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Peterson, Natalie L. ***Revising Theory: A Universal Framework for the Comprehensive Editing of Technical Communications***

Abstract

Technical editing is an important process in the development of technical materials. Through an analysis of technical editing, two independent dichotomies are revealed: visual versus textual and specialized versus general. Previous editing systems have been practical and have included the Levels of Edit, a well-known system in the technical editing field. The Levels of Edit and similar systems were not developed to be a conceptual framework for thinking about editing, but rather a process to be used to edit technical manuscripts. Significant difference between different levels-of-edit systems were discovered through analysis. A universal, theoretical framework was developed that includes all tasks necessary to revise technical communication products. These tasks were classified by the different dichotomies and into different levels of editorial decision making. Different sources of editing tasks were found to be very incomplete. Using this framework, past editing systems were evaluated for completeness and potential bias. These editing systems were found to be biased towards textual editing tasks. Most editing systems were found to be biased towards general editing tasks.

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Chapter I: Introduction

The improvement of technical documentation through revision is an important process in the development of technical communication products. Not all of the tasks involved in revision have been considered historically as part of an editor's role; however, they are tasks that are part of the editorial process.

As technical editors tried to systematically improve the practice of editing, they developed editing systems using lists of editing tasks that they used to improve documents. The most recognized system, the Levels of Edit (Buehler, 1976; Van Buren & Buehler, 1980), was originally developed to manage expectations and resources for the Jet Propulsion Laboratory and was not designed to be a theoretical framework. The authors grouped editorial functions into nine categories: coordination, policy, integrity, screening, copy clarification, format, mechanical style, language, and substantive. They applied different combinations of these editorial groupings, called levels, to different documents based upon the purpose of the document, the intended audience, and time and budgetary constraints.

Other organizations have developed their own levels-of-edit systems based on the original Levels of Edit. These practical editing systems became a standard conceptual structure for thinking about editing, even as researchers noted significant limitations. The levels-of-edit systems previously developed were incomplete and tended to include tasks that focused on editing the text instead of visuals. These systems also focused on editing general components of the document, like correcting spelling, and not editing specialized components of the document, like improving technical accuracy.

Natural dichotomies between visual and verbal communication and between general and specialized communication have been recognized for a long time, and utilizing the dichotomies

to build a new theoretical framework for how technical communicators think about editing will reveal deeper insights into technical editing.

Statement of the Problem

Editing approaches in the past have been based on utilizing practical editing systems that include groupings of editing tasks to achieve results in an organization (Clements & Waite, 1983; Dressel & Prasad, 1989; Hobel & Urbach, 1988; Nadziejka, 1999; Van Buren & Buehler, 1980; Vetter, 1990). Because editing tasks can be completed through different practical approaches, different practical editing systems exist. These editing systems differ in basic attributes like the number of levels of editing tasks and how individual editing tasks' importance are weighted differently. Practical editing systems are specific to each person's or organization's needs and are arbitrarily developed through the experiences of that person or organization. A practical approach must be persuasive because it infuses values or judgments into choices. Because values will be different for each person or organization, practical approaches will be somewhat local or arbitrary. Because values can change through time, practical approaches are never permanent. Theoretical approaches uncover fundamental, universal truths by objective study of a subject. This objective approach to understanding a subject does not infuse values into choices and therefore is less biased.

Theoretical approach to editing. While practical editing approaches are valuable, fundamental truths about the primary skills needed in the editing process can only be uncovered through a theoretical approach. A theoretical approach may uncover an underlying structure for all the editing tasks that can be done to improve technical communications. By defining clear distinctions between the types of tasks that an editor does and the level of objectivity or subjectivity in the execution of the task, the framework should be free of individual bias. A

theoretical approach to technical editing may highlight symmetry between tasks in the visual or verbal areas of technical communication in documents.

It is not possible to create a theoretical structure by modifying a practical one, but practical systems can be improved through a better theoretical understanding. According to Adler and Van Doren (1972), “to make knowledge practical, we must convert it into rules of operation.” (p. 66). There is no way to move backwards in that method without completely undoing all the interpretation that went into creating the rules of that operation and going back to the original data. Therefore, it is best to find editing tasks in a variety of practical editing sources, remove from them their value-infused importance, and organize them in an objective manner.

Purpose of the Study

The purpose of this study is to develop a theoretical, universal framework for comprehensive editing that sorts editing tasks in an objective way into categories defined by important, natural dichotomies in technical communication. The purpose is also to analyze the levels-of-edit systems with this new framework to determine how thorough the different structures are and to determine any bias in their construction. Four questions will be answered through this research:

1. How much variation exists between different levels-of-edit systems?
2. How complete are the sources from which editing tasks were obtained, including the different levels-of-edit systems?
3. Are the sources from which editing tasks were obtained balanced between technical and non-technical tasks?
4. Are the sources from which editing tasks were obtained balanced between visual and textual tasks?

Definition of Terms

These are the terms that need defining.

Editing task. Editing tasks are the specific methods of improving a technical communication product. The tasks in this study have been structured to be in declarative statements. They include revision processes that may be more traditionally associated with different job titles.

The Levels of Edit. The use of this phrase with capital letters specifically refers to the second edition of the Jet Propulsion Laboratory (JPL) Levels of Edit by Van Buren and Buehler (1980).

A levels-of-edit system. The use of this phrase, with lower case letters and hyphenation, refers to any system of accomplishing practical editing tasks that traces its origin to the Levels of Edit. It is often shortened to system.

Non-technical communication. Non-technical communication requires general knowledge that is common across all communication fields. It includes basic literary, layout, and graphical editing. The terms *non-technical*, *literary, general, language,* and *linguistic* have equivalent meaning in the various sources cited and are sometimes used equivalently in this research study.

Technical communication. Technical communication requires specialized knowledge in a particular subject area. Technical information need not be restricted to scientific, business, or engineering fields, but in any field that has unique terminology or processes. The terms *technical, specialized, subject-specific, scientific, subject-matter,* and *content* also have equivalent meaning in the various sources cited and are sometimes used equivalently in this research study.

Technical editing. Technical editing is the suggestion of improvements to a document or other communication product to help an author increase the effectiveness and efficiency of the transmission of information in a specialized subject to the author's intended audience.

Textual communication. Textual communication expresses ideas using words and sentences. Components of textual communication include grammar, logic, and rhetoric. The terms *textual, verbal, language, prose,* and *writing* have equivalent meaning in the various sources cited and are sometimes used equivalently in this research study.

Visual communication. Visual communication expresses ideas without using words and sentences. Components of visual communication include the display of data in graphical or tabular form, the design of documents to provide structure, and the selection of typographic and graphic style. The terms *visual, non-textual, non-verbal, graphic, visuospatially,* and *design* have equivalent meaning in the various sources cited and are sometimes used equivalently in this research study.

Visuals. Visuals, or graphics, are used as nouns as general placeholders for graphics, maps, illustrations, charts, diagrams, sketches, infographics, pictograms, photographs, and other visualizations of data or information.

Limitations of the Study

This study relies on editorial tasks located in an exhaustive literature search without adding any additional tasks. There was some subjective decision making when determining which activities from different sources represented the same editing task. There was also some subjective decision making in determining which activities in the literature were not related to improving documents.

Methodology

The methodology chapter, chapter three, describes in detail the processes by which the data (editorial tasks) were selected, sorted, and analyzed. The chapter explains the methods by which activities were selected from literature sources, grouped into common tasks, and written in a common format. It includes the specific, objective questions that are necessary in a universal framework so that each task can belong in only one grouping. Because this is a theoretical or universal framework, the divisions of tasks must be intrinsic and objective (practical editing systems group tasks functionally or subjectively). For every editorial task, three basic, independent determinations about the task's fundamental, intrinsic nature are made:

1. The nature of the edit or revision is textual (verbal) or non-textual (visual).
2. The nature of the edit or revision is technical (specialized, content, subject-specific) or non-technical (literary, general).
3. The nature of the edit or revision is at one of three levels of decision making: rule-based, maxim-based, and discretionary.

These three determinations were made by answering specific questions, which are detailed in chapter three.

Once the tasks were sorted, the sources from the literature used to find the editorial tasks were analyzed for their completeness and bias when compared to the new, universal framework, as fully described in the methodology chapter.

Chapter II: Literature Review

The literature review explores how technical editing involves the revision of technical content and the non-technical aspects of the document, how the increasing role of visual communication in technical communication necessitates revision of the visual components of a document, and how different editing tasks require different levels of decision making. It then explores how the definition of technical editing given in the previous chapter is a natural extension of previously published work. Finally, it describes the Jet Propulsion Laboratory (JPL) Levels of Edit system as a practical tool for accomplishing a specific function (time and resource management), explains how it became the basis for other practical systems and a non-universal framework for discussing editing, and notes the criticisms that have been identified by other authors.

Editors Need General Language and Specialized Subject-Matter Knowledge

The need for technical editors to have knowledge and experience inside the technical field was recognized in the nineteenth century when disseminating results from scientific expeditions (Thompson, 2015). Before the Levels of Edit were developed and published, authors advocated that editing required literary and technical skills (Boomhower, 1975; Speers, 1962; Wall, 1953). Boomhower (1975) even felt that the two skills might be sufficiently diverse that it might require two people to complete the editing tasks. Wall (1953) stated, “Technical editing calls for a combination of abilities based on knowledge of both the technical aspects of the given subject and the mechanics of correct writing (p. 517)”. Speers (1962) noted that “people who had the necessary degree of technical training for this kind of work lacked sufficient facility with the language” (p. 162) and that proficient language users “were short-suited in technical training and ability” (p. 162) but that with training either type could do the job. In 1967, Cox found the

similar trend that technical editors were often either "scientists who can write well or English majors with a strong science background" (Cox, 1975, p. 7), implying both skills were very important. This dual background for technical communication was also noticed by Wymer (1981), who recognized that technical writing is accomplished by technical specialists or professional communicators, either people who have knowledge in the subject field or in the writing field. Others noted that there is a fundamental difference between the technical and the writing or editing skill sets (Dillingham, 1981), and that technical and non-technical people can have different skills (Ferrill, 1981). Farkas (1984) found that a general editor "may not fully understand the subject matter of the document and therefore may make changes that distort the writer's meaning" (p. 5), and that because editing technical content requires technical knowledge, generalist editors could learn the necessary technical knowledge to serve as a technical editor in a specific area. Zook (1985) found "the technical editor must learn how to work with technical material" (p. 4).

Technical editing requires competence in science or technology (Collins & Jones, 1958; Dukes, 1973). Dukes stated "In addition to the usual linguistic, literary, and other professional training required for general editing, technical editing demands competence in science or technology" (p. 14). Editors without sufficient expertise in the technical subject area were advised that they would need to work closely with a subject-matter expert to fully improve technical communication (Zook, 1981). With the widespread adoption of the Levels of Edit, the literary versus technical editing framework was largely ignored and disappeared from the literature, even though the need for subject-specific knowledge was included in discussions of editing. It was found that technical knowledge is needed to successfully edit technical documents (Cheney & Schleicher, 1984), that technical communicators must master technical and language

skills (Allen, 1993), and that editing for technical accuracy and mechanical/format are different steps in editing documents (Grove, 1994). Bush has been a longtime advocate for the idea that editing the content is different than editing the language of a document (Bush, 1981, 2000a, 2000b; Bush & Campbell, 1995).

There are several reasons why editors must have technical and language skills. Technical editors need familiarity with scientific tools and methods in order to effectively and accurately help an author describe them (Ferrill, 1981; Kantrowitz, 1985). Words can have different meanings in specific technical fields (Ferrill, 1981; Graves & Graves, 1998; Killingsworth & Jones, 1989; Mancuso, 1985; Ransone, 1981; Sawyer, 1983). Each technical field can have its own conventions and language (Barnum, 1981; Clements, 1975; Meloncon, 2013; Sawyer, 1983; Stepanova, 2015; Zook, 1985). Professionals in the field of technical communication have recognized that different technical fields have different writing formats and rules (Lanier, 2009). Technical writing often involves reporting, evaluation, and interpretation of data (Barnum, 1981; Cortelyou & Jones, 1958). Calculations and mathematics are also often a part of technical communication (Clements & Waite, 1979; Woodward, 1995). Philbin (1985a) noted that mathematical and statistical usage has been established by formal rules and traditions that can pose problems to editors with stronger training in the use of language but weaker backgrounds in mathematics. Even selecting proper graphs can require technical knowledge of the field (Connatser, 2012; Hutto, 2008; Kosslyn, 1994).

The unique qualities of technical language had been recognized in the field of translations by the 1970s. Translators recognized that technical words and phrases can have different and specific meanings that are more restricted than the same words in non-technical contexts and that translation errors for technical terminology represent the highest error rates of non-personal

preference translation errors (Cunningham, 1971). Technical language is more nuanced and can change from field to field: editors need to understand the differences.

Technical communication professionals have recognized that technical language usage varies by field. Soderston (1985) noted the importance of utilizing reviews of technical documents by subject-matter experts as a demonstration of the need for subject-specific knowledge while revising technical documents. Editors' knowledge of the technical field being communicated helps keep the technical information accurate. Barnum (1981) noted that a teacher without experience or skill with technical information impairs the ability to teach technical communication. Technical communication employers expect that technical communicators have both general experience and writing experience in the specific technical fields for which they will be working (Lanier, 2009), and others have stressed the importance of subject-specific knowledge for effective editing (Cerejo & Rajan, 2012).

It is the role of the technical communicator to know that visuals convey important technical information, and that different audiences may need the visuals to be formatted differently, even when they both may be highly technical audiences (Hutto, 2008). Data visuals that may have sufficient detail for one audience may not be sufficient for another because the second audience can have different technical knowledge, conventions, and assumptions. Even related fields may need different visuals.

Technical Communication is both Textual and Visual

Technical communication has become more visual, and the writing process has evolved into document creation. Visual organization of documents and the inclusion of data visualizations represent parts of documents that can be improved, and therefore edited.

Technical editing grew out of copy editing (Speers, 1962; Wall, 1953), and historically editing has been considered verbal based (Cortelyou & Jones, 1958; Osborne, 1981). The growth of technical communication and technical communication programs started from a verbal background and approach. Technical writing programs grew from English departments and English faculty and still have a verbal approach (Cheney & Schleicher, 1984; Meese & Wahlstrom, 1988; Sawyer, 1983). Technical communication courses often have been taught by teachers with English backgrounds, not design (Brillhart & Debs, 1981). The lack of a teacher's skill with graphics can impair the ability to teach technical communication (Barnum, 1981). Technical communication programs have started to add visual coursework, but they are still heavily focused on textual communication (Whiteside, 2003). As a consequence of development from the verbal approach (Barnum, 1981; Thralls, 1980), visuals have often been seen as secondary components to technical documents (Barton & Barton, 1985; D. E. Zimmerman, 1985).

Illustrations have been present in books since the fifteenth century (Spurgeon, 1981), and since the eighteenth century there has been a massive expansion of the graphic display of quantitative information (Tufte, 2001). Documents were less reliant on visual components in the past (Langendorf, 1991), but visuals are increasingly common in technical communication (Barton & Barton, 1985), and the usage of graphs in technical documents continues to grow (Kostelnick, 2008; Spurgeon, 1981). Because of the critical role of visual communication in the way people process and understand information, technical communication has more strongly emphasized visual components of communication from the writing or producing standpoint (Brumberger, 2007b). Allen (1993) found that words and images are both components of communication, and that technical communication involves both visual and language skills.

Visual and verbal communication need to be considered as equal components (Kostelnick, 1989; Rosner, 2001). Kellner (1985) noted that "being able to work with the visual text is as important… as being able to work with words" (p. 108).

Bayer (1991) recognized that "the scientific community has begun to appreciate that thinking and communicating visually can facilitate their work" (p. 223). Ruhl (2008) points out that "it is now necessary to create and execute complex information strategies involving both visual and verbal elements" (p. 1). Visual and verbal components of text should complement each other (Brownlee & Kirtz, 1981; Killingsworth & Sanders, 1990) to deliver information. The manipulation of those components, visual literacy, assumes that visual forms can utilize a type of syntax that parallels verbal forms of communication (Gribbons, 1991). Needs for greater visual language skills have been recognized in technical communication (Dayton & Bernhardt, 2004; Kostelnick, 1988; Lanier, 2009; Lauer & Sanchez, 2011; Northcut & Brumberger, 2010; Portewig, 2004), even if they have not been strongly incorporated into technical editing discussions. To improve the entire document, both types of literacy must be improved and, therefore, must be edited (Collins & Jones, 1958). Visual content editing must be as comprehensive as visual content creation in order to produce technical documents.

Visual aspects of documents were recognized as important early in the development of technical communication (Wall, 1953), and the assessment of visuals is an important editorial task (Dukes, 1973; Murphy, 1989; Zook, 1995). Improving visuals as part of the editorial processes was once advocated (Amsden, 1980, 1982; Dukes, 1989).

Benson (1985) observed that document design and writing have merged into a single task in many cases. Document design has become more a part of what the technical writer or content

creator accomplishes (Brumberger, 2007a; Kostelnick, 1996), in part because the tools that are used to design documents are more readily available (Kostelnick, 1996).

Well-designed documents allow the readers to understand content more efficiently and effectively (Barton & Barton, 1987, 1989; Benson, 1985; Bernhardt, 1986; Kostelnick, 1988, 1994; Kumpf, 2000; Schriver, 1993). Visual aspects of the document can impart meaning beyond the words themselves, and document design has important verbal and visual aspects that impart meaning from the author to the reader (Kostelnick, 1996). Typography, as a visual element, can aid comprehension (Brumberger, 2004) and influence readers' emotions and perceptions about a document (Brumberger, 2003; Mackiewicz, 2004).

Non-textual aspects of technical documents include tables, photographs, illustrations, and graphs (P. V. Anderson, 2011; Spurgeon, 1981; Tarutz, 1992). All are useful ways to efficiently convey complex data to the audience (Brownlee & Kirtz, 1981; Spurgeon, 1981), and visualization of data aids in its interpretation (Adler & Van Doren, 1972; Alley & Neeley, 2005; Andrews, 1985; Benson, 1985; Brownlee & Kirtz, 1981; Colet & Aaronson, 1995; Langendorf, 1991; Tufte, 2001; Wainer, 1992). Information graphics (infographics) can reduce complex data into easier to interpret segments in ways that can be independent of text (Liu & Hao, 2010). Editing equations, tables, graphs, and illustrations have been a part of editing technical documents in order to make them more effective (Clements & Waite, 1979; Peterson, 1999). Making tables more focused and better formatted was a part of the editorial process in the past (Barnow, 1982; Cortelyou, 1958; Dukes, 1989).

Visual language must be checked for accuracy, usability, and efficiency. This should be part of the editorial process. The visual language, and the rules that govern it, needs to be understood and applied. The editor's role to advocate for the transmission of the message means

visual edits should be important. Lauer and Sanchez (2011) found that not all students in technical communication have equal native ability to think visuospatially. This difference in ability extends beyond the classroom to practitioners. The editing of visuals is necessary because many creators of visuals are not very good at doing so (Barton & Barton, 1989).

In addition to utilizing conventions to improve visuals in non-technical ways, the editor must know that graphics (Kosslyn, 1994; Reavy, 2003) and cartographics (Monmonier, 1996; Propen, 2007) can be deceptive (either intentionally or unintentionally) and should be reviewed the same way that textual components of a document are reviewed. Unnecessarily complex graphs can distort meaning (Huff & Geis, 1954; Spurgeon, 1981; Tankard, 1987). Like word choice in the verbal realm, conciseness and the emphasis of function over flamboyance should be a part of the editor's job because simple designs can be more effective (Barton & Barton, 1987). Visuals are not always created to serve the communication purpose best (Barton & Barton, 1985). Often this can happen when selecting default options for plotting programs (P. V. Anderson, 2011; Kostelnick, 2008; Monmonier, 1996; Tufte, 2001). It can also happen when choosing trendy plotting options (Connatser, 2012; Monmonier, 1996; Tufte, 2001).

Sometimes visual representations can compete with or even contradict the written message. Some editors have explained the importance of editing visuals and text together in order to find discrepancies (Clements & Waite, 1983; Smith, 1987). Nadziejka (1999) explained the importance of making sure the visuals supported the text.

Editing is a Decision-Making Process

Dukes (1973) argued that editing is fundamentally a decision-making process. Editors must do more than follow rules to improve technical documents (Bush, 1979; Cheney & Schleicher, 1984; Putnam, 1985). Simons (1980) explained that explicit improvements, like

following a style guide, and implicit improvements, those which require knowledge of how to improve non-rule based errors, are important aspects of editing. Lower-level skills and language edits are often less technical and more objective (Ramey, 1985). Editors with more experience better understand how to recommend complex changes to documents (Hayes, 1989). Editors' overreliance on rigid rules fails to take into account the complexities of language, and editors must master the intelligent application of rules (Bush, 2000a).

Editing involves a variety of objective and subjective activities (Buehler, 1986; Bush, 1986; Dukes, 1986; Gerich, 1994; Lutz, 1986; Zook, 1986). Lutz (1986) found that most tasks fell along a spectrum from simple, rule-based choices to complex ethical questions that needed experience and knowledge in a specific technical field. Some editorial tasks involve the application of rules or maxims, and some require experience and judgement (Haugen, 1991). Haugen identified rule-based, maxim-based, and intentional diagnoses types of editorial changes. She defined rule-based edits as the lowest level of complexity where the violation of the rule leaves only one solution. She defined maxim-based edits as a moderate level of complexity where the violation of the rule has multiple solutions. She defined the intentional diagnoses as the highest level of complexity where the problem is not a violation of the rule and its solution is not obvious. Ramey (1985) also separated editing tasks into three levels of decision-making. The lowest, corrective edits, were similar to rule-based edits. The middle, interpretive edits, include what Haugen called maxim-based and intentional diagnoses edits. Ramey's highest edits, preferential, were style changes preferred by the editor and would represent some of the intentional diagnoses in Haugen.

The level of decision-making is a measure of skill and experience in an aptitude area. Some of the more advanced edits require more advanced training and exposure (Speck, 1991).

Greater experience in editing, both for content and general language skills, leads to better editing (Hayes, 1989).

The Definition of Technical Editing

For this research, a new definition was developed. It keeps some parts of earlier definitions, but is more inclusive of all forms of communication. This definition combines prior ideas and is more applicable to the changes in the practices of technical communication:

> Technical editing is the suggestion of improvements to a document or other communication product to help an author increase the effectiveness and efficiency of the transmission of information in a specialized subject to the author's intended audience.

This definition describes the general mechanism of providing help to the author—making suggestions—as in Tarutz (1992). Like the definitions of Grove (1990) and Masse (1985), the definition emphasizes that the role of the editor is to help the author to achieve the author's purpose. The definition includes the objective of improving the effectiveness of the communication, as was important in Bennett (1970), Buehler (1981), Grove (1994), Masse (1985), Van Buren and Buehler (1980), and Zook (1983). Like the definitions of Bush and Campbell (1995), Van Buren and Buehler (1980), and Zook (1983, 1985), the definition includes a requirement that the information be of a specialized (technical) subject. Finally, the editor must help the author focus the message to the audience the author intended, as in Boomhower (1975), Bush and Campbell (1995), Murphy (2010), Wall (1953), and Zook (1976, 1983).

Unlike Boomhower (1975), Bush and Campbell (1995), Wall (1953), or Zook (1975), the definition uses audience instead of reader to make it more clear that textual communication is not more important than visual communication. Likewise, it avoids the words "writing" and

"manuscript" that are present in the definitions of Bennett (1970), Boomhower (1975), Bush and Campbell (1995), Van Buren and Buehler (1980), Woodward (1995), and Zook (1983) for the same purpose. Previous definitions focused much more on textual aspects of editing. In the early 1980s, the definition of technical editing did not include visuals (Barton & Barton, 1981). Some authors have even considered visuals as graphic aids, a term that can make them seem secondary to words (Spurgeon, 1981; Weil, 1958). Previous definitions have also stressed engineering, business, and sciences as the technical fields (Blickle & Passe, 1963; Mills & Walter, 1978), but the definition of technical editing grows as "the continuing trend toward specialization … [leads to] a continued growth of technical terminology … [that] will draw more non-technical people into technical areas" (Dulek, 1981, p. 156) and increase the number of fields that can be considered technical.

The definition of technical editing developed for this research grew from previous definitions of technical editing. It might be useful to compare it to ideas about technical communication generally, which has grown to better recognize the visual components of communication. Technical communication has been defined as "the art and science of making complex technical information accessible, usable, and relevant to a variety of people … [requiring] clear writing and good visual design" (Gurak & Lannon, 2007, p. 4). Portewig (2004) found that "technical communicators … integrate visuals into materials to assist in effectively communicating messages" (p. 32). Indeed, the importance of visual communication as a component of technical communication has been widely reported (Brumberger, 2007b; Dayton & Bernhardt, 2004; Kostelnick, 1989; Lanier, 2009; Lauer & Sanchez, 2011; Northcut & Brumberger, 2010; Rosner, 2001; Waller, 2012). An editing framework needs to incorporate

visual revision, but it often does not (Kellner, 1985). Previous editing systems that do mention visual revision do not treat it as equal to textual revision.

It is important to note that revisions of visual information and formatting choices were made in the past, but those tasks were accomplished often in different departments like "art," "technical illustration," and "production" (Smith, 1987; Tarutz, 1990). These different divisions (Jenks & Huntsman, 1958; Killingsworth & Jones, 1989) did not mean that the revisions were less necessary in the past, but that technical communication was very strongly verbal-centric (Barnum, 1981; Barton & Barton, 1981; Brillhart & Debs, 1981). Expectations were often that editors would participate in the visual revision process by giving instructions to technical illustrators (Clements & Waite, 1983), graphic artists (Tarutz, 1992), and layout specialists (Dukay, Locke, & Tyrone, 1992). Because of electronic publishing and other computer tools, the scope of work for technical communicators has changed (Vetter, 1990), and visual and verbal forms of communication are merging (Benson, 1985).

The Levels of Edit

The Levels of Edit framework allowed an organization to enforce minimum standards for its authors and for authors and editors to become more explicit with their editing needs (Grove, 1990; Van Buren & Buehler, 1980). It was originally developed to manage expectations and resources for the Jet Propulsion Laboratory. The authors grouped editorial functions into nine categories: coordination, policy, integrity, screening, copy clarification, format, mechanical style, language, and substantive. They applied different combinations of these editorial groupings, called levels, to different documents based upon the purpose of the document, the intended audience, and time and budgetary constraints. The minimum level of edit, level five, included coordination and policy edits. The next level of edit, level four, added integrity and screening

edits. The middle level of edit, level three, added copy clarification and format edits. The next level of edit, level two, added mechanical style and language edits. The final level of edit, level one, includes all nine groups.

The Levels of Edit was also useful as a pricing scheme (Buehler, 1988; Haugen, 1991; Kantrowitz, 1985; Murphy, 1989; Parrott & Poore, 1989). Because the Levels of Edit was so effective as a tool for managing editing groups, the Levels of Edit system was adopted for use in other organizations (Dressel & Prasad, 1989; Hobel & Urbach, 1988; Parrott & Poore, 1989; Prono, DeLanoy, Deupree, Skiby, & Thompson, 1998).

The Levels of Edit was never intended to be a theoretical or rhetorical framework (Buehler, 2003). Because it was useful in managing editorial departments, it was never challenged when practitioners adopted the Levels of Edit as a framework for thinking about editing. Because the Levels of Edit was designed first to meet minimum NASA standards, some of the tasks were grouped in ways that do not lend themselves for use by other organizations (Masse, 1985).

The Levels of Edit continues to be used as a strong foundation for editing both in the literature (S. L. Anderson, Campbell, Hindle, Price, & Scasny, 1998; Cathcart, 1983; Murphy, 2010; Rude, 2010; Soderston, 1985; Weber, 2010) and in textbooks (Tarutz, 1992), even though the authors of the Levels of Edit recognized that it was being used in ways that it was not intended to be used (Buehler, 1981).

The Levels of Edit focuses mainly on rule-based editorial changes (Haugen, 1991; Nadziejka, 1994; Speck, 1991). Haugen (1991) noted, “the great majority of the tasks [Van Buren and Buehler] describe are rule based (p. 60).” Many improvements to writing will not be rule-based edits. The ability to suggest or impose changes to the text are an important part of

what Speck (1991) defined as editorial authority. Speck (1991) noted that the Levels of Edit framework did not sufficiently explain the editing process in terms of authority.

Not only does rule-based editing fail to improve the language sufficiently, it makes it very difficult to improve content. Limitations to the Levels of Edit system have been noted, including that it lacks appropriate structure for editing technical content (Corbin, Moell, & Boyd, 2002). A limitation to the Levels of Edit is that all content review is only part of the final, most comprehensive editing tasks (Nadziejka, 1994). Nadziejka (1994) pointed out that leaving content review for the highest editing process prevents editors from fully editing the text until the end when it is more difficult to make major changes. Technical content editing often requires more decision-based editing, and so content editing is harder to accomplish with a primarily rule-based system. Nadziejka (1995) argued that editors should emphasize content and accuracy editing first to produce higher-quality documents, and the Levels of Edit does not revise content as part of early revisions. Brouns and Grove (1988) also described the benefits of content editing before grammar editing. Technical fields have different rules to follow, and only the most general rules are a part of the Levels of Edit system. Even while adopting the Levels of Edit system for their organization, Hobel and Urbach (1988) noted that even their highest level, called Comprehensive, “does not include a review for technical accuracy” (p. WE-38). While developing the Levels of Technical Editing, Nadziejka (1999) tried to incorporate additional technical content editing.

Also, the Levels of Edit system does very little for incorporating edits to the visual components of a document. The Levels of Edit includes some formatting editorial tasks and limited graphical editorial tasks, including checking to make sure photographs are oriented correctly for inclusion into the document.

Chapter III: Methodology

This chapter will explain the procedures for collecting data, categorizing them, and analyzing them.

Data Collection Procedures

In this research study, a list of activities or tasks that are a part of the editing of technical documents and the revising of visual elements of a document was compiled from 59 sources. Unlike textual edits, visual edits are not always found in editing sources. To find tasks to describe the revision or editing of visuals, some sources were identified that focused on creating graphics elements instead of editing them. Editing and revision tasks were identified in:

- Four textbooks (P. V. Anderson, 2011; Bush & Campbell, 1995; Lannon & Gurak, 2014; Tarutz, 1992),
- Seven non-textbook books (Doumont, 2009; Felici, 2003; Huff & Geis, 1954; Kosslyn, 1994; Monmonier, 1996; Schriver, 1997; Tufte, 2001),
- Seven editing guides developed for organizations (Clements & Waite, 1983; Dressel & Prasad, 1989; Hobel & Urbach, 1988; Nadziejka, 1999; Peterson, 1999; Prono et al., 1998; Van Buren & Buehler, 1980),
- Fourteen chapters in major technical editing compendia (Brillhart & Debs, 1981; Cochran, Albrecht, & Green, 1989; Cortelyou, 1958; Dukes, 1986; Farkas, 1985; Jenks & Huntsman, 1958; Losano, 1985; Philbin, 1985a, 1985b; Plunka, 1988; Sadowski, 1987; Southard, 1988; Spurgeon, 1981; Woodward, 1995),
- Nineteen peer-reviewed journal articles (Barton & Barton, 1987; Boomhower, 1975; Buehler, 1976; Colet & Aaronson, 1995; Duffy, 1995; Eaton, Brewer, Portewig, & Davidson, 2008; Gerich, 1994; Gribbons, 1991; Haugen, 1991; Hutto, 2008; Joshi,

2013; Kostelnick, 2008; Kumpf, 2000; Lauer & Sanchez, 2011; Mackiewicz, 2004; Masse, 1985; Reavy, 2003; Rude & Smith, 1992; Soderston, 1985),

- Seven conference abstracts (Amsden, 1980; Barnow, 1982; Cathcart, 1983; Clements & Waite, 1979; Liu & Hao, 2010; Stocker, 1990; M. Zimmerman, 1983), and
- One regional technical communication newsletter (Baker, 2007).

Data Analysis

The process for preparing the data for analysis included removing tasks that are not part of the revision of technical documents, combining activities described differently by different authors that are essentially the same, separating complex tasks, and coding the type of editorial task.

Removing tasks that are not tasks that revise the technical document. Some activities listed in the sources were not tasks for the improvement of the technical document. These tasks were removed from the analysis. For example, some authors would talk about the importance of talking with authors during the editing process. Although that may be something an editor should do, it is not a task that is about editing the document itself. Those types of tasks were not included in this research.

Combining editing activities. Task descriptions from different authors that described the same activities differently were combined into the same tasks. For example, some guides would say to correct spelling while others would say to check spelling. These activities differ only in the active verb, and it seems logical that the act of checking would imply correcting. Some sources suggested checking leading while others suggested checking line spacing. These are the same activities using different terms with different levels of technical jargon. In another

example, because “remove unnecessary tickmarks or gridmarks” and “eliminate chartjunk” achieve the same goal, the tasks were combined.

Each type of visual graphic requires different appropriate standards, like making sure that all bar charts start at zero or making sure that no more than one segment of a pie chart is exploded. That level of specific formatting was not included as individual tasks, but were grouped as part of applying appropriate visual standards for specific chart types.

Separating complex tasks. Some tasks, which combined different tasks in one statement or were so general that they would split several categories, were split so that the tasks were stated separately. Clements and Waite instructs editors to “correct all misspelled words and errors in punctuation” (1983, p. 12). These tasks were separated into “correct spelling errors” and “correct punctuation errors” in part because other authors separated them, but mostly because they are different tasks.

Several authors discussed the handling of bold or italic typefaces, but did not distinguish the typeface’s ability to distinguish information that is technical from that which is stylistic. Biologists write species names in italic font, and so that usage of special typography is technical in nature. Italic fonts can also be used for general emphasis, for example, to identify subtotals in a table. The italic typeface provides special, specific meaning in this use, but that special meaning is not technical in nature. These different usages of special typography, and the unclear meaning used by some authors, lead to the task being separated into special typography for technical and special typography for non-technical purposes. Some sources stated that checking for technical accuracy was an important task, but did not clarify if it was for textual or visual accuracy and through context it did not seem to exclude one or the other. Since both are

important, the task was split into “verify technical accuracy of graphs” and “verify technical accuracy of text.”

Rewriting tasks into a common declarative statements structure. Even in single sources, the presentation of tasks was not uniform. In Nadziejka (1999), some tasks were presented as bullets after a statement to “ensure that” they were true statements (Nadziejka, 1999, p. 11, 14, 16), some were just listed as bullets under a general heading of considerations (Nadziejka, 1999, p. 11, 15), and some were presented as questions to be answered (Nadziejka, 1999, p. 12). Many sources referenced edits that could be done in very different ways. A common grammatical form makes it easier to consider the tasks independently and to better compare different tasks. Every task was converted into an active phrase for this research.

For example, “visual should be placed near text that references it” is changed to “place visual near first reference point in text.” The task “rivers should be removed from text blocks” has become “remove rivers from text blocks.”

Coding the categories from the sorting processes. Because the determination between visual and verbal, technical and non-technical, and decision-making levels are completely independent, the order in which the determinations were made is unimportant. For consistency, they are categorized first as either technical or non-technical, then as either visual or textual, and finally as rule-based, maxim-based, or discretionary edits.

Because visual and verbal both start with V, verbal edits were coded as textual and represented them with the letter T and visual edits as V. Because T is no longer available for Technical, technical edits were coded as subject-specific or specialized and the letter S was selected for them. Non-technical edits were coded as general edits and the letter G was selected. Decision-making levels were selected to be rule based, R; maxim-based, M; and discretionary,

D. For any given level of decision making, the two dichotomies separate tasks into four areas, as demonstrated in figure 1. The four areas are specialized and visual (SV), specialized and textual (ST), general and visual (GV), and general and textual (GT).

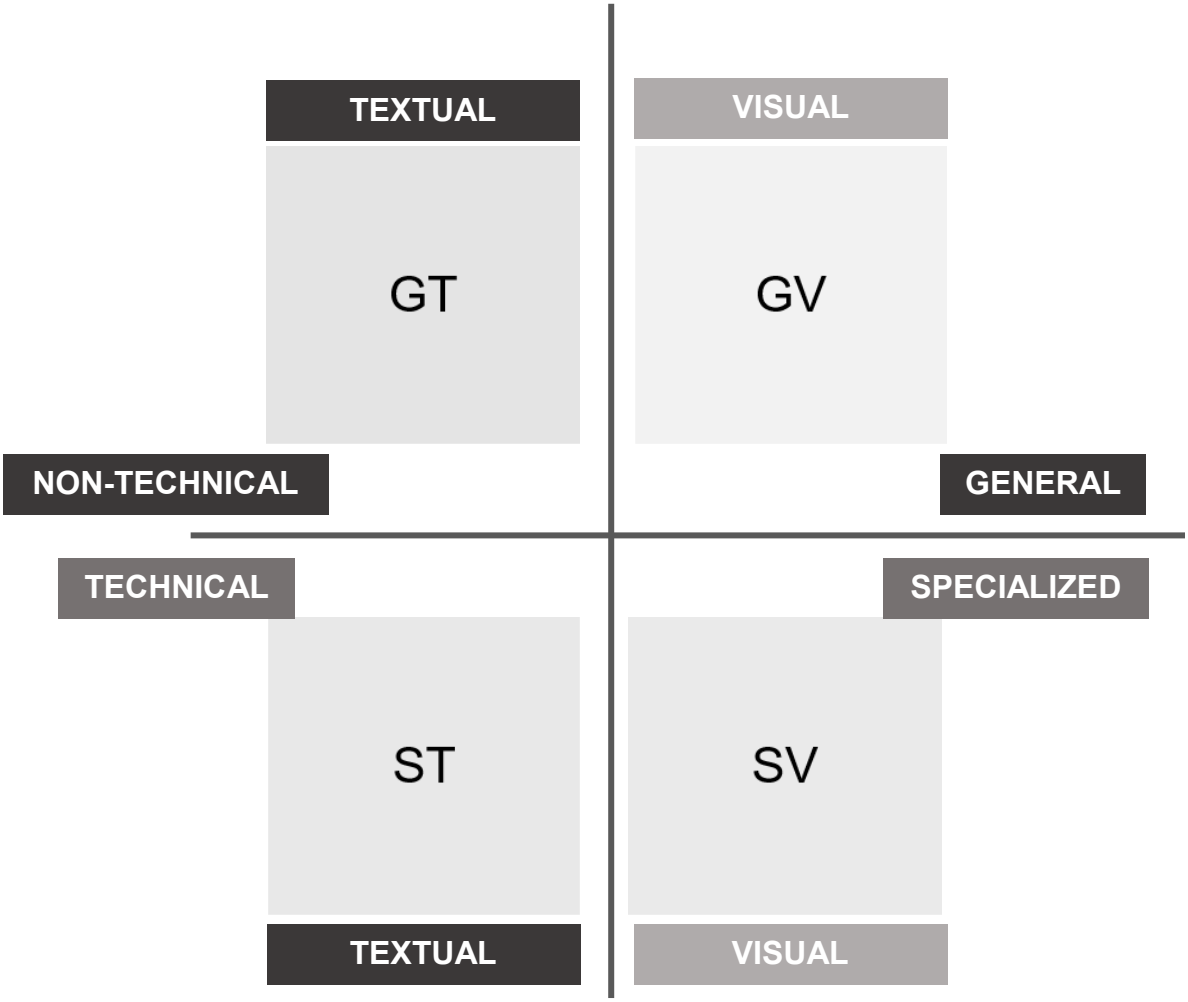

Figure 1. Generalized schematic of tasks. This generalized schematic shows how tasks are sorted by the two dichotomies: Textual/visual and non-technical/technical (or general/specialized).

Adding the three levels of decision making allows the different dichotomies to be stacked into a three-dimensional representation of editing tasks (figure 2).

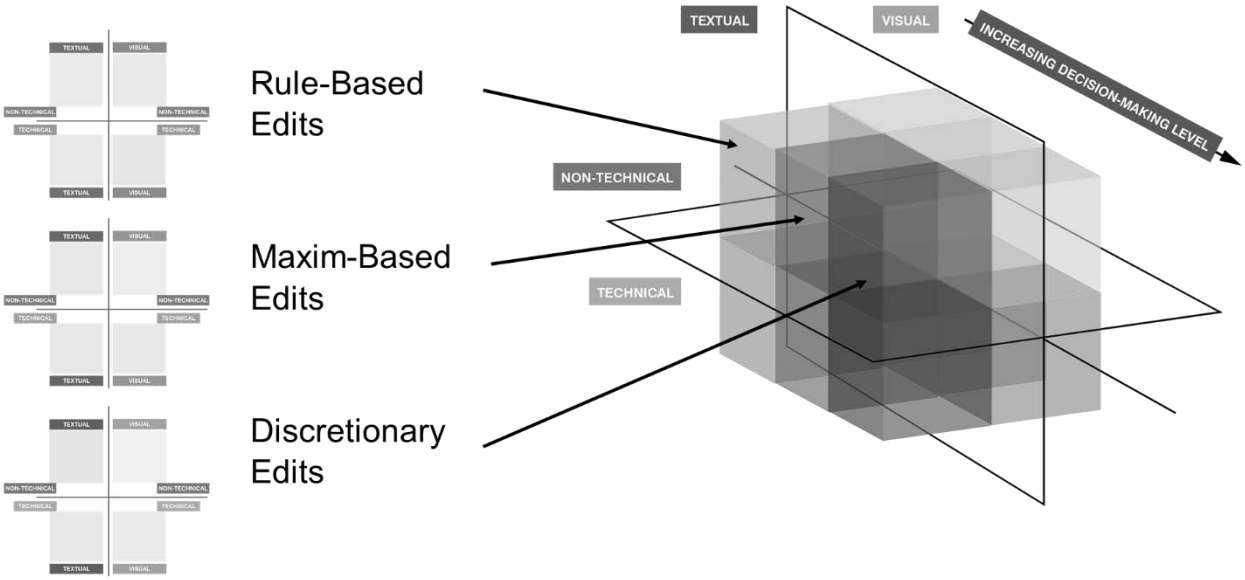

Figure 2. Generalized schematic in three dimensions. This generalized schematic shows how different levels of decision-making are incorporated to create a three-dimensional representation of editing tasks.

Categorizing tasks as either technical or non-technical activities. The need for technical (specialized) knowledge and subject-specific conventions was established in chapter 2, page 18. Tasks were sorted using objective questions to see if an editorial task requires knowledge of mathematics, field-specific usage of terms and jargon, special knowledge of specific tools or methods of a techical field, or knowledge of conventions that are unique will separate technical tasks from non-technical tasks (Figure 3).

For example, the task "identify all symbols in calculations" is a mathematical edit, and as such would be classified as a technical edit from the first question. The task "define technical terminology" is not a mathematical edit, but does involve jargon and so would be technical. The task "project data using conventions standard in the applicable field" would become a technical task because it uses the conventions of a specific field. The task "replace generic colors with colors that convey technical meaning" will be technical because a color's technical meaning is

specific to the field. The task “eliminate inconsistencies in tone” is non-technical because it is not mathematical, is not be specific to the field, does not require knowledge of field-specific tools, and is not dependent on conventions from specific fields.

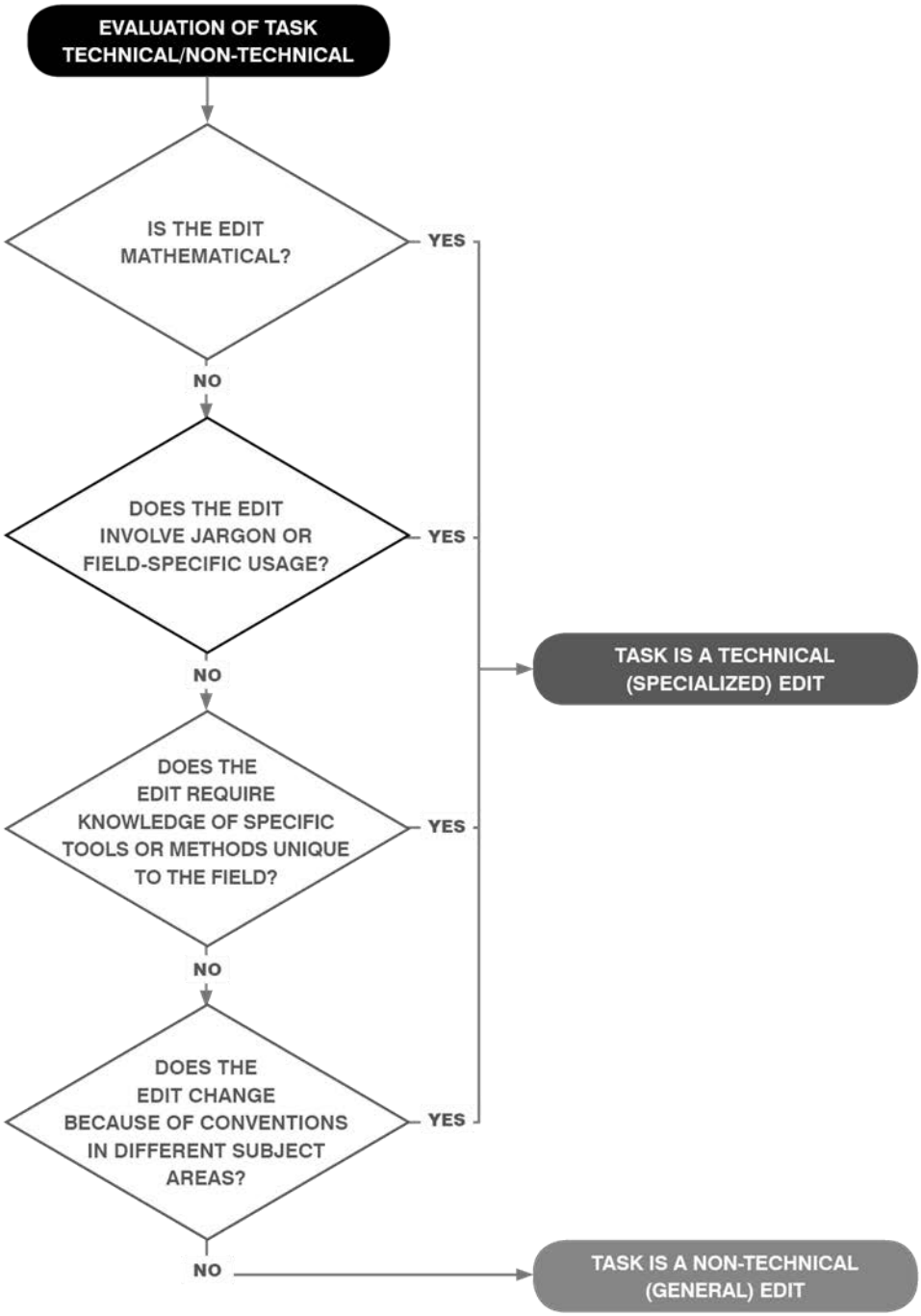

Figure 3. Technical/Non-technical flowchart. This flowchart demonstrates the process by which tasks are determined to be either technical (specialized) or non-technical (general).

Categorizing tasks as either visual or textual activities. The need for visual and textual knowledge for editing was established in chapter 2, on page 22. Textual and visual tasks can be sorted effectively through objective questioning, first to assess whether the edits involve words and then to determine if the edits to the words alter the message (Figure 4). Many traditional editing tasks will be textual tasks, but formatting changes would be visual because even though the words may appear altered by the formatting, their meaning will be unchanged. Although the alteration of the appearance of words and letters can change how the audience may feel about the message or their level of confidence in the author, the message itself is not actually changed. Likewise, some choices can improve or impair the usability of the text, but will not change the message itself.

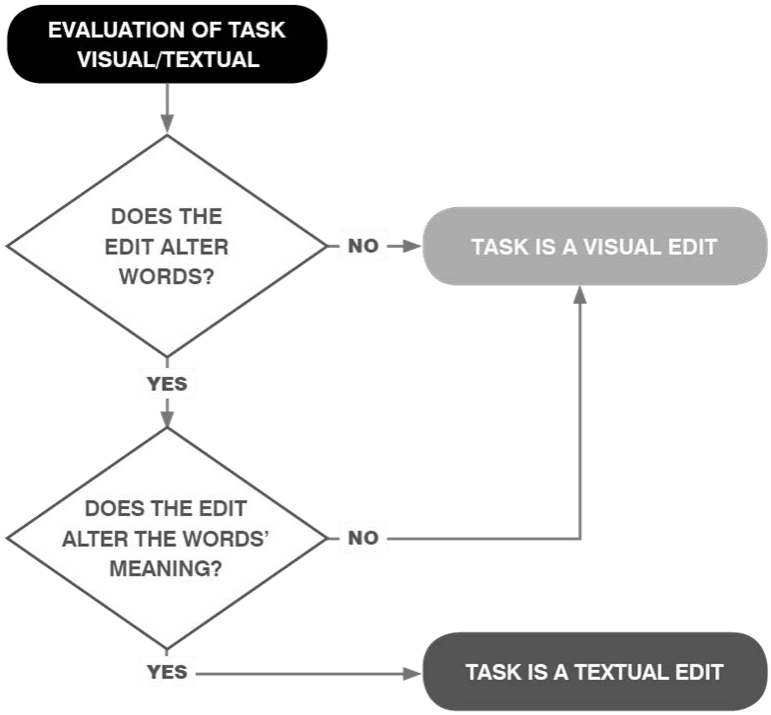

Figure 4. Visual/Textual flowchart. The flowchart describes the process used to determine if an editing task is visual or textual.

For example, the task "choose the best form of a graph to express data/evidence" will be visual because it will not involve words, but images. The task "select proper font size" will change the appearance of the words, and can impart useful information about information hierarchy, but does not change the actual message. It is therefore a visual task. The task "select word phrases that should not be interrupted by line breaks" will be visual because it will not change the message. The task "correct spelling errors" will be textual, because the text will be changed from letters which have no meaning (or the wrong meaning) into words that have the correct meaning.

Categorizing the level of decision making. The level of decision-making is an important editorial aspect that was established in chapter 2 on pages 23. Determining what level of decision-making is needed for an editorial task helps determine the level of ability an editor

might need to accomplish it. Objective questions sort all tasks into different levels of decision-making authority by determining if rules are broken and if there is one solution or multiple solutions to correct the violation of the rule (Figure 5). Editorial tasks that are required to correct broken established rules of communication and for which only one fix is permitted were called rule-based edits. Editorial tasks that are required to correct broken established rules of communication, but that have multiple ways to resolve the broken rules were called maxim-based edits. Editorial tasks that are important for good communication, but that are not required because established rules have been broken, were called discretionary edits.

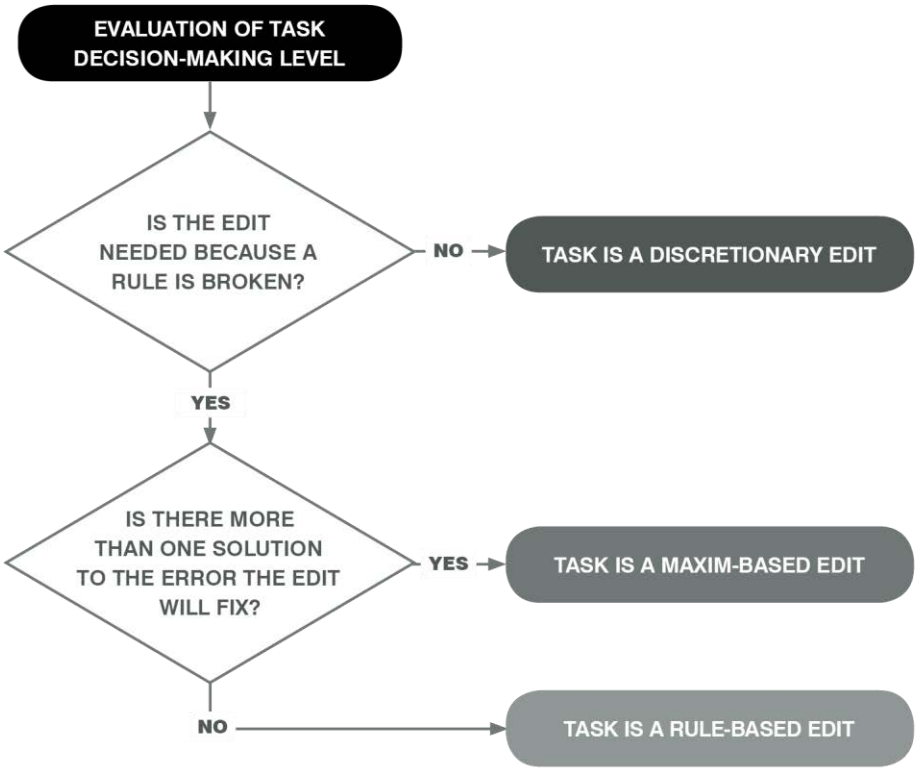

Figure 5. Decision-making level flowchart. The flowchart details the process for determining which level of decision-making is required for each editorial task.

For example, the task “correct spelling errors” replaces misspelled words with the correctly spelled word. With rare exception, there is only one correct way to spell a word in a given language and dialect (once either American or British English are selected as the standard, most dual spellings become singular). Therefore, it is a rule-based edit. The task “construct lists in a parallel fashion” is needed because the rules of good grammar require parallel structure; however, there are multiple ways to build the list in a parallel fashion. The decision on how to build that parallel list will depend on many factors, but any of the corrections would be acceptable. Therefore, it is a maxim-based edit. The task “improve pace, flow, and transitions” is not a required edit because there are any specific rules broken, but a good editor will be able to identify improvements. This would be a discretionary edit. The task “identify all symbols in calculations” is rule-based because it requires one specific action if there are unidentified symbols in calculations. The task “add appropriate details to explain or prove generalizations” requires the editor to recognize that the information is not well explained, but this does not involve any specific editing rule. It is therefore a discretionary task. The task “replot graphs so that data effects are not obscured by order” is needed when a rule, that all data is visible, is broken and the solution is to replot it. Therefore, this is a rule-based edit.

Additional Data Analysis

A list of editing tasks and a framework of objectively-arranged tasks was created through the data processing. In addition to analyzing the levels-of-edit systems for their variation between sources, these systems were analyzed to determine their completeness and bias.

Variation between editorial sources. The levels-of-edit systems were compared to each other to determine the variation that exists between them. To measure this, the total number of tasks and their placement in different groupings were compared. The fraction of the numbers of

tasks similarly grouped in two systems was calculated to determine the similarity between them. The similarities between systems was then assessed for total variation. The similarities between systems were also assessed for variation between classifications for tasks that are in both systems.

Completeness of and bias in editorial sources. Once the list of editorial tasks was generated, each of the sources used for generating that list was analyzed to determine how complete it was compared to the entire list and lists as separated by the aptitudes. Additionally, each source that separated editorial tasks into categories retained the information about those categories (see Appendix B), so that it was possible to determine which categories were the most complete, or which were more heavily biased towards some aptitudes or ability levels. Completeness was the number of tasks identified in a source divided by the total number of tasks in the list generated for this work, as either the whole or in any of the given subsets.

Limitations

Because only tasks that were identified in literature sources were used, it is possible that there are some important tasks that could be done to improve technical documents that were excluded from this study. However, because the methods by which tasks were sorted are objective, any new tasks would be placed into the same categories regardless of the person doing the sorting.

Summary

Editing tasks identified from a large number of sources were used to generate a more complete list of tasks for the revision of technical documents. These tasks were categorized by their nature as either visual or textual tasks, general or specialized tasks, and level of decision-making needed to suggest edits.

The framework developed through this approach was compared to the sources used to generate it to determine completeness and bias.

Chapter IV: Results

The editorial tasks identified through the research included 191 individual tasks that are included, in full, in Appendix A. This list of tasks is the most comprehensive list of editing tasks compiled. Approximately 75% of the tasks were classified as general, or non-technical, tasks. Approximately 50% of the tasks related to verbal, or textual, tasks. A summary of the objective classification of the tasks is provided in Table 1. The distribution of tasks by type is shown in figure 6.

As Ramey (1985) had indicated, general editorial tasks had fewer tasks requiring discretionary skills. Technical editorial tasks were more balanced or more discretionary. This is easily seen in figure 6.

Table 1

Task Category Summary

Task Type	Number of Tasks
All General, Textual Tasks	
GTR (Non-technical, textual, rule-based)	36
GTM (Non-technical, textual, maxim-based)	22
GTD (Non-technical, textual, discretionary)	6
Subtotal	*64*
All General, Visual Tasks	
GVR (Non-technical, visual, rule-based)	46
GVM (Non-technical, visual, maxim-based)	32
GVD (Non-technical, visual, discretionary)	1
Subtotal	*79*
All Specialized, Textual Tasks	
STR (Technical, textual, rule-based)	12
STM (Technical, textual, maxim-based)	6
STD (Technical, textual, discretionary)	14
Subtotal	*32*
All Specialized, Visual Tasks	
SVR (Technical, visual, rule-based)	5
SVM (Technical, visual, maxim-based)	4
SVD (Technical, visual, discretionary)	7
Subtotal	*16*
Total	191

Note. This summary of the number of tasks in each of the twelve editing categories shows how the tasks were sorted.

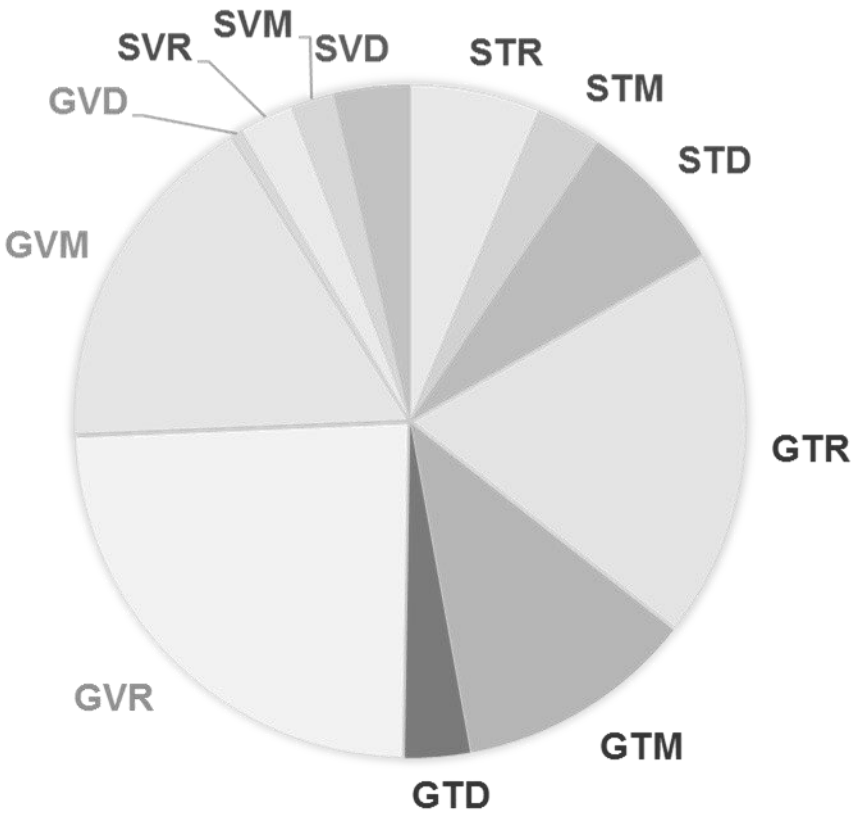

Figure 6. Distribution of editorial task by classification. Note that visual (SV and GV) tasks and textual (ST and GT) tasks are about evenly split. Technical tasks (SV and ST) are about a third of general tasks (GV and GT). Rule-based tasks (R) make a much higher component of general tasks than specialized tasks.

Four research questions will be answered:

1. How much variation exists between different levels-of-edit systems?
2. How complete are the sources from which editing tasks were obtained including the different levels-of-edit systems?
3. Are the sources from which editing tasks were obtained balanced between technical and non-technical tasks?

4. Are the sources from which editing tasks were obtained balanced between visual and textual tasks?

Research Questions

Four research questions will be answered.

Research question 1: How much variation exists between different levels-of-edit systems? *The levels-of-edit systems have significant variation, as up to 90% of the system can be different than other levels-of-edit systems.*

Existing levels-of-edit systems do not categorize tasks in the same ways. Some have three levels of editing (Nadziejka, 1999; Prono et al., 1998) while others have five (Van Buren & Buehler, 1980). The systems do not agree on the relative importance of certain tasks. Most place the task "correct spelling errors" as part of the most basic level of edit, but the task "correct punctuation errors" has been placed in either the most basic level or the second most basic level of edit. The task "make all sentences complete" has also been placed in either the most basic or second most basic level of edit. There is no correlation between which level the tasks "correct punctuation errors" and "make all sentences complete" are placed. The editing task "modify sentences to create parallel language structure" was placed in the most basic editing level in some systems and the most advanced level in other systems. Many editing tasks that were included in some systems were not included in others.

Different levels-of-edit systems included visual editing tasks more than others, but most of the visual editing tasks that were included in the various systems focused on formatting text and not revising figures. Editing tasks focusing on improving figures, tables, and other visuals were found in specialized editing sources. Page layout tasks tended to be found in the specialized sources as well.

Three of the levels-of-edit systems (Hobel & Urbach, 1988; Nadziejka, 1999, and Prono et al., 1998) have three levels, if the proofreading category and screening and language categories are combined into the lowest level of Hobel and Urbach. Hobel and Urbach identified 25 of the tasks included in the list. Nadziejka identified 68 tasks. Prono et al. identified 29 tasks. Hobel and Urbach shared 18 tasks with Nadziejka and 16 tasks with Prono et al. Nadziejka and Prono et al. shared 17 tasks.

The results of this analysis are presented in table 2. Two individual levels-of-edit systems can share as little as ten percent similarity. When only considering the tasks identified in both systems, the similarity can be around 50%.

Table 2

Variations between Different Levels-of-Edit Systems

System Comparison	Difference (All Tasks)	Difference (Shared Tasks)
Nadziejka v. Prono et al	89.7%	51.4%
Prono et al v. Hobel & Urbach	81.6%	56.3%
Hobel & Urbach v. Nadziejka	87.7%	48.6%

Note. These comparisons show that individual level-of-edit systems are significantly different, both in total tasks and in the tasks, that are shared between the individual systems.

Research question 2: How complete are the sources from which editing tasks were obtained including the different levels-of-edit systems? *Most sources for editing systems lack many tasks that can improve the effectiveness of the systems.*

To determine how comprehensive a technical editing source is, it is important to understand how complete its coverage of editorial tasks is. Coverage is the number of tasks present in the source divided by the total number of tasks identified by this study. The most

complete sources had coverage rates of approximately 36%. Tasks that were identified from sources focused on subsets of technical communication; like building and editing tables (Barnow, 1982; Dukes, 1989), expressing and revising mathematics and calculations (Philbin, 1985a; Woodward, 1995), or typography (Felici, 2003); were not expected to have significant coverage of the tasks compiled in this work. They tended to be focused in one aptitude area. Coverage was around 5-10% for these sources. The distribution is shown in figure 7.

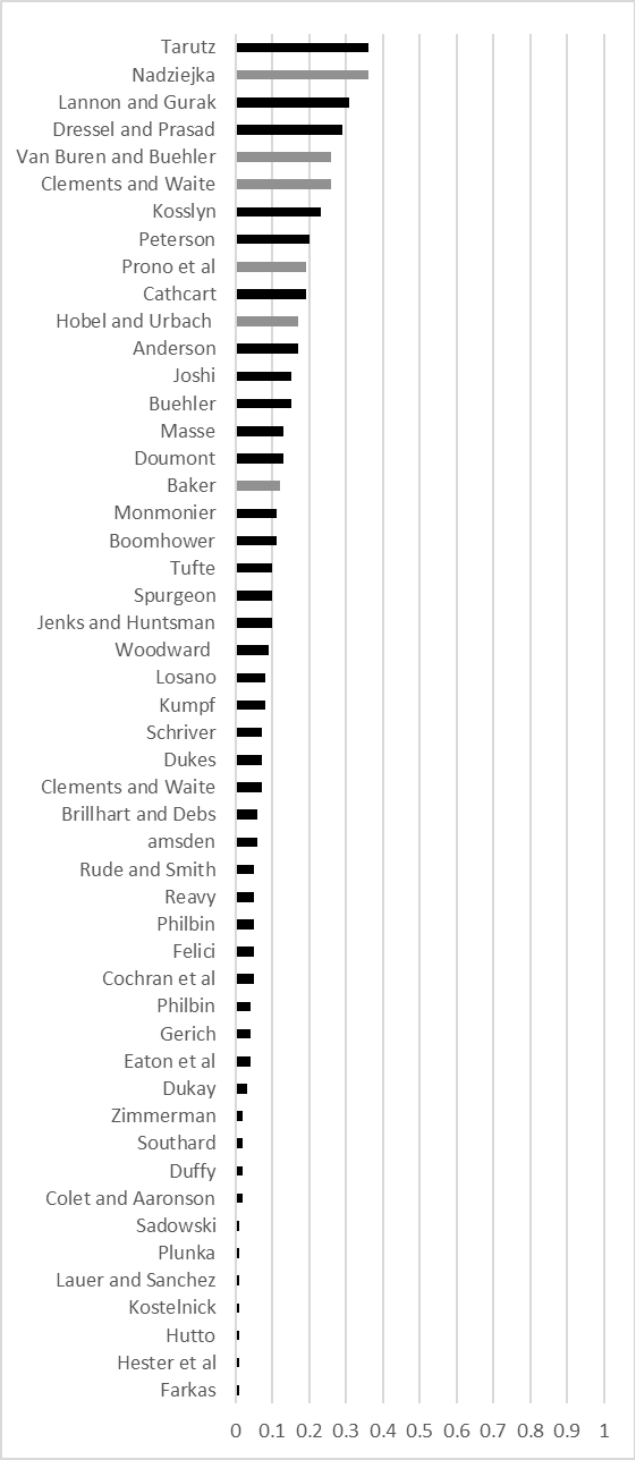

Figure 7. Distribution of total completeness. Gray indicates levels-of-edit systems. Many specialized sources (non-guides) have low completion percentages. The best sources have 36% completeness.

Research question 3: Are the sources from which editing tasks were obtained balanced between technical and non-technical tasks? *Most levels-of-edit systems are strongly biased towards general tasks.*

Most levels-of-edit systems lacked coverage in visual tasks and in technical tasks as classified through this methodology. By plotting the fraction of technical and non-technical tasks from each source that were compiled as part of this research for each task, or the completeness for technical and non-technical tasks, it is possible to visualize any bias towards technical or non-technical editing. The Levels of Technical Editing (Nadziejka, 1999) had the best coverage across technical and non-technical edits. The emphasis of current editing systems was more general than specialized, as was the trend of most other references (Figure 8). This emphasis towards general editing is probably suppressed, because few of the sources identified all the improvements that could be made to grammar.

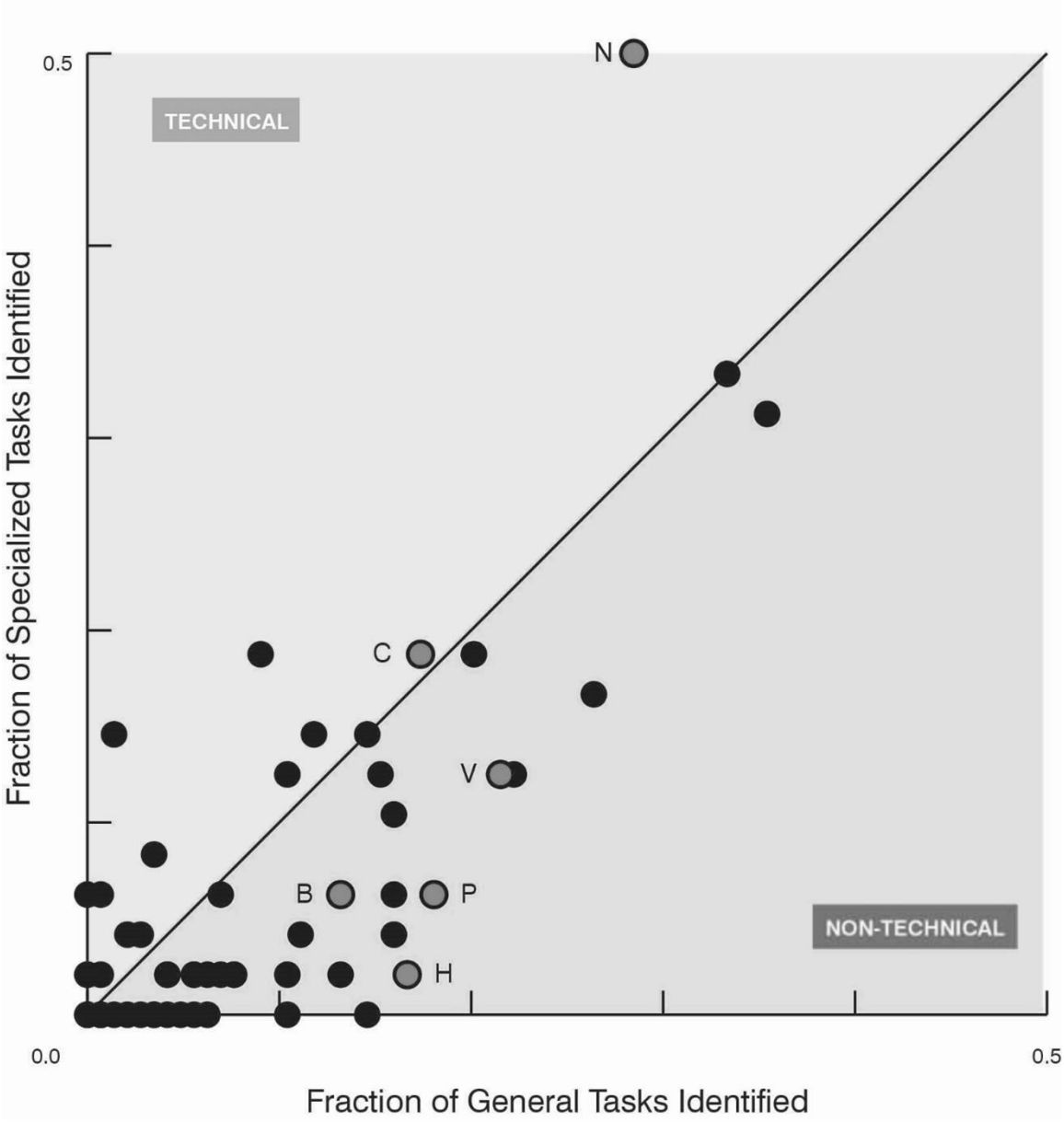

Figure 8. Bias of sources between specialized and general tasks. Many references have more coverage of the general tasks than specialized tasks. The levels-of-edit systems are shown as gray symbols and are displayed as B (Baker, 2007); C (Clements & Waite, 1983); H (Hobel & Urbach, 1988); N (Nadziejka, 1999); P (Prono et al, 1998); and V (Van Buren & Buehler, 1980). The diagonal line indicates the general and specialized tasks are equally represented. The area above the line indicates sources that cover more of the specialized tasks. The area below the line

indicates sources that cover more general tasks. The Guide for Beginning Technical Editors (Clements & Waite, 1983) is balanced and The Levels of Technical Editing (Nadziejka, 1999) is noticeably stronger in specialized tasks.

Research question 4: Are the sources from which editing tasks were obtained balanced between visual and textual tasks? *The level-of-edit systems tend to be more strongly focused for textual tasks.*

The emphasis of current editing systems is more textual than visual (Figure 9). By plotting the fraction of editing tasks identified in each of the sources that are on the list compiled by this research, or the completeness of all visual tasks and all textual tasks, it is possible to understand if there is a bias between the two types. Because many of the non-levels-of-edit-systems sources were focused on specific visual aspects of editing, they tended to be much more strongly visual and had very few or no textual components. Van Buren and Buehler (1980) had good balance because of the tasks identified for formatting and typographic choices.

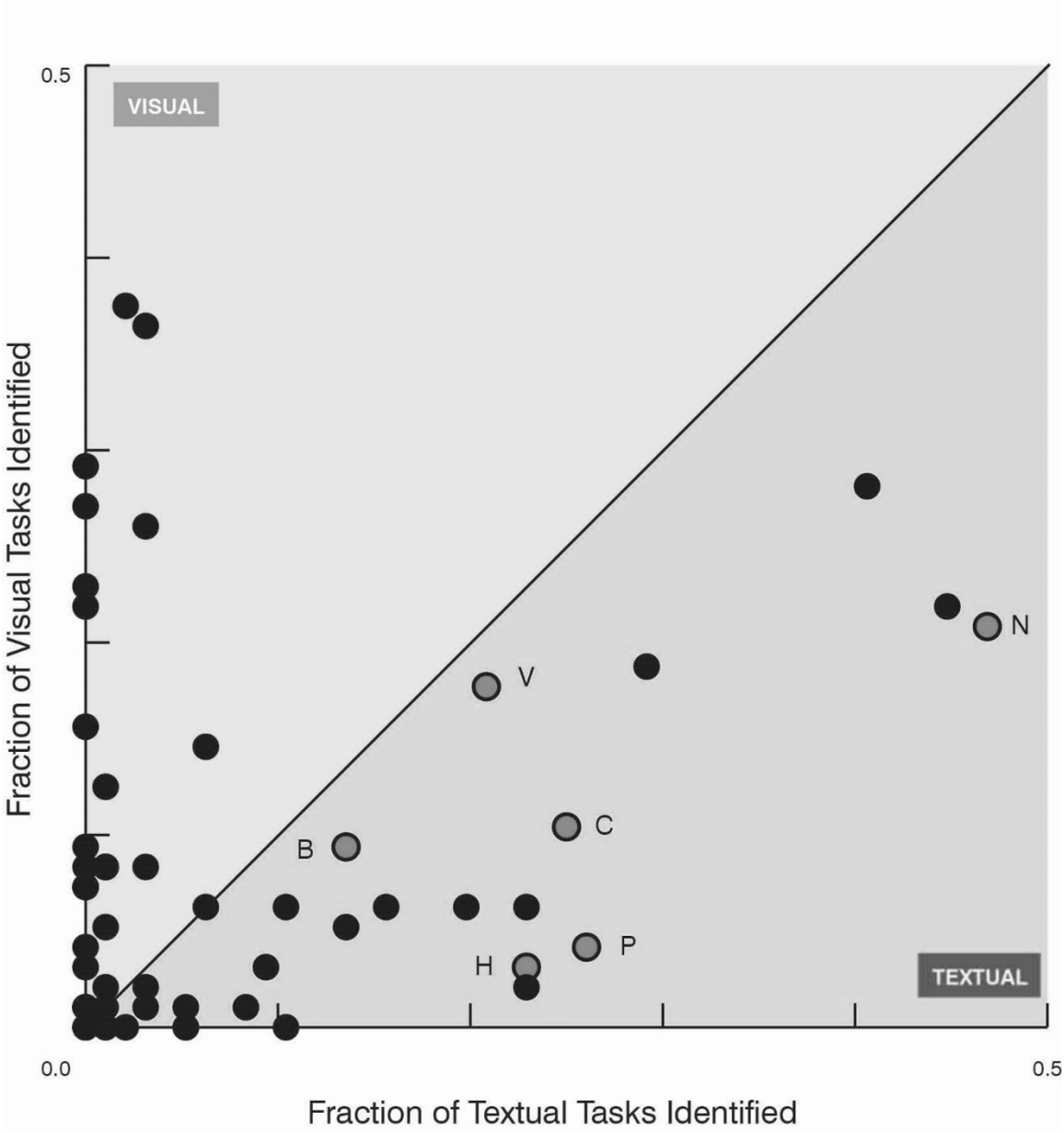

Figure 9. Bias of sources between visual and textual tasks. The levels-of-edit systems, gray symbols, tended to identify tasks that were much more textual than visual. The levels-of-edit systems are displayed as B (Baker, 2007); C (Clements & Waite, 1983); H (Hobel & Urbach, 1988); N (Nadziejka, 1999); P (Prono et al., 1998); and V (Van Buren & Buehler, 1980). The diagonal line indicates sources that were balanced between textual and visual tasks. The area

above the line represents sources that were more inclusive of visual tasks. The area below the line represents sources that were more inclusive of textual tasks.

Chapter V: Discussion, Conclusion and Recommendation

Previous level-of-edit systems are incomplete and biased towards textual and non-technical editing. No other framework had nearly as many editing tasks on its list as the list compiled for this research. As a source of actions for the improvement of technical documents, this research is highly valuable. The way the list was created makes it easier to understand and organize the tasks in a practical manner. The groupings highlight which editorial tasks are most transferable between different technical fields. Editing tasks that are rule- and maxim-based can potentially benefit from computers to identify the tasks and help offer solutions. The development of this universal framework suggests future directions for research.

The List of Tasks Generated for this Research is the Most Inclusive of any Source

The list of tasks compiled for improving technical documents is significantly larger than any single existing source. The list provides a good balance between visual and textual tasks and between general and technical tasks. Future efforts to either develop new practical editing systems or to update and expand editing systems will benefit from this more exhaustive list.

Because the list contains complete ideas, it will be much easier for others to use it to create practical systems. Since each editing task is a complete thought, any new practical system can use the tasks independently.

It is important to note that the editing tasks identified for improving documents were not invented for this project, even though they were not necessarily found in tasks for editors. In earlier times, the editorial role included coordinating improvements with typesetters and technical illustrators. With the increased role of desktop publishing, the role of the editor has shifted from coordinating those improvements to identifying and implementing them. Although

technology can help manage these tasks, the aptitudes required to achieve edits across the technical, non-technical, visual, and textual areas require a lot of training to improve documents.

The Tasks Identified as Non-technical or General are Highly-transferable Skills

Editing processes and decisions that are technical depend upon jargon, conventions, and knowledge that is specific to a field. The aptitudes an editor has mastered in that field are not readily transferable to different subjects. Editing processes that are non-technical will not change between different fields. When the aptitudes an editor has are more general, the more transferable the aptitudes are to any subject area. This is true for both textual and visual editing tasks. Previous practical approaches, like the Levels of Edit and similar systems, did not recognize how technical editors that change fields would need to learn new conventions and practices in some specific areas, and they did not identify which skills were transferable. This is because those systems were practical approaches developed for people in a specific field, and they did not try to consider what would happen to an editor that might change fields.

The Tasks Identified as Rule-based have Potential for Future Development in Computerized Editing

Computers can be employed to help detect some editorial changes that are needed because of broken rules (P. V. Anderson, 2011; Doumont, 2009; Rieber, 1992; Vernon, 2000). The list of rule-based and maxim-based edits identify areas where computer programs can be improved to provide help identifying places where communication rules have been broken. Although computers can be used to help address rule-based edits, because the aptitudes needed to fully revise technical communications are sufficiently diverse, the role of computers in editing will always be limited. To comprehensively improve documents, an editor needs to have the

insights, knowledge, and experiences that were previously divided between at least three people (technical editors, technical illustrators, and layout specialists).

Better Understanding of Editing Theory and Future Directions

Whereas practical knowledge is intended to explain how to do something (Adler & Van Doren, 1972), theoretical knowledge leads to deeper insight. In order to better understand how the different aptitude areas relate to each other and how the tasks in those areas have similar functions, a true theoretical framework is necessary.

Because previous editing structures organized tasks in subjective in ways that were infused with values, the groupings do not show fundamental insights into editing. Because the new framework organized tasks in a meaningful, objective way to highlight the tasks' intrinsic properties, it is possible to better understand how the different tasks relate to each other.

In future steps, tasks that are in the different quadrants as defined by the two dichotomies (the technical textual, technical visual, non-technical visual, and non-technical textual aptitude areas) that are similar tasks with shared purposes will allow deep insights into how messages in technical communication products are strengthened by effective editing in all areas. This theoretical insight is the ultimate purpose of the universal framework for the comprehensive editing of technical communications.

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Appendix A: List of Tasks and Classification

Task	Class
Format vectors and scalars correctly	SVR
Graph differences between curves	SVR
Graph rate of change directly	SVR
Add error bars when appropriate	SVR
Enforce subject-specific usage of special typography (bold, italic, caps)	SVR
Project data using conventions standard in the applicable field	SVM
Remove unnecessary data in figures	SVM
Replace generic symbols with symbols that convey technical meaning	SVM
Replace generic colors with colors that convey technical meaning	SVM
Separate or combine visuals, as needed, to clarify or emphasize their purpose	SVD
Choose best form of graph to express data/evidence	SVD
Visuals support claims, conclusions, and recommendations provided in text	SVD
Verify technical accuracy of graphics	SVD
Select best visuals to explain message	SVD
Add visuals to explain or prove generalizations	SVD
Recommend additional visuals to demonstrate assertions	SVD
Convert units as appropriate	STR
Organize calculation components to emphasize important terms	STR
Define technical terminology	STR

Complete all fences in equations	STR
Identify all symbols in calculations	STR
Provide formulas before numerical substitution	STR
Provide intermediate calculations as appropriate	STR
Derive or cite non-standard formulas	STR
Express equations in efficient forms and break long equations into shorter segments	STR
Verify that used sources are reputable	STR
Specify values and their units of measurement	STR
Reformat numbers to their appropriate significant figures and to include appropriate statistical significant values	STR
Remove contradictions and inconsistencies in content	STM
Reword text to eliminate distortions of fact	STM
Use technical terminology only when necessary and appropriate	STM
Clarify general or abstract terms with concrete terms	STM
Include important components in introduction	STM
Include important findings in conclusion	STM
Verify title accuracy	STD
Retain only the most important points for abstract	STD
Move related ideas and elements into correct sequence and with appropriate subordination and coordination	STD
Add text to strengthen message	STD
Use correct level of technical language for audience	STD

Support claims, conclusions, and recommendations with evidence	STD
Remove unnecessary technical details	STD
Verify technical accuracy of text	STD
Add appropriate details to explain or prove generalizations	STD
Select best information to support message	STD
Describe technical interpretation of figures in captions	STD
Remove unnecessary tabular data elements	STD
Revise captions to emphasize interpretation	STD
Determine which words and phrases should be added to or removed from index	STD
Select footnote location and size	GVR
Verify colors and symbols are used consistently between figures	GVR
Confirm caption type matches visual	GVR
Enforce consistent caption locations and shapes	GVR
Remove titles from artwork areas	GVR
Correct alignment and orientation issues for figures and tables	GVR
Enforce consistent usage of special typography (bold, italic, caps)	GVR
Enforce typographic and graphic consistency	GVR
Reformat visuals to appropriate proportions to aid their function	GVR
Verify colors and fills are used consistently between figures	GVR
Use fonts to differentiate text hierarchy	GVR

Replot graphs so that data effects are not obscured by order	GVR
Set constant scale for figures	GVR
Replot unreadable data	GVR
Display data with appropriate dimensions	GVR
Represent data proportionally	GVR
Select appropriate scale of illustration	GVR
Set axes ranges to appropriate values	GVR
Enforce distinguishing features of data lines on graphs	GVR
Minimize callouts	GVR
Replace inconsistent symbols	GVR
Replace data representations that have inappropriate dimensions	GVR
Remove unnecessary design elements in visuals	GVR
Select appropriate justification/alignment for table elements	GVR
Select appropriate table row and column sizes for ease of use	GVR
Remove inconsistencies in the way information is presented in tables	GVR
Place labels in stub heads and field spanners	GVR
Use appropriate internal gridding for figure elements	GVR
Label axes	GVR
Verify all symbols are labeled	GVR
Verify all fills are identified in legend or by label	GVR

Align numbers in tables by decimal points	GVR
Add adequate borders so that visuals and text are distinct	GVR
Orient left side of broadside table to page bottom	GVR
Place visual near first reference point in text	GVR
Verify page numbers and information in headers and footers are used consistently	GVR
Eliminate orphans and widows	GVR
Format lists appropriately and consistently	GVR
Enforce formatting requirements of document type	GVR
Enforce adherence to graphic standards	GVR
Add map scale, compass direction, and projection information to maps	GVR
Replace improperly formatted lines and rules on figures and tables with proper weight	GVR
Add figure labels next to data and not in legend or key	GVR
Replace complex color scales with simple hue scales when mapping numeric data	GVR
Project data consistently in visuals	GVR
Select word phrases that should not be interrupted by line breaks	GVR
Suggest appropriate column and margin width	GVM
Select proper font size	GVM
Suggest cropping areas for figures and photos	GVM
Suggest appropriate page size	GVM
Remove unnecessary non-data elements of tables	GVM

Place visual objects that should be viewed by audience as a group in visual proximity	GVM
Represent data that should be viewed by audience as related with similar colors or shapes	GVM
Place visual objects that should be viewed by audience with similar attributes near each other to emphasize common fate	GVM
Recommend changes to achieve visual continuation	GVM
Recommend changes to achieve visual balance	GVM
Recommend layout changes to create symmetry/balance of text and graphics	GVM
Eliminate or deemphasize distracting focal points	GVM
Repeat elements to create visual cohesion	GVM
Align visuals with common attributes for easier comparison and vision cohesion	GVM
Remove unnecessary details in figures	GVM
Select proper typefaces	GVM
Reinforce information hierarchy with page layout	GVM
Enforce grid structure with consistent visual theme	GVM
Recommend changes to improve white space usage	GVM
Enforce appropriate and consistent leading	GVM
Enforce visually consistent heading format	GVM
Recommend improvements to color choices in page elements	GVM
Suggest appropriate index map for maps	GVM
Adjust kerning and tracking as appropriate	GVM

Group related page elements	GVM
Align related page elements	GVM
Add labels and callouts to figures as appropriate	GVM
Suggest shading to aid table interpretation and legibility	GVM
Suggest Justification or Rag for text boxes	GVM
Suggest Hyphenation rules for text (non-word-compounding)	GVM
Remove rivers from text blocks	GVM
Select appropriate special characters and symbols	GVM
Recommend improvements to page layout	GVD
Correct spelling errors	GTR
Correct grammar	GTR
Correct punctuation errors	GTR
Correct verb tenses	GTR
Correct subject/verb disagreements	GTR
Make all sentences complete	GTR
Capitalize proper nouns and the first word of every sentence	GTR
Enforce consistent compounding of words and hyphenation	GTR
Define abbreviations and acronyms at first use	GTR
Verify in-text references to visuals are correct	GTR
Replace inconsistent or incorrect Roman or Arabic numerals	GTR
Verify order of caption numbers	GTR

Use abbreviations and acronyms consistently	GTR
Enforce consistent citation style	GTR
Correct misplaced and dangling modifiers	GTR
Complete all comparisons	GTR
Enforce adherence to style guide	GTR
Replace incorrect homophones	GTR
Correct improper use of articles	GTR
Eliminate redundancy in sentences	GTR
Remove idioms	GTR
Identify uncited images and illustrations	GTR
Verify table of contents references are correct	GTR
Identify undocumented data sources	GTR
Number pages correctly	GTR
Verify quotations are accurate	GTR
Clarify pronouns without obvious antecedent noun	GTR
Remove excessive prepositions	GTR
Correct nominalizations to verb forms	GTR
Remove bias, sexism, and offensive language	GTR
Replace inconsistent terminology in text and graphics	GTR
Attribute information or materials to sources	GTR
Correct formatting errors in reference list	GTR
Eliminate personal pronouns if required	GTR

Verify all pages referenced in index are correct	GTR
Eliminate all circular references in the index	GTR
Modify sentences to create parallel language structure	GTM
Eliminate linking verbs	GTM
Simplify overly complex vocabulary	GTM
Recommend more appropriate word choice	GTM
Break long paragraphs into shorter paragraphs	GTM
Describe figures completely in captions	GTM
Eliminate inconsistencies in tone	GTM
Use level of formality appropriate for audience	GTM
Unstack modifying nouns	GTM
Covert weak verbs, adverbs, and adjectives to active verbs, adverbs, and adjectives	GTM
Convert negative sentence constructions to positive	GTM
Remove unnecessary words and qualifiers	GTM
Vary sentence construction and length	GTM
Eliminate triteness, clichés, and platitudes	GTM
Rephrase headings to emphasize document purpose	GTM
Restructure sentences and paragraphs for comprehension	GTM
Enforce grammatically parallel headings structure	GTM
Integrate quotations in text	GTM

Eliminate euphemisms	GTM
Provide descriptive figure title	GTM
Construct lists in a parallel fashion	GTM
Improve syntax	GTM
Organize information in paragraphs to increase coherency	GTD
Clarify overly complex sentences	GTD
Remove contradictions in text	GTD
Restructure sentences and paragraphs for logical organization	GTD
Improve pace, flow, and transitions	GTD
Restructure major groupings of paragraphs into logical sections and chapters	GTD

Appendix B: Total Data

In the following data table, each number corresponds to the original activity listed in the sources, the finalized editorial task or the disposition of the activity, and the classification for tasks which were analyzed. Afterward, the number key is used to include all data sources used to find editorial tasks. Numbers in other columns of the data table indicate to where the task is categorized when used without parentheses. The numbers in parentheses represent from where a task originally came. The letter 'x' is used for tasks that have no categories. For authors which used different categories for editing activities, the alphabet code used for each author is:

Anderson (2001): G=graphics guideline, P=page design guideline; guidelines were numbered.

Baker (2007): K=knowledge, L=language, P=layout.

Boomhower (1975): E=equal, L=literary, T=technical; fractions are levels of importance in the primary and secondary areas.

Buehler (1976): C=copy clarification, F=format, I=integrity, L=language, M=mechanical style, S=substantive.

Clements & Waite (1983): A=Title, Abstract, Organization, B=Editing Tables, D=Data Presentation, F=Editing Figures, Q=Sequence Check, R=Minimum Editing Requirements, T=typographic conventions, Y=Scientific Symbols, Z=Edit reference listings.

Colet & Aaronson (1995): A=additional, D=data graph, L=layout principles.

Dressel & Prasad (1989): A=accuracy, I=image, R=readability.

Dukay et al. (1992): C=copy, D=development, T=content.

Eaton et al. (2008): C=copyediting, P=proofreading, R=readability, T=comprehensive.

Gerich (1994): A=macro, I=micro.

Haugen (1991): I=intentional diagnoses.

Hobel & Urbach (1988): C=comprehensive, I=integrity and format, L=screening and language, P=proofreading.

Jenks and Huntsman (1958): E=English Usage, M=mechanics, T=engineering usage.

Joshi (2013): C=character, F=formatting, H=housekeeping, P=phrase, S=sentence, W=word, Z=citations and references.

Kumpf (2000): A=attraction, C=consistency, E=external skeleton, H=heft, I=interpretation, K=chunking, M=expense, S=style, V=convention.

Lannon & Gurak (2014): C=persuasion, E=ethical, D=page design, G=usability-page design, L=usability-ethical, legal, and cultural considerations, O=usability-organization, P=proofreading, R=research, S=style, T=usability-content, U=usability-style, V=visual.

Lauer & Sanchez (2011): A=alignment, B=balance, C=color contrast, E=color aesthetic, F=focal point, G=proximity/grouping, R=repetition, T=type contrast, W=blankspace/white space, Y=type aesthetic.

Masse (1985): F=format, M=mechanics, P=policy, R=structure, S=style, T=content, U=tone.

Nadziejka (1999): R=rush, S=standard, V=revision.

Prono et al. (1998): A=level A, B=level B, C=level C.

Rude & Smith (1992): D=document, R=related, S=sentence level.

Stocker (1990): L=language, P=policy;

Tarutz (1992): C=copy, D=development, P=production, x=no category.

Van Buren & Buehler (1980): C=copy clarification, D=coordination, E=extraordinary, F=format, I=integrity, L=language, M=mechanical style, N=screening, P=policy, S=substantive.

Key	Activity	Task or Disposition	Class
1	Title Accuracy	Verify title accuracy	STD
2	Abstract Concision	Retain only the most important points for abstract	STD
3	Headings Accurate	<<move 325>>	
4	Logical Groupings	<<move 132>>	
5	Content Contradictions removed	Remove contradictions and inconsistencies in content	STM
6	Missing Material is Identified	<<Vague>>	
7	Copyright permissions obtained	<<Not Editing Task>>	
8	Spelling	Correct spelling errors	GTR
9	Grammar and Syntax	Correct grammar	GTR
10	Punctuation	Correct punctuation errors	GTR
11	Usage	<<move 356>>	
12	Fluency	<<move 108>>	
13	Language Parallelism	Modify sentences to create parallel language structure	GTM
14	Conciseness/Shorten Sentences	<<move 279>>	
15	Verb Tense	Correct verb tenses	GTR
16	Subject/Verb Agreement	Correct subject/verb disagreements	GTR
17	Complete Sentences	Make all sentences complete	GTR

Key	Activity	Task or Disposition	Class
18	Capitalization	Capitalize proper nouns and the first word of every sentence	GTR
19	Word Compounding/hyphenation	Enforce consistent compounding of words and hyphenation	GTR
20	Form and Construction of numerals	<<move 61>>	
21	Abbreviations and acronyms (explained)	Define abbreviations and acroynyms at first use	GTR
22	Citation Appearance	<<move 363>>	
23	Page Layout	Recommend improvements to page layout	GVD
24	Cover type and placement headings	<<Not Editing Task>>	
25	Width of columns and margins	Suggest appropriate column and margin width	GVM
26	size of type	Select proper font size	GVM
27	form of figure captions	<<move 62>>	
28	position of figures and tables	<<move 311>>	
29	Citations correct	<<move 363>>	
30	correct sequence of elements	Move related ideas and elements into correct sequence and with appropriate subordination and coordination	STD

Key	Activity	Task or Disposition	Class
31	cross references correct	Verify in-text references to visuals are correct	GTR
32	figure captions and table titles unique	<<move 62>>	
33	Interpreting illegible copy	<<antiquated>>	
34	marking mathematics	<<move 66>>	
35	tops of figures (antiquated)	<<antiquated>>	
36	cropping marks on figures/photos	Suggest cropping areas for figures and photos	GVM
37	Organization Specific Issues	<<drop drop>>	
38	Eliminate Linking Verbs	Eliminate linking verbs	GTM
39	Convert Negatives	<<move 278>>	
40	Simplify Vocabulary	Simplify overly complex vocabulary	GTM
41	Use Active Verbs	<<move 275>>	
42	Missing Material is Added	<<move 197>>	
43	Working with foreign language speakers	<<Not Editing Task>>	
44	Repeated Operations	<<drop drop>>	
45	Editing for Technical Content	<<move 104>>	
46	Combining manuscripts (Edit Tech cont)	<<Vague>>	

Key	Activity	Task or Disposition	Class
47	Verify accuracy of data (edit Tech Cont)	<<move 332, 375>>	
48	Converting Units (Edit Tech Cont)	Convert units as appropriate	STR
49	Time Consuming Services	<<Vague>>	
50	Multiple Authors (Time consume)	<<Vague>>	
51	Determine page size	Suggest appropriate page size	GVM
52	Typeface selection	<<move 200>>	
53	Boldface and italicized meaning	<<move 109>>	
54	Footnote location and size	Select footnote location and size	GVR
55	Footnote type	<<move 54>>	
56	Figure symbol consistency	Verify colors and symbols are used consistently between figures	GVR
57	Figure location	<<move 311>>	
58	List indentation	<<move 319>>	
59	List symbols	<<move 319>>	
60	Page numbers location, etc.	<<move 312>>	
61	Use of Roman or Arabic numerals	Replace inconsistent or incorrect Roman or Arabic numerals	GTR
62	Caption type (fig, figure, sketch, etc.) (and number)	Confirm caption type matches visual	GVR

Key	Activity	Task or Disposition	Class
63	Caption numbers	Verify order of caption numbers	GTR
64	Caption location and shape	Enforce consistent caption locations and shapes	GVR
65	Labels on graphs	<<move 294>>	
66	Math appearance	Organize calculation components to emphasize important terms	STR
67	Math vectors/scalars, etc.	Format vectors and scalars correctly	SVR
68	Planning and estimating manuscript process	<<Not Editing Task>>	
69	Record maintenance	<<Not Editing Task>>	
70	Scheduling document	<<Not Editing Task>>	
71	Manuscript marking-organizational	<<Vague>>	
72	Monitoring and Liaisoning	<<Not Editing Task>>	
73	Verify institutional requirements	<<Not Editing Task>>	
74	Verify TOC matches headers, etc.	<<move 220>>	
75	Verify TOC matches pages, etc.	<<move 220>>	
76	Format consistent with prior volumes	<<Move to 358>>	
77	Clean artwork is generated	<<antiquated>>	
78	Camera ready input is ready for camera	<<antiquated>>	
79	Ordinates and Abscissas are labeled	<<move to 225>>	

Key	Activity	Task or Disposition	Class
80	Titles are not part of artwork	Remove titles from artwork areas	GVR
81	Figure/Table misalignment/misorientation	Correct alignment and orientation issues for figures and tables	GVR
82	Word Choice - Wrong Word	Recommend more appropriate word choice	GTM
83	Undefined Technical Jargon	Define technical terminology	STR
84	Pronoun/antecedent disagreement	<<move 268>>	
85	Acronym usage consistant	Use abbreviations and acronyms consistently	GTR
86	Nonstandard Acronyms	<<move 85>>	
87	Inconsistant acronyms	<<move 85>>	
88	Inaccessible references	<<Not Editing Task>>	
89	Inconsistant reference style	Enforce consistent citation style	GTR
90	Inconsistent number usage	<<move 61>>	
91	Misplaced modifiers (dangling modifiers)	Correct misplaced and and dangling modifiers	GTR
92	Paragraphing (length)	Break long paragraphs into shorter paragraphs	GTM
93	Paragraphing (coherence)	Organize information in paragraphs to increase coherency	GTD
94	Overly complex sentences	Clarify overly complex sentences	GTD

Key	Activity	Task or Disposition	Class
95	Incomplete comparisons	Complete all comparisons	GTR
96	Organization of report	<<move 30>>	
97	Setting Leading	<<move 316>>	
98	Completeness of fences in math	Complete all fences in equations	STR
99	Contradiction in manuscript	Remove contradictions in text	GTD
100	Usability	<<Not Editing Task>>	
101	Adherence to a style guide (text)	Enforce adherence to style guide	GTR
102	Correctness, accuracy, clarity	<<Vague>>	
103	Suggestions about considering readers	<<Vague>>	
104	Suggestions about content	<<Vague>>	
105	Remove unnecessary tabular elements (non-data)	Remove unnecessary non-data elements of tables	GVM
106	Format and Style	<<split 258, 358>>	
107	(Logical) Sentence and Paragraph Structure	Restructure sentences and paragraphs for logical organization	GTD
108	Pace and flow and transitions	Improve pace, flow, and transitions	GTD
109	Special typography (bold, italic, caps) have meaning	Enforce consistent usage of special typography (bold, italic, caps)	GVR
110	Typographic and graphic consistency	Enforce typographic and graphic consistency	GVR

Key	Activity	Task or Disposition	Class
111	Proofreading	<<Vague>>	
112	Agreement with publishing specifications	<<move 358>>	
113	Working outline	<<Vague>>	
114	Audience definition	<<Not Editing Task>>	
115	technical terminology	<<move 83>>	
116	early consultation with author	<<Not Editing Task>>	
117	continuing consultations	<<Not Editing Task>>	
118	Effective graphic techniques	<<Vague>>	
119	Text and art coordination	<<Not Editing Task>>	
120	Tone of language	<<move 258>>	
121	visual proximity	Place visual objects that should be viewed by audience as a group in visual proximity	GVM
122	visual similarity	Represent data that should be viewed by audience as related with similar colors or shapes	GVM
123	visual common fate	Place visual objects that should be viewed by audience with similar attributes near each other to emphasize common fate	GVM

Key	Activity	Task or Disposition	Class
124	visual continuation	Recommend changes to achieve visual continuation	GVM
125	visual conformity	Project data using conventions standard in the applicable field	SVM
126	visual balance	Recommend changes to achieve visual balance	GVM
127	visual gridding (figures)	Use appropriate internal gridding for figure elements	GVR
128	visual proportion	Reformat visuals to appropriate proportions to aid their function	GVR
129	font readability	<<move 200>>	
130	number of columns	<<move 25>>	
131	convention	<<move 125>>	
132	(logical) breaking into sections (and chapters)	Restructure major groupings of paragraphs into logical sections and chapters	GTD
133	breaking into chapters	<<move 132>>	
134	uniform color choices	Verify colors and fills are used consistently between figures	GVR
135	expense	<<Not Editing Task>>	

Key	Activity	Task or Disposition	Class
136	symmetry and balance of text and graphics	Recommend layout changes to create symmetry/balance of text and graphics	GVM
137	text describes graphics (language)	Describe figures completely in captions	GTM
138	graphic style	<<Vague>>	
139	attention drawn to one part	Eliminate or deemphasize distracting focal points	GVM
140	readability	<<move 200>>	
141	logical color choices	<<move 305>>	
142	hierarchy from text differentiation	Use fonts to differentiate text hierarchy	GVR
143	visual cohesion from repetition of elements	Repeat elements to create visual cohesion	GVM
144	visual cohesion from alignment	Align visuals with common attributes for easier comparison and vision cohesion	GVM
145	whitespace used appropriately to direct attention	<<move 314>>	
146	data effects not obscured by order	Replot graphs so that data effects are not obscured by order	GVR
147	scale constant	Set constant scale for figures	GVR

Key	Activity	Task or Disposition	Class
148	data readable	Replot unreadable data	GVR
149	follows convention	<<move 125>>	
150	graph not too complex	<<move 156>>	
151	dimensions of data display appropriate	Display data with appropriate dimensions	GVR
152	data representation proportional to data	Represent data proportionally	GVR
153	scale of illustration	Select appropriate scale of illustration	GVR
154	choose number of illustrations	<<move 157>>	
155	choose correct form of illustration	<<move 199>>	
156	select appropriate level of detail (figure)	Remove unnecessary details in figures	GVM
157	separate or combine illustrations (to clarify, emphasize, or summarize)	Separate or combine visuals, as needed, to clarify or emphasize their purpose	SVD
158	check axes for appropriateness	Set axes ranges to appropriate values	GVR
159	question abundance of data	Remove unnecessary data in figures	SVM
160	distiguish between curves	Enforce distinguishing features of data lines on graphs	GVR
161	minimize pointers (callouts)	Minimize callouts	GVR
162	determine suitability of illustrations	<<move 199>>	

Key	Activity	Task or Disposition	Class
163	spacing (leading)	<<move 316>>	
164	symbols	Replace inconsistent symbols	GVR
165	fonts	<<move 200>>	
166	consistency	Eliminate inconsistencies in tone	GTM
167	homophones	Replace incorrect homophones	GTR
168	sense-related	<<move 356>>	
169	prepositions	<<move 276>>	
170	articles	Correct improper use of articles	GTR
171	tenses	<<move 15>>	
172	tautology	Eliminate redundancy in sentences	GTR
173	idiomatic usage	Remove idioms	GTR
174	de=nominalization	<<move 277>>	
175	Check for visual syntactic compatibility	<<Vague>>	
176	Check for visual semantic compatibility	<<Vague>>	
177	Check for visual pragmatic compatibility	<<Vague>>	
178	Check for visual syntactic and semantic compatibility	<<Vague>>	
179	Check for visual syntactic and pragmatic compatibility	<<Vague>>	

Key	Activity	Task or Disposition	Class
180	Check for visual semantic and pragmatic compatibility	<<Vague>>	
181	Reduce Clutter in Graphics	<<move 187>>	
182	Simplify Design	<<move 187>>	
183	Graph differences between curves	Graph differences between curves	SVR
184	Graph rate of change directly	Graph rate of change directly	SVR
185	Do not ask reader to judge area or volume	Replace data representations that have inappropriate dimensions	GVR
186	Choose scales wisely	<<move 158>>	
187	Maximize data/ink ratio (simplify design)	Remove unnecessary design elements in visuals	GVR
188	Avoid clutter	<<move 105>>	
189	Footnotes	<<move 54>>	
190	Alignment	Select appropriate justification/alignment for table elements	GVR
191	Legibility	Select appropriate table row and column sizes for ease of use	GVR
192	Consistency	Remove inconsistencies in the way information is presented in tables	GVR
193	check stub head (and field spanners)	Place labels in stub heads and field spanners	GVR

Key	Activity	Task or Disposition	Class
194	check field spanner	<<move 193>>	
195	properly cite sources for images/illustrations	Identify uncited images and illustrations	GTR
196	Add appropriate symbols	Replace generic symbols with symbols that convey technical meaning	SVM
197	Add additional information for clarity (text)	Add text to strengthen message	STD
198	Add error bars	Add error bars when appropriate	SVR
199	Choose correct form of graph (or illustration)	Choose best form of graph to express data/evidence	SVD
200	Select proper font	Select proper typefaces	GVM
201	Format lists properly	<<move 319>>	
202	Check Eye Flow	<<drop drop>>	
203	Check Format (paper, etc)	<<move 358>>	
204	Check Formal/Informal Balance	<<move 136>>	
205	Check Negative/Positive Balance (white space)	<<move 314>>	
206	Check Organization (grid system)	<<move 313>>	
207	Check Title Placement	<<move 358>>	
208	Check highlighting techniques	<<move 109>>	
209	Identify all symbols in calculations	Identify all symbols in calculations	STR

Key	Activity	Task or Disposition	Class
210	Units needed on numbers in calculations	<<move 296>>	
211	Sources of numerical data identified	<<move 234>>	
212	Formulas before numerical substitution	Provide formulas before numerical substitution	STR
213	Describe steps in calculations	Provide intermediate calculations as appropriate	STR
214	Non-standard formulas derived or cited	Derive or cite non-standard formulas	STR
215	Long calculations broken into shorter segments	Express equations in efficienct forms and break long equations into shorter segments	STR
216	Make calculation readable	Express equations and calculations in efficient forms	
217	Multiple Authors - formality/restraint/objectivity	<<move 258>>	
218	Multiple Authors - Concreteness	<<move 288>>	
219	Parts in order	<<move 30>>	
220	TOC agree with text	Verify table of contents references are correct	GTR
221	subheads identified for style	<<Move to 326>>	
222	Check for racism	<<move 291>>	

Key	Activity	Task or Disposition	Class
223	check for sexism	<<move 291>>	
224	Axes scales	<<move 158>>	
225	Label Axes	Label axes	GVR
226	Label Symbols	Verify all symbols are labeled	GVR
227	All material is relevant to the reader	<<Vague>>	
228	all material is technically accurate	<<move 332>>	
229	level of technicality is appropriate for audience	Use correct level of technical language for audience	STD
230	warnings and cautions inserted where needed	<<Not Editing Task>>	
231	claims, conclusions, and recommendations supported by evidence	Support claims, conclusions, and recommendations with evidence	STD
232	material free of gaps, foggy areas, and needless details	<<move 279>>	
233	key terms clearly defined	<<move 83>>	
234	all data sources documented	Identify undocumented data sources	GTR
235	structure of document visible at glance	Reinforce information hierarchy with page layout	GVM
236	clear line of reasoning that emphasizes most important	<<move 30>>	

Key	Activity	Task or Disposition	Class
237	material organized in sequence for readers to follow	<<move 30>>	
238	everything easy to locate	<<Vague>>	
239	material "chunked" into easily digestable parts	<<move 132>>	
240	each sentence understandable first time it is read	<<move 329>>	
241	rich information expressed concisely	Remove unnecessary technical details	STD
242	sentences have variety	<<move 281>>	
243	words chosen for exactness, not camouflage	<<move 259>>	
244	tone is appropriate for situation/audience	<<move 258>>	
245	page design is inviting, acessible, and appropriate	<<Vague>>	
246	aids to navigation (heads, lists, type styles)	<<split 142.235>>	
247	Adequte visuals to clarify, emphasize, or summarize	<<move 157>>	

Key	Activity	Task or Disposition	Class
248	supplements (front and end matter) accommodate needs of diverse audience	<<Not Editing Task>>	
249	document reflects sound ethical judgement	<<Not Editing Task>>	
250	document complies with copyright law and other legal standards	<<Not Editing Task>>	
251	document respects cultural diversity	<<Not Editing Task>>	
252	evidence supports claims	<<move 231>>	
253	argue without being argumentative	<<drop drop>>	
254	avoid stereotypes of cultures and groups	<<move 291>>	
255	document provides expected level of detail	<<split, 241 336>>	
256	appropriate organization	<<move 30>>	
257	accepted interpersonal conventions	<<move 258>>	
258	appropriate level of formality	Use level of formality appropriate for audience	GTM
259	text avoids distortion	Reword text to eliminate distortions of fact	STM
260	jargon used appropriately	Use technical terminology only when necessary and appropriate	STM

Key	Activity	Task or Disposition	Class
261	certainty and probability used appropriately	<<move 356>>	
262	information sources are valid, reliable, and relatively unbiased	Verify that used sources are reputable	STR
263	credit all contributors	<<Not Editing Task>>	
264	pages numbered correctly	Number pages correctly	GTR
265	quoted material clearly marked	<<move 267>>	
266	quotations used appropriately	<<move 231>>	
267	quotations accurate	Verify quotations are accurate	GTR
268	pronoun clearly refers to noun	Clarify pronouns without obvious antecedant noun	GTR
269	modifiers close to words	<<move 91>>	
270	modifying nouns unstacked	Unstack modifying nouns	GTM
271	active voice	<<move 275>>	
272	sentences appropriate length	<<move 279>>	
273	free of wordiness	<<move 279>>	
274	free of needless openers and prefaces	<<move 279>>	
275	weak verbs(, adverbs, adjectives) converted to active verbs(, adverbs, adjectives)	Covert weak verbs, adverbs, and adjectives to active verbs, adverbs, and adjectives	GTM
276	excessive prepositions removed	Remove excessive prepositions	GTR

Key	Activity	Task or Disposition	Class
277	nominalizations restored to verb forms	Correct nominalizations to verb forms	GTR
278	negative constructions converted to positive form	Convert negative sentence constructions to positive	GTM
279	remove clutter words and needless qualifiers	Remove unnecessary words and qualifiers	GTM
280	related ideas subordinated and coordinated appropriately	<<move 30>>	
281	sentences varied in construction and length	Vary sentence construction and length	GTM
282	ideas needing emphasis get own sentence	<<Vague>>	
283	short sentences used for special emphasis	<<Vague>>	
284	appropriate word choice (jargon free)	<<move 260>>	
285	acronyms explained	<<move 21>>	
286	free of triteness	Eliminate triteness, clichés, and platitudes	GTM
287	words precisely convey meaning	<<move 356>>	
288	general or abstract terms clarified by concrete terms	Clarify general or abstract terms with concrete terms	STM

Key	Activity	Task or Disposition	Class
289	tone appropriate	<<move 258>>	
290	formality appropriate	<<move 258>>	
291	bias, sexism, and offensive language removed	Remove bias, sexism, and offensive language	GTR
292	visual serves valid purpose	Visuals support claims, conclusions, and recommendations provided in text	SVD
293	visual complexity appropriate	<<move 156>>	
294	patterns identified by label/legend	Verify all fills are identified in legend or by label	GVR
295	visuals titled and numberred	<<move 62>>	
296	values and units of measure specified	Specify values and their units of measurement	STR
297	visual relationships represent numeric relationships accurately	<<move 152>>	
298	captions and explanatory notes provided	<<move 137>>	
299	data sources cited	<<move 234>>	
300	visuals integrated into text	<<move 311>>	
301	can visual stand alone?	<<drop drop>>	
302	best type of visual for puprose	<<move 199>>	

Key	Activity	Task or Disposition	Class
303	decimal points in column aligned	Align numbers in tables by decimal points	GVR
304	visual free of noise	<<move 187>>	
305	visual color used appropriately	Replace generic colors with colors that convey technical meaning	SVM
306	visual easy to locate	<<move 311>>	
307	visual design elements have balance	<<move 126>>	
308	visual on page for balance	<<move 136>>	
309	visual has adequate borders	Add adequate borders so that visuals and text are distinct	GVR
310	left side of broadside table on bottom of page	Orient left side of broadside table to page bottom	GVR
311	visual placed near text that references it first	Place visual near first reference point in text	GVR
312	page numbers, headers, footers used consistently	Verify page numbers and information in headers and footers are used consistently	GVR
313	grid structure provides consistent visual theme	Enforce grid structure with consistent visual theme	GVM
314	white space used appropriately	Recommend changes to improve white space usage	GVM
315	margins correct	<<move 25>>	

Key	Activity	Task or Disposition	Class
316	line spacing appropriate and consistent	Enforce appropriate and consistent leading	GVM
317	paragraph tailored to suit purpose	<<Vague>>	
318	paragraphs lack orphans and widows	Eliminate orphans and widows	GVR
319	lists formatted appropriately	Format lists appropriately and consistently	GVR
320	typeface consistently/appropriately used	<<move 200>>	
321	type sizes readable	<<move 26>>	
322	Full caps for short phrases, single words, POTUS tweets	<<move 109>>	
323	highlighting consistent and tasteful	<<move 109>>	
324	headings used appropriately	<<move 360>>	
325	phrasing of headings consistent with document purpose	Rephrase headings to emphasize document purpose	GTM
326	headings visually consistent	Enforce visually consistent heading format	GVM
327	equations show units	<<move 296>>	
328	Consistent use of terminology in text and graphics	Replace inconsistent terminology in text and graphics	GTR

Key	Activity	Task or Disposition	Class
329	comprehensibility and readablity (paragraph and sentence level clarity)	Restructure sentences and paragraphs for comprehension	GTM
330	style and consistencey with any specifications	<<Vague>>	
331	coherence and organization of section or document	<<move 30>>	
332	technical accuracy of text	Verify technical accuracy of text	STD
333	grammar and mechanics	<<move 9>>	
334	information being transferred to reader	<<Vague>>	
335	what is message	<<Vague>>	
336	provided details explain or prove generalizations	Add appropriate details to explain or prove generalizations	STD
337	best materials (textual) selected to explain message	Select best information to support message	STD
338	ideas fully explained	<<move 231>>	
339	unnecessary materials excluded	<<move 241>>	
340	structure seen	<<move 30>>	
341	logical structure	<<move 30>>	
342	introduction set up parts	Include important components in introduction	STM

Key	Activity	Task or Disposition	Class
343	middle sections fulfil introduction	<<Vague>>	
344	logical coherence between parts	<<move 30>>	
345	conclusion summarizes parts	Include important findings in conclusion	STM
346	writing clear	<<move 94>>	
347	writing concise	<<move 279>>	
348	writing strong	<<Vague>>	
349	style of sentences and words appropriate to subject	<<move 258>>	
350	style interfere with message	<<move 258>>	
351	language appropriate for audience	<<move 356>>	
352	parallelism, subordination, and coordination used effectively	<<split 13, 280>>	
353	absence of wordiness, compound phrases, and redundancy	<<move 279>>	
354	avoid passive constructions	<<move 275>>	
355	action verbs, adverbs, adjectives	<<move 275>>	
356	diction clear, concise, and connotative	<<Vague>>	
357	what format used	<<Vague>>	
358	appropriate format	Enforce formatting requirements of document type	GVR

Key	Activity	Task or Disposition	Class
359	graphic aids effectively prepared and placed	<<split 199, 311>>	
360	headings used and spaced correctly	<<Move to 326>>	
361	material referenced correctly	Attribute information or materials to sources	GTR
362	footnotes/citations used correctly	<<split 22,54>>	
363	bibliography/references set up correctly	Correct formatting errors in reference list	GTR
364	general apperance of writing improved	<<Vague>>	
365	dangling modifiers	<<move 91>>	
366	writer present	<<Not Editing Task>>	
367	personal pronouns	Eliminate personal pronouns if required	GTR
368	persona for writer	<<move 366>>	
369	Color contrast/compliment on page	Recommend improvements to color choices in page elements	GVM
370	headings grammatically parallel	Enforce grammatically parallel headings structure	GTM
371	quotations integrated	Integrate quotations in text	GTM
372	free of misleading euphamisms	Eliminate euphamisms	GTM
373	free of overstatement	<<move 259>>	

Key	Activity	Task or Disposition	Class
374	text describes graphics (technical)	Describe technical interpretation of figures in captions	STD
375	technical accuracy of graphics	Verify technical accuracy of graphics	SVD
376	best visuals to explain message	Select best visuals to explain message	SVD
377	document provides expected level of visual detail	<<split 159, 378>>	
378	provided visuals explain or prove generalizations	Add visuals to explain or prove generalizations	SVD
379	Adherence to graphic standards	Enforce adherence to graphic standards	GVR
380	Add additional visuals for clarity	Recommend additional visuals to demonstrate assertions	SVD
381	Remove unnecessary tabular elements (data)	Remove unnecessary tabular data elements	STD
382	Special typography (bold, italic, caps) have technical meaning	Enforce subject-specific usage of special typography (bold, italic, caps)	SVR
384	Significant Figures and Statistical Significance	Reformat numbers to their appropriate significant figures and to	STR

Key	Activity	Task or Disposition	Class
		include appropriate statistical significant values	
385	Maps have scale, compass	Add map scale, compass direction, and projection information to maps	GVR
386	Maps have index map	Suggest appropriate index map for maps	GVM
387	Captions give interpretations	Revise captions to emphasize interpretation	STD
388	Text Hyphenation and Justification	<<split 404-407>>	
389	Text Kerning	Adjust kerning and tracking as appropriate	GVM
390	Figure lines correct weight	Replace improperly formatted lines and rules on figures and tables with proper weight	GVR
391	Complete figure title	Provide descriptive figure title	GTM
392	Size of table appropriate	<<move 191>>	
393	group related page elements	Group related page elements	GVM
394	align related page elements	Align related page elements	GVM
395	add figure labels (photos, etc.)	Add labels and callouts to figures as appropriate	GVM
396	labels next to data, not in legend/key	Add figure labels next to data and not in legend or key	GVR

Key	Activity	Task or Disposition	Class
397	Appropriate use of shade/color on maps	Replace complex color scales with simple hue scales when mapping numeric data	GVR
398	Shade tables for usability	Suggest shading to aid table interpretation and legibility	GVM
399	Graphs are honest and ethical	<<move 125>>	
400	Create/edit index	Verify all pages referenced in index are correct	GTR
401	visual conformity (general)	Project data consistently in visuals	GVR
402	create index	Determine which words and phrases should be added to or removed from index	STD
403	Eliminate circular references	Eliminate all circular references in the index	GTR
404	Justification/Rag	Suggest Justification or Rag for text boxes	GVM
405	Suggest Hyphenation	Suggest Hyphenation rules for text (non-word-compounding)	GVM
406	Select Word Phrases for no-breaks	Select word phrases that should not be interrupted by line breaks	GVR
407	rivers	Remove rivers from text blocks	GVM

Key	Activity	Task or Disposition	Class
408	Special typography	Select appropriate special characters and symbols	GVM
409	lists parallel	Construct lists in a parallel fashion	GTM
410	Grammar and syntax - syntax	Improve syntax	GTM

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1								S			
2								S			A
3								325			325
4			132					132			
5			K					S	x		
6	x							S			
7								S			
8			L					L	x		R
9			L			L 2/1		L	x		R
10			L			L 3/1		L	x		T
11			356			356		356	356		
12			108					108			
13			L					L			
14						279		279	279		
15			L					L	x		
16			L					L	x		R
17			L			L 2/1		L	x		
18						L 2/1		M	x		T
19			L					M	x		R
20								61	61		61

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
21	x					L 2/1		M	x		
22						363		363			363
23		P2, P8	P			L 2/1		F			
24								F	x		
25		P2	P					F			
26		P5	P					F	x		
27			62					62			
28			311					311			
29						363		363	363		363
30			K, K (96			T 1/2, T 1/2 (96)		I			Q,, A (96)
31		G6				E 1/1		I	x		x
32								62	62	62	
33								C			
34								66			66
35								C			
36		GX						C			F
37						L 2/1		P			

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
38											
39											
40									x		
41											
42											
43											
44											
45						T 1/4					
46											
47			332, 375								
48									x		
49											
50											
51		P8									
52	200		200			200					
53			109			109					
54			L, L (55)						x, x(55)	x, x (55)	
55			54						54	54	

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
56									x		
57											
58									319		
59									319		
60											312
61								M	x, x		T, T
								(20)	(20)		(20)
62			P					F	x	x	
			(27)					(27),	(32)	(32)	
								I (32)			
63											
64	x									x	
65											294
66								C			Y, Y
								(34)			(34)
67											Y
68											
69											
70											
71											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
72											
73											
74									220		
75									220		
76						L 2/1					
77											
78											
79	x										
80											
81										x	D
82											R
83			K			T 1/2					
			(115)			(115)					
84											
85											R
86											
87											
88											
89											Zs
90											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
91											R
92											
93											
94											
95											R
96			30			30					30
97											
98											Y
99									x		
100											
101									x		
102						T 1/4					
103											
104											
105				x					x	x	
106						258, 358					
107						L 2/1					
108			L (12)			L 2/1		L (12)			

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
109		P5	L (53)			L 3/1, L 3/1 (53)				x	
110		P6				L 3/1					
111						L 3/1					
112						358					
113						T 1/4					
114						T 1/2					
115			83			83					
116						T 1/4					
117						T 1/4					
118			L			E 1/1					
119						T 1/2					
120						258					
121											
122											
123											
124											
125											
126											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
127										x	
128										x	
129											
130											
131											
132			K (4)					S (4)			
133											
134		G4									
135											
136	x		P								
137											
138											
139											
140											
141											
142		P5									
143											
144	x	P3									
145											
146											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
147							x				
148											
149											
150											
151		G9					x				
152		G9									
153	x						x				
154	157										
155	199				199						
156	x										
157	x, x (154)										
158	x	GX					x (158, 186)				
159	x	G3									
160	x										
161	x										
162	199										
163											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
164											Y
165											
166											R
167											
168											
169											
170											
171											
172											
173											
174											
175					x						
176					x						
177					x						
178					x						
179					x						
180					x						
181											
182											
183											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
184											
185											
186							158				
187		G3									
188											
189											
190		P5									B
191		GX									B
		(392)									
192											B
193		G3									
194											
195		G7									
196							x				
197											
198											
199	x (155, 162)	G2			x (155)						

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
200	x	P5,P7	P			L 3/1					
	(52)		(52)			(52)					
201											
202											
203											
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205											
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212											
213											M
214											
215											
216											
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218											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
219											
220									x (74, 75)		
221											
222											
223											
224											
225		G7					x				
226							x				
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
237											
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Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
257											
258						E 1/1 (120), L 2/1 (106)					
259											
260											
261											
262											
263											
264											
265											
266											
267											
268											
269											
270											R
271											
272											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
273											
274											
275											
276											
277											
278											
279						T 1/3 (14)		L (14)	x (14)			
280											
281											
282											
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288											
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291											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
292											
293											
294		G3									D (65)
295											
296											M (327)
297											
298											
299											
300											
301											
302											
303											
304											
305		G4									
306											
307											
308											
309											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
310											
311		G6	P (28)					F (28)			
312		P6									Q (60)
313		P2									
314		P4									
315											
316		P4									
317											
318											
319									x (58, 59)		
320											
321											
322											
323											
324											
325								S (3)			A (3)

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
326											
327											296
328											
329											
330											
331											
332			K (47)								
333											
334											
335											
336											
337											
338											
339											
340											
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342											
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344											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
345											
346											
347											
348											
349											
350											
351											
352											
353											
354											
355											
356			L (11)			L 2/1 (11)		L (11)	x (11)		
357											
358						L 2/1 (112, 106)					
359											
360		P5									
361											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
362											
363						E 1/1 (22, 29)		M (22), I (29)	x (29)		Z (22, 29)
364											
365											
366											
367											
368											
369		G4,P5									
370											
371											
372											
373											
374											F
375			K (47)								
376		G2									
377		G6									

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
378											
379											
380		G1									
381											
382											M
384											
385											
386											
387		G6									
388											
389											
390											
391											
392		191									
393		P4									
394		P3									
395		G3									
396		G3									
397											
398											

Key	Amsden (1980)	Anderson (2011)	Baker (2007)	Barnow (1982)	Barton & Barton (1987)	Boomhower (1975)	Brillhart & Debs (1981)	Buehler (1976)	Cathcart (1983)	Clements & Waite (1979)	Clements & Waite (1983)
399											
400											
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402											
403											
404											
405											
406											
407											
408		P5									
409											
410											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
1				R							
2				R							
3				325							
4				132							
5				R							
6				R							
7				R							
8				R				P		I	
9				R	x (9)			C		I	
10				R				C		I	
11				356				356			356
12				108							
13				R						I	
14				279				279			279
15				R							
16			x	I							
17				I						I	
18				R							

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
19				R							
20				61							
21				R							
22				363							
23				I							
24				I							
25				I						x	
26				I		T				x	
27				62			62				
28				311							
29				363							
30					x						A
				A	(331)						(96)
31				A							
32				62							
33				I							
34				66							
35				I							
36			x	I							

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
37				A							
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51				I							
52				200							
53				109							
54				I, R			x				
				(55)			(189)				

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
55				54							
56				R						x	
57				311							
58				319							
59				319							
60				312							
61				R, R							
				(20)							
62				R, I							
				(27),							
				A			x				
				(32)			(27)				
63				R							
64				I							
65				294							
66				I, I							
				(34)							
67				R							
68				A							

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
69				A							
70				A							
71				A							
72				A							
73				A							
74				220							
75				220							
76				A							
77				A							
78				I							
79				I							
80				I							
81											
82											
83				R							
84											
85				R							
86											
87											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
88											
89									x		
90											
91											
92											
93											
94										I	
95											
96											30
97				316							
98				R							
99				R							
100											
101								C			
102								C			
103								T			
104								T			
105							x				
			x				(188)				

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
106								258, 358			258, 358
107											A
108				R (12)							
109				R (53)		T				x	
110						D				x	
111								P			
112											
113											
114								T			A
115											
116											
117											
118								T			
119											
120											258
121		D	x								

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
122		D	x								
123		D									
124		D									
125		D									
126		L									
127		L									
128		L									
129		200									
130											
131											
132				R (4)							
133											
134											
135											
136											
137	L					C	x				
138											
139											
140								200			

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
141											
142						T				x	
143											
144											
145											
146											
147											
148											
149											
150											
151											
152			x								
153											
154											
155											
156			x								
157			x								
158	x										
	(186)		x								

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
159			x								
160											
161			x								
162											
163											
164											
165											
166									x		
167											
168											
169											
170											
171											
172											
173											
174											
175											
176											
177											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
178											
179											
180											
181	187										
182	187						187				
183	x										
184	x										
185	x		x								
186	158										
187	x, x										
	(181,						x				
	182)		x				(182)				
188							105				
189							54				
190			x				x				
191			x				x				
192							x				
193							x, x				
							(194)				

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
194							193				
195											
196											
197											
198			x								
199			x			D					
200		A						R			
		(129)		I (52)				(140)		x	
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
212											
213											
214											
215											
216											
217											
218											
219											
220				A (74, 75)							
221											
222											
223											
224											
225											
226											
227											
228											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											
241											
242											
243											
244											
245											
246											
247											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											A (120), I (106)
								C (106)			
259											
260											
261											
262											
263											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
264											
265											
266											
267											
268											
269											
270											
271											
272											
273											
274											
275			x								
276											
277											
278											
279				R				C			A
				(14)				(14)			(14)
280											
281											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
282											
283											
284											
285											
286											
287											
288											
289											
290											
291											
292											
293											
294				I (65)							
295											
296											
297											
298											
299											
300											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
301											
302											
303			x								
304											
305						C					
306											
307											
308											
309											
310											
311				I (28, 57)							
312				I (60)							
313			x								
314			x								
315											
316				I (97)						x	
317											
318											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
319				I (58)							
			x	R(59)							
320											
321											
322											
323											
324											
325				R (3)							
326											
327											
328					x						
329					x						
330					x						
331						30					
332					x						
333						9					
334											
335											
336											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
337											
338											
339											
340											
341											
342											
343											
344											
345											
346											
347											
348											
349											
350											
351											
352											
353											
354											
355											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
356				R				C			
				(11)				(11)			I (11)
357											
358								C			I
								(106)			(106)
359											
360										x	
361											
362											
363				R(22)							
				A							
				(29)							
364											
365											
366											
367											
368											
369										x	
370											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
371											
372											
373											
374											
375						T					
376			x			D					
377											
378											
379											
380			x								
381											
382											
384											
385											
386											
387			x								
388										x	
389										x	
390											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
391											
392											
393											
394			x								
395											
396			x								
397											
398											
399											
400											
401											
402											
403											
404										x	
405										x	
406										x	
407										x	
408										x	
409											

Key	Cochran et al. (1989)	Colet & Aaronson (1995)	Doumont (2009)	Dressel & Prasad (1989)	Duffy (1995)	Dukay et al. (1992)	Dukes (1989)	Eaton et al. (2008)	Farkas (1985)	Felici (2003)	Gerich (1994)
410											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
1											
2											
3									325		
4									132		
5											
6	I										
7											
8			P		E	C				P	
9			L		E						
10			L		E	C				P	
11			356								
12			108								
13			L							P	
14			279			279					
15			L			W					
						(171)					
16			L							P	
17			L							P	
18			P			C					

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
19			L		E					P	
20			61							61	
21			L		M					P, S	
										(285)	
22						363					
23						F					
24											
25					M				H, H	D	
									(130)	(315)	
26					M				H	D	
										(321)	
27			62			62					
28						311					
29						363				363	
30			C						E	O	
			(96)						(96)	(237)	
										, C	
										(256)	
31			I			Z					

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
32			62			62			62		
33											
34											
35											
36											
37			I								
38											
39											
40			C								
41						275					
42	197		197								
43	I										
44											
45	I										
46	I										
47	332, 375										
48											
49	I										

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
50	I										
51									H		
52											200
53										109	
54			I, I (55)								
55			54								
56			I		M						
57											
58			319								
59											
60									312		
61			L (20)							P (20)	
62			I, I (27, 32)		M	H (27, 32)			I (32)	V (295)	
63			I								
64											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
65											
66											
67											
68											
69											
70											
71											
72											
73											
74			220								
75			220								
76											
77											
78											
79											
80											
81											
82			C		E						

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
83										T (233)	
84										P, S (268)	
85					M						
86											
87											
88											
89											
90											
91										S (269)	
92									K		
93											
94			L								
95			C								
96			30						30		
97									316		
98											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
99			C								
100											
101					M				C		
102			C								
103											
104											
105											
106											
107											
108			L(12)								
109										P (53), D (322, 323)	
110							x		C		
111											
112									358		
113									E		

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
114											
115											
116											
117											
118											
119											
120											
121							x				
122							x				
123							x				
124							x				
125							x				
126									C	V (307)	
127							x		C		
128							x		C		
129									200		
130									25		
131									V		

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
132									K, K (4, 133)	O (239)	G
133									132		
134							x		C		
135									M		
136									A	V (308)	B
137									I	V (298)	
138									S		
139											F
140						200					200
141											305
142										G (246)	T
143											R
144							x				A
145											314

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
146							x				
147							x				
148							x				
149											
150											
151							x				
152							x			V (297)	
153							x				
154											
155											
156										V (293)	
157							x			G (247)	
158							x				
159							x				
160							x				
161											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
162											
163						316					
164						C					
165						200					
166						C					
167						W					
168						W					
169						276					
170						W					
171						15					
172						W					
173						P					
174						277					
175											
176											
177											
178											
179											
180											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
181								187			
182								187			
183											
184											
185							x				
186											
187							x	x (181, 182)		V (304)	
188											
189											
190											
191											
192											
193											
194											
195		x									
196				x			x				
197	I (42)		C(42)	x							

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
198				x			x				
199							x			V (302)	
200					M	S (140) C (165)	x		C (129)	D (320)	Y (52), C (140)
201			I (58)								
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
213											
214											
215											
216											
217											
218											
219											
220			I (74, 75)								
221											
222											
223											
224											
225							x				
226							x				
227										T	
228										332	
229										T	
230										T	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
231										T, C (252), R (266)	
232										T	
233										83	
234										T, V (299)	
235										O, G (246)	
236										O	
237										30	
238										O	
239										132	
240										329	
241										U	
242										281	
243										U	
244										258	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
245										G	
246										142, 235	
247										157	
248										G	
249										L	
250										L	
251										L	
252										231	
253										C	
254										291	
255										C	
256										30	
257										258	
258										C, C (257), S (289, 290),	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
										U (244)	
259										E, S (373/ 286), U (243)	
260					T					E, S (284)	
261										356	
262										E	
263										E	
264										P	
265										move d 267	
266										231	
267										R, R (265)	
268										84	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
269										91	
270										S	
271										275	
272										S	
273										S	
274										S	
275						S				S, S	
						(41)				(271)	
276					E	W				S	
						(169)					
277						S				S	
						(174)					
278										S	
279			C			S				S	
			(14)			(14)					
280										S	
281										S, U	
										(242)	
282										S	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
283										S	
284										260	
285										21	
286										372, 373	
287										356	
288										S	
289										258	
290										258	
291										S, C (254)	
292							x			V	
293										156	
294										V	
295										62	
296										V	
297										152	
298										137	
299										234	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
300										311	
301										V	
302										199	
303										V	
304										187	
305							x			V	E (141)
306										311	
307										126	
308										136	
309							x			V	
310										V	
311						F (28)				V, V (300, 306)	
312									E (60)	D	
313										D	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
314										D	W (145)
315										25	
316					M	C (163)			H (97)	D	
317										D	
318										D	
319										D	
320										200	
321										26	
322										109	
323										109	
324										360	
325									E (3)	D	
326										D	
327											
328							x				
329										U (240)	

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
330											
331											
332	I (47)									T (228)	
333											
334											
335											
336											
337											
338											
339											
340											
341											
342											
343											
344											
345											
346											
347											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
348											
349											
350											
351											
352											
353											
354											
355											
356			L (11)							E (261), S (287)	
357											
358							x		C (112)		
359											
360										D (324)	
361											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
362											
363						Z (22, 29)				P (29)	
364											
365											
366											
367											
368											
369							x				
370											
371											
372											
373										259	
374											
375	I (47)										
376											
377											
378											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
379											
380											
381											
382											
384											
385							x				
386											
387							x				
388											
389											
390											
391											
392											
393											
394											
395											
396							x				
397							x				
398											

Key	Haugen (1991)	Hester et al. (1989)	Hobel & Urbach (1988)	Hutto (2008)	Jenks & Huntsman (1958)	Joshi (2013)	Kosslyn (1994)	Kostelnick (2008)	Kumpf (2000)	Lannon & Gurak (2014)	Lauer & Sanchez (2011)
399											
400											
401											
402											
403											
404											
405											
406											
407											
408											
409											
410											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
1											
2						R					
3		325									
4											
5						R					
6											
7											
8				M		R					A
9		x		M		S					
10				M		S					B
11											356
12											
13				M		V					C
14		279									279
15				M							
16				M							A
17		x		M		S					A
18						S					
19						S					C

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
20											61
21						S					B
22		363		363					363		363
23											
24		x							x		
25						R					C
26											
27		62									
28											311
29		363									
30				R (340, 341, 342, 344)		S					A, C (96)
31		x				S			x		
32		62							62		
33											
34								66			
35											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
36					x						
37				P							
38											
39											
40											C
41											275
42											
43											
44											
45											
46											
47											
48						S					C
49											
50		x									
51											
52											
53											
54				F							
55											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
56											
57											
58		319									
59											
60									312		312
61											C (20, 90)
62		x (27, 32)				R S	x		x (32)		
63						S					A
64							x				
65											
66						S		x (34)			
67						S					
68											
69											
70											
71											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
72											
73											
74											220
75											220
76		x									
77											B
78											B
79											
80							x				
81		x				R	x				A
82						S					B
83											B
84				M							B
85											C, C
		x,x									(86,
		(87)				S					87)
86											85
87		85									85
88											A
89											C

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
90											61
91				M							
				(365)							C
92											C
93											C
94				S							
				(346)							C
95											C
96											30
97											
98						S					
99						S					
100											
101											
102											
103											
104											
105						V					
106											
107						V					

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
108						V					
109						S					
110						S	x				
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											
121							x				
122							x				
123											
124											
125					x	V	x				
126											
127											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
128						S	x				
129											
130											
131											
132						V					
133											
134					x		x				
135											
136											
137						S					
138											
139											
140											
141											
142						V					
143					x						
144											
145											
146							x				
147					x		x				

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
148											
149											
150											
151											
152							x				
153					x	S					
154											
155											
156					x						
157						V	x				
158							x				
159					x						
160					x						
161											
162											
163											
164					x		x	x			
165											
166											
167											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
168											
169											
170											
171											
172											
173						S					
174											
175											
176											
177											
178											
179											
180											
181											
182											
183											
184											
185											
186											
187					x	S	x				

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
188											
189											
190						R					
191						S					
192						S					
193						S					
194											
195						R					
196					x		x				
197						V					
198							x				
199				T							
	x			(359)	x		x				
200			x								
201		319								319	
202											
203											
204											
205											
206											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
207											
208											
209						S					
210											
211											
212											
213											
214								x			
215								x			
216											
217		258									
218		288									
219											
220											A (74, 75)
						S					
221						S					
222									291		
223				291					291		
224											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
225					x		x				
226					x		x				
227											
228											
229						V					
230											
231				T							
				(338)		R					
232											
233											
234						R					
235											
236						S					
237											
238											
239											
240											
241				T							
				(339)		V					
242											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
243											
244											
245											
246											
247											
248											
249											
250											
251											
252											
253											
254											
255						V					
256											
257											
258				U							
				(289)							
				, S							
		x		(349,							
		(217)		350)		S					

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
259											
260											
261											
262											
263											
264											
265											
266											
267											
268											
269											
270											
271											
272											
273											
274											
275				S (354, 355)							C (41)
276											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
277											
278											
279				S							
		x		(347,							C
		(14)		353)		V					(14)
280						V					
281											
282											
283											
284											
285											
286											
287											
288		x									
		(218)									
289				258							
290											
291									x		
				P, P					(222,		
				(223)					223)		

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
292											
293											
294					x		x				
295											
296						S					
297											
298											
299											
300											
301											
302											
303											
304											
305					x		x				
306											
307											
308											
309											
310											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
311				T (359)							B (28)
312									x (60)		A (60)
313											
314											
315											
316											
317											
318											
319		x (58, 201)								x (201)	
320											
321											
322											
323											
324											
325		x (3)									
326											
327											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
328						S					
329						V					
330											
331											
332						R					
333											
334				T							
335				T							
336				T							
337				T		V					
338				231							
339				241							
340				30							
341				30							
342				30		R					
343				R							
344				30							
345				R		R					
346				94							
347				279							

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
348				S							
349				258							
350				258							
351				356							
352				S							
353				279							
354				275							
355				275							
356				S, S (351)		V					B (11)
357				F							
358				F		V					
359				199, 311							
360				F							
361				F							
362				(22,5 4)							
363		x (22, 29)		F, F (22)		S			x (22)		C (22)

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
364				F							
365				91							
366				U							
367				U							
368				U							
369					x						
370											
371											
372											
373											
374						R					
375						S					
376						V					
377											
378					x						
379											
380											
381						S					
382											
384						S					

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
385					x						
386											
387											
388											
389											
390							x				
391											
392											
393											
394											
395							x				
396							x				
397					x						
398											
399											
400											
401							x				
402											
403											
404											

Key	Liu & Hao (2008)	Losano (1985)	Mackiewicz (2004)	Masse (1985)	Monmonier (1996)	Nadziejka (1999)	Peterson (1999)	Philbin (1985a)	Philbin (1995b)	Plunka (1988)	Prono et al. (1998)
405											
406											
407											
408											
409											
410											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
1											
2											
3											
4											
5					x				C		
6											
7											
8		S							C		L
9		S							C		L
10		S							C		L
11											356
12											108
13									C		L
14								279			279
15									C		L
16									C		N
17									C		N
18											
19											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
20											
21											
22											
23		D							C		F
24											F
25				x							F
26		D		x							F
27							62				
28		311					311				
29							363				
30		D									
		(96)							D		I
31									C		I
32		62					62				62
33											C
34											66
35											
36									P		
37											
38								P			

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
39								278			
40							P				
41								275			
42											197
43											E
44											E
45											E
46											E
47											332, 375
48									C		E
49											E
50											E
51		D									F
52		200									200
53											109
54											F, M
									P		(55)
55											54
56				x							M

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
57											311
58											319
59											319
60											312
61											M
62		D (32)					x, x(27, 32)				M, I (32)
63							x		C		M
64							x				F
65							294				294
66											F, C (34)
67											M
68											D
69											D
70		R									D
71											D
72											D
73											P

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
74											220
75											220
76											I
77							x				I
78		D									N
79											N
80											N
81									P		
82									C		
83									C		L
84											
85									C		L
86											
87											
88											
89											
90											
91									x		
92											
93		D							D		

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
94											
95											
96		30									
97											316
98									C		L
99									D		S
100					x						
101									C		
102											
103											
104											
105				x					C		
106		258, 358									
107											
108											L
									C		(12)
109						x					M
						(208)			C		(53)
110									C		

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
111											
112											
113											
114		D									
115											
116											
117											
118							x				
119											
120		258									
121				x						x	
122				x					C		
123										x	
124				x							
125	x										
	(149)			x						x	
126											
127											
128											
129											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
130											
131											
132									D		
133											
134											
135											
136			x								
			(204)								
137											
138											
139											
140											
141											
142				x							
143				x						x	
144				x							
145											
146	x										
147	x										
148	x										

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
149	125										
150	156										
151	x									x	
152	x									x	
153										x	
154											
155											
156	x										
	(150)									x	
157										x	
158							x				
							(224)			x	
159										x	
160											
161											
162							199				
163											
164											
165											
166											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
167											
168											
169											
170											
171											
172											
173									C		
174											
175											
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179											
180											
181											
182											
183											
184											
185										x	
186											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
187										x	
188											
189											
190				x					C	x	
191									C		
				x					(392)	x	
192				x						x	
193											
194											
195							x				
196										x	
197											E
											(42)
198										x	
199							x				
							(162)			x	
200		D									F
		(52)		x					C		(52)
201											
202											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
203			358			358					
204			136								
205			314			314					
206			313								
207			358								
208						109					
209									C		
210											
211											
212									C		
213									C		
214											
215											
216											
217											
218											
219											
220											I (74,
									P		75)
221									C		

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
222											
223											
224							158				
225							x				
226							x				
227											
228											
229									D		
230											
231											
232											
233											
234											
235											
236									C		
237											
238											
239											
240											
241									D		

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
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252											
253											
254											
255									D		
256											
257											
258		S (120), D (106)									

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
259											
260									C		
261											
262											
263											
264									P		
265											
266											
267											
268											
269											
270									x		
271											
272											
273											
274											
275								P			
								(41)	C		
276											
277									C		

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
278								P			
								(39)	C		
279								L			L
								(14)	C		(14)
280											
281									C		
282											
283											
284											
285											
286											
287											
288											
289											
290											
291									C		
292				x						x	
293											
294							x				F
							(65)		C		(65)

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
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308											
309											
310											
311		D					x				F
		(28)		x			(28)		C		(57)
312											F
									P, C		(60)

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
313			x								
			(206)	x							
314			x			x					
			(205)			(205)					
315											
316											F
				x					P		(97)
317											
318									P		
319											F
											(58)
											M
											(59)
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323											
324											
325											
326				x							

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
327											
328											
329									C		
330											
331											
332											E
					x				C		(47)
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Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
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352											
353											
354											
355											
356											L(11)
357											
358		D (106)	x (203, 207)			x (203)					
359											
360				x					P		
361											
362											
363							x(29)				

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
364											
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366											
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369											
370											
371											
372											
373											
374											
375										x	E(47)
376									C		
377										x	
378									C		
379									P		
380				x					C	x	
381											
382											
384									C		

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
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388											
389											
390									C		
391											
392									191		
393				x							
394				x							
395				x					C		
396				x							
397											
398				x							
399											
400									C		
401											
402											
403									C		
404											

Key	Reavy (2003)	Rude & Smith (1992)	Sadowski (1987)	Schriver (1996)	Soderston (1985)	Southard (1988)	Spurgeon (1981)	Stocker (1990)	Tarutz (1992)	Tufte (2001)	Van Buren & Buehler (1980)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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23		x
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25		x
26		x
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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66	x (34)	
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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153		x
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Zimmerman (1983)	Woodward (1995)
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206		
207		
208		
209		x
210	296	
211	234	
212		x
213		x
214		x
215		x
216		x
217		
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Key	Woodward (1995)	Zimmerman (1983)
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233		
234	x (211)	
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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296	x	
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Key	Woodward (1995)	Zimmerman (1983)
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311		x (57)
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314		x (145)
315		
316		x (97)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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Key	Woodward (1995)	Zimmerman (1983)
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