AD ASTRA
INFORMATION SYSTEMS

TIER PROJECT FINDINGS: UNIVERSITY OF IOWA

SEPTEMBER 2015

AN ANALYSIS USING AD ASTRA'S HIGHER EDUCATION SCHEDULING INDEX SOFTWARE

CONTENTS

METHODOLOGY

Ad Astra gathered facilities, section schedule, student, and faculty data from the University of Iowa, Iowa State University, and the University of Northern Iowa. These data were then discussed and refined with campus subject matter experts. Spring 2014 and Fall 2014 schedules were then analyzed using Ad Astra's patented analytics software in a framework called the Higher Education Scheduling Index (HESI). The HESI™ metrics, which have been used on more than 114 campuses (roughly half of which are four-year public institutions), form the basis of our findings and a context against which Ad Astra interprets data. The metrics objectively describe the effectiveness of the course and room scheduling processes at each university and contextualize each finding relative to the industry using a percentile ranking (higher is always better).

INTRODUCTION

ASSIGNMENT

Ad Astra Information Systems™ was directed by the Board of Regents of the State of Iowa to pursue these two business cases as part of the TIER Project:

SSU-03 — IMPROVE UTILIZATION OF CLASSROOM SPACE THROUGH SCHEDULING POLICY

SSU-04 — OPTIMIZE FACULTY ALLOCATION THROUGH A DATA-INFORMED, STUDENT-CENTERED COURSE SCHEDULE

Analysis, findings, recommendations and implementation strategies for SSU-03 have been expanded to include both classrooms and teaching laboratories.

LIMITATIONS TO THE FINDINGS

While the metrics provide insights into the allocation of critical resources, there are important limitations to consider. These data were derived from student information systems that are principally designed to process transactions, and therefore, were not optimized to support analysis. As a result, some data points (such as maximum enrollment per section) are commonly edited to support the registration or room scheduling processes. While Ad Astra and its campus contacts worked diligently to address data integrity for the purpose of this analysis, the scale of data prohibits Ad Astra from being able to claim that every section and room have been completely vetted and updated.

At the request of all three universities, "Like" institutions in this study are limited four-year public institutions in our database with the same Carnegie classification as the university being analyzed. This reduces the comparison group from 62 four-year public institutions to 11 Research Universities (very high research activity) and 21 Master's College and Universities (larger programs), respectively.

References to course offering change "candidates" must all be reviewed by campus experts before schedule changes are made. While the quantity and ratio of these candidates to the overall number of offerings is generally indicative of schedule alignment to student needs, it should be assumed that some candidates should not be acted upon, and that other appropriate changes to the schedule might not be listed as candidates.

Additionally, the analysis results suggest no need for additional, traditional classroom space, but do not speak to the quality of existing space, the need to renovate or replace existing space, or the space's relevance to evolving pedagogy. Some space may need to be renovated and/or reconfigured (which would involve additional cost), but Ad Astra does not see a need to construct net new space (and take on the financial burden of its maintenance), unless older buildings with significant deferred maintenance are subsequently taken offline. Assumptions are made in the model to infer capacity of academic space, such as the ability to support 80% utilization during primetime, that do not perfectly apply to all institutions. While the Iowa BOR uses a 50-hour week for space utilization reporting, differences in the duration of the scheduling weeks of the three universities (and the institutions in the HESI database) make utilization comparisons inherently difficult.

WHAT IS THE HESI?

In their work with more than 800 colleges and universities, Ad Astra has gathered critical space, faculty, and resource data to compile the Higher Education Scheduling Index, or HESI. The data highlight key performance metrics and national averages to provide insight to institutions concerning their resource allocation and opportunities for improvement. The HESI metrics also provide a context for comparing institutional performance to a sub-set of like (comparable) institutions.

The HESI metrics are updated quarterly as new institutions are measured and added to the database. The Spring 2015 database utilized for this report includes findings from 114 public and private institutions.

HESI TERMINOLOGY AND METRICS

GENERAL TERMS

Mean Performance — Average values for each metric among all institutions compared

Like Mean Performance — Average values for each metric among all 'like' institutions (e.g., four year public)

Percentile of All Institutions — Percentile ranking of this institution in comparison with peers

COURSE OFFERING METRICS

Average Enrollment — Average value of the enrollment (census) per section for the term

Average Capacity — Average value of the maximum enrollment per section for the term

Enrollment Ratio — Overall average fill rate for course offerings calculated as census enrollment divided by enrollment caps

Balanced Course Ratio — The percentage of unique courses offered that are balanced with student need defined as having an Enrollment Ratio between 70% and 95%

Overloaded Course Ratio — The percentage of unique courses offered that are difficult for students to get because they are over-filled - defined as having an Enrollment Ratio greater than 95%

Underutilized Course Ratio — The percentage of unique courses offered that are an inefficient use of faculty resources because they are under-filled - defined as having an Enrollment Ratio less than 70%

Undefined Course Ratio — The percentage of unique courses offered for which an Enrollment Ratio cannot be calculated because, although the course is being offered, the number of seats offered is zero

Addition Candidates — The percentage of total sections in a schedule that could potentially be added to the schedule based on sufficient pent up demand to justify one or more additional sections

Addition Candidates Offered — The percentage of total Addition Candidate sections in a schedule, limited to those courses offered in the Analysis

Reduction Candidates — The percentage of total sections in a schedule that could potentially be removed from the schedule based on insufficient demand to justify these sections

Elimination Candidates — The percentage of total sections in a schedule associated with courses that could potentially be removed from the schedule based on insufficient demand to justify these courses. Criteria: total enrollment less than 10 and less than 50% enrollment ratio

CLASSROOM CAPACITY METRICS

Classroom Utilization Standard Week - The percentage of hours in a standard scheduling week (as defined by each institution's usage patterns) that a typical classroom is in use

Classroom Utilization Prime Week — The percentage of hours in the primetime subset of a scheduling week (as defined by each institution's usage patterns) that a typical classroom is in use

Prime Ratio — Percentage of hours scheduled during primetime hours (Prime hours / Total hours)

Seat Fill Utilization (Enrollment) — The percentage of seats in use (based on enrollment) in a classroom when it is scheduled (Enrollment divided by room capacity)

Seat Fill Utilization (Enrollment Cap) — The percentage of seats in use (based on section enrollment caps) in a classroom when it is scheduled (Enrollment cap divided by room capacity)

Off-Grid Utilization — The percentage of scheduling using non-standard meeting patterns (i.e. not on-grid meeting patterns) during primetime hours

Off-Grid Waste — The percentage of capacity wasted by scheduling using non-standard meeting patterns (i.e. not on-grid meeting patterns) during primetime hours

THE SCHEDULE IS **COMPLEX**
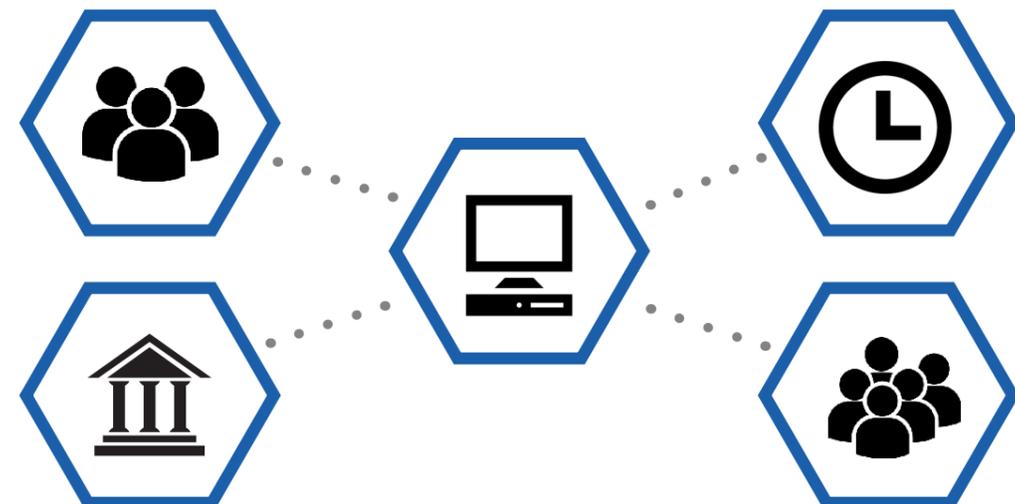
HIGH-LEVEL FINDINGS

High-level findings, below, represent a distillation of the more detailed analysis in this document and the associated reports. These findings represent the most significant opportunities and/or observations for the university.

	Finding	Rationale	Impact	Implementation
Finding 1 (SSU-03)	No additional, traditional classroom space is currently needed	Below average (58%) primetime classroom utilization, well below 80% bottleneck level	Each additional classroom costs roughly $250,000 (initially) and $6,000 (annually) to maintain[1]	Policy to limit off-grid scheduling and room ownership could increase effective capacity
Finding 2 (SSU-03)	Departmental ownership of classrooms and labs limits the university's ability to efficiently meet students' needs	134 of the 272 general purpose classrooms on the main campus are departmentally controlled and poorly utilized	Significant improvements in efficiency, capacity to support enrollment growth and change, and the ability to centrally manage space	Policy to centrally assign general purpose classrooms and centrally update room inventories
Finding 3 (SSU-04)	The University of Iowa does a good job of meeting students' course needs, but some opportunities exist	Two key HESI metrics place the University of Iowa in the 89th and 75th percentile, respectively, in course access. High off-grid scheduling creates registration conflicts.	Increase in velocity to degree completion and resulting increases in retention/completions	Form a team to regularly perform university-wide course demand analysis and monitor off-grid scheduling
Finding 4 (SSU-04)	Significant opportunities exist to improve the efficiency of faculty allocation	15% of offerings in historical schedules are statistically not needed by students	Significant reduction in offerings and related instructional cost	Create a policy to limit the percentage of unneeded offerings in a schedule for each academic unit
Finding 5 (General)	A targeted data warehouse could greatly benefit the University and the Board of Regents	Manual process of data collection is labor-intensive and prone to error	Accurate, homogenized tracking of performance and longitudinal progress with little effort	Creation of a targeted data warehouse with common data formatting for all three institutions

[1] - *Society of Colleges and University Planners*

FINDINGS DETAILED

Finding 1: We see the ability to support significant enrollment growth with existing classroom space. Key policies to maximize enrollment capacity should focus on off-grid scheduling and room ownership.

Finding 2: University of Iowa's generally assigned classrooms are utilized to a level of almost 3 times that of the 134 departmentally owned classrooms. Those "owned" rooms make up 39% of the classroom inventory and significantly limit effective enrollment capacity and the ability to meet students' course needs. Additionally, detailed information (equipment, technology, etc.) about lab space is not centrally maintained, limiting the ability to effectively manage that space at a university level.

Finding 3: A low number (20%) of University of Iowa's courses are overloaded (>95% full at census date). There are also a low number of additional sections needed, but not offered (20% of existing section count) to meet student need (well below the like institution average of 29%, placing the University of Iowa in the 89th percentile).

Finding 4: Course offering efficiency is slightly below average, compared to other four-year public institutions. University of Iowa does not centrally and comprehensively analyze offerings each term from each academic unit. The University could greatly benefit from adding this process, especially if coupled with data-driven policy to ensure efficiency and effectiveness from each unit.

Finding 5: While all three universities employ different student information systems, common practices can and should be adopted for storing schedule and facilities data to facilitate consistent analysis at the state level.

HIGHLIGHTS FROM THE HIGHER EDUCATION SCHEDULING INDEX REPORT

Below is a breakdown of the University of Iowa's Fall 2014 benchmarks against the 17 HESI indices. The University is compared to like institutions (four year public in the same Carnegie classification). Finally, the University is given a percentile ranking placing performance relative to all institutions in the HESI for each metric.

COURSE ACCESS

	University of Iowa Findings	Potential Goal	HESI Like Mean	Percentile
Off-Grid Waste	28%	10 - 15%	18%	10%
Overloaded Course Ratio	20%	10 - 15%	29%	89%
Addition Candidates Offered	2%	1%	5%	75%
Average				**58%**

RESOURCE EFFICIENCY

Resource Efficiency	University of Iowa Findings	Potential Goal	HESI Like Mean	Percentile
Enrollment Ratio	77%	80 -85%	79%	40%
Classroom Utilization	40%	50 - 55%	51%	10%
Seat Fill (Enroll)	56%	65 - 70%	64%	10%
Average				**20%**

OTHER

	University of Iowa Findings	Potential Goal	HESI Like Mean	Percentile
Average Enrollment	25	27 - 28	29	20%
Average Enrollment Cap	33	N/A	37	30%
Balanced Course Ratio	37%	50 - 55%	33%	67%
Under-utilized Course Ratio	42%	30 -35%	38%	22%
Reduction Candidates	13%	5 - 8%	12%	22%
Elimination Candidates	2%	2%	5%	78%
Primetime Classroom Utilization	58%	N/A	70%	40%
Prime Ratio	59%	50 - 55%	62%	60%
Off-Grid Utilization	61%	30 - 40%	50%	20%
Standard Week Hours	70	N/A	60	80%
Primetime Hours	28	N/A	27	60%
Average				**42%**

OVERVIEW

- The University of Iowa has a dedicated team that manages classroom scheduling. This team manages classroom assignments through a commercial software package that includes an optimization algorithm that they leverage effectively.

- University of Iowa has also begun to analyze course demand and more closely scrutinize off-grid scheduling. There is also an interest in limiting or doing away with classroom ownership. Strong interest exists to leverage course schedules to help students accelerate time to degree completion.

We did not uncover "hard" policy restrictions that enforced best practices. Policy is the most reliable approach to continued improvement, given the inherently decentralized nature of academic scheduling. Additionally, we recommend that goals be set by the Provost's office for improvement in some of the metrics listed below to define and objectively track progress – longitudinally, across like terms.

CREATE A SCHEDULE REFINEMENT TEAM

As mentioned above, University of Iowa should form a Schedule Refinement Team consisting of representatives from the Provost's Office, the Registrar's Office and Academic Units. This team should, ideally, have 6-8 members and review course demand with the goal of suggesting refinements to the rolled-forward course schedules.

OPPORTUNITIES IN THIS AREA INCLUDE THE FOLLOWING:

Merging this team with the room scheduling team to increase the coordination of their processes, goals, and policies. Course scheduling and room scheduling are inherently interdependent activities which are rarely coordinated sufficiently to leverage interdependencies.

THIS ACTION WOULD ENABLE THE UNIVERSITY TO:

1) Meet enrollment needs with finite faculty and space. Unneeded offerings and late cancellations superficially limit capacity of academic space. Additionally, a false belief of being "out of space" keeps many institutions from adding offerings that they know students need.

2) Set team goals and policies. Following a change management system that includes celebration of a student-focused scheduling approach and related wins (internally and externally).

3) Integrate historical course demand analysis with student pathways and/or student-specific progress through degree rules. This forward-looking assessment of students' course needs is an effective way to enhance the existing historical schedule analysis to better predict changes based on enrollment shifts, degree rule/pre-requisite changes and student preferences. Additionally, degree audit integration now allows pathways to be implemented to focus students and improve time to completion.

CREATE A TARGETED DATA WAREHOUSE

Data for this analysis was gathered from the Maui Student Information System and the room scheduling team's room inventory database. This manual process required University of Iowa to create spreadsheets that Ad Astra imported into its system. Subsequent analysis of the three universities, regardless of how it's performed, will require similar manual intervention unless a targeted data warehouse is created.

THIS ACTION WOULD ENABLE THE UNIVERSITY TO:

1) Have one location that contains the most up-to-date information. This location could host detailed data on rooms, sections, faculty and students would greatly improve the feasibility for ongoing analysis.

2) Set standard, repeatable methods for managing inherent data complexities. This would improve consistency and accuracy of findings. Complexities include cross-listing, teaching modality, section cap inconsistencies, room types and features, and independent study courses or other courses needing to be filtered from this type of analysis.

3) Gain a deeper understanding of all academic space and its utilization. Limited information is stored centrally on the university's many departmentally owned rooms.

4) Centralize ongoing analysis. Findings generated for each institution can be shared with the Board of Regents in a generic format and compared with like-institutions' performance.

CREATE OBJECTIVE POLICIES

Create objective policies to ensure effective scheduling from the many academic units involved in this decentralized process.

POLICIES SHOULD HAVE THESE ATTRIBUTES:

1) A Grassroots orientation. Policy should originate from consensus on opportunities to pursue within the university. Policies originating from the university (v. the Board of Regents) are more likely to have their intended result of mobilizing stakeholders to improve outcomes.

2) Focus. A policy should focus on equity that minimizes the common phenomena of effective, efficient academic units subsidizing other academic units.

3) Objectivity gained from the analysis of prioritized findings. Policy implementations often fail because they are either too hard to measure/enforce or they are based on a generic but not necessarily applicable set of best practices. For example: if the goal is to improve capacity and course access by staying on a primetime meeting pattern grid, policy could be focused directly on adherence to the grid and minimizing capacity waste from off-grid scheduling.

4) Prioritization from alignment to the most important goals. Policy should not be implemented where it is not needed or where there is not an institutional priority.

Statistically, these findings show slightly below average efficiency and well above average course access for students. Highlights include the following:

☑ FINDING #1: There are low levels of "Addition Candidates" (additional sections statistically needed to be added to meet student demand)

Sections needed but not offered amount to 2% of existing schedules, as compared to the like institution average of 5% (75th percentile).

OPPORTUNITY: Reallocation of faculty using targeted cuts and additions in the schedule to meet student course demand, especially for required courses

☑ FINDING #2: A relatively low percentage of the courses offered are Overloaded (>95% full at census date)

20% of the courses are Overloaded, compared to the like institution average of 29% (placing University of Iowa in the 89th percentile).

OPPORTUNITY: Reallocate faculty, and focus adjunct assignments to address the relatively low number of courses with pent-up demand

☑ FINDING #3: Allocation of faculty could be more efficient

The overall Enrollment Ratio of 77% (census enrollment to enrollment caps) is slightly lower than the like institution average of 79% (40th percentile).

Average enrollments of 25 and enrollment caps of 35 are below the like institution averages of 29 and 37, respectively.

Sections that are statistically not needed are moderate, compared to industry averages

- Sections not needed from courses with multiple offerings in a term make up 13% of the total schedule, compared to 12%, on average, for like institutions (22nd percentile).
- Sections potentially not needed from courses with a single offering in a term make up 2% of the total schedule, compared to 5%, on average, for like institutions (78th percentile).

OPPORTUNITY: Develop a policy that sets a maximum percentage of sections offered that are Reduction and Elimination Candidates for each academic unit (e.g. no academic unit can have more than 10% of the sections it controls classified as Reduction Candidates)

☑ **FINDING #4:** Off-Grid scheduling and related waste is well above average, negatively impacting students' ability to get conflict-free schedules

During primetime, 61% of the hours scheduled fall outside of the "dominant meeting pattern grid" on MWF and TR.

Some degree of off-grid scheduling is unavoidable, but 61% is worse than the like institution average of 50%. This places the University of Iowa in the 20th percentile.

Off-Grid Waste of 28% is worse than the like institution average of 18%. Improvement to average levels, or even goal levels of 10% is attainable with policy.

OPPORTUNITY: Target policy limits of 30% off-grid scheduling and 10% off-grid waste

Statistically, these findings show below average efficiency. Highlights include the following:

☑ **FINDING #1:** Classroom utilization is below average

Classrooms are, on average, in use 40% of the hours in University of Iowa's standard scheduling week. This is below the like institution average of 51% (this places the University of Iowa in the 10th percentile).

University of Iowa's scheduling week of 70 hours is longer than the like institution average of 60 hours, placing the school in the 80th percentile.

A moderate percentage of activities are scheduled in primetime (59% of total hours). The like institution average is 62% and University of Iowa is in the 60th percentile.

When assigned, classrooms are not filled very effectively. On average, 56% of the seats in a room are occupied (based on census enrollment) compared to the like institution average of 64%. This places University of Iowa in the 10th percentile.

Primetime bottlenecking is not evident, given relatively low levels of primetime utilization, 58% compared to the like institution average of 70% (40th percentile).

OPPORTUNITY: Consider slight increases in enrollment caps for some courses and refine course offering schedules to improve room fill rates

SPACE UTILIZATION FINDINGS (CONTINUED)

☑ **FINDING #2:** As referenced above, Off-Grid scheduling and related waste are well above average, negatively impacting students' ability to get conflict-free schedules

During primetime, 61% of the hours scheduled fall outside of the "dominant meeting pattern grid" on MWF and TR

Some degree of off-grid scheduling is unavoidable, but 61% is worse than like institution average of 50%. This places the University of Iowa in the 20th percentile.

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OPPORTUNITY: Target policy limits of 30% off-grid scheduling and 10% off-grid waste

MORE ABOUT AD ASTRA INFORMATION SYSTEMS

Since 1996, Ad Astra has partnered with more than 800 colleges and universities to transform campuses by optimizing resources and creating student-friendly schedules. As a result, institutions have successively maximized capacity, improved efficiency and advanced student success.

Through integration with a variety of student information and degree audit systems, Ad Astra products and services focus on a data-informed approach to manage academic and event activities as well as reveal important insights into an institution's operational metrics. Additionally, Ad Astra's expertise extends to interpreting and advising clients on how to utilize and implement the findings within an institution's data and understand comparisons to like institutions.

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