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Of course, it is important not to stretch the functional and tonal responsibility and capability of visualization too far. This is where any hype and disproportionate expectation about the potential impact of data visualization can be misplaced.

Data visualization is a means to an end, not an end in itself. It's merely a bridge connecting the messenger to the receiver and its limitations are framed by our own inherent irrationalities, prejudices, assumptions, and irrational tastes. All these factors can undermine the consistency and reliability of any predicted reaction to a given visualization, but that is something we can't realistically influence.

All we can do is form a best judgment about where on the continuum of design style, from a pragmatic experience through to an emotive one, the purpose of our data visualization will be most suitably defined. The ultimate responsibility for what happens beyond the visualization engagement sits with the reader or the user.

Key factors surrounding a visualization project The following is a quotation from Edward Tufte's book, The Visual Display of Quantitative Information:

"Most principles of design should be greeted with some skepticism... we may come to see only through the lenses of word authority rather than with our own eyes."

While establishing the purpose of the visualization project sets the desired tone of the design and its function, there are inevitably many other factors that will have a significant influence on the shape and direction of our visualization design.

It is especially important to identify and recognize the impact of the contextual conditions, within and around your project that will affect what you can and can't achieve and how you might achieve it.

This list of factors may seem quite obvious and fairly rudimentary, but if we wish to eradicate the likelihood of misjudgments or misunderstandings, and maximize the efficiency and effectiveness of the process, we need to nail them early on.

There is simply no point waiting until it is too late to consider these, because by then you will have already followed a certain path and spent valuable time and resources on your work.

Setting the Purpose and Identifying Key Factors

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Here are some of the most important factors to consider and to evaluate their potential impact:

• The aim: As we have seen already, there are different origins and triggers for a project. We mentioned the self-initiated ones as being almost free of external constraint and essentially framed by our own capabilities and intentions. The important thing worth reinforcing here is the need to take responsibility when a project involves a brief, commissioned by a client or a colleague. You must demonstrate excellent communication skills to ensure you seek and gather as much of an understanding as possible of what it is they are aiming to achieve. Sometimes, you might be provided with a very open brief because a client may not even know what it is they are seeking. In these situations, your responsibility needs to extend to assist them in the scoping and requirements of the work. On other occasions you will be asked to create something that goes against your general practice (for example, the subject matter or requested style) or it might even be simply impossible to deliver (perhaps due to the desired design or available resources). Here again your communication skills are going to be required to manage the expectations. It is easy to be shy and delay asking vital questions but this will only cause you pain later.

• Time pressures: Common to just about every commissioned design project will be the pressure of time and deadlines. Most projects have clear timescales, from in-day quick turnaround pieces to longer-term grand projects. The challenge of maintaining objective creativity in the face of diminishing time is something that will severely test designers of all experiences. Whatever your situation, you have to use your time effectively and that's where value will come from following the tactics in this methodology. Plan your work and create a balanced layout of the things you need to accomplish, so that you avoid disproportionately spending time on tasks that are less important than others. Often you will find yourself undertaking a visualization project in parallel with many other commitments. Not only will your capacity be limited, the momentum and duration of your focus will be impacted. This is where project management skills come to the fore as well as a realistic appreciation of what you should and shouldn't commit to undertaking. It also highlights the importance of keeping notes so that you can move seamlessly between projects and not lose track of your thoughts, ideas, or progress.

• Costs: The issue of financial resource will unquestionably emerge, especially for large-scale projects. Costs will significantly influence the time you are able to commit to a project, the scope for bringing in additional collaborators, and the range of tools or technical resources you might be able to utilize. Once again, the planning and preparation stages will be invaluable to surface all potential issues around financial matters.

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• Client pressures: Aside from time pressures, you need to anticipate and reduce the impact of potential unexpected pressures and interruptions coming from your client or colleagues. This might be changes in requirements, new demands, interference in the design solution, and generally annoying things that get in the way of your progress. A further manifestation of the pressure that can come from clients is the insistence on observing organizational visual or brand identities, layout rules, editorial guidelines, and technical frameworks. All of these will shape the scope of your design choices. You have to be prepared for and capable of managing this relationship, and the mutual expectations, effectively so always be open with your client, keep them regularly updated with progress and, where applicable, involve them in the key decision moments throughout the process.

• Format: From a design perspective this will be a significant influencing aspect. Are you creating a static or an interactive design? Maybe it's a multifaceted project and you are looking to create both. If it is an interactive design, what platform do you need to achieve compatibility with? Will it be for the Web, a tablet, and/or smartphones? If it is a static design, will it be a small graphic in a publication, a full-page spread, or a large poster display? Maybe it will be a video animation or an ambient display out in the wild, or a large touch screen installation in a museum. This is a vital consideration that needs to be cleared up at the earliest possible stage. Another factor to take into account will be the likely frequency of the project—is it a one-off piece or will it be something that needs to be replicable and/or scalable? That could hugely affect what you can or can't deliver.

• Technical capabilities: Aside from your own technical capabilities, what are the technical resources to which you have access? For example, are you limited to free tools or can you access more premium software? Do you have the most appropriate technical infrastructure, such as server speed and capacity if it is an online project? Depending on your format choices, what frameworks are you going to deploy, what browsers do you need to have it working on, what backend database technologies are you going to require? This is a wide-ranging and very technical set of decisions that will likely require a specialist technician to determine.

Setting the Purpose and Identifying Key Factors

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The "eight hats" of data visualization design The final scoping issue to consider at this stage of your visualization design project is an assessment of your personal capabilities and those of any collaborators that you involve in the work. What skills and knowledge do you collectively possess or lack? This is a big issue for many, so we need to spend the remaining pages of this chapter looking at it closely.

The demands on a visualization designer in terms of capability are many, reflecting the truly multidisciplinary nature of the subject. The convergence of different ingredients introduces a wonderful richness and variety of issues to be concerned with, but it can equally present quite a challenge for people looking to master the subject.

For many, the prospect of trying to acquire the necessary array of knowledge and skill across the entire range of capabilities is something that can be intimidating or at least exist as a perceptual barrier. There is a sense that to be successful you need to be some sort of superhero.

Taking an analytical look at the range of required capabilities reveals a role and need for many types of people, which can of course be fulfilled by a number of people or just one.

These are proposed as the "eight hats of data visualization design". Influenced by the concept of Edward de Bono's six thinking hats, which related to the different thinking perspectives we should try to occupy when tackling complex problems, this is an attempt to organize the different attributes required to accomplish success in visualization.

It should help you recognize where you fit it in to the spectrum of duties and responsibilities, helping you identify your strengths and your weaknesses accordingly. You may then choose to address these weaknesses personally or plug the gaps with support from others.

The initiator The initiator is the leader, the person who is seeking a solution to the task as per the brief or self-initiated curiosity. The hat is that of an explorer; they want to explore data and different design avenues to find answers to problems or evidence to serve their researcher mindset. The initiator will be responsible for much of the considerations covered in this chapter. They will establish the functional and tonal direction of the project, as well as identify and profile the target audience. The initiator will also define other parameters such as the intended format/platform of the solution and some of the key technological issues.

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The data scientist The data scientist is characterized as the data miner, wearing the miner's hat. They are responsible for sourcing, acquiring, handling, and preparing the data. This means demonstrating the technical skills to work with data sets large and small and of many different types. Once acquired, the data scientist is responsible for examining and preparing the data. In this proposed skill set model, it is the data scientist who will hold the key statistical and mathematical knowledge and they will apply this to undertake exploratory visual analysis to learn about the patterns, relationships, and descriptive properties of the data.

The journalist The journalist is the storyteller, the person who establishes the narrative approach to the visualization's problem context. Working with the data scientist and the initiator, they are able to establish the key stories and angles with which to slice the analysis. They work on formulating the data questions that help keep the project's focus on its intended editorial path. Building on the initiator's initial sparks of ideas, the journalist will develop a deeper researcher mindset to really explore the analytical opportunities.

The computer scientist The computer scientist is the executor, the person who brings the project alive. With their critical technical capability they are ultimately the ones who will construct the solution. They will also bolster the data scientist with their technical know-how to most effectively and efficiently handle the data gathering, manipulation, and pre-production visualization activities. The breadth of software and programming literacy will have a great bearing on the potential direction and sophistication of the data visualization solution, whether this is created within a tool or through programming.

The designer The designer is the creative, the one, who, in harmony with the computer scientist, will deliver the solution. They have the eye for visual detail, a flair for innovation and style and are fully appreciative of the potential possibilities that exist. However, they also have the necessary discipline to follow the message established by the initiator and taken on by the journalist. They respect the capabilities of the computer scientist in terms of what solutions could be feasible, but themselves have the helicopter-like vision to rationalize and reason what things will work and will not work, and why.

Setting the Purpose and Identifying Key Factors

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Their key responsibility is also to be capable of ensuring the harmony of the solution between its form and its function, ensuring it is aesthetically appealing to draw in the reader while fundamentally delivering the intended, communicated message.

The cognitive scientist The cognitive scientist is the thinker in terms of appreciating the science behind the effectiveness of the technical and designed solutions. They have the visual perception knowledge about how the eye and the brain work most effectively and efficiently. They also have deep knowledge about concepts such as the Gestalt Laws, communication theories, color theories, and human-computer interaction principles. Additionally, they are able to inform the design process in relation to the complexities of how the mind works in terms of memory, attention, decision-making, and behavioral change.

The communicator The communicator is, naturally, concerned with the communication side of the project. With their hard hat on, they act as the negotiator and presenter, operating at the client-customer-designer gateway, helping to inform all those who are involved on progress, requirements, problems, and solutions. The communicator needs to be close to all stages of the process, understanding requirements, appreciating restrictions, recognizing possibilities, and then ultimately launching, publicizing, and showcasing the final work. An ability to articulate and explain matters to different types of people, technical and non-technical, and be capable of managing expectations and relationships is vital.

The project manager This final role is essentially that of the manager or coordinator, the person who does much to pick up many of the unpopular duties to help bring the whole project together. They manage the project's process and its progress, ensuring it is cohesive, on time, and on message. They understand the brief and identify/manage all the key factors surrounding the project. Ultimately, this role is required to ensure things get finished, so they need to have an eye for detail, the commitment and patience to check everything and they should also be concerned with integrity matters around visualization ethics.

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Summary In this chapter, we have started our journey through the data visualization methodology. The emphasis has been on the importance of planning, preparation, and scoping our project, before we embark on any design work. Without this early work we could undermine the effectiveness and efficiency of our eventual design process: something any designer can ill afford to allow.

We have seen how data visualization is a means of facilitating the discovery of patterns and relationships that exist within data. These are insights that would otherwise be practically impossible to draw from data in its raw state.

The importance of establishing the purpose of our visualization project was the key part of this first stage. Specifically, we highlighted the distinction between functional intent and tonal intent.

Within these characteristics we described the difference between visualizations that are functionally seeking to explain, explore, or exhibit data. Furthermore, we saw the significance in potential design differences between visualization styles that serve a pragmatic tone and those that are more emotive or abstract.

As we will appreciate throughout the remaining chapters, developing the clarity of our purpose at this early stage is paramount to the success of our visualization design process. The choices we make fundamentally influence our design choices and the potential experience of our target audience.

We explored some of the key factors that can have a strong influence on the shape and scope of our visualization project. Whether it is the technical matters, the issue of format, financial resources, or timescales, each factor mentioned can have a huge impact on your creative path and scope.

Finally, we looked in depth at the range of personal capabilities required to successfully deliver a visualization design and drew attention to how you might need to personally address any gaps through development or collaboration.

In the next chapter we'll look at two further important stages of planning and preparation: identifying your intended narrative and getting intimate with your data.