Chapter 8. Following Patterns over Time

In this chapter, you will look at patterns in streams of verbal data that indicate how aspects of your data vary over time. Looking for patterns in time helps to define the temporal shape of your coded data. We will consider simple temporal indexes and then go on to look at aggregate patterns.

Time

Verbal data is inherently temporal. That is, we expect language to be ever changing—minute by minute in oral interactions, line by line in written interactions, and minute by minute as well as line by line in electronic interactions. We all recognize that topics shift in conversation, that texts change as they structure the reader's experience, that what we say in an interview this week will be different from what we say a week from now. Surprisingly, however, relatively few researchers try to describe the patterns in language that occur over time—what Geisler has elsewhere called "temporal shape" (Geisler & Munger, 2001).

The neglect of time as an analytic construct in the analysis of verbal data may arise from the belief that the temporal shape of verbal data is unpredictable. The exact temporal shape of language might be thought too indirect and messy to be worth examining. Verbal interactions are, however, often more regular than might first appear. Conversations don't bounce from topic to topic without rhyme or reason, but often progress with some kind of rationale. Texts likewise don't shape the reader's experience without pattern. Indeed, genre conventions exist to provide a kind of routinized shape that can structure the reading experience and help us make sense of what we're reading. For instance, despite what many students think, first person pronouns (I or we) are not absent in scientific texts; but neither are they distributed evenly throughout a text. Instead, they are more normally encountered in the introduction when authors announce the contribution they will make or in the conclusion when they summarize the contribution they have made. Looking at a text without a sense of how it evolves temporally may leave you unaware of such patterns. The techniques described in this chapter will help you to discover underlying temporal patterns in your streams of verbal data and thereby better understand how the stream of language shapes human experience over time.

Indexing in Time

The simplest temporal patterns involve indexing the distribution of your coding categories across any unit by which you have segmented the data. These can range from the obvious units of time itself (minutes, seconds, etc.) to segments of continuous discourse (words, lines, t-units, paragraphs, etc.). We might, for example, index how speakers change by t-unit within a meeting.

As you saw in Chapter 7, the overall distribution of speaker contribution can be examined by using distribution graphs like those in Figure 7.1 that show us, relatively speaking, how often speakers speak. When we index this data in time, we take this question one step further and ask how the speakers' contributions shift segment by segment during the course of the meeting: Did all speakers speak consistently throughout the meeting or were there clusters of interaction between one or more of the participants at some times and not at others?

The Temporal Index

A temporal index can help us to answer questions about temporal distribution. In Figure 8.1, for example, we see movement across the four speakers,

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Cheryl, John, Ed, and Lee, as we move across the first 180 t-units of a meeting. This temporal index suggests that although interaction between John and Cheryl was fairly even throughout this time, contributions by Lee and Ed were more sporadic. Lee came in just twice and said very little; Ed came in five times, three for relatively short contributions, but once for an extended interaction with Cheryl and a second time for a conversation primarily with John. Simple temporal indices like this, then, can tell us a great deal more about how a phenomenon of interest, like speaker contribution, plays itself out over time.



As shown in Figure 8.1, temporal indices map two variables against each other. One variable is temporal, the unit of segmentation such as the t-unit we have used in Figure 8.1. The second variable is the categorical dimension of the data you wish to index over time. In Figure 8.1, this dimension is speaker contribution. Conventionally, time goes on the x-axis; the categorical dimensional data on the y-axis. To read a temporal index, then, you move from left to right through time and up and down across the categories of your data.

Exercise 8.1 Test Your Understanding

In Figure 8.2 and Table 8.1 (available at https://wac.colostate.edu/books/practice/ codingstreams/) you will find a temporal index of the agents that a student talked about during an interview about a writing project on paternalism. Use this temporal index to match the phenomenon listed on the left below with one or more portions of the index listed on the right.



Figure 8.2: A temporal index of agency over the t-units of an interview.

Table 8.1: A temporal index of agency over the t-units of an interview.

1.	The first time during the interview	a.	12-24
	when the student talked a lot about	b.	27-48
2	the paternalist as agent.	с.	52-55
2.	view when the student talked a lot	d.	52-67
	about the paternalist as agent.	e.	64-67
3.	The last time during the interview	f.	70-109
	when the student talked a lot about	g.	78-89
4.	A time when the student talked	h.	106-128
	almost exclusively about herself as	i.	111-125
	agent.	j.	128-141
5.	A time when the student talked not at all about herself as agent	k.	153-155
6.	A period in which the student talk-	1.	164-181
	ed a great deal about agents other		
	than herself or a paternalist.		

For Discussion: Which of the following seems to happen more often: Mixing *I* as agent with others as agent or mixing *I* as agent with paternalist as agent?

Making a Temporal Index

Before you make a temporal index for your data, it is useful to consider the order in which you want the codes to be layered (see Excel Procedures 8.1 and 8.2 and MAXQDA Procedures 8.1 and 8.2). In Figure 8.1, for example, we have placed Cheryl at the bottom of the index, John second, Ed third, and Lee at the top. In general, it is often best to place the most frequently-occurring categories so that they will be plotted in the lower region of the index. For example, by placing the two most frequent speakers, Cheryl and John, in the lower ranges of the index in Figure 8.1, we have created a base against which we can more easily see the more intermittent participation of Ed and Lee.

Excel Procedure 8.1: Giving a Numeric Value to Codes for a Temporal Index in Excel

https://goo.gl/Bk9wHv

- 1. Assign each of the codes a numeric value, beginning with 1 for the code you want to be in the lowest position on the index.
- 2. In a copy of your worksheet, insert a new column for the numeric codes next to the coding column you want to track in the temporal index.
- 3. Copy the contents of the alphanumeric column into the new column.
- 4. Select the newly created column.
- 5. Select Edit > Find > Replace and then type the alphanumeric name of your first code under Find what: and the chosen numeric value under Replace with.
- 6. Click **Replace All** and then **OK**.
- 7. Repeats steps 5-6 until you have replaced all of your verbal codes with their chosen numeric values.

The newly created column should now be filled with the numeric values you have assigned to your codes as shown in Figure 8.3.

/	А	A B		D
1	T-Unit #	Speaker #	Speaker	Text
2	1	1	Cheryl:	We need a little hole in the middle of this table.
3	2	2	John:	Oh, Jesus! We could just go get a drill right now.
4	3	1	Cheryl:	We need one of these don't we?
5	4	2	John:	Or a big hammer.
6	5	4	Lee	It wouldn't actually have to be in the middle
7	6	2	John:	I mean

Figure 8.3: Assigning numeric values to categories of speaker in Excel.

X Excel Procedure 8.2: Making & Formatting a Temporal Index in Excel

https://goo.gl/Bk9wHv

- 1. Select the column holding the unit numbering and the column holding your numeric coding.
- 2. From the **Insert** ribbon, insert chart as an X-Y (Scatter) with Lines as shown in Figure 8.4.
- 3. Using the **Move Chart** command on the **Chart** ribbon, move the chart to a new sheet, naming it appropriately.
- 4. If necessary, double click on the x-axis and change the Maximum Bounds to your last data point (180 in Figure 8.1)
- 5. Double click the y-axis and, under Axis Options in the Format Axis pane, change the Major Unit to 1 and the Maximum Bounds to the number of categories you have (4 for Figure 8.1).
- 6. Under Labels in the Format Axis pane, select None for the Label Position.
- Select the graph and then grab the bottom right hand selection point. Move it right to make room for your code labels.
- 8. On the **Insert** ribbon, insert a text box on the graph using the **Text** dropdown menu as shown in Figure 8.5.
- 9. To label with code names, insert and arrange text boxes with code names next to the y-axis like those shown in Figure 8.1.



Figure 8.4: Choosing a scatterplot with the insert ribbon in Excel.



Figure 8.5: Inserting a text box to label lines from the chart with code names in Excel.

🗶 MAXQDA Procedure 8.1: Ordering Codes for a Temporal Index in MAXQDA

https://goo.gl/Bk9wHv

- 1. In the Code System window, select the code you want to be in the lowest position of your index.
- 2. Drag it to the end of the code list.





For the temporal index in Figure 8.6, we have dragged Cheryl to the end of the code list shown in Figure 8.7 in order to place it in the lowest position.

3. Drag the remaining codes to the positions you have chosen above this lowest code.



Figure 8.7: Ordering the codes in MAXQDA.

🔕 MAXQDA Procedure 8.2: Creating a Temporal Index in MAXQDA

https://goo.gl/Bk9wHv

- 1. Activate the codes and document you want to place on the temporal index.
- 2. Chose Visual Tools > Codeline and check the option for Only for activated codes command under the Visual Tools menu.

You can use the scroll bar along the bottom to move through the temporal index. The slider at the top can be adjusted to make the columns wider or narrower.

- 3. To adjust column size, grab its right-hand boundary, and drag as desired.
- 4. To make the index fit the window, click on the Fit to window width icon.
- 5. To refresh the index after making changes in the code order, click on the **Refresh** icon.
- 6. To open the index in Excel, click on the Excel icon.
- 7. To save the index as a image, click on the Export icon and choose an image format in the pop up window.

Exploring with Temporal Indices

Temporal indices function as indices into your data, helping you first to see patterns over time and then to explore the underlying language. Hovering over any point in a temporal index in Excel will show you the x- and y-coordinates of the temporal point. If, for example, we hover over the point with coordinates (68,3), this represents the 68^{th} segment, which has been coded as speaker #3, *Ed*.

Temporal indices like those shown in Figures 8.1 and 8.6 can help us to pinpoint places that involve high periods of interactivity that involve all three main speakers and then return to the data to examine the nature of those interactive periods. From T-Unit 23 through T-Unit 41, for example, we see a period in which Cheryl speaks three times, John five times, and Ed six times, a level of interaction that occurs nowhere else in the meeting. An examination of the actual language used shows that the three participants are coming to an agreement about a set of design features, something that would require the participation of all three. The temporal index has given us a quick way of interrogating the sequence and then delving back into the verbal data to better understand them.

Temporal indices can also be compared, one index to the next, to identify differences in the temporal shape of two or more streams of verbal data. Geisler and Munger (2001), for example, compared the temporal shape of emergency runs with routine and critical care patients as shown in Figure 8.8. Any stream of language expected to have generic shape will exhibit a particular temporal shape, whether it be a written text or a routine class meeting. Constructing and comparing temporal indices across instances of these genres can help you to uncover interesting variations (see Excel Procedure 8.3 and MAX-QDA Procedure 8.3).

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Figure 8.8: Comparing the temporal shape of two ambulance runs (from Geisler & Munger, 2001).

Exercise 8.2 Try It Out

Using the temporal index in Figure 8.1 or in 8.6, identify the sequence of interaction that seems to follow the interesting sequence pinpointed in Figures 8.9 or 8.11 (T-Units 23-41). How does this sequence appear to be different from the one that came before it?

For Discussion: If you were to retrieve the data associated with this second sequence, what questions would you want to try to answer using the verbal data itself?

Memo 8.1:Temporal Index

Construct a temporal index for each piece of your data across your built-in contrast.

Note overall differences in temporal shape among them. What differences do you see in how they unfold over time?

Are there specific sequences that you find interesting? Explore them further by using the temporal indices to look at the verbal data itself.

What might you conclude from looking at your temporal indices?

X Excel Procedure 8.3: Exploring Verbal Data with a Temporal Index in Excel

https://goo.gl/Bk9wHv

- 1. Using a temporal index, pinpoint a interesting sequence for further exploration.
- 2. Hover over the beginning and end points to retrieve their x- and y-coordinates.

In Figure 8.9, for example, we have hovered over the beginning point of our interesting sequence and retrieved the coordinates (23,2).



23	3	Ed:	I think
24	2	John:	Well, I like the one about the ports.
25	3	Ed:	I think
26	3	Ed:	it's achievable
27	2	John:	Yeah I think : so we :
28	2	John:	so that would be a piece of furniture.
29	1	Cheryl:	uh-hmm
30	2	John:	It would have all of the interactive.
31	3	Ed:	Well, what's the piece of furniture like? Does it :
32	2	John:	It's like the center part of this table
33	3	Ed:	***voice subsumed*** center part
34	1	Cheryl:	Yeah
35	1	Cheryl:	we need to work on this
36	3	Ed:	***voice subsumed*** so we're satisfied with this,
37	3	Ed:	I think th-at
	3	Ed:	what we want to do is project these screens ***voice
38			subsumed***
39	1	Cheryl:	Because we are still sharing public monitors, right.
40	2	John:	Right
	3	Ed:	flat screens and I would like to ***voice subsumed***
41			positioning

Figure 8.9: An interesting sequence pinpointed using a temporal index in Excel.

Figure 8.10: Marking an interesting sequence with highlighting in Excel.

- 3. In the spreadsheet holding the verbal data, go to the segment numbered with the first coordinate (23 in our example).
- 4. To facilitate further analysis, highlight the data from this beginning point down to the segment with the first coordinate of the ending point (41 in our example).

Figure 8.10 shows an interesting sequence highlighted to facilitate further analysis.

MAXQDA Procedure 8.3: Exploring Verbal Data Associated with a Temporal Index in MAXQDA

https://goo.gl/Bk9wHv

1. Use the scroll bar at the bottom of the **Codeline** window to scroll through the temporal index to pinpoint an interesting sequence for further exploration, as shown in Figure 8.11.

• • • •						C							🖾 🗟 📑 🛈						
Paragraphs	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Cee Cee																	-		
Cheryl														_					

Figure 8.11: An interesting sequence pinpointed with a temporal index in MAXQDA.

- 2. Double click on the beginning cell of the interesting sequence.
- 3. The associated verbal segment will appear highlighted in the **Document Browser** window.
- 4. Select the text from this segment down to the ending point of the interesting sequence.
- 5. Click on on the icon for **Highlight Coding** to mark the sequence for further examination.

Figure 8.12 shows an interesting sequence marked with Highlight Coding.

John	١ؤ	23	Ed: I think
John	Q.	24	John: Well, I like the one about the ports.
Ed	۰Ş	25	Ed: I think
John	Q.	26	Ed: it's achievable
Ed	Q.	27	John: Yeah I think : so we :
Ed	Q.	28	John: so that would be a piece of furniture.
John	۰Ş	29	Cheryl: uh-hmm
John	Q.	30	John: It would have all of the interactive.
John	Q.	31	Ed: Well, what's the piece of furniture like? Does it :
Cheryl	þę -	32	John: It's like the center part of this table
John	۰.	33	Ed: ***voice subsumed*** center part
Ed	6	34	Cheryl: Yeah
GREEN	Q.	35	Cheryl: we need to work on this
John	Q.	36	Ed: ***voice subsumed*** so we're satisfied with this,
Ed	Ý.	37	Ed: I think th-at
Chervl	\$	38	Ed: what we want to do is project these screens voice subsumed
Chond	Q.	39	Cheryl: Because we are still sharing public monitors, right.
Chery	8	40	John: Right
EQ	١¢.	41	Ed: flat screens and I would like to ***voice subsumed*** positioning
FO	-	40	

Figure 8.12: Marking an interesting sequence with highlight coding in MAXQDA.

Aggregating in Time

Temporal indices track segment-by-segment change across coding categories and often provide too much detail to be useful—a real case of not being able to see the forest for the trees. If you find that your temporal index obscures the differences that your distribution analysis suggests are there, you should consider aggregating your data into larger units of analysis. To see more of the forest, that is, you might aggregate:

- turns into conversational sequences,
- t-units into topical chains,
- seconds into minutes, and so on.

You could also aggregate your stream of language using what you take to be significant turning points in a conversation or text. In the transcript of classroom interactions, you might aggregate by curricular unit. In the printed text, you might aggregate by section.

Once your data is aggregated, you can construct an aggregate temporal graph like the one shown in Figure 8.13. In this graph, the number of t-units each speaker spoke in an aggregate are stacked one on top of the other for each conversational sequence. The total height of the stack shows you how much talk any individual aggregate exhibited. We can tell from Figure 8.13, for example, that interaction in Conversational Sequence 19 was quite lively compared to the interaction in Conversational Sequence 32.

Memo 8.2: Aggregate Unit

Examine your temporal index and your data overall. Are there larger temporal patterns that could be better captured by aggregating with a larger segmenting unit? If you have looked at a text by t-unit, what if you looked at it section by section? If you have examined a semester's worth of classroom sequences, what if you looked at it by curricular units? Chose an aggregate unit and document the rationale for your choice.

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Figure 8.13: An aggregate temporal graph.

Making an Aggregate Temporal Graph

Creating an aggregate temporal graph takes several steps. Begin by choosing an appropriate aggregate unit and then marking its borders in your data. If you have been working in Excel, you will then number these new aggregates, get subtotals for them, and then use these subtotals to create an aggregate temporal graph. If you are working in MAXQDA, you will need to use both MAXQDA and Excel to create an aggregate temporal graph. Specifically, you will create a codeline in MAXQDA and then move it into Excel to use subtotals to create an aggregate temporal graph. Procedures for both are outlined in Excel Procedures 8.4 through 8.7 and MAXQDA Procedures 8.4 through 8.10.

Exercise 8.3 Try It Out

The data in Table 8.2 (available at https://wac.colostate.edu/books/practice/codingstreams/) has been segmented by the second. For example, 002.36 equals 2 minutes and 36 seconds. Aggregate the data by the minute. That is, demarcate the boundaries and number the minutes from 1 to 6.

	Time in	Time in		
Sequence	Minutes	Seconds	Text	Tool
1		000.00		PDA
2		000.10	Make second Palm Movie (Mar 21)	PDA
3		000.13	Send Teri Pilot proposal (Mar 21)	PDA
4		000.18		PDA
5		000.45	Take in leave request (Mar 26)	PDA
6		000.58		PDA
7		001.01		PDA
8		001.13	email programmer (Mar 26)	PDA
9		001.26		PDA
10		001.28		PDA
11		001.36		spreadsheet
12		001.39		spreadsheet
13		001.47		PDA
14		001.49	call about hotel bill [Mar23, Maint]	PDA
15		002.08		PDA
16		002.17		PDA
17		002.18		PDA
18		002.19	email programmer (Mar 26)	PDA
19		002.24		PDA
20		002.25	Take in leave request (Mar 26)	PDA
21		002.32		PDA
22		002.34	hotel bill	Off-line
23		005.27		PDA
24		005.27	call about hotel bill [Mar23, Maint]	PDA
25		005.34		spreadsheet
26		005.38		PDA

Table 8.2: Data Segmented by the Second

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	Time in	Time in		
Sequence	Minutes	Seconds	Text	Tool
27		005.41		spreadsheet
28		006.33	Book Prospectus	spreadsheet
29		006.49	Discipline	spreadsheet
30		006.53	Book Prospectus	spreadsheet

X Excel Procedure 8.4: Marking the Aggregate Borders in Excel

https://goo.gl/Bk9wHv

- 1. Make a copy of your original data sheet.
- 2. Insert a new column to the left of the original segmenting unit.
- 3. Locate the beginning of each aggregate unit and place a zero (0) next to it in the new column.

In Figure 8.14, for example, we placed a zero at the beginning of each aggregate. These zeroes function as placeholders that will be relaced by numbers in the next step.

/	А	В	С	D	E
1	Interchange	T-Unit #	Speaker #	Speaker	Text
2	0	1	1	Cheryl:	We need a little hole in the middle of this table. Oh. Jesus! We could just go get
3		2	2	John:	a drill right now.
4	0	3	1	Cheryl:	We need one of these don't we?
5		4	2	John:	Or a big hammer.
					It wouldn't actually have to be in
6		5	4	Lee:	the middle
7	0	6	2	John:	I mean
					You could put it like right here
8		7	4	Lee:	off to the side.
9	0	8	2	John:	Yeah
					We could probably put one in
10	0	9	2	John:	every thing,
					and then when we're not using
11		10	2	John:	it; stick flowers in it or
12		11	1	Cheryl:	Yeah, right.

Figure 8.14: Delimiting the aggregate units with zeroes in Excel.

Excel Procedure 8.5: Numbering the Aggregate Units in Excel

https://goo.gl/Bk9wHv

- 1. Filter the column so only the zeroes are visible.
- 2. In the first data cell of the new column, replace the zero with the following formula: =MAX(A)+1

where AX is the the name of the cell above the current cell.

	А	В	С	D	E
1	Interchange	T-Unit #	Speaker #	Speaker	Text
2	1	. 1	1	Cheryl:	We need a little hole in the middle of this table.
3	1	2	2	John:	Oh, Jesus! We could just go get a drill right now.
4	2	3	1	Cheryl:	We need one of these don't we?
5		4	2	John:	Or a big hammer.
6		5	4	Lee:	It wouldn't actually have to be in the middle
7	3	6	2	John:	I mean
8		7	4	Lee:	You could put it like right here off to the side.

Figure 8.15: Filling each aggregate unit with the new numbering in Excel.

In the worksheet shown in Figure 8.15, for example, the formula in cell A2 would be

=MAX(\$A\$1:A1)+1

- 3. Drag the formula down to fill the column.
- 4. Remove the filter.
- 5. Select the column and Paste Special in place for Values only.
- 6. Within each aggregate unit, drag the unit number down.

The result is that each of the larger aggregate units are progressvely numbered as has been done for sequence 1 in Figure 8.15.

X Excel Procedure 8.6: Subtotaling by Aggregate Unit

https://goo.gl/Bk9wHv

Excel gives us the ability to create subtotals for the data in each of our aggregate units.

- 1. Place your cursor anywhere in the data for which you want subtotals.
- 2. Click on the **Subtotal** icon on the **Data** ribbon.
- 3. As shown in Figure 8.16, In the field **At Each change in:** choose the column with your aggregate unit numbering.
- 4. In the field Use function: choose Sum.
- 5. Under Add subtotal to: check off the columns for which you want subtotals.
- 6. Click OK.

	Subtotal	
At each change in	n:	
Interchange	•	
Use function:		
Sum	•	
Add subtotal to:		
John Ed]
✓ Lee ☐ (Column J)		
 Replace currer Page break be Summary below 	nt subtotals stween groups w data	
Remove All	Cancel OK	1

Figure 8.16: Setting up subtotals in Excel.

	A	В	С	D	E	F	G	Н	1
	Interchange	T-Unit #	Speaker #	Speaker	Text	Cheryl	John	Ed	Lee
		с 1	1	Cheryl:	We need a little hole in the middle of this table. Oh, Jesus! We could just go get a drill right pow	1	0	0	
	1	1 2	: 2	John:	a drin right now.	0	1	0	
	1 Total				W. 1 64 1 1 0	1	1	0	
	3	2 2	្រា	Cheryl:	we need one of these don't we?	1	0	0	
	2	2 4	2	John:	Or a big hammer.	0	1	0	
		2 5	4	Lee:	It wouldn't actually have to be in the middle	0	0	0	
	2 Total				S	1	1	0	
	1	3 6	1 2	l John:	I mean You could put it like right here	0	1	0,	
		3 7	4	Lee:	off to the side.	0	0	0	
	3 Total					0	1	0	
		1 8	2	John:	Yeah	0	1	0	
	4 Total					0	1	0	
-		5 5		! John:	We could probably put one in every thing, and then when we're not using it; stick flowers in it or something	0	1	0	
		5 10	1 2	John:		0	1	0	
		5 11		Cheryl:	Yeah, right,	1	0	0	

Continued . . .

Figure 8.17: Subtotals inserted for the aggregate units in Excel.

X Excel Procedure 8.6: Subtotaling by Aggregate Unit (continued)

https://goo.gl/Bk9wHv

As shown in Figure 8.17, new lines are inserted at the bottom of each aggregate, with subtotals for each of the coding columns.

Notice that a new area has appeared to the left of your data representing the aggregate levels.

7. To see only the aggregates, click on the Level 2 icon at the top of the level bar.

As shown in Figure 8.18, this will collapse the data, showing only the subtotals.

1 2 3		А	В	С	D	E	F	G	Н	1
2	1	Interchange	T-Unit #	Speaker #	Speaker	Text	Cheryl	John	Ed	Lee
•	4	1 Total					1	1	0	0
+	8	2 Total					1	1	0	1
+	11	3 Total					0	1	0	1
٠	13	4 Total					0	1	0	0
٠	17	5 Total					1	2	0	0
٠	20	6 Total					1	1	0	0
٠	25	7 Total					0	4	0	0
٠	32	8 Total					0	5	1	0
٠	39	9 Total					1	3	2	0

Figure 8.18: Collapsing the data to show only subtotals in Excel.

- 8. To reveal all of the data, click on the Level 3 icon at the top of the Level bar.
- 9. To inspect a single aggregate, click on the + sign next to the aggregate unit.

XII Excel Procedure 8.7: Making an Aggregate Temporal Graph in Excel

https://goo.gl/Bk9wHv

- 1. Make sure the coding columns you want to graph are in numeric form (see Excel Procedure 8.1: Giving a Numeric Value to Codes) and that only your aggregates are visible (see Excel Procedure 8.6).
- 2. Select the values in the coding columns to be graphed. Make sure not to select the Grand Total row.

For the aggregate temporal graph shown in Figure 8.13, we selected the columns for the four speakers as shown in in Figure 8.19.

123	/	А	F	G	Н	I
	1	Interchange	Cheryl	John	Ed	Lee
+	4	1 Total	1	1	0	0
+	8	2 Total	1	1	0	1
+	11	3 Total	0	1	0	1
+	13	4 Total	0	1	0	0
+	17	5 Total	1	2	0	0
+	20	6 Total	1	1	0	0
÷	25	7 Total	0	4	0	0
÷	32	8 Total	0	5	1	0
+	39	9 Total	1	3	2	0

Figure 8.19: Selecting the data to be graphed for the aggregate temporal graph shown in Figure 8.13.

- 3. On the Insert tab, click on Insert Line Chart.
- 4. In the pop-up window, click on the **2-D Area** chart.

🔊 MAXQDA Procedure 8.4: Marking the Aggregate Borders in MAXQDA

https://goo.gl/Bk9wHv

- 1. Make a copy of your original document.
- 2. Right click in the Coding Strip to the left in the Document Browser.
- Select Only activated codes in the dialogue box as show in Figure 8.20.
- 4. Click OK.
- 5. Locate the beginning of an aggregate unit and drag to select the entire aggregate.
- 6. Click on one of the Highlight Coding icons.
- Select the next aggregate unit and click on a second Highlight Coding icon.
- 8. Repeat steps 5-6 for the remainder of the data.

As shown in Figure 8.21, your data will now be highlighted by aggregate with alternating colors.

Or	lly activated co Ily user:	des	
		0	
3 (
2			
7			
	BLUE		
7			
/	RED		
Co	lor-coded text		
Dis	lor-coded text splay code nam	ies	
Co Di:	lor-coded text splay code nam oltip: author ar	nes nd date	
Co Di: To	lor-coded text splay code nam oltip: author ar splay emoticod	nes nd date es	
Co Dis To Dis	lor-coded text splay code nan oltip: author ar splay emoticod splay coded se	nes nd date les gments in image	

Figure 8.20: Showing only activated codes in MAXQDA.



Figure 8.21: Aggregate units with highlight coding in MAXQDA.

MAXQDA Procedure 8.5: Creating and Moving the MAXQDA codeline into Excel

https://goo.gl/Bk9wHv

To make an aggregate temporal graph with MAXQDA data, we need to move the codeline data into Excel and then create the graph there.

- 1. In MAXQDA, create a codeline for the data by selecting the Codeline command from the Visual Tools menu.
- 2. Leave the defaults in the dialog box and click **OK**.
- 3. Move the codeline into Excel by clicking on the Excel icon.

The codeline will now open in an Excel workbook.

MAXQDA Procedure 8.6: Moving the MAXQDA codeline into a new Excel worksheet

https://goo.gl/Bk9wHv

Next we create a copy of the codeline data and move it into a new worksheet were we can reformat it in order to make the aggregate temporal graph.

- 1. Place your cursor inside the table and type **Control-A** to select it.
- 2. Copy the selected table and move to a new worksheet
- Place your cursor in A1 and issue the Paste Special command under the Edit menu.
- 4. As illustrated in Figure 8.22, in the dialog box, select **Transpose**.

	Paste Special
aste	
	All using Source theme
Formulas	 All except borders
O Values	O Column widths
Formats	Formula and number formats
Comments	🔵 Values and number formats
O Validation	 All, merge conditional formats
peration	
 None 	Multiply
Add	Divide
Subtract	
Skip Blanks	✓ Transpose
Paste Link	Cancel

Figure 8.22: Transposing codeline data from MAXQDA in Excel.

Continued ...

MAXQDA Procedure 8.6: Moving the MAXQDA codeline into a new Excel worksheet (continued)

https://goo.gl/Bk9wHv

- 5. Click OK.
- 6. If you have a warning symbol next to the numbers in your first column, select all of the column values and choose **Convert to Number** under the warning symbol as shown in Figure 8.23.



Figure 8.23: Converting t-units from a MAXQDA codeline to numeric values in Excel.

🔕 MAXQDA Procedure 8.7: Marking the Aggregate Borders in Excel

https://goo.gl/Bk9wHv

- 1. Insert a new column to the left of the original segmenting unit.
- 2. In the aggregate column, next to the first data point, type a zero.
- 3. Next to the second data point, type the following formula

=IF(OR(X3>X2,Y3>Y2),0,"")

where X is the column with your first highlight color and Y is the column with your second highlight color.

Continued ...

MAXQDA Procedure 8.7: Marking the Aggregate Borders in Excel (continued)

https://goo.gl/Bk9wHv

In Figure 8.24, for example, we have used the following formula to locate the beginning of the aggregates

=IF(OR(C3>C2,D3>D2),0,"")

where Column C contains the red highlight and Column D contains the blue highlight.

	А	В	С	D	E	F	G	н
1	Aggregate	T-Units	RED	BLUE	Cheryl	John	Ed	Lee
2		01	0	1	0	0	0	0
3		2	0	1	0	1	0	0
4		03	1	0	1	0	0	0
5		4	1	0	0	1	0	0
6		5	1	0	0	0	0	1
7		06	0	1	0	1	0	0
8		7	0	1	0	0	0	1

Figure 8.24: Marking the beginning of the highlighted aggregate units from a MAXQDA codeline.

🔕 MAXQDA Procedure 8.8: Reformat the MAXQDA codeline in Excel

https://goo.gl/Bk9wHv

- 1. Filter the column so only the zeroes are visible.
- 2. In the first data cell of the new column, replace the zero with the following formula: =MAX(\$A\$1:AX)+1

where AX is the the name of the cell above the current cell.

In the worksheet shown in Figure 8.24, for example, the formula in cell A2 would be

=MAX(\$A\$1:A1)+1

- 3. Drag the formula down to fill the column.
- 4. Remove the filter.
- 5. Select the column and Paste Special in place for Values only.
- 6. Within each aggregate unit, drag the unit number down as show in Figure 8.15.

MAXQDA Procedure 8.9: Subtotaling by Aggregate Unit

https://goo.gl/Bk9wHv

- 1. Place your cursor anywhere in the data for which you want subtotals.
- 2. Click on the Subtotal icon on the Data ribbon.
- 3. As shown in Figure 8.16, In the field At Each change in: choose the column with your aggregate unit numbering.
- 4. In the field Use function: choose Sum.
- 5. Under Add subtotal to: check off the columns for which you want subtotals.
- 6. Click OK.

As shown in Figure 8.17, new lines are inserted at the bottom of each aggregate with subtotals for each of the columns chosen.

Notice that a new area has appeared to the left of your data representing the aggregate levels.

7. To see only the aggregates, click on the Level 2 icon at the top of the Level bar.

As shown in Figure 8.18, this will collapse the data, showing only the subtotals.

- 8. To reveal all of the data, click on the Level 3 icon at the top of the Level bar.
- 9. To inspect a single aggregate click on the + sign next to the aggregate unit.

MAXQDA Procedure 8.10: Making an Aggregate Temporal Graph in Excel

https://goo.gl/Bk9wHv

- 1. Make sure that only your aggregates are visible (see MAXQDA Procedure 8.9).
- 2. Select the values in the coding columns to be graphed. Make sure not to select the Grand Total row.

For Figure 8.13, we selected the columns for the four speakers as shown in in Figure 8.19.

- 3. On the Insert tab, click on Insert Line Chart.
- 4. In the pop-up window, click on the 2-D Area chart.

Interpreting Aggregate Patterns

Aggregate temporal graphs like that in Figure 8.13 help you to understand the relative contribution of each of the coding categories to the total activity in an interchange. In Figure 8.13, for example, we can see that the activity starting roughly at Conversational Sequence 16 and continuing through Conversational Sequence 28 was lively and involved all the three major participants. Interaction between Interchange 33 and 40, by contrast, though somewhat lively, took place between just Cheryl and John. Such patterns can send us back into the data itself to explore what was going on.

To see how aggregate temporal graphs differ from temporal indices, compare the graph in Figure 8.13 with the one in Figure 8.1. Figure 8.1 does a better job of pinpointing the exact locations of contribution from each speaker and the relatively infrequency of participation by Lee and Ed. It is for this reason we call it an index—there is a one-to-one relationship between each point on the graph and each segment of the data.

The aggregate temporal graph in Figure 8.13 does a better job, however, of helping us to see who is interacting with whom over more extended periods and gives us a much better sense of the level of activity in any given period. All this information is, of course, very useful is pulling together a complete description of the way that the stream of verbal data plays itself out over time across the categories in your coding scheme.

Exercise 8.4 Try It Out

In Figure 8.17, you will find an aggregate temporal graph of the agents talked about by a student during an interview about a writing project on paternalism, aggregated by turn. Each turn represents the student's response to a question by the interviewer. These were the six questions asked:

- At what point did you stop today?
- Why did you stop?
- Can you sort of describe to me generally what you put in the introduction?
- Can you summarize what you put in that paragraph too?
- Can you summarize what you put in that paragraph too?

• Do you feel better now that you've gotten those first two paragraphs written?

Given the pattern of activity and attention to agency shown in Figure 8.25, what kinds of questions would you ask to elicit attention by a writer to agents others than the writer herself? What kind of questions would you ask to elicit a lot of discussion? What kinds seem to elicit attention only to the writer herself?



Figure 8.25: Aggregate temporal graph of the data shown in Figure 8.2, aggregated by turn.

For Discussion: What aspects of the verbal data are clearer in Figure 8.25 than in 8.2? What aspects of Figure 8.2 are less clear in Figure 8.25?

Memo 8.3: Aggregate Temporal Graph

Construct a temporal aggregate graph for each piece of your data across your built-in contrast.

Note overall differences in temporal shape among them. What differences do you see in how they unfold over time?

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Are there specific sequences that you find interesting. Explore them further by using the temporal indices to look at the verbal data itself.

What might you conclude from looking at the temporal aggregates?

Selected Studies Examining Temporal Patterns

- Geisler, C., & R. Munger, R. (2001). Temporal analysis: A primer exemplified by a case from prehospital care. In E. Barton & G. Stygall (Eds.), *Discourse Studies in Composition*. NY: Hampton Press.
- Geisler, C. (2003). When management becomes personal: An activity-theoretic analysis of Palm technologies. In C. Bazerman & D. R. Russell (Eds.), Writing selves / writing societies: Research from activity perspectives (pp. 125-158). Fort Collins, CO: The WAC Clearinghouse and Mind, Culture, and Activity. Retrieved from: https:// wac.colostate.edu/books/perspectives/selves-societies

For Further Reading

Kelly, A. R., Autry, M. K., Mehlenbacher, B. (2014). Considering chronos and kairos in digital media rhetorics. In G. Verhulsdonck & M. Limbu (Eds.), *Digital rhetoric* and global literacies: Communication modes and digital practices in the networked world. Hershey, PA: IGI-Global.