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# Uncovering Connections: CAQDAS and Tropy for Art Historians and Archaeologists

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# Uncovering Connections: CAQDAS and Tropy for Art Historians and Archaeologists

## **Abstract**

This article reports on a 2021 study that aimed to assess art historians' and archaeologists' familiarity with computer-assisted qualitative data analysis software (CAQDAS), so that academic librarians and visual resources professionals could begin to consider if access to and instruction on these tools might benefit their patrons in these disciplines. Initial findings from the study were presented at the Visual Resources Association 2022 Annual Conference. Scholarship concerning the information organization needs and practices of material culture researchers is limited but growing. Self-identified art historians, archaeologists, and object-based and material culture researchers were invited to take a survey disseminated through convenience and snowball sampling. Responses revealed a lack of participant knowledge about CAQDAS and mixed opinions about their utility. The participants' research needs demonstrated that art historians and archaeologists interested in CAQDAS should be advised to use them for their original intended purpose: that is, as an analysis aid that helps discover patterns within medium-to-large, sometimes mixed media, datasets. CAQDAS should not be recommended as a replacement for standardized databases, and knowledge management applications like Tropy better fit the need for personal image management support. For patient and motivated researchers with digital experience, CAQDAS can be a powerful tool. For others who fare well with more traditional analog and digital methods of analysis and organization, the packages may cause more frustration than success due to substantial learning curves and financial cost.

## **Keywords**

Visual resources, image management, technology, research, instruction, open-source software, Tropy, archaeologists, art historians, visual anthropologists, digital humanities, analysis aids, qualitative coding, computer-assisted qualitative data analysis software (CAQDAS), qualitative data analysis software (QDAS), visual anthropology, archaeology, material culture studies, academic librarianship.

## **Author Bio & Acknowledgements**

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## Introduction

Art historians and archaeologists adapt as they uncover artifacts, explore new methodologies, and draw connections. Just as every research project is unique, individual researchers have unique identities. Though the methods that both groups use to study material culture can appear similar, emphasis on substantial, formal, and stylistic analyses will change to fit research goals and accommodate the objects that comprise their cultural datasets. These terms are only one way to explain the foundations of object-based research: substantial analysis focuses on “the physical dimensions, material, and articulation of the object,” essentially creating “a descriptive physical inventory;” formal analysis then concerns “the object’s form or configuration, its visual character,” and works to transform what one sees into a cohesive, understandable description.<sup>1</sup> It can give insight into decisions made by individuals of different cultures when forming and employing objects, and lastly, in stylistic analysis – which also can be referred to as comparative analysis – the researcher compares objects to others within or across temporal and spatial contexts. In this way, they can examine the influence and impact of culture on the form and use of artifacts.<sup>2</sup> At a glance, visual analysis is not completely alien from the content analysis of other humanities disciplines, and object-based researchers frequently practice both throughout their education. Whereas textual content analysis can include finding patterns among paragraphs, sentences, and words, objects can be categorized by their stylistic and iconographic components in addition to the context in which they are found. Over the years, theoretical frameworks and research priorities have changed across material culture disciplines, but the fundamental importance of the object has not. Instead, what has changed is increased access to objects through their image proxies. Whether it is a photograph, sketch, or 3D model, art historians and archaeologists are adjusting to acquiring images in an age of digitization and digital tools.

While performing their own archaeological research, this author experimented with QDA Miner Lite, an example of computer-assisted qualitative data analysis software (CAQDAS). Because they felt that the package facilitated their analysis of complex sets of iconographic elements, they decided to assess other art historians’ and archaeologists’ familiarity with CAQDAS through a survey.<sup>3</sup> The scope of survey questions was broad as the objective was to shine further light not only on the possible interest these populations could have in CAQDAS, but also on their image use and image collection behaviors. This paper will offer a frame of reference concerning what is known about CAQDAS and visual research, as well as some recommendations for academic librarians and visual resources professionals, should they consider providing access to and instruction on CAQDAS for object-based researchers. Art historians’ and archaeologists’ “heavy reliance on objects, or images of these objects, is a critical difference between their research methods and that of their colleagues in other humanities-based disciplines” and thus, librarians and visual resource professionals must continue to investigate specialized ways to support them.<sup>4</sup> Moreover, studies on research information needs provide data on how user-based discovery systems can be built or

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<sup>1</sup> Jules Prown, *Art as Evidence: Writings on Art and Material Culture*, New Haven, Connecticut: Yale University Press (2001): 80.

<sup>2</sup> Ibid.

<sup>3</sup> This article pulls from a master’s paper submitted to the School of Information and Library Science of the University of North Carolina-Chapel Hill, as well as a presentation on the results of the study at the VRA 2022 Conference in Baltimore.

<sup>4</sup> See Joan Beaudoin, “Image and Text: A Review of the Literature Concerning the Information Needs and Research Behaviors of Art Historians,” *Art Documentation: Journal of the Art Libraries Society of North America* 24, 2 (October 2005): 36, <https://doi.org/10.1086/adx.24.2.27949373>; and Jasmine Burns, “Images as Research Data and the Role of the Information Professional,” *Visual Resources Association Bulletin* 46, no. 2 (2019): 3.

improved.<sup>5</sup> Identifying barriers to object-based researchers' use of these systems, information professionals could generate solutions that unlock the potential benefits of CAQDAS for analyses of large, challenging, and image-saturated collections.

### What is CAQDAS/QDAS?

In the 1980s, CAQDAS as we know them began to develop with the upward progression of computing capabilities. Early packages were created by qualitative researchers who experimented with “do-it-yourself approaches using word processors and text retrievers.”<sup>6</sup> Seeking more efficient ways to analyze their data, they took advantage of new technological developments. Early programs were created around the world and across operating systems.<sup>7</sup> Now one can choose from many packages, and forums and tutorials are plentiful online. CAQDAS provide digital workstations where researchers assign “codes” to strings of text, selected areas of images, or segments of videos and audio rolls. Depending on the package, quantitative datasets may be entered as well. A code is “most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data.”<sup>8</sup> This unit of meaning assists in “pattern detection, categorization, assertion or proposition development, theory building, and other analytic processes.”<sup>9</sup> Social scientists are generally more familiar with the term, especially if they analyze large numbers of transcribed interviews. In teams, they benefit from CAQDAS' intercoder reliability features. Coding can be used to quantify one's qualitative data, but that does not have to be the case.

In the context of artifact research, a code can be as simple as an identified icon on a vase or as complex as a sentence describing the relationship between icons on that vase. One can create codes based on what they deduce from experience, or they can pull them deductively from the woodwork of their data. Proponents of coding methodology have given names to the number of times one codes a corpus and how types of codes relate to the researcher's frame of reference.<sup>10</sup> Most important to remember is that CAQDAS does not replace researchers. Researchers create their own controlled vocabularies, or “codebooks.” From there, they can query their codes to reveal patterns within and between coded documents.

### Literature Review

Few studies focus on image use and image organization behaviors of art historians and archaeologists. This will be only a short review of the target populations' known image use and organization behaviors, as well as how the introduction of image digitization, digital metadata, and digital tools have impacted them. Firstly, in her study of archaeologists, architects, art historians, and artists, Beaudoin found that archaeologists and art historians specifically used images to increase knowledge for themselves or their students, communicate information to others, retain and recall information (i.e. images as *aide-mémoire*), develop students' critical thinking skills through object

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<sup>5</sup> Christina Kamposiori, “The Impact of Digitization and Digital Resource Design on the Scholarly Workflow in Art History,” *International Journal for Digital Art History* 4 (2019): 3-11; Sander Münster, Christina Kamposiori, Kristina Friedrichs, and Cindy Kröber, “Image Libraries and Their Scholarly Use in the Field of Art and Architectural History,” *International Journal on Digital Libraries* 19, no. 4 (2018): 367-383.

<sup>6</sup> Urszula Wolski, “The History of the Development and Propagation of QDA Software,” *The Qualitative Report* 23, no. 13 (2018): 8.

<sup>7</sup> *Ibid.*, 9.

<sup>8</sup> Johnny Saldaña, *The Coding Manual for Qualitative Researchers* (3rd ed.), London, England: Sage (2016): 4.

<sup>9</sup> *Ibid.*

<sup>10</sup> For more detail, see Matthew B. Miles, A. Michael Huberman, and Johnny Saldaña, *Qualitative Data Analysis: A Methods Sourcebook*, Sage (2014).

observation, engage and maintain student interest, and support research arguments.<sup>11</sup> Beaudoin's study takes on an instructional lens as much as it does a research one, so her participants speak to their experiences as instructors in addition to their preferences as researchers. The variety of ways individuals use images lends itself to the development of large personal image collections.

In another study, Beaudoin and Brady explored the image collection and organization needs of archaeologists, architects, art historians, and artists by reviewing their image resource preferences. They found that while digital resources like online databases were well-used, technological learning curves served as a barrier to entry and use. It became clear that personal image collections comprised of images the users had photographed or scanned themselves were critical to their research.<sup>12</sup> Several years later, Larkin surveyed visual arts humanities scholars in their information-seeking needs and concluded that they heavily relied on personal image collections, and that those collections grew larger with online access to information. That study also showed that "while visits to the library have declined considerably, computer use for research has increased..." with "more than half of the respondents own[ing] a digital image collection, over forty percent frequently us[ing] computerized databases, and a similar percentage regularly us[ing] online library catalogs."<sup>13</sup>

As researchers acquire images, they may simultaneously begin to organize them, and organization can be intertwined with impromptu annotation. A researcher may already have a solid understanding of their materials before planning an organizational schema, if they plan one at all. According to Rose, researchers historically turned to notebooks, folders and binders, and index cards. Over time, the use of word processors became more widespread for recording memos, and bibliographic reference sources like Endnote and Zotero became more commonplace for organizing secondary resources.<sup>14</sup> Now devices have file explorers and scholars mirror the analog process of storing documents in folders within their digital workspaces. Art historians are known to assign unique names to files and folders based on artists, related course titles, geographic regions, object dates and time periods, excavation seasons, or subject themes.<sup>15</sup> These tasks can be performed using the software that comes with most operating systems. The next natural topic of discussion is how additional proprietary or open-source digital tools can be used for object-based research.

An in-depth account of the history of scholarship and individual opinions on how digital tools have shaped one discipline can be found in "Forgotten Genealogies: Brief Reflections on the History of Digital Art History," wherein Zweig counters the formerly accepted argument that art historians are largely unwilling to take on new technologies. He argues instead that art historians are no further behind in the digital arena than their other counterparts in the humanities. He describes rigorous attempts by art historians to digitize, store, and retrieve cultural heritage information over the past several decades. Zweig discusses how analysis can be aided through data visualization and how there are ways to generate new data through tools like geographic information systems (GIS).<sup>16</sup>

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<sup>11</sup> Joan Beaudoin, "A Framework of Image Use Among Archaeologists, Architects, Art Historians and Artists," *Journal of Documentation* 70, no 1 (2014): 120-128.

<sup>12</sup> Joan Beaudoin and Jessica Evans Brady, "Finding Visual Information: A Study of Image Resources Used by Archaeologists, Architects, Art Historians, and Artists," *Art Documentation: Journal of the Art Libraries Society of North America* 30, no. 2 (2011): 24-36, <https://doi.org/10.1086/adx.30.2.41244062>.

<sup>13</sup> Catherine Larkin, "Looking to the Future While Learning from the Past: Information Seeking in the Visual Arts," *Art Documentation: Journal of the Art Libraries Society of North America* 29, no. 1 (2010): 56-57, <https://doi.org/10.1086/adx.29.1.27949539>.

<sup>14</sup> Trish Rose, "Technology's Impact on the Information-Seeking Behavior of Art Historians," *Art Documentation: Bulletin of the Art Libraries Society of North America* 21, no. 2 (2002): 37-38.

<sup>15</sup> Roger C. Schonfeld, and Matthew Long, "Supporting the Changing Research Practices of Art Historians," *Ithaka S+R* (2014): 23, <https://doi.org/10.18665/sr.22833>.

<sup>16</sup> Benjamin Zweig, "Forgotten Genealogies: Brief Reflections on the History of Digital Art History," *International Journal for Digital Art History* 1 (2015): 39-46, <https://doi.org/10.11588/dah.2015.1.21633>.

Schonfeld and Long's study also highlights how art historians do apply technology in their research, even if those methods "do not always fit into the narrowly-defined category of 'digital humanities.'"<sup>17</sup> Whether or not the methods fall under digital humanities or digital art history, many scholars understand how technology helps them analyze data and support research questions. Projects can be facilitated with technology, and that technology can be "a medium for new research practices without necessarily transforming researcher's methods."<sup>18</sup>

There is a lacuna in scholarship regarding archaeologists' use of digital tools. They are often considered a subsidiary population of art history, though many archaeologists would argue against this classification. Information about how archaeologists use digital tools thus comes almost solely from their own methodology sections, their experimental studies focusing on the current or future utility of a new tool, or handbooks written by and for archaeologists. There are, of course, many digital tools they now employ regularly in their research. They allow them to retrieve and store large quantifiable or semi-quantifiable datasets during or shortly after ground survey or excavation. These include tools used during excavation (e.g., ground penetrating radar [GPR], global positioning systems [GPS]), individual databases and information systems that manage data for sites or countries, or data visualization software. Others include photogrammetry and 3D scanning, which are used to capture or produce visuals of environments and objects.

In theory, individuals may try new resources if the barriers to entry are low and the usefulness of the resources is perceived as high. Reality is more complicated. Kamposiori, Warwick, and Mahony stress that "the tools scholars tended to use mostly were those suggested either by their colleagues or their institutions...while they were more likely to use a tool when given at the start of their project and when receiving relevant training and support."<sup>19</sup> Even with newer professionals, there is no guarantee that they will be supported when learning and employing digital tools. Time is a rare commodity. Tools have learning curves, and if a researcher thinks that the benefits do not outweigh the cost, then they may not pursue them at all.<sup>20</sup> Moreover, many art historians are self-identified loners who shy away from collaborative work when there are not enough incentives to do so. There is a deeply ingrained fear of losing ownership of one's research, thus leading "to a sense of territoriality that pervades the discipline."<sup>21</sup> Researchers may believe that digital methods are of lesser quality, or they are concerned about how using them will affect tenure review processes.<sup>22</sup>

Long and Schonfeld explain that among their participants, "almost all senior researchers who are engaged in digital methodologies said that they have steered their graduate students away from experimentation, since they see it as a risk to an untenured scholar's career."<sup>23</sup> Despite this, Long and Schonfeld suggest that new tools be developed for working with digital images, that art historians require more assistance to learn about proper image management as those tools appear, and that institutions should offer grant funding or similar investments if scholars are to feel comfortable implementing technology. Those pursuing sustainable, long-term projects struggle with hurdles presented by the cultural and financial infrastructure of art history disciplines, and

<sup>17</sup> Zweig, "Forgotten Genealogies," 35.

<sup>18</sup> Long and Schonfeld, "Supporting the Changing," 35.

<sup>19</sup> Christina Kamposiori, Claire Warwick, and Simon Mahony, "Building Personal Research Collections in Art History," in *Cultural Heritage Infrastructures in Digital Humanities*, edited by Agiatas Bernardou, Erik Champion, Costis Dallas, and Lorna Hughes, UK: Routledge (2017): 12.

<sup>20</sup> Rose, "Technology's Impact," 38.

<sup>21</sup> Diane M. Zorich, *Transitioning to a Digital World: Art History, Its Research Centers, and Digital Scholarship. Report to the Samuel H. Kress Foundation and the Roy Rosenzweig Center for History and New Media, George Mason University*, Samuel H. Kress Foundation (2012): 19-20, <https://www.kressfoundation.org/Resources/Sponsored-Research/Research-Items/Transitioning-to-a-Digital-World>.

<sup>22</sup> Long and Schonfeld, "Supporting the Changing Research," 8; Zorich, *Transitioning to a Digital World*, 20-21.

<sup>23</sup> Long and Schonfeld, "Supporting the Changing Research," 8.

comparatively, archaeological ones. Unfortunately, the brunt of technological labor falls on contingent individuals like graduate students and new professionals. As they juggle old and new methods, they can end up feeling like “jack[s] of all trades and master[s] of none.”<sup>24</sup> Until this point in the review of scholarship, none of the studies have mentioned CAQDAS.

Concerning CAQDAS, few studies discuss their use by visual researchers. Woods et al. used the database Scopus to pull 763 studies published in peer-reviewed journals between 1994-2013 claiming to use CAQDAS. They focused on ATLAS.ti and NVivo (previously NUD\*IST) and hoped to see how researchers applied the software in empirical research. Most frequent were interviews and focus groups used in health science studies. Video and image data appeared in only 4.6% of their sample. Almost all examples used CAQDAS for data analysis and data management, while about 10% worked with the data visualization features. Though the packages could facilitate team analysis of multimedia datasets, Wood et al. expressed that few researchers took advantage of the features.<sup>25</sup>

Estrada then describes the functionalities of NVivo, Transana, and ELAN in audiovisual (AV) media analysis.<sup>26</sup> Indexing of AV sources is a relatively new addition to the CAQDAS repertoire, and “unlike text, these sources usually require manual sequential viewing and annotation, in order to transcode the content (e.g., creating a transcription), or to identify meaningful units at different levels, such as objects or actions, spoken words, or abstract ideas.”<sup>27</sup> This is not unlike how art historians and archaeologists already iteratively review their materials through analog sorting. Unlike text-based analysis where the system can crawl through the words and symbols, one cannot easily automate adding codes to images in CAQDAS.<sup>28</sup> For AV analysis, Estrada identifies transcribing, segmenting, coding, linking, and commenting as core processes across disciplines. They conclude that CAQDAS scholars who use AV (e.g., visual anthropologists, oral historians, etc.) can benefit from the tools. They caution scholars to compare software packages to find which one will best support their thematic or multimodal analyses, and that they should be vocal about whether it is helpful for them to be able to analyze multiple media types in the same digital workstation.<sup>29</sup> They acknowledge that scholars should still be prepared to use multiple programs outside of CAQDAS to accomplish their needs. Ethnographic anthropologist Franzen enforces this concern, as Transana provides features missing in video editing programs, but likewise lacks the ability to enhance qualities of video footage.<sup>30</sup>

Budzise-Weaver brings us back more squarely into the realm of artifact research and provides direct information about their personal experience with the CAQDAS ATLAS.ti. They also emphasize the librarian’s role in introducing these kinds of tools to patrons and assisting them throughout the learning process. Forty paintings by Roy Lichtenstein and James Rosenquist were input into the software package.<sup>31</sup> From there, visual grounded theory allowed “the paintings to

<sup>24</sup> Zorich, *Transitioning to a Digital World*, 25.

<sup>25</sup> Megan Woods, Trena Paulus, David P. Atkins, and Rob Macklin, “Advancing Qualitative Research Using Qualitative Data Analysis Software (QDAS)? Reviewing Potential Versus Practice in Published Studies Using ATLAS.ti and NVivo, 1994-2013,” *Social Science Computer Review* 34, no. 5 (2016): 598-599, 603-605, 608, 611.

<sup>26</sup> Liliana Melgar Estrada and Marijn Koolen, “Audiovisual Media Annotation Using Qualitative Data Analysis Software: A Comparative Analysis,” *The Qualitative Report* 23, no. 13 (2018): 44.

<sup>27</sup> Ibid.

<sup>28</sup> Ibid, 41, 44

<sup>29</sup> Ibid, 42, 55-56.

<sup>30</sup> Sarah Franzen, “Digital Transformations: Integrating Ethnographic Video into a Multimodal Platform,” in *Anthropological Data in the Digital Age*, edited by Jerome W. Crowder, Mike Fortun, Rachel Besara, and Lindsay Poirier, Macmillan, 2020: 136-137.

<sup>31</sup> Tina Budzise-Weaver, “Developing a Qualitative Coding Analysis of Visual Artwork for Humanities Research,” *DHQ: Digital Humanities Quarterly* 10, no. 4 (2016): para. 8

reveal intricacies through in-depth observation.”<sup>32</sup> Budzise-Weaver describes their process of open coding and provides insight into how codes can visibly overlap over images within the digital workstation. They make use of ATLAS.ti’s code occurrence and query features. The query tool permitted them to visualize the frequency of certain codes concerning style, gender, and color or hue.<sup>33</sup> In all, they “encourage the examination of imagery through qualitative coding, or annotation, to reveal themes and visual stories to further unravel the layers of a visual object.”<sup>34</sup>

While university libraries do offer CAQDAS and Tropy workshops to patrons, the target patron audience is not always clear. A singular publication details a CAQDAS library workshop series at the Norwegian University of Science and Technology (NTNU) University Library. Rødnesnes, Faber, and Jensen offered workshops in person. They think this is more effective than online workshops on digital tools. NVivo was their package of choice, and they planned two days of instruction for PhD candidates and researchers. They recognize that most institutions would prefer workshops to be two hours rather than two days. The reason for a longer workshop was simple: patrons had diverse research designs, data, subject areas, and levels of computer literacy. For them, there was no doubt that the library was the place to hold these sessions.<sup>35</sup>

## Methodology

For this study, the author sought out not only self-identified art historians and archaeologists, but object-based and material culture researchers in general, given the interdisciplinarity of these fields of study. A survey was disseminated through convenience and snowball sampling. This included reaching out to former colleagues in art history and archaeology as well as sending the survey out on the Art Libraries Society of North America (ARLIS/NA) and Visual Resources Association (VRA) listservs. Researchers may take on positions in academic departments across disciplines depending on their career goals or the job climate. It is not unusual to find object-based researchers in anthropology, ethnic studies, classics & Near Eastern studies, Islamic studies, African studies, communications, and more. It was important, then, to encourage participants to share the survey with their colleagues across department lines. Once the surveys were received, the author cleaned the Qualtrics data in Microsoft Excel, and then imported the data into ATLAS.ti for grounded qualitative analysis.

Participants were required to read and agree to a consent form that outlined the study's low risk, how their anonymity would be protected, and the fact that the study had been cleared through the Institutional Review Board (IRB) at the University of North Carolina-Chapel Hill. The survey then opened with a question on the participant’s disciplinary identity, but in addition to the options “art historian” and “archaeologist,” they were given the opportunity to write in a label after selecting “other.” Then, they were asked to select an option that represented their position (i.e. graduate student, post-doctoral candidate or fellow, faculty member). A write-in “other” option was available here, too. Researchers gave a description explaining what purpose images serve in their projects. More technical questions followed, asking whether they use their devices’ default file explorers and image viewers and what other software they use to organize files and open images. The survey prompted participants to review a list of CAQDAS (ATLAS.ti, NVivo, Dedoose, MAXQDA, QDA Miner, webQDA, Transana). Another question asked about their familiarity with a non-CAQDAS application: Tropy, an open-source knowledge organization application developed by the Roy

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<sup>32</sup> Budzise-Weaver, “Developing a Qualitative Coding Analysis,” para. 13, 15.

<sup>33</sup> Ibid, para. 16-26.

<sup>34</sup> Ibid, abstract.

<sup>35</sup> Sara Rødnesnes, Hege Charlotte Faber, and Magnus Rom Jensen, “NVivo Courses in the Library: Working to Create the Library Services of Tomorrow,” *Nordic Journal of Information Literacy in Higher Education* 11, no. 1 (2019): 30-33.



Rosenzweig Center for History and New Media (RRCHNM). The addition of Tropy served as a useful foil to CAQDAS. As the survey was meant to parse out details concerning participants' image needs and organization habits, their versatility with using digital tools, and ultimately their interest in employing novel digital tools like CAQDAS to perform analyses, it seemed appropriate to include a more recognizable, open-source tool that has already gained traction among archival researchers. Although the scope of survey questions was broad, the intention was to understand whether participants recognized the tools and how those tools may benefit different essential areas of image data collection, management, and analysis.

Participants selected the tools that they had heard of or used before. To keep the survey at a manageable length, they only received further questions about their use of each tool if they selected them in this prior question. These clarifying questions sought to record how they discovered the digital tool, why they thought to try it, how often they used it during their research, if they had access to it through their institutions, if they received instruction on it, and if they would return to that tool again. Regardless of whether they selected any CAQDAS or Tropy, they were asked what other applications they use to organize, view, or compare images throughout their research, followed by the same clarifying questions. The survey concluded by asking whether they were interested in learning more about CAQDAS, and if so, what modes of training they would want to receive. A last question that went largely unanswered was about the possible impact that CAQDAS could have on professional development, from applying for grants to receiving tenure.

### **Survey Findings and Discussion**

In total, 24 individuals completed the survey for this study. Most respondents were researchers in academic positions (faculty [n:8], graduate students [n:10], or post-doctoral candidates [n:3]). Four participants chose the "other" option with respect to their discipline identification: one person labeled themselves simply as "staff," two identified as librarians, and one was a former post-doctoral fellow and current museum researcher. One person had faculty status, but under another question they noted that their primary work is as a librarian, leaving us with three librarians in all. Within the pool there were self-identified archaeologists (n:11) and art historians (n:9). Four filled in the "other" option or selected it before leaving the write-in field blank. Two outliers who did fill in the field self-reported as a visual anthropologist and a digital humanities specialist. The assumption is that all participants are or have in the past been researchers who are, or have been, affiliated with an American university or cultural heritage institution as these criteria were outlined in the consent form. Input from professionals experienced with other aspects of higher education and cultural institutions allowed for additional rich perspectives and input.

Should this study be replicated, it would benefit the researcher to send surveys out to additional professional academic organizations like the American Institute of Archaeology (AIA), the Association of Art Historians (AAH), and perhaps the College Art Association (CAA). At the time of this study, funding barriers were an obstacle to pushing the survey forward to those populations. To manage the scope of the sample, the author also chose to limit their search to affiliates of American universities and museums. Further research on this topic could also extend to participants globally, but researchers will need to be prepared to not only analyze larger sample sizes, but also to be able to provide and read surveys in multiple languages.

The information gleaned from the responses was loosely broken down into categories: participant image use, image collection organization behaviors, and use of digital tools as image research aids. When looking at the users' methods of collecting, viewing, organizing, and manipulating images in artifact-based research, it can become easy to conflate metadata and research data. Here, Burns provides clear definitions that should be kept in mind going forward, with "metadata being data that represents the image or the file itself," and "research data as an

interpretation of the content or context of the image.”<sup>36</sup> So in this case, when digital tools are used as research aids, their utilization goes beyond simply storing images and assigning identifying metadata through them. Instead, this category pertains to how digital tools are used to aid pattern recognition and information creation. For example, a digital tool becomes a research aid when used to open two images for comparison in order to establish those objects as *comparanda*. For our purposes, software is not a research aid if it is used to simply open two image files to find and delete duplicates. Discussion of participants’ reception and knowledge of CAQDAS falls under the last category. Though Tropy is designed as a knowledge organization application for archival research, responses make clear its potential for direct use both as an aid for image-saturated research and as a vehicle for personal image collection management.

### *Participant Image Use*

Participants described several ways that they use images, such as: inspiration for research questions, evidence to answer research questions and support claims, proxies for – or reconstructions of – objects, places, and features, illustrative examples in teaching or publications, and lastly as *aides-mémoire*. An art historian said that images are “vital assets for art historical research because without reference images it is nearly impossible to begin developing a research idea,” while an archaeologist described the significance of illustrations as reconstructions. They use “images in the form of maps, architectural renderings, site plans, building plans, etc. to understand the use of urban space, historical sites, and artifacts that no longer exist.” Artifact researchers commonly create their own illustrations and data visualizations that then become part of their and other researchers’ corpora. Archaeologists update and refer to these reconstructions over years of working on sites and projects. Also worth mentioning is that survey participants emphasized the significance of *comparanda*, the technique of comparing objects, and by proxy images of those objects, to draw connections, track trends, and support arguments. Seven mentioned this technique either by name or with synonymous phrases like “comparing images.” Other descriptions included “identifying” other objects or referencing images of “diagnostic artifacts.” As a component of stylistic analysis, establishing *comparanda* allows art historians and archaeologists to determine whether their objects fit known taxonomies, or if new taxonomies need to be created. In all, these responses are not so different from Beaudoin’s observations.<sup>37</sup>

Though participants were not asked about their image discovery and acquisition habits, they still mentioned digital collections databases in responses. They asserted that certain collections have features that they find useful for their analyses. For example, as of this article, users found it helpful that Artstor allows users to view multiple images at one time and Mirador has annotation capabilities for images that follow the International Image Interoperability Framework (IIIF). The British Museum and Metropolitan Museum digital collections, Europeana, the Prometheus Bildarchiv, and the Beazley Archive Pottery database were also mentioned. Of note is the fact that these are all open-source collections. Again, respondents were not prompted to speak to their experiences with image discovery, so they were not expected to address proprietary databases or datasets accessible through their institutions. Because there were no questions on image acquisition, the composition of the researchers’ personal image collections is unknown, and it is unclear how many of their images are photographs they took themselves.

### *Image Collection Organization Behaviors*

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<sup>36</sup> Burns, “Images as Research Data,” 4.

<sup>37</sup> Beaudoin, “A Framework of Image Use.”

As discussed before, personal image collections can grow to include thousands of images scanned from print books, downloaded from museum collections databases, or taken by the person using a personal camera while visiting a museum, archive, or while finding the object *in situ*. The lines between cumulative personal image collections and defined project corpuses blur over time. Images, like physical objects, can be useless without context. A disaster, or at the very least frustration, results from an object being divorced from its location information or an image being divorced from its metadata. So while building a personal collection can be liberating because the researcher can organize it using their own personal criteria, participants expressed that it can also become a struggle. Although each response indicated a sophisticated and unique way of organizing images, it became clear that the process becomes more stressful as the number of projects increases. This reinforces previous studies' findings that users in these groups hoard images, as they fear losing access to those objects that could spark inspiration for their next project at any moment.

Half of the sample acknowledged that they place image files in folders. Most then attempt, with mixed success, to apply their own naming conventions based on the project needs. These naming protocols can be as simple as labeling individual files by the object accession or archive number, or as complex as using the file name field to record image metadata (e.g., image source including pagination, identifiable visual information about the object, titles of works of art). For file organization, several popular tools were described that have been mentioned in other similar studies, including Adobe products (Lightroom, Bridge, Photoshop, Illustrator), Zotero, Google products (Excel, Drive, Picasa [now Photos], Open Gallery), and relational database platforms like FileMaker Pro and Microsoft Access.<sup>38</sup> For all of these, participants recorded that they use each tool for multiple purposes, but no one program fulfilled all of their image organization or research analysis needs.

#### *Digital Tools as Image Research Aids*

NVivo was the only recognized CAQDAS. Only three participants had heard about or used the software package. One art historian explained that they encountered NVivo in a research methods course while training to be a librarian, and they have yet to find a use for it in their art historical research, but they have used it to code interview transcripts. A digital humanities specialist learned about it at their institution's university library, and one of their graduate students employed NVivo "to create an image database that used spatial tags on the images for querying." This user has also tested it a few times to organize, compare, and annotate images. Then, even though another art historian said they have not worked with NVivo, they know a faculty colleague who uses it. A visual anthropologist discovered NVivo "during a grant-writing process as a tool for coding ethnographic field notes," and their subject specialist librarian also told them about its image capabilities. Because none of them have used NVivo extensively and most of them are hesitant to return to it, they did not have opinions on how it could affect professional development and tenure. Only two of the three individuals have institutional access to the program.

There is little to glean about the software's utility from the information given by participants, as those who were familiar with it admit that they are hesitant to return to NVivo. One art historian gave a compelling reason for not using it at all:

...the nature of my art historical research is not at the scale of studying more than ten works of art at any given time. The amount of formatting, coding, and data manipulation in a database like this ends up consuming much more time than it would to manually markup

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<sup>38</sup> Long and Schonfeld, "Supporting the Changing Research," 6; Kamposiori, Warwick, and Mahony, "Building Personal Research Collections," 7-9, 11, 13; Burns, "Images as Research Data," 6.

this sort of information...I did not find that art historical discourse utilizes traditional qualitative analysis that would facilitate the use of this sort of software.

Meanwhile, the digital humanities specialist noted that while NVivo has not been applicable to their most recent projects, they anticipate that it could become useful for their future work. Two other significant findings from the responses are that librarians were resources of discovery and instruction for NVivo, and the use of CAQDAS can be a worthy inclusion in the grant-writing process in some way. Given the proprietary nature of CAQDAS, subscriptions unavailable through one's university could be paid for as part of a research grant, though researchers will probably need to be well-acquainted with a package to feel comfortable enough to request funds for one.

Of those unfamiliar with CAQDAS, fourteen indicated that they are interested in learning more. Based on responses across the survey, for a new analysis tool to be useful, participants said it needs to be applicable across projects with varying object types and dataset sizes, include the ability to easily input and query archival and source information, and provide a standardized way to view, organize, and analyze images in one place. When possible, open-source options are preferred, especially so that they can be made accessible to students. Suggested modes of instruction and aid were online webinars and tutorials, in-person trainings and workshops, and FAQ or troubleshooting webpages. A digital humanities specialist requested that demonstrations use data that is tailored to patron disciplines: "I am always looking for humanities-oriented training. There is a continual dearth in digital humanities (or computer-assisted humanities) training. So introducing a platform for the specific needs of a scholar, with real examples [sic]."

Deterrents cited by those who were skeptical about trying CAQDAS were time commitments and a lack of knowledge about the packages in general. An art historian said that they "find that this type of data analysis and visualization tends to be very project specific and that they fail to scale to most other people's research aims and methods," but they still want to hear more from their institution's makerspace and digital scholarship studio about how this kind of software is being employed by other art historians. A few were honest and said that they cannot imagine why such a program would be useful for artifact research.

In comparison, six participants had experience with Tropy. Three had also considered or tested using NVivo. Unlike the hesitancy surrounding NVivo, responses about Tropy were generally positive. They encountered the application through digital humanities courses and library workshops, social media, and through RRCHNM demonstrations. Previous positive experiences with RRCHNM creations were enough to prompt some researchers to try another. A digital humanities specialist tested it because they use Omeka, while an archaeologist sought out Tropy because they use Zotero. Users were pleased with the available annotation feature. Presently, this feature "allows you to transcribe documents, select image details, and manipulate photographs to get the clearest view of your sources," and one can tag photos for quick retrieval.<sup>39</sup> An archaeologist commented that Tropy aided the "searchability of large image collections" stored on their device.

This time, one participant said that they regularly use the application, and two others said that while they have only used it a few times, they would highly recommend it to others. One reason that they find it so easy to recommend is because of its user-friendly interface and open-source availability. Below is a detailed describe given by an art historian about how they employ the application:

[In addition to organizing files in folders], I am also organizing images of individual artworks using Tropy, so that I can add research notes to each image as well as annotate/tag the

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<sup>39</sup> "Explore Your Research Photos," *Tropy*, accessed October 7, 2022, <https://tropy.org/>.

artworks into categories...The organizing and annotating aspect really helps me keep track of what I have, what I know about what I have, and where it came from. And I don't have to make lists of notes that are separate from the images and can therefore potentially get lost or separated from the images. And I have more metadata fields to work with than when trying to use IPTC data to add information directly to the image file itself (which also isn't the easiest thing to do using Photoshop).<sup>40</sup>

Responses also mentioned Tropy's interoperability. Presently, data can be exported as CSV, HTML, Markdown, or JSON files for use in other databases.<sup>41</sup> The application's ability to link back to an image's online source (e.g., museum digital collections webpages) was another benefit noted by participants.

Once more, participants recognized that they will not use software that adds more complexity than they need in their research. An art historian said that they would not use Tropy again because "it is an extra component that doesn't necessarily add much to [their] research at this point," though they elaborated that they see how Tropy could be "a way to save topics of interest or make notes on images before I start a proper project with them." Once the actual project research has begun, however, they do not think it would be beneficial to them. Similarly, though not about Tropy, an art historian emphasized that when they use Zotero or Artstor, they save the tool for the beginning of the image searching journey in a project. It makes it simple for them to cull images before diving into deeper analyses.

According to participants, other programs and applications that they use to compare, annotate, and manipulate images included Getty Scholars' Workspace, Artstor Image Groups, ArcGIS/ArcScene and QGIS, Flourish, the digital humanities tool Recogito, and Mirador. As with the tools that they use for image collection organization, these resources served multiple other functions for participants. The exception was the 3D model viewer Sketchfab, which was only used by a participant for simply opening and reviewing 3D models of objects. Regarding Adobe Illustrator, Artstor, and Zotero, respondents identified themselves as self-taught. Those who did not and instead received help from students, colleagues, librarians, and digital humanities specialists were more likely to try a new tool if they saw that it was effective for their colleagues or students.

## Conclusions and Recommendations

This study aimed to not only gather information on art historians and archaeologists' familiarity with CAQDAS, but to also contribute to conversations about supporting the unique needs of material culture researchers through digital tools. Respondents discussed the significance of images to their work, the technical aspects of their image file organization, obstacles that arise when learning new digital tools, and their willingness to experiment when supported by librarians, visual resource professionals, and digital humanities specialists. For visual resource professionals and librarians, as well as their art historian and archaeologist patrons, there are gray areas between image retrieval, personal collection management, and qualitative data analysis. Object-based researchers form hypotheses even as they discover and organize their new data. One makes significant progress towards answering research questions from the first images they collect, and they continue to gain experience throughout the trials of developing organizational methods for themselves and their collaborators. The act of placing images side-by-side to perform identifications, uncover patterns,

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<sup>40</sup> Note that Burns offers advice about Adobe products in their publication and one difficulty that users can encounter is that the metadata fields are locked in to the photography-centered IPTC Core schema: "Images as Research Data," 5.

<sup>41</sup> "Export from Tropy," *Tropy*, accessed November 11, 2022, <https://docs.tropy.org/other-features/export>.

and ultimately establish objects as *comparanda* does not only happen once all images have been collected, sorted, and retrieved through digital browsing and query. That is not to say that all researchers follow the same patterns when performing comparative visual analysis and organizing their image collections.

Because the process of organizing is, in some ways, concurrent with analysis of material culture by object-based researchers like art historians and archaeologists, it is unsurprising that participants laud tools that have multiple functions. For image resource professionals, however, it can be difficult to determine when the number of features cross the line into overwhelming and intimidating new users. Still, art historians and archaeologists are not new to technological change, and the disciplines have developed a history of employing digital tools throughout their research. With that said, because the capabilities of Tropy and CAQDAS were adapted from analog techniques used by qualitative researchers for decades, some will find them intuitive, and others will be willing to tackle the learning curve. Others will discover that they are not conducive to their workstyles and that their experience with file explorers and analog methods are sufficient for them.

Although information provided by participants about the use of NVivo was limited, there are some material culture researchers who may still benefit from this type of tool. Many in the study showed interest in learning more about CAQDAS, and visual researchers like Budzise-Weaver have found the digital workstations useful. Those historians and archaeologists interested in CAQDAS should be advised to use them for their original intended purpose: that is, as an analysis aid that helps discover patterns within medium-to-large, sometimes mixed media, datasets. They require the researcher to look slowly and decisively when adding codes, and they are designed to encourage iterative revisiting of materials as new codes develop or old codes change. For patient researchers inclined towards computer-assisted technology, CAQDAS can be a powerful tool.

Thus far this paper has referred to CAQDAS monolithically, but it is important to remember that packages vary in the features they offer.<sup>42</sup> Drawing from the result of this study and observations made by others like Estrada, there are a handful of specific features that librarians and visual resource professionals can consider pointing out to object-based researchers. Such features include:

- Support for multiple data types in one project (e.g., text, video, images, numerical data).
- Capability to compare multiple images side-by-side. Some packages allow zooming, rotating, and resizing; note that most do not offer ways to brighten or sharpen.
- Exportation of codebooks and exportation of lists that contain only images labeled with certain codes.
- Option to differentiate between codes, quotes (as for querying sections of texts for literature reviews), and notes.
- Support for collaborative work on the same project, and possible support for cloud-storage.
- Option to organize codes together into groups or family trees.
- Scans to show the quantity of objects assigned with a code and their co-occurrence with objects and text that are coded differently, with options to show results in matrices or charts.

There are a few main reasons why CAQDAS should not be recommended for curating personal image collections at this time. Furthermore, CAQDAS should not be seen as a replacement for standardized databases. The packages are designed as analysis aids and codes are tailored to discrete projects. Metadata capabilities are limited to short summaries, notes, and limited tags. Even

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<sup>42</sup> Each CAQDAS has different available features, and these features are updating constantly. For reviews and comparisons, see “Choosing an Appropriate CAQDAS Package,” University of Surrey, accessed October 7, 2022, <https://www.surrey.ac.uk/computer-assisted-qualitative-data-analysis/resources/choosing-appropriate-caqdas-package>

though creating codes could be seen as writing metadata to an extent, someone interested in using CAQDAS to manage personal image collections will need to be made thoroughly aware that projects in the digital workstations are saved as “project bundles” or hermeneutic units. Unlike an application like Zotero which can save copies of uploaded files into an application directory or cloud for reattachment to entries, there is no guarantee that documents uploaded to NVivo or ATLAS.ti from a hard-drive or external storage device will have copies saved elsewhere. If users move documents away from their original locations, the packages will not recognize them. Even though several CAQDAS are useful for collaborative work, all team members must have access to the root storage of the documents that are present in the project. This is not unlike how many GIS programs operate. For these reasons, CAQDAS is not as stable as structured relational databases that are already used to preserve physical artifact data.

Knowledge management applications like Tropy better fit the needs of patrons who want to test new ways of organizing large personal image collections. Survey participants corroborated several pros and cons mentioned by Burns in their review of useful tools for image-saturated research.<sup>43</sup> The most salient and useful of Tropy’s features mentioned by these participants were its:

- User-friendly interface.
- Customizable metadata fields which help improve querying of large image collections.
- Ability to add research notes and annotations.
- Capabilities for rotating and sharpening images.
- Data export options for use in other databases.

Although the annotation and tagging features of Tropy are arguably less robust than CAQDAS’ coding infrastructure, they are no less useful for assisting simultaneous image organization and research. As an open-source application with a smaller learning curve, Tropy may be more amenable to patrons who wish to keep data for multiple projects in one place. They can include their annotations, physical object descriptions, and image metadata while also comparing and enhancing images. In this way, it can also aid research just as much as it can streamline personal image collections. If there are concerns that may arise with Tropy, they are that a user cannot easily work with the data from a cloud server like OneDrive or Google Drive, and it is not yet possible to import PDFs of images. Cloud services available for Zotero are not yet available for Tropy, so there are fewer opportunities for teams to collaborate on collections remotely.

At a distance, Tropy may appear to be the easier of two options to recommend, especially since the terms “code” and “coding” can seem like alien concepts to object-based researchers,<sup>44</sup> even if these populations are well-versed in similarly grounded research frameworks. That said, it would be remiss of librarians and visual resource professionals to assume that researchers can use Tropy without instruction or assistance. Researchers are creative and push boundaries, but as Burns points out, “we, as information professionals, do not have to push metadata schema and standards onto users who will find little or no use for them outside of a library context.”<sup>45</sup> When instructing patrons on Tropy, it will be worth exploring how to customize metadata fields with researchers so that they can tailor it to their needs. When possible, both CAQDAS and Tropy should be among the digital tools considered when researchers seek help with their analyses of large, challenging, and image-

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<sup>43</sup> Burns, “Images as Research Data,” 4.

<sup>44</sup> Gillian Rose, *Visual Methodologies: An Introduction to Researching with Visual Materials*, Sage Publications, 2016: 96-97. This book is one of few sources that mention these terms in a visual context; Ana Isabel Rodrigues, António Pedro Costa, and António Moreira, “Using CAQDAS in Visual Data Analysis: A Systematic Literature Review,” *World Conference on Qualitative Research*, Springer: 235-247. A team of teacher education professionals are in the process of creating a systemic review of package use across disciplines that use visual data.

<sup>45</sup> Burns, “Images as Research Data,” 4-5.

saturated collections. Over time, input from these user populations can continue to inform not only information professionals, but software developers as well.



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