



## **Task Force on Supporting Research, Creativity and Collaborative Innovation**

### **Work Group 4: Increasing Collaborations**

This Research Task Force is asked to evaluate how we can construct a more effective research infrastructure that supports the advancement, financial support, and visibility of research, creative works and innovation at Brandeis that promotes our historical strength in collaboration and exploring across boundaries. Within this broad mandate, working group #4 (WG#4) was specifically tasked to analyze possible ways to increase collaboration with industry, other universities and foundations. The following broad questions were posed for WG#4:

- 1) How do we promote more industry collaboration while increasing the income from IP licenses and agreements?
- 2) What other partnerships with universities and foundations should we be pursuing and what barriers may be preventing such partnerships?
- 3) How do we increase our federal funding and identify new foundations, corporations and private philanthropists for support of our research and scholarship including the arts and humanities?

We solicited input from the following groups across Brandeis:

- 1) All Centers and Institutes on campus
- 2) Hiatt Career Center
- 3) Rabb School of Continuing Studies
- 4) Dept. chairs from Biochemistry, Biology, Volen Center, Theater Arts
- 5) Some specific faculty members.

WG#4 had three meetings and discussion among its membership on these issues. The following data were collected (appendices available on request)

- Research funding at comparable universities from various sources (Appendix A).
- Experiential learning projects (Appendix B).
- Top 10 existing connections - Hiatt Career Center and the Rabb School (Appendix C).
- Collection of responses from Centers and Institutes (Appendix D - still being finalized).

## **Executive Summary**

### **1. What do we propose?**

Establishment of a University-wide Research and Computational Analytics Knowledge Lab (LAB from here on). The LAB is a platform fostering cross-disciplinary applied research, fueling the integration of ideas and attracting funding and engagement from external partners including corporations, foundations, and government entities. While the primary research engine driving the LAB would be built around applications of data science, predictive analytics, and machine learning, to different research fields including business, humanities, social sciences, and natural sciences; the LAB will also serve as a collaborative research platform for the Humanities, Humanistic Social Sciences and the Arts. The vision is to have a central collaborative research facility that facilitates ideation and spillovers across disciplines.

### **2. Why?**

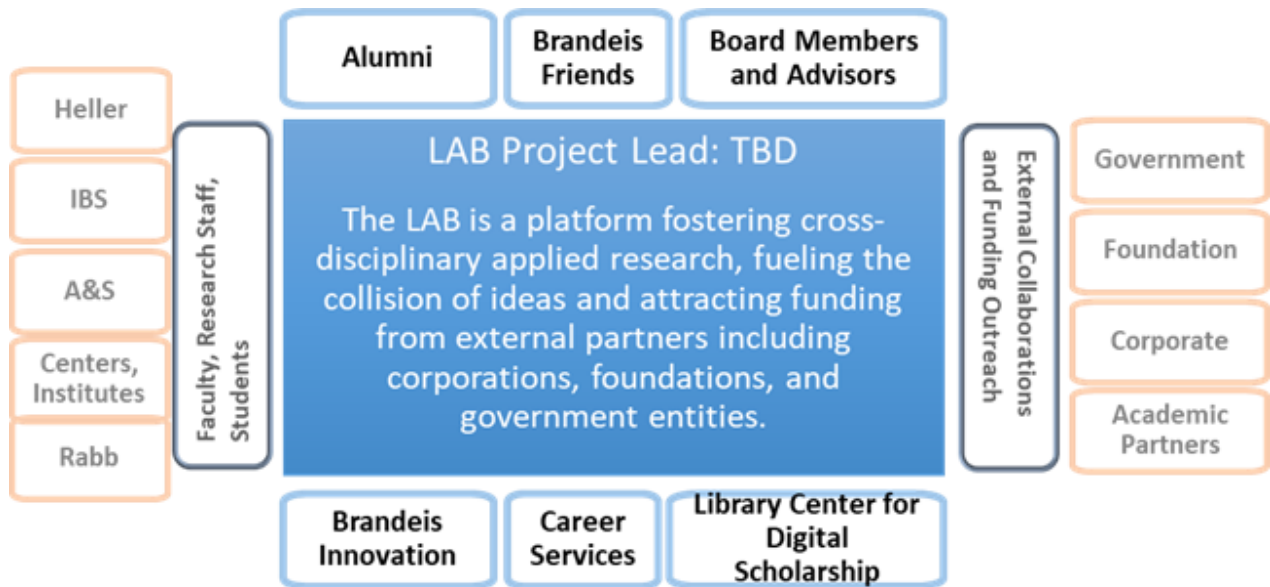
The proposal tackles two core components forecasted to define the future of work, education, and research:

- Interdisciplinary approach: research and training enabling the cross-pollination of ideas, where researchers and students collaborate on real-world challenges and context-specific programs across disciplines. The proposal imagines expanding experiential learning goals and the success we have with the collaborative interdisciplinary culture across the Sciences to the rest of the University. With our unique size and quality of research combination, we are distinctly positioned to further make Brandeis a place of transformative creativity and collaboration.
- Data-driven innovation: with the world generating 2.5 quintillion bytes of data every day, the ability to interpret and apply those portions applicable to society can have profound impacts for humanity. The proposal leverages the prevalence of both quantitative and qualitative data and application of data analytics in different fields including computational linguistics, neurobiology, social policy, health policy, political science, economics and finance, computer science or marketing.

### **3. Structure**

The Structure of the LAB will be representative of the collaborative environment it aims to create across campus, engaging a wide spectrum of stakeholders. A visual representation follows below:

Figure 1 Diagram depicting how the LAB will become integrated across the university with stakeholders in all divisions and schools. The LAB is thought of as a networked platform for collaboration and innovation that can connect researchers with end users. End users may be found among colleagues in other departments and schools, at other universities and in the private sector, or among federal and state-level sponsors.



## 4. Implementation

**Phase 0: Create a working group to build a grant proposal & identify academic and administrative project leads. Apply to Provost Research Award to cover initial research costs.**

Potential grant sources:

- NSF 18-511: Partnerships for Innovation - the grant “supports a research consortium ecosystem focused on a clear project thrust. It allows for partnerships between academic researchers and a variety of third-party organizations (such as industry, non-academic research organizations, federal laboratories, public or non-profit technology transfer

organizations, and/or other universities) to conduct applied research in highly collaborative, multidisciplinary teams, on problems typically beyond the reach of a single researcher.<sup>1</sup>

- Google.org is issuing an open call to organizations around the world to submit their ideas for how they could use [AI to help address societal challenges](#). Selected organizations will receive support from Google's AI experts, Google.org grant funding from a \$25M pool, credit and consulting from Google Cloud, and more.
- The Mastercard Center for Inclusive Growth and The Rockefeller Foundation are pioneering a new approach to data science for social impact. The two organizations have founded the [Data Science for Social Impact Collaborative](#) to help bring systemic change to the way that the social sector is able to use and apply data for good. The initiative is a new approach to collaborative philanthropy, with \$50 million in initial funding and an invitation for others to join the mission.

**Phase 1: Upon acquired initial funding, establish the structure of the LAB and initiate pilot projects. Prototype version of the LAB:**

- Provide support infrastructure including server space, Project Leads turns into full-time position.
- Identify Faculty Champions across departments; create a repository of research expertise and interests. Applied research at the LAB will build on Brandeis' existing research strengths and needs to scale organically with growth in cross-disciplinary research interests.
- Source projects, closely collaborating with alumni, Brandeis supporters and Board members.
- Create clear opportunities for cross-disciplinary collaboration, involving faculty, students and research staff.
- Create student experiential learning projects in multiple disciplines.<sup>2</sup>
- Disseminate findings through blog posts, whitepapers to raise visibility.

<sup>1</sup> <https://www.nsf.gov/pubs/2018/nsf18511/nsf18511.htm>

<sup>2</sup> Please see Appendix B for an explanation of analytics based experiential learning projects that are currently part of the core curriculum at IBS. Please also see "A Collaborative Research and Creativity Community for the Humanities, Humanistic Social Sciences, and the Arts" based on the QBRc model, developed by Professor Eric Chasalow.

**Phase 2: Create a capital campaign to raise funds for establishing the physical presence of the LAB. Explore Corporate/Foundation naming gifts for different verticals within the LAB.**

- Provide physical space for faculty/researchers/staff/practitioners/community leaders to meet, engage in various exchanges and events. The LAB might be co-located with other related entities, such as the Office of Technology Licensing, Hassenfeld Family Innovation Center, the MakerLab, Brandeis University Press, etc.
- Build a team consisting of 1 or 2 additional members, supporting the operations and fundraising for the LAB.

## **5. Sustainability**

The LAB will have a strong external-facing component, elevating Brandeis' profile in using cutting-edge research to solve important local, national, and global challenges. The operations of the LAB are expected to be externally funded through:

- Sponsored applied research projects.
- Foundation funding to build solutions to pressing societal challenges.
- Government funding to create solutions addressing important local and national social and economic issues.

## **Summary of Discussions: Proposal for Innovation LAB**

- The main idea coming out from WG#4 discussions is that Brandeis will benefit from a greater degree of interdisciplinary collaborative research. Such collaborative research should be the driving factor that spurs innovative interdisciplinary projects across the entire University.
- Common Thread that potentially ties researchers across the University:
  - Discussions suggest that the common thread that connects almost all departments and schools within Brandeis is the prevalence of both quantitative and qualitative data and application of data analytics in different fields, whether it be in computational linguistics, neurobiology, social policy, health policy, political science, economics and finance, computer science or marketing. With the world generating 2.5 quintillion bytes of data every day, the ability to interpret and apply those portions applicable to society can have profound impacts for humanity. This requires increased collaboration both within and across disciplines in Business, Humanities, Social Policy, Social Sciences and the Sciences. Applied research using such quantitative and qualitative data that integrates these ideas in different

fields also provides the potential for the development of innovative project ideas for students and interested faculty.

- Why is there need for interdisciplinary research?
  - In many situations, techniques and methodology used in one field may be applicable for solving a problem in a different field. For example: research that underlies image layering or image differencing may have very different applications in astronomy, biology, computer science, geography, and real estate finance. If one of these departments has a researcher with expertise in this area, it could easily influence research projects in other fields, giving rise to joint inter-disciplinary research.
- To facilitate such inter-disciplinary research interactions and given the common thread of data analytics that is prevalent across disciplines, WG#4 proposes the establishment of a University wide Research and Computational Analytics Knowledge Lab (LAB from here on). The LAB will facilitate efficient cross-disciplinary applied research that would help build external collaborations, and attract grants and funding from Corporations, Foundations, Governments and other external partners. The LAB should be considered a central research and meeting platform for the exchange of ideas, between researchers, students, alumni, and our various board members, facilitating projects that focus on cutting-edge applied research across disciplines.
  - WG#4 also proposes that the primary research engine driving the LAB be built around applications of data science, predictive analytics, and machine learning and AI, across different fields in Business, Humanities, Social Policy, Social Sciences and the Sciences, thereby drawing interested researchers from across disciplines to collaborate within the LAB.
  - In addition, the LAB should also serve as a central facility for humanities or ethnographic researchers who are not oriented towards big-data analytics. Community interactions and broad-based conferences (along the lines of the Sawyer Seminars), and collaborations between scholars and artists through exhibitions, performances, or other projects will also be facilitated by the LAB.<sup>3</sup>
  - In addition, along with the gradual development of the LAB, dedicated programming that cuts across research “verticals”, potential “partner” talks, and experiential learning

<sup>3</sup> <https://mellon.org/programs/higher-education-and-scholarship-humanities/sawyer-seminars/>

courses for undergraduate and graduate students should be facilitated if there is a growing interest among LAB members to engage in such activities.<sup>4,5</sup>

- The specific goals for this LAB can be thought of as follows:
  - (1) To provide a common platform that supports researchers from across disciplines to conduct research and present their work. Primary research support will be to help write and source grants and sponsorships for researchers across disciplines. The overhead from these grants should support the operational administrative overhead for the LAB (this is similar to the existing model in the Sciences). The funding model for this LAB should be similar to that of MRSEC or a hybrid model that integrates corporate and foundation grant support together with an endowment for the LAB raised from Corporate, Community, or Foundation sponsors. The LAB should also cross-appoint a few faculty members/researchers, who are excited to explore/conduct research that leverages data analytics and/or other qualitative data analysis. Such research would also require significant support from the Library's "Center for Digital Scholarship" or the equivalent library department, to support all computing and database management systems and requirements.
  - (2) To provide a venue that facilitates interaction (through seminars and symposiums and invited presentations) between researchers in the LAB and corporate researchers (such as from Google or Astra Zeneca or Fidelity), or community policy makers (such as Waltham Chamber of Commerce, Massachusetts Clean Energy Center, Federal Reserve Bank of Boston etc.). In addition, the LAB should also proactively engage with the advisory Boards of the University and the various professional schools, and interested alumni, to provide updates and solicit feedback on the activities and involve them in different events. Finally, such a LAB should also actively integrate itself as a thought leader in data analytics among other Boston area Universities and research centers, which may increase research collaboration among the greater-Boston area

<sup>4</sup> Partner refers to potential funding partners, whether they be Foundations, Corporations or other Community focused organizations that are interested in collaboration and where the end objective is beneficial to both Brandeis and the collaborating partner.

<sup>5</sup> An example of early programming the cuts across research verticals could simply be a seminar series with presentations that are targeted to a general audience, such as in the "[Science Café](#)" seminars or the "[Bridging the Two Cultures](#)" symposium. Over time, with more faculty and student involvement and interest, further inter-disciplinary programming should be developed.

schools. This function will also require administrative and staff support that is mentioned later in this document.

- Current State: Even though there is a significant history of collaborative research within the Sciences at Brandeis, such collaboration is infrequent elsewhere at the University; between the Heller School for Social Policy and Management, Humanities, International Business school, Social Sciences, and the Rabb School of Continuing Studies, both across these schools and between each of these schools and the Sciences. Currently, there is no common platform that facilitates such interdisciplinary interactions across the entire University.
- We have a lot to gain by developing a collaborative inter-disciplinary culture across the University. The Sciences provide a great example of an integrated, efficient approach for nurturing a collaborative research environment. Discussions point to this uniqueness being an attractive feature that lets us attract great research faculty in each of the science departments. While some research collaboration does exist intermittently throughout the rest of the University, it is relatively rare and driven by chance. The primary vision of this proposal is to provide a well thought out infrastructure, based on a data driven engine, to make applied research collaboration efficient within the rest of the University, both between the Sciences and the rest of the University and between each of the other schools. We are large enough to have multiple Schools and expertise in various fields, and at the same time small enough to explore setting up an applied data driven innovation LAB that cuts across schools and disciplines, while taking advantage of the various academic, corporate, and foundation connections that exist throughout the University.

## **Summary of Discussions: Uniqueness and Sustainability of LAB at Brandeis.**

- Such LAB's that are focused on "data" as their core research engine and applied inter-disciplinary research as their core methodological approach, are starting to become common. Below are a few selected **local** examples:<sup>6</sup>
  - Example 1: [Ideas 42](#)
  - Example 2: [MIT Probabilistic Computing Project](#)

<sup>6</sup> There are several other similar research labs at Universities and corporations, for example: Stanford University - [IRiSS](#); [Microsoft](#); Cornell - [CSS](#); University of Washington - [CSSCR](#); [IBM](#); UC Berkeley-[D-Lab](#); UNC Charlotte-[Data Science Initiative](#)



- Example 3: [UMass Computational Social Science Institute](#)
- Example 4: [Abdul Lateef Jameel Poverty Action Lab](#)
- Example 5: [Northeastern University - Lazer Lab](#)
- Applied research in the LAB necessarily needs to build on Brandeis’ existing research strengths. The LAB should facilitate and promote interdisciplinary applications of existing cutting-edge research that is already carried out within the University.
- Given Brandeis’ core values, the LAB should be initially focused on innovative interdisciplinary research on “transformational ideas” that are of critical importance for society. Examples of such ideas are those related to climate change, wealth inequality, ethics and AI, and so on. This would allow us to establish a unique applied research platform at Brandeis, that distinguishes us as a producer of innovative interdisciplinary, evidence-based research for the community.

## **Summary of Discussions: Operationalizing the LAB**

- It is critical that the LAB grows organically with participation from affiliated faculty and staff who share such similar interests of applying data science, predictive analytics and AI in their respective disciplines and have an interest in interdisciplinary research. This is extremely important for the long-term sustainability and growth of the LAB. Our understanding is that there currently exists several such interested faculty members across different schools.
- Wide dissemination of research and community development projects through whitepapers, blog posts etc. should be a large priority, to achieve quick success in raising funding. This dissemination should be in addition to academically published journal articles, books, monographs etc.
- Provide a physical space for faculty/researchers/staff/practitioners/community leaders to meet, engage in various exchanges and events. The LAB might be co-located with other related entities, such as the Office of Technology Licensing, Hassenfeld Family Innovation Center, the MakerLab, Brandeis University Press, etc. This can also be the “sandbox” for faculty and industry practitioners to interact – involving our Boards and alumni is critical in this respect. Such interactions will not only inform potentially new research avenues, but also serve as potential opportunities for soliciting sponsored applied research projects.
- Provide support infrastructure and both academic and senior administrative staff for the LAB. It should be noted that though academic leadership is essential for the success of this LAB, the faculty position may be a joint appointment with one of the Schools. As

noted by several members, support for grant writing is foremost, followed by operational and administrative functions of running the LAB, outreach functions to engage corporate, community and foundation interaction with the LAB are all essential elements to make this successful. Infrastructure support includes server space, and software and hardware support along with security features that would allow storage and safe handling of data. It is our understanding that some excess capacity on this front exists at the University (or is planned at the Library to increase capabilities for enhancing support for digital scholarship), which could provide the initial computational support infrastructure. Staff support should also include strategic leadership provided jointly by senior academic and administrative staff. Other staff support for administrative duties, corporate relations and other related activities are essential.

- If there are interdisciplinary projects that receive financial support from the Provost research grants, such projects could also be “starter” projects for this LAB, once it receives or is able to raise some seed fund to get it started.
- The LAB should provide undergraduate and graduate students opportunities for experiential learning and engaging in applied interdisciplinary research. Experiential learning projects could initially be sourced through the connections of the various board members throughout the University.<sup>7</sup>

## **Summary of Discussions: Funding the LAB and continued Financing**

- Provide initial seed funding for the LAB from the Provost Grants, a framework for which is being proposed by WG#3 of this Research Task Force.
- There are various sources to fund the LAB and research projects at the LAB, particularly from government and foundation grants and corporate funds as well as through a capital campaign. WG#4 envisions the LAB as the foundation for a capital campaign on innovation. We also see this as a naming opportunity that may be particularly attractive for a corporate entity with similar interest and focus on cross-disciplinary data analytics applications. Corporate involvement in applied data science is increasing. In a way, the LAB could be thought of as “suppliers” of solutions for the problems that are at the core of the missions of Governments, Foundations, the business models of Corporations, and the development & socio-economic growth of the Community.
- A few recent examples of such funding sources:

<sup>7</sup> An outline for sourcing potential experiential learning projects is included in Appendix D.

- The Mastercard Center for Inclusive Growth and The Rockefeller Foundation are pioneering a new approach to data science for social impact. The two organizations have founded the [Data Science for Social Impact Collaborative](#) to help bring systemic change to the way that the social sector is able to use and apply data for good. The initiative is a new approach to collaborative philanthropy, with \$50 million in initial funding and an invitation for others to join the mission.
- Google.org is issuing an open call to organizations around the world to submit their ideas for how they could use [AI to help address societal challenges](#). Selected organizations will receive support from Google's AI experts, Google.org grant funding from a \$25M pool, credit and consulting from Google Cloud, and more.
- MacArthur Foundation announced their second 100&change competition. [100&Change](#) is a competition for a \$100 million grant to fund a single proposal that promises real and measurable progress in solving a critical problem of our time. We consider proposals from any field or problem area.
- While continued funding for the LAB could be addressed through a capital campaign and a naming endowment. Partnerships with corporations and foundations for continued support should also provide funding opportunities. The LAB could serve as a central platform for supporting sponsored research, including providing administrative support and research staff and infrastructure support. It is critical to clearly define the core value proposition of the LAB to potential funding partners. In our mind, the core value proposition will be our ability to successfully develop the culture of interdisciplinary applied research in data science across the University.

## **The LAB and the Hassenfeld Family Innovation Center (HFIC)**

The HFIC currently provides a central hub for all activities around research innovation. According to a recent report, "Innovation That Matters 2016," by the U.S. Chamber of Commerce Foundation, FreeEnterprise.com and a public benefit corporation called 1776, Boston ranks number 1 among the top 25 startup hubs in the U.S. Brandeis University is the only research institution in Massachusetts situated on the Route 128 suburban beltway that circles the city of Boston. Within Waltham and surrounding communities lie a multitude of high tech and biotech companies including Astra-Zeneca, Biogen, Oracle and Raytheon. Communities along Route 128 have surpassed Cambridge in growth of lab space, adding 1.2 million square feet between 2007 and 2012. With the establishment of HFIC and additional funding from NSF I-Corps, Brandeis aims to capitalize on Boston's startup culture and our proximity to technology companies located in the area.

We see the LAB as an enabling mechanism for the success of HFIC programs in areas other than the Sciences. The culture of rigorous interdisciplinary scientific research at Brandeis has so far

resulted in successful commercialization of several technologies, through OTL. However, the same degree of success has not been achieved in other disciplines, primarily because the research behind the “applications” mostly happen simultaneously within the Spark, or iCorps programs, which is inefficient for the following reasons:

- (i) There is not enough time to completely devote to rigorously conducting the research behind the application, which is the commercial “product”.
- (ii) This is not ideal, since many times the final research may indicate a different outcome.

With the rise of analytics and machine learning and data driven commercial approaches in almost every field, the LAB will be able to provide the necessary rigorous applied research infrastructure and support that needs to first happen, thereby enabling the pitching of much refined and well-developed applied projects that have commercialization potential. The LAB could provide the building blocks for AI driven social impact ventures; integration of natural language processing in finance applications for potentially developing Fintech ventures; integration of predictive analytics in healthcare ventures; addressing crime and terrorism through income inequality and social justice approaches and many more. The ability to develop and conduct these and similar inter-disciplinary research rigorously will enable some of these projects to end up with a higher probability for potential commercialization, that will support the success of OTL and HFIC.