‘Deploy or die’: The role of design in supporting entrepreneurial processes at the MIT Media Lab

Luca Simeone *
Malmö University
Ö Varvsg. 11 A, 205 06 Malmö (Sweden) &
Innovation Insights Hub
University of the Arts London (UK)
E-mail: me@luca.simeone.name
* Corresponding author

Structured Abstract

Purpose – Nowadays, thanks to conditions such as agile manufacturing (e.g., using affordable machines like 3-D printers, laser cutters, small CNCs or Pick & Place), low production costs and quick execution cycles, it is easier to turn ideas into a finished product ready to be distributed. Joi Ito, the director of the MIT Media Lab, created the slogan ‘Deploy or die’ precisely to encourage the researchers of the lab to take these conditions into consideration and to push their projects up to the production stage (and thus beyond the creation of a demo). This paper examines how design is used at the Media Lab to support this ‘deploy or die’ approach and, consequently, to foster entrepreneurial processes fuelled by the research activities of the lab. The paper contends that design activities - such as user research and user testing, rapid and frequent prototyping, visualization techniques, co-design, attention to the brand experience – contribute in igniting and sustaining the ‘deploy or die’ approach.

Design/methodology/approach – The study is the result of an investigation - also based on ethnographic methods – conducted by the author in the city of Cambridge, MA across 2011 and 2014. The application of an ethnographic approach with the direct involvement of researchers in the field has proven to be a common element of a good number of recent studies on organizations (Czarniawska 2012).

Originality/value – The study contributes to the ongoing discussions on how design can support entrepreneurship, with particular reference to the area of academic entrepreneurship.

Practical implications –The paper contends that design activities contribute in igniting and sustaining the ‘deploy or die’ approach and, consequently, could be adopted by research organizations to support operations in the area of academic entrepreneurship.

Keywords – Academic entrepreneurship, design, innovation, entrepreneurial process.

Paper type – Academic Research Paper
1. Introduction

Since its foundation in 1985, the MIT Media Lab has pioneered several innovative technologies ranging from educational toys (LEGO Mindstorms), to videogames (Guitar Hero), up to 3-D digital holographic printing, the MPEG-4 code, and many others. More than 80 external sponsors (mostly private companies such as: Sony, Hasbro, Google, Shell) support the lab with an overall annual operating budget of approximately $45 million¹. The lab also frequently collaborates with a wider set of stakeholders, such as other faculties within MIT or at other universities, government bodies and community-based initiatives. The Media Lab premises are located in Cambridge, MA, within the MIT main campus.

Design is used as a cornerstone of the educational, prototyping and production processes of the Media Lab. Nicholas Negroponte, founder and former director of Media Lab, coined the slogan ‘Demo or die’, to highlight how the lab relied on constructionist approaches (Harel and Papert 1991), where the very process of designing, making and prototyping was not only important for its educational outcomes, but also as a way of creating value together with the wide set of stakeholders that collaborate with the lab (Negroponte 1995; Brand 1987). The demos embody the knowledge produced by the lab, sparkle interest in external stakeholders and thus activate and sustain collaboration processes.

In 2011, Joi Ito was appointed new director of the MIT Media Lab and created the slogan ‘Deploy or die’. In Joi Ito’s vision, nowadays academia should go beyond prototyping (or creating demos) and get to the final implementation of innovative software and hardware products (Rowan 2012). Conditions such as agile manufacturing (e.g., using affordable machines like 3-D printers, laser cutters, small CNCs or Pick & Place), low production costs, quick execution cycles, easy access to web-based distribution channels (von Hippel 2005; Anderson 2012) are all at the basis of Joi Ito’s vision.

Within this context, this paper presents some initial reflections on how a designerly approach can support entrepreneurial approaches in academia. The paper contends that design activities - such as user research and user testing, rapid and frequent prototyping, visualization techniques, co-design, attention to the brand experience – contribute in igniting and sustaining the ‘deploy or die’ approach adopted at the Media Lab. Reflecting upon this specific case, the paper will offer considerations on how design can support entrepreneurial processes within academia. The remaining of the paper is organised as follows: section 2 introduces the theoretical background of the work; section 3 describes the research methods; section 4 illustrates the findings and section 5 presents concludes the paper with a short discussion.

2. Theoretical framework

2.1 The notion of design

In design research, literature and practice many different definitions of design are commonly used and they are generally quite fiercely discussed in venues such as the

One recurrent definition comes from the work of Herbert Simon, who defines design as "[devising] courses of action aimed at changing existing situations into preferred ones" (Simon 1982, 129). Simon’s book, The Sciences of the Artificial, is rooted into a positivist perspective, with a clear problem-solving approach. His definition reflects a vision where the design process is articulated into two phases of planning (“devising courses of action”) and implementation (“changing existing situations into preferred ones”). On the one hand, this definition works at a very general level to describe the purposeful creation of different kinds of artifacts, from ceramic pots dated to the Upper Paleolithic to a user interface for a touchscreen device. On the other, this definition is so ample that includes activities - such for example writing a novel - that are typically not associated with the work of a designer.

Richard Buchanan lists four areas in which design operates: symbolic and visual communication (for example, in graphic design, typography, photography, etc.); material objects (clothing, tools, vehicles, etc.); activities and organized services (for example, a marketing event); complex systems or environments for living, working, playing, and learning (for example, in the case of urban planning or systems engineering) (Buchanan 1992). These areas are not distinct and separate containers, but instead design processes tend to flow across these four categories. For example, designing a new material object – such as an electric car – has also to take into considerations both the symbolic and visual dimension and the wider environment in which the object will be used. Buchanan argues that Simon’s definition can tie together design activities across the four categories (and across different design disciplines) on a common theme: the conception and planning of the artificial.

Building upon Simon’s and Buchanan’s definitions, in this paper design is seen as composed of two dimensions:

- A way of thinking ("devising courses of action")
- A practice ("changing existing situations into preferred ones").

These two dimensions are strictly interrelated. The design practice unfolds in specific conditions and contexts and it is carried out using a variety of approaches and methods, such as user research and user testing, rapid and frequent prototyping, visualization techniques, co-design, attention to the brand experience, transdisciplinary teams. All these components mark a distinctive way of thinking about and approaching design problems (Buchanan 2004). This is a reflective practice where the very designerly acts of sketching, prototyping and making are also a way of thinking about a problem and elaborating potential solutions whilst in the making; this is a process that has been termed by Donald Schön as reflection-in-action (Schön 1983).

---

1 [https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=PHD-DESIGN](https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=PHD-DESIGN) accessed 22 July 2014.

2 This way of approaching design problems is referred to by some scholars as ‘design thinking’ (for a review of different positions in design thinking, see: Johansson-Sköldberg, Woodilla, and Çetinkaya 2013). In the rest of the paper, I will not specifically use the term design thinking. As authors like Donald Schön pointed out, in design, processes of thinking, reflecting and learning can be strictly entangled with the design practice (Schön 1983). I prefer not using the term design thinking, as, in my opinion, it does not immediately convey this entangled and nuanced dimension.
2.2 The notion of (academic) entrepreneurship

In their introductory book about entrepreneurial studies, Paul Westhead and Mike Wright show the multifaceted dimension of the notion of entrepreneurship:

The entrepreneur is: a person who assumes the risk associated with uncertainty; a person who supplies financial capital; an opportunity creator and innovator; a decision-maker; an industrial leader; a manager or superintendent; an organizer and coordinator of economic resources; the owner of an enterprise; an employer of factors of production; a contractor; an arbitrageur; an allocator of resources among alternative uses; a channel for the spillover of knowledge from a knowledge organization into a new firm to exploit the knowledge; an alert discoverer or seeker of opportunities (Westhead and Wright 2013).

It is here interesting to note how some of these dimensions describe the entrepreneur as someone who operates activating and managing connections, arbitrating among different stakeholders or acting as a channel for knowledge transfer. This notion of entrepreneurship can help in seeing the entrepreneurial dimension of academia. Today, entrepreneurship - in the form of intellectual asset management, university spin-offs and technology transfer and brokering - constitutes an important source of funding for academia (Wright et al. 2009; Shane 2004a; Shane 2004b; Wright et al. 2007; Wong 2011). The revenues generated by these forms of academic entrepreneurship are very important in terms of economic and financial viability for higher education, especially considering that in some contexts the access to government funding has become hard. Within this context, academia precisely operates activating and managing connections. Michael Gibbons et al. have proposed Mode-2 as a new form of knowledge production that emerged in the late 20th Century, in which the 'context of application' is a crucial component of knowledge production processes and practices (Gibbons et al. 1994). Traditional research (defined as Mode-1 knowledge production) is internally initiated in academic contexts by researchers and is carried out within disciplinary borders. On the contrary, Mode-2 knowledge production is context driven, and involves multidisciplinary teams brought together to respond to real-world problems and challenges (Nowotny, Scott, and Gibbons 2001; Gibbons 2000). Although this notion of Mode-2 has been criticized by some scholars, for example for not confronting problems of gender and colonialism adequately (Harding 2008), it still constitutes an interesting perspective on the needs to situate research beyond academic borders and in connection with external contexts. The triple helix (Etzkowitz 2008) is another influential model that positions innovation at the intersection of reciprocal relationships across academia, government and industry. Also the notion of academic entrepreneurship proposed by Bruce Kingma goes into this direction. Kingma does not deny the importance of processes such as marketability, entrepreneurial dynamics, profit-driven economics, but claims that the very process of engagement with the community is a key element for creating value. In more practical terms, although figures such as the number of spin-offs originated at a university are important, they should also be complemented by additional information, such for example how these spin-offs connect with and impact local communities. This paper builds upon this notion of academic entrepreneurship, which highlights its potential in terms of activating and managing connections.
2.3 Design to support entrepreneurial processes

Literature has investigated the relationship between design and entrepreneurship, for example studying their different languages, approaches and practices – both as taught in design schools or MBAs (O’Grady 2012) or in the daily processes of a company (Hirsch 2012; Borja de Mozota 2003; Best 2006). Other authors have praised the potential of a designerly approach to support entrepreneurship: Andrew Hargadon claims that design, armed with a unique set of abilities to communicate about and deal with the ambiguities of the early stages of new ventures, should be more proactively used in entrepreneurial settings (Hargadon 2005); along a similar line, Thomas Walton argued for the potential of design as an economic asset: “Within corporations large and small, and as corporations collectively power national and international economies, executives should count on design to make a meaningful contribution to prosperity” (Walton 2004, 10).

At a more operational level, the Design Management Institute proposed some criteria to be used to measure the contribution of design to business (see table 1).

Table 1. The contribution of Design to Business

| 1. Purchase influence/innovation | 6. Cost savings/ROI |
| 2. Enable strategy/new markets | 7. Customer satisfaction |
| 3. Enable product and service emotion | 8. Developing communities of customers |
| 4. Reputation/awareness/brand value | 9. Good design is good for all/triple bottom line |
| 5. Time to market/process improvement | DMI, 2007, cited in (Best 2010) |

Innovation is another topic frequently explored by authors who seek to investigate the relationship between design and entrepreneurship. Cruickshank proposes a review of the academic field of innovation and puts this in connection to a design perspective (Cruickshank 2010). Mike Hobday et al. adopt a management and economic perspective to analyze innovation and design (Hobday, Boddington, and Grantham 2011). Brigitte Borja de Mozota presents a categorization of different forms in which design can be integrated into an organization and how it can support innovation and value chain (Borja de Mozota 2006).

Table 2. The contribution of Design to Innovation and Value Chain

<table>
<thead>
<tr>
<th>Different ways in which design is used in organizations</th>
<th>The role of design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design as differentiator</td>
<td>Design as a source of competitive advantage and differentiation, through brand equity, customer loyalty, price premium, or customer orientation.</td>
</tr>
<tr>
<td>Design as integrator</td>
<td>Design as a resource that improves new product development processes (time to market, building consensus in teams using visualization skills); design as a process that favors a modular and platform architecture of product lines, user-oriented innovation.</td>
</tr>
</tbody>
</table>

1 Diagram adapted by the author from (Borja de Mozota 2006).
Design as transformer
Design as a resource for creating new business opportunities; for improving the organization’s ability to cope with change; or (in the case of advanced design) as an expertise to better interpret the organization and the marketplace.

Design as good business
Design as a source of increased sales and better margins, more brand value, greater market share, better return on investment (ROI); design as a resource for society at large (inclusive design, sustainable design).

The categorization presented by Borja de Mozota suggests an interesting perspective, as it provides an overview of the different ways in which design can be integrated into an organization and sees design as a managerial competency. This viewpoint is in line with some other scholarly work (Boland and Collopy 2004; Boland Jr et al. 2008), which precisely examines how design – as a way of thinking and as practice and set of methods – can be used in management.

In the rest of the paper, Borja de Mozota’s model will be therefore employed to investigate the MIT Media Lab and its use of design in the ‘deploy or die’ approach. As the model has been originally developed mostly analysing firms operating in the market – and not specifically research centers – the application of this model to the academic environment can sparkle reflections on some entrepreneurial trajectories of higher education.

3. Research approach

The study is the result of an investigation - also based on ethnographic methods – conducted by the author in the city of Cambridge, MA across 2011 and 2014. The application of an ethnographic approach with the direct involvement of researchers in the field has proven to be a common element of a good number of recent studies on organizations (Czarniawska 2012).

Data has been collected through archival research, direct observation, the author’s experience as participant, e-mail exchanges and semi-structured conversations.

The principles suggested by Yin (Yin 2009) for the process of data collection have been followed. Firstly, evidence was collected from different sources in order to check if there was convergence about the same findings. Secondly, a database to store all the empirical data from the fieldwork (including pictures, videos, notes and audio files) has been created, so that this material can be eventually accessed and verified by other researchers.

3.1 The Research context: the Media Lab and the ‘deploy or die’ approach

In 2011, Joi Ito has been appointed new director of the Media Lab. Joi Ito has an extensive experience in igniting, supporting and managing online communities, as he was an early investor in Twitter, Six Apart, Wikia, Flickr, Last.fm, Kickstarter, Pinwheel and
other Internet companies and as he sits on the board of Creative Commons, Mozilla Foundation. 

Joi Ito uses the term ‘antidisciplinarity’ to describe the environment of the Media Lab:

Today a couple of kids using open-source software, a generic PC and the internet can create a Google, a Yahoo! and a Facebook in their dorm room, and plug it in and it’s working even before they’ve raised money. That takes all the innovation from the centre and pushes it to the edges - into the little labs inside the Media Lab; inside dorm rooms; even inside terrorist cells. Suddenly the world is out of control ---- the people innovating, disrupting, creating these tools, they're not scholars. They don't care about disciplines. They're antidisciplinary (Rowan 2012).

This excerpt shows a specific orientation towards processes that are open, collaborative, unconventional, decentralized. Whilst these processes are typically applied to software, the conditions for extending this approach to the production of hardware and physical objects are nowadays emerging:

- The Media Lab is equipped with agile manufacturing machines, which can be used by students and staff not only to create prototypes, but also a certain number of final products
- This is also possible because of the lowered costs for buying and operating these machines
- It is also easier to distribute the final products, for example through existing e-commerce services
- In some cases, the design and production processes can be crowd-sourced or highly collaborative; for example, if a researcher is working on an Arduino-based interactive artefact¹, chances are that she can find online relevant information and possibly freely available components or similar projects already developed by the Arduino community. She can also find collaborators, partners and suppliers.

Joi Ito’s role is precisely to enable this new orientation towards deployment and manufacturing for the Media Lab, also thanks to his entrepreneurial experience and his connections with industry and venture capitalists.

4. Findings

4.1 How design supports the ‘deploy or die’ approach

Departing from Borja de Mozota’s categorization presented in paragraph 2.3, the paper will now show the different ways in which design is used to support the ‘deploy or die’ approach at the MIT Media Lab.

Design as differentiator

Design has been used as a way of repositioning the lab, mostly in light of Joi Ito’s vision. In this sense, design has been employed to create a new visual identity and some visual artefacts representing the new organizational principles of the Media Lab.

¹ Arduino is an open-source electronics platform based on easy-to-use hardware and software (http://www.arduino.cc/ accessed 10 March 2015).
The new visual identity has been designed by Pentagram partner Michael Bierut and reflects the multiple identities of the Media Lab. More than a single logo, the Media Lab now has an overarching logo and a specific logo for each of its individual departments. All the logos share the same visual grammar and they are built over the same grid and set of forms.

![Figure 1 The new logo for the Media Lab (2014)](image1)

The logos suggest that the Media Lab as organization praises the unique identities of the individual departments and at the same time offers an overarching, unified umbrella for all these departments. As described by Bierut, the new logos are “an acknowledgement that the Media Lab is not fixed in time or purpose, but can accommodate so many different ideas and directions in terms of what passes through it” (Brownlee 2014). Design has also been used to create visual artefacts that represent Joi Ito’s new organizational principles for the Media Lab.

![Figure 2 Logos for the Media Lab’s individual departments, sharing the same visual grammar and forms](image2)
This iconic representation has been consistently used in various ways: in official presentation materials, as a key section of the information architecture of the Media Lab website, as a downloadable element for the press from the Media Lab website and in public talks given by Joi Ito. Both the new identity and these visual artefacts are ways to strategically reposition the Media Lab and work on its brand equity.

**Design as integrator**

Design is also used to integrate ideas, competences and resources, thus leading to developing innovative products or services. In the past few years, Joi Ito promoted various design interventions in different geographic locations; for example, researchers and staff from the Media Lab used co-design methods and sought the engagement of the local communities, deploying technological interventions in Detroit and addressing issues such as the quality of air or urban regeneration. Design methods are an important component of these interventions as they allow:

- Involving local relevant stakeholders, for example inviting them to be an active part in the ideation phase and in the testing phase;
- Using iterative processes, where multiple prototypes can be rapidly released and tested in context of use, until the final product or service is finalized and locally deployed.

Industry members are also invited to participate to these co-design events, so that they can reflect upon further entrepreneurial and commercial activities. Design connects multiple stakeholders and invites them to be an active part of the development and deployment processes. Design therefore becomes a resource not only helpful for the ideation phase, but also oriented towards the final implementation and deployment of products and services.

**Design as transformer**

Design is at the very core of the Media Lab and, in Joi Ito’s vision, it is strictly coupled with manufacturing:
Your ability to contribute and participate to the design process changes significantly when you change the mode of manufacturing. We just sent a bunch of students to Shenzhen last year and they sat in the factories and started hacking in the factories. What the kids in Shenzhen do is they make cellphones in these factory lines. They make thousands of them, go down the stairs, sell them in the [local] stores and then they copy each other’s stuff, they go up and make some more [cellphones]. Every week they have a new model of cellphone... They are A-B testing... It’s agile software development for hardware. And you can only do that when you’re hacking on the manufacturing equipment (The Future of Making - SXSW Interactive 2014).

In a traditional manufacturing process, the production phase only starts when the design phase is completed. In agile manufacturing, the distinction between design and production can be more nuanced, as the design process can also continue throughout the production stage. Joi Ito is now trying to replicate this environment at the Media Lab. The Media Lab is also interested in studying how the interplay between design and deployment will change with advances in 3-D printing or genetic engineering or nanotechnologies. The work of researchers such as Neri Oxman⁷, Skylar Tibbits⁸ or Neil Gershenfeld⁹ goes into this direction.

In the ‘deploy or die’ approach, the boundaries between design and production are continuously challenged and, consequently, academia can host and drive manufacturing processes. In this perspective, design – coupled with agile manufacturing - is a resource to radically transform the Media Lab’s core abilities and potentially to create new business opportunities.

---

Design as a good business
Locally- or home-based manufacturing - using tools such as laser cutters, 3-D printers or small CNC machines - is not going to replace traditional, large-scale manufacturing, at least in the short run. Large-scale manufacturers still have a competitive advantage in terms of complexity of the products they can produce and distribute. Whilst nowadays with agile and low cost equipment it is relatively easy to create small and simple objects (e.g., a plastic toy soldier), it is more difficult to produce more complex products, such for example a fridge or a washing machine. Producing a complex product requires considerable organizational, financial and operational efforts, also because in most cases it is a production process that sees the interplay of various external suppliers and partners. Large manufacturers can also be more competitive in terms of production costs and capacity to secure sound financial, marketing and distribution strategies. In this scenario, locally- and home-based manufacturing can still play an important role in leveraging local capabilities in order to produce new small and simple objects or to finish more complex objects assembled somewhere else. Imagine the case of a mobile phone, which can be assembled in China and then finished somewhere else by a maker, with the addiction of some originally designed and custom-made 3-D printed covers. This is precisely one of the orientations of the design activities of the Media Lab and of the ‘deploy or die’ approach: the Media Lab is not interested in becoming a manufacturer and competing in the market with existing large-scale manufacturers; instead, the lab wants to create platforms or infrastructures that can enable and empower locally-positioned processes. Researchers from the Media Lab are currently working on projects originated from the lab in Boston and then instantiated in other geographic areas all over the world. This is a great way also to engage local communities in the design activities, in order not only to do typical user research and testing (discovering what the users want and need from a product or a service), but also to actively involve final users in collaborative processes such as hackathons or other DIY (do-it-yourself) design sessions.

5. Discussion and conclusion
This study explores how design can help academia in adopting entrepreneurial approaches and offers some reflections upon innovative models – based on the ‘deploy or die’ approach – that can reposition research and educational organizations. Table 3 summarizes the main findings of the study, showing how typical design activities - such as user research and testing, rapid and frequent prototyping, a consistent use of visualization techniques, attention to the brand experience, co-design – are instrumental in igniting and sustaining the ‘deploy or die’ approach adopted at the Media Lab.

1 Hackathons originated in the hacker culture as 24-48 hours events where participants gather for collaboratively developing software or building things. Hackathons can be considered part of the broader category of DIY events, where diverse stakeholders gather and spend a few hours together collaboratively working on specific issues, such for example a new medical device or a mobile app for cyclists. These events are very frequently organized across MIT, Harvard and many other organizations in Cambridge, MA.
Table 3. Ways in which design supports the ‘deploy or die’ approach

<table>
<thead>
<tr>
<th>Different ways in which design is used in organizations</th>
<th>The use of design at the Media Lab</th>
<th>In which way design supports the ‘deploy or die’ approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design as differentiator</strong></td>
<td>• New visual identity</td>
<td>Strategic repositioning of the lab in terms of a new organization also interested in manufacturing processes.</td>
</tr>
<tr>
<td></td>
<td>• Visual artifacts representing new key organizational principles</td>
<td></td>
</tr>
<tr>
<td><strong>Design as integrator</strong></td>
<td>• Application of design and co-design methods</td>
<td>Design and co-design processes become a resource not only helpful for the ideation phase, but also oriented towards the implementation and deployment of products and services in local contexts.</td>
</tr>
<tr>
<td></td>
<td>• Locally deployed design interventions</td>
<td></td>
</tr>
<tr>
<td><strong>Design as transformer</strong></td>
<td>• Strict interplay between design and production</td>
<td>Design – coupled with agile manufacturing - is a resource to radically transform the Media Lab’s core abilities. The lab can be an active player in the field of manufacturing research, technologies and processes, especially user- and community-driven.</td>
</tr>
<tr>
<td><strong>Design as good business</strong></td>
<td>• Designing platforms or infrastructures to enable and empower local communities</td>
<td>Design as a resource for society at large, deployed thanks to locally situated interventions, such as the creation of platforms or infrastructures.</td>
</tr>
<tr>
<td></td>
<td>• User testing and research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hackathons, DIY design sessions</td>
<td></td>
</tr>
</tbody>
</table>

5.1 How design supports entrepreneurial processes at the Media Lab

This study shows how design supports the ‘deploy or die’ approach and, consequently, fosters the related entrepreneurial dimension of the Media Lab:

- By repositioning the lab, also in terms of its brand equity
- By strengthening the ties with industry, interested in how the lab investigates, tests and directly adopts advances in manufacturing processes
- By providing Media Lab students and staff with a way of thinking and a practice, which is oriented towards engaging the final users in collaboratively designing, testing and finally deploying products or services. In this perspective, the Media Lab students and staff operate at the borderland of market-oriented industrial operations, and their patents or spin-offs can more easily appeal to external financial investors.
Having good ties with industry is of paramount importance for a lab located in an institution such as MIT. The revenues generated from external collaborations are nowadays crucial in terms of economic and financial viability of the institute.\(^1\) The ‘deploy or die’ approach is a way for the Media Lab to activate entrepreneurial processes, through patents, spin-off, private funding or other forms of collaboration. Design can be instrumental in igniting and sustaining the connections behind this entrepreneurial dimension.

**Acknowledgements**

The author wishes to express his gratitude to Giustina Secundo for her contributions to the paper and to the anonymous reviewers for their insightful comments. This work has also greatly benefited from the support of Giovanni Schiuma, Maria Hellström Reimer, Per Linde and the staff at MIT.

**References**


---

\(^1\) In the fiscal year 2014, 44% of MIT operating expenditures referred to sponsored research ($1,283.2 million); during the 2013–2014 fiscal year, organizations and individuals gave or pledged a total of $458 million (http://web.mit.edu/facts/index.html accessed 15 March 2015).


