

Integrating Influence Diagramming to Explore Visualization in Project Work

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Abstract

This case describes the use of Kumu, a web-based software package, to create an influence diagram to analyze and present research findings related to visuals in project work. The study design I describe integrated an influence diagram with the traditional qualitative methods of semi-structured interviews and thematic analysis. The use of Kumu enabled me to professionally present the influence diagram and made clear the relationship between different aspects of the research findings and, ultimately, helped me to illustrate the contribution of the study to existing literature. However, the use of Kumu and influence diagramming does require careful consideration. For researchers unfamiliar with systems thinking and who lack basic programming capabilities, it is necessary to allow time for developing knowledge of influence diagram syntax and to experiment with Kumu. This case provides researchers with information to evaluate the suitability of Kumu to create an influence diagram for their research project. It also summarizes a step-by-step process to integrate influence diagramming, using Kumu, into a traditional research methodology.

Learning Outcomes

By the end of this case, students should be able to:

- Differentiate and describe the key components in an influence diagram.
- Evaluate their own readiness for using, and the suitability of their research project for the application of, software such as Kumu.
- Explain the integration of influence diagramming into more traditional qualitative research processes
- Apply a systematic approach to create an influence diagram in Kumu for a suitable research question and data.

Project Overview and Context

Project work is increasingly pervasive in society and visuals are argued to be a beneficial type of communication in this form of organizing ([Gerald & Art, 2015](#); [Killen, 2017](#); [Maylor & Turkulainen, 2019](#)). However, research on visuals in project work is relatively new and the studies are often undertaken (though not exclusively) in non-practice settings. For example, experiment-based studies are undertaken with university students to determine the advantages of visuals in decision-making (see, for example, [Killen, 2013](#)). These studies have provided important insights for researchers and practitioners and can inform the design of studies regarding the experience of visuals in real-life practice contexts.

Within this need to extend research on visuals into practice contexts, I chose to focus on the use of visuals to engage executives and senior managers. I selected this focus, as research has established the importance of the leadership exercised by executives in enabling project delivery ([Ahmed et al., 2016](#); [Englund & Bucero, 2016](#)). Furthermore, where practice research has been undertaken, it often focuses on the influence of a

particular visual(s) on a specific project process (see, for example, [Chang et al., 2013](#)). Studies do not generally consider the conditions that influence the production of effective visuals nor the favorability (or otherwise) of how the visuals are received. The question guiding my exploratory study was: What are the conditions that influence the effective use of visuals by project managers to engage executive stakeholders in project work, and what are the relationships between these conditions? ([van der Hoorn, 2020](#)). The focus of this SAGE research case is my use of Kumu, a web-based systems diagramming software package, to support the analysis and presentation of the results from the study in the form of an influence diagram. The creation of an influence diagram in Kumu was highly suited to answering my research question (i.e., focused on the *relationship* between conditions) and was highly appropriate given the research area—which was focused on the value of visualizing information.

Section Summary

- Research on the use of visuals in project work is relatively new.
- I explored the conditions influencing the use of visuals to engage executives in practice contexts.
- I used a web-based software package, Kumu, to create an influence diagram that supported the analysis and presentation of the study's results.

Research Design

To explore the conditions influencing the effective use of visuals in project work, I interviewed a combination of practising project managers and executives involved in projects. I recruited these participants using a snowballing approach ([Tenzek, 2017](#)) and used a combination of both online (e.g., Zoom) and in-person interviews. I adopted a semi-structured interview approach with questions to the project managers such as:

- Do you consider there are benefits in using visuals? Why/why not?
- Are there barriers to you using visuals in your work? If so, please describe.

For the executives the questions included:

- Have there been any times when a project team has used a visual that has been useful? Please describe.
- Have there been any times when a project team has used a visual that has not been useful? Please describe.

Semi-structured interviews provided me with an opportunity to focus on my exploratory research question and simultaneously allowed flexibility to engage with the individual's specific experiences ([Roulston & Choi, 2018](#)). I did ask the participants to cite specific examples relating to their experiences to anchor their accounts into practice; there are similarities here to episodic interviewing (see, for example, [Flick, 2000](#)).

I transcribed the interviews with the aid of automated software (sonix.ai). The use of the automated software did save me time. However, I still needed to manually check and correct each transcript. Following the

finalization of the transcribing, I then imported each of the participant's accounts into Nvivo, which is qualitative analysis software. I adopted a process like [Braun and Clarke \(2006\)](#) thematic analysis. This involved becoming very familiar with the data, generating initial codes within the data, searching for themes across the codes, reviewing the themes, and then defining and naming the themes. However, of pertinence to this case, unlike a standard approach to thematic analysis, I integrated influence diagramming into the thematic analysis process. I worked across both Nvivo and the influence diagram simultaneously as part of the thematic analysis using both the participant's narratives and the evolving influence diagram to explore and understand the story in the data, refining the coding and theming, and influence diagram iteratively. This approach to thematic analysis aided in the presentation of the results and literally *illustrating* the contribution to the literature.

Influence diagrams, and systems archetypes specifically, is a way to represent common patterns that arise in the workplace and beyond ([Senge et al., 2011](#)). Influence diagrams have their foundations in systems thinking and are a powerful problem-solving tool ([Senge et al., 2011](#)). Systems thinking-based storytelling asks "how did we (through our internal thinking, our processes, our practices, and our procedures) contribute to or create the circumstances (good and bad) we face now?" ([Senge et al., 2011, p. 201](#)). In my research, I looked for cues in the participants' transcripts that pointed toward the conditions that influenced the effective use of visuals.

In influence diagramming the connectedness of the elements (in my study coined "conditions") are directional (see [Figure 1](#)). For example, in the case where an increase in element A results in an increase in element B, it is shown as a positive (+) relationship. Conversely, if two connected elements move in the inverse directions, as one element goes up the connected elements also goes down, this could be considered a negative (-) relationship. Underpinning the systems thinking archetypes are two key patterns, namely, reinforcing loops and balancing loops (see [Figure 2](#)). Reinforcing loops generate growth in the situation. Balancing loops are associated with a form of regulation rather than escalation. These loops create common archetypes or patterns of behavior ([Senge et al., 2011](#)).

Figure 1. Positive (a) and negative (b) connections between elements.

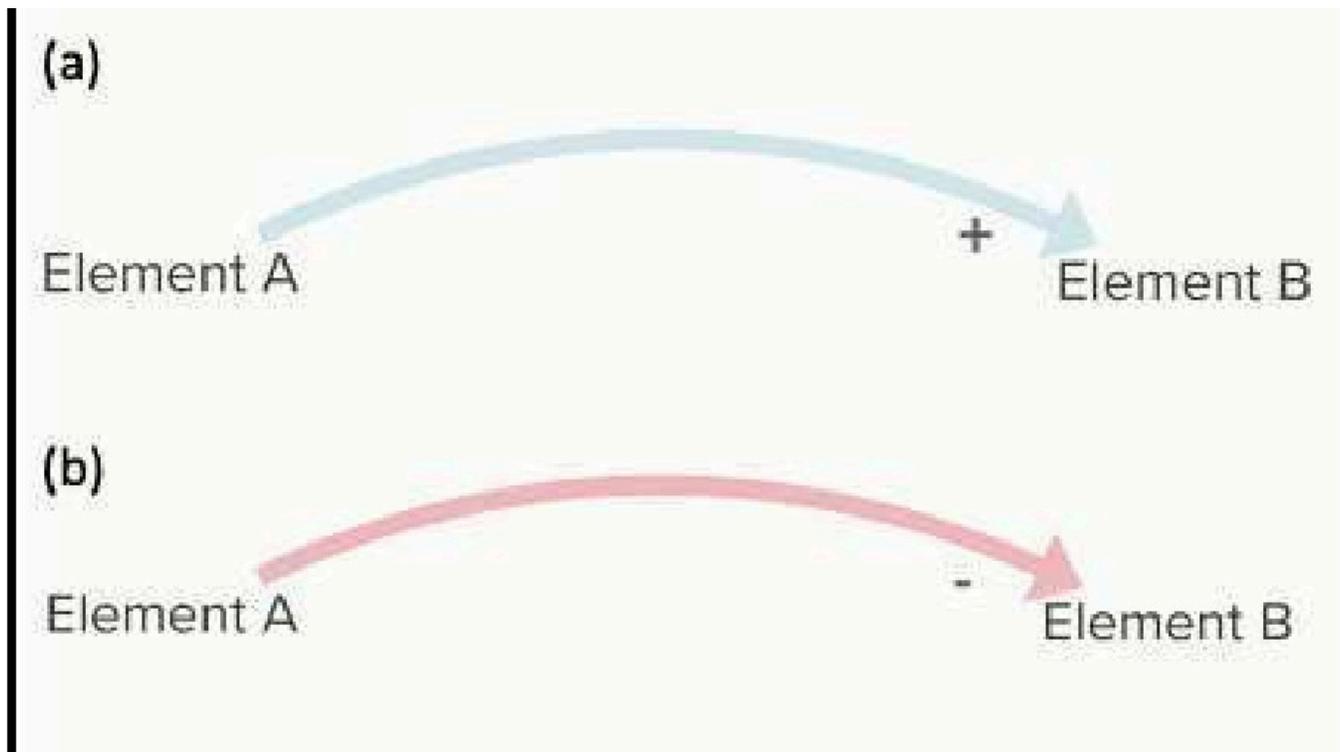
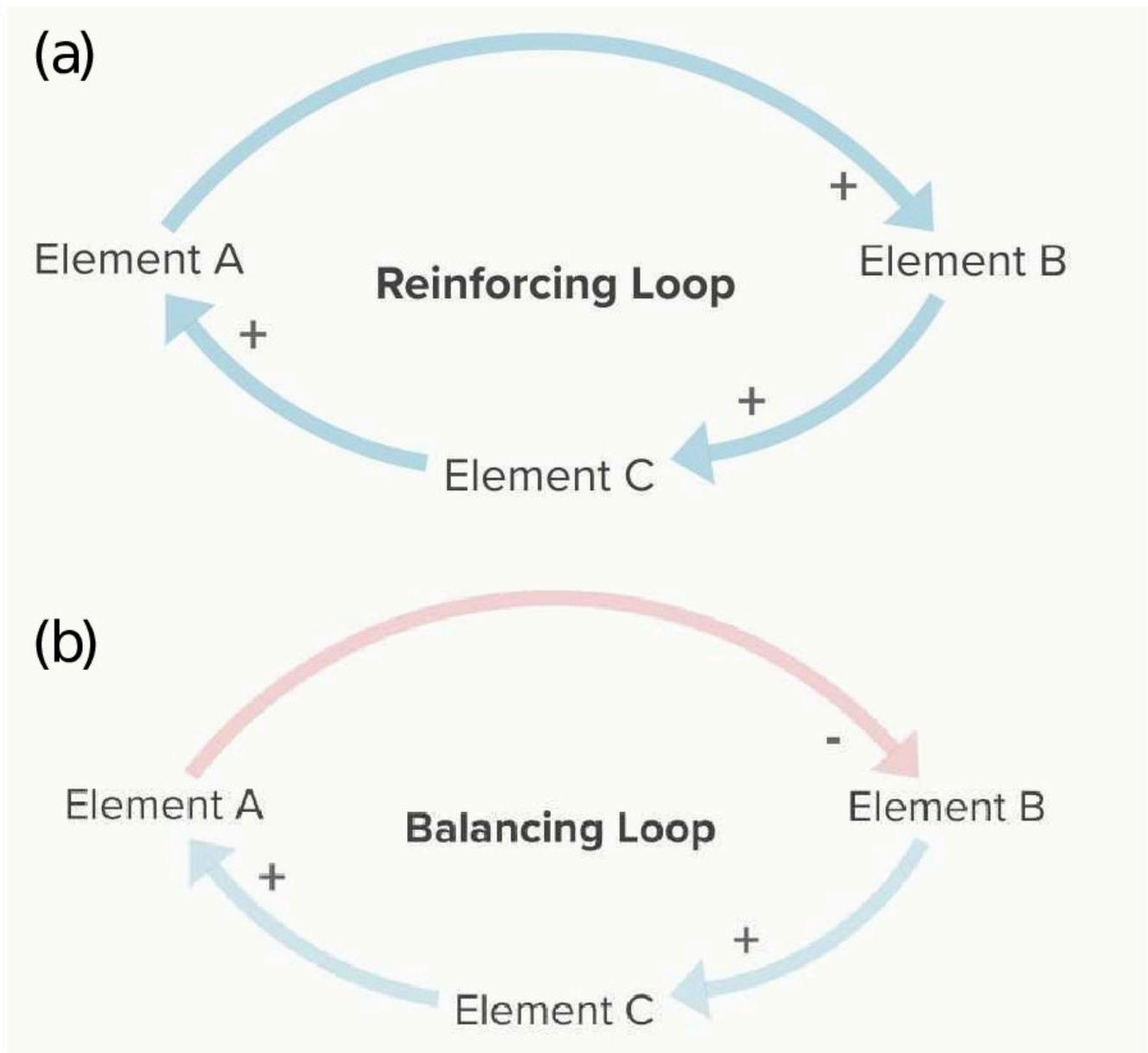


Figure 2. Reinforcing (a) and balancing (b) loops.



I identified 29 conditions from the participant's narratives, and I used the influence diagram to reveal that executives' and project managers' desires to use visuals is a reinforcing loop, continually escalating. However, this reinforcing loop is regulated by the current limits of the project managers' visualization capability. This has a balancing effect and hampers the growth of the visuals' use (see [van der Hoorn \(2020\)](#) for the diagrams used in the final publication). It is certainly possible to draw influence diagrams by hand, however, particularly with many elements and connections, to leverage the power of this style of visualization in research publications it is useful to use software that is designed to present the diagrams professionally.

Section Summary

- Influence diagramming can be integrated with traditional research methods such as interviewing and thematic analysis.
- To effectively use influence diagramming, it is necessary to become familiar with the language of

systems—elements, connections, and loops.

- Complex influence diagrams are more likely to have a more professional appearance if produced in specialist software.

Research Practicalities

To reveal the relational nature of the conditions, I adopted a five-step process to transform the findings of my thematic analysis into an influence diagram in Kumu. The following steps are not a detailed set of instructions on using Kumu—the package has its own help resources, but rather is my methodological approach to creating a “Senge” influence diagram as part of a thematic analysis in this online package.

Before even starting this process, I had a tabulated list with four categories of the conditions influencing the use of visuals and also had NVivo open as a source of quick reference for further information on a condition if needed. My detailed knowledge of the transcripts was also particularly important throughout these steps. I had previously used Kumu so I was not entirely new to the software when undertaking this process.

1. **Logging in and setting up Kumu.** Kumu, like many online visualization and research tools, has various subscription levels. I decided to use the free subscription as I was comfortable with the influence diagram being in the public domain (it would eventually be public through my publication!). I was then prompted to create a user account, chose to set up a “new project,” entered the required particulars, and selected the “causal loop” template.
2. **Adding the “themes” as elements into Kumu and clustering the elements into their categories.** I treated each condition as a Kumu “element.” This resulted in each condition being represented as a small text box on the page. I then moved the conditions to be located in the same area as the other conditions in the category. To guide this, I imagined a grid—top left, top right, bottom left, bottom right—and allocated a category of conditions to each part of the grid.
3. **Adding the connections between the groups and arranging the elements.** For each condition, I then considered what other condition(s) it influenced. This information was not only evident in my descriptions of the conditions (themes) but also informed by my detailed knowledge of the transcripts which contextualized how the conditions existed in practice. I represented this influence as a “connection” between of the two conditions. In some cases, a condition influenced more than one other condition or was influenced by multiple conditions. As I added the connections, I moved the “elements” to avoid the connections crossing over one another or adjusted the arc of the connections to avoid overlaps. I moved through this process category by category but there were cases of making connections across categories—which is appropriate for an influence diagram.
4. **Formatting the elements and lines.** With the conditions and their relationships shown, I then formatted the text of the conditions (size, color, and so forth) and used Kumu’s “connection type” function to add positive/negative arrows to indicate the direction of influence between the conditions.
5. **Revising and creating loops and labels.** I reviewed the influence diagram multiple times to confirm whether the elements and connections accurately reflected the participants’ narratives—was the

visual giving voice to the participants' experiences? After a series of revisions (and refining the text-based thematic analysis as well), I then considered Senge's archetypes and concepts of reinforcing and balancing loop against the influence diagram in the context of my research problem. I identified examples of both reinforcing and balancing loops in the influence diagram. I created loops from the elements and connections and labelled them accordingly to refer to in my article's findings and discussion.

In the final stages of refining the paper, I also added annotations to the influence diagram to clearly show the categories to which each condition had been assigned. I copied the influence diagram into another graphics package (refer to note regarding Method in Action) to add the annotations, as this was more time efficient given my familiarity with Kumu.

Section Summary

- It is important that you are well progressed in the initial coding of the data before commencing the influence diagram.
- However, the drawing process will require that you return to the data to refine the conditions and categories.
- Senge et.al's systems thinking can inform the identification of the patterns that are occurring in the lived experience of the narratives.

Method in Action

Kumu provided the necessary functionality for creating a complex Senge influence diagram. I had previously tried creating complex influence diagrams in standard software packages (such as the MS Office suite) but found that they were an inefficient tool for the task at hand. You could choose to use these standard packages to create an influence diagram, but ultimately it will likely be more time consuming, and the diagram may lack "the look" of an influence diagram created in specialist software. For those with some coding experience or a willingness to learn some basic "programming" Kumu offers extensive functionality suited to influence diagramming, for example, the functionality to "tag" elements and connections and then apply specific formatting to objects with those tags. Kumu also supports various layout algorithms to space the elements professionally. These affordances, once you have mastered the functionality, are invaluable for creating influence diagrams. However, to leverage some of the more advanced functionality, you will need an appetite for experimentation and to think like a programmer.

I wanted to include my influence diagram as a figure in a journal article. Therefore, I need my influence diagram to be of a high resolution. It took me some time to establish which export file type best suited my needs. I recommend reviewing the help files regarding export functionality (<https://docs.kumu.io/guides/export.html>) to determine what file export you require and then trialling the export features and confirming whether it meets your needs very early in the design stages. Do not leave the first export of the influence diagram to just before a submission deadline.

Unrelated to Kumu, but impacting the design of the influence diagramming, is the need to consider from which perspective you will generate the conditions (elements). This involved two aspects. First, the study participants talked about the conditions impacting the use of visuals, both in terms of an ideal state (that did not currently exist) and current problems. As part of my thematic analysis process, I needed to consider the latent conditions that were underpinning the participant's experience. For example, the condition related to project managers' use of a suitable visual style for the purpose at hand, and the executives cited experiences of where this had been done poorly. I identified a latent meaning in these examples relating to project managers' lack of capability that was hindering the creation of effective visuals. Second, I also chose to create a "universal" representation rather than reflect any individual participant's experience. This means I considered the narratives collectively rather than trying to represent in the influence diagram any one participant's description of the experience of visuals. I declared this methodological choice in my research findings with justification for this choice to "universalize" based on the nature of the dataset, and that in aggregate there were very few differences in participants' accounts but rather the narratives brought focus to the number of conditions impacting the use of visuals in practice.

Section Summary

- Kumu is specialist software for influence diagramming, however, you require an experimentation appetite and/or programming skills to leverage its advanced functionality.
- Well before you require your influence diagram for inclusion in your research publication, practice exporting the influence diagram to ensure you can export at the required resolution.
- Even at the early thematic analysis stages consider how the data will need to be shown in an influence diagram format. This will influence how you word the themes (conditions).

Practical Lessons Learned

I have seen the value in a tool such as Kumu. However, there is a learning curve that can only be achieved with time. For researchers with a tight deadline and limited experience using such software packages, you could become quickly frustrated. I made use of Kumu's help resources, but much learning was through trial and error, which may not be suited to every researcher's circumstances. Through trial and error and engagement with the help resources, it is possible to become familiar with the affordances of the package. It is important to be aware of these affordances, and the limitations to decide whether the product will meet your research or information presentation needs. Like any software, the more I use Kumu, the better equipped I have become to determine what tasks it is useful for and those where a different tool may be more suited.

For example, I did not use Kumu to directly identify archetypes or loops. Rather, I leveraged Senge's Field Handbook to act as the tool to support me in identifying and labelling the patterns in the influence diagram. You may choose to use internet resources that provide a quick reference guide to the various Senge archetypes. These quick reference guides were easier than looking for the archetypes across multiple pages in Senge's volume, but to ensure the integrity of my classification I always referred to the handbook as a

source of truth to confirm before labelling.

Influence diagrams can appear to those who are not familiar with these to be a quantitative tool associated with proving a hypothesis. It was very important that I was clear in my methodology that the influence diagram was proposing relationships between the conditions rather than attempting to infer causality. This research was exploratory, and the influence diagram was seeking to (literally) help build an initial picture of how visuals were being used effectively (or not). I was not seeking to indicate that condition A *caused* condition B. Simply, that there seemed to be a positive or negative relationship between the two conditions. It is entirely possible that as more research on the use of visuals in practice is undertaken more conditions and additional relationships may be identified.

Section Summary

- Getting familiar with software and being able to discern their affordances and limitations take time. Ensure you allow for this time in your planning.
- Multiple tools, including both online (such as Kumu) and more traditional “tools” such as reference texts, can be used together to help construct interesting findings from research data.
- Care is required to explain novel research analysis and presentation techniques. Do not assume your readers are familiar with the techniques you are employing and their underlying assumptions.

Conclusion

I would recommend using Kumu to create influence diagrams to analyze and present research that is focused on the connectedness between elements. It would have been very difficult to describe, and for the reader to understand the connectedness between elements and, therefore, the findings relating to growth and limits to growth of visuals in project work, without the influence diagram. However, if you are new to systems thinking and/or are do not have basic programming skills, you will need to allow yourself time to become familiar with the syntax of influence diagrams and to experiment with a software package like Kumu. It is also necessary to ensure that your audience, who may not be familiar with these techniques, are provided with sufficient information to understand the visual syntax you have applied.

As this study revealed in the context of projects, visualizing information is a powerful way to support stakeholders to understand complex information (and many people really appreciate visuals that support written content!), and as researchers, we have an opportunity to leverage the benefits of visualized information. However, like the project managers I interviewed, many researchers will need to invest in their capabilities to derive the benefits of such techniques.

Classroom Discussion Questions

1. What are some of the key considerations in using diagramming software, such as Kumu, as part of the research process?

2. How could influence diagramming lead to an explanatory, quantitative study?
3. Besides semi-structured interviews what other qualitative data collection techniques could leverage influence diagramming? How?
4. What is a study design aligned with your own research interests that could leverage influence diagramming as part of analysis and/or data presentation?

Further Reading

Senge, P., Kleiner, A., Roberts, C., Ross, R. B., & Smith, B. J. (2011). *The fifth discipline fieldbook: Strategies and tools for building a learning organization*. Nicholas Brealey Pub.

van der Hoorn, B. (2021). *Visuals for influence: In project management and beyond*. University of Southern Queensland. <https://usq.pressbooks.pub/visualsforprojectmanagement/>

Web Resources

Kumu software: <https://kumu.io/>

Sonix transcription software: <https://sonix.ai/>

Peter Senge: Introduction to Systems Thinking: <https://www.youtube.com/watch?v=eXdzKBWDraM>

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