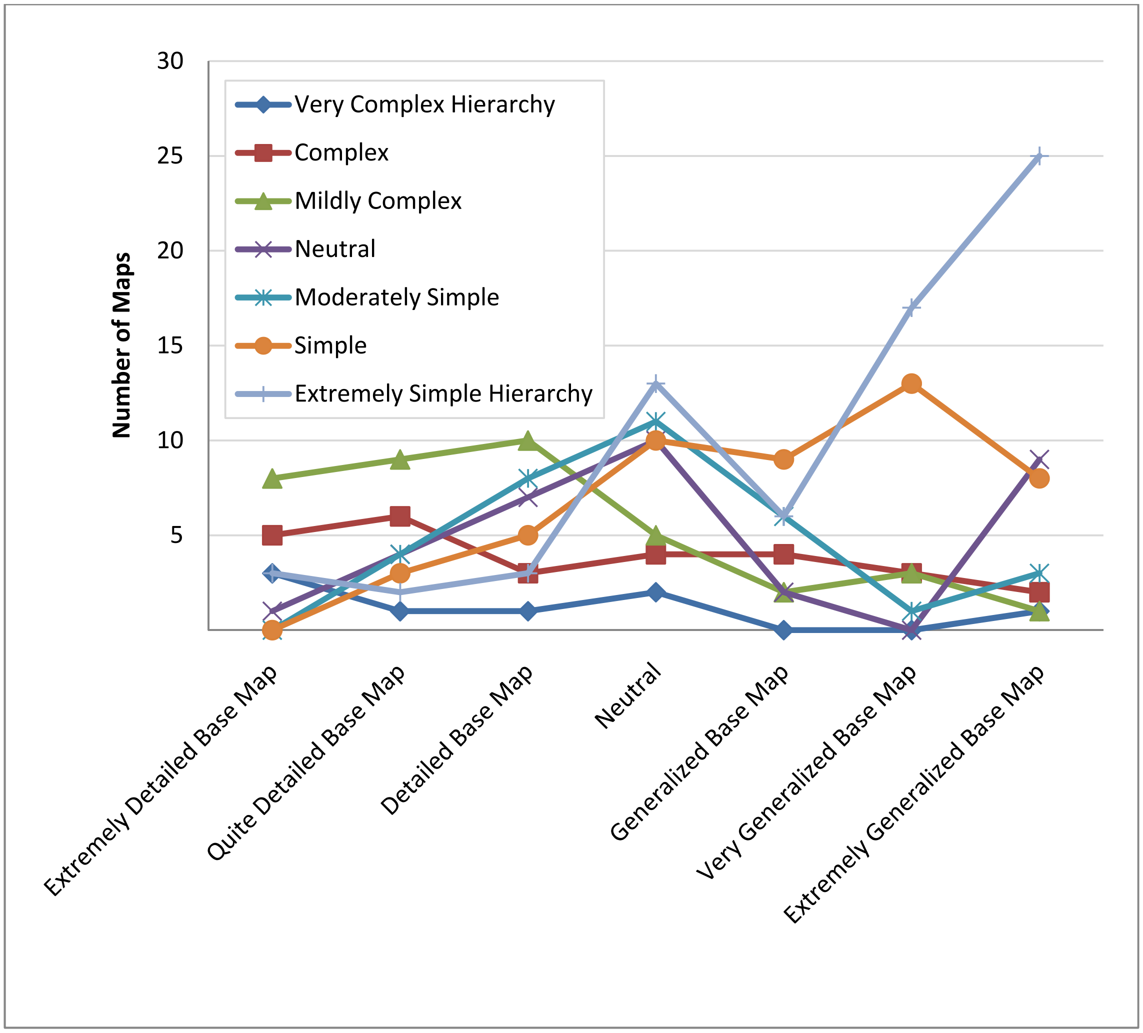



**Figure 6.24 –** Base map specificity and visual hierarchy complexity.

OBLIQUE / TOP-DOWN PERSPECTIVE

DYNAMIC / STABLE REPRESENTATION

Maps that had oblique perspectives were more likely to represent the data in a dynamic fashion. Top-down representations often meant the map would also appear more static (Figure 6.25).

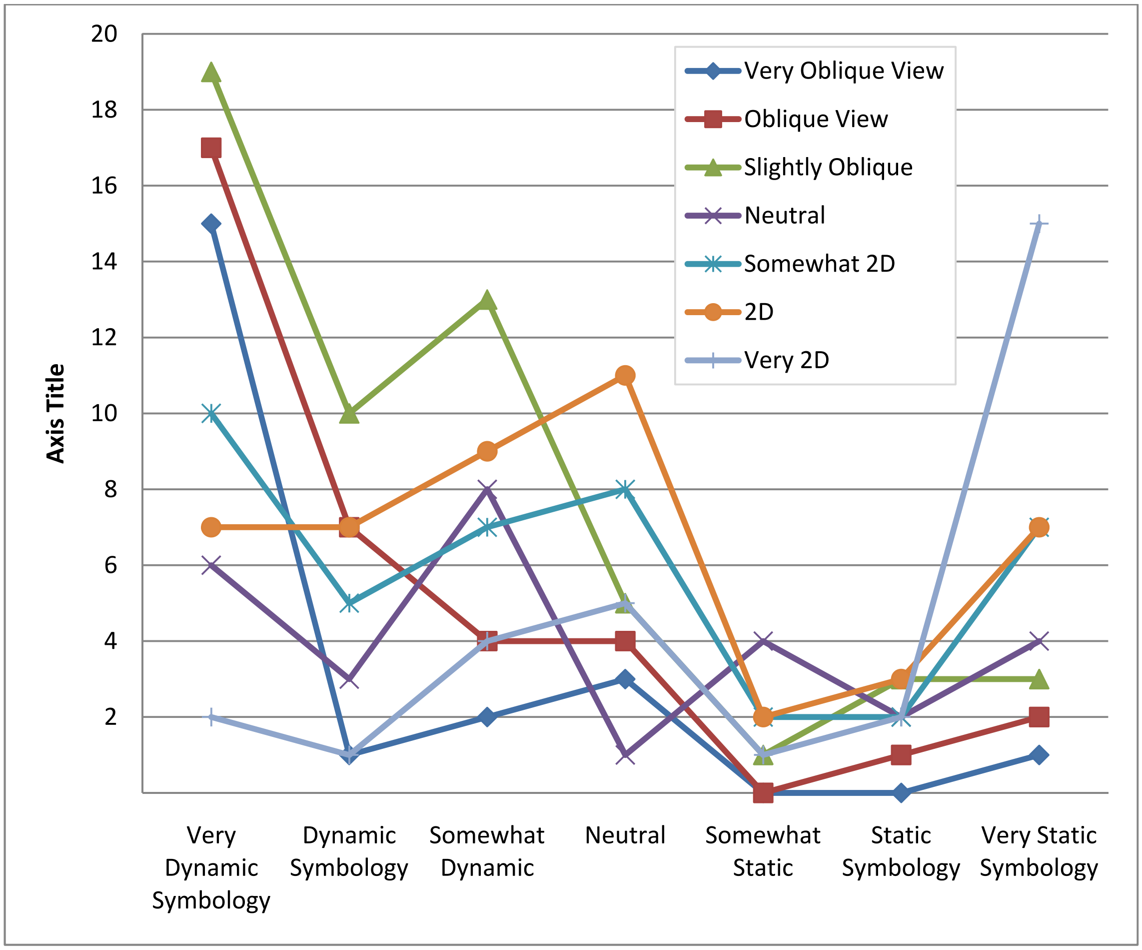



**Figure 6.25 –** Map perspective and dynamism.

OBLIQUE / TOP-DOWN PERSPECTIVE

EMOTIVE / GEOMETRIC SYMBOLOGY

Maps with a traditional, 90° view of the world tended to use more simplistic geometric symbology than maps with less conventional, oblique views of the world (Figure 6.26).

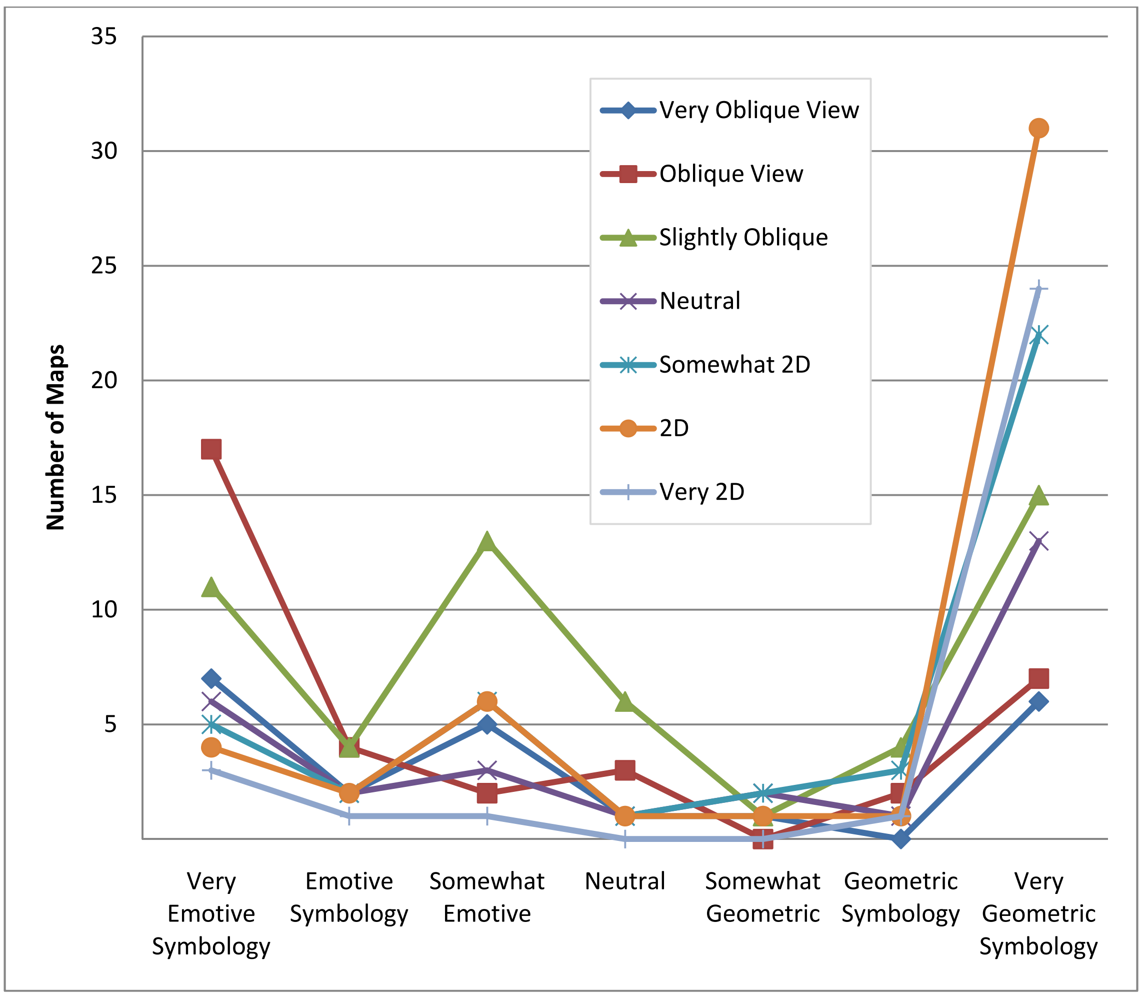



**Figure 6.26 –** Map perspective and emotive symbology.

EMOTIVE / GEOMETRIC SYMBOLIZATION

DYNAMIC / STABLE REPRESENTATION

Emotive symbols were more frequently found on dynamic maps than static ones.

Geometric symbols correlated with stability as a whole (Figure 6.27).

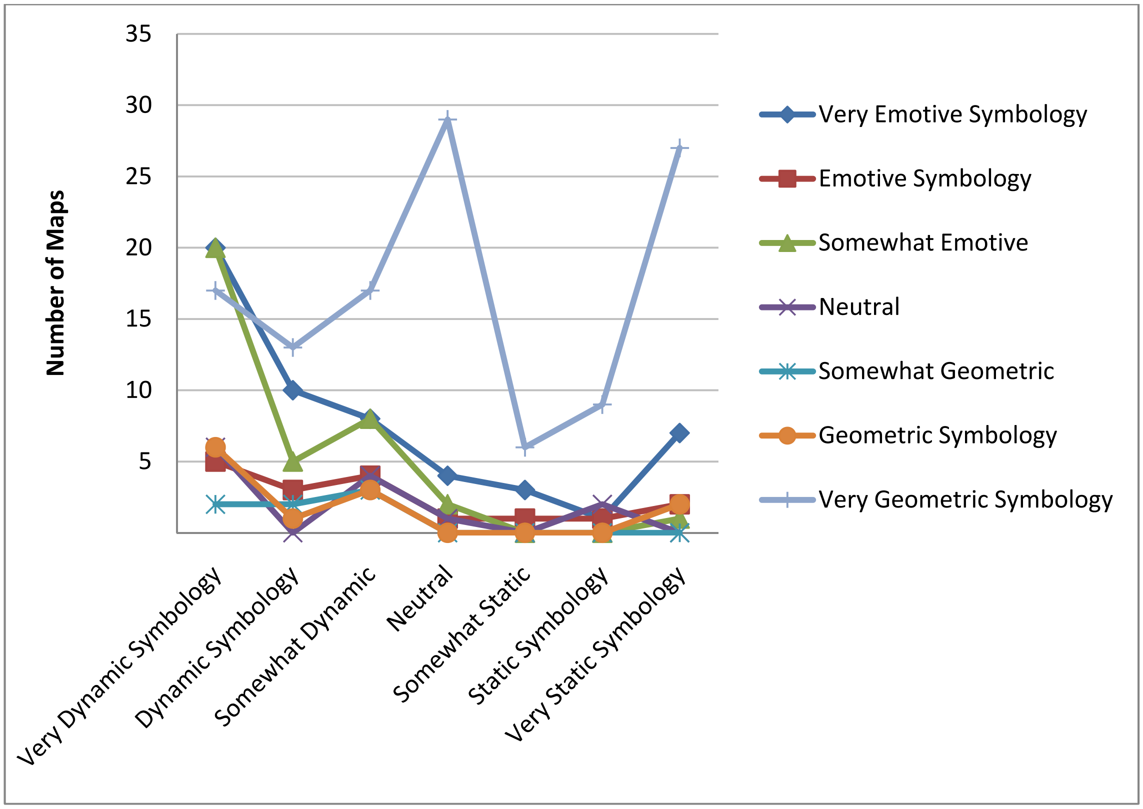



**Figure 6.27 –** Map dynamism and emotive symbology.

NON-CARTOGRAPHIC / CARTOGRAPHIC

COMPLEX / SIMPLE HIERARCHY

Maps that were non-cartographic were more likely to have simple visual hierarchies than more scientific-looking maps (Figure 6.28).

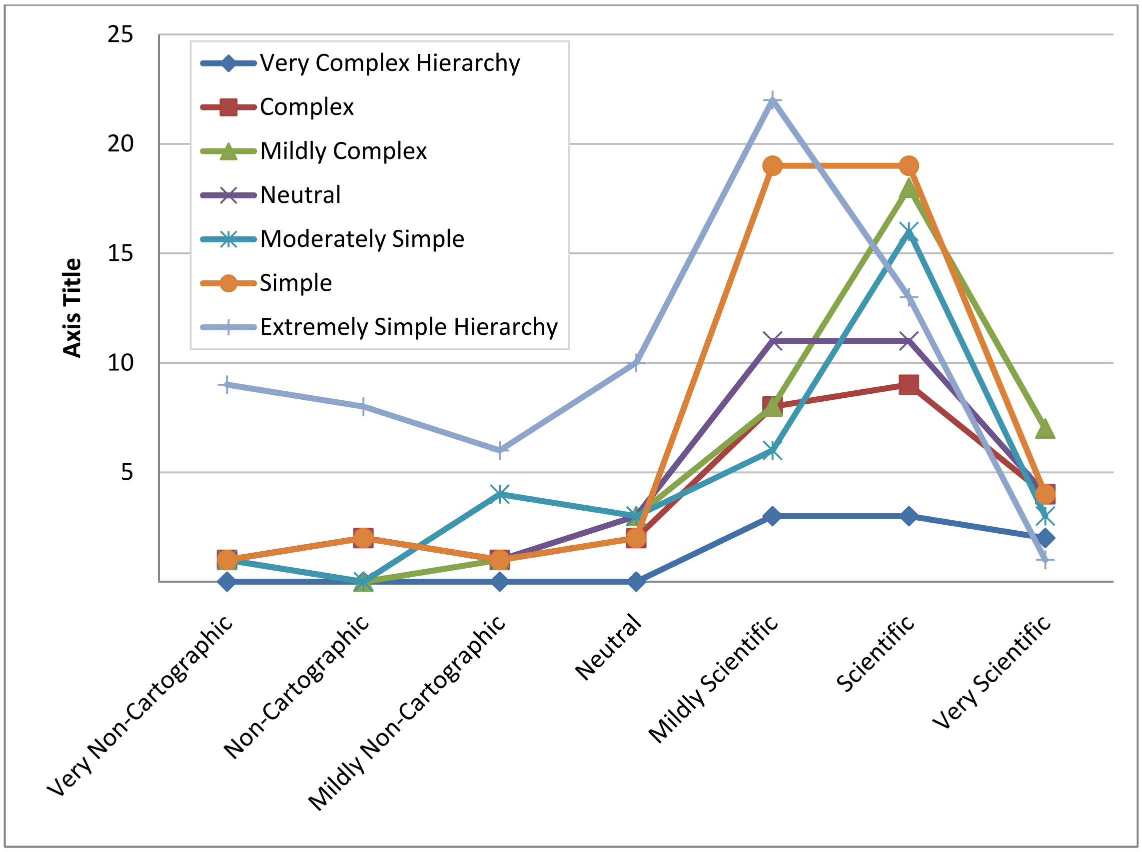



**Figure 6.28 –** Visual hierarchy complexity and scientific appearance.

UNEVEN / BALANCED LAYOUT

FRAGMENTED / FLUID LAYOUT AND

The more fragmented a map's layout, the more likely the map was to be uneven. In contrast, maps with relatively organic and smooth layouts were often more balanced (Figure 6.29).

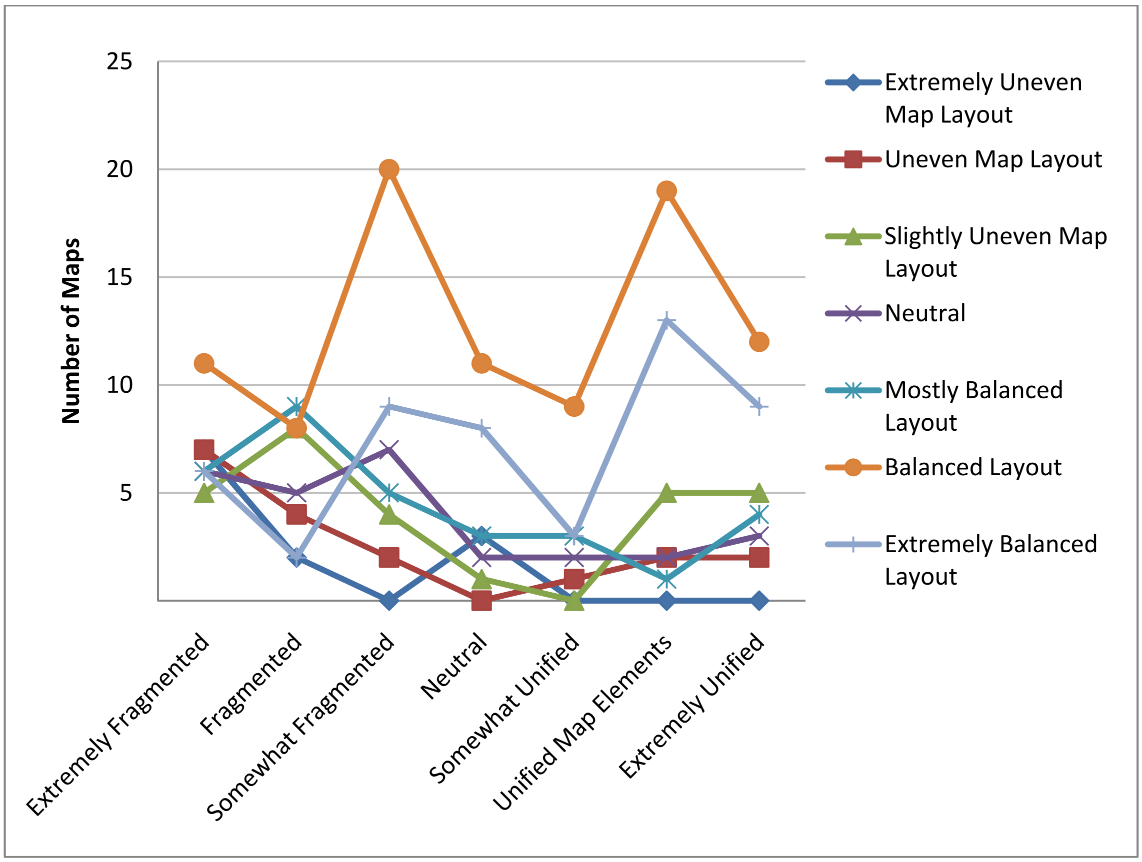



**Figure 6.29 –** Map balance and fragmentation.

COMPLEX / SIMPLE HIERARCHY

HIERARCHICAL ACCENTING / FLATTENING

The more complex the visual hierarchy, the more likely it was to be flattened and difficult to interpret. The simpler the visual hierarchy, the more likely certain traits were well accented and easily discernable (Figure 6.30).

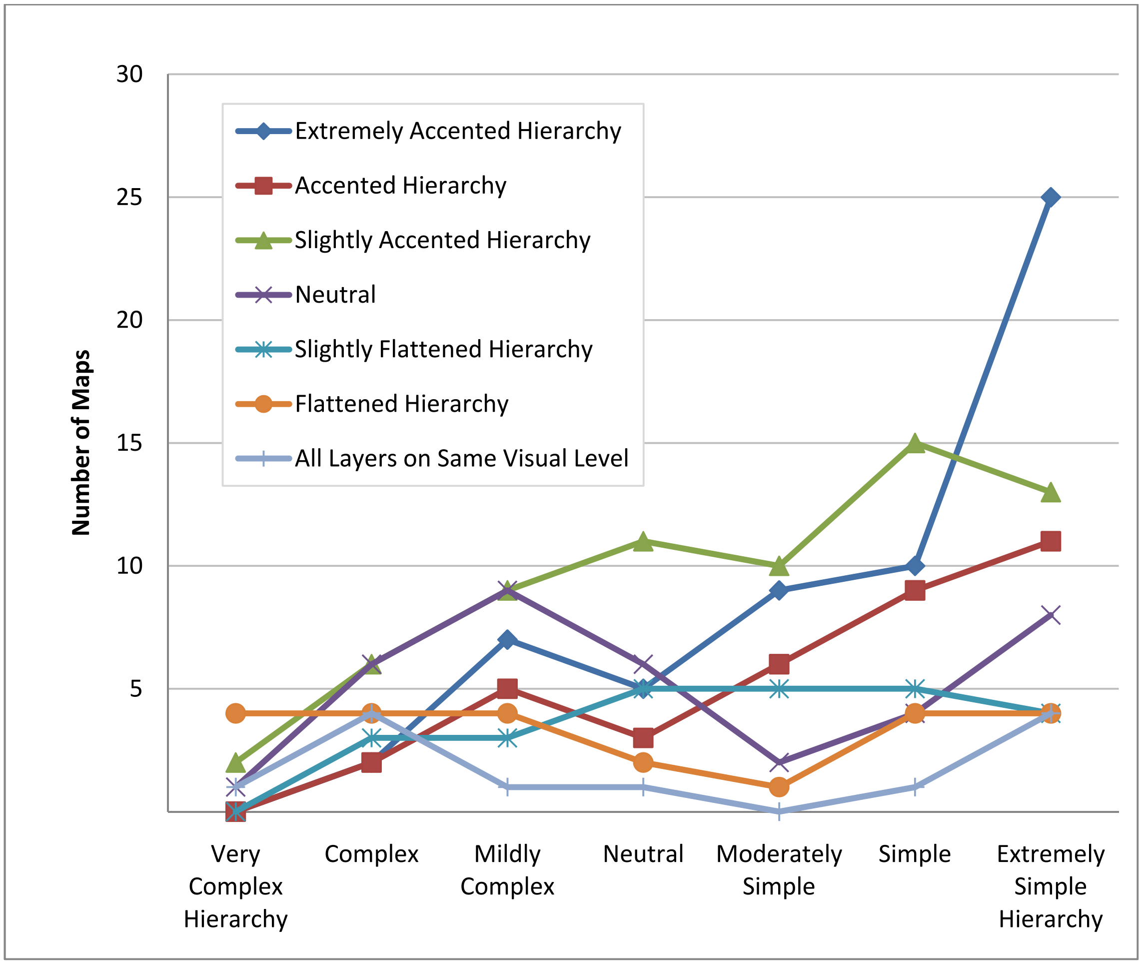



**Figure 6.30 –** Visual hierarchical complexity and hierarchical accenting.

DATA SPECIFICATION / GENERALIZATION

COMPLEX / SIMPLE HIERARCHY

The more complex the map hierarchy was, the more detailed the data was. The less complex the hierarchy, the more generalized the data being represented (Figure 6.31).

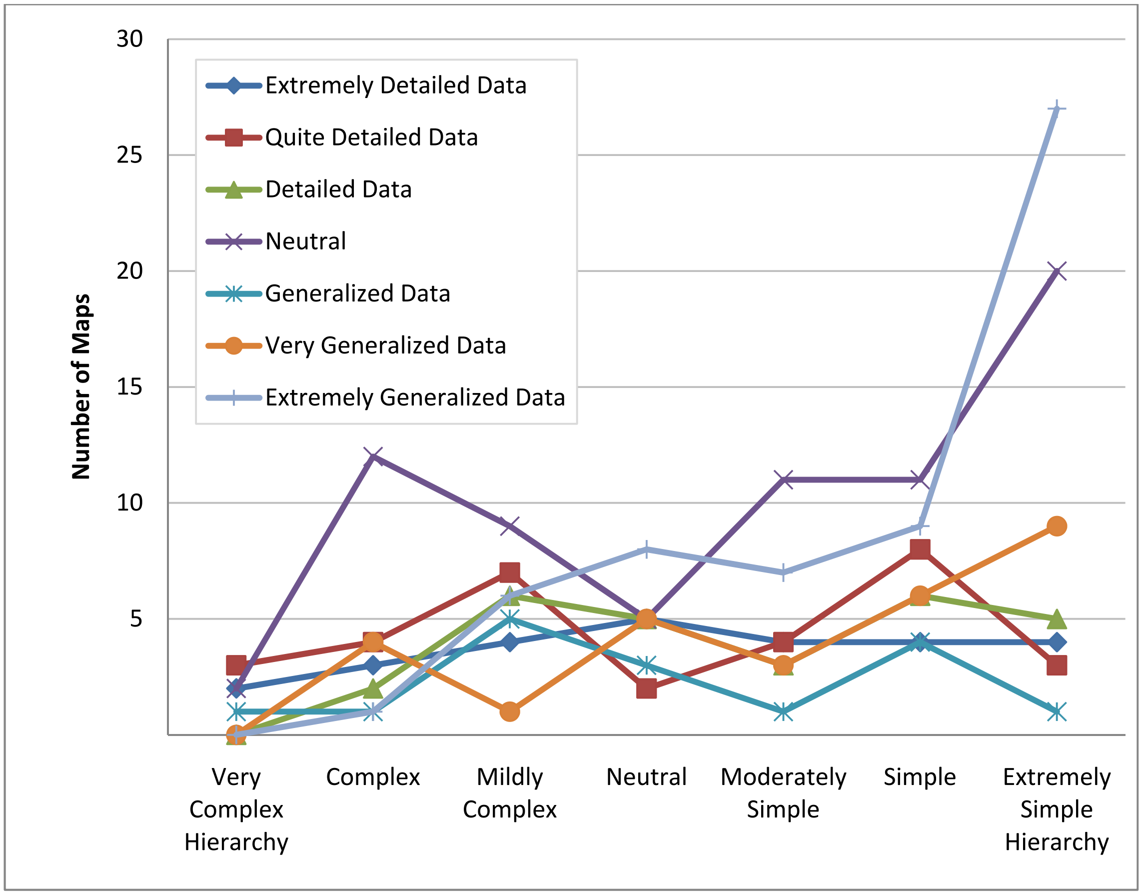



**Figure 6.31 –** Data generalization and visual hierarchy complexity.

BASE MAP SPECIFICATION / GENERALIZATION

DATA SPECIFICATION / GENERALIZATION

The most intriguing thing about these two variables is that the relationship is not stronger. A significant positive relationship existed between the level of detail in the mapped data and the level of detail found in the base map underlying the data (Figure 6.32).

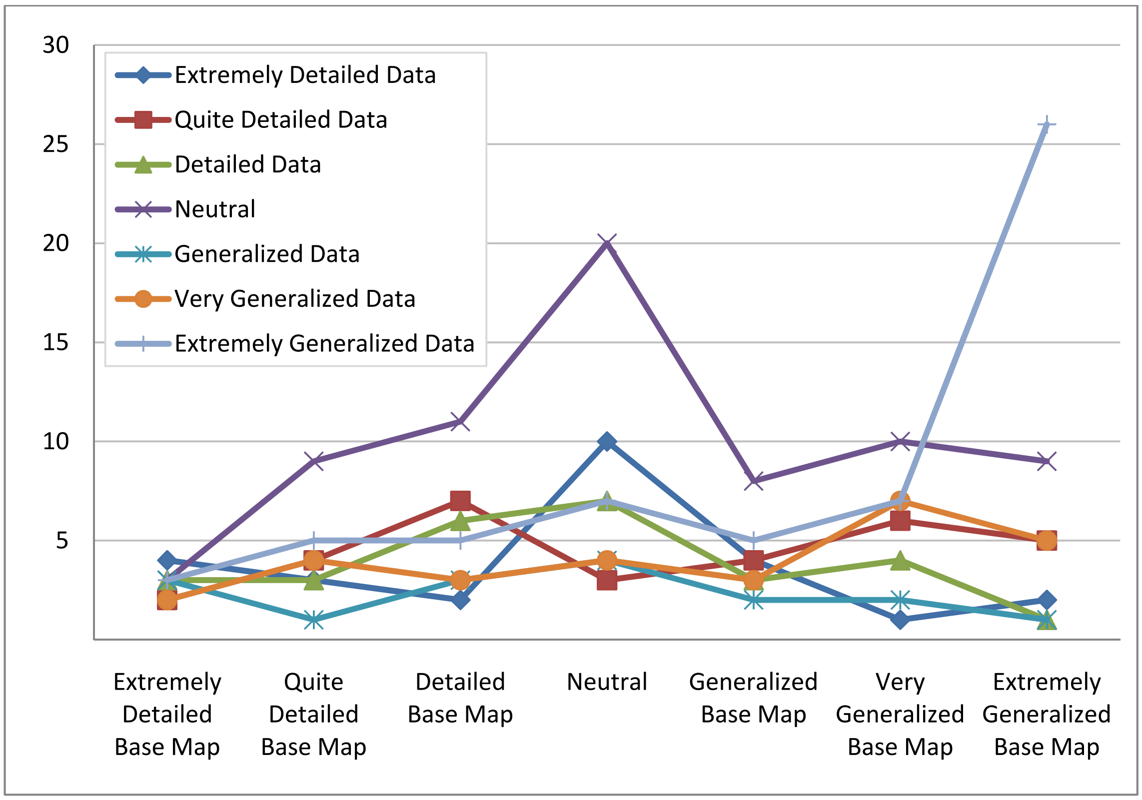



**Figure 6.32 –** Base map specificity and data generalization.

DYNAMIC / STABLE REPRESENTATION

HIERARCHICAL ACCENTING / FLATTENING

Dynamic maps also tended to have a more easily discernable visual hierarchy than stable representations, which tended to flatten the map layers (Figure 6.33).

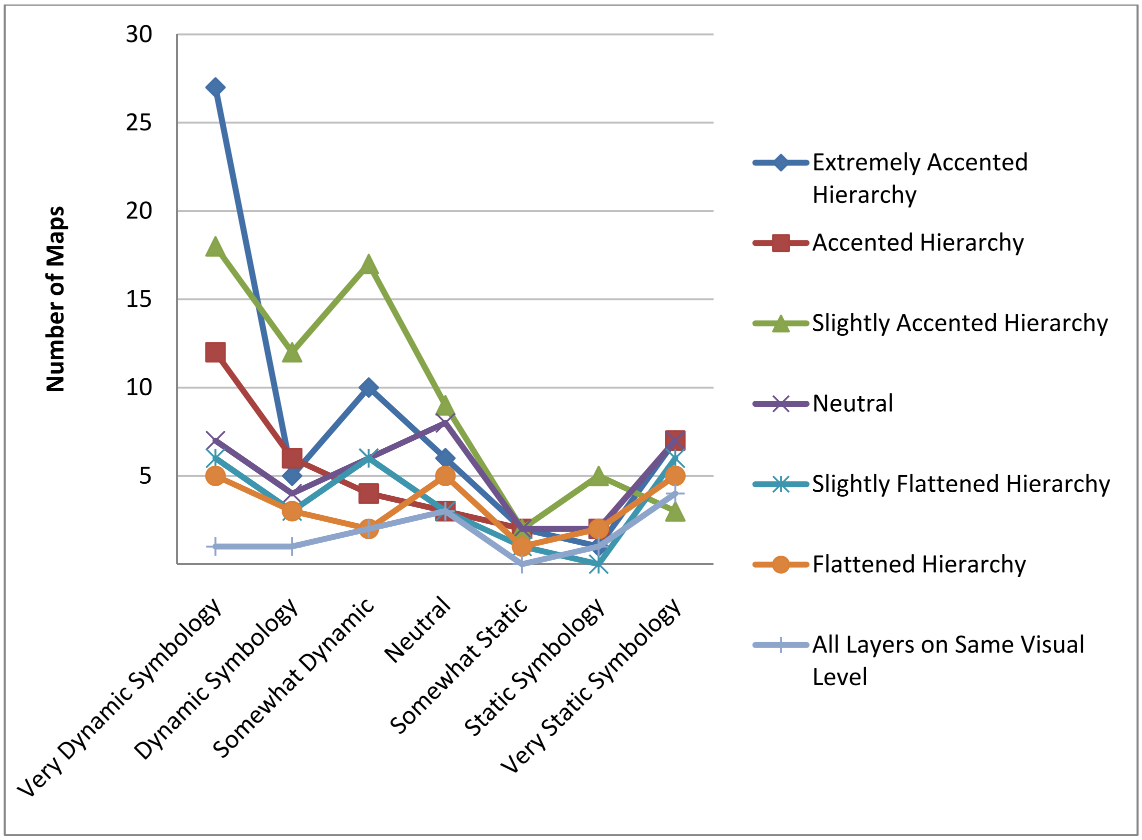



**Figure 6.33 –** Map dynamism and emotive symbology.

## The Role of Layout and Design

Based on the above results, it is obvious that different pairings of map layout and design play a significant role in how PCMs are used to communicate to map readers. In fact, map layout methods are even more important in determining the rhetorical nature of a PCM than any data model or graphic variable. The cross-tabulations illustrate just how entwined these variables are with one another.

The layout variables that had the most significant relationships are:

- Base map generalization;
- Non-cartographic versus scientific display;
- Emotive versus geometric symbology;
- Complex versus simple hierarchy; and
- Dynamic versus static representation.

These five variables had strong relationships with many other layout variables, as well as many data model and graphic variables (reviewed in the earlier section). They appear to be central in determining the rhetorical nature of a PCM. Differences in how these connect to other variables will be central in determining whether map categories exist.

## Conclusion

As has been hypothesized anecdotally in the literature for decades, the above tests demonstrate that *data model, graphic, and layout manipulations are often interrelated variables.* Based on the data from this sample, we can argue that *yes, certain cartographic manipulations in political maps come in pairs and be linked to one another*. Quantifying the cartographic manipulations found in map data and searching for relationships among them is not an ultimate endeavor in itself, however. The goal of the next chapter is to see if we can forge this information into a framework that can be utilized to help categorize political cartographic manipulations based on the data model, graphic, and layout techniques found therein.

# Chapter Seven

*Categorizing Political Cartographic Manipulations*

## RESEARCH QUESTION

*Can a categorical framework be created to analyze and label political cartographic manipulations based on their different characteristics?*

The evidence used to answer my first two questions has led me to the final, and most important, question. Now that I have established what types of manipulations have significant relationships with one another, I can classify and categorize the 256 maps based on the most pertinent and interdependent manipulations found within them. This chapter will do two things. First, I will use two-step cluster analysis to establish different categories of PCMs based on their attributes. Second, I will describe these categories and review their differences. Third, I will test these categories against the era and producer variables to see if any correlations happen to exist that may provide additional support to the research questions proposed in chapter five – do political manipulations change by era and producer.

### Analytical Methods

To test this research question, I ran two-step cluster analysis in SPSS 17 on all of the cases in the sample. I weeded out variables that were not deemed significant after previous analysis and based the cluster analysis solely on codes that were statistically relevant. One rationale for doing this was that, in order for others to analyze and categorize their maps using the same methods in the future, the amount of coding necessary needs to be limited and manageable.

Two-step cluster analysis was determined to be the most suitable classification technique for several reasons. First of all, two-step clustering allows for the inclusion of both categorical and continuous measurements (Norušis 2010: 363). *K*-means and hierarchical clustering *do not* allow for the mixing of categorical and continuous variables (Norušis 2010). Second, two-step clustering is ideal for studies with over 200 cases. Third, the use of a non-random sample is acceptable with two-step clustering (Norušis 2010: 380). Finally, the ultimate benefit of two-step cluster analysis is that no assumption need be made about the underlying data distribution – whether variables are normal or multi-nominal does not matter (Norušis 2010: 362, 380).

### Results of Two-Step Cluster Analysis

Upon deciding what variables were relevant for inclusion based on previous analysis, I ran six two-step cluster analyses with slightly different parameters. After much consideration and tinkering, including looking at what maps were clustered together using each technique, it was decided that the initial Schwartz's Bayesian Criterion (BIC) analysis was the most accurate and useful classification. The maps were quite evenly divided into four clusters (please see Figure 7.1). Relatively even and homogenous clusters are what one should strive for in cluster analysis whenever possible (Norušis 2010). For a statistical overview of how the clusters varied based on different variables, please see Appendix II.

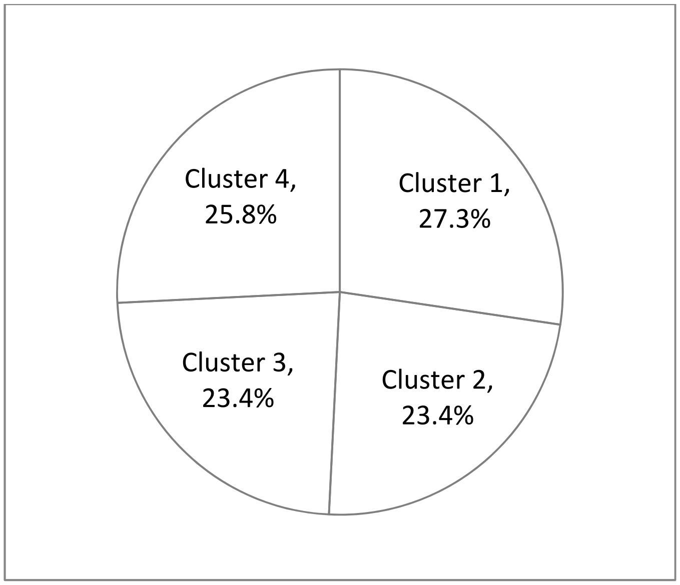



**Figure 7.1** – Cluster breakdown.

### From Clusters to Categories: Four Genres of PCM Rhetoric

Now that four clusters are established, I redefine them in non-statistical terms as *rhetorical categories of political cartographic manipulation.* Though these categories have only been determined to be relevant with these maps, I believe that many other political cartographic manipulations use these rhetorical methods as well and can be labeled as such. This will be touched upon in the next chapter.

## Rhetorical Category 1 – Sensationalist Maps

> ***Sensational:*** *…**(2)** Arousing or tending to arouse (as by lurid details) a quick, intense, and usually superficial interest, curiosity, or emotional reaction* (Merriam-Webster Inc. 2009).

The first rhetorical category of political cartographic manipulation I call *Sensationalist.* By and large, these maps are used as supplements to current events, in graphic laden advertising, or to shift public opinion about political and social policies.

Sensationalist maps are typically characterized by the use of:

- Oblique perspectives and/or elevation data;
- Emotive iconography and symbolization;
- Dynamic representations (though not always a necessity); and
- Illustrations surrounding the mapped area or over the mapped area.

These maps typically do not look scientifically accurate – they appear non-cartographic – but their illustrations, unique viewing perspective, emotive icons, and sense of action are often combined to persuasively make an argument – regardless of its scientific or legal accuracy.


**Figure 7.2** – An example of a Sensationalist map produced by Boris Basheff for *Fortune Magazine* during the Second World War. Oblique perspective, unconventional orientation, dynamic representation, emotive iconography, and a Japanese flag illustration likely made this map's message quite riveting to an average map reader (Japan in Asia 1941).

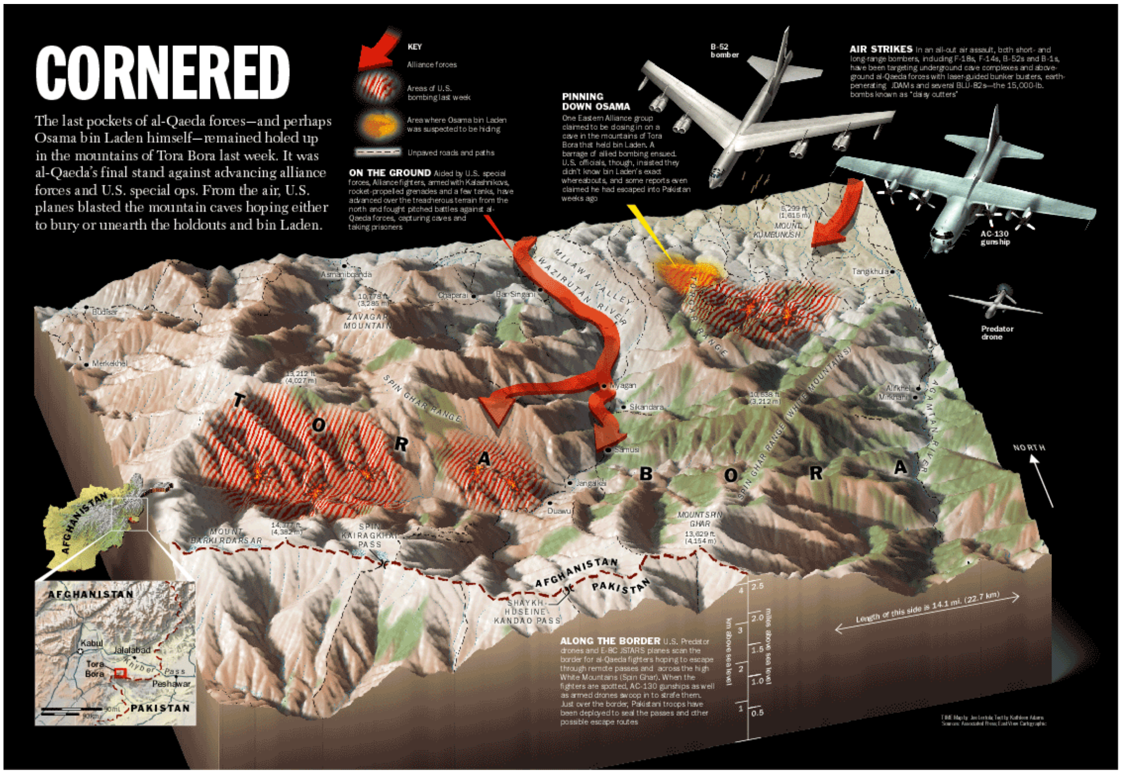



**Figure 7.3** – An example of a Sensationalist map produced as a news supplement in *Time Magazine*. Oblique and three-dimensional perspectives, unconventional orientations, dynamic representation, and numerous action packed illustrations made the battles of Tora Bora look quite exciting indeed! Particularly interesting is that this represents "al-Qaeda's final stand" (Cornered 2001).

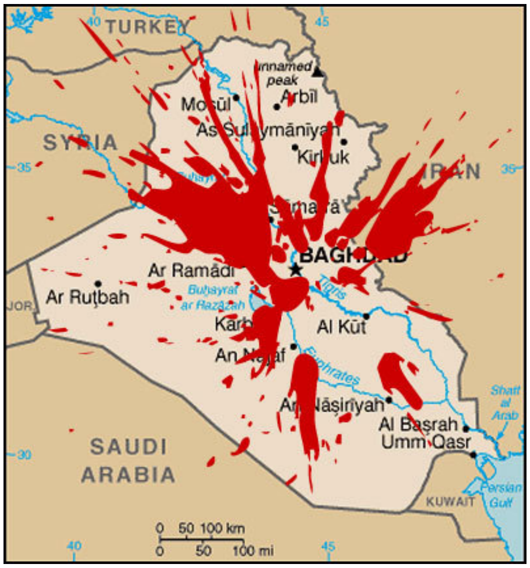



**Figure 7.4** – A sensationalist map of Iraq making a point without any concrete data (Iraq 2007).

### Rhetorical Category 2 – Propagandist Maps

> ***Propaganda:**… (2) the spreading of ideas, information, or rumor for the purpose of helping or injuring an institution, a cause, or a person (3) ideas, facts, or allegations spread deliberately to further one's cause or to damage an opposing cause;* also*: a public action having such an effect* (Merriam-Webster Inc. 2009).

These maps are almost exclusively created to communicate government policies, agendas, ideology, or other nationally oriented messages. Perhaps due to their frequent affiliation with official policy, these maps rarely use illustrations of any kind. Instead, they often use more cartographically appropriate embellishments, such as high levels of visual contrast and dynamic symbolizations instead of static ones. The use of mimetic symbols is optional, depending on the audience and the message being propagated. Interestingly, these are almost never choropleth – perhaps this is linked to the static and concretized appearance of this type of representation (please refer to Chapter 6 for correlation results dealing with thematic maps). Instead, other types of thematic maps are the norm, including flow, dot, proportional symbols, and reference maps showing places of interest. These maps frequently highlight more than one theme at a time, but rarely more than two.


**Figure 7.5 –** A propagandist map using an unconventional projection, bright contrast, swooping arrows, and invisible manipulation – i.e., South Korea has become South Vietnam and North Vietnam has turned into Laos
(from *The war we are in, view 1* 1960).

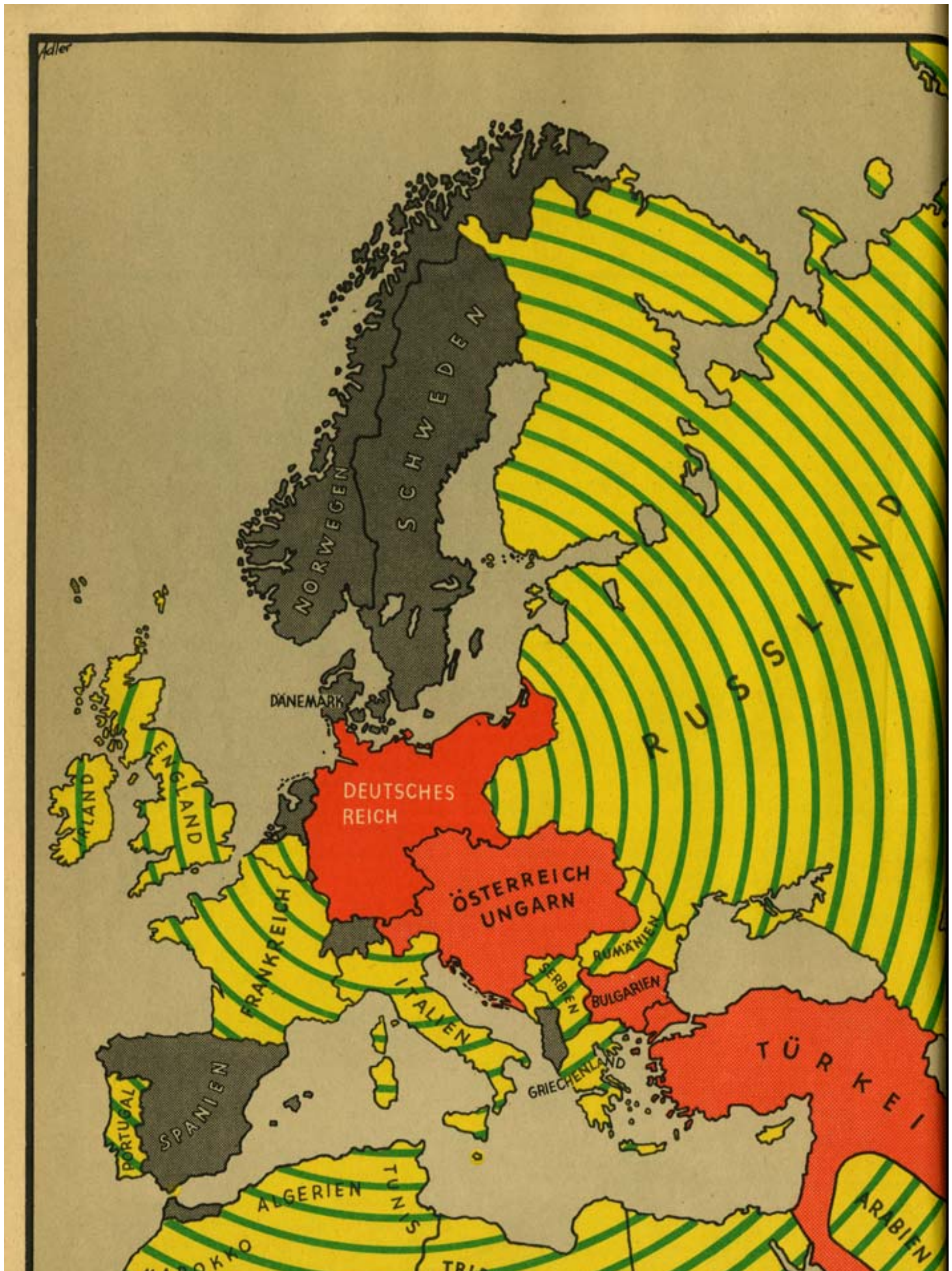


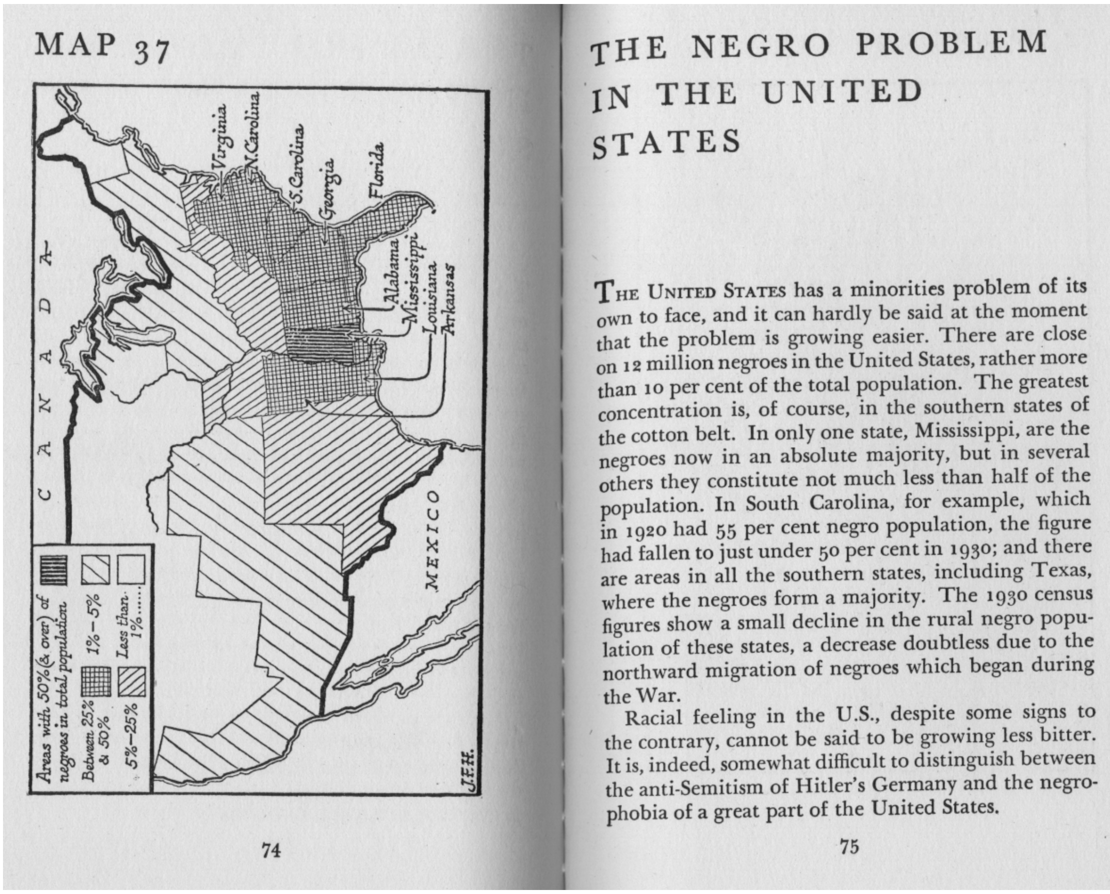

**Figure 7.6 –** A propaganda map using choropleth representation (somewhat rare), with the added flair of concentric circles tightening around the German-speaking states like a vice-grip (Wirsing et al. 1943).

## Rhetorical Category 3 – Understated Maps

> ***Understated:*** *avoiding obvious emphasis or embellishment* (Merriam-Webster Inc. 2009).

The third category of PCMs I label *Understated.* This category is defined by Cluster 3. They are maps that portend to provide only the facts – *"Just the facts, Maps"* – with no bells and whistle. They are frugal in their use of visual variables, map elements, and contrast.

These maps can serve a multitude of purposes, appearing in news magazines, advertisements, government publications, and elsewhere. They are not easily categorized by their role as much as they are by their simplicity. Such maps rarely have illustrations, and when they do, the illustrations are not flamboyant. These maps *never* use multivariate symbols or show more than one thematic representation per map. Most typically, understated maps use a choropleth representation, but other types of thematic maps and generic reference maps are also common. The base maps are generally devoid of any extra features, lacking shaded relief and unconventional perspectives. The graphic hierarchy is extremely simplified. The symbology is most often geometric and the data is displayed in a concrete, static manner.




THE NEGRO PROBLEM IN THE UNITED STATES

THE UNITED STATES has a minorities problem of its own to face, and it can hardly be said at the moment that the problem is growing easier. There are close on 12 million negroes in the United States, rather more than 10 per cent of the total population. The greatest concentration is, of course, in the southern states of the cotton belt. In only one state, Mississippi, are the negroes now in an absolute majority, but in several others they constitute not much less than half of the population. In South Carolina, for example, which in 1920 had 55 per cent negro population, the figure had fallen to just under 50 per cent in 1930; and there are areas in all the southern states, including Texas, where the negroes form a majority. The 1930 census figures show a small decline in the rural negro population of these states, a decrease doubtless due to the northward migration of negroes which began during the War.

Racial feeling in the U.S., despite some signs to the contrary, cannot be said to be growing less bitter. It is, indeed, somewhat difficult to distinguish between the anti-Semitism of Hitler's Germany and the negrophobia of a great part of the United States.

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**Figure 7.7** – This map is an example of understatement. There is little visual dramatization here, just a display of demographic data couched in the terms of a "problem." (A problem for who is never addressed.) What is most disturbing to me, perhaps, is that the atlas compares the "anti-Semitism of Hitler's Germany" to the "negrophobia of a great part of the United States" without implying that either chauvinism is morally reprehensible (Horrabin 1935: 74).

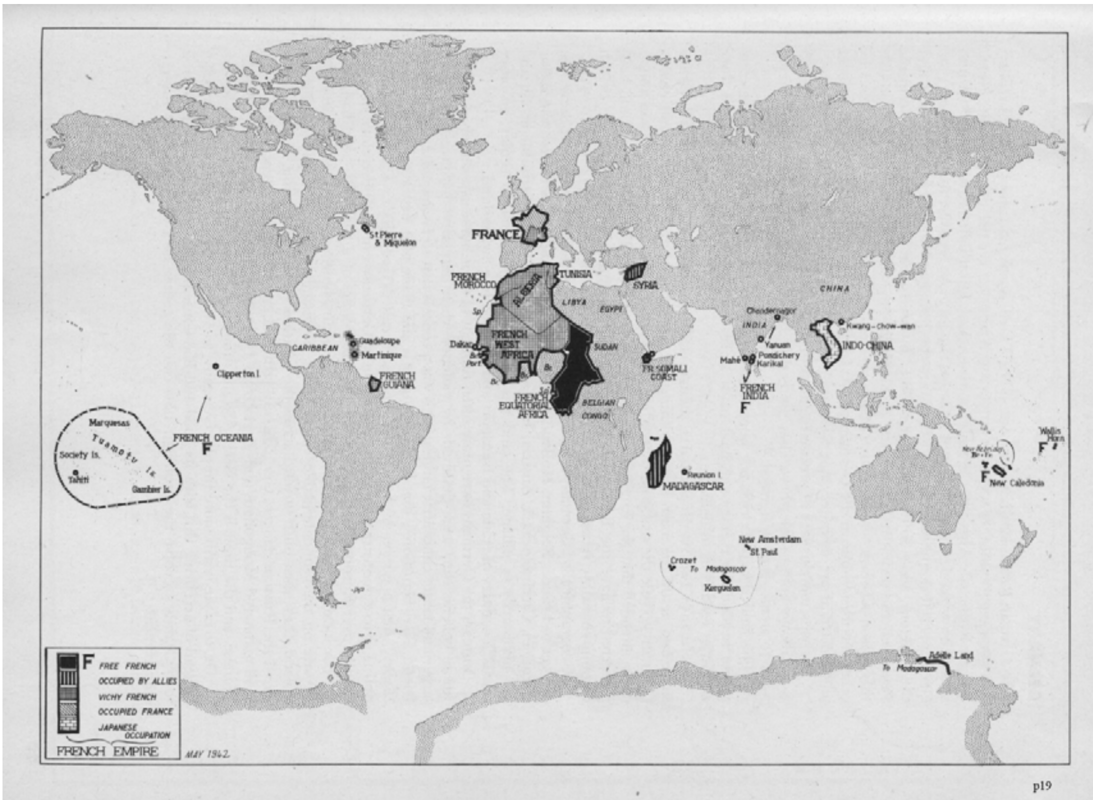


**Figure 7.8** – The French Empire in 1942 does not appear as large as it might were it not for this projection (Mowrer and Rajchman 1942: 19).

## Rhetorical Category 4 – Authoritative / Magisterial Maps

> ***Magisterial:*** ***(1)*** *of, relating to, or having the characteristics of a master or teacher: authoritative* ***(2)*** *marked by an overbearingly dignified or assured manner or aspect* (Merriam-Webster Inc. 2009).

Magisterial maps are often used to validate or reify particular political perspectives. They are most often created for general reference or education purposes. They typically appear scientific and cartographically accurate. These maps rarely have illustrations, but this can change depending on the target audience (primary school children versus discerning adults). Visual contrast is often kept to a minimum on these maps, evoking an objective feel to the data being mapped. The visual hierarchy of such maps is often quite complex, swamping a map reader with detail, and it is typically flat – with no particular map element standing out more than any other. The map is littered with detail to lend even more authority to the data being mapped – including all of the scientific cartographic necessities, including scale bars, orientation, dates, data sources, and the cartographer. Base maps and the spatial data being mapped are generally quite detailed compared to maps in other categories. (Of course, the accuracy of the data being mapped is unknowable to the map reader.) Many of these magisterial maps reference historical events.

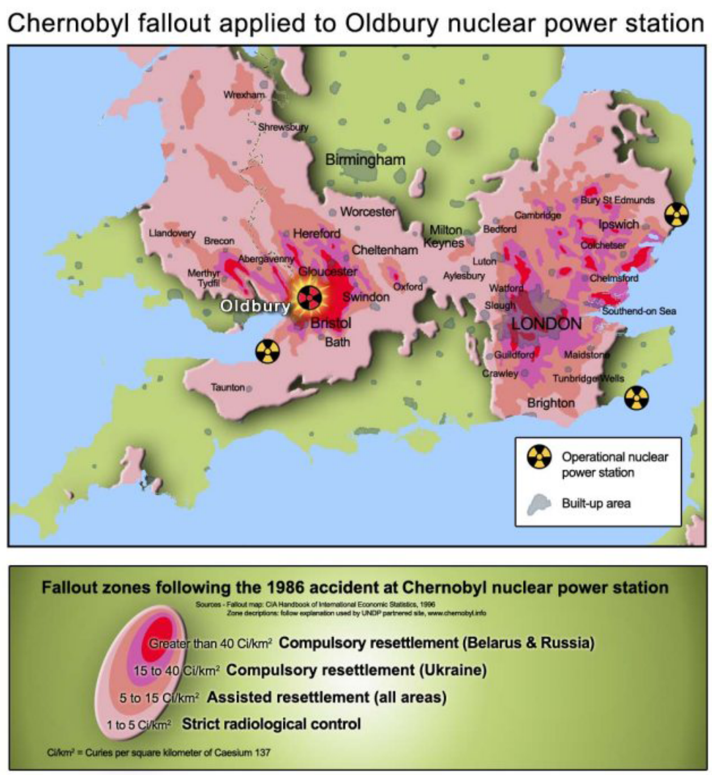


**Figure 7.9 –** An example of a non-profit Magisterial Map. Professionally made, full of many detailed numbers, and meant to highlight the "obvious" dangers of nuclear power (Chernobyl fallout applied to Oldbury nuclear power station 2007). Unlike most maps in this category, this one uses a healthy dose of visual contrast.

An Introduction to Geography

SOUTH AMERICA

in the northern section of South America, forming a land of more than 3,000 square miles.

3.5-5 - THE FORMER INT'L RESERVE OF AMAZON FOREST

Since the middle 80's the most important rain forest of the world was passed to the responsability of the United States and the United Nations. It is named as FINRAF (Former International Reserve of Amazon Forest), and its foundation was due to the fact the Amazon is located in South America, one of the poorest regions on earth and surrounded by irresponsable, cruel and authoritary countries. It was part of eight different and strange countries, which are in the majority of cases, kingdoms of violence, drug trade, illiteracy and a unintelligent and primitive people.

The creation of FINRAF were supported by all nations of G-23 and was really a special mission of our country and a gift of all the world, since the possession of these valuable lands to such primitive countries and people should condemn the lungs of the world to disappearance and full destroying in few years.



map 3.5-5.1 - We can see the location of the International Reserve. It took area of eight South America's countries: Brazil, Bolivia, Peru, Colombia, Venezuela, Guyana, Suriname and F.Guyana. Some of the poorest and miserable countries of the world.



We can consider that this area has the most biodiversity in the planet, with a vast number of species of all types of animals and vegetals. The value of this area is unable to calcule, but the planet can be certhat The United States won't let these Latin American countries explorate and destroy this real ownership of all humanity.

FINRAF is like an international park, with very severe rules of exploration.

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Pic_888 Brazilbrazil.com

**Figure 7.10** – An example of a hoax presented as a magisterial map. This purports to be a scanned page from an American elementary school textbook showing the US and UN actually occupy and administer a large swath of the Amazon Rainforest. This has been widely distributed via the Internet in Brazil to garner support against international interference over the management of this region (Introduction to Geography 2009).

### Do These Categories Correlate with Era, Producer, or Map Medium?

Now that these rhetorical categories of political cartographic manipulation are established, I would like to further explore several of the original research questions tentatively answered in Chapter 5:

1) *How have techniques and types of political cartographic manipulation evolved over time; and*
2) *Are different methods of political cartographic manipulation typically embraced by different map producers?*

To further test the results from Chapter 5, I ran Chi-square tests on the four clusters with the three following variables: (1) era; (2) producer; and (3) map medium. It is important to note that none of these variables were used in originally constructing the clusters. Again, I used Cramer's V to measure the significance of each relationship.

#### PCM Categories by Era

As the contingency table below highlights (Table 7.15), the map categories have a medium strength relationship with the geopolitical era of production ($X^2$ value: 76.693; df = 9; Sig. <0.000; Cramer's V= 0.316). The traditional propaganda map really had its heyday amid the First and Second World Wars, as well as during the depression years between them. The Cold War appears to have seen three types of political maps flourish at the expense of *Propagandist* maps – *Sensationalist* (32.8% of maps from this era), *Magisterial* (27.6%), and to a lesser extent, *Understated* maps (22.3%). Since the end of the Cold War, political maps have increasingly shifted toward *Understated* representations. *Propagandist* and *Sensationalist* maps were each roughly 30% less frequent after 1991. Before 1915, the sample size was too small to put much weight on the numbers, though maps in this sample were more likely to be *Sensationalist* or *Magisterial* (as shown in Figure 7.38).

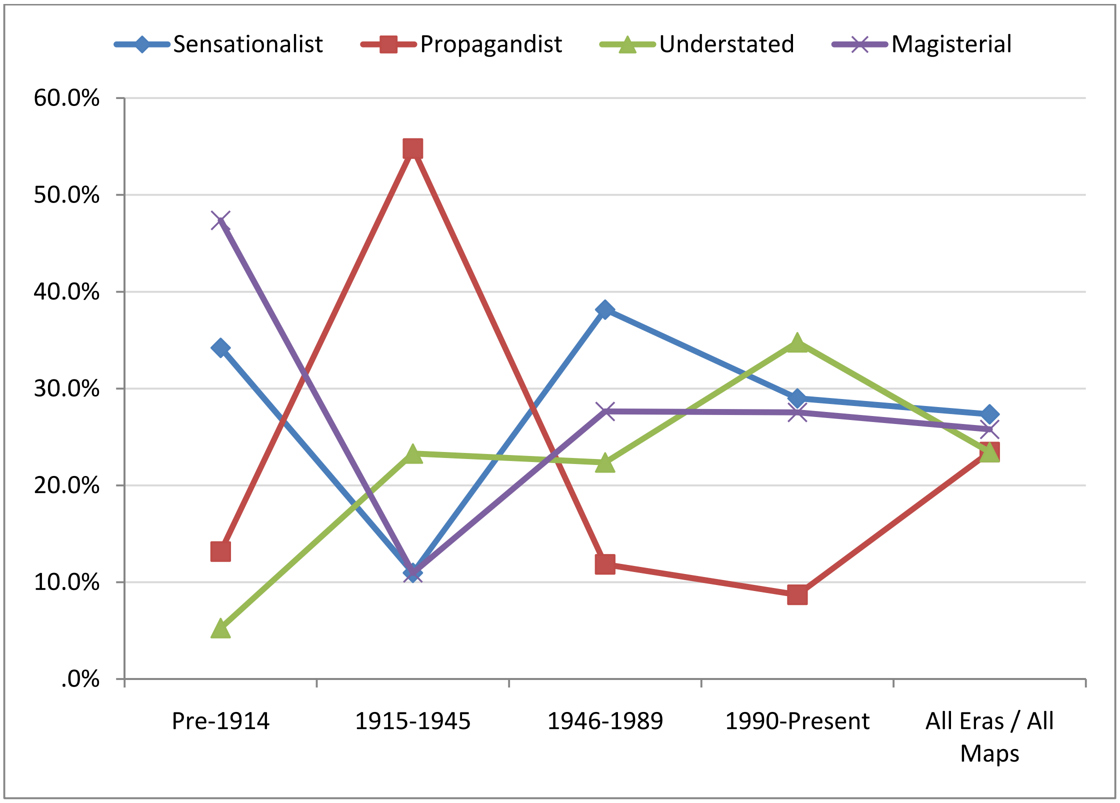


**Figure 7.11** – PCM categories by era (100% by era).

The use of the four newly developed map categories lends further support to the claim that the cartographic manipulation found in political maps has changed throughout time depending upon the geopolitical era. It is interesting to note that, though Nazi and World War Two maps still capture the imagination of many who study political maps, PCMs using such overt and government filtered rhetoric are largely disappearing. This suggests that future research may want to focus on the three other types of PCMs about which less is written – *Sensationalist*, *Understated*, and *Magisterial*.

### Producer by PCM Category

The political map categories more loosely align with different producers than they do with eras, but the $X^2$ (52.007, df=6, Sig. = 0.000) and Cramer's V value (0.319) show that a medium strength link exists. The contingency table below further illustrates this point. Over 43% of the government maps in the sample fell into the *Propagandist* category. Just under 45% of maps sampled from magazines, journals, newspapers, and other news media sources fell into the *Sensationalist* category. Corporate maps tended to be more Sensationalist – it should be noted that this sample was quite small, but this trend makes sense considering that most of these maps were used in advertisements. Maps appearing in atlases, books, or other professional publications tended to be *Magisterial*. Lobby groups had the most understated maps – though, again, this needs to be taken with a grain of salt, as the sample for this group was so small.

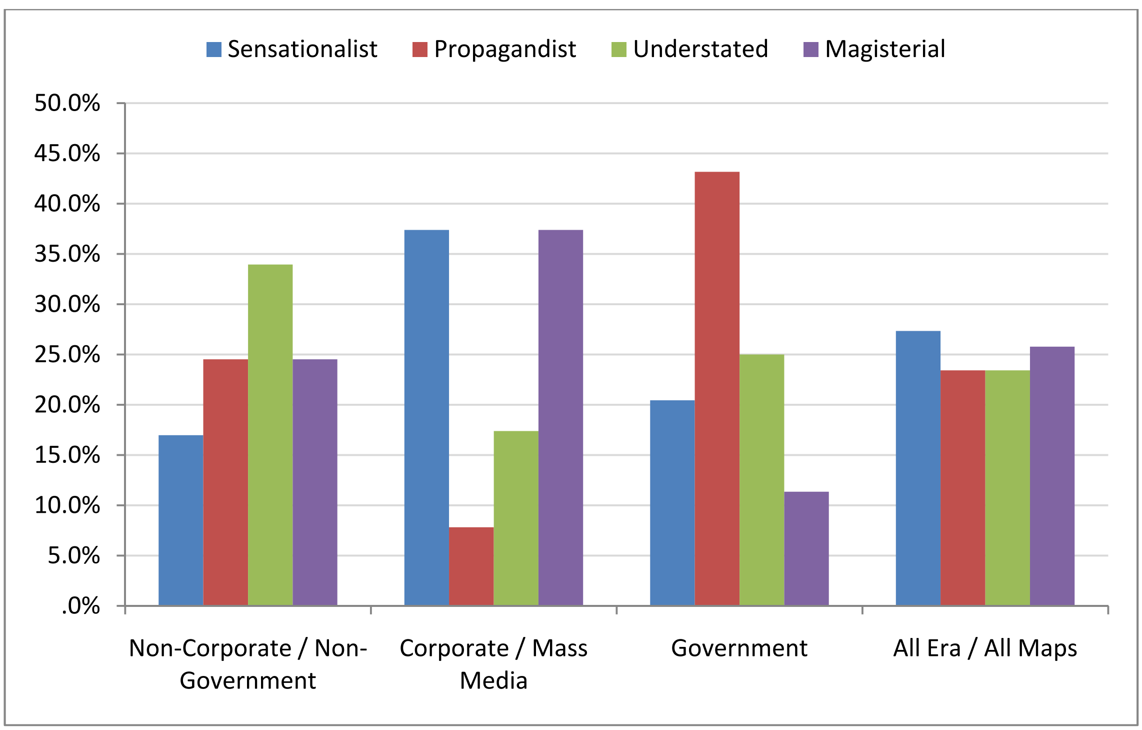


**Figure 7.12** – PCM category breakdown by producer (100% per producer).

The four categories of maps significantly correlate with the type of map producer, though the link is weaker than it is for era. This lends further evidence to the argument that the style of political map, and use of political cartographic manipulations, is somewhat dependent upon who is producing the map – as discussed in Chapter 5.

### Map Medium and PCM Category

The medium used to present a map appears to be linked to at least two of the PCM categories ($X^2$=40.413; df=9; Sig. = 0.000; Cramer's V=0.229). Maps sampled from atlases and books were far more likely to be *Propagandist* than otherwise. Print maps found on the Web tended to belong to the *Understated* category.

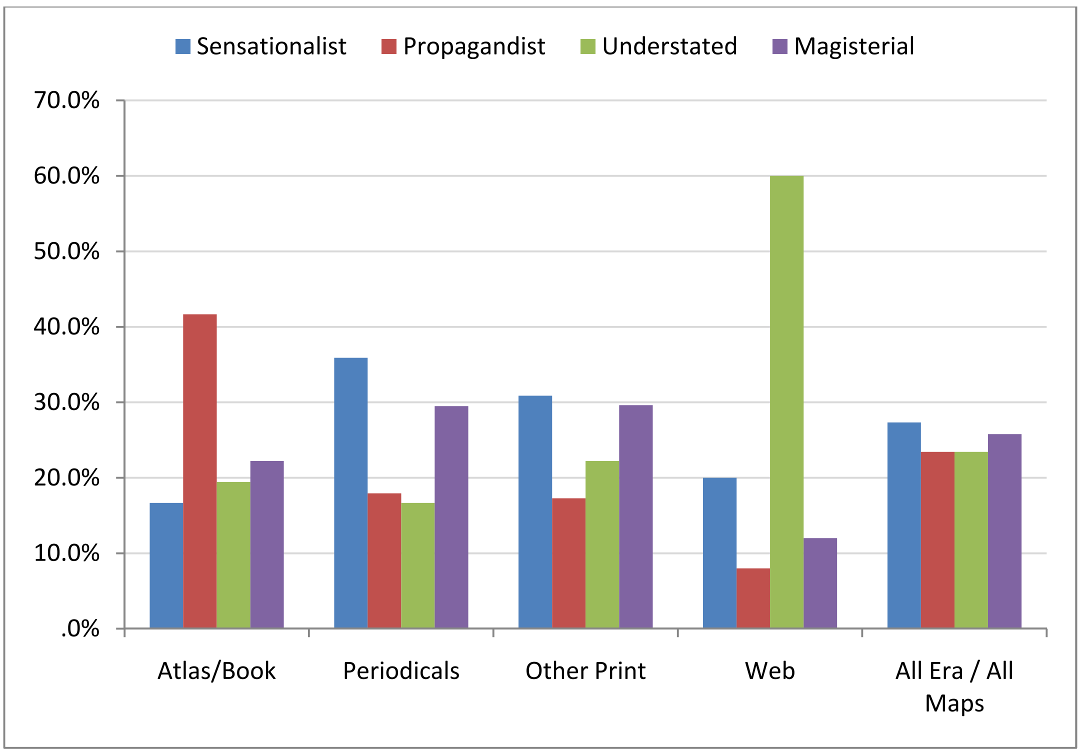


**Figure 7.13** – PCM category breakdown by medium (100% per medium).

## Review of Results

It is well known that political maps come in a variety of guises. Such maps are used to communicate arguments differently depending on social context and purpose. Some are cartographically manipulated to be more outspoken than others. Though this has been observed empirically, in this research I have quantified the types of manipulation found in a sample of political maps and, in this chapter, used these counts to establish four broad classifications for the rhetorical style of political maps.

The *Sensationalist* category represents PCMs that are often flamboyant in their appearance. A map in this category is more likely to elicit strong feelings about a particular topic than those using other rhetorical techniques. These maps often provide illustrations and oblique perspectives. They are often extremely animated both in the presentation of the spatial data and in their layout. Such maps are most typically found in news periodicals, advertisements, and children's educational materials.

The *Propagandist* category represents maps that are almost exclusively created to communicate political agendas, ideologies, or other rhetorical messages. These were a mainstay during the first half of the twentieth century up through the early stages of the Cold War. They have been reviewed and critiqued thoroughly in the literature (as already reviewed in Chapters 1 & 2). I hypothesize that a growing public awareness of these types of maps may be why they are rarely used as a serious form of political communication in the West today. Still, they remain some of the most emblematic PCMs to this day.

I speculate that *Understated* maps are the fastest growing segment of political maps being produced today – based off of data counts in this sample. These are maps comprised of the bare essentials. They typically have geometric symbology, as well as a relatively flat and dull visual hierarchy with minimal contrast. They are often the easiest maps to read. Of course, the danger in maps that are this easy to read is that the map may be withholding important information. Interestingly, these maps are typically used for more widespread purposes than those found in other categories.

Finally, *Magisterial* (or *Authoritative*) maps are those that have highly detailed base maps, spatial data, and map elements. These maps are more likely to instill the belief, in a map reader, that what they are seeing is official and largely infallible. When it comes to politics, these maps may prove most useful when trying to convince or persuade and educated and reluctant audience to your position. An example of how these maps can be both official but fallible is evident in official CIA representations of Iraq before the 2003 invasion (Biological weapons 2002; Nuclear facilities 2002; Ballistic missile facilities 2002). Of course, the data on such maps regarding weapons of mass destruction was erroneous, but the maps themselves were meticulously detailed and official looking – at least official enough to help convince the US Congress and population of the administration’s case for war.

## Conclusion

The answer to the question posed at the outset of this chapter – *i.e., Can a categorical framework be created within which one can analyze and label PCMs based on the nature of their characteristics and components?* – is yes, with several caveats. Cluster analysis has allowed us to create a four-pronged categorical framework of political maps based on the each map’s most relevant attributes. There were no outliers in the cluster analysis, meaning that these categories are quite encompassing of all map types in the sample. Each category has its own distinct characteristics with minimal overlap.

This being said, the map sample in this study is not random. At this time it is still unknown whether any or all political maps falling outside of this large sample would fit into one of these four categories. However, one of the primary benefits of quantitative content analysis is that by merely using the same coding matrix – though this time only based on the relevant codes used in the cluster analysis – more maps can continually be analyzed and added to the sample. Thus, over time researchers trained in the coding (myself or anyone else) may add maps and see if these clusters hold up or evolve further based on a larger sample number.

Thus, what this chapter provides is *the beginning* of a permanently evolving taxonomy for political maps based on their cartographic and communicative nature. Though this research has established four broad categories of political maps, I hypothesize that these broad categories can be further broken down into sub-categories in the future once a larger sample is collected, coded, and added to the existing database. Such an endeavor is beyond the scope of my current research questions, however.

# Chapter Eight

## *Summary of Findings, Research Limitations, and Future Directions*

This research originated from a practical and ongoing conundrum: *Though all maps distort reality, why are some maps more readily perceived as objective distortions than others?* Though such a broad, philosophical question is beyond the scope of any single piece of scholarship, this thesis has helped establish an appropriate methodological approach that allows us to chip away at this enigma.

### Quantitative Content Analysis for Cartographic Research

The first goal of this research was to find a more useful method for comparative map analysis than currently existed. The preceding pages represent the first systematic and quantitative attempt to individually measure and compare a multitude of cartographic components found throughout a large sample of maps. This research in particular focused on using quantitative content analysis (QCA) to answer specific questions about a large sample of *PCMs* – i.e., maps that were created with the express purpose of communicating an ideological, political, social, or economic message (please see pages 22-26 for a more detailed explanation). Quantitative content analysis has proven itself a very effective tool for the critical analysis of PCMs.

Unlike previous methods of analyzing the communicative and rhetorical nature of political maps (most notably Black 1997; Herb 1999; Monmonier 1996; Pickles 1992; Wood and Fels 1986), QCA has allowed for both an intricate and quantifiable analysis of 256 maps at the same time. A first in the study of political maps, *it allowed for the statistical comparison of different maps to one another*. Of potentially even more use, QCA also facilitated a comprehensive analysis of *how different cartographic variables* *manifest themselves throughout a large sample of maps* – e.g., how common is it for a map scale to be included on PCMs? … 43.4% of the time. This research has shown QCA is likely robust enough to be used in future, non-political map analysis to answer myriad questions about cartographic process or the characteristics of a map sample.

## The Nature of Political Cartographic Manipulation

The utility of QCA was tested by using the method to answer a series of research questions of varying specificity. The first broad test – *Could QCA be used to measure and count the characteristics of political maps?* – was reviewed in Chapter 4. *The answer was an unequivocal yes.* Quantitative content analysis allows us to glean characteristics about a sample of maps that might otherwise be missed using more common descriptive and interpretative techniques of analysis. Moreover, we could use descriptive statistics to characterize the sample of political maps as a whole – something that was heretofore impossible using other techniques.

In Chapter 6, the ante of difficulty was upped – *Could quantitative content analysis be used to find significant correlations among the characteristics of different political cartographic manipulations?* More surprising than the fact that QCA was effective at this task, was just how many new relationships came to light that had been overlooked in previous literature. Moreover, reviewing the statistical significance of different types of political cartographic manipulations found in this sample, it has become apparent that more descriptive forms of analysis have often dwelled upon data model techniques that, in actuality, may not be that frequently employed by political map producers (e.g., misuse of visual variables).

## The Foundations of Taxonomy: Four PCM Classifications

Using quantitative content analysis to show that certain types of cartographic manipulations are significantly linked to one another within political maps was effective, but it raised even more questions than it answered. Fortunately, the results did allow for the testing of my final research question – *Can a categorical framework be created within which one can analyze and label political maps based on their different types of political cartographic manipulation?* Based off of the variables of political cartographic manipulation that were deemed most significant throughout the dissertation, I was able to use two-step cluster analysis to evaluate and classify different types of PCMs into categories.

The results were more easily discernable than originally expected – four distinct rhetorical categories of political cartographic manipulation emerged from the analysis based off of the maps' quantified characteristics. The first category – *Sensationalist Maps* – does not evoke a strong sense of scientific accuracy or legitimacy. These maps are characterized by heavy illustration, dynamism, mimetic symbology, and visual contrast. The second category – *Propagandist Maps* – is more mixed. These maps are almost exclusively created to communicate government policies, agendas, ideology, or other politically oriented messages. The third category – *Understated Maps* – is comprised of maps conservative and frugal in their use of visual elements and symbology. The final category – *Magisterial Maps* – is comprised of those that exert official authority or legitimacy via a mix of their level of detail and the context of their production.

These four new categories correlate to some degree with previous empirical studies on political maps, while avoiding the ongoing arguments over semantics about what makes a map propaganda versus informative. Quantitative content analysis has allowed us to move beyond mere anecdotal description of "propaganda" maps, to argue that numerically speaking, four rhetorical categories of PCMs exist and many maps communicating a political message likely fall into one of them. This research has established a firm foundation from which we can further analyze and study political maps in the future.

Moving beyond my personal methodological bias for quantitative content analysis, it is hoped that these four categories might facilitate further empirical or deconstructionist research as well. For example, a post-modern deconstructionist no longer need say he is analyzing political maps from the Second World War; he can specifically analyze a handful of *Propagandist Maps* created during the Second World War. The four categories will also allow other researchers to narrow their focus and limit their sample numbers – the latter often being a crucial component to detailed descriptive analysis.

### Limitations and Qualifications of This Research

As with any research, there have been several shortcomings and limitations with this study. I break these issues down into two groups: *Data Limitations* and *Research Limitations*.

## Data Limitations

The biggest question mark with this research is whether or not the convenience sample adequately covers both the timeframe of analysis (primarily post-twentieth century maps) and the types of PCMs in production. The maps in this study were all produced in Europe, the United States, Israel, Canada, and Latin America. Obviously, culture has a major impact on the nature of rhetoric and cartographic norms – i.e., light blue on Israeli maps rarely signifies water but, rather, Israeli territory. Thus, it is certain that the results of this study are not universally applicable to all types of PCMs produced around the world – e.g., maps produced in Kampuchea or Angola would need separate analysis.

A random sample is not necessary for accurate analysis, but it is necessary to accurately infer the results – i.e., the four categories – to political maps at large. Thus, until further data is analyzed using the significant metrics and four categories of maps laid out herein, it is impossible to speculate with certainty how robust the results of this analysis are. Certainly, great care was given to code a sufficiently large sample and select a wide variety of maps, but future tests are needed to add to, or detract from, the validity of these results. Quite simply, though I believe that further research will hone and validate the results from this non-random sample, at this point they *should not be inferred to other samples without critical evaluation.*

## Research Limitations

Probably the biggest drawback to my use of quantitative content analysis in this research was that I could not solicit a full-time research associate to double-code all of the maps with me. Though I conducted various tests to ensure that my coding remained *reliable* (as reviewed in Chapter 3), to truly test whether this research is *replicable* would necessitate a second researcher coding most, if not all, of the same maps as myself. Though quantitative content analysis can be conducted without anyone testing whether the data is replicable (Riffe, Lacy, and Fico 1998), as was done in this research, I am the first to admit that future endeavors using this technique should be done in teams of at least two researchers. In the interest of transparency, I am providing online access to my SPSS database with bibliographic information to as many of the maps as possible in my sample so that others can evaluate my work throughout the future.

Finally, the most glaring shortcoming of any research project is when one is unable to answer a research question that he himself has proposed. I was not able to determine what role, if any, technology played within the evolution of political cartographic manipulations. There was no clear role discernable from the analysis of the dataset’s variables. Speculating on the reasons for the disappearance of old and arrival of new types of political cartographic manipulation would have gone against the goals of this project – to verify and test through quantification of map components. In the grand scheme of things, this question was of tertiary importance. Now that political maps have been better defined as PCMs, and the types of cartographic manipulation that correlate with one another are better understood, this question may be tackled in the future. It will likely require a mixed methodology, though – e.g., both QCA and a framework that better takes into consideration the history of mapping technologies.

## Future Directions and Applications

This research represents an important first step, not a final destination. In many ways, using QCA to study maps has opened a Pandora's box of far more questions than one researcher could ever hope to answer. Before concluding, I will review a handful of key areas for future research that I think will further our understanding of the rhetorical nature of political maps and help expand our knowledge concerning the communicative techniques of maps broadly.

First, the groundwork has been laid to begin an earnest analysis of many more political maps using a limited set of codes. Now that many variables have been weeded out as insignificant or circumstantial, the coding process (by far the most time consuming part of this research) will be shortened dramatically. Moreover, training other map interpreters in the codes will be much simpler, as there will be far fewer codes to memorize and manage.

To help facilitate this, an online software mechanism and database should be established that would allow other cartographic historians to code their own maps by answering questions on a Web site. By uploading a map's reference information to the site, other researchers could attempt to replicate and verify the appropriateness of the coding, as well as use the data for their own research. In this way, a database of political maps, along with a catalog of the cartographic manipulations comprising them, could be accrued and used to hone the four categories of political maps established in this dissertation.

Now that an embryonic taxonomy has been laid out, it is time to start developing subcategories. The best way to do this successfully is to add more maps to the sample.

However, unlike the initial foray into this analysis, which attempted to be a catch-all for political maps broadly, we can now be more selective with the maps we choose. This will allow the inclusion of future research that focuses on limited time frames, particular publishers, and that uses random samples. For example, one might decide to select maps from a certain news magazine (e.g., *Time*) during the Cold War (e.g., 1945-1991). Maps could be *randomly sampled* from *Time* during this period. Once coded, it would be interesting to see how many end up categorized as Sensationalist versus Magisterial, and so forth. Once enough additional maps are categorized, the development of subcategories using cluster analysis should be feasible.

Of a more dubious ethical nature, this research has opened up a potential new field of study regarding how people interpret political maps presented in different rhetorical styles. Now that categories of political maps have been established, it would be fascinating to test how different demographics are persuaded by them. By and large, quantitative content analysis is already being used to do this with generic images in the field of marketing studies. In geography, where cognitive research is well established, it would be a relatively simple and fascinating endeavor to test what people see and are more likely to believe based both on the type of representation *(Sensationalist, Propagandist, Understated, or Magisterial)* and their personal biases. Such studies may actually tell us how to elicit certain beliefs or feelings from map readers with a certain level of certainty, rather than merely speculate about what works and what does not as we have been forced to do thus far.

As maps continue to evolve into digital and ephemeral forms at the expense of paper maps, the variables and codes underlying this analysis will need to do the same.

At some point aspects of dynamic and animated propaganda maps should be considered, particularly as government organizations (e.g., the CIA) begin to actively create and disseminate animated maps online for persuasive and informational purposes.

Indeed, why stop at expanding the codes to incorporate only digital political maps. At this point, it appears evident that quantitative content analysis is viable for the analysis of all types of maps. The only prerequisite is that the codes used for map analysis are appropriate for answering the questions one is researching. The original codes reviewed in this project could easily be modified to analyze all types of map samples. One could use QCA to test everything from how often Taiwan is shown as an independent state on world maps produced in Japanese news magazines to analyzing the frequency of state bird and flag icons appearing on US highway maps.

### In Conclusion…

The research herein has illustrated the effectiveness of using quantitative content analysis to evaluate and compare political maps. Using this method, I have answered:

1) What types of political cartographic manipulation are most common (Chapter 4);
2) What types of political cartographic manipulation were most prevalent at different times and among different producers (see Chapter 5 & 7);
3) What map characteristics significantly correlate with one another in political cartographic manipulations generally (see Chapter 6); and

   Whether we can classify and label political cartographic manipulations based on the characteristics of the maps themselves (see Chapter 7).

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## Appendix 1

*Donis Dondis Likert Scale Code Definitions*

**One-Off / Solitary Map**
Maps that show different, anecdotal comparisons among different enumeration units on the same map.

Mild example: Inset maps showing different variables than the main map but still tied to the major theme.

Middle example: Inset maps but merely for detail.

Extreme example: No insets or sequential data.

**Neutral**
Map that has insets that may be showing different data but not for purposes of sequencing or time comparison.

**Map Sequencing**
Themes that are unified in their message put together for comparison in a series of maps or map insets.

Mild example: Base map with a series of insets showing different battles happening at different times.

Middle example: A series of the same base maps showing before and after or change through time.

Extreme example: A series of maps showing change over time, with time being one of the main data types being mapped.

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**Instable/Unstable**
Map viewers eyes are drawn to a particular part of the map at the expense of other areas. The map is not optically centered nor does it coalesce around or emphasize one particular part of the map. Many areas are emphasized.

Mild example: A map that draws one's eyes away from the optical center, even though one's eyes end up viewing the main area of the map.

Middle example: A map that does not blend its map elements in well so that the title or legend or other visually "heavy" non-map items draw your attention away from the mapped area itself.

Extreme example: A smaller base map with a series of images and inset maps around the edges and popping up in the middle of it.

**Neutral**
Map readers eyes can be drawn all over the place, but they are funneled to the optical center of the map like a black hole.

**Balanced**
When a map is well balanced, the eyes rest in the middle. The eyes focus around the optical center of the map.

Mild example: a map that, by-and-large, presents most of its information around and mostly near to the optical center.

Middle example: a map that concentrates a majority fo the mapped area right smack center near the optical center.

Extreme example: a map that is nearly perfectly aligned around the optical center. A prime example might be a map of the Earth from Harrison.

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**Complex Visual Hierarchy**
Many forms, units, and background graphics inter-dependently comprise the message and meaning of the map. Figuring out the map's meaning is more difficult because it is complexly/richly illustrated throughout several levels of the visual hierarchy.

Mild example: a map showing borders that also contains highways and rivers, which are also lines

Middle example: a maph showing shaded relief underneath transparent choropleth coverings and with several other layers of material.

Extreme example: a map showing shaded relief/contour lines, roads, rivers, lakes, ferry routes, cities, towns, capitals, provinces, parks, and oh yeah, the main theme... lines of advance.

**Neutral**
A map with a limited amount of contextual background base map information that does not interfere with the prominence and ease of viewing the main thematic or reference elements of the map.

**Simple/Elemental Hierarchy**
Direct. Plain. No secondary forms/shapes taking away from the main message of the map. Figuring out the map's message is easy, because it is plain to see and all of the information is clearly presented on but several levels of the visual hierarchy.

Mild example: Only important/message oriented features are on the map. Minimal labeling of non-intrinsic features. Minimal background/contextual data.

Middle example: Minimal contextual information – perhaps nothing other than borders and country labels. Mostly labeling primary features.

Extreme example: No more than five different data symbolizations/visual variables. Blank (white or solid colored) background base map – unless choropleth map is one of the visual variables. No labeling other than primary features.

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**Fragmented Layout**
A map comprised of many individual components that stand out as individual entities within the map itself. Often these are contained in bold boxes or graphics littering the edge of frameline. They often distract from the spatiality of the mapped area itself.

**Neutral**
A map that is neither overly fragmented beyond what is necessary, nor excessively unified in graphic theme.

**Unified Layout**
A map comprised of components that blend together very well and do not detract from the spatiality/mapped area of the map itself. A map that is "smooth" on the eyes.

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**Non-Scientific / "Non-Cartographic"**
Unconventional layout and design to a map. Includes most maps referred to by Ager as "non-cartographic" maps, as well as maps that are more experimental and pictographic than scientific and visual variable oriented (e.g., north not at the top, unconventional neatlines, maps inside of other images, untypical thematic representations.

Mild example: a map that obviously distorts the mapped area and is more interested in theme than cartographic attributes.

Medium example: a map that completely distorts cartographic measurement and data reliability. Political cartoon maps. Propaganda poster maps.

Extreme example: a map that is more a graphic design element than an actual map. Cartoon maps, maps in drawings, the Strait of Hormuz shown as an alligator's mouth, for example.

**Neutral**
A map that is both cartographic but also has advertising and cultural images placed over it. Example: tourist maps with mimetic symbols, children's maps, maps used as the primary medium in art projects.

**Scientific / "Cartographic"**
Conventional layout and design of map. Map elements and spatial features are present and oriented in the typical fashion. North at top. Standard neatline. Typical visual variables or thematic representation as deemed from cartographic literature.

Mild example: A map that may have mimetic graphics on it but is also cartographically accurate in its portrayal of the spatial data and base map. Also, a map given out as a promotional piece with an agency's/publisher's/company's name on it (e.g., National Geographic). News magazine maps.

Medium example: A map showing detailed information about a place but not as much detail as it might. Seneralization of cartographic data is fine, but overall, it is attempting to accurately depict the spatial data. Example from sample: CIA's map of Iraq.

Extreme example: Map that is mostly technical, must have coordinate reference system, is more interested in detail than generalization, and attempts to cram as much data as possible onto the map.

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**Depth & Perspective (2.5D and 3D)**
The illustration or visual illusion of looking at three dimensional spatial data on a 2D surface. A 3D perspective of the globe scores a 2 (Harrison's maps, for example).
Mild example: Hill shading scores a 1.

Medium example: Merely using 3D graphics or profiles over or in addition to a 2D base map -- such as a three dimensional plane flying over an otherwise flat map, or a 3D arrow swooping over an otherwise plainly 2D map, or an inset showing where the area is on a spherical globe.

Medium-Extreme: A map with 3D mountains coming up, etc., can score between 2 and 3, depending on just how many mountains there are.

Extreme example: The most extreme maps use 3D perspectives, cut-aways, and 3D perspective height of the data themselves (Score 3).

**Neutral**
A map that is not necessarily cognitively viewed as 3D but has elements of 3D on it – i.e., contour lines. Depth is there, but one must be trained to see it automatically.

**Flat (2D)**
A map that is illustrated from a straight-down view of the earth's surface. The most flat maps do not even bother to illustrate elevation. The visual hierarchy may differentiate between objects well, but all mapped objects appear to be sandwiched flat on top of one another. Extremely flat images will not have transparency at all (a ranking of 3 by default).

Mild example: A map that does not show elevation, but it may have graticules curving. It may also have map elements with drop shadows and 3D.

Medium example: A map with minimum, ***though not absolute,*** dimensionality. Curvature of graticules or earth's surface should not be shown (unless it is deemphasized by the flatness of the map itself); drop shadows/call outs should be kept to an absolute minimum.

Extreme example: No elevation shown; no 3D map elements (e.g., 3D callouts, text boxes, drop shadows); No illustrated curvature in the projection (i.e., graticule lines or horizontal perspective). Absolutely no transparency. Flat as a pancake!

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**Intricate/Mimetic Symbology**
Maps comprised of many graphically designed or mimetic, rather than generically and simply shaped geometric symbols.

Mild example: A map with well designed/3D pie charts on it. Minor intricate design, but still stylistic. Or a map with mimetic point symbols.

Medium example: Many mimetic symbols or several types of 3D shapes. Perhaps a themed arrangement for a choropleth map. Patterned streets and lines.

Extreme example: Map almost entirely comprised of mimetic or intricately designed symbology.

**Neutral**
Symbology that is neither consistently mimetic nor geometric – a mix of both that approximates 50/50.

**Economic / Utilitarian / Geometric Symbology**
Maps comprised of generic, bare bones components meant to represent the data in as straightforward, and non-cultural manner as possible. Maps that use shapes and bare-bones symbology.

Mild example: Map may have several mimetic symbols but is absolutely dominated by simplistic geometric forms.

Medium example: Map that has many symbols but most are simple geometric shapes that are differentiated by something other than mimetic looks.

Extreme example: A map comprised entirely of geometric symbols, with almost every symbol representing but one variable.

**Uneven Symbolization**
Non-systematic symbolization. Symbolization that seems to change in different places on the map (e.g., one point symbol meaning something in one place, a different point symbol meaning the same thing somewhere else). **Important:** this also includes not marking something on one part of the map but "loading" the other side of a map.

Mild example: Map using different symbols to mean the same things on different parts of the focus of the map area.

Medium example: symbolization emphasized on one particular part of the mapped area or an inset map, but not used in other parts of the mapped area or inset maps.

Extreme example: Symbolization on one part of the mapped area but completely missing from another (major) section of the mapped area. For example, the industrial output shown in western Ianland, with eastern Ianland lacking any symbolization dealing with industrialization.

**Neutral**
Symbolization that is consistent but still changes depending on systematic placement.

**Systematic Symbolization**
Systematic symbolization across the entire map. Structured representation that does not deviate throughout the mapped area.

Mild example: a map of a country showing the same symbology throughout the country, regardless of which region it is illustrating. Neighboring states may have different symbology.

Medium example: same as above, but neighboring states have the same symbology, just less data is shown.

Extreme example: Everything that can be seen in the mapped area, regardless of where it is, has the same method/system of symbolization.

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**Multivariate Symbology**
Maps that use visual variables to show many thematic variables for a single point or place. If a map is showing more than one theme, that ***does not*** make it Multi-Variate Symbology. Only if a single place has many variables representing data occurring there.

Mild example: A map with a single ***bivariate*** symbol.

Medium example: A map with a single ***multivariate*** symbol.

<u>Extreme example</u>: A map with at least ***two different types of bivariate symbols, two multivariate symbols, or a single multivariate symbol with two additional individual variables.***

**Neutral**
A map with many variables located at one place, but symbolized independently. Example: a map with four different types of point symbols located on/around a city.

**Univariate Symbology**
Maps illustrating only one or two primary data types for given enumeration units or points.

<u>Mild example</u>: a map symbolizing only individual variables with individual methods of symbolization.

<u>Medium example</u>: a map showing three or less variables using individual visual variables for each.

<u>Extreme example</u>: a map showing only one variable on the entire map. Punkt.

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**Dynamic/Activeness/In Flux**
Implies change, motion, and/or movement of certain spatial variables.

**Mild:** Different lines showing the change of borders over time.

**Middle:** A series of maps or insets showing change over time.

**Extreme:** Arrows on the map showing movement or perceived change in the future or past.

**Neutral**
Example: a reference map with future places or growth shown via different visual variable (i.e., dashed lines meaning future highway).

**Static/Stasis/Permanence**
More than merely a snapshot, the map implies permanency of what is shown through visual concretization of most spatial variables.

**Mild example:** A map with no arrows or movement shown on it but data that is presumed to change frequently.

**Middle example:** A standard reference map -- e.g., highway map.

**Extreme example:** A map of states, capitals, and borders. Better yet, a map of Berlin with the wall around it in red.

**Hierarchical Accenting (Overt Messaging)**
Certain spatial data are highlighted and promoted ***above other data in the visual hierarchy.*** Something is isolated in the visual field, even though there are other objects of the same classification or type that are not. Example: a country or province in bright red, and all the others in green.

Mild example: A handful of places stand out on the map and things are accented on a variety of levels.

Medium example: Three or fewer places are accented (same level or different ones) and made to stand out on the map itself.

Extreme example: Only one place/data point is accented; it is made stand out on the entire map.

**Hierarchical Flattening**
Just the facts maps. Positivist/scientific maps. Serious and official looking representation of spatial data. Objects are largely flattened in the hierarchy so that they all appear on the same layer.

Mild example: Maps where there may be visual layers but all of the layers are orderly in their prominence and little stands out individually from each layer.

Medium example: Maps with data that all appear on the same visual hierarchy until the map reader discerns what they are looking for. USGS topographic maps for example.

Extreme example: Maps in which the one cannot visualize what is higher than what. Often white backgrounds without any shading. Completely flattened/deemphasized information maps.

Example: European cities (regardless of whether they are in the EU or not) occupy the same place in the visual hierarchy.

**Embellished Contrast**
Maps that use extreme contrast to present certain spatial data.
Example: red arrows swooping down on a country colored white.

Mild example: Use of color or prominent shape on certain objects to make them stand out.

Medium example: Use of color or other prominent visual variable to make several, three or less, objects stand out.

Extreme example: Blatant, over the top, contrast to make one object stand out.

**Neutral**
Objects stand out in the visual hierarchy, but by and large, an entire data set stands out, not just one spatial object within the dataset.

**Minimized Contrast**
Maps that use minimal/frugal contrast in presenting certain spatial data.

Mild example: Only some objects are contrasted.

Medium example: Extremely little contrast on the map.

Extreme example: Map has so little contrast it is difficult to tell different datasets from one another, much less data inside of the datasets.

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**Distortion (Base Map Generalization)**
Maps with heavy distortion are not as concerned with shape, distance, area, angle or scale of the base map itself. Heavy generalization may result but the message may very well be clearer because of it.

Mild example: Maps that simplify borders, physical features, or human made features more than necessary for a given scale.

Medium example: Maps that place locations or features somewhat willy-nilly on the map, with an obvious lack of absolute accuracy but with locations relatively accurate.

Extreme example: Monmonier's geometric US base maps

**Neutral**
Maps that have generalized base maps that are not overtly simplified or generalized enough for their scale or resolution.

**Accuracy (Base Map Specification)**
On maps with heavy accuracy, spatial elements (including shading and background elements) are drawn in a precise fashion. Minimum generalization given the scale of representation. Obviously all maps have distortion, but "accurate" maps attempt to alleviate distortion as much as possible and look as accurate as possible.

Mild example: Accurate shapefiles that are a little less generalized than they could be.

Medium example: Shapefiles that are overly accurate and not generalized enough -- definitively georeferenced.

Extreme example: remotely sensed background imagery with exact polygons or points placed on top

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**Detailed (Data Specification)**
Spatial attributes concerning the data being mapped like location and size are made to appear absolute or mathematically proportional. Maps concerned with allowing the map reader to discern intra-data similarities and contrasts.

Mild: mathematically scaled proportional symbols for points or unclassified choropleth maps.

Medium: georeferenced and extremely specific location of places with distances between them labeled or visualized

Extreme: extremely detailed and nuanced data representation that allows for the map reader to make detailed calculations based off of the map if necessary.

**Neutral**
Data that is shown relatively accurately and presumably detailed enough for the scale of the map and the resolution of the base map.

**Fuzzy/Relative (Data Summarization/Generalization)**
Spatial attributes concerning the data like location, distance, and size are relative, not absolute or mathematical. These maps are often more concerned with base map themes, patterns, orders, and hierarchies than intra-data differences.

Mild example: Proportional symbol map with enumeration units, not points

Medium example: Data changed from quantitative to ordinal (or nominal, for extreme 3!) data for representation.

Extreme example: Metro/Subway map

## Appendix 2

*Cluster Analysis Data*

### The Role of Different PCM Variables in the Clusters

The following sections outline what PCM variables were included in the final cluster analysis. Accompanying each variable are charts illustrating the statistical significance that a variable had on determining whether a map would fall into a particular cluster. For the Likert-scale variables, an additional intra-cluster variability chart is included, showing the standard deviations of Likert scores found in each cluster. The Likert-variables were tested as continuous. Ordinal variables with seven or more steps are eligible for certain continuous measurements (Burt and Barber 1996; O'Brien 1979).

### Three Categorical Variables of Significance

Three categorical variables were deemed significant enough from both previous analysis and the cluster analysis to merit inclusion in the final classification scheme. These were: (1) the inclusion or exclusion of non-photographic illustrations around and over the mapped area; (2) the role of the map; and (3) the type and number of thematic representations included on each map.

### Inclusion of Illustrations over and around the Mapped Area

Illustrations were a key factor in determining the clustering. Cluster 1 in particular was heavily defined by Illustrations – 100% of maps belonging to the first cluster included illustrations. In the sample at large, less than 30% of the maps had illustrations. By including so many illustrated maps in the first cluster, the other clusters became defined by their lack of illustration – Cluster 2 had no maps with illustrations, and only 1.4% of maps in both Clusters 3 and 4 had illustrations (as shown in Table 7.2).

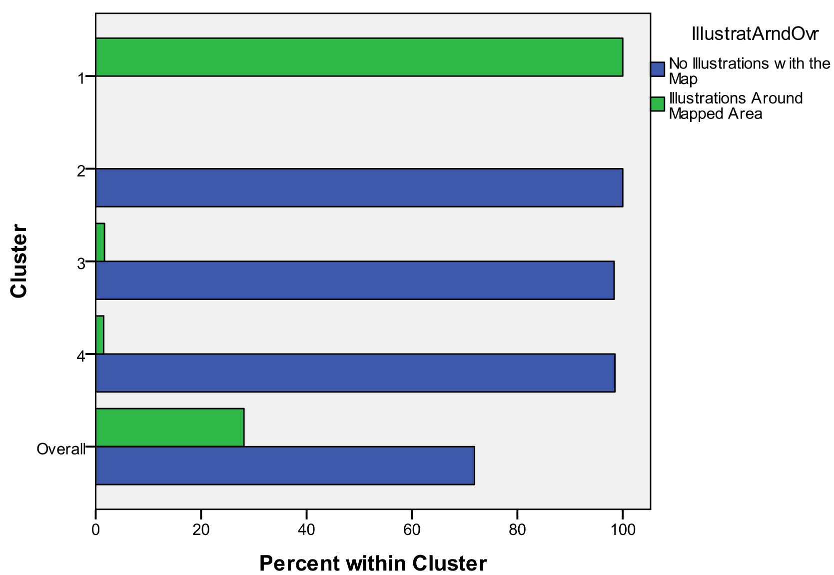


**Figure A2.1 –** Percent of maps in each cluster with non-photographic illustrations around or over the mapped area.

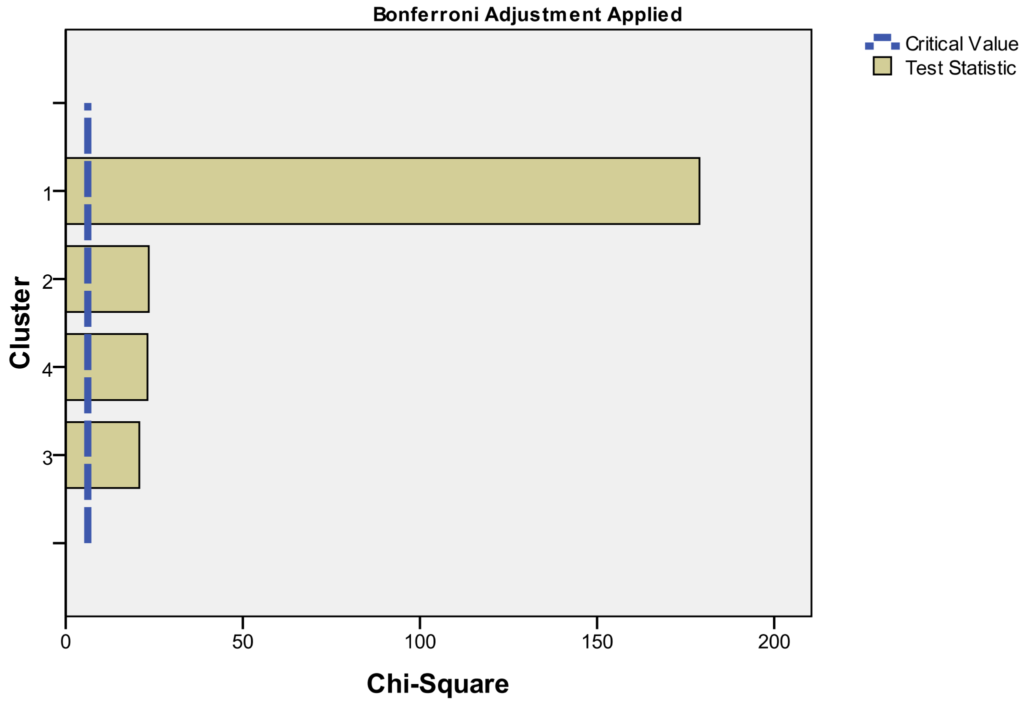


**Figure A2.2 –** The Chi-square value of significance of Illustrations in defining each cluster. The illustration variable is significant in determining each cluster.

### The Role of Map Purpose

Map purpose played a less pronounced but still fundamental role in determining clusters. Nearly 60% of maps communicating messages dealing with national politics fell into Cluster 2. Just less than 80% of maps produced as thematic references, and 50% produced as educational supplements, were found in Cluster 4. Advertising and news maps were found in Cluster 1 at 58.3% and 46.8% respectively. Cluster 3 was more balanced than the other clusters, with 40.7% of editorial and policy shaping maps belonging to this category – though Cluster 1 claimed 35% of such maps as well. Of major interest was the fact that of maps created for public reference, none belonged to either Cluster 2 or 3. As Figure 7.5 highlights, the lack of reference maps was a significant attribute of Cluster 2, but was merely coincidental for Cluster 3.

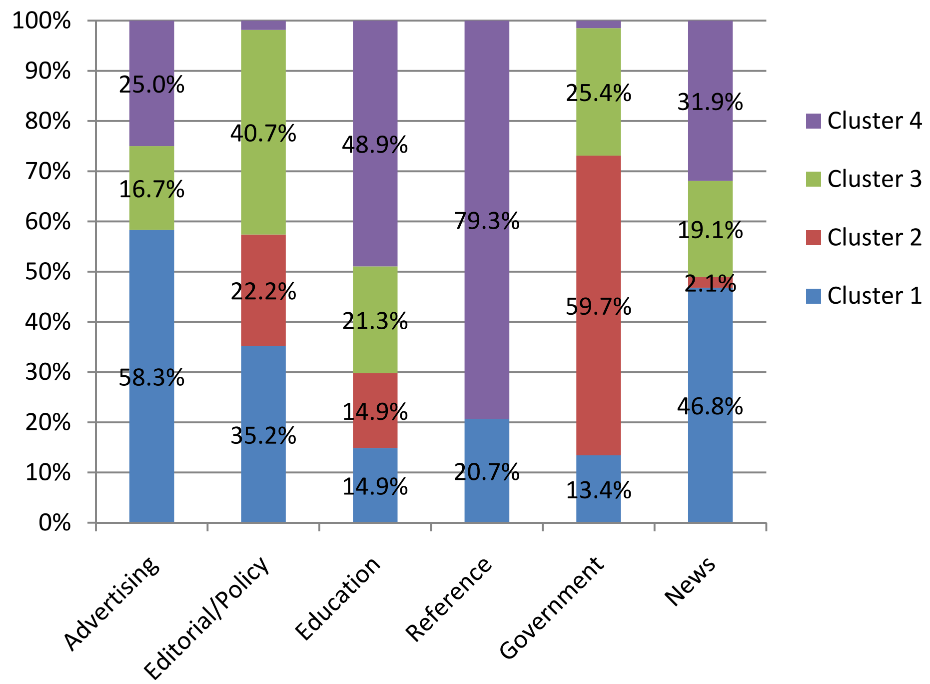


**Figure A2.3 –** Different Map Roles broken down by percent belonging to the four clusters.

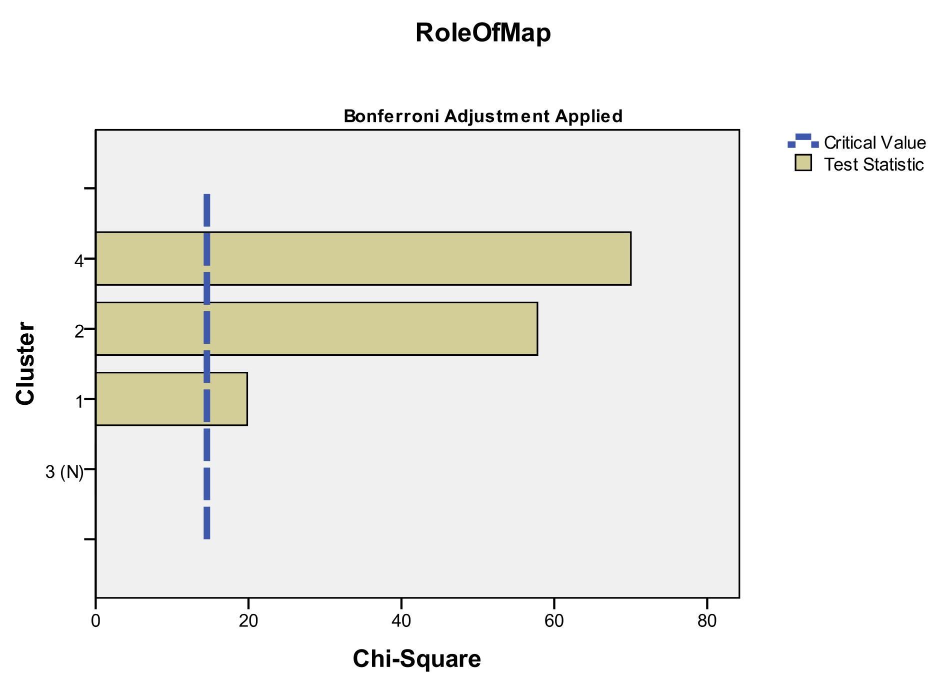


**Figure A2.4 –** The Chi-square value and significance of the Role of Map defining each cluster. The role of a map is a significant variable in determining three out of four clusters.

### Thematic Representation

Thematic representation had a more nuanced impact on whether a map was likely to end up in a particular cluster or not. Cluster 1 had a relatively balanced mix of different thematic representations; it was the only cluster that thematic representation had no significant impact on defining (please see Figure 7.7). The most interesting correlation for Cluster 1 was that it possessed 60% of all maps with three or more thematic representations on a single map. Cluster 2 had no reference and no choropleth maps. It was instead characterized by non-choropleth thematic maps (35% of all such maps) and maps with two types of thematic representation (over 60% of all such maps). Cluster 3 was best defined by the proclivity of its maps to be choropleth (67% of all choropleth maps were in this cluster). Figure 7.8 shows just how large the impact of choropleth maps was on this cluster. Cluster 3 also had no maps with more than one type of thematic representation – thus, the maps could be characterized as visually less complex. Finally, Cluster 4 was best characterized by its amount of reference maps (51.8% of all reference maps), non-choroplethic thematic maps (27.1% of all such maps), and multi-thematic maps (17% of two-type and 30% of three-or-more-type thematic maps).

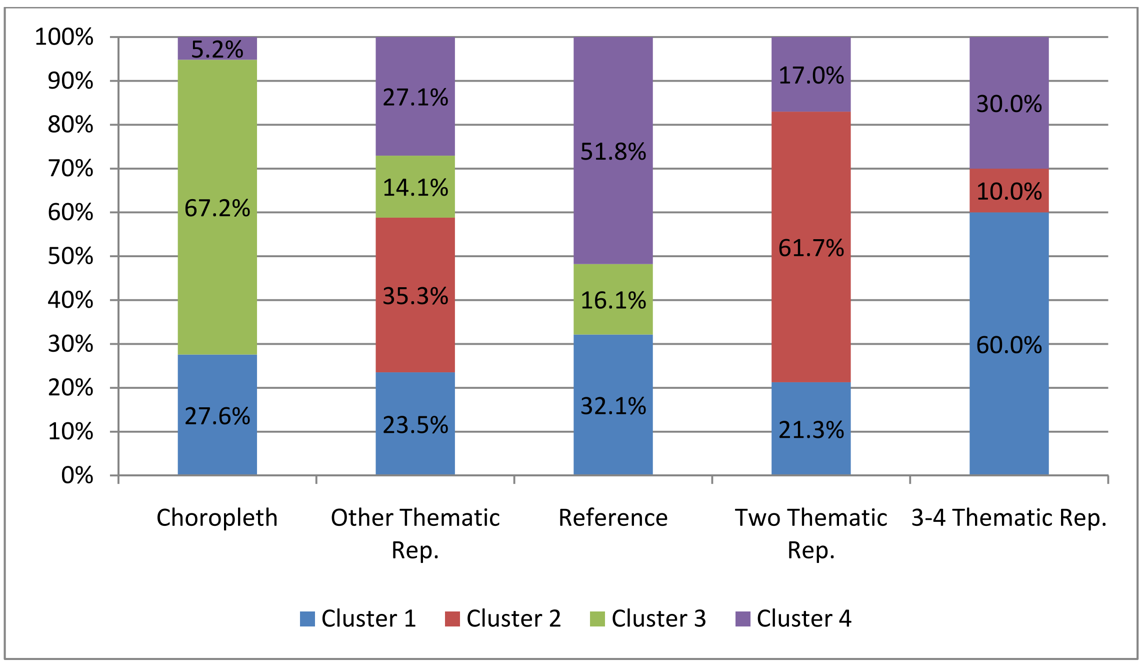


**Figure A2.5** – Thematic Representations found within each cluster.

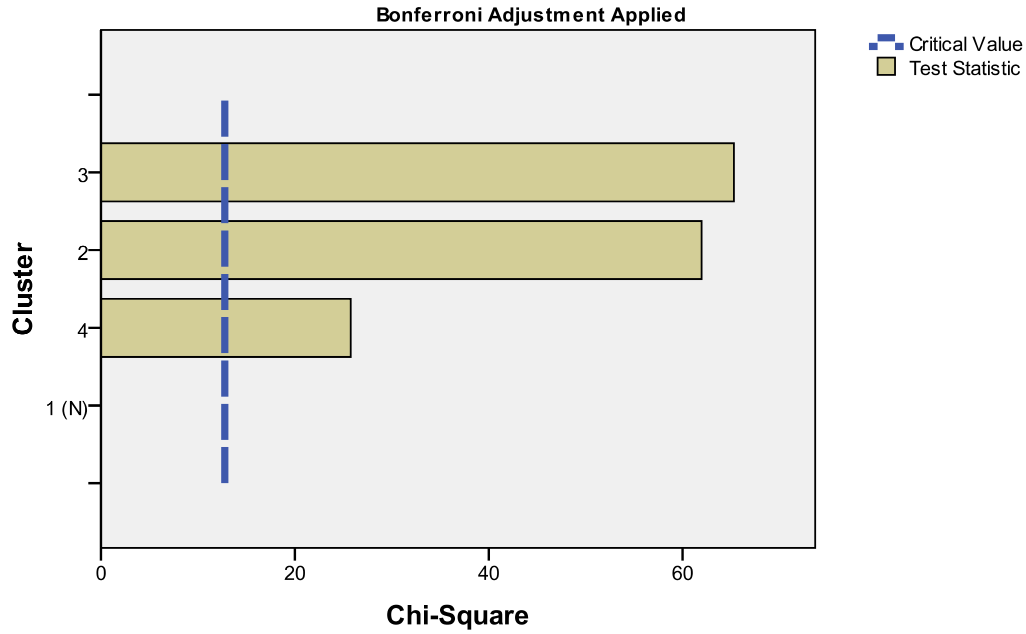


**Figure A2.6 –** The Chi-square value and significance of Thematic Representation defining each cluster. The Thematic Representation(s) found on maps are significant variables in establishing three out of the four clusters.

## Ten Ordinal and Continuous Variables of Significance

Ten ordinal and continuous variables were deemed significant enough from both previous analysis and the cluster analysis to merit inclusion in the final classification scheme. These were the: (1) complexity of the visual hierarchy; (2) scientific or non-scientific appearance of the cartography; (3) the obliqueness and depth of perspective provided on the map; (4) geometric or emotive nature of map symbology; (5) static or dynamic nature of the map; (6) level of hierarchical accenting found on the map; (7) amount of visual contrast; (8) level of base map generalization or specification; (9) level of data generalization or specification; and (10) the amount of invisible manipulation used on the map.

## Complexity of the Visual Hierarchy

The complexity of the visual hierarchy played a large role in Cluster 3 and a smaller, but still significant, part in defining Cluster 4 (see Figure 7.9 and 7.10). Maps in Cluster 3 typically had simpler visual hierarchies than those in the other clusters. Maps in Cluster 4 had the most complex hierarchies. It should be noted, however, that other than Cluster 3, there was substantial overlap with the values of this variable in Clusters 1, 2, and 4 (as illustrated in Figure 7.9 and Table 7.1).

| Cluster | Mean | Std. Deviation |
|---|---|---|
| 1 | 4.83 | 1.841 |
| 2 | 4.67 | 1.782 |
| 3 | 5.85 | 1.338 |
| 4 | 4.17 | 1.981 |
| Combined | 4.86 | 1.852 |

**Table A2.1 –** Mean scores and standard deviations of each cluster and the Complexity of Visual Hierarchy variable.


**Figure A2.7 –** Mean and standard deviation within the clusters.

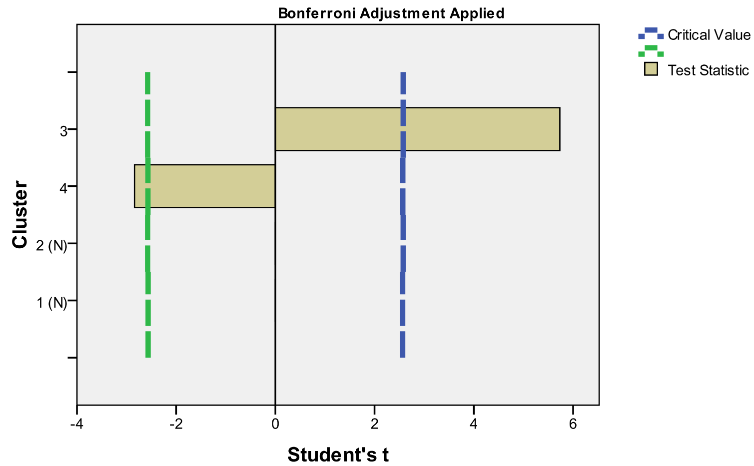


**Figure A2.8** – The t-test value and significance of the complexity of the visual hierarchy defining each cluster. Though only significant for Clusters 3 and 4, it is important to point out that Cluster 3 claimed maps with the simplest visual hierarchies and Cluster 4 claimed those with the most complex.

## Non-Scientific and Scientific Appearance

Whether or not a map appeared scientifically accurate or merely an illustration played a role in determining what cluster a map would likely fall into. Maps in Cluster 1 were more likely to have a non-scientific appearance, but this cluster did include a fair share of neutral and even mildly scientific maps. Maps in Cluster 4 were far more likely to appear scientific (see Figure 7.11). This variable was insignificant in defining Clusters 2 and 3, both of which had large ranges around the mean.

| | 1 = Non-Cartographic / Scientific = 7 | |
|---|---|---|
| **Cluster** | Mean | Std. Deviation |
| 1 | 4.23 | 1.819 |
| 2 | 4.95 | 1.630 |
| 3 | 5.08 | 1.418 |
| 4 | 5.64 | .835 |
| Combined | 4.96 | 1.556 |

**Table A2.2 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7 with lower values representing more Non-Cartographic looking maps and higher values more Scientific in appearance and layout.


**Figure A2.9 –** Mean and standard deviation within the clusters.

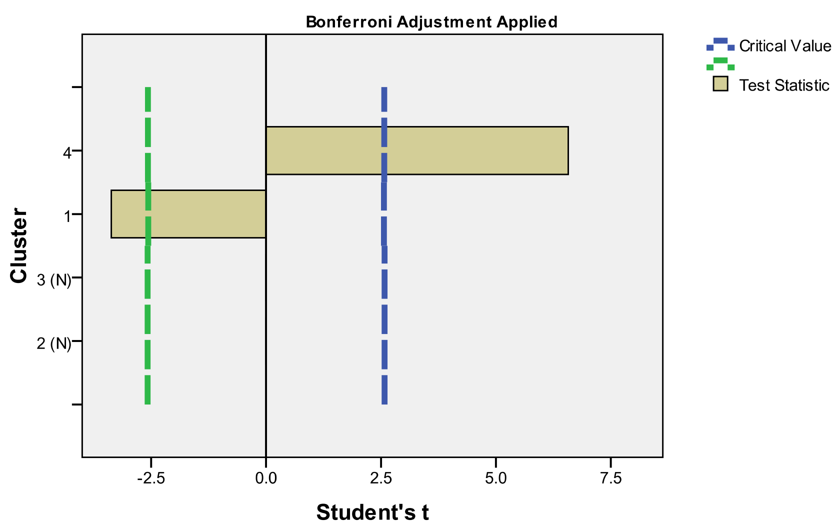


**Figure A2.10 –** The t-test value and significance for whether a map appeared non-cartographic or scientific cluster. Though only significant for Clusters 1 and 4, it is important to point out that Cluster 1 was significantly defined by maps with non-cartographic appearance and Cluster 4 largely by those that appeared more scientific.

### Depth and Obliqueness of Perspective

The type of perspective and depth provided on different maps had the opposite impact on Clusters 1 and 3 and were non-significant in defining Clusters 2 and 4 (Figure 7.14). Maps in Cluster 1 were far more likely to offer an oblique perspective or provide some form of relief. Maps in Cluster 3 were exceedingly likely to offer flat, completely two-dimensional representations of the Earth's surface. Clusters 2 and 4 straddled the mean.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | 3.31 | 1.707 |
| 2 | 3.75 | 1.674 |
| 3 | 5.35 | 1.459 |
| 4 | 4.23 | 1.944 |
| Combined | 4.13 | 1.861 |

**Table A2.3 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had more oblique perspectives and higher scores more two-dimensional, straight-down views.

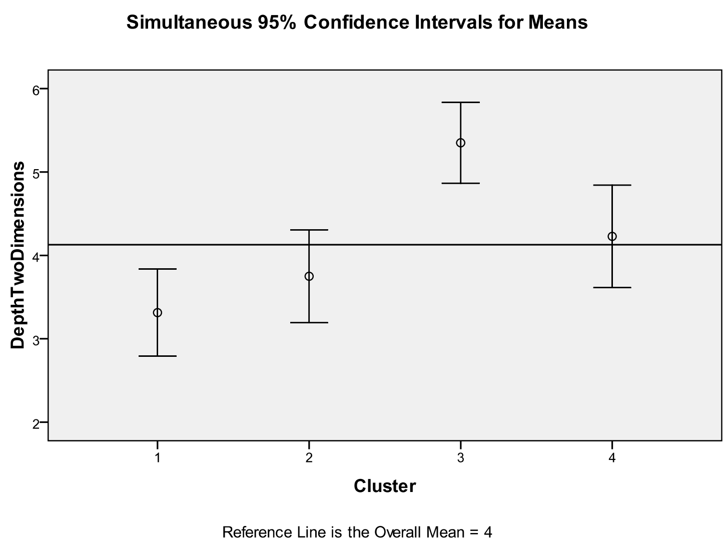


**Figure A2.11 –** Mean and standard deviation within the clusters.

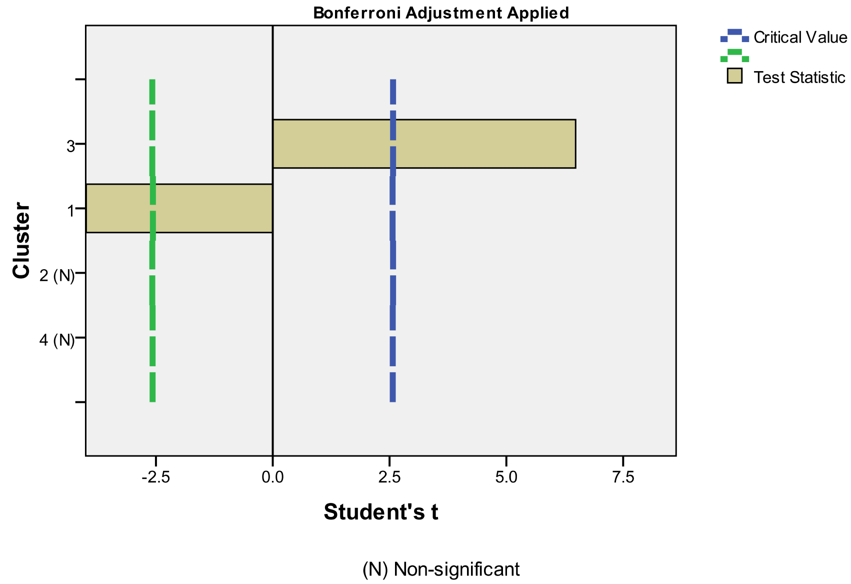


**Figure A2.12 –** The t-test value and significance for whether a map offered an oblique perspective laden with depth (e.g., Cluster 1) or relatively flat representations (Cluster 3).

## Emotive and Geometric Symbology

The type of symbology had an impact on Clusters 1 and 3. Maps in Cluster 1 were more likely to use emotive and mimetic symbols than those found in other groups. Maps in Cluster 3, on the other hand, were most likely to make heavy use of geometric symbology and not use any type of emotive symbols. Again, the type of symbology had no significant impact on whether a map was classified in Cluster 2 or 4.

| Cluster | Mean | Std. Deviation |
|---|---|---|
| 1 | 3.10 | 2.253 |
| 2 | 4.67 | 2.282 |
| 3 | 5.82 | 2.251 |
| 4 | 5.06 | 2.436 |
| **Combined** | 4.61 | 2.507 |

**Table A2.4 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had more emotive symbolization and higher scores more geometric.

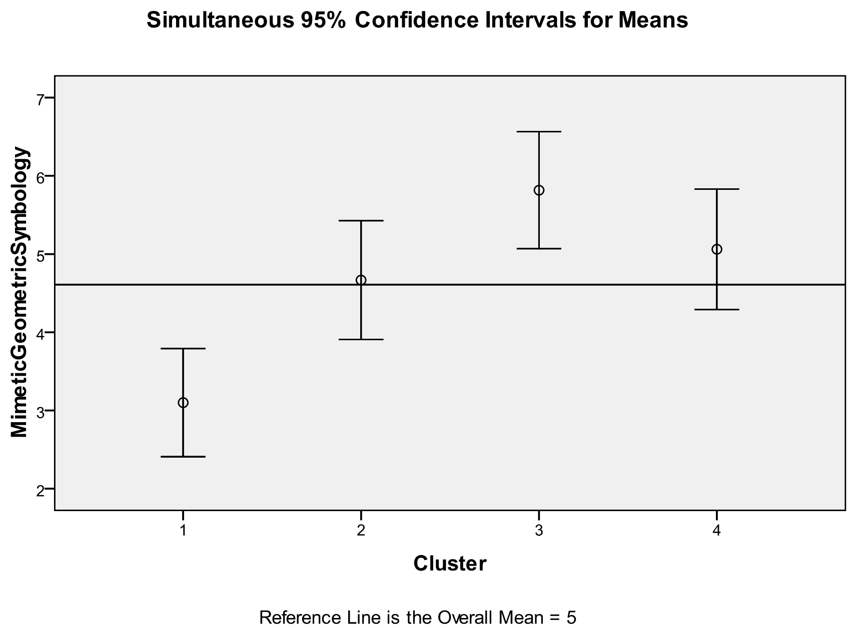


**Figure A2.13 –** Mean and standard deviation within the clusters.

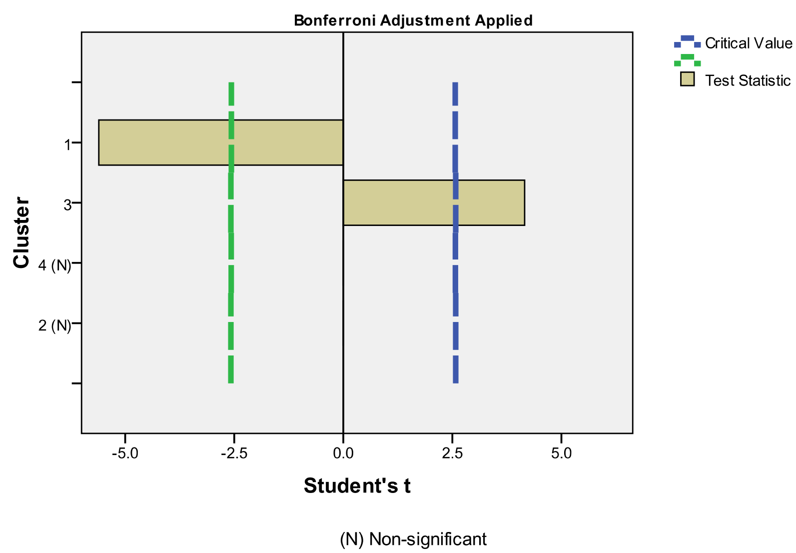


**Figure A2.14 –** The t-test value and significance for whether a map offered emotive and mimetic symbology (i.e., Cluster 1) or largely geometric symbology (i.e., Cluster 3).

## Dynamic and Stable Map Representation

Whether or not a map successfully visualized movement and spatial data change or instead attempted to portray its spatial data as static and/or permanent was significant in defining Clusters 1, 2, and 3. Maps in Cluster 1 and, particularly Cluster 2, were more likely to have dynamic characteristics that mimicked change and movement on the maps. Maps in Cluster 3 were far more likely to be static representations of data.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | 2.73 | 1.685 |
| 2 | 1.72 | 1.027 |
| 3 | 5.20 | 1.903 |
| 4 | 3.45 | 2.062 |
| Combined | 3.26 | 2.113 |

**Table A2.5 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had more dynamic representations, higher scores more static.

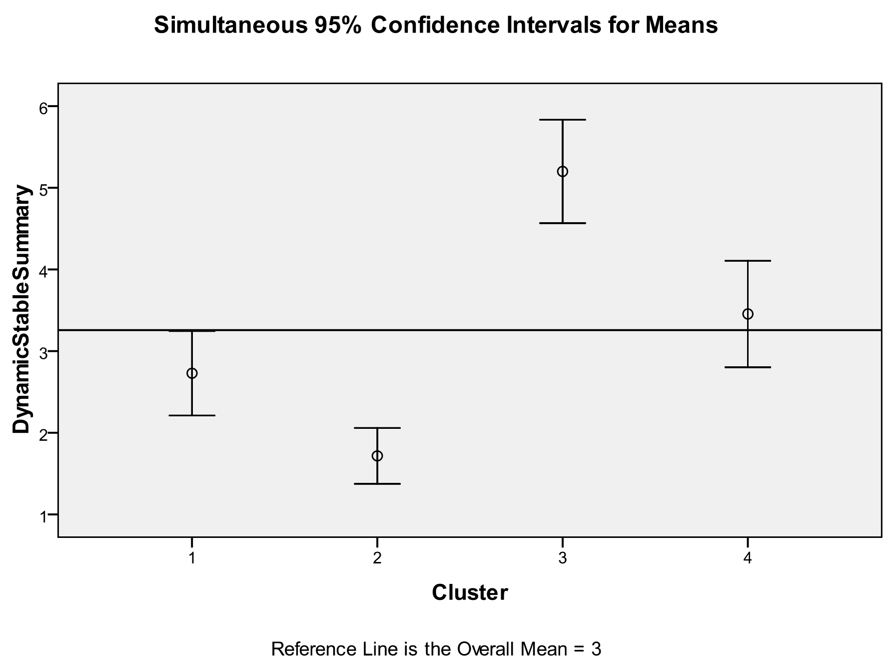


**Figure A2.15 –** Mean and the standard deviation ranges within the clusters.

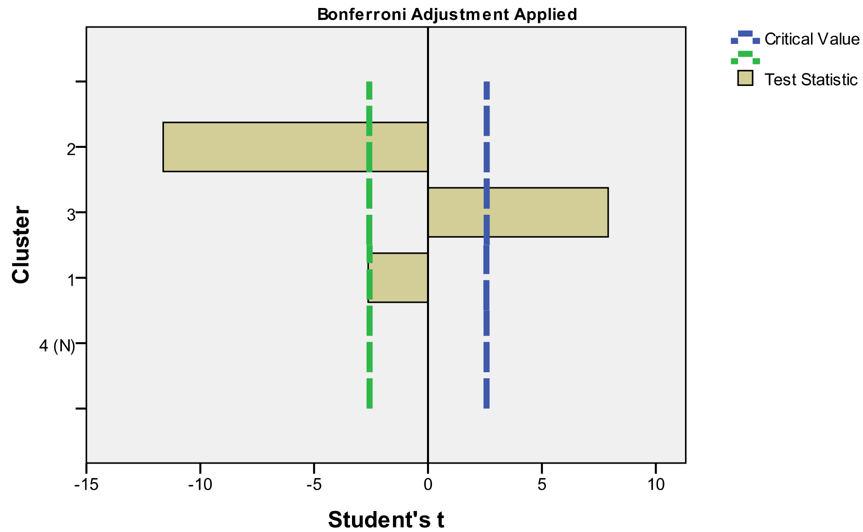


**Figure A2.16** – The t-test value and significance for whether a map offered dynamic (i.e., Clusters 1 and 2) or static visualization (i.e., Cluster 3).

### Hierarchical Accenting and Flattening

Only Cluster 4 was significantly defined by this variable, containing maps that were mostly flattened from a hierarchical standpoint – i.e., none of the visual hierarchies stood out from one another very much, making figure-ground more difficult to discern. Overall, the mean was quite low for this variable, meaning that more maps had accented hierarchies than not. The three other Clusters' means were at or below the combined mean, making Cluster 4 a bit of an outlier compared to them.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | 2.91 | 1.657 |
| 2 | 2.80 | 1.582 |
| 3 | 3.23 | 1.817 |
| 4 | 3.83 | 1.836 |
| Combined | 3.20 | 1.763 |

**Table A2.6** – The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had more accenting and higher scores less.

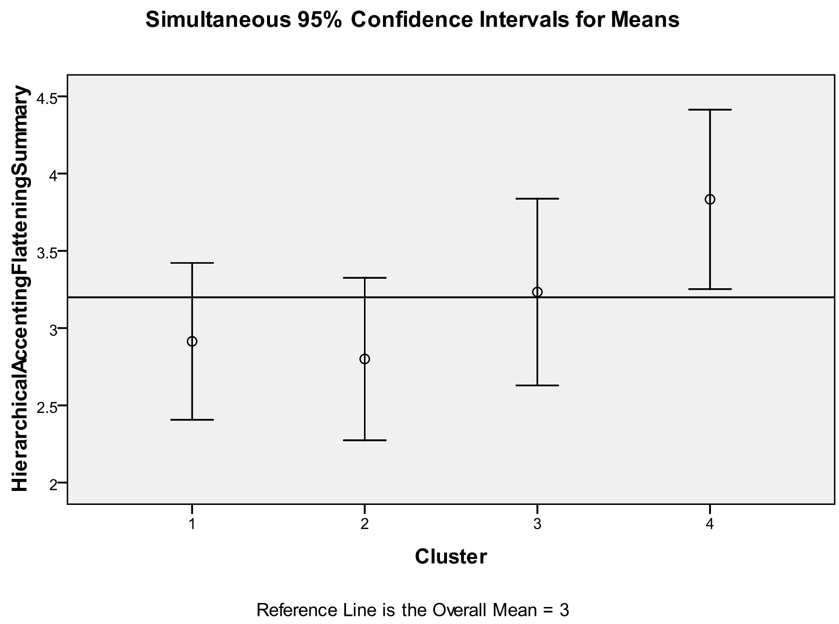


**Figure A2.17 –** Mean and the standard deviation ranges within the clusters.

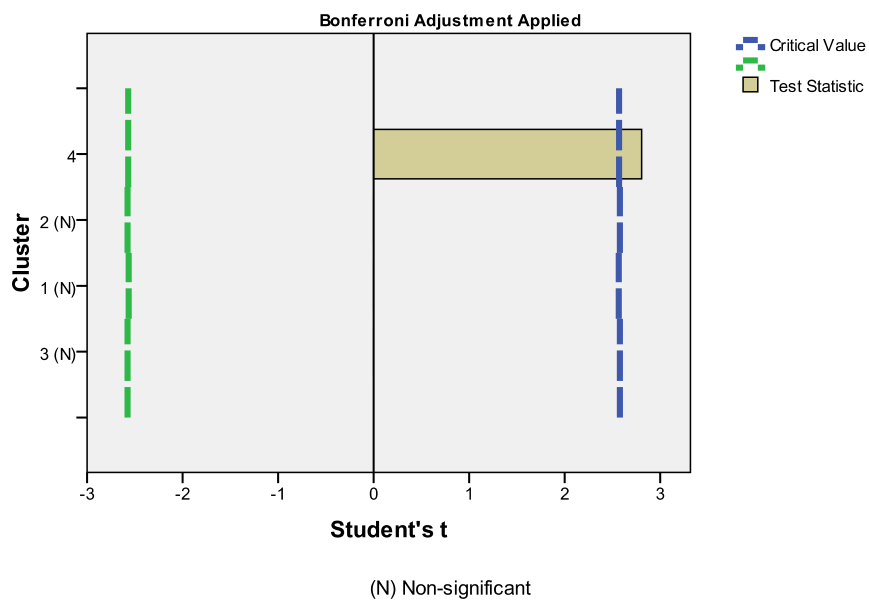


**Figure A2.18 –** The t-test value and significance for Cluster 4, which offered maps that were far more likely to have a flat visual hierarchy making it difficult to differentiate among figure-ground and the map elements.

## Embellished and Minimized Contrast

Maps in Cluster 2 were more likely to have higher levels of embellished contrast as compared to other clusters. Maps in Cluster 4 were more staid in their portrayal of data, having a higher rate of minimal contrast among map symbols. Overall, most maps used very slight embellishment among their map symbols, but the level of embellishment was not significant for Clusters 2 or 3.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | 3.00 | 1.659 |
| 2 | 2.55 | 1.281 |
| 3 | 3.17 | 1.879 |
| 4 | 3.89 | 1.656 |
| Combined | 3.16 | 1.696 |

**Table A2.7 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had more embellished contrast, higher scores minimized contrast.

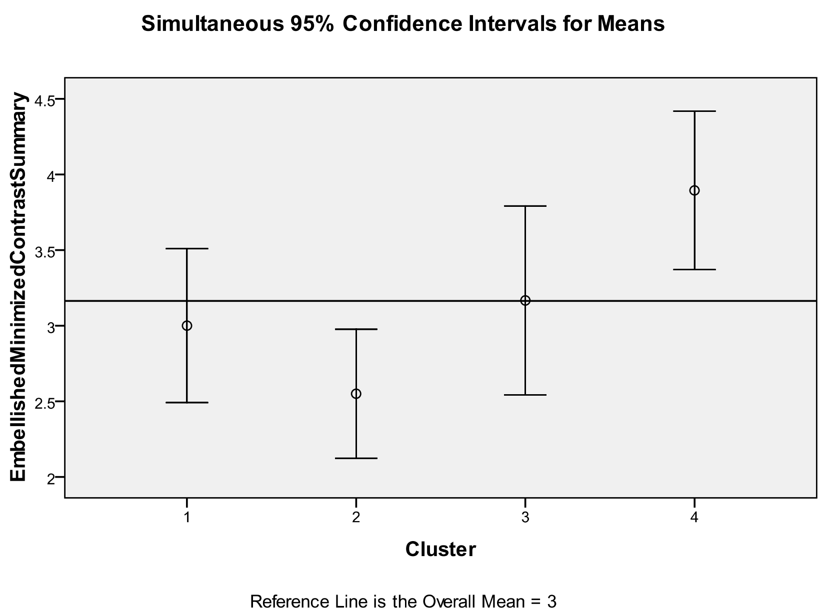


**Figure A2.19 –** Mean and the standard deviation ranges within the clusters.

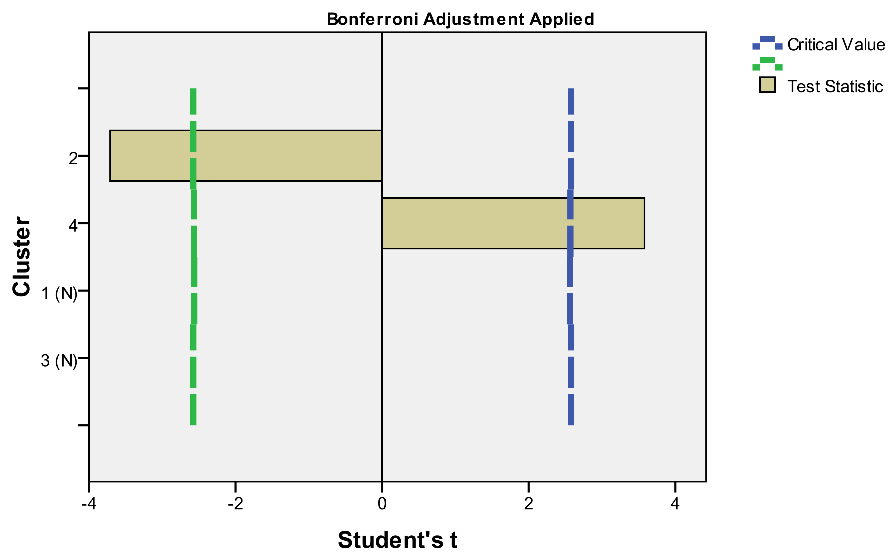


**Figure A2.20** – The t-test value and significance for whether a cluster was more likely to contain maps with embellished (Cluster 2) or minimized contrast among its symbols (Cluster 4).

## Level of Base Map Generalization and Specificity

Though base map generalization had a prominent role in the previous chapter, as it had significant relationships with many other variables, it had a relatively small impact on determining which cluster a map would wind up in. It was only a significant variable for Cluster 4. The base maps in this cluster were far more specific than they were in the other clusters.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | 4.70 | 1.973 |
| 2 | 4.32 | 1.855 |
| 3 | 4.72 | 1.748 |
| 4 | 3.76 | 1.857 |
| Combined | 4.37 | 1.895 |

**Table A2.8** – The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had detailed and specific base maps, whereas higher scores had more heavily generalized base maps.

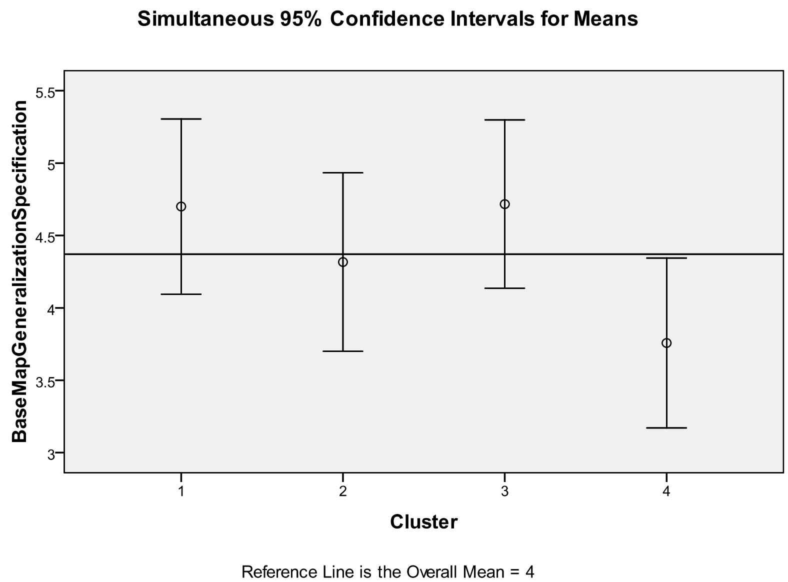


**Figure A2.21** – Mean and the standard deviation ranges within the clusters.

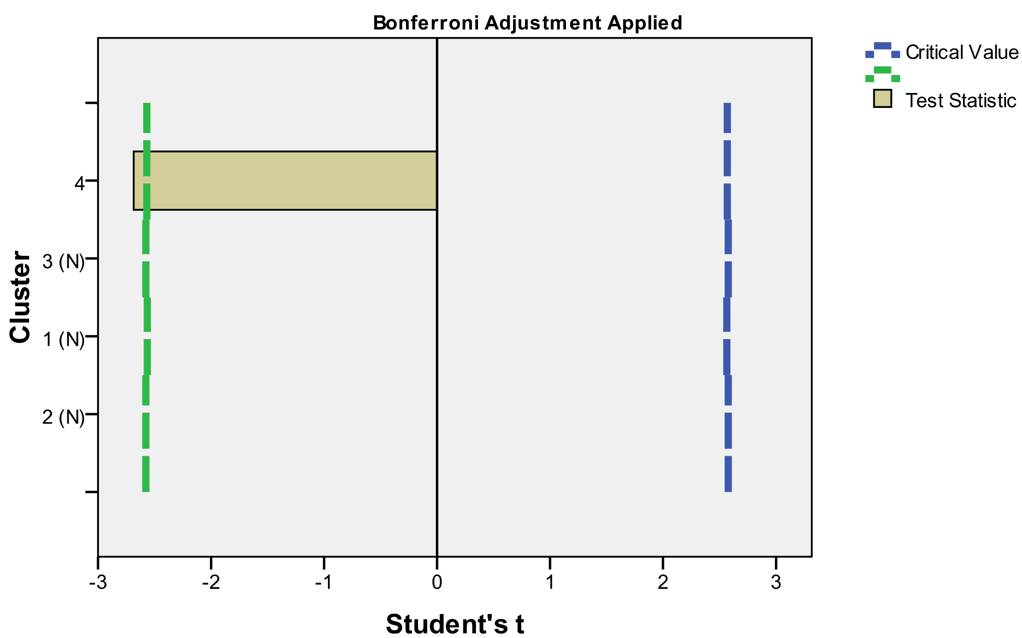


**Figure A2.22** – The t-test value and significance for whether a cluster was more likely to contain maps with very accurate and specific base maps or extremely generalized base maps. This variable was only significant for Cluster 4, which tended to have the most specific base maps.

### Level of Data Generalization and Specificity

Though tinkering with data generalization plays a large role in certain PCMs, aside from Cluster 4, which had maps with very specific data, it did not play a major role in determining which cluster a map would likely fall under. The data found on maps in Cluster 4 was far more specific than data found on maps in other clusters.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | 4.57 | 1.982 |
| 2 | 4.72 | 2.164 |
| 3 | 4.58 | 2.102 |
| 4 | 3.41 | 1.414 |
| Combined | 4.31 | 1.991 |

**Table A2.9 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had higher levels of detailed spatial data, higher scores had more generalized data.

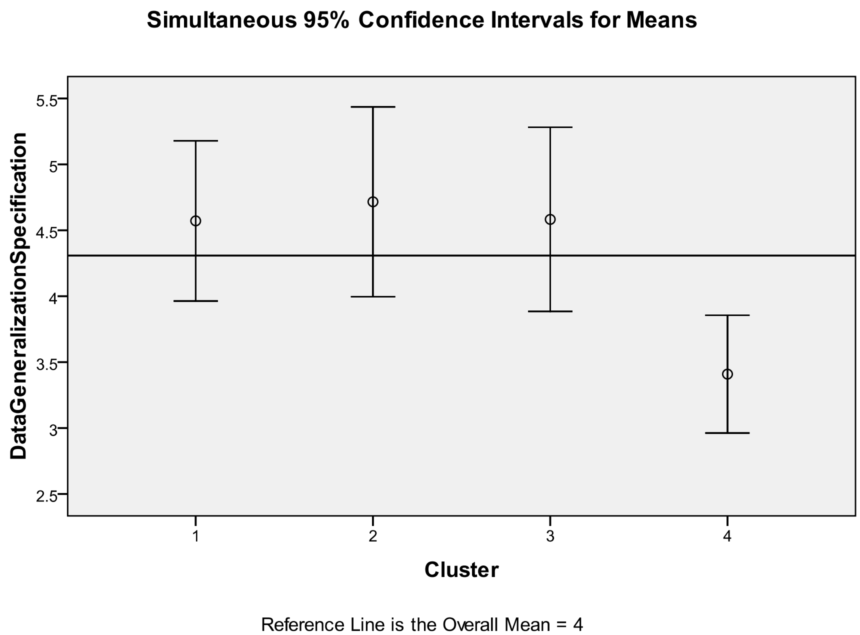


**Figure A2.23 –** Mean and the standard deviation ranges within the clusters.

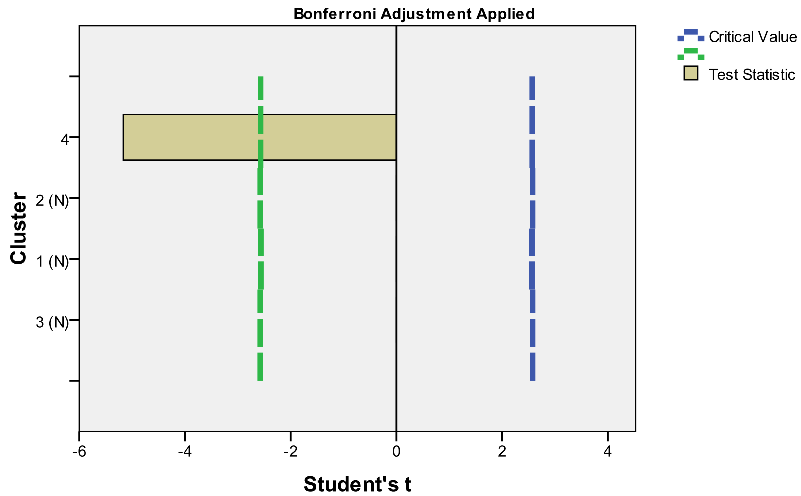


**Figure A2.24 –** The t-test value and significance for whether a cluster was more likely to contain maps visualizing detailed or generalized data. This variable was only significant for Cluster 4, which tended to have the most detailed data.

## Level of Invisible Manipulation

The amount of invisible manipulation found on a map had little impact on what cluster it would belong to unless it had very low levels. Cluster 4 had maps with less invisible manipulation than otherwise. For all of the other clusters, this variable was not a significant determinant.

| **Cluster** | Mean | Std. Deviation |
|---|---|---|
| 1 | .90 | .919 |
| 2 | 1.18 | .948 |
| 3 | 1.13 | .965 |
| 4 | .65 | .794 |
| Combined | .96 | .926 |

**Table A2.10 –** The mean scores and standard deviations of each cluster. The range of scores varied between 1 and 7. Lower scores had fewer types of invisible manipulation and higher more.

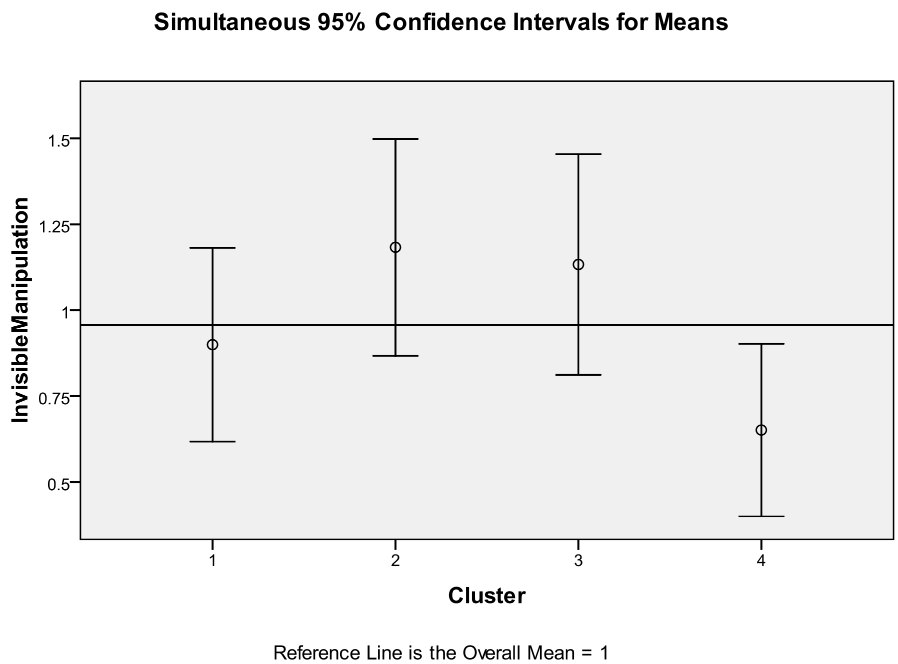


**Figure A2.25 –** Mean and the standard deviation ranges within the clusters.

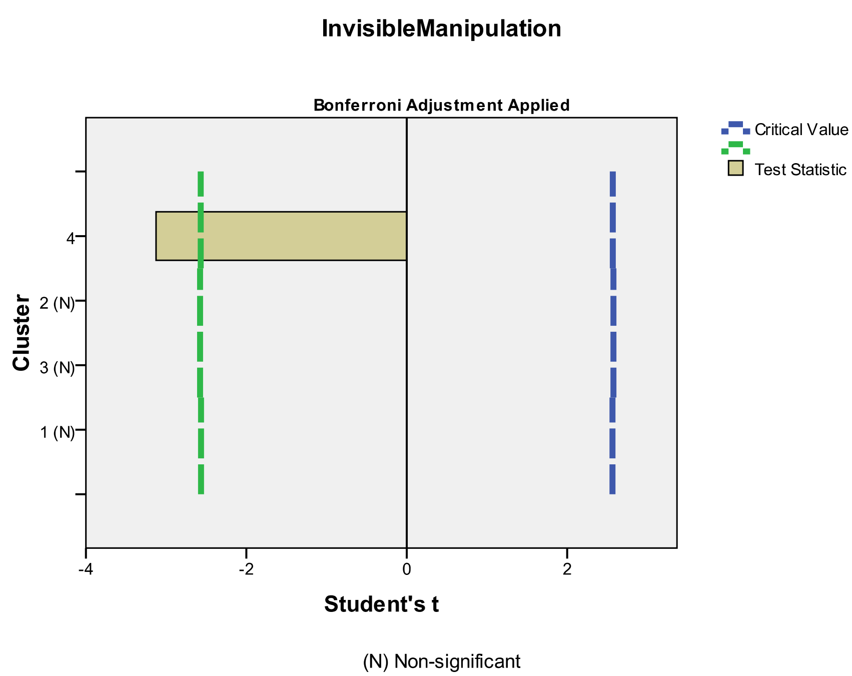


**Figure A2.26 –** The t-test value and significance for Cluster 4 shows that it had significantly lower levels of invisible manipulation than did the other clusters.