Predicting Staff Requirements for Simulation Programs

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INTRODUCTION

As simulation programs continue to grow, there needs to be a quantifiable metric to predict support needs for simulation classes. Accurate prediction of support will allow for adequate staff scheduling to help ensure success of the class, and consequently the success of the simulation program. We propose a model to help quantify those supports needs for each class and applied that model to a randomly selected month at WISER.

HYPOTHESIS

We developed a model for simulation class support workload that can accurately predict the support needs of a busy simulation center.

METHODS

We define a course as a standardized set of curriculum, scenarios, and procedures to train or educate students. A class is a specific instance of a course. For individual classes, Simulation Class Support Workload (SCSW) can be defined in 5 phases: Setup, Wind up, Maintain, Wind down, and Tear down. Setup is defined as the time and effort involved in preparing the facility for use for the class. This happens before the class starts. Wind up is defined as the time and effort involved in the initial starting period of the class where students and instructors arrive and the class begins. Maintenance is defined as the time and effort involved during the middle portion of the class. Wind down is defined as when the class is coming to an end and students and instructors are leaving the facility. Tear down is defined as the time and effort for personnel to reset the facility to normal or prepare it for the next class. Each phase of the SCSW can be defined by two variables: Time and Effort. Effort was defined as a portion of full time equivalent (FTE) staff member. A visual representation is presented in Figure 1.

We randomly selected a month (October, 2010) of classes at WISER and applied SCSW for every class during that month. We assigned Time and Effort values to each of the 5 phases of SCSW for each course and summed the values over time, with classes with overlapping times summing the effort values.

It is important to realize that this model only takes into account the efforts surrounding the support of classes that are actively running. It does not take into account many of the activities that are required to support a simulation center, such as maintenance of simulators and equipment, simulator programming, and course development.

Figure 1

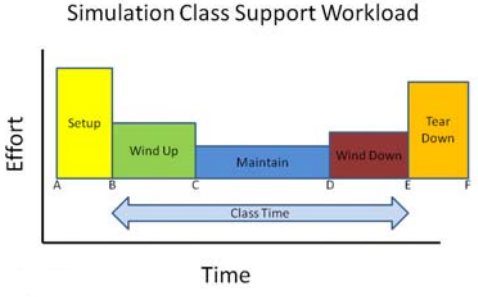


Figure 2: Example Dataset – Highlighted columns are the change in effort at points A – F in Figure 1

Course	Start Time	End Time	Class Time	Setup	Setup Start	A	Windup	Windup Start	B	Maint. FTE	Maint. Start	C	Maint. FTE	Windown start	D	WindDown FTE	Tear Down Start	E	Tear Down End	F
3RD YR CCM	10-1 8:00	10-1 11:00	3:00	10-1 7:30	0.5		10-1 8:00	0.5		1	10-1 8:15	0	1	10-1 10:45	0	1	10-1 11:00	-0.5	10-1 11:30	-0.5
MSIC Training	10-1 9:00	10-1 17:00	8:00	10-1 9:00	0		10-1 9:00	0		0	10-1 9:15	0	1	10-1 17:00	0	0	10-1 17:00	0	10-1 17:00	0
Tour -Med Stu Applicants	10-1 9:15	10-1 9:45	0:30	10-1 9:00	1		10-1 9:15	-1		0	10-1 9:15	0	0	10-1 9:45	0	0	10-1 9:45	1	10-1 9:50	-1
ALT	10-1 8:00	10-1 12:00	4:00	10-1 7:30	2		10-1 8:00	-1		1	10-1 8:15	0	1	10-1 11:45	0	1	10-1 12:00	0	10-1 12:35	-1
4TH YR CCM	10-1 11:00	10-1 13:00	2:00	10-1 10:30	0.5		10-1 11:00	0.5		1	10-1 11:15	0	1	10-1 12:45	0	1	10-1 13:00	-0.5	10-1 13:10	-0.5
Meeting	10-1 11:30	10-1 12:30	1:00	10-1 11:00	0		10-1 11:30	0		0	10-1 11:50	0	0	10-1 12:15	0	0	10-1 12:30	0	10-1 12:55	0
Meeting	10-1 14:00	10-1 15:00	1:00	10-1 13:30	0		10-1 14:00	0		0	10-1 14:20	0	0	10-1 14:45	0	0	10-1 15:00	0	10-1 15:25	0
ALT	10-1 8:00	10-1 12:00	4:00	10-1 7:30	2		10-1 8:00	-1		1	10-1 8:15	0	1	10-1 11:45	0	1	10-1 12:00	0	10-1 12:35	-1
Nurs 207 HRI	10-1 8:00	10-1 15:00	7:00	10-1 7:45	2		10-1 8:00	-1		1	10-1 8:00	1	2	10-1 15:00	-1	1	10-1 15:00	1	10-1 15:15	-2
MSIC Training	10-1 8:00	10-1 17:00	9:00	10-1 8:00	0		10-1 8:00	0		0	10-1 8:00	0	0	10-1 17:00	0	0	10-1 17:00	0	10-1 17:00	0
4TH YR EM	10-1 9:00	10-1 11:00	2:00	10-1 8:45	1		10-1 9:00	-0.5	0.5	1	10-1 9:15	-0.5	1	10-1 11:00	0	1	10-1 11:00	0.5	10-1 11:05	-0.5
Tour -Med Stu Applicants	10-1 9:15	10-1 9:45	0:30	10-1 9:00	1		10-1 9:15	-1		0	10-1 9:15	0	0	10-1 9:45	0	0	10-1 9:45	1	10-1 9:50	-1
4TH YR CCM	10-1 11:00	10-1 13:00	2:00	10-1 10:30	0.5		10-1 11:00	0.5		1	10-1 11:15	0	1	10-1 12:45	0	1	10-1 13:00	-0.5	10-1 13:10	-0.5
RSCH Trauma Team Leader	10-1 13:00	10-1 17:00	4:00	10-1 12:15	2		10-1 13:00	-1		1	10-1 13:15	0	1	10-1 16:45	0	1	10-1 17:00	1	10-1 17:30	-2
OT Transfers	10-1 9:00	10-1 13:00	4:00	10-1 8:30	2		10-1 9:00	-1		1	10-1 9:15	-0.5	0.5	10-1 12:45	0.5	1	10-1 13:00	-0.5	10-1 13:30	-1
Tour -Med Stu Applicants	10-1 9:15	10-1 9:45	0:30	10-1 9:00	1		10-1 9:15	-1		0	10-1 9:15	0	0	10-1 9:45	0	0	10-1 9:45	1	10-1 9:50	-1
Meeting	10-1 10:00	10-1 11:00	1:00	10-1 9:30	0		10-1 10:00	0		0	10-1 10:20	0	0	10-1 10:45	0	0	10-1 11:00	0	10-1 11:35	0
Meeting	10-1 11:00	10-1 12:00	1:00	10-1 10:30	0		10-1 11:00	0		0	10-1 11:20	0	0	10-1 11:45	0	0	10-1 12:00	0	10-1 12:35	0
4TH YR CCM	10-1 11:00	10-1 13:00	2:00	10-1 10:30	0.5		10-1 11:00	0.5		1	10-1 11:15	0	1	10-1 12:45	0	1	10-1 13:00	-0.5	10-1 13:10	-0.5
Tour - WISER	10-1 12:00	10-1 16:00	4:00	10-1 11:45	1		10-1 12:00	-1		0	10-1 12:00	0	0	10-1 16:00	0	0	10-1 16:00	1	10-1 16:05	-1
JAI	10-1 14:00	10-1 17:00	3:00	10-1 13:45	1		10-1 14:00	-1		0	10-1 14:15	-1	0	10-1 17:00	1	0	10-1 17:00	1	10-1 17:05	-1
Tour - WISER	10-1 14:00	10-1 15:30	1:30	10-1 13:45	1		10-1 14:00	-1		0	10-1 14:00	0	0	10-1 15:30	0	0	10-1 15:30	1	10-1 15:35	-1
Tour - WISER	10-1 16:00	10-1 18:00	2:00	10-1 15:45	1		10-1 16:00	-1		0	10-1 16:00	0	0	10-1 18:00	0	0	10-1 18:00	1	10-1 18:05	-1
FND SIM 1 CREATE	10-1 8:00	10-1 16:00	8:00	10-1 7:45	1		10-1 8:00	0		1	10-1 8:15	0	1	10-1 15:45	0	1	10-1 16:00	0	10-1 16:10	-1
ANES ELECT OB	10-1 9:00	10-1 11:00	2:00	10-1 8:45	1		10-1 9:00	-1		0	10-1 9:15	0	0	10-1 9:45	0	0	10-1 9:45	1	10-1 9:50	-1
Tour -Med Stu Applicants	10-1 9:15	10-1 9:45	0:30	10-1 9:00	1		10-1 9:15	-1		0	10-1 9:15	0	0	10-1 9:45	0	0	10-1 9:45	1	10-1 9:50	-1
Meeting	10-1 11:00	10-1 12:00	1:00	10-1 10:30	0		10-1 11:00	0		0	10-1 11:20	0	0	10-1 11:45	0	0	10-1 12:00	0	10-1 12:35	0
ANES ELECT NEUR	10-1 10:00	10-1 11:30	1:30	10-1 9:45	1		10-1 10:00	-1		1	10-1 10:15	0	1	10-1 11:15	0	1	10-1 11:30	0	10-1 11:45	-1
Meeting	10-1 11:00	10-1 12:00	1:00	10-1 10:30	0		10-1 11:00	0		0	10-1 11:20	0	0	10-1 11:45	0	0	10-1 12:00	0	10-1 12:35	0
4TH YR CCM	10-1 11:00	10-1 13:00	2:00	10-1 10:30	0.5		10-1 11:00	0.5		1	10-1 11:15	-1	1	10-1 12:45	0	1	10-1 13:00	-0.5	10-1 13:10	-0.5
BLS HC	10-1 11:00	10-1 12:00	1:00	10-1 10:50	0.5		10-1 11:00	0.5		1	10-1 11:15	-1	0	10-1 11:55	1	1	10-1 12:00	-1	10-1 12:00	0
Meeting	10-1 12:30	10-1 14:30	2:00	10-1 12:00	0		10-1 12:30	0		0	10-1 12:50	0	0	10-1 14:15	0	0	10-1 14:30	0	10-1 14:55	0
OT Transfers	10-1 12:30	10-1 16:30	4:00	10-1 12:00	2		10-1 12:30	-1		1	10-1 12:45	-0.5	0.5	10-1 16:15	0.5	1	10-1 16:30	0	10-1 17:00	-1
Meeting	10-1 14:00	10-1 15:00	1:00	10-1 13:30	0		10-1 14:00	0		0	10-1 14:20	0	0	10-1 14:45	0	0	10-1 15:00	0	10-1 15:25	0
Meeting	10-1 14:00	10-1 15:00	1:00	10-1 13:30	0		10-1 14:00	0		0	10-1 14:20	0	0	10-1 14:45	0	0	10-1 15:00	0	10-1 15:25	0
RAUL	10-1 14:00	10-1 17:00	3:00	10-1 13:45	1		10-1 14:00	0		1	10-1 14:15	-1	0	10-1 16:45	1	1	10-1 17:00	0	10-1 17:15	-1
Special Events	10-7 8:00	10-7 12:30	4:30	10-7 8:00	1		10-7 8:00	0		1	10-7 8:00	0	1	10-7 12:30	0	1	10-7 12:30	0	10-7 12:30	-1
4TH YR EM	10-7 9:00	10-7 11:00	2:00	10-7 8:45	1		10-7 9:00	-0.5	0.5	1	10-7 9:15	-0.5	0	10-7 11:00	0	1	10-7 11:00	0.5	10-7 11:05	-0.5
Meeting	10-7 10:00	10-7 11:00	1:00	10-7 9:30	0		10-7 10:00	0		0	10-7 10:20	0	0	10-7 10:45	0	0	10-7 11:00	0	10-7 11:35	0
4TH YR CCM	10-7 11:00	10-7 13:00	2:00	10-7 10:50	0.5		10-7 11:00	0.5		1	10-7 11:15	0	1	10-7 12:45	0	1	10-7 13:00	-0.5	10-7 13:10	-0.5
BIP HP	10-7 12:00	10-7 15:00	3:00	10-7 11:00	1		10-7 12:00	0		1	10-7 12:15	0	1	10-7 14:45	0	1	10-7 15:00	0	10-7 15:15	-1
SCS	10-7 12:00	10-7 14:00	2:00	10-7 11:30	1		10-7 12:00	0		1	10-7 12:15	0	1	10-7 13:45	0	1	10-7 14:00	0	10-7 14:30	-1
Meeting	10-7 12:30	10-7 13:30	1:00	10-7 12:00	0		10-7 12:30	0		0	10-7 12:50	0	0	10-7 13:15	0	0	10-7 13:30	0	10-7 13:55	0
MSIC Training	10-7 13:00	10-7 14:30	1:30	10-7 12:30	0		10-7 13:00	0		0	10-7 13:20	0	0	10-7 14:00	0	0	10-7 14:00	0	10-7 14:30	0
OSCE EURGS/ERK	10-7 15:00	10-7 18:00	3:00	10-7 14:45	2		10-7 15:00	-1.5	0.5	1.5	10-7 15:15	-0.5	0	10-7 18:00	0	0	10-7 18:00	2	10-7 18:00	-2
Tour - WISER	10-7 16:00	10-7 17:00	1:00	10-7 15:45	2		10-7 16:00	-1		0	10-7 16:00	0	0	10-7 17:00	0	0	10-7 17:00	1	10-7 17:05	-1
OSCE EURGS/ERK	10-8 7:00	10-8 12:00	5:00	10-8 6:00	3		10-8 7:00	-1.5	0.5	2	10-8 7:15	-0.5	0	10-8 12:00	0	0	10-8 12:00	3	10-8 12:00	-3
3RD YR CCM	10-8 8:00	10-8 11:00	3:00	10-8 7:30	0.5		10-8 8:00	0.5		1	10-8 8:15	0	1	10-8 10:45	0	1	10-8 11:00	-0.5	10-8 11:30	-0.5
Tour -Med Stu Applicants	10-8 9:15	10-8 9:45	0:30	10-8 9:00	1		10-8 9:15	-1		0	10-8 9:15	0	0	10-8 9:45	0	0	10-8 9:45	1	10-8 9:50	-1

Figure 3

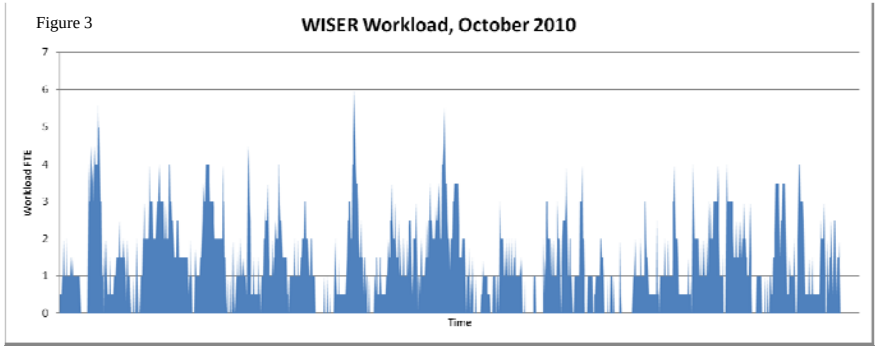


Figure 4: High workload day

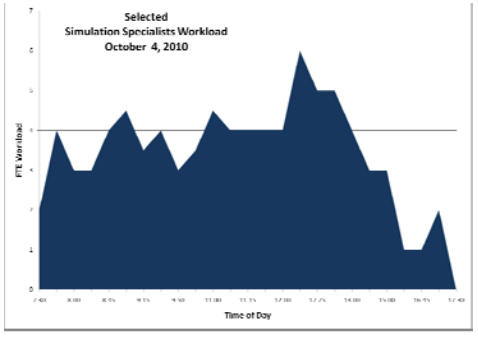
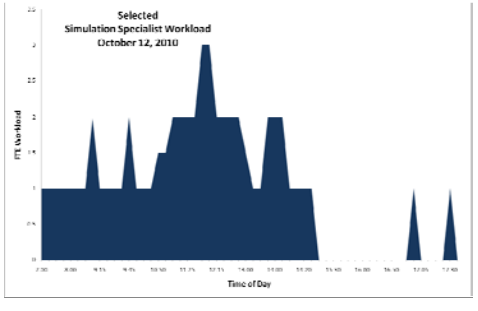


Figure 5: Low workload day: PTO day for 1 simulation specialists



RESULTS

The average daily peak workload was 3.71 (SD ± 1.20). The average daily workload was 1.43 (SD ± 0.63). This accurately reflected the workload experienced by the four simulation specialists at WISER. During the 21 work days of October, 2010, there were a total of 10 personal time off (PTO) days taken by the four simulation specialists at WISER.

Conclusions

We feel we can use this model to assist us in scheduling classes at WISER. We plan on incorporating this into our Simulation Information Management System (SIMS) that we use to manage the center.

While we think the model is good, we are aware of some limitations and areas for improvement.

Simple percentage of FTE is a crude metric for effort. Some courses require short but intense work on a particular class, precluding any other involvement in other classes. Examples of this include participating as a confederate in scenarios, running the computer for a complex scenario, or assisting an instructor "one on one". Some courses are low intensity but require longer periods of time and allow for interruptions and flexible amounts of attention. Examples of this would be being "on call" to assist with technical problems with a class running many simulators or resetting a room to its basic state. We need to develop a metric that can factor in intensity of work, likelihood of engagement, and length of potential engagement.

While we take into account travel time to remote facilities in the Warms Up and Tear Down phase of the SWSC, there are also many other tasks that are not captured. These tasks include: simulator and equipment maintenance and repair, programming scenarios, course development, and meetings attended by the specialists. Other non task related factors that need to be considered are specialist's PTO time as well as limiting the specialists to 40 hour work weeks.

We feel we have an good start at measuring and predicting workload for simulation programs and are looking to improving both quality of support we give at WISER to our instructors and students as well as improving our SCSW's ability to measure and predict workload of our simulation specialists.

This presentation will be available in PDF form via the WISER web site after the 2011 IMSH meeting at:

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