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Introduction

This document summarizes the results of the IT @ MIT Working Group, a part of MIT’s Institute-wide Planning Task Force. Our results are based on interviews with various groups at MIT that use IT, advice from IT experts at MIT, information provided by IS&T, and the personal knowledge of members on this working group. Even though the time available to us did not allow us to develop definitive recommendations or refined financial analyses, we have identified preliminary ideas and made very rough estimates of the potential savings from these ideas. Based on very rough approximations and educated guesses, we estimate total potential savings in the range of approximately $21M for all the ideas evaluated here.

In the sections that follow, we first present several overall themes that emerged from our work, followed by the more detailed Single-Page Ideas (SPIs) we developed.

The mission of IT at MIT

We support the current move to clarify and simplify the mission of the Information Services & Technology (IS&T) group at MIT. At the same time, however, we believe MIT should not lose sight of the potential importance of IT to its overall mission.

Since MIT’s core functions of teaching and research are both, in essence, information-based activities, we believe that the effective and innovative use of information technology can be of strategic importance to MIT. For example, we believe that, in addition to the innovations in research and educational technologies developed in departments, laboratories and centers, certain innovative uses of IT in core, Institute-wide services could significantly increase MIT’s ability to attract and retain excellent faculty and students, to provide excellent education, and to do excellent research. Conversely, if MIT’s core uses of IT are out-of-date or ineffective, this could interfere with its ability to carry out its mission at the level of excellence the world expects of MIT.

We believe this has two primary implications for IT at MIT. First, MIT should simplify, standardize, streamline, and possibly outsource some of the key IT services it uses today. Most of our recommendations below suggest ways to do this.

One important goal of this simplification should be to reduce the fraction of MIT’s total IT budget spent on operating and maintaining existing systems. For instance, IS&T currently devotes approximately 80% of its budget to operating and maintaining its current services, but a typical research university spends only 66% of its budget on current services. That means that other universities can devote substantially more of their IT resources to developing new services instead of just maintaining old ones (34% vs. 20%).
In this time of budget reductions, we understand that some of the savings on current services will reduce the overall IT budget. But the second key implication of the strategic importance of IT to MIT is that it is very important to use some of the resources freed up from existing IT services to increase the rate at which MIT provides innovative new services. A few of the recommendations below suggest specific ways to do this, but we believe more attention to these possibilities is needed.

**Standardization**

Several of the ideas below suggest ways to standardize IT services such as purchasing and managing PC hardware and software. We believe such standardization has the potential to both reduce costs and increase the quality of these services. However, there are several additional things that we believe will be important for this standardization to work well in the MIT environment.

*MIT should support standards rather than require them*

While many corporations require all employees to follow IT standards (e.g., for specific PC models and software packages), we do not recommend that MIT do this. Instead, we recommend that IS&T support certain standards but not require them. Such support might include arranging quantity discounts, installing and maintaining equipment, providing help desk advice, and guaranteeing compatibility with other MIT standards (such as the network and identity management systems).

However, any MIT users, including Departments, Labs, and Centers (DLCs), should be allowed to use non-standard things, as long as they pay for all the incremental costs and risks of doing so. For example, if a given group wants to use non-standard laptops, they would be responsible for dealing with installation, maintenance, compatibility problems, and help-desk support for these laptops. Some groups might choose to do these things themselves, others might find outside vendors to provide these services, and still others might contract with IS&T to provide these services at an additional cost.

We realize that this may, in some cases, lead to MIT spending more on IT than it would if everyone were required to follow the same standards. However, we believe that groups or individuals with spending authority should be allowed to decide for themselves whether the additional costs are worth it, relative to all the other things on which they could spend their budgets. To do otherwise would, we believe, be incompatible with an important—and desirable—aspect of the MIT culture: that individuals with spending authority have wide discretion in deciding how best to achieve their parts of MIT’s mission.

*A governing board should determine which standards to support*

One risk of the approach we are proposing is that IS&T, in an attempt to keep many of its powerful constituencies happy, might be tempted to support too many standards and, thus, not end up actually realizing any significant savings by standardizing. To help
avoid this, we recommend that there be some kind of governing board that is, in some sense, “above” IS&T to make final decisions on what standards to support. We have some general recommendations below about restructuring the current IT governance structure, but the key point here is that this governing body should include people who are powerful or respected enough in the MIT environment to “take the heat” from disgruntled people whose desired technologies are not supported as standards.

*On-line communities should be created for users of non-standard services*

In addition to this governing board, we also strongly encourage the creation of communities of people who use (or might want to use) non-standard technologies or services. With technologies like wikis, it will be much easier than it would have been in the past for such communities to form and share all kinds of information about pricing, compatibility, and how to deal with problems. For example, companies that have used this approach (like Cisco did for Apple Macintosh users) often find that the members of these communities provide a very effective kind of decentralized help desk service for each other. Furthermore, the existence of these communities will help IS&T and the governing board more rapidly identify new technologies or services that should become supported standards.

*Different levels of standardization are appropriate for different activities*

We believe it would be a mistake to try to apply the same level of standardization across all of MIT’s different types of activities. One useful way of thinking about the different opportunities for standardization is in terms of MIT’s three core activities: administration, education, and research. As suggested in Figure 1, many administrative activities can probably be done in very standard ways throughout the Institute while research activities are often very different in different DLCs. Educational activities are probably somewhere in between: less standardizable than administration, but more than research.

![Figure 1](image-url)

**Figure 1.** Opportunities for standardization in different aspects of MIT’s activities. Note that this diagram is intended to be suggestive only, not a definitive recommendation. (Key: x = many opportunities for standardization, ? = some opportunities for standardization. Based on discussion with Peter Weill, MIT.)
MIT’s should actively explore possibilities for decustomizing enterprise applications

As described in more detail below, MIT has, over the years, developed highly customized versions of its core enterprise systems, including SAP (the administrative management system) and MITSIS (the student information system). While some amount of customization of such standard systems is often necessary and desirable, we believe that MIT has gone too far in this direction. Undoing some of this customization would have significant cost, and should not be undertaken without more detailed evaluation. But we expect that, in the long run, these costs would be more than repaid by having systems that are much easier to operate, maintain, and upgrade. However, we realize that this decustomization may require changes in business processes.

User-centered IT systems

Many of MIT’s administrative and educational systems have been developed piecemeal over the years with too little attention to the needs of most actual users. While this is, unfortunately, common in many organizations, we believe there is substantial opportunity for MIT to benefit significantly from rethinking and redesigning some of these applications.

Since many of the same systems are involved, a logical possibility is to combine this user-centered redesign with the de-customization of enterprise applications along with the process standardization we suggested above. Here, too, there would be significant costs in the short term, and this effort should not be undertaken lightly. But we expect that in the long run, the costs of redesigning key systems to more effectively meet the needs of DLC users will be more than repaid by very substantial reductions in the amount of time administrators, faculty, and others throughout MIT need to spend on their routine tasks.

More user-centered IT systems will facilitate standardization

To some degree, there is a contradiction between standardization and user-centered computing: Standardization often makes it harder to have systems that are adapted to the details of each user’s different needs. For this reason, it would be useful to tackle the tasks of standardizing IT systems and making them more user-centered at the same time. In this way, the tradeoffs between these two goals can be explicitly and consistently addressed.

In addition, in MIT’s case, there is also an interesting synergy between these two goals. Since MIT’s administrative systems are so non-user-centered now, many DLC’s have developed their own “shadow” systems to maintain the same data in ways that are more useful to the DLC’s. By making the main administrative systems more user-centered in the first place, the need for all these different shadow systems in DLC’s would be reduced, and MIT could, therefore, standardize more.
Outsourcing

In many cases, other organizations have been able to realize significant cost savings and quality improvements from outsourcing some of their IT functions to external vendors. It is impossible to determine whether this would be appropriate for MIT without detailed exploration in specific cases, including eventually soliciting bids from potential outsourcing vendors. Conducting these detailed explorations is beyond the scope of our working group, but in the suggestions below, we identify several promising possibilities for outsourcing which we believe deserve more detailed investigation. In addition to the possibilities specifically analyzed below, we recommend that MIT also explore other outsourcing possibilities such as for data centers.

Streamline operations for IT at MIT

In addition to the general themes already discussed, we also recommend below several other possibilities for simply eliminating or improving the efficiencies of current IT operations such as printing and help desk support.

Streamline the governance and organizational structures for IT at MIT

Today there are a plethora of committees, advisory boards, and other groups related to governing IT at MIT. In addition, there is overlap and ambiguity even within the DLCs specifically charged with supplying IT services to the community (such as IS&T, Libraries, and the office of the Dean for Undergraduate Education (DUE)). While we believe some degree of overlap and ambiguity in these matters is probably inevitable and even desirable in an academic institution like MIT, we believe MIT would benefit from some simplification and rationalization of this constellation of groups. More detailed suggestions along these lines are included below.

Innovation and strategic advantage

In the time available to our working group so far, we have concentrated primarily on changes needed to simplify and reduce costs for the current operational systems. We believe, however, that it is also important to think about innovative new uses of IT that might provide long-term strategic advantage to the Institute. Only a few of the specific ideas below are devoted to this topic, but we believe that more effort should be devoted to developing additional ideas for innovation, either as part of this Planning Task Force or in some other forum. For example, one promising area for further exploration is how to better involve MIT students in developing IT for MIT, either as student employees or as entrepreneurs.
Cultural change

There is one final issue that pervades all the suggestions we have just discussed: the cultural changes that will be required. Implementing these suggestions will be hard, not just because of the financial costs involved, but also because some strong—and we believe undesirable—aspects of MIT’s culture will make the changes especially difficult. While a deep analysis of these cultural issues is beyond the scope of our group, we include in Appendix A several examples of the kinds of cultural changes we believe may be necessary. To derive the most value from the changes we suggest, we believe that MIT’s most senior leadership will need to make a substantial commitment to changing some of these persistent—but undesirable—aspects of MIT’s culture.
Summary of Single Page Ideas (SPIs) by cost saving potential

<table>
<thead>
<tr>
<th>Idea</th>
<th>Estimated savings ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hard $</td>
</tr>
<tr>
<td>Support location-independent work (see Note 6)</td>
<td>$2.7</td>
</tr>
<tr>
<td>Reduce printing costs (see Note 7)</td>
<td>$4.3</td>
</tr>
<tr>
<td>Decustomize administrative enterprise systems</td>
<td>$2.6</td>
</tr>
<tr>
<td>Streamline help desk support and outsource as appropriate</td>
<td>$2.0</td>
</tr>
<tr>
<td>End support for selected IT products and services</td>
<td>$1.8</td>
</tr>
<tr>
<td>Centralize purchasing and management for computer hardware</td>
<td>$1.7</td>
</tr>
<tr>
<td>Remove pain points in using MIT enterprise systems</td>
<td>$1.5</td>
</tr>
<tr>
<td>Outsource voice and video communication</td>
<td>$1.3</td>
</tr>
<tr>
<td>Decustomize educational enterprise systems</td>
<td>$0.6</td>
</tr>
<tr>
<td>Replace landline phones with mobile phones</td>
<td>$0.5</td>
</tr>
</tbody>
</table>

Notes:

1. This table includes only the ideas for which costs could be estimated.
2. Some ideas require one-time investments, which are not included in the table.
3. All cost estimates should be considered very preliminary. In many cases, they are intended as only very rough approximations.
4. Hard $ savings = reductions in headcount or other direct expenses
5. Soft $ savings = time savings for existing employees or other less-easily estimated benefits. Realizing these benefits in financial terms would require additional actions, such as consolidating jobs or bringing in new revenues because of time saved or increased quality.
6. Estimates in this row are for each 10% of MIT employees who participate in the program. If, say, 50% of employees participate, the estimated savings would be 5 times those shown here.
7. The printing cost savings shown here are based on an extrapolation of numbers for Athena. We suspect this number may be too high, but we include it here to illustrate the potential magnitude of savings and encourage further analysis.
Single page ideas (SPIs)
Standardization
Centralize purchasing and management for computer hardware

Summary description

Desktop and laptop purchasing is a loosely managed process at MIT. The eCAT purchasing system directs purchasers towards preferred vendors and models. However, a few clicks beyond the preferred machines screen in eCAT and any model, configuration, and price is available for purchase. This may lead to instances of “overbuying” based on the needs of the average MIT staff or faculty member.

MIT could potentially realize significant savings on desktop and laptop hardware by standardizing on a small number of hardware options and then centralizing purchasing, installation, maintenance, support, and – eventually – disposal and replacement for these items. The existing desktop renewal program administered through the IS&T DITR team could be expanded beyond the 1,000 machines currently supported through the program to include all administrative and faculty (non-research) computers.

As a starting point, for instance, we would suggest standardizing on (a) a single vendor and set of standard options for Windows machines and (b) a set of standard options for Apple machines.

The desktop renewal program estimates their cost per machine as $850 per Dell desktop with monitor, and $1,300 per iMac desktop machine. Under the current renewal program, the “standard” machine is a desktop, with cost sharing between DITR and the DLC for any machine outside the standard. We make no recommendations with respect to setting a desktop vs. laptop standard and cost sharing between DITR and departments at this time. However, current pricing available for a standard equipped laptop suggests a cost per laptop of $1,100 (Dell) and $1,400 (Apple).

Quantify the idea

Quantifying this idea is difficult due to the complexity of the reporting systems around purchasing data.

Utilizing the data provided by the Procurement Task Force in their SPI “Standardize Institute personal computing purchases on Dell PC’s” we assume the following reflecting average cost data for computer purchases during FY08:
Further analysis done by the IT Task Force suggests that 52% of purchases are funded from GIB funds, 18% from Designated funds, 21% from Sponsored Research, and 9% from Other funds.

We’ve estimated the percent participation in the standardization program by funding source. For each funding source category the number of participating machines is multiplied by the lower cost/machine for standardized machines plus number non-participating machines at the current average cost per machine. This equals the new total spend for computer hardware.

Assuming that 80% of machines supported by GIB funds can be standardized we estimate hardware cost savings of $1.2M.

<table>
<thead>
<tr>
<th>GIB standard machines 52% of total * 80%</th>
<th>GIB non-standard 52% of total *20%</th>
<th>Old GIB $</th>
<th>New GIB $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell Laptops 395</td>
<td>$1,100</td>
<td>$0.4M</td>
<td>99</td>
</tr>
<tr>
<td>Apple Laptops 366</td>
<td>$1,400</td>
<td>$0.5M</td>
<td>92</td>
</tr>
<tr>
<td>Dell Desktops 936</td>
<td>$850</td>
<td>$0.8M</td>
<td>234</td>
</tr>
<tr>
<td>Apple Desktops 354</td>
<td>$1,300</td>
<td>$0.5M</td>
<td>88</td>
</tr>
<tr>
<td>Total</td>
<td><strong>$2.2M</strong></td>
<td><strong>$0.8M</strong></td>
<td>Total</td>
</tr>
</tbody>
</table>

Using conservative estimates for program participation, an additional $500k in hardware cost savings from non-GIB sources is possible:

<table>
<thead>
<tr>
<th>Designated standard 18% of total *50%</th>
<th>Designated non-standard 18% of total *50%</th>
<th>Old Des $</th>
<th>New Des $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell Laptops 86</td>
<td>$1,100</td>
<td>$0.1M</td>
<td>86</td>
</tr>
<tr>
<td>Apple Laptops 79</td>
<td>$1,400</td>
<td>$0.1M</td>
<td>79</td>
</tr>
<tr>
<td>Dell Desktops 203</td>
<td>$850</td>
<td>$0.2M</td>
<td>203</td>
</tr>
<tr>
<td>Apple Desktops 77</td>
<td>$1,300</td>
<td>$0.1M</td>
<td>77</td>
</tr>
<tr>
<td>Total</td>
<td><strong>$0.5M</strong></td>
<td><strong>$0.7M</strong></td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research standard 21% of total *30%</th>
<th>Research non-standard 21% of total *70%</th>
<th>Old Rsch $</th>
<th>New Rsch $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell Laptops 60</td>
<td>$1,100</td>
<td>$0.1M</td>
<td>140</td>
</tr>
<tr>
<td>Apple Laptops 55</td>
<td>$1,400</td>
<td>$0.1M</td>
<td>129</td>
</tr>
<tr>
<td>Dell Desktops 142</td>
<td>$850</td>
<td>$0.1M</td>
<td>331</td>
</tr>
<tr>
<td>Apple Desktops 54</td>
<td>$1,300</td>
<td>$0.1M</td>
<td>125</td>
</tr>
<tr>
<td>Total</td>
<td><strong>$0.3M</strong></td>
<td><strong>$1.2M</strong></td>
<td>Total</td>
</tr>
</tbody>
</table>
Total estimated potential annual savings from above calculations: $1.7M

Portion of estimated potential annual savings in GIB: $1.2M

Estimated range for potential annual savings in GIB (including subjective uncertainty estimates): $1.0M - $1.5M

Additional savings not quantified in this SPI include minimized support costs due to reduced variation in types of machines supported, and ensuring that all machines meet hardware standards. There may also be real savings associated standardizing the process for wiping and disposal of used machines, as well as avoided costs that could be associated with improper disposal of machines containing confidential MIT information.

**Implementation considerations**

Implementing this SPI would represent a significant cultural shift, from a loosely managed to a moderately managed environment.

Expansion of the DITR program would require shifting of GIB hardware funds from DLC’s to a centralized budget. Additional centralized staffing would also be required, but it is hoped that personnel FTE and salary dollars could also be moved from DLC’s to the centralized service.
Centralize purchasing and management for computer software

Summary description

Overall, MIT spends over $4M per year on software licenses and software management. In FY 2008, for example, $2.3M was spent from the GIB on software licenses, and another $2M through DLCs, sponsored research, and other accounts. In addition, IS&T supports more than 150 software packages, and manages releases and testing on different platforms, which requires about 10 FTEs. Here are 3 ideas for reducing these costs:

1) Enterprise-wide licenses and quantity discounts. MIT already saves significantly on our enterprise-wide software licenses for products like Microsoft Windows and Office, Oracle, and VMware. However, there are still places where additional savings could be achieved through centralized software purchasing. For example, even though all MIT staff members are already licensed for MS Office, $33K was spent last year on Microsoft Office by individual DLCs through a different licensing arrangement. Centralized software purchasing should at least avoid simple problems like this.

MIT also has an even greater potential for savings with smaller volume products that do not qualify for enterprise-wide licenses. Three approaches should be explored on a case-by-case bases for these products: (a) centralized volume purchase, (b) concurrent licensing (that is MIT buys a certain number of licenses which can be used by anyone at MIT, subject to a limit on the number of concurrent users of the license at any one time), and (c) discounted but individualized license purchases.

2) Standardize on a smaller number of software products. As suggested in the introduction to this report, IS&T could reduce the number of software application it supports. Many of the 150 applications supported by IS&T have a small user group and are candidates for having their IS&T support ended. If DLCs or other users need these non-standard applications, they can make arrangements for supporting the applications themselves (even if the licenses are purchased centrally).

3) Open source software MIT could consider moving more to open source or other free software applications in selected cases. We have not investigated these possibilities in detail, but as an example, consider the fact that MIT spends over $300K per year on Microsoft Office alone. While some MIT users certainly need this functionality, there may be others for whom the more limited functionality of OpenOffice or Google's office suite would be completely acceptable. There are also many other licensed applications for which open-source alternatives are available.
Quantify the idea

After preliminary investigation, we have found that estimating the current volume (and potential savings for) software purchasing would be difficult with the data currently available. We believe such estimation should be done, but it would require more time that we had available.

To give some sense of the savings potential, however, we include here some current examples of the possible approaches to saving.

Through a centralized volume purchase (option 1a) of Adobe Acrobat Professional and Adobe Dreamweaver, MIT pays $45K per year to license 3,750 copies of Acrobat Pro and 2,700 copies of Dreamweaver. The current individual MIT discounted price (option #3) for Acrobat Pro is $55 and for Dreamweaver is $210. Collectively the volume discount on these two products has saved MIT over $725K in licensing costs compared to individuals buying separate academic licenses. Interestingly, even though we have these large volume licenses, MIT also spent an estimated $250K on Adobe products (including additional Acrobat Pro and Dreamweaver licenses) in FY 08 through our academic resellers (GovConnection and CDW-G).

Another way we can achieve savings is with concurrent licensing (option 1b). For example, we are able to provide Matlab for all 10K+ students with only 430 licensees because not everyone runs Matlab at the same time. IS&T and various IT groups around campus already run concurrent license servers for specific needs, but such servers are not yet used for any broad enterprise audiences beyond Matlab for students.

Finally, open source versions (option 3) would reduce direct costs for certain licenses to $0, but may require adjustments for users and business processes. In addition, the management costs might be larger.

Implementation considerations

One of the biggest obstacles to implementing these suggestions is determining how to "chargeback" to individual users or DLCs for the software they buy. For enterprise licenses, funding comes from the GIB (or other central funds) and no charge back system is needed. But for smaller licenses paid for by individual DLCs, some method of fairly allocating total costs to individual DLCs is needed. For instance, if MIT has to commit to buy 1000 copies of a product in order to get a quantity discount, but individual users have not yet committed to use the product, how should MIT allocate the total costs among the users who eventually want to use it?

Even deciding which licenses would benefit from a volume purchase or concurrent license arrangement is difficult because the data is not readily available as to who is buying what. Numerous attempts have been made by IS&T and other IT groups at MIT to share this information, but these efforts have not been very successful because of the very decentralized approach to purchasing software.
Switching to open software might incur problems with users currently using commercial versions of the application, with which they are familiar.

To better achieve these savings and determine for which products the savings justify the investment, all software purchases should be tracked and studied by MIT Purchasing to identify savings opportunities. When the volume of software reaches a threshold, a central team should explore what options are possible for the given software title and work with the individual DLCs that need the software to minimize the overall cost to MIT.
WORKING GROUP: IT@MIT

Centralize online process for graduate admissions

Summary description

Currently, the Admissions Office sends paper copies of graduate applications to individual departments. This process is costly and ecologically wasteful (in its use of paper), and it is also inefficient for many faculty members (who would prefer to review online applications). Several departments have independently set up their own systems to allow faculty members to review applications online. It would be much more efficient to set up a centralized online process for reviewing graduate applications.

Quantify the idea

There are two primary costs that could be reduced:

* The costs for the Admissions Office to print and deliver paper copies of the graduate applications to individual departments.

* The development costs for individual departments to set up their own online systems. Of course, these costs are not necessarily seen in the central MIT budget, and centralizing the development could add costs to the central MIT budget, but it would lead to Institute-wide savings.

Note: We have not developed detailed cost estimates or implementation considerations for this SPI because we did not feel it was useful to duplicate the work already done on this idea by the Education Working Group. We include this SPI here to add our support to the idea and to use it as an example of the benefits of standardization in the educational domain.
Decustomize administrative enterprise systems

Summary description

Because MIT was the first educational institution to use SAP, MIT had to write substantial amounts of customized software to adapt SAP to work in an educational environment. Because of this customization, it is now very difficult for MIT to make further changes to SAP and to stay current with new versions of the software distributed by SAP. For instance, minor modifications that should take 2-4 months can take as long as a year, and IS&T employs about 20 developers to work on the customized modules and make other changes to SAP.

However, in the years since MIT installed SAP, a number of other educational institutions have installed it, too. And now many of the special capabilities that MIT had to write for itself have been incorporated (in some form) in the standard version of SAP. That means that MIT could now, potentially, remove many of its special SAP customizations and use the equivalent features that are now in the standard SAP software. If MIT did this, it would greatly reduce the amount of effort needed in the future to upgrade to new versions of SAP or to make other changes.

Another benefit of decustomizing SAP is that this would also create the possibility of outsourcing the operation of MIT's SAP system at some point in the future.

These same observations also apply to MIT's other enterprise systems, such as MIT's administrative system for educational services, MITSIS (the MIT Student Information System) and to other educational systems (see related SPI “Decustomize educational enterprise systems”).

Quantify the idea

It will require some additional investment to decustomize SAP because modules that MIT has developed must be replaced with standard SAP modules that work slightly differently. It will also require some process changes in how MIT does business. In the long run, decustomization will allow MIT to evolve its administrative processes faster, outsource more work, and reduce staff (e.g., fewer SAP developers). We have not attempted to estimate these costs, and they could be substantial, so a much more detailed analysis of these costs should be performed before proceeding.

However, the ongoing savings from doing this could be quite substantial, as much as $2.6M. The long-term benefits could be much larger, including the ability to more quickly adapt new SAP features, and the possibility of outsourcing SAP operations.
altogether. We have not attempted to estimate these additional benefits since they are difficult to quantify and are not realizable until decustomization has been done.

**Implementation considerations**

Before deciding whether to implement this idea, MIT should conduct a review to determine the software costs of decustomizing the systems. More importantly, this review should also examine whether MIT’s management is willing to seriously consider transforming some of the highly customized administrative processes used here to more standard versions of the same processes (see Appendix A on cultural changes needed).

In general, back office processes and operations rarely provide competitive advantage or differentiated service levels, and we see no reason to believe that they could do so in MIT’s case. Therefore, we believe that MIT’s best course in this case is to adopt administrative processes that are as standardized as possible in order to reduce costs and increase agility.
Decustomize educational enterprise systems

Summary description

MIT currently has three key enterprise educational systems: WEBSIS, Stellar, and OCW. WEBSIS, while originally based on industry software, has an outdated code base and modifying it to keep up with current demands has proven expensive or impossible. Stellar was developed locally at MIT since it was believed that there were no commercially (or open) available solutions that would meet MIT needs. OCW, while developed locally, is a system that was built with industry products and much of the development of the product was outsourced (Sapient). Because of these customizations, it is now very difficult for MIT to make further changes to WEBSIS and Stellar without significant expense. By moving to "industry" standard systems there is the potential to reduce the amount of effort needed in the future to upgrade to new versions and make other changes. Another benefit of decustomizing these systems is that this would also create the possibility of outsourcing their operations at some point in the future.

Quantify the idea

Decustomizing will require some process changes in how MIT does business. This will be particularly challenging for these educational systems since the touch-points with faculty are many. In the long run, de-customizing will allow MIT to evolve its educational processes faster, outsource more work, and reduce staff (e.g., fewer WEBSIS, Stellar, and OCW developers).

Ignoring the one-time investment to decustomize, we might hope for a savings of approx. $550K.

Decustomizing OCW is more complex, since there is no current industry solution for this type of publishing system. The Content Management System (CMS) it’s based on will no longer be supported in a few years, thus a current MIT project (DOS) is identifying options for moving the system to a newer CMS. Attempting to estimate savings for OCW is premature at this time.

The potential for long-term savings of decustomizing is much larger (including the possibility of outsourcing and quicker adaption of new features), but those benefits are difficult to quantify, and will not be possible until decustomizing has been done.

Implementation considerations

As with the SPI for decustomizing administrative enterprise systems, this idea should not be implemented before a review of financial costs as well of as MIT management’s willingness to make significant process changes.
User-centered IT systems
Removing pain points in using MIT enterprise systems

Summary description

Administrative personnel experience many pain points in performing tasks with the existing enterprise systems (SAP, Coeus, the Data Warehouse, etc.). In general, for many systems, the user interface is awkward and prohibits tasks from getting done efficiently. Further, the systems are inflexible and not fully integrated making the systems harder to use and the data harder to access. It is often difficult to find people who know how to fully accomplish complex tasks in the enterprise systems. Some people know the technology, others know the business practices, but few know both. And, unfortunately, there is little education and training material available to close these gaps.

With the implementation of SAP Financials, SAP HR Payroll, and the accompanying web-based applications, MIT has moved to more electronic forms of creating the necessary transactions to support our business. Our team has reviewed a number of initiatives presently underway to continue the improvement of these processes (Travel initiative, the HR appointment initiative as examples), but much remains to be done.

Specifically, much of what has been done to date has focused on improvements to transactions, but far more emphasis needs to be placed on improvements to the way in which we provide management information to support our business. Here are a number of themes distilled from the sampling of systems in the detailed attachment (see Appendix B):

1. Enterprise systems have been deployed with a focus on the creation of transactions, but little investment has been made or scheduled to support information needs.
2. Enterprise systems have been viewed as necessary to provide information for central purposes, but not to support the business processes to accomplish those tasks in departments.
3. Data that is provided (in the Data Warehouse) is not well documented or defined and is difficult to access. Furthermore, most users do not have the expertise needed to use the Data Warehouse for their departmental needs, including the maintenance of local data elements.
4. Although many processes run through SAP or SAPWeb, departmental users cannot depend on changes across systems in real time. When data are refreshed in the multiplicity of systems, departmental users are not confident that the data is consistent across the various interfaces (the multiplicity of "views of the data" or "reports on the data" do not appear to be a consolidation of the same data across the varied systems/views/reports).
5. The lack of systems integration has resulted in "every tub on its own bottom" such that each Department, Lab, and Center has established its own methods,
processes, and systems to conduct its work. While there are many common functions and processes that cross departmental boundaries, there are very few common business processes, reports, and/or approaches shared across departments. The few exceptions are mostly grass roots efforts initiated by the DLCs themselves. This lack of well-leveraged departmental systems across departmental boundaries has led to many inefficiencies.

Many of these problems (and others) have been well-known for years and have been documented (a list of reports is available), but no forward progress has been made. As a result, DLCs run shadow systems, administrative personnel spend too much time on simple tasks, and simple tasks that PIs themselves could do are performed indirectly by administrative personnel.

**Quantify the idea**

Implementing this idea would lead to some potential savings in staff who provide system support and maintenance in IS&T and other central departments. However, even more dramatic savings would come from substantial reductions in the time administrators throughout the Institute spend working with these systems. This includes administrators working directly with cumbersome systems on their own tasks, and also those who take on additional work in order to shield their faculty and/or PIs from the unusable systems. If the systems were more functional, the PIs and faculty could interact directly with the systems and would only need to use administrative personnel when they would add value to a process or activity.

For example, there are approximately 76 FTEs focused on developing and maintaining enterprise systems across multiple departments at MIT, with the majority in IS&T. (This FTE estimate includes SAP Financials, HR/Payroll, Account/Planning, Student Systems, Data Warehouse, Coeus and Admissions and may not be complete.) Potential savings could be gained by reducing the number of FTEs, but only AFTER streamlining or de-customizing the work (as described in other SPIs).

While there are some potential savings possible in the systems support area, MIT administrators estimate that they spend 10-20% of their time translating transactional information into management information and trying to adapt the outputs of our transactional systems into usable formats for presentation to faculty members, principal investigators, or deans. The process is so cumbersome that detailed notes are required to map the process that leads to the final report product, and yet that investment does not guarantee efficient replication because too many variables may change between reporting requests (report queries, request for data elements that vary from the original request, and the integrity of the actual data coming out of our enterprise systems).

Once the systems are simplified, we estimate that MIT can realize a productivity savings of approximately $1,500,000 per year based on the following assumptions:
**Typical DLC administrator time savings of 10% per person per DLC (conservative)**

$10,000 per department (based on 10% time of a $100K "loaded" salary)

*150 DLCs*

**Total $1,500,000 annual savings in administrative time spent.**

Please note that while we expect that we could reap these significant time savings, they may not translate into actual dollar savings in the departments, but rather into quantifiable increases in time that can be refocused on more innovative or value-adding activity. The estimate above also does not numerically account for savings that could be gained in the central offices, which may be able to reduce the number of staff needed to develop and maintain the multiple complex systems presently in use.

**Implementation considerations**

Rethinking administrative computing requires strong leadership to make the right decisions (e.g., custom versus off-the-shelf, resolving conflicting goals, prioritizing changes, extensibility for DLCs) and a willingness to embrace change. Progress should be judged by metrics that relate directly to the end user tasks (i.e., time spent/ability to perform certain administrative tasks) rather than just system performance standards. It is advisable that the implementation proceeds incrementally instead of with wholesale redesigns.

A good starting point for actionable items would be previous reports with recommendations for changes to administrative systems. An even simpler step would be to just share the pain points in Appendix B with the IS&T groups responsible for these systems and ask them what can be done to reduce these problems.
Outsourcing
Outsource voice and video communication

Summary description

MIT currently installs and manages its own voice telephone system. This system includes: (a) a private 5ESS telephone switching system for the older analog lines, (b) a new Voice Over IP (VOIP) system that is currently installed for about 1/3 of MIT phones, and (c) a primitive operator-assisted voice conferencing facility.

We believe that there may be significant savings (and enhanced quality) possible if the operation of MIT’s telephone system is outsourced to an external vendor such as Verizon, Cisco, or Avaya. Because of their economies of scale and wide experience with many other organizations, these vendors may be able to provide better quality service at lower cost.

Quantify the idea

Based on information provided by IS&T (and assuming a loaded cost of $100K per FTE), we estimate that MIT currently spends approximately $3.2M / year to operate its various telephone systems. In addition, MIT has approximately $6M of capital equipment devoted to the telephone system (including both switches and desk telephone sets). If we assume (conservatively) that this capital equipment is amortized over a 6 year period, that means approximately $1M per year of capital expense, giving a total annual cost of $4.2M.

It is impossible to know for sure how much, if any, savings would be possible from outsourcing without getting detailed proposals from one or more vendors.

However, based on our general knowledge of the industry, we estimate that outsourcing might save approximately 30% of the current annual operating costs (approx. $1.3M).

If MIT decides to implement this option, we estimate that it would take approximately 1-3 years to complete the changeover.

Implementation considerations

Before deciding whether to implement this idea, MIT should conduct a serious RFP process with several telephone service vendors. We estimate that this process would take approximately 6-12 months. It is not clear whether any vendors would be capable of or
willing to take on this project, much less whether the savings would justify doing so, but we believe this option is worth investigation.

Though not currently part of MIT's telephone services, we recommend that the prospective outsourcing vendors also be asked to bid on providing enhanced services such as the following: (a) convenient dial-in voice conferencing, and (b) various forms of video conferencing.
WORKING GROUP: IT@MIT

Replace landline phones with mobile phones

Summary description

MIT currently provides landline telephones for almost all its employees and also cellphones for over 10%. However, more and more people at MIT and elsewhere are finding that they rarely use their landlines, but they use their cellphones all the time.

If this idea is implemented, most traditional landlines would be eliminated completely, and employees would just use MIT provided “mobile” phones for all their calls while at their desks or anywhere else. These mobile phones would be a combination of (a) regular cellphones, (b) hybrid devices that use local WiFi networks for voice calls when possible and the cellphone network otherwise, and (c) “soft phone” programs that run on laptops or desktops and provide Voice Over IP telephone service without needing a separate telephone device.

Quantify the idea

As described in the previous SPI, MIT spends approximately $4.2M per year to operate its telephone system. Dividing by the total number of MIT telephone lines (16,500), we estimate a cost of approximately $255 / year / line (or $21 / month / line).

Estimating the costs and potential savings from this idea would also require a serious RFP process like the one described in the previous SPI.

However, based on very preliminary data, we estimate at least the following savings from eliminating landlines only for employees who already have MIT cellphones:

- Appx. 1,500 cellphones currently paid directly by MIT
- 500 additional cellphones paid directly by employees but reimbursed by MIT (rough estimate)

Total: appx. 2,000 cellphones currently paid (directly or indirectly) by MIT Times $255 / yr / line = appx. $500K / yr savings.

We would also expect (but have not estimated here) further savings from replacing some desk phones with “soft phones.”

Finally, we suspect (but do not know for sure) that a more careful analysis of current landline costs combined with negotiating special deals with cellphone providers might lead to net savings from directly replacing landlines with cellphones.
Implementation considerations

This proposal should probably be phased in over a 2-3 year period. Some aspects of it could be implemented immediately, such as replacing some landlines with PC-based “softphones” and eliminating some landlines for people who already have MIT-paid cellphones. Others, such as using cellular/WiFi hybrid devices, will require a wider availability of such devices before widespread adoption at MIT is likely.

One key issue is whether the cellular coverage on the MIT campus will be satisfactory. Today, the coverage is probably not good enough in some places on campus to be depended upon. However, if MIT selects, say, one or two approved cellphone vendors and tells them that most campus phones will be converted to their cellphone network, we expect that these vendors would be highly motivated to install additional equipment on the MIT campus to guarantee excellent cellular coverage.

These vendors would also, very likely, be motivated to give MIT significant discounts on cellphone service in return for bringing such a large number of users.

Even if this proposal is implemented, we expect that there would still be some remaining landlines. For example, employees who always work at the same desk and never need to use a telephone elsewhere might be able to get slightly cheaper service from a landline. And for certain kinds of calls (e.g., live radio interviews), the slightly more reliable quality of landlines might make them worth using.
Remove disincentive for outsourcing research technical support services

Summary description

There are currently three options for researchers to acquire technical support for their computation systems: 1) task graduate students, postdocs, or research staff to divert a portion of their effort, 2) hire permanent staff, or 3) engage outside vendors.

Option 1, using existing staff, diverts them from their primary research mission. Option 2, hiring new staff, is often not cost effective, especially for small research groups. Option 3, engaging outside vendors on a part-time basis, is often the best solution.

However, the current rules for Facilities and Administrative (F&A) overhead charges, require that these charges be applied to all consulting services, not just the first $25K as is required for other subcontracts. This provides a disincentive for outsourcing these technical support services and, instead, encourages researchers to hire permanent staff members even in cases where the research needs could be more cost-effectively served by outside consultants.

We propose that MIT attempt to renegotiate MIT’s overhead rules with the US government, so that consulting services, like other subcontracts, will be exempt from overhead charges on amounts over $25K.

Quantify the idea

If this idea is adopted, we would expect to see more research groups outsource their technical support services, thus reducing salary, benefits, space needs, and other costs of MIT employees doing these tasks.

Implementation considerations

We understand that this is potentially a complex matter involving alterations to the cost base on which F&A is assessed. However, having looked at the relevant Office of Management and Budget circular A21, section G.2 it is not clear that nothing can be done about this. In light of this, and because there may be a net savings possible, we feel that this matter warrants serious consideration. The knee-jerk reaction of assuming this will simply increase the F&A burden elsewhere may not actually be correct.
Streamline operations for IT at MIT
End support for selected IT products and services

Summary description

Over the years, MIT has collected many IT products and services that are no longer appropriate for support---they are out of date, used by few people, or better alternatives are available. Consistent with our earlier SPIs about standardizing hardware and software support, we believe that IS&T (and, in some cases, DLCs) should end support for these products and services. While a more detailed investigation will be needed to determine exactly which services to eliminate, we include below a preliminary list of possibilities.

Quantify the idea

Closing (or de-supporting) the services listed below could save IS&T from $1.2M to $1.8M per year.

In addition, if some or all Athena clusters are closed, there may be additional savings from space costs.

Implementation considerations

Ending support for these services is likely to be difficult because there will almost always be some contingent of people who will argue strongly for continuing support. However, as noted in the Introduction of this report, we believe it is important to have some method (such as a governing board) to make and defend difficult decisions like this.

Even though further evaluation is needed before final decisions are made, here is a tentative list of services for which support could be ended:

Athena
Close some or all Athena cluster spaces (Most students have their own computers now)
Stop building unique Linux builds (in progress)
Use generic hardware

Web Tools
Dreamweaver
Creative Suite
Adobe products (other than those required for Grant Proposals and Legal)
Remote Access/Dial-up
Tether
Ipass

Security
Kerberos 4

Email/Calendaring
Eudora
Thunderbird
Spam Assassin/Barracuda (new Spam Quarantine now available)
WebMail (Exchange will remove need)
TechTime (Exchange will remove need)
OCFO (Oracle calendar client for Outlook - Exchange will remove need)

Mobile
All mobile devices except iPhone and Blackberry
SynJE
SyncML
VersaMail

Other IS&T Services
AdminIT program
Zephyr
Calling Card Services
Conferencing (replace with automated web/audio conferencing solution)

Other services in DLCs
Low-volume email systems in several DLCs
Network and email in MIT Medical
WORKING GROUP: IT@MIT

Reduce printing costs

Summary description

MIT can, without extensive effort, realize significant cost savings by modifying the way printing is done. Currently, printers are over-installed and under-utilized. By being smarter about printer selection, distribution and the use of consumables, we believe a sizable cost savings can be realized in a short period of time.

We divide the possibilities into two categories: (1) high impact, requiring significant changes to achieve, and (2) low impact, requiring minimal changes to achieve.

(1) High Impact. Active Print Management - A broad strategy that takes an investment of both time and money to implement. This process can take as long as two years for organizations of tens of thousands of users. If implemented correctly, organizations over the long term can cut office print costs up to 30%. Active print management includes the following focus items:

- Upgrade to a modern printing infrastructure - allows for cross-platform, graphical management of print jobs, to allow users to correct for accidental or unwanted printing (as opposed to the awkward and difficult to remember command line - and Athena-only interface currently offered).

- Implement and deploy print queue monitors that automatically remove large jobs from the print queues and notifies users during peak demand periods.

- Printing Pools - Typically, printers are over-installed and under-utilized. Walking down a hallway, one may see a printer in nearly every office. It is easy to see that there is additional cost in maintenance and consumables by dedicating a workgroup-class printer to a personal-class need. Instead, having a few printer pools per hallway would reduce the number of printers at MIT and cut consumable and energy costs. A printer pool may consist of two printers (one color and one black and white), recycling and trash bins, staplers, hole punches and perhaps a fax machine. This initiative would require space planning and additional cost to implement but could realize a large cost savings by reducing equipment.

- Standardize Equipment and Manufacturers - Printing assets become expensive when there is no standard printer that the organization has settled on. Reducing the number of printer manufacturers that MIT uses and going a step further to purchase printers that use common consumables will greatly reduce the cost of using and maintaining printers.

- Printer leasing and outsourced printer maintenance - Leasing of printer units and outsourcing their maintenance provide several potential advantages. There is the potential to obtain units at low monthly payments without large cash outlays. This may
also be an effective way to avoid technology obsolescence of printers and offer a potential tax savings. In addition, a common way for organizations to standardize on printer resources is to opt for the leasing scenario.

(2) Low Impact. Configuration of Printing Assets - Low impact changes can reduce costs with an easier deployment strategy. Many of these savings can occur from changes to existing printer configurations.

- Eliminate Banner Pages - Some offices may use banner pages on high volume printers to differentiate printer jobs. According to Gartner research, a 1,000 person organization could cut up to 1.6 million pages and save $33,500 per year by eliminating banner pages throughout their organization. This savings is in the form of reduced costs on consumables by up to 20% as banner pages can represent up to one-quarter of all pages printed.

- Duplex By Default - Either through software settings on individual computers' driver settings or on printers themselves, this is one of the cheapest solutions to implement. If printing is handled through a print server (as we currently do on managed machines in the service departments) it is fairly easy to implement. According to Garner research, an organization can cut its annual paper costs by at least 30% using this method alone.

- Toner Saving Modes - Most printers have a toner saving mode. This reduces the density of toner by 10% to 20% and can reduce printing costs by $6-$10 per month per user. Color pages will have an even greater realized savings by a factor of about three.

Quantify the idea

Using toner consumption, we estimate that Athena printing costs are 6% of the total Institute printer costs. (Athena printing $441K/year). Extrapolating that number to the total Institute, we can estimate that MIT spends about $7.4M on printing costs annually (excluding printer lease costs). This number seems high to us, but we will use it here to make rough estimates of potential savings. Based on this number and savings estimates from Gartner research, we can estimate the following savings:

- Active Print Management - $2.2M (30% of total office print costs)
- Elimination of Banner Pages - $335K ($33.5k/1k of users. 10,000 users)
- Duplex printing - $1.0M (30% of annual paper costs)
- Toner Savings mode - $720,000 ($6/user month - 10,000 users)

Overall, we estimate savings of $4.3M or 58% of total annual printing costs from implementing these recommendations.
Implementation considerations

Other Benefits

• Potential for reduced IT support costs due to reduction in number of printers to maintain

• Reduced energy consumption through reduction in number of printers and replacement of less efficient units.

• Lessened environmental footprint creates community goodwill both internally and externally to MIT

Costs

Detailed estimates of implementation costs will need to be developed, though in general, we expect the following:

• Low cost: Stoppage of banner page use and default duplex printing

• Medium cost: Centralized software to manage optimal printer settings such as toner use

• High cost: Long-term efforts to lower number of printing devices through the use of printer pools and standardization of equipment.
Streamline help desk support and outsource as appropriate

Summary description

MIT has several departments providing help desk IT services to either the entire community or within their own DLC. Some of the DLC help desk units provide very DLC-specific IT support, but there is still substantial overlap in services provided. In addition, these different help desk operations use different tools and processes, and this adds to the overhead and inconsistency for users of these services.

There is currently no active life cycle management of supported services within IS&T. We believe that streamlining services that the HelpDesk should support is a critical effort that needs to be undertaken to decrease the Institute's costs and help increase the quality of support.

Some of the help desk services should also be selectively outsourced to external partners that can operate at scale across multiple clients and can offer competitive pricing and services to MIT.

Quantify the idea

With the caveat that these numbers are a broad approximation, we estimate that we could potentially save between $1.5M-$2M annually across the Institute.

Implementation considerations

There is significant evidence that exploring different sourcing solutions for all or some of the help desk services is a valuable exercise. The first step is to have a fairly accurate assessment of the current baseline of services and costs. We recommend that a baseline of current help desk services across the Institute be carried out, including service levels, response times, resource models and costs. This can then be used to evaluate and identify gaps, overlaps, inefficiencies, and cost saving opportunities.

For instance, many of today's IT services (such as Gmail and Skype) have become so consumer-oriented and well-documented that there is no need for IS&T to provide live assistance for such services. Additionally, the number of IT services supported by IS&T's help desk needs to be analyzed and focused on those that have large usage across the community.
Some options to be considered for outsourcing include: (source: Gartner)

- Level 1 help desk outsourcing, where initial contact is with the outsourced help desk for lower-level problems, and escalation of problems to Level 2 and above remains in house or with other service providers
- Keep Level 1 help desk support, but outsource specific Level 2 support where internal IT lacks knowledge or skills
- No change, significant internal improvements (Services tied to actual usage and unit costs are well understood)

There is some evidence that outsourcing some or all of help desk services is not necessarily a cost saving solution. Looking at Lincoln Lab's experience to date, their effort to outsource their tier 1 help services is, on paper, costing them more than what they were spending previously. However, they are extending their service availability and potentially reaping other benefits.
Streamline the governance structure for IT at MIT
WORKING GROUP: IT@MIT

Reorganize committees and organizational units related to IT

Summary description

IT at MIT today suffers from an overabundance of advisory committees and organizational units, coupled with unclear processes for decision-making, oftentimes resulting in a great deal of effort expended to achieve very little. While we value very highly the inclusive and collaborative intent of this model, it should be streamlined and made more transparent in order to facilitate, rather than impede, the achievement of the Institute's IT goals.

Today, a number of organizational units (including IS&T, Libraries, Office of the Dean for Undergraduate Education, and others) provide various kinds of IT-related services to the MIT community, but the mechanisms for coordinating all these activities are often unclear.

In addition, many different committees exist to advise on specific aspects IT at MIT (see list below). Some committees focus on administrative computing, some on academic computing, and others on research computing. Some exist primarily as information-sharing mechanisms, while others advise organizations on an ongoing basis, and still others guide temporary project teams and disband when the project concludes. There are also MIT committees whose main focus is not IT, but whose sign-off is an implied prerequisite to launching any significant IT initiative.

The resulting maelstrom of voices and opinions, many conflicting, often leads to a complete stalemate. As a result, committee members (and much of the community at large) have become frustrated that the same problems are discussed over and over and no resolution is ever reached. In the meantime, the perception of IT staff is that one voice crying "no" can stop progress in its tracks, especially if that voice belongs to a member of the faculty. And from the faculty and research perspective, computing needs are not addressed until a catastrophe is imminent and something MUST be done, often too quickly, less effectively and at unnecessary expense. To avoid this circumstance, many faculty and PIs prefer to remain self-reliant for their computing needs, which may not serve the best interests of the Institute but prevents their research from being delayed by bureaucracy.

Clearly there is a need to break this stalemate and institute a governance model that can allow opinions to be voiced, heard and considered without preventing forward movement. For example, one promising idea is to have a governance board for IT that includes users of the IT systems, as is done at Lincoln Lab. As IS&T faces a change in leadership, we have an opportunity to put in place someone who can champion a new
governance structure, and this should be an important consideration in selecting that individual.

Quantify the idea

The long-term savings of reorganizing IT governance at MIT are potentially large, but difficult to quantify. However, a very preliminary analysis of membership in the different committees and groups suggests that substantial amounts of faculty, administrative, staff and student time are spent on activities that overlap, delay progress rather than facilitate it, and ultimately create confusion. In terms of actual cost savings, task force members even cited one example where Institute funds were expended for work that never took place because of disagreements and delays caused by decision-makers who did not solicit advice from the right people during the negotiations.

Below is a partial list of committees and advisory groups with some involvement in IT:

| • Information Technology Strategic Planning and Resources Coordinating Council (IT-SPARCC) | • Administrative Systems and Policies Coordinating Council (ASPCC) |
| • Academic Computing Coordination (ACCORD) | • Administrative Advisory Council II (AACII) |
| • Student Systems Steering Committee (SSSC) | • SAPbiz |
| • MIT Council on Educational Technology (MITCET) | • ITLeaders |
| • IS&T Student Technology Advisory Board (ISTAB) | • ITPartners |
| • Faculty Committee on the Library System | • Student Systems Vision Faculty Steering Committee |
| • OCW Faculty Advisory Committee | • Committee on the Undergraduate Program (CUP) |
| • Stellar Advisory Committee | |

While some of these committees have long-standing mandates and others have clear and essential functions, the total number is high, and savings in key staff, administrative and faculty time could be achieved by analyzing the functions served with an eye to reducing redundancies and clarifying the processes by which the activities of these committees lead to policy or operational decisions.
Implementation considerations

Our Task Force is not yet prepared to recommend any particular governance model, but we believe some reorganizing is clearly desirable. For instance, it is clear from our discussions that there are differing needs between MIT’s three primary thrusts of academic, research, and administrative computing, and that research computing feels underrepresented in the present structure. One possibility, not yet recommended by our committee but worthy of consideration, would be to have a new position, reporting through the Provost, responsible for coordinating research computing across the Institute.

In addition, we feel that IT-SPARCC (Information Technology Strategic Planning and Resources Coordinating Council) has not fully performed the function for which it was intended. While this group has provided advice to the Provost and EVP on IT-related matters, it has not played an active enough role to really serve as "the strategic coordinating body for information technology at MIT."

In order to develop a satisfactory redesign of IT governance, we must take great care to consider the strategic, cultural and political implications of any structure we put in place, and we should be transparent in describing to what extent advisory boards simply provide counsel or actually participate in decision-making, and how and by whom those decisions will ultimately be made.

Regardless of the structure we put in place, this problem cannot be solved without strong and active leadership from MIT’s senior administration (EVP, Provost, VP for Research) as well as its principal IT staff. Over time, many community members have come to believe that we will never break free of this perpetual cycle of indecision, which is now an accepted norm of our culture (see Appendix A). It will take a repeated pattern, not merely a single instance, of decisive action and visible results before this skepticism will be overcome.
Innovation and strategic advantage
Support location-independent work

Summary description

We propose that MIT formally provide technological and organizational support for "location independent work"; that is, work which may be performed anywhere, anytime rather than only in a specific place on campus. This does not mean that some employees would always work at home, and others never would. Instead it means that most employees would have much more flexibility about when and where they work. Some might work at home one or two days a week and come to MIT the rest of the week. Others might work at home most of the time and come to MIT only for scheduled meetings. Still others might live or travel outside of Boston most of the time, but still be included electronically in most MIT activities.

Making this change successfully would require both technologies (such as videoconferencing equipment and broadband connections at people’s homes) and organizational and cultural changes (such as creating “pooled” office suites where each person had office space when they were present but other people used the same space at other times).

The change would allow a variety of benefits, including:

a. cost savings from reduced MIT office space,

b. environmental benefits from reduced commuting and other travel,

c. productivity increases for workers who spend less time commuting,

d. increased ability to collaborate with research and educational partners around the world, and

e. increased ability to recruit and retain faculty and staff with geographical constraints or preferences

MIT would not be the first organization to do this. Other respected organizations (such as (Stanford University, Case Western University, and Sun Microsystems) have already implemented “distributed work” programs. But we believe that implementing such a program well here would be very consistent with MIT’s image and could provide not only cost savings, but also strategic advantages in recruiting and reputation.

Quantify the idea

Following are rough estimates of the possible savings from this idea:
According to data provided by Lydia Snover, there are 11,200 office spaces currently assigned to our 11,500 individuals employed on campus. We estimate that for every 10 people who participate in a flexible-office program, a total of one office will be freed up. (In other words, we should have a savings of 10% of the office space for people who participate.) We believe this is a conservative estimate, given Stanford’s finding that typical Stanford offices were unused about 30% of the time.

That means if only 10% of MIT’s employees participate in the program, 10% of their offices, or 1% of MIT’s total offices would be freed up. And, for every additional 10% of employees who participate, another 1% of offices would be freed up.

For each 1% of offices (115 offices) freed up, we estimate saving the following amounts per year:

<table>
<thead>
<tr>
<th>Hard Savings:</th>
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<tbody>
<tr>
<td>Rental space for 38 office clusters eliminated</td>
</tr>
<tr>
<td>We assume that the freed up space would be used to reduce MIT’s office rental costs. Office space rental fees range in price from $40/sq ft/year to $55/sq ft/year. It is likely that no less than three offices (plus circulation) could be released from rental at a time, and so the savings are more likely in the form of 1000 sq ft of office space per year x $55/sq ft/year = $55,000 per three person cluster of office rentals saved per year. 115 office rentals eliminated divided by 3 offices / cluster = 38 office clusters eliminated. 38 clusters times $55K / cluster / yr = $2.1 M / yr</td>
</tr>
<tr>
<td>Unneeded office rehabs</td>
</tr>
<tr>
<td>$5K per office times 115 offices</td>
</tr>
<tr>
<td>Total hard savings</td>
</tr>
</tbody>
</table>
Soft Savings:

<table>
<thead>
<tr>
<th>Productivity savings</th>
<th>$1.7M</th>
</tr>
</thead>
<tbody>
<tr>
<td>We use data from the Telework Coalition and New Ways of Working (see references in Appendix C), to estimate that working from home or other places, avoiding some commuting, and other benefits of location-independent work will make employees 15% more productive:</td>
<td></td>
</tr>
<tr>
<td>115 employees times 15% times $100K (salary + benefits) = $1.7M</td>
<td></td>
</tr>
<tr>
<td>Total soft savings</td>
<td>$1.7M</td>
</tr>
<tr>
<td>Total savings</td>
<td>$4.4 M</td>
</tr>
</tbody>
</table>

The above total of $4.4M per year does not include other potential hard savings such as avoiding travel costs for meetings in other cities. It also does not include less tangible benefits such as environmental savings, political gains from reducing parking demands in Cambridge, or other recruiting and reputational benefits.

These savings estimates also do not include the IT and other investments that would be needed to make this plan effective. For instance, one relevant data point about these costs is Stanford’s report that they spend $500K per 100 people ($5K per person) for their program.

We believe that it might be desirable for MIT to include in its investment plans some high end videoconferencing systems, and it might also be desirable to include a “home office allowance” to help employees who participate equip their home offices.

Implementation considerations

To achieve the cost savings and other benefits of this idea, there will need to be changes in work culture and work practice. For example, it may be useful to make special efforts to have regular face-to-face events to encourage a sense of community, even among workers who are mostly working remotely. Some additional cultural considerations as well as a sample of possible videoconferencing systems and costs are summarized in Appendix C.

We also note that MIT already owns the VOIP technology and “soft phone” software to support the sending and receiving of voice calls anywhere in the world on the Internet using our MIT office phone numbers.
Create a more cost-effective research computing environment

Summary description

Research computing is at the heart of the MIT community’s knowledge generating work. In many cases, research computing makes many research projects and teaching activities possible. Therefore, investment of effort and funds in research computing enables MIT to sustain our strengths as a premier academic and research institution.

Beginning in 2002-2003, MIT commissioned a series of committees (task forces and teams) to examine trends in high-end research computing and to make recommendations on strategic directions the Institute should follow. The key recommendation that all four such committees made is to take collective action to address the growing cost of research computing, a consequence of growing power, cooling and space requirements. These recommendations are even truer today than when these messages were first telegraphed in the committee reports, and by numerous other ad hoc efforts.

At present there is no recognized mechanism, structure or organization that is known as, and is, the go-to place for sharing and exchanging research computing knowledge. As a result researchers needlessly duplicate effort as they establish local, one-off research computing facilities. There is a need to provide a mechanism to share best practices of research computing from across the community and outside of MIT. There are savings (in the aggregate possibly significant) in avoiding continual reinvention and recreation of smaller computation systems. These savings would be realized in dollars in the Institute general budget and in research funds. In addition there would be savings in space and time and the avoidance of missed opportunities in research.

As an example, new faculty hires often negotiate funds to acquire guaranteed dedicated computational resources for their research. Using modern resource sharing technology it is possible to create a common resource that will meet many of these needs. MIT should promote looking across facilities projects in research computing with a goal of improving efficiency. We should also consider alternatives to personal or shared ownership hardware, such as pay-as-you-go services (Amazon EC2 and S3, etc.).

The working group specifically recommends that we:

- Create and sustain an official (small) standing body charged with ensuring timely exchange of research and research computing knowledge among campus and Lincoln researchers
- Begin to actually implement the long term strategies for research computing that have already been articulated by a number of committees and task forces
• Proactively and thoughtfully manage space, power and cooling issues associated with research computing

• Provide a route to reliable access of computational resources other than individual purchases/ownership of hardware/software/space and virtualization of MIT research computing resources

Quantify the idea

The amount of new knowledge and the scale of the contribution to MIT's educational and research "brand" derived from research computing is huge. World class research is one of the MIT’s most treasured assets, so efforts to make it easier and more cost effective to perform research should be endorsed at all levels of the Institute.

It is also clear that current practices incur unnecessary costs in time and effort. For example, money has certainly been wasted, from sources such as research, start up, unrestricted as well as Institute general funds, when unfortunate decisions are made due to lack of knowledge of prior researchers’ experiences with vendor, technology, space, power and cooling issues. Another added benefit from an official standing body would be having close to “real-time” needs assessment. This would help in forming tactical and strategic decisions, and eliminate unnecessary effort spent trying to get a snapshot of the campus needs every time this subject recurs.

The development of research computing space continues to often be done in a scattered ad-hoc manner across the campus. We advocate a more coordinated centralized approach so that space, cooling and power can be shared (and also possibly network infrastructure). This could also include making more off-campus research computing facilities available. From the operational expenses of off-campus research computing, potential savings to the institute power bill (and also CO2 footprint) are significant (estimated at $3.5M/year and 115,000 tons CO2/year in a 2007 report).

Some additional savings and more efficient use of funds, in particular startup packages, could be realized along with critical savings in investigator time, effort and distraction. There may be energy savings from more efficient utilization of existing systems.

Flexible use of pay-as-you-go computing resources incurs no additional capital cost (assuming a preexisting network). And once it is properly established and configured, it would require very small lead time to scale upward and downward providing significant flexibility for the research computing community.

Implementation considerations

Leadership by research computing users found in each of the five Schools in every aspect of this set of recommendations is very important. Research computing efforts for MIT
require strong user involvement to ensure sustainable success and to create trust amongst researchers that their needs and concerns are being adequately addressed and will be met. Funding issues present major challenges particularly given the current economic condition. MIT should consider working closely with the Federal government, the State government, other research institutions and private companies including manufacturers of equipments and providers of services.

In order to make sure we use scarce space, limited cooling and expensive power effectively, people involved with the research computing must work closely with CRSP, the Deans and Facilities.

The idea of sharing knowledge has been attempted before. For example a now dormant web-site was established in 2003 for this purpose. To make an impact the approach must be low cost to maintain (for example a monthly meeting associated with an existing seminar series) and be publicized amongst the MIT community. As to publicity, we believe that Domeview announcements would be effective. Jack Costanza of CSAIL and Chris Hill of EAPS have expressed willingness to act as coordinators for this activity. This organization could be viewed as a resource of best practices and consulted by senior administration, IS&T, and faculty making decisions about research computing projects.

It would be worth the effort to determine how to make the leap from private research ‘clouds’ to commercially available clouds. At present cloud computing is done only on small scales. The Institute needs to determine if this is a reasonable solution for more researchers. It would be beneficial to have some number of cloud hours available in an organized way at MIT so experiments in this method of delivering computing resources could include a diverse cross section of users. Note that a couple of years ago Sun donated 100,000 hours of the Sun grid to CSAIL.

Any efficiencies and optimizations that the MIT administration adopts for research computing should be careful not to harm the MIT mission. Improving MIT’s research capabilities will most likely mean being open to doing things in a new and different way driven by innovative, state-of-the-art, research approaches.
Appendices
Appendix A: Cultural change issues

This appendix presents a few examples of the kinds of cultural changes that may be needed for MIT to achieve significant benefits from some of the changes recommended here.

(1) We’re different. While MIT is justifiably proud of its uniqueness, most organizations believe they are more different from other organizations than they actually are. And they often pay unnecessarily high costs to develop software systems that are more tailored to their needs than necessary. In MIT’s case, for example, we understand that very significant customization and complexity in the payroll system is required to accommodate the Modified Annual Plan for faculty members. Similarly, one reason MIT has not used more standardized, externally developed student information systems is because these systems do not allow for grading on a 5 point scale like MIT uses. We don’t have strong opinions on whether these particular customizations are worth the costs to MIT they require, but these examples illustrate the kinds of hard decisions that may be needed to take advantage of potentially significant savings in our software.

(2) Administrative processes support top-down control, not bottom-up effectiveness. Many MIT administrative processes and systems appear to be designed to control legal and financial risks on behalf of the institution as a whole. To some degree, of course, this is necessary. But these systems provide very little support—and often make things significantly harder—for others at MIT, including DLC managers, Principal Investigators (PIs), and administrators. A frequent result of this is that DLCs spend substantial resources maintaining “shadow systems” to track information already captured by MIT’s enterprise systems. These shadow systems are needed because the enterprise-level systems do not provide access to the information in a form that is usable at lower levels in the Institute. Without a significant commitment to changing this aspect of the MIT administrative culture, it is unlikely we will be able to take advantage of the potential savings from more user-centered systems.

(3) Acceptance of unnecessary administrative complexity. After years of increasingly complex bureaucratic processes, many people at MIT have become resigned to—or even resistant to changing—the often unnecessary complexities in MIT’s systems. It seems unlikely to us that this culture of administrative complexity will change without very substantial commitment to change from the very top leadership at MIT. Unless someone at the top of the organization is willing to say, “We don’t really need to do X anymore,” there will almost always be someone lower in the organization who will explain why it is essential.

(4) A culture of indecision. Some of the recommendations in this report have been made, in various forms, many times before at MIT, and many of the people we
talked to in the course of our work have become skeptical that any significant change will ever occur. They report that a frequent pattern is for substantial resources to be devoted to discussing possibilities, developing plans, and making recommendations, but then no decisions to implement the recommendations are ever made. In fact, we worry that the work of this task force may meet a similar fate. However, we hope that MIT’s senior leadership will make a substantial commitment to implementing the group’s suggestions—even if those suggestions require changing some of the undesirable—but persistent—aspects of MIT’s culture.
Appendix B: Enterprise system pain points

This appendix lists a sampling of enterprise systems and challenges:

(1) **SAP Financials.** SAP Financials as an enterprise system was deployed to support the processing of financial transactions, but the data that resides in the multiple applications in SAP has not been leveraged for other purposes in an effective manner.

   SAP is data-rich but the transactional data would be more valuable if enriched with local departmental data. SAP data is largely centered around transactions, not information. There is a "firewall" (or the perception of one) between the multiplicity of systems deployed in SAP. An administrator who changes information in one application of SAP does not have the ability to readily see the outcome of that change in a related application of SAP (see DACCA example below). The transition between one SAP application and another is clumsy (most administrators “log out” of one system, wait 24-48 hours, and then “log in” to the corresponding systems).

   In addition, once the “transaction” in the enterprise system is complete, departments do not have an easy way (in real time while the transaction is fresh) to leverage the data elements used to create the transaction, nor to augment that information (see Websis example below). The outcome is that information is keyed into SAP to create a transaction, and that same information is maintained (and often rekeyed) into departmental shadow systems.

(2) **Data warehouse.** The strategy intended to meet departmental needs for information was/is the data warehouse. The system that stores all of MIT’s transactional data (the Data Warehouse) provides a rich source of information for MIT and its DLCs. Unfortunately, the current system has two problems that impede current and potential usages: 1) the query interface (BrioQuery) is for experts only; and 2) the data stored are confusing and sometimes of low quality. For example, there are many fields labeled "start date"; in some cases, the intended meanings are slightly different and important, but they are undocumented and not rationalized globally across the repository. This hinders DLCs in running their own reports, because either one has to be an expert at making queries or at understanding the data -- preferably both. If one is neither, then it is difficult to have confidence in the reports. As a result, many DLCs run their own shadow systems where they can manipulate and manage their data in response to their needs. Also, while there are large volumes of transactional data deposited into the data warehouse daily, managing a department requires more than just the ability to report on transactional data. Administrators utilize some of the elements of the transactional data, but they also find opportunities to accumulate/cluster the data, enhancing it with departmental information, so that it may be used in real time for managing day-to-day operations, and/or assessing trends, and/or supporting management information needs. Our most experienced administrators were not easily able to query our systems to develop the quantities needed to accompany this report.
Downloading data from the Data Warehouse to a department shadow system requires constant checking of refreshed data, and it is not uncommon for local data to be unintentionally overwritten. Because departments do not typically have the expertise to manage critical database applications, the solution for some is to rekey information into their shadow systems (such as Excel worksheets or Filemaker databases). Departments with more demanding needs pay for "administrative computing applications." The FTE's and dollars associated with those efforts are material. Those FTE's could be better utilized analyzing the data, not rekeying it, nor designing systems that will "produce" meaningful "information" to manage their business unit.

We know that the Data Warehouse team has made several efforts to find a more usable tool than BrioQuery, and they have been unsuccessful. If, however, there really is no better tool, then IS&T needs to create a service that can provide reporting support to DLCs utilizing the data in the Warehouse (the current staffing does not scale). Otherwise there is no point in maintaining the Warehouse.

We also need to launch a management reporting overhaul that looks at all of the tables in the Warehouse and identifies fields with duplicate names, identical fields with different names, and other anomalies that prevent departmental staff from being able to derive meaningful information from the vast array of collected data. BOTH of these efforts (tool/service and data revision) are necessary to solve this problem and to allow the departments to give up their shadow systems.

(3) NIMBUS. NIMBUS is the system of record for budgets. Many administrators view NIMBUS as a data entry module to provide information for the Central offices, but it does little to support the needs for planning and budgeting in the units. Administrators do not have direct access to the system to make changes. The requests for change are submitted to a central budget office administrator, reviewed and keyed into NIMBUS, and then days later the updates are viewable, but not “useable” for the local department. Departments cannot utilize NIMBUS to perform the modeling necessary to develop the budget, nor use the data inside NIMBUS to manage ongoing changes to their budget, nor do they have an enterprise system that is available to manage “budget versus actual” in a departmentally meaningful way. Because day to day budgeting processes/tasks are separate from the data/budgeting processes in NIMBUS, when the central budget office requests an explanation of variances to budget, departments often must reacquaint themselves with the manner in which this information was reported (the format of the budget submission), map that information to their working budget, and then work to understand and report on the variances. There should be a more seamless way in which this end-to-end cycle may be accomplished and “useable” for both departmental and central needs.

(4) SAP salary reviews. SAP contains an application for submitting salary reviews. However, an administrator cannot create the “what if?” scenarios that are the precursor to the information to be recorded into SAP. Rather, they download the information into a spreadsheet, enhance it with locally relevant and pertinent data, run various scenarios, and then ultimately upload the resulting final recommendations into the SAP interface.
The data is ultimately viewable, but not “useable” in SAP for the local department. The salary review model is viewed as a data entry exercise to support central information needs, but is not departmentally useful for accomplishing salary review processes.

(5) Roles Database. The Roles Database is the system that manages access to the various enterprise systems, and the Data Warehouse. The roles database was built in-house, and the knowledge of the system/maintenance is dependent upon ONE staff person. These and other constraints led to deployment of an authorization system that is not granular enough for our business needs (example: choose between an administrator’s access to “all salaries” or “no salaries”).

(6) SAP HR/Payroll. Human capital expenditures represent more than 60% of the expenditures in our operating budget. Administrators have little (or no, or incomplete, or untimely) access to the data that drives the preponderance of the costs of the business unit (even though it exists in many applications of the enterprise systems).

Example: the design of the application, and the workflow around establishing or creating an appointment (which ultimately resides in SAP) is very manual and duplicative: a department administrator fills out a web form, prints it, mails it to HR payroll, information is rekeyed into SAP, a triggering event sends an email confirmation (which is in a format that is not useful to departments), a triggering event sends another confirmation via paper copy in interdepartmental mail (an HR confirmation form which is in a format that is not departmentally useful). Once the transaction is entered into SAP, that enterprise data is off limits to departments except through the interface of the data warehouse. Ultimately the impact of the transaction (the person is paid) is shown as an aggregate amount in the SAP Financial system (faculty salaries in total charged to an account). Appointment data, from an SAP HR Payroll data transfer, is ultimately uploaded to the data warehouse. However:

- the view of that data is inconsistent with the systems and outputs utilized in the creation of that transaction (the outputs from the departmental originated web form are not well mapped to the email confirmation, nor the paper confirmation, nor serve the needs of the department);
- the web form contains fields that do not tightly map to the business needs of the department (example: annual salary is neither annualized salary nor fiscal year total salary);
- the web form fields do not map well to what is required in order to transact the appointment in SAP, hence the errors in transferring/rekeying this info in the HR service center into SAP.

We hope that this situation will be improved through the HR appointment team’s efforts. We note, however, that those efforts are largely centered around the transaction process, and not on supporting the information needs of the department.

(7) SANDI. The system that is deployed to distribute the costs of human capital across the MIT accounts is referred to as the SANDI. It is cumbersome to run, use and print. Before the deployment of SAP, the legacy system produced a paper copy of a report at month end that displayed both salary paid and distributions to accounts. Despite its paper
format, it was considered to be more useful than the equivalent “close as we can get” SANDI “report” that is created in the data warehouse/SAP/SAPweb applications today. Similarly, the effort required to change a salary distribution, while paper based, was less time consuming than the system in use today. In the current system, an administrator:
- may only view one person’s salary distribution at a time,
- cannot determine the impact of changing that salary distribution in the financial system without “logging out” of the SANDI application,
- cannot view the full salaries distributed to one departmental account “at a glance” within the SANDI System.

There are documented examples where the amount of compensation paid to an individual is not the same as the distribution of that person’s total compensation across the MIT accounts. There are also examples of a two day gap between when the SANDI information is changed, and when the payroll is run. During that window of time, a change made and viewed on the system is “irretrievably lost” after the payroll runs.

In previous years, when a salary was no longer chargeable to a grant/contract, the systems moved the salary to a “suspense” holding account, and when the grant was extended, the system automatically shifted the salary back to the original account. Today, the salary continues to “bounce” to the suspense account, but the efforts to restore the salary distribution to an active account are manual and time consuming. In addition, there are multiple views of this data in the ESandi, and those views do not create the appearance of the same transaction/distribution outcomes.

(8) Timesheets. The electronic system to record nonexempt time sheets locks an employee record for 20 minutes when the person accessing it exits the systems in certain ways. This method of exiting the application does not create the same consequence in most other systems. The user interface for each system is different, which is not efficient from a work or training perspective.

(9) DACCA. The system that is deployed to certify (not distribute) effort charged to an MIT financial account is referred to as the DACCA system. Regulations require this to be accomplished every 90 days. There is no interaction between the SANDI system noted above, and the DACCA certification process. The system used to distribute the salary to an account is not the same as the system used to certify the effort for that same data. Every 90 days, every MIT account must be certified, and notations must be recorded (in an auditable fashion) to describe inaccuracies in the certification of effort. Unfortunately, since the systems are not well integrated, it can often be the case that months go by before salary distribution issues are resolved, and certification of the salaries as shown on the DACCA must be annotated to note the gap between the information in the two systems and/or the two processes. It is unclear that a DACCA process would be required if the SANDI process worked more smoothly, was more integrated into the financial reporting and data systems, and the administrator merely had to “certify” the accuracy (or lack thereof) of the SANDI on a periodic basis. This would eliminate the need for a separate DACCA certification application used by departments, and maintained by central offices. As with other systems noted above, departments do not have electronic access to leverage the data that is viewed and transacted in the
DACCA system so the information is rekeyed in the shadow system when an administrator develops financial forecasts. The same Roles access constraints apply -- one either certifies all the salaries or none of the salaries; one either has access to ALL the DACCA information in the data warehouse or none.

(10) Websis. Websis is the interface to support student data. However, much like the other systems noted above, it does not provide more than a transactional interface; it does not provide for data elements that departments need to manage the information about students, courses, aid. We understand that other Task Force groups are working on recommendations to improve this.

(11) Coeus. Coeus is the enterprise system of record for all proposals and proposal related data as well as all sponsored awards. Coeus can also be used to prepare, route and submit proposals. Similar to SAP and SAPweb, there are two interfaces to Coeus – CoeusLite (web interface) and Coeus Premium (gui). Consistent with SAP, and by design, there is reduced capability in the web version than the gui. There is a tremendous amount of data in Coeus and the Data Warehouse that is also maintained locally because it is difficult to extract and/or combine with data from other systems. Often the data is viewable, but not useable in the way that the DLC needs.

(12) Wire transfers. The wire transfer/EFT/ACH system is very antiquated, slow and dependent on one or two people at MIT. In-house tracking of wire payments into the correct account is problematic.
Appendix C: Cultural issues and technologies for location-independent work

Creating the right cultural and organizational context for location independent work is critical for its success. For instance, here are some useful observations from documents prepared by Stanford and Case Western based on their experiences with distributed work:

1. "Information technology provides the backbone for the communication that must substitute for face-to-face interaction. You want distributed people communicating frequently and easily to make up for the loss of density of informal communication that takes place when people are collocated."

2. It is important to obtain support from senior administration (expressed in commitment to the community, financial support of the initiative, and support for utilization of this style of work where feasible).

3. It is also important to identify a critical mass of volunteer adopters (who are motivated not only by the dollars saved, but by the time saved.).

4. The program would launch most efficiently with a short term "program" staff to collect the data, disseminate information, develop solutions for implementation considerations, and advocate for and support the "use" cases.

5. According to the Telework coalition (www.telcoa.org) and New Ways of Working (www.newwow.net), many generations of employees seek flexibility in work location for a broad set of reasons. These sources also estimate benefits to the organizations, including a 22% boost in productivity, 12% boost in customer satisfaction, 26% increase in retention, 63% decrease in costs related to absenteeism, and 20% reduction in training costs.

Based on our reading of these and other documents, there appear to be many misconceptions about location independent work. The following table summarizes corrections for some of these common misconceptions:
<table>
<thead>
<tr>
<th>Location independent work IS …</th>
<th>Location independent work IS NOT …</th>
</tr>
</thead>
<tbody>
<tr>
<td>… a shift from the model of &quot;one person / one office&quot; to &quot;<strong>one person / one timeshared suite of offices</strong>&quot;*</td>
<td>… intended to create positions which are 100% on campus or 100% off campus</td>
</tr>
<tr>
<td>… a recognition that a material number of staff currently commute to campus, only to spend the majority of their time on the phone or connected to our digital enterprise or remote enabled systems (especially certain IT and financial positions)</td>
<td>… intended to create negotiations between two or more people who &quot;share&quot; an office, nor to create smaller offices for those that work off campus</td>
</tr>
<tr>
<td>… accomplished through: -- a review of current utilization of traditional office space.** Porous boundaries between DLC's would be required in order to gain &quot;clusters&quot; of offices that could be reallocated, releasing MIT’s use of rental space. --establishing reservation systems for &quot;touchdown&quot; or &quot;hotel&quot; spaces</td>
<td>… an &quot;accumulation&quot; of individuals who occasionally telecommute</td>
</tr>
<tr>
<td>… accomplished by reviewing positions that may take advantage of this</td>
<td>… meant to completely &quot;replace&quot; travel, nor to diminish opportunities for face to face interaction</td>
</tr>
<tr>
<td>… enabled by the development of incentives for those that voluntarily &quot;opt in&quot;</td>
<td>… feasible for every employee</td>
</tr>
</tbody>
</table>

* It is important to maintain the identity of departmental and center units for those who visit our DLC's. This reduces/eliminates reconfiguring of office space for this purpose.

** Stanford's study showed that offices were utilized only 30% of the time due to occupant's travel, meetings in other spaces, and current patterns of distributed work.
# Comparison of Video Conferencing Systems

<table>
<thead>
<tr>
<th>Features</th>
<th>Voice Only MIT VoIP Conference Call</th>
<th>* Hosted Conference Call</th>
<th>Voice plus presentation VoIP Web Conference Call</th>
<th>Video plus presentation Web Video Conference Call</th>
<th>Video Traditional Video Conference Call</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audio</strong></td>
<td>Telephone</td>
<td>Telephone</td>
<td>Telephone</td>
<td>Telephone</td>
<td>Integrated VoIP</td>
</tr>
<tr>
<td>Host Video - Low Res</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Host Video - High Res</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Attendee Video - Low Res</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Attendee Video - High Res</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Shared Presentation</strong></td>
<td>None</td>
<td>None</td>
<td>Yes - WebEx or Live Meeting</td>
<td>Yes - WebEx or Live Meeting</td>
<td>Yes - WebEx or Live Meeting</td>
</tr>
<tr>
<td><strong>Collaboration Tools</strong></td>
<td>None</td>
<td>None</td>
<td>Yes - WebEx or Live Meeting</td>
<td>Yes - WebEx or Live Meeting</td>
<td>Yes - WebEx or Live Meeting</td>
</tr>
<tr>
<td><strong>Multiparticipant Size</strong></td>
<td>2 to 5</td>
<td>2 to 20</td>
<td>2 to 20</td>
<td>2 to 6 participant cameras</td>
<td>2 locations</td>
</tr>
<tr>
<td>One to many size</td>
<td>N/A</td>
<td>Up to 125</td>
<td>Unlimited</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td><strong>Technology Required to Host</strong></td>
<td>Telephone, Web Access to MIT VoIP Portal</td>
<td>Telephone, Web Access to MIT VoIP Portal</td>
<td>Computer with Microphone and Speakers (headset), Web Camera, Web Browser, Reliable Internet</td>
<td>Computer with Microphone and Speakers (headset), Web Camera, Web Browser, Reliable Internet</td>
<td>TCP/IP or ISDN Video conferencing equipment</td>
</tr>
<tr>
<td><strong>Technology Required to Attend</strong></td>
<td>Telephone, Web Access to MIT VoIP Portal</td>
<td>Telephone, Web Access to MIT VoIP Portal</td>
<td>Computer with Microphone and Speakers (headset), Web Camera, Web Browser, Reliable Internet</td>
<td>Computer with Microphone and Speakers (headset), Web Camera, Web Browser, Reliable Internet</td>
<td>TCP/IP or ISDN Video conferencing equipment</td>
</tr>
<tr>
<td><strong>Ease of setup</strong></td>
<td>Easy</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Difficult</td>
</tr>
<tr>
<td><strong>Ease of use</strong></td>
<td>Easy</td>
<td>Easy</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Very Reliable</td>
<td>Very</td>
<td>High</td>
<td>High</td>
<td>Very</td>
</tr>
<tr>
<td><strong>Host Risk</strong></td>
<td>Very Low</td>
<td>Very Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Attendee Risk</strong></td>
<td>Very Low</td>
<td>Very Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Interoperability</strong></td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td><strong>Availability of Tech</strong></td>
<td>Very</td>
<td>Very</td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td><strong>Use Existing MIT Service</strong></td>
<td>Yes</td>
<td>Yes (up to 16 participants)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Use Existing MIT Partner</strong></td>
<td>N/A</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cost - Host equipment</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Web cam, sub $100 Panoramic Camera $3k Projector $3k Web cam, sub $100</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Cost - Attendee equipment</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Web cam, sub $100 Panoramic Camera $3k Projector $3k Web cam, sub $100</td>
</tr>
<tr>
<td>Cost - per meeting Standard phone rates</td>
<td>$.10 per participant per minute</td>
<td>$.20 per participant per minute</td>
<td>$.20 per participant per minute</td>
<td>$.20 per participant per minute</td>
<td>$.20 per participant per minute</td>
</tr>
</tbody>
</table>

Please Note- Costs are extremely rough. It is assumed that all participants have access to a telephone and a computer with Internet access
Appendix D: Background numbers (2008)

As part of our work, we examined a variety of data sources to get a sense of the overall magnitude and distribution of spending for IT at MIT. This appendix summarizes some of the key data we found on this topic.

Rough estimates suggest that there are about 600-700 FTEs in total involved with IT services throughout MIT. Roughly half of these FTEs are in the central IS&T department, and the other half are in various DLCs. Estimates of the total IT expenditure at MIT are in the range of $140-150M, including IT for research.

IT in DLCs

A number of DLCs (e.g., Broad, Libraries, Sloan) have more than 20 staff members each in IT, but many DLCs have only a few IT-related staff. Some of the DLC IT staff deliver unique, local services to the DLCs (e.g., OSP has IT staff for Coeus). Many DLCs also contract with IS&T for services.

IS&T

IS&T has a budget of around $67M, of which $46M comes out of the General Institute Budget. The remaining part is recovered through charges to the DLCs for services such as telephone and network, server operations, software licensing, training, PC repair, and other departmental services. Most of IS&T’s budget is spent on operations and maintenance, with a small fraction on innovation in services. Based on numbers from Peter Weill, it appears MIT spends less on innovation in IT services than comparable institutions.

The bulk of IS&T budget is FTEs. Roughly $15M in 2008 was spent on equipment. In 2008 IS&T employed approximately 320 FTEs, which are distributed among the following functions (this does not reflect the recent reduction in staffing for IS&T):

Administrative IT - 71
- SAP
- Shared Technical Services
- HR/Payroll
- Account/planning
- Admissions
- Student services

Client services - 112
- Computing Help Desk (CHD) (call center, PC/Printer/Software repair, Athena, Residential Computing, Walkins, Business Help, etc.)
- Departmental Consulting & Application Development (DCAD) (Web/db projects)
Departmental Information Technology Resources (DITR) including SLA, DITR+ (VIP support)
Software release and certification, licensing, Athena software, mobile support, contracts
Publishing, Training, Accessibility, ATIC & Usability
Voice over Internet Protocol (VOIP) and legacy telephony
Information Technology Security Support (ITSS)
Headquarters services and reporting, PMO, VoIP support, Management support

*Operations and infrastructure* (email, VOIP, network) - 60
  - Data center and colo (backup ....), 24x7
  - Core infrastructure
  - Cabling, network gear, networking

*Infrastructure development* (Kerberos, Stellar, ...) - 41
  - Data ware house, reporting support, BI tools
  - Stellar
  - Kerberos (50% funded by outside sources)
  - Identity systems, roles
  - Web service teams
  - Developer tools, collaboration, mobile, UI, Q&A

*VP office* - 30
  - Directors
  - Finance
  - Human Resources
  - Site support
  - Special projects
  - Relationship management

*Total IS&T* - 320

*Unit costs*

There were a number of places in our analyses where we needed to know the unit costs for various kinds of services (e.g., cost per telephone line), and we had to calculate (or have others calculate) these numbers on an ad hoc basis. We suspect that, in the future, MIT would be able to make better IT decisions if these unit costs are routinely calculated and used.
Appendix E: Organizational changes considered

One of the goals of our working group was to consider possible ways of reorganizing IT at MIT. To reduce the chances that we overlooked any major opportunities of this type, we systematically considered a comprehensive range of organizational change possibilities.

The framework we used is shown below. The rows represent a comprehensive (if not completely exhaustive) set of IT services currently provided at MIT. The columns represent three major types of organizational change we considered for each service:

1. **More decentralization** – moving functions currently performed by central IS&T to the DLCs
2. **More centralization** – moving functions currently performed by the DLCs to central IS&T
3. **More outsourcing** – moving functions currently performed by MIT employees (in either the DLCs or IS&T) to external vendors

Note that, in each case, we were not trying to assess whether the current arrangements were centralized, decentralized, or outsourced. Instead, we were only trying to assess whether changes in the direction indicated would be desirable.

For each cell of the matrix, we considered whether there were promising possibilities for making the organizational change represented by that cell, and we rated the promise of these possibilities as High, Medium, or Low. In most cases, we then prepared a more detailed SPI for the possibilities rated High.

The ratings were based upon (a) the technical and organizational feasibility of making the desired change, (b) the amount of potential savings, and (c) any other potential benefits. For example, some possibilities that were both feasible and desirable were rated Medium because, even though they might be good things to do, they did not promise the same magnitude of potential savings as the possibilities rated High.

This matrix-based analysis was done by a subset of the members of the working group who were knowledgeable about MIT’s current IT operations and about general possibilities in the industry. We believe that it would certainly be possible to do a more detailed analysis, but we think this “quick and dirty” approach helped us quickly focus our attention on the most promising possibilities.
Organizational change possibilities considered

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
<th>Potential desirability of organizational changes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>More decentralized</td>
</tr>
<tr>
<td>Email and calendaring</td>
<td>Email and calendar servers (to be used by multiple clients)</td>
<td>L</td>
</tr>
<tr>
<td>Help desk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voice and video</td>
<td>Telephone and videoconferencing</td>
<td>L</td>
</tr>
<tr>
<td>SAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data warehouse</td>
<td>Repository for storing and retrieving structured data</td>
<td>L</td>
</tr>
<tr>
<td>Course management</td>
<td>Teaching and learning software</td>
<td>L</td>
</tr>
<tr>
<td>Student systems</td>
<td>Administration, admissions, grades</td>
<td>L</td>
</tr>
<tr>
<td>Hardware and software</td>
<td>Selection, acquisition, installation, management, licensing</td>
<td>L</td>
</tr>
<tr>
<td>Data center operations</td>
<td>Servers, cooling, heating, etc.</td>
<td>L</td>
</tr>
<tr>
<td>Network</td>
<td>Wired and wireless</td>
<td>L</td>
</tr>
<tr>
<td>Storage</td>
<td>Backups, records retention</td>
<td>L</td>
</tr>
<tr>
<td>Application user experience</td>
<td>Usability, accessibility, training, publications</td>
<td>L</td>
</tr>
<tr>
<td>Authentication and authorization</td>
<td>Sign-ins, passwords, directory services</td>
<td>L</td>
</tr>
<tr>
<td>Mobile</td>
<td>Cellphones, PDAs, remote data access, mobile portal and applications,</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>development, security, support</td>
<td></td>
</tr>
</tbody>
</table>

**Key:**
H = High desirability  
M = Medium desirability  
L = Low desirability  
SPI = An SPI was developed for this idea
Appendix F: Members of the IT @ MIT Working Group

**Faculty**
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