UNIVERSITY of VIRGINIA

STRATEGIC INVESTMENT FUND
PROJECT BUSINESS PLAN

PROJECT NAME:

Launching the Link Lab: a model of collaborative, interdisciplinary engineering research

PROJECTED BEGIN AND END DATES:

Aug 2016 - Aug 2019

EXECUTIVE SUMMARY:

Society's biggest Grand Challenges today -- energy, health, transportation, and environment -- can only be addressed when scientists and engineers from different disciplines work together. However, interdisciplinary research and training is harder to do when academic institutions are organized according to conventional disciplinary silos.

With the proposed funds, we will launch a visionary new laboratory to support collaborative, interdisciplinary research and training. The lab will be called the Link Lab because it will "link" multiple departments through cross-cutting mechanisms such as shared lab space, grant-management and fundraising support, and mentoring that bridges multiple disciplines.

By promoting collaboration across departments, the Link Lab will help build critical mass and increase visibility in an important cross-cutting research area, despite our small size compared to other top engineering shools. The Link Lab is a cornerstone in the E-school's larger strategy to "punch above our weight" through cross-cutting initiatives, which also includes an increased focus on interdisciplinary hiring, joint appointments, and revised P&T guidelines that reward and recognize interdisciplinary research.

The Link Lab will be the first of several cross-cutting labs and will serve as a model for the future of the E-school, ushering in a new paradigm of interdisciplinary collaborative research and training in engineering.

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PROJECT MANAGERS' NAMES & TITLES:

Kamin Whitehouse, Link Lab Director and Commonwealth Associate Professor of Computer Science

KEY STAKEHOLDERS:

The Link Lab includes 23 faculty (15% of the E-school) from 5 departments in the E-school: Civil Engineering, Computer Science, Electrical Engineering, Mechanical Engineering, and Systems Engineering.

Approximately 18 of these faculty have already agreed to relocate their research groups in an interdisciplinary Link Lab space to facilitate collaboration, co-advising of students, and pooling of equipment across departments. This high level of buy-in is indicative of the unmet needs and untapped opportunities that the Link Lab would fulfill.

PROJECT DESCRIPTION:

The mission of the Link Lab is to enhance excellence in Cyber-Physical Systems (CPS) research: the science and engineering that bridges the gap between the cyber- and physical-worlds. CPS is an interdisciplinary field that is not well supported by traditional disciplinary study even though it is fundamentally changing the way that engineers think about societal grand challenges like transportation, energy, environment, and healthcare: just as the Internet revolutionized the business and social worlds, CPS technology will revolutionize the physical world. The Link Lab will support cross-cutting research that transcends traditional disciplinary boundaries, positioning SEAS to be a world leader in this important and emerging area.

The proposed funds will be used to launch the Link Lab, including 2 essential components:
1) Create a space to support collaborative research. The Link Lab will be the first truly collaborative space in SEAS that will house students and faculty from different departments. The planning and design of the Link Lab space is already ongoing and funded by the E-school. The proposed funds would cover construction costs.
2) Administrative research support, including a research scientist, administrative support, and an industry liason to facilitate sponsorship and funding from industry and foundation partners. This support will be covered 100% the first year, 66% in the 2nd year as external grants and gifts begin to increase, and 33% in the 3rd year with the plan of total self-sufficiency in the 4th year due to increased grant funding from the new collaborations enabled and propelled by the space and staff support.

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PROJECT OBJECTIVES

Goals:

The Link Lab will house approximately 18 faculty, 105 students, 3 research scientists, 3 staff, and 6 post-docs. The lab will include brainstorming and interaction spaces including shared lab equipment, team rooms, and brainstorming space. An open floor plan will promote cross-pollination between research groups while at the same time using furniture and layout to provide sound insulation and reduce interruptions. The space will also include numerous "touchdown" spaces and "hotel" desks to facilitate collaborations with visiting researchers from other labs and other universities.

The research scientist will support research through both lab management and grant writing. The industry liason will increase funding and engagement from industry partners, supporting a critical mass in CPS research created by the Link Lab. Both staff members would be largely self-funded in the long term.

Milestones:

Construction Milestones

- Oct 14, 2016 -- Complete preliminary design
- Nov 15, 2016 -- Demo construction begins
- Jan 3, 2017 -- Final, approved construction documents
- Jan 9, 2017 -- Renovation construction begins
- Aug 1, 2017 -- Move in

Staff Milestones

- Aug 1, 2016 -- Recruiting Begins
- Oct 1, 2016 -- Onboarding begins
- Apr 1, 2017 -- Launch of initial Industrial Advisory Board

Measurable Outcomes:

Interdisciplinary research outcomes

- -- joint proposals and grants
- -- co-advised students
- -- joint papers
- -- total external funding per member
- -- total research supported (expected $10-12 million in annual research expenditures)

Staff outcomes

- -- IAB membership
- -- industrial sponsorhip
- -- grants and projects supporting research scientist
- -- proposals co-written by research scientist

RISK MANAGEMENT PLAN

Key Success Factors:

Construction:
- participation of Link Lab members in the design process
- effective space management before, during and after construction
- adequate funding

Staff:
- ability to find and recruit top talent
- ability of staff activities to become financially self-sustaining

Risks to Project Success:

Project costs could run over budget or behind schedule due to unexpected issues with construction or mechanical systems.

The research scientist must be able to contribute to enough research projects to support themselves, and must be able to find enough collaborators for writing new grant proposals. This risk is mitigated by the fact that the Link Lab members, including 5 new hires this year, create a critical mass that covers several separate but closely related technologies, making it easier for a research scientist to find support from at least one of the 23 faculty in the Link Lab.

To sustain long-term relationships with industry, Link Lab research must meet a range of needs, including early-access to both new discoveries and translational research.

Risk Mitigation Strategies:

Many strategies and steps have been and are being taken to mitigate the construction risks described above. The first floor of Olsson Hall was recently renovated and so the building has already been surveyed, reducing the risks of surprises during construction. The mechanical systems in all of Olsson Hall were also recently renovated, reducing the risks that we find unexpected issues with the mechanical systems. We have already completed schematic design and the design team meets on a weekly basis. We have also established a project steering committee that meets on a bi-weekly basis to keep the project on schedule and to ensure that all stakeholders are engaged with design and space management. The Link Lab members periodically meet to discuss and give feedback on design.

The critical mass produced by the Link Lab offers a broad research portfolio that is sufficiently focused on CPS to support a research scientist and engage industry. The space is being designed to facilitate a visitor experience so that partners and visitors can quickly get a feel for the breadth and depth of Link Lab research.

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FUNDING REQUEST:

Total Amount:
$4.5 million

Granted In Increments Over What Period:
$4.25M in '16/'17
$165K for '17/'18
$82.5K for '18/'19

FINANCIAL PLAN:

(Please Attach the Following, as applicable)

Cash Flow Forecast

- Show inflows and outflows
- Self-sustainability and potential pay back

Performance Metrics

- Include qualitative and quantitative metrics
- Quantitative may include ROI or break-even analysis
- Describe the events that would activate an exit strategy
- Describe the plan for exiting the investment

SUBMITTED BY:

Name:  **Date:** 19 July 2016

Craig H. Benson, Dean, School of Engineering

UVA Strategic Investment Fund
Proposal Addendum

This addendum is intended to confirm the requestor's commitment to project metrics and to a plan for sustainability beyond the term of Strategic Investment Fund support.

Proposal: 58

Title: SEAS Link Lab

Additional Information Requested by Advisory Committee:
The Advisory Committee asked how outcomes would be different if this proposal were funded at a lower level ($3.5M rather than the $4.5M originally requested). Construction costs estimates have increased since the project was initially developed, bringing the project request to $4.81M. If necessary project scope could be revised downward to $4.38M but it would eliminate several positions necessary to make the Link Lab sustainable.

Options for reducing project budget
At the time of proposal submission, UVA Facilities Planning & Construction (FP&C) estimated a renovation cost of $4.08M, using the cheapest of three levels of construction ($190/sf) plus furniture costs, as shown in the *Conceptual Cost Estimate*, dated May 6, 2016. Unfortunately, FP&C has since increased that estimate. Even while reducing scope of the project to a "Hybrid" option in which only half of the space is renovated while the other half receives "light" updates, the renovation estimate has increased to $4.31M. This new estimate is detailed in FP&C's *Olsson DRAFT budget*, and already includes an estimated reduction of $120K from a SEAS contribution and $200K that is expected from maintenance reserves. No further reduction in scope is possible. We explored two other buildings for renovation besides Olsson Hall, but after 8 months of planning FP&C has not identified any other option that could meet the Link Lab needs with lower capital investment.

In light of this increase, the total requested budget has changed to $4.81M, including the three staff members described above. If the budget for this project were reduced below this amount, it would first impact support for the research scientist and industry liaison, the hiring of whom could be postponed until additional funding is secured. The first year after Link Lab's launch, however, would be the best time to take advantage of new opportunities for industry partnerships and research projects.

At least one administrative staff member is necessary to launch and operate a new lab of over 100 occupants. Therefore, the minimum project cost is $4.38M, which includes construction costs ($4.31M) and an administrative staff member ($.07M, including fringe). If funded below this level, additional funding would need to be secured from other sources in order to complete the first year of the project.

Metrics:
As noted in proposal (Milestones), with these additional metrics:

Measurable Outcomes after 1 Year:
Link Lab staff will be hired during the first year to develop immediate opportunities, and Link Lab construction will be completed by September 2017. At the end of the first year, this project will be evaluated in terms of several measurable outcomes, listed below. These metrics will be tabulated by the Link Lab's administrative staff each year and presented to the Link Lab members in an annual "all-hands" meeting to discuss strategies for improvement.

Measurable Outcome	**1st Year Target**
The number of industrial sponsors who joined the Link Lab IAB	2 companies
The number of industrial partnerships on sponsored research projects	2 sponsored projects
The number of industrial mentors for students and projects	1 industry mentor
The number of sponsored research projects that support the research scientist	1 sponsored project
The number of funding proposals co-written by the research scientist	5 funding proposals
The total increase in external funding for CPS research	$4-10M in the first year*
The number of new graduate courses offered in Cyber-Physical Systems (CPS) topic	7 new courses
The number of faculty/students who use the Link Lab space on a daily basis	18 faculty and 90 students
The number of new joint proposals and grants written by Link Lab members	20 joint funding proposals
The number of students co-advised by interdisciplinary teams of advisors	15 co-advised students
The number of new papers co-authored by interdisciplinary teams from the Link Lab	40 joint papers

* At least 3 proposals of $4-10M are currently being developed by the Link Lab.

Plan for sustainable funding beyond SIF investment:

The financial health of the Link Lab will be sustained by an increase in research funding and teaching activities that results from creating a new center of excellence. For example, after only a few months it has already helped catalyze new partnerships with industry and relationships with alumni. It has also stimulated curriculum design that may lead to a new revenue-generating professional Master's program in Cyber-Physical Systems. The lab needs staff support to develop and enhance these fundraising opportunities, including i) an industry liaison, ii) a research scientist, and iii) administrative staff. The activities of these staff members *will directly support their own salaries*, as described below, in addition to enhancing research activities.

a) **Industry Liaison:** will recruit companies to join the IAB, which provides early access to new discoveries and students produced by the Link Lab for an expected contribution of $25K

annually (on average). Several companies have already inquired about partnering with the Link Lab. We expect at least 6 companies on the IAB by the 4th year, which will fully fund this position. These companies will also enhance research activities through research guidance, student mentoring, and sponsored projects.

b) **Research Scientist:** will develop new research proposals that will each support the research scientist for an expected 1-3 months per year. With over 20 faculty working in Cyber-Physical Systems, the research scientist will have many opportunities to contribute to projects. We expect the research scientist to be involved in at least 6 funded projects by the 4th year, which will fully fund this position.

c) **Administrative Staff:** will manage new research grants and educational activities. We expect the Link Lab to stimulate a substantial increase in research funding and professional Masters students. Even a small increase of $1M annually or 5 new Master students by the 4th year would fully fund this position.

Signed, 

_____ 9/7/16

(Dean or VP) (Date)