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Food Preparation Scheduling Tool

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Food Preparation Scheduling Tool

Abstract

This is a general planning tool with the scope of a single day, rather than a detailed real-time planning tool. It is designed both to illustrate and to help manage the complexities of scheduling food-service preparation work. The tool is limited to 10 people and 10 resources or pieces of equipment, and it uses time increments of 15 minutes. We illustrate the capabilities of the tool via sample files for the preparation of a BBQ-theme dinner party. The tool uses a variety of inputs—including people, equipment, and the recipes that need to be prepared in a given day—and a scheduling optimizer to develop a schedule that's displayed from many different perspectives. I'll explain the components of the tool, then demonstrate how one can use it to explore solutions to food preparation problems.

Keywords

Cornell, food-service preparation work, scheduling, tools, CHR, worksheets

Disciplines

Food and Beverage Management

Comments

Required Publisher Statement

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Instructions for the Food Preparation Scheduling Tool v2015

by Gary Thompson

EXECUTIVE SUMMARY

This report explains how to use the accompanying food preparation tool and offers an example of how this tool might work. Although the tool is relatively simple to use, it is based on fairly complex algorithms that use an element of randomness to achieve a near-optimal result. For this reason, users will want to run the tool solution more than once and compare the outcomes to select the best procedure for the meal at hand. The tool's solutions are governed in part by the weights assigned to a series of criteria specified by the user. Thus, the tool responds to the user's preferences, while it also spells out what tasks are needed and when the tasks should be performed.

ABOUT THE AUTHOR



Gary M. Thompson, Ph.D., is a professor of operations management in the School of Hotel Administration at Cornell University, where he teaches graduate and undergraduate courses in service operations management. Prior to joining Cornell in 1995, he spent eight years on the faculty of the David Eccles School of Business at the University of Utah. His current research focuses on restaurant revenue management, food and beverage forecasting in lodging operations, workforce staffing and scheduling decisions, wine cellars, scheduling conferences, and course scheduling in post-secondary and corporate training environments. His research has appeared in the *Cornell Hospitality Quarterly*, *Decision Sciences*, *Journal of Operations Management*, *Journal of Service Research*, *Management Science*, *Naval Research Logistics*, and *Operations Research*. He has consulted for several prominent hospitality companies and is the founder and president of Thoughtimus® Inc., a small software development firm focusing on scheduling products. From July 2003 through June 2006 he served as executive director of the school's Center for Hospitality Research.

Acknowledgment

The author expresses his thanks to Rupert Spies, a long-time faculty member in the School of Hotel Administration, for requesting a tool like this and for his useful feedback on earlier versions.”

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This is a general planning tool with the scope of a single day, rather than a detailed real-time planning tool. It is designed both to illustrate and to help manage the complexities of scheduling food-service preparation work. The tool is limited to 10 people and 10 resources or pieces of equipment, and it uses time increments of 15 minutes. We illustrate the capabilities of the tool via sample files for the preparation of a BBQ-theme dinner party. The tool uses a variety of inputs—including people, equipment, and the recipes that need to be prepared in a given day—and a scheduling optimizer to develop a schedule that’s displayed from many different perspectives. I’ll explain the components of the tool, then demonstrate how one can use it to explore solutions to food preparation problems.

EXHIBIT 1

Legend for tool color coding

LEGEND
Labels
Inputs
Times
Input or Output Cells

EXHIBIT 2

Definition of terms

Term	Definition
Recipe	Recipes identify the item being prepared, the steps involved, and the labor and equipment necessary.
Daily Plan	This is the set of recipes that will be prepared on the day in question.
People	These are the people who will prepare the food. Their capabilities are defined individually.
Equipment (Resources)	This is the equipment or non-people resources that are necessary to perform some or all of the food preparation.

EXHIBIT 3

Interface worksheet with tool's main components

Recipes/Menu Items/Tasks	Functions
BBQ Baby Back Ribs (6)	Add Recipe
BBQ Chickens (2)	Edit Recipe
BBQ Sauce	Delete Recipe
Baked Beans (quick soak)	Create Daily Plan
Coleslaw	
Cornbread	
Mac & Cheese	
Potato Salad	

Instructions

To use the model you will need to identify people, equipment, and the recipes that are required for a specific day's preparation. This is done via the **Interface**, **People & Equipment** and **Daily Plan Data** worksheets, which are described below. Throughout the tool, labels are shown in a light brown color while inputs are shown in a light blue-grey color; time slots, on the output plan sheets, are shown in purple; and depending on the sheet, input cells or output cells may also have no color, as illustrated in Exhibit 1.

Definitions. General definitions of the terms used in the tool are given in Exhibit 2. Exhibits 3 through 22 show screen shots from the BBQ-theme dinner party sample file. Below we describe each of the worksheets in the tool.

Interface Worksheet. The Interface worksheet shown in Exhibit 3 is the main access point to recipes via the *Add Recipe* button. Click this button to add a new recipe from scratch. See the **Define Recipe** worksheet for additional information.

Edit Recipe. Click this button to edit an existing recipe or to create a new recipe from an existing recipe. The recipe to be edited must be highlighted in the list. Again, see the **Define Recipe** worksheet for additional information.

Delete Recipe. Click this button to delete the highlighted recipe(s).

Create Daily Plan. Click this button to create a daily plan from the highlighted recipes. See the **Daily Plan Data** worksheet for additional information.

EXHIBIT 4

People component of “People & Equipment” worksheet

	A	B	C	D	E	F	G	H	I	J	K
1		People									
2	Name:	Me	Spouse	--	--	--	--	--	--	--	--
3	Pay Grade:	0	0	0	0	0	0	0	0	0	0
4	Maximum Simultaneous Tasks:	3	3	2	3	3	2	2	3	3	3
5	Maximum Load:	90	100	90	100	100	100	100	100	100	100

EXHIBIT 5

Equipment component of “People & Equipment” worksheet

	Equipment										
9											
10	Name:	Smoker Rack 1	Smoker Rack 2	Oven 350, Shelf 1	Oven 350, Shelf 2	Stove, Burner 1	Stove, Burner 2	Oven 400, Shelf 1	Oven 400, Shelf 2	n/a	n/a

People & Equipment Worksheet. On this sheet you define information on the available people and the equipment and resources. The information on up to ten people is shown in Exhibit 4. Note that when you are preparing a daily plan, you can flag people as being available or unavailable.

Pay Grade is the pay level of the people, where higher grades mean higher pay. Instead of a pay grade, you can use their hourly wages. Volunteer labor can be assigned a pay grade of zero, as in the example presented in these instructions.

Maximum Simultaneous Tasks is the maximum number of simultaneous tasks the person can perform. This value would typically be higher for more experienced people.

Maximum Load is the maximum percentage of time that a person can be working in any 15-minute period. This value would typically be higher for more experienced people, with an upper limit of 100.

The Equipment information (or resources) section allows you to identify up to 10 different resources or pieces of equipment, as shown in Exhibit 5. Since resources cannot be shared simultaneously, it can be useful to define the resource at the component level. In this example, the two racks of the smoker are the resources in question.

Recipe list worksheet

	A	B	C	D	E	F	G	H
1	WARNING: Do not edit this sheet directly. Make changes via the Add/Edit/Delete recipe functions on the "Interface" sheet.							Maximum Delay Before Next Step (mins)
2								
3								
4		Earliest	Latest	Earliest	Component Steps		Duration	(mins)
5	Recipe /Menu Item	Time Due	Time Due	Start Time	Label	Name	(mins)	
6	BBQ Chickens (2)	17:00	18:00	8:00	A	tchcock &	15	0

Label is an abbreviation for the component steps, which should be serial. Using letters of the alphabet or numbers is recommended.

Name is a description of each component step. Keeping the name short is useful for ensuring that the reports can be easily read.

Duration (mins) is the duration of the component step, in minutes. If the duration is dependent on which piece of equipment is used, leave this blank. The duration must be in multiples of 15 minutes, but need not require the full use of a person for that time, as we will see below.

Maximum Delay Before Next Step (mins) is the maximum allowed amount of time between the completion of the current step and the start of any step that must follow it. For example, the "Rest" step in the recipe will take at least 60 minutes but could be as long as 120 minutes.

Precursor Steps are the component steps that must be completed before the current step can be started. You need not identify all the necessary precursors; only the immediate precursors are necessary (i.e., you don't need the precursors' precursors). You identify a precursor using either its label or name. For example, the ribs must rest (step D) before being portioned (step E).

The screen shots in Exhibits 7 and 8 show more information that can be defined for each component step. In the *People Qualified* section of the worksheet, shown in Exhibit 7, you identify which people can perform each component step, and the

workload required if they do it. Using the example, component step A can be performed by me, and it would fill 90 percent of any of my available time in each 15-minute period the task requires. In contrast, component step C would take 5 percent of my time. Because the workload can vary depending on who is doing a task, you can distinguish between the skill levels of people on specific tasks. Also, people can perform more than one task at a time, as long as the sum of the workloads for the component tasks does not exceed the *Maximum Load* defined for them.

In the *Equipment Needed* section of the worksheet, shown in Exhibit 8, you identify the equipment needed for each component step of the recipe. Enter an "X" to indicate a piece of equipment is necessary for a step; alternately, you can enter a time, where the duration of the component step is dependent on the equipment. For example, the values of 300 for the Smoker, Rack 1 and Smoker, Rack 2, indicate that the ribs can be placed on either rack of the smoker and the time required will be same in both cases. The times need not be the same, however. With the example, the time required to bake something in a 400 degree oven would be less than that for the 350 degree oven.

Recipe List Worksheet. This worksheet, a portion of which is shown in Exhibit 9, records all the recipes you have defined. It is important that you not edit this worksheet directly. Instead, recipes should be added, modified and deleted via the **Interface** worksheet.

Setting availability of people on the Daily Plan Data worksheet

	O	P	Q	R	S	T	U	V	W	X	Y
	People Qualified										
Name:	Me	Spouse	--	--	--	--	--	--	--	--	--
Pay Grade	0	0	0	0	0	0	0	0	0	0	0
Maximum Simultaneous Tasks:	3	3	2	3	3	2	2	3	3	3	3
Maximum Load:	90	100	90	100	100	100	100	100	100	100	100
Can Use?	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

Daily Plan Data Worksheet. This worksheet contains a list of all the recipes that will be created on the day being scheduled. To create the list, go to the **Interface** worksheet, highlight all the recipes that you wish to create (hold the Control key down to select multiple recipes) and click the *Create Daily Plan* button.

Once you have placed recipes on the Daily Plan Data worksheet, following the steps above, you can make changes to the recipes for that day. Note, however, that any changes made at this point will not be saved in the recipe list. If you want the changes to be permanent, make the changes in the recipe before creating the daily plan.

The information you see on the **Daily Plan Data** worksheet is the same as what you can see and edit on the **Recipe**

worksheet, so see the information on that sheet, provided earlier. The one exception is that on the **Daily Plan Data** worksheet, you can specify which of the people are available on the day, by setting the *Can Use?* field to “TRUE” as shown in Exhibit 10. This allows the plan to vary based on day of the week, if desired. In the example shown, I am the only one available to prepare the meal.

Once you have made any desired changes to the day’s recipe, clicking the *Develop Plan* button will create the daily plan. Before doing so, however, you should review the information on the **Scheduling Criteria** worksheet, described on the next page.

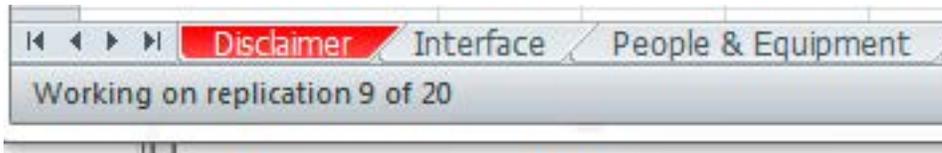
EXHIBIT 11

Scheduling Criteria worksheet

	A	B	C	D	E
1	Scheduling Objectives	Weight			
2	Start as late as possible	35		Develop Plan	
3	Use as few people as possible	50			
4	Minimize staffing costs	0			
5	Balance total workload	5			
6	Balance workload over the work time	5			
7	Keep free time together	5			

EXHIBIT 12

Tool progress status bar



Scheduling Criteria Worksheet. On this sheet you set relative priority on six criteria used to judge the quality of the daily plan. This sheet is important, in that it affects the schedule you get. You can allocate 100 points across the criteria in any way, based on what you wish to optimize, with one example shown in Exhibit 11. The criteria that the tool can optimize are:

- *Start as late as possible* means that the work should start as late as possible.
- *Use as few people as possible* means that the plan should use as few people as possible.
- *Minimize staffing costs* considers the pay grades or hourly wages of the people and the hours they are required. In this example, its weight is set to zero, because the labor is volunteer.
- *Balance total workload* attempts to spread the work evenly across the scheduled people.
- *Balance workload over the work time* means that the people should be working at a consistent utilization, rather than being busy at some times and slow at others.

- *Keep free time together* means that any gaps in the work should be placed together, as this could more easily allow a person to perform side tasks not listed in the daily plan data.

Once you have set the appropriate weighting criteria, clicking the *Develop Plan* button will create the daily plan, as described next.

Develop Plan. The daily plan can be created using the *Develop Plan* buttons found on the **Daily Plan Data** and **Scheduling Criteria** worksheets, or using the *Run Planner Again* button on the **Summary Metrics** worksheet. Because of the complexity of this planning problem the tool uses a search heuristic to find a plan. There is an element of randomness to the search, so it can be worthwhile to develop more than one plan, saving the spreadsheet if the new plan was superior to the previous one. When the scheduler is running, you will see the status of the search process in the status bar of the tool, as it works through 20 replications of its search algorithm, as shown in Exhibit 12.

Recommended Plan-H (horizontal worksheet)

	A	B	C	D	E	F	G	H	I	J	K	L
1	People	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00
2	Me	BBQ Baby Back Ribs (6) Remove silverski	BBQ Chickens (2) Spatchcock & rub			Baked Beans (quick soak) B oil						
3												
4											Baked Beans (quick soak) Prep ingredients	
5												
6	Equipment	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00
7	Smoker Rack 1											
8	Smoker Rack 2											
9	Oven 350, Shelf 1											
10	Oven 350, Shelf 2											
11	Stove, Burner 1											
12	Stove, Burner 2											
13	Oven 400, Shelf 1											
14	Oven 400, Shelf 2											
15												
16	Recipe / Menu Items	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00
17	BBQ Baby Back Ribs (6)	Remove silverskins & rub		Rest								
18	BBQ Chickens (2)		spatchcock &		Rest							

Once the search process is complete, the tool will switch to the **Unscheduled Recipe Analysis** worksheet. At this point, the different views and reports for the plan can be examined, as shown in Exhibits 13–22. As described next, the tool offers the resulting plan worksheets in either a horizontal format (H) or a vertical format (V).

Recommended Plan-H Worksheet. This worksheet, illustrated in Exhibit 13, shows the activities of the people and equipment, with people and equipment in the rows and the time periods in the columns. From this plan, you can see when multi-tasking is occurring. For example, I am responsible for three separate tasks from 11:45-12:00. An alternative layout is provided in the **Recommended Plan-V** Worksheet.

EXHIBIT 14

Recommended Plan-V (vertical worksheet)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	People	Me				Equipment	Smoker Rack 1	Smoker Rack 2	Oven 350, Shelf 1	Oven 350, Shelf 2	Stove, Burner 1	Stove, Burner 2	Oven 400, Shelf 1	Oven 400, Shelf 2		Recipe / Menu Items	BBQ Baby Back Ribs (6)	BBQ Chickens (2)	BBQ Sauce	Baked Beans (quick soak)
2	09:30	BBQ Baby Back Ribs (6) Remove silverskins				09:30										09:30	Remove silverskins & rub			
3	09:45	BBQ Chickens (2) Spatchcock & rub				09:45										09:45		Spatchcock & rub		
4	10:00					10:00										10:00	Rest			
5	10:15					10:15									10:15					
6	10:30	Baked Beans (quick soak) Boil				10:30										10:30		Rest		Boil
7	10:45					10:45										10:45				
8	11:00					11:00										11:00				Snak
9	11:15					11:15										11:15				

EXHIBIT 15

People Plan-H (horizontal worksheet)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	People	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30
2	Me	BBQ Baby Back Ribs (6) Remove silverskins	BBQ Chickens (2) Spatchcock & rub			Baked Beans (quick soak) Boil									BBQ Baby Back Ribs (6) Smoke							
3															BBQ Chickens (2) Smoke							
4										Baked Beans (quick soak) Prep ingredients					Baked Beans (quick soak) Bake							
5																						

Recommended Plan-V Worksheet. This worksheet, illustrated in Exhibit 14, also shows the same activities of the people and equipment, but this time people and equipment are in the columns and the time periods in the rows. From this plan, you can see when multi-tasking is occurring; I am responsible for two separate tasks beginning at 11:00, for example.

People Plan-H Worksheet. The People Plan-H Worksheet and the People Plan-V Worksheet are also alternatives to each other. The Plan-H worksheet, illustrated in Exhibit 15, shows the activities of the people with people in the columns and the time periods in the rows. From this plan, you can see when multi-tasking is occurring. For example, I am responsible for three separate tasks from 11:45-14:30.

EXHIBIT 16

People Plan-V (vertical worksheet)

	A	B	C	D
1	People	Me		
2	09:30	BBQ Baby Back Ribs (6) Remove silverskins & rub		
3	09:45	BBQ Chickens (2) Spatchcock & rub		
4	10:00			
5	10:15			
6	10:30	Baked Beans (quick soak) Boil		
7	10:45			
8	11:00			
9	11:15			
10	11:30			
11	11:45			
12	12:00	BBQ Baby Back Ribs (6) Smok	BBQ Chickens	
13	12:15			
14	12:30			

The alternative layout provided in the **People Plan-V** worksheet, illustrated in Exhibit 16, shows the same activities with people in the rows and the time periods in the columns. From this plan, you can see when multi-tasking is occurring; I am responsible for three separate tasks from 11:45-12:00, for example.

EXHIBIT 17

Equipment Plan-H (horizontal worksheet)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Equipment	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30
2	Smoker Rack 1	BBQ Chickens (2) Smoke																				
3	Smoker Rack 2	BBQ Baby Back Ribs (6) Smoke																				
4	Oven 350, Shelf 1																					
5	Oven 350, Shelf 2	Baked Beans (quick soak) Bake																				
6	Stove, Burner 1																					

Equipment Plan Worksheets. The Equipment Plan-H Worksheet, illustrated in Exhibit 17, and the Equipment Plan-V Worksheet, illustrated in Exhibit 18, show two views of the activities of the equipment, one with with equipment in the columns and the time periods in the rows (Plan-H) and the other with equipment in the rows and time periods in the columns (Plan-V).

EXHIBIT 18

Equipment Plan-V (vertical worksheet)

	A	B	C	D	E	F	G	H	I
1	Equipment	Smoker Rack 1	Smoker Rack 2	Oven 350, Shelf 1	Oven 350, Shelf 2	Stove, Burner 1	Stove, Burner 2	Oven 400, Shelf 1	Oven 400, Shelf 2
2	09:30								
3	09:45								
4	10:00								
5	10:15								
6	10:30								
7	10:45								
8	11:00								
9	11:15								
10	11:30								
11	11:45								
12	12:00								
13	12:15								
14	12:30								
15	12:45								
16	13:00	BBQ Chickens (2) Smoke	BBQ Baby Back Ribs (6) Smoke						
17	13:15								
18	13:30								
19	13:45								
20	14:00								
21	14:15								
22	14:30								
23	14:45								
24	15:00								
25	15:15								
26	15:30								
27	15:45								
28	16:00								
29	16:15						Potato Salad Boil Potatoe		
30	16:30						Coleslaw Char cabbage	Cornbread Bake	

EXHIBIT 19

Recipe Plan-H (horizontal worksheet)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Recipe / Menu Items	09:30	09:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15
2	BBQ Baby Back Ribs (6)	Remove silverskins & rub	Rest				Smoke														
3	BBQ Chickens (2)	Spatchcock & rub	Rest				Smoke														
4	BBQ Sauce																				
5	Daked Beans (quick soak)					Boil	Soak				Prep Ingredients	Bake									

EXHIBIT 20

Recipe Plan-V (vertical worksheet)

	A	B	C	D	E	F	G	H	I	J	K	
1	Recipe / Menu Items	BBQ Baby Back Ribs (6)	BBQ Chickens (2)	BBQ Sauce	Baked Beans (quick soak)	Coleslaw	Cornbread	Mac & Cheese	Potato Salad			
2	09:30	Remove silverskins & rub										
3	09:45	Rest	Spatchcock &									
4	10:00											
5	10:15											
6	10:30			Rest		Boil						
7	10:45	Smoke	Smoke		Soak							
8	11:00											
9	11:15											
10	11:30						Prep Ingredients					
11	11:45											
12	12:00											
13	12:15											
14	12:30											
15	12:45											
16	13:00											
17	13:15											
18	13:30											
19	13:45				Bake							
20	14:00											
21	14:15											
22	14:30											
23	14:45											
24	15:00											
25	15:15											
26	15:30											
27	15:45					Prep						
28	16:00	Rest	Rest							Prep Potatoes	Heat Water	
29	16:15										Boil Potatoes	
30	16:30							Charcabbage	Bake		Combine	
31	16:45			Separate				Cool				
32	17:00						Cool	Prep	Boil pasta	Chill		

Recipe Plan Worksheets. Likewise, the Recipe Plan-H Worksheet, illustrated in Exhibit 19, and the Recipe Plan-V Worksheet, illustrated in Exhibit 20, show the alternative format for the plans for each recipe, with recipes in the columns and the time periods in the rows for Plan-H and recipes in the rows and time periods in the columns for Plan-V. Notice that some component steps for a recipe can be performed simultaneously: Prep and Boil Pasta steps for “Mac & Cheese,” for example.

Summary Metrics worksheet)

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	Scheduling Objectives													
2	Average Start Time:					9:30:00 AM			Run Planner Again					
3	# People Used:					1								
4	Total Pay Grade-Hours (or Total Pay):					8.5								
5	Total workload discrepancy across people (mins):					0.0								
6	Total workload discrepancy across time (mins):					56.5								
7	Average length of free-time blocks (mins):					30.0								
8														
9	People-Based Metrics						Equipment-Based Metrics							
	Person	Work-span (hours)	Active Time (hours)	Average Task Load (%)	Maximum Task Load (hours)	Average # Simultaneous Tasks	Maximum # Simultaneous Tasks (hours)	Equipment	Available Time (hours)	Work-span (hours)	Active Time (hours)	Active Time (%)		
10	Me	8.5	8	37.25	90 (1)	2.44	3 (4.5)	Smoker Rack 1	8.5	5	5	58.82		
11								Smoker Rack 2	8.5	5	5	58.82		
12								Oven 350, Shelf 1	n/a	n/a	n/a	n/a		
13								Oven 350, Shelf 2	8.5	5.75	4.5	52.94		
14								Stove, Burner 1	n/a	n/a	n/a	n/a		
15								Stove, Burner 2	8.5	1	0.75	8.82		
16								Oven 400, Shelf 1	8.5	0.5	0.5	5.88		
17								Oven 400, Shelf 2	n/a	n/a	n/a	n/a		
18														

Summary Metrics Worksheet. This worksheet, illustrated in Exhibit 21, provides a variety of summary information about the daily plan, specifically with respect to the scheduling criteria, people-based metrics, and equipment-based metrics.

Scheduling Objectives. The Scheduling Objectives section of the worksheet has information on:

- *Average Start Time*, the average start time for all scheduled people;
- *Number of People Used*, the number of people required for the daily plan;
- *Total Pay Grade-Hours (or Total Pay)*, the sum, across all scheduled people, of the hours worked times the pay grade (or hourly pay);
- *Total workload discrepancy across people (mins)*, the sum of the absolute difference, across all scheduled people, between the average workload and the workload of the person;
- *Total workload discrepancy across time (mins)*, the sum of the absolute difference, across all time periods in the day span, between the average period workload and the workload in the period; and
- *Average length of free-time blocks (mins)*, the average length of any free-time blocks, across all scheduled people.

People-based Metrics. The People-Based Metrics section of the worksheet has information for each person on:

- *Workspan (hours)*, the amount of time between the person first starting and last finishing work;

- *Active Time (hours)*, the amount of time the person is performing at least one task;
- *Average Task Load (%)*, the average percentage workload, across all tasks, across their active time;
- *Maximum Task Load (hours)*, the maximum workload percentage of the person at any point;
- *Average # Simultaneous Tasks*, the maximum number of tasks the person is performing simultaneously, across their active time; and
- *Maximum # Simultaneous Tasks (hours)*, the maximum number of tasks the person is performing simultaneously, across the workday.

Equipment-based Metrics. The Equipment-Based Metrics section of the worksheet has information for each piece of equipment on:

- *Available Time (hours)*, based on the earliest start time of any person until the latest finish time of any person;
- *Work-span (hours)*, the amount of time between the equipment first being used and last being used;
- *Active Time (hours)*, the amount of time the equipment is in use; and
- *Active Time (%)*, the percentage of the available time that the equipment is being used.

As noted earlier, the results you obtain typically will be affected by the weights you assign to the six Scheduling Criteria (Exhibit 11).

Unscheduled Recipe worksheet (showing that all recipes were scheduled)

	A	B	C	D
1	Recipe	People or Equipment	Current Load (%)	Load if Scheduled (%)
2	All recipes were scheduled			

Unscheduled Recipe Analysis Worksheet. This worksheet, illustrated in Exhibit 22, provides information on any recipes that were not scheduled. It reports the utilization of people and equipment that would have occurred, had the recipe been scheduled. The projected utilizations are color-coded, from dark red for very high, to dark green for very low. In this case, all recipes were scheduled. We address how to handle unscheduled recipes in the next section.

Using the Tool for Planning

Here are some general suggestions for using the tool for planning food preparation:

Make the recipe “fit” the tool. As should be apparent from the example of the BBQ-theme dinner party, the plan does not contain all the detailed steps of a recipe. For example, the third step of the “Baked Beans (quick soak)” recipe is simply “Prep Ingredients” which is obviously an abstraction of the individual activities that “Prep Ingredients” would entail. However,

because the percentage of effort is defined for each person who could perform a task (see Exhibit 7), you have a lot of flexibility in representing the time intensity of tasks.

Run the planner more than once. As noted earlier, the tool uses a sophisticated search algorithm that has an element of randomness. Because of the randomness, running the planner more than once allows you to compare plans and select the best plan. Simply save the results the first time you run it; run it again and save only if you find a superior plan; and repeat as many times as desired.

Experiment with the Scheduling Criteria. The Scheduling Criteria worksheet (Exhibit 11) allows you to the weight the criteria the tool uses in its search for the best schedule. Since some of the criteria conflict (using as few people as possible and starting as late as possible, for example), it can be useful to see how the schedule changes as you weight the criteria differently. You will see the biggest differences in those cases where you have more people performing the work.

Unscheduled Recipe worksheet (showing an unscheduled recipe)

	A	B	C	D
	Recipe	Staff or Equipment	Current Load (%)	Load if Scheduled (%)
1				
2	Bread	Proofer	60	90
3		Emp4	67	85
4		Emp1	49	67
5		Bench	50	55
6		Oven	35	45
7		Emp6	25.5	43.5
8		Emp5	23	41
9		Mixer	15	20
10		Emp2	0	8
11		Emp3	0	6

Handle unscheduled recipes. Exhibit 23 shows a screen shot of the Unscheduled Recipe Analysis worksheet, for an example (not from the BBQ-theme dinner party) where the “Bread” recipe was not scheduled. Although it initially appears that the issue might be with Emp4, who would have very high utilization had the recipe been made, different people could do the work and the other people have notably lower utilizations. So the issue in this case is with the Proofer. To have this recipe scheduled could necessitate changing the time limits on the recipe in the **Daily Plan Data** worksheet.

The steps you should consider if you have an unscheduled recipe include:

- Increasing the time window for the recipe (see Exhibit 6);
- Using more people. Perhaps someone who has been set as unavailable (see Exhibit 10) needs to be asked to pitch in;
- Increasing the number of tasks that a person can perform simultaneously, through training (see Exhibit 4);
- Increasing the skill level of people, through training (see Exhibit 4) and
- Purchasing more equipment, equipment with higher capacity, or allowing a recipe to be made using a different set of equipment (see Exhibit 8).

Develop a repository of recipes. As you continue to use the tool, your recipe list will grow. By using the recipes you’ve previously defined to create the daily plan, you will greatly reduce the time required to use the tool.

Manage pre-heating resources manually. Currently the tool does not allow you to specify, for example, that an oven must be turned on, a smoker lighted, or a flattop heated, prior to use. As such, you would need to examine the resource schedule and manually include these activities.

Final Observations

From the example of the BBQ-theme dinner party that we have presented, it should be obvious that scheduling food preparation can entail a high degree of complexity—a realization that is no surprise to those in the food-service business. My hope is that the Food Preparation Scheduling Tool has provided some insight into this complexity and that it is a means of helping you manage effectively food preparation by supplementing intuition with analysis. ■

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