[CV-03-030] Map Production and Management

Abstract

Map production describes the experience of managing the many aspects and details of map creation. Often the map product is created for someone else—a client, supervisor, or instructor. Describing the intention of the map and evaluating available resources ahead of the project can help the cartographer define content requirements, stay on task, and ultimately meet deadlines. The project management life cycle involves clear communication between the cartographer and client, with resolutions to common questions best addressed at the beginning of the project. The process then iteratively cycles through phases that include research and production, followed by quality control, and concludes with file preparation and delivery.

Keywords: cartography, design, production, professional cartography, project management, workflow

Author & citation

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Explanation

1. Definitions

audience: the people for whom the map is intended

budget: the resources available for the project

contract: an agreement about the project plan negotiated by all stakeholders

data evaluation: identification and evaluation of where or how the data might be acquired or created, and which existing datasets might serve as a proxy for a concept that supports the map intention

deadline: the expected date that products will be delivered

deliverable: presented form of the final product

estimate: anticipated value of the work, including costs of data, creation of proofs, design labor, etc.

intention: the point the map is attempting to communicate

map production: the experience of managing the many aspects and details of map creation

peer edit: a review of the map product against cartographic conventions, conducted by an external evaluator

physical size: the print or digital footprint of the map, often measured in a standard measurement of length (i.e., screen size or paper size)

project management: an intentional process that provides a framework to keep a project moving forward, anticipating areas that might cause trouble and areas that need more resources

self edit: a review of the client's expectations against the finished product, conducted by the cartographer

specification sheet: detailed guidelines for all colors, line weights, typefaces, etc., in the map representation and supporting materials

version control: a process for storing previous versions of a product, enabling roll-back in the event of a file corruption or a revision requested by the client

2. Introduction

Project management is an intentional process that provides a framework to keep a project moving forward, anticipating areas that might cause trouble and areas that need more resources. Project management encompasses the lifecycles of a many kinds of deliverables related to GIS&T, such as geospatial datasets, design portfolios, interactive websites, research papers, or other GIS applications. A project management plan should consider scope—to which all stakeholders agree before the project begins—expectations for managing change, plans for dealing with issues as a project progresses, management of people, success metrics by which the project will be evaluated, and a monitoring strategy for quality control. These processes do not follow a linear order; instead they are iterative and build upon one-another as the project moves through its lifecycle. A clear project plan establishes from the very beginning open lines of communication between the creator and the recipient, providing a foundation for negotiation and problem solving when change occurs. Project plans are intended to reduce scope creep, evaluate success, ensure all

stakeholders have a shared vision, and consistently move the project toward this shared vision.

The focus of this article is on the cartographic production process of a maps and other cartographic applications. Broadly, **map production** describes the experience of managing the many aspects and details of map creation. This article draws heavily on theories of Project Management, and applies a project management framework described in, A Guide to the Project Management Body of Knowledge (PMI, 2013).

3. Initiating

Entering into an agreement to complete a project can happen in many ways (see Springer, 2004). For example, an author may contact the cartographer directly, or a publisher who then contacts the cartographer. Each of these contacts has different interests in the project (i.e., the author might be more interested in the authenticity of the story, a publisher might feel that a map will help the product sell more copies of the book). For this reason, it is important to note who is requesting and funding the map, as well as the motivation for including the map in the product. In most cases, the cartographer and someone requesting a map (client, supervisor, instructor, etc.) enter into dialogue and work through what is possible. The planning phase helps both parties decide what is feasible and identify the resources required to complete the work.

4. Planning

Project expectations and identification of needs. Before any production begins, there should be an understanding about the final product: the **intention** of the map, its **audience**, as well as where and how it is displayed. These needs and constraints become the guiding principles for all map decisions. The cartographer can start by asking the following of the client, supervisor, or instructor:

1. Audience. The people for whom the map is intended impacts the content and the style of the design, including: type and organization of content, language, colors, font size, etc. Further considerations include: Who will consume the map? How will they interact with it? Where will they engage with it? Will it be consumed on paper or on a screen, in bright sunlight or indoors? Principles of user experience and user interface design help to define the audience and identify project constraints therein (see **UI/UX Design**).

2. Purpose. The cartographer should establish the point the map is attempting to communicate. What is the scope of the map: will it focus on a single piece of a broader story (see **Narrative & Storytelling**, forthcoming), or does it need to be more comprehensive? This request may be provided by an instructor through a course syllabus and rubric, where the expectations are outlined and the grade assessment is explained. Or, a client might explain the point of the map and in doing so mention specifics about what the map should include. In both situations, it is advisable to note

carefully each requested project requirement, while also evaluating whether the client requests are the proper design decisions to make based on cartographic conventions and thematic research. If the client request is inappropriate cartographically or thematically, the cartographer needs to present a justification for the change from the beginning to set expectations and avoid future conflict.

3. **Deliverables**. How will the final product be presented? The largest distinction to make for cartographic deliverables is print versus digital. Each option then requires additional questioning: If the map is created for print, in which type of media is it produced (e.g., book, magazine, poster)? What are the publication specifications: print quality (e.g., offset, digital, print-on-demand), paper type, color or grayscale? If it is a dynamic map, what is the most likely form of presentation (e.g., mobile, tablet, desktop)? What interactions are needed to achieve the purpose of the map?

4. **Budget**. The feasibility of the client request, with the money available or the percentage of one's grade, will influence how many hours to invest into a map and the production technology.

5. **Deadlines**. Like the budget, deadlines can impact the amount of time and resources available to spend on a project. The cartographer should set and manage multiple deadlines, including intermediary deadlines for prescribed check-ins as well as press and launch expectations.

6. **Physical size**. The footprint of a map impacts the level of detail of the data and amount of content. In print, the cartographer must consider the output size and constraints of the publication like other page elements, margins, gutters, and bleeds (see **Visual Hierarchy & Layout**). For a digital product, the cartographer needs to know the screen size and resolution as well as potential bandwidth constraints (see **Mobile Maps and Responsive Design**).

7. Cartographic scale and geographic extent. The purpose and physical size of the map often determine the cartographic scale and geographic extent (see **Scale and Generalization**). In the case of small scale regions, placing the subject area in context might require a larger geographic extent or locator map. It is common to center the feature of the map and enlarge it as much as possible while still portraying the desired information. The scale impacts design decisions related to size of design elements and how they are represented as well as the amount and detail of mapped content.

8. Projection. It is important to intentionally choose a projection based on the cartographic scale and geographic extent (see **Map Projections**). Projections are a powerful design decision, helping the audience see geographic information in a new way. Clients, however, can be resistant to projections with which they are not familiar. For this reason, it is important to have agreement on a projection before getting too far into production; a projection change can create significant increase in effort late in

the process.

9. Data evaluation. The cartographer should identify and evaluate where or how the data might be acquired or created, and which existing datasets might serve as a proxy for a concept that supports the map intention. During this data evaluation, the cartographer primarily is assessing data availability to determine if the project is feasible. Questions to consider are: cost, use restrictions and permissions, processing required, comprehensiveness, authoritativeness, timeliness, and spatiality.

10. Aesthetics. The cartographer then works with the client to identify the map aesthetics and style that reinforce the intention and evoke the expected reaction from the audience (see **Aesthetics & Design**, forthcoming). Obtain printer specification requirements at this stage to determine if there are minimum line weights, font sizes, etc., to be considered.

11. Technology. Finally, the cartographer should identify the necessary software, hardware, and technical skills needed for the product. Access to the chosen technology also should be determined early, as well as a general workflow for employing the technology in the project.

5. Stakeholder agreement and plan

5.1 Contract negotiation

Negotiating the **contract**, or production agreement, puts the questions outlined above into writing and provides all stakeholders the opportunity to approve the project plan. Contract negotiation also formalizes the remuneration exchanged upon successful completion. Finally, a contract provides a foundation for the client and cartographer to have a conversation if a misunderstanding arises.

During the initial conversations of the agreement, it is recommended to know who will be evaluating the work (e.g., client or publisher, peer or supervisor, teaching assistant or professor), and who will supply final approval (e.g., a manager outside of the process that will enter late in the process).

5.2 Estimating: budget and deadlines

The cost **estimate** requires that the cartographer knows the value of the work (i.e., costs to operate), including anticipated costs of data, creation of proofs, travel, etc. This also includes an estimate of the number of hours it will take to produce the requested product.

Deadlines can influence the cost of the project. If it is a rush order, then it is reasonable to charge more than normal or reduce the complexity of the project. If it is an ongoing, long-term project that can provide consistent income, it might be billed at a lower rate, but one that still covers all expenses. Additionally, deadlines may impact the availability of data or processing of data, which in turn impact the estimate.

6. Execution

After completing the steps above, the cartographer works through a process of paired design and feedback loops with the client (see **Usability Engineering & Evaluation**). Often, there is a flow back and forth between the steps below, always with the goal of working closer to the shared vision outlined and accepted in the planning process. Depending on the agreement between stakeholders, the cartographer may supply sketches or drafts to the client before sending a final draft. The cartographer should budget for more time if the negotiated plan includes several client reviews of the project.

1. Basemap. The cartographer begins the production process by implementing many of the cartographic decisions made with the client (e.g., scale, projection, aesthetics) to create a basemap prototype atop which the thematic data will be displayed (see **Basemaps**, forthcoming). Depending on budget and timeline, this may be a good opportunity to obtain feedback from the client, supervisor, or instructor.

2. Data acquisition. Data collection and creation should happen early in the process to learn how acquisition may impact the map production such that any additional, potentially time-consuming data acquisition processes can be started immediately.

3. **Specification sheet**. The specification ("spec") sheet details all colors, line weights, typefaces, etc., used in the map product and supporting materials. In long-term projects, or atlas-like projects including many maps, it often is useful to create a spec sheet and develop styles that are easily applied throughout the project. The creation of a spec sheet can be time consuming, but the benefits include: easier hand-off to other cartographers, consistency across maps in a large project, and establishment of a coherent brand.

4. Data preparation. Data preparation includes all processing—performing calculations, statistics, aggregating, and normalizing. It also includes tasks like line generalization and filtering of information.

5. Production. The following are some tips when executing your map design:

    - Include linework that extends beyond what your final map is originally planned to depict. Including a larger than initially needed geographic extent enables panning and added context in digital maps and, importantly, accommodates late client requests for changes to layout and page bleeds in a print publication.

    - Keep all non-printing layers in print maps and comment-out, but do not delete, unused code in digital maps, especially for difficult to recreate processes or destructive processes (e.g., converting text or lines to outlines, or coded functionality that is removed at some part of the process).

- Enact a process for **version control**, including frequent back-ups, for both static and dynamic products. Share the versioning process with all production collaborators. Version control allows the cartographer to roll back to a previous design states in the event of a file corruption or a revision requested by the client.

6. Finalize. Finalizing a design requires the cartographer to integrate graphics and text from across the project, sometimes with the materials produced by different cartographers or teams. An example of this might be incorporating the maps within a layout prepared by a graphic or web designer, where alignment and placement need to fit with the supplemental graphics, headers, and text. Harmonize data resolutions and aesthetic styles, and adjust the placement of all map elements in relationship to one another.

7. Prepare final files. Final file preparation and delivery depends on the stage of production and process of quality assurance. Many clients are unable to view proprietary software formats, which makes saving as a general raster, portable format (i.e., PDF), or printed hard copy more desirable for client proofing. Follow the established specifications for printing, file formats, and resolution. Preparing fonts can include: converting to outlines within the file (which makes the text non-editable) and saving a copy of the file, embedding the fonts within a portable document, or packaging the fonts with the file. Preparing fonts in one of the ways that increases the likelihood the map will print in the way that the cartographer has intended. Any linked files should be embedded or packaged with the main file. A naming convention that clearly expresses the relationship among working and review files is important.

7. Monitoring and Editing

Several stages of editing provide an opportunity to catch any errors in content, inconsistencies in styles, misspelled labels, or confusing symbolization.

1. **Self edit**. In the best circumstances, the cartographer can set the project aside for a time—a few hours or a day—returning with a fresh perspective to review the client's expectations against the finished product.

2. **Peer edit**. Asking a peer, or following a prescribed chain of command with a specified editor, should follow the self edit. Any materials used to produce the map should be provided to the editor (e.g., emails or notes from the client specifying desires, research with sources documented) in an orderly way. The editor evaluates the map for thematic and reference content, as well as aesthetics and symbolization choices.

3. Client review. Once the product is approved internally, the client reviews a draft in a format that does not require proprietary software to view. Discuss with the client the expectations on timing of receiving revisions.

4. Revisions. After each edit, the cartographer makes adjustments to the map, addressing the errors or suggestions. In some cases, the edited product should return to the editor for another round of evaluation.

8. Closing and Post-mortem

8.1 Evaluation

After completing a project, evaluating the process can provide valuable insight for future projects to note aspects that went particularly well and those that can be improved. During this process, consider the budget, skills acquired, context or impact on the portfolio, bottlenecks, and strengths. What explanations are there for the success or lack thereof in meeting the original estimates or deadlines?

8.2 Derivative products

Additionally, consider if there is follow-up that is required for the project, or an opportunity to create a derivative products. These projects might include a publication about a new process, a social media or blog post promoting the work, or a conference presentation. Follow-up can help promote the cartographer's brand and skills.

8.3 File management

To archive the project, create back-ups of all editable files in a secure space. Preserve any difficult to create or expensive data, along with all metadata and use requirement documentation (see **Cartographic Metadata & Standards**, forthcoming). Discard any large, unnecessary files to save on storage space.

8.4 Invoice or grade

Finally, supply an invoice and agreed to documentation about the project to the client. There should be no surprises to the client at the invoice stage. If it happened that data were more expensive than the budget had originally allowed, this conversation should have happened with the client right away. Or, if a dataset was unavailable but the instructor was expecting you already had acquired it, this conversation should have happened earlier as well. It is important to discuss adjustments to the budget as they happens, not at billing.

References

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