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# Forming a Coalition to Decrease Freshout Rampup Time in the Engineering Workplace: A Business Plan for an Academic, Industry, and Government Partnership

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*BUSINESS PLAN*

# *Engineering the Engineers*: A Coalition to Enhance Workforce Development through Industry-University Dialog, College Engineering Education, & Workplace Onboarding

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https://sites.google.com/a/boisestate.edu/ieeci/e2r2p/project-deliverables

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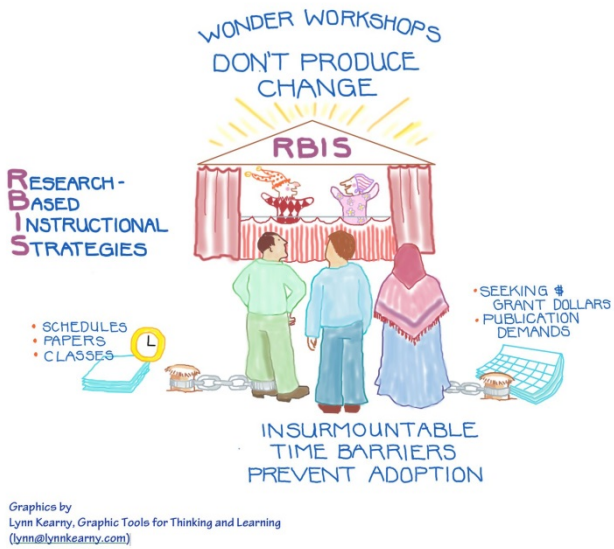
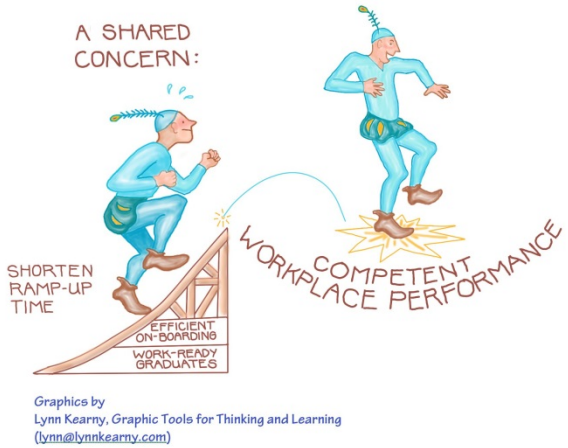
# Abstract


Having spent more than three years trying to change the engineering curriculum at one university, the Engineering Education Research to Practice ($E^2$R2P) team has realized that wonder workshops for faculty, visible redesigns of courses, and other sub-system solutions don't work. Stated simply, engineering faculty often face significant time barriers to implementing research-based instructional strategies. Changing the curriculum requires re-engineering the larger engineering education system and the ways in which it academic, government, and industry components interact to produce and onboard newly hired and graduated "freshout" engineers. In other words, there is an unmet need to use systems engineering to change the system that produces new engineers and ramps up their performance in the workplace.

To this end, the $E^2$R2P team has proposed creating a larger venue for collaboration, where these parties can reach past their traditional silos to address a shared concern: decreasing the time that freshouts need to fit into their new jobs and reach competent levels of workplace




performance. This collaborative venue could provide the mechanism for changing the system to produce work-ready graduates and the onboarding processes that engineering businesses use.


This venue would allow academics, government, and industry to work together as part of a larger community of concern and practice. Collaboratively, they could collect and interpret data in ways that would let them identify problems, determine root causes, and

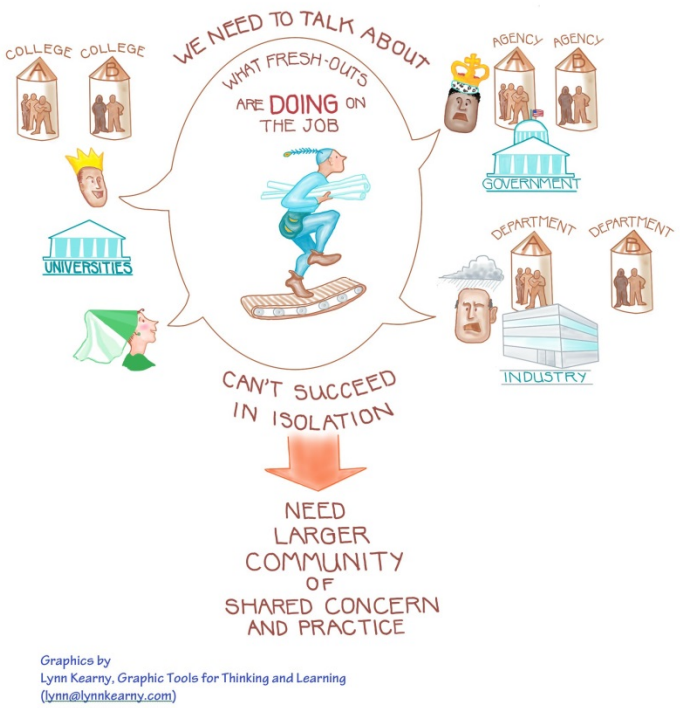
determine corrective actions that improve engineering education and onboarding.

To create this venue, the team has drafted a business plan for a nonprofit coalition to decrease new engineer ramp up time. The plan consists of the following major sections:

- Foundation: Current state and historical context, along with the mission, vision, values, and style/image of the proposed coalition.
- External environment: Stakeholder segments, competition, and important trends.
- Business model: services to be offered, customers, positioning and value proposition, channels to customers, financial model, organization and staffing model.
- Goals and strategies: biggest challenges and opportunities, potential benefits for institutional members, goals and strategies, business processes.
- Organization: form of business, organization structure and roles and responsibilities, compensation and financial model.
- Action plan for implementation: start-up risks and risk mitigation; milestones, Objectives, activities and timelines; financial forecast.

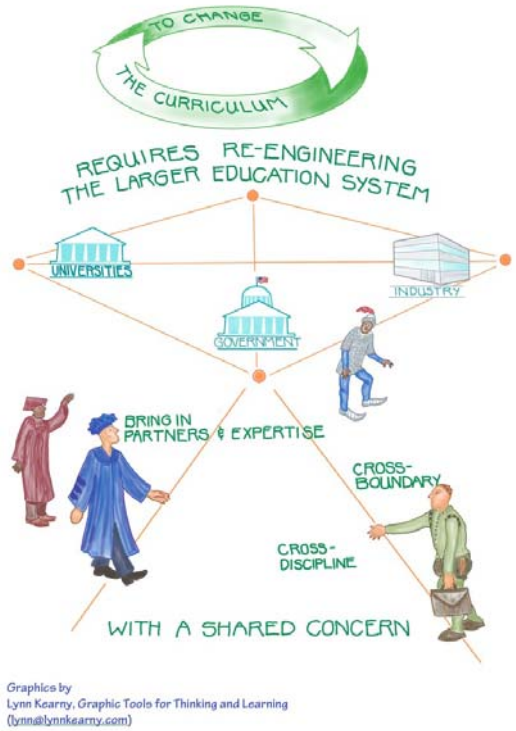
The $E^2$R2P team is interested in finding academic and business partners willing to explore and collaborate in this effort.

# Executive Summary




To date, the university, government, and industry components of the larger system that prepares engineers and onboards them into the workplace largely work with in their own silos. Engineering universities look to improve their own curricula, but working alone, they face significant barriers to implementing the research-based instructional strategies that can better prepare future engineers for the workplace. Likewise, industry largely works alone to improve its onboarding systems by improving recruitment, selection, orientation, and training efforts. Funding agencies provide support for some forms of academic/industry partnerships, but these remain the exception--rather than the norm.

An application of systems theory would indicate that such "sub-system solutions" are unlikely to change the larger system that prepares and onboards future engineers. Instead, a systemic engineering approach could reengineer the way the system creates and supports freshout engineers themselves. Such an approach would provide a venue for the system's academic, industry, and government stakeholders to collaborate in ways that would let them better manage the interfaces among their respective silos. Finding new ways to make traditional boundaries porous, academics and industry can significantly decrease the time that newly graduated and hired “freshout” engineers need to



fit into the workplace and perform their tasks competently.

This business plan proposes an innovative approach to create a coalition where academics, industry, and government stakeholders can work together to decrease rampup time to competent performance in the engineering workplace. Initial academic coalition members could include engineering colleges of Boise State University and two or three engineering colleges from other universities.[1] The initial academic members would recruit industry members to the coalition.

The coalition itself would work much like an engineering research center. Where existing centers engineer new, emerging technologies that transform technologies and the economy, the proposed coalition would work to transform the transition that engineers make from the university to the workplace. Proposed revenue streams would include monies from:

- Membership fees.
- Shared research in areas of mutual interest in decreasing rampup time.
- Proprietary research.
- Consulting services for universities providing information about the job readiness of their engineering graduates.
- Consulting services for industry providing assistance in improving their onboarding practices.
- Grant monies investigating new areas of interest.

This business plan describes the initial set up and operation of the proposed coalition, which would occur over a time frame of 1 – 1.5 years.

[1] The authors are actively seeking other colleges of engineering who want to collaborate with Boise State University to set up the proposed coalition.

# Foundation

## Current State and Historical Context

The Engineering College at Boise State University and the National Science Foundation are currently sponsoring the Engineering Education Research to Practice ($E^2$R2P) project. This project aims to build a coalition of university, business, and government stakeholders to decrease the length of time it takes for a new engineer to perform competently and independently on the job. The project focuses on three areas:

- Graduating work-ready engineers.
- Improved "onboarding" in the workplace.
- Porous boundaries between academic and business environments.

In 2012 the United States graduated approximately 38,000 engineers[1]. Those newly graduated and hired "freshout" engineers will earn an annual starting salary of about $62,000[2]. As personnel costs are expensive, their employers will have already spent the equivalent of 25 percent or more of freshouts' first year salaries towards advertising, selection, and interviewing to fill each of their positions[3]--before these freshouts even start their jobs

Like other new employees, freshouts start out as "liabilities" before they learn how to use their skills and experience to make positive contributions that their employers will value. The more quickly they get up to speed, the faster they can start contributing to the bottom line[4]. Successful adjustment of these newcomers to their role and organization has implications for performance, retention, and turnover[5]. Industry estimates for the length of time it takes freshouts to become independently productive (generating more value than cost) are spotty and range from 6 months to 5 years[6]. The cost of this ramp-up time alone exceeds several billion dollars a year.

Approaches to onboarding that help freshouts adjust to social and performance aspects in their new jobs vary widely. Some approaches to onboarding these employees are structured, systematic, and effective; others use a "sink or swim" strategy where freshouts struggle to determine what their organization and colleagues expect. On the one hand, effective onboarding improves time to productivity, customer satisfaction, and retention rates[7]. On the other hand, one-third of organizations in the U.S. do not even provide even minimal orientation programs for their new employees[8]. Only 30 percent of surveyed global executives reported that they are satisfied with their employers' onboarding processes for new hires[9].

Faced with less than adequate onboarding support, freshouts often experience anxiety and uncertainty with regard to their roles, tasks, and career prospects in the organization[5]. While the rate of annual freshout engineer turnover in the U.S. is unknown, survey results indicate that, within four years of graduation, 64 percent of graduates remain in engineering positions as practitioners, consultants, and managers. Conversely, 25 percent are not employed in engineering and 12 percent are not employed at all[10]. This attrition results in a total loss of investment to

the hiring organization and the loss of the individual's and society's investment in engineering degrees. The direct and indirect costs of replacing those newly hired employees who leave their jobs range between 1–2 years' pay and benefits for each departing freshout[11].

In order to decrease the ramp-up time to competent performance and reduce the career-limiting frustration of new engineers, the "system" has to change in ways that

- Improve the starting skills of freshout engineers.
- Support freshouts' onboarding into the workplace, thereby reducing time to competent performance and improving the fit between freshouts and their employing organizations.
- Make traditional boundaries between universities and industry increasingly porous.

Clearly, altogether eliminating rampup time to competent performance in the engineering workplace is impossible. However, the university, industry, and government agents that mint freshout engineers and place them on the job can work together in ways that optimize this larger system. An optimized system would require active collaboration among university, government, and industry stakeholders.

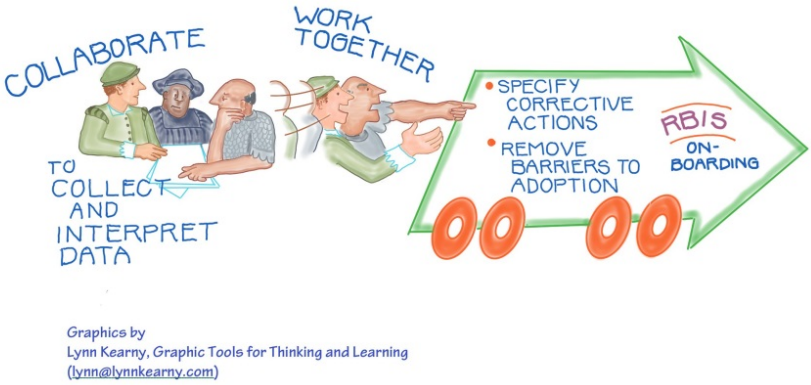
Typically, these stakeholder groups work independently in their "silos" to address this problem. Academics focus on curricular change, government creates policies, and industry creates ramp-up systems for newly graduated and hired "freshout" engineers. These subsystem solutions alone are incapable of changing the system. **To date there has been no venue for these stakeholder groups to collaborate on systemic solutions to optimize rampup efforts for freshout engineers. No one is responsible for managing the multiple interfaces among the system components.**

This initiative proposes to provide a venue for the necessary collaboration among universities (including their administration, faculty, and students), government, and industry to optimize the system for preparing and ramping up freshout engineers in the workplace. This initiative also goes beyond existing efforts to provide cooperative learning experiences and internships. While these learning experiences are valuable, they are only one component of a larger system to decrease rampup time to competent workplace performance.

# Mission

The mission of this coalition is to reduce the time to competent performance and reduce the dropout rate for new freshout engineers by fostering collaboration among academic, government, and industry stakeholders in ways that create, implement, maintain, and continuously improve systemic solutions.

# Vision




A nation-wide coalition with a variety of large and small private and public universities will work together with small, medium, and large industry partners, government agencies, and others to decrease the time it takes freshouts to demonstrate competent performance and fit comfortably into their workplaces.

***Academia.*** The coalition will help academic partners to remove barriers that keep university programs from adopting progressive instructional practices and instead:

- Incorporate problem- and project-based learning using real-world engineering situations.
- Leverage internships and co-ops (the "cooperative" experience alternates semesters of academic study with semesters of full-time employment).
- Reduce any academic content no longer essential to future employment.
- Add non-technical collaboration and communications skills throughout the engineering curriculum.
- Participate in ongoing dialog with industry about engineering work opportunities.

***Industry***. Likewise, the coalition will work with industrial partners to employ practices that improve ramp-up time, such as:

- Performance-based training that
    - Provides opportunities to learn job tasks by doing.
    - Employs a blended mix of appropriate delivery methods, such as such as classrooms, social media, mentors and coaches, et cetera, to decrease time to performance.
- Just-in-time learning and tools to accomplish a given job task.
- Role identification and negotiation that would specifically help freshouts their employers better define roles and build workplace relationships.

Working together, universities and industry will find a way to blur the distinctions between them. Engineering students will work on real engineering projects with real clients. Multiple co-op and internship experiences will put students in the workplace long before they graduate. Engineering tools, resources, processes from industry will appear in classroom learning activities. And

industry will help academics gain support for revising tenure guidelines to support better engineering education.

***Government.*** In a similar vein, the coalition will work with government agencies and policymakers to:

- Support data collection to examine any new workforce development strategies in play.
- Fund experiments to develop and assess best practices.
- Provide funding for underrepresented and non-traditional engineering populations to enter the profession (e.g., minorities, women, veterans, first-generation college students).
- Provide tax and other incentives for universities and businesses.

***Impact.*** Because the nation-wide coalition will employ a systems engineering approach, the data will show that ramp-up time has decreased by at least 25%, saving billions of dollars per year. The dropout rate among new engineers will decline. The number of underrepresented and non-traditional students entering engineering will double.

# Values

The underlying values that will govern decision making in this initiative include

- Increasing the opportunity for underrepresented and non-traditional populations to successfully enter the engineering workforce.
- Decreasing ramp-up time and cost for new engineers.
- Decreasing early job frustration and drop-out among recent engineering graduates.
- Increasing the number of job-ready engineers graduating from our universities.

# Critical Features

The only way to approach the "wicked problem" of slow ramp-up to competent performance is by collaborating among all stakeholders in ways that optimize the new engineer transition system and manage system component interfaces. This effort will require systems engineering of the very system that creates engineers and places them in the workplace. Seizing the opportunities manifest in this problem will require all stakeholder groups to learn the environment, language, and reward structures of the other groups.

As described below, the style/image of the proposed coalition will merge aspects of the National Science Foundation (NSF) Engineering Research Centers (ERCs) and the American Society for Training and Development (ASTD) Forum within a financially sustainable nonprofit.

## ERCs

Since 1984, NSF-sponsored ERCs have provided a venue for new collaborations between universities and industry to

- Engineer innovation.
- Promote discovery.
- Facilitate technical transfer across the "valley of death" that separates inventing from commercializing.
- Contribute to economic recovery[12].

In interdisciplinary centers located at universities across the United States, ERCs provide an environment in which academe and industry jointly pursue strategic advances in complex engineered systems and systems-level technologies. These efforts have the potential to spawn whole new industries or to radically transform the product lines, processing technologies, or service delivery methodologies of current industries. Today's ERCs focus on the following technological areas:

- Manufacturing.
- Biotechnology and Health Care.
- Energy, Sustainability, and Infrastructure.
- Microelectronics, Sensing, and IT.

ERCs provide the intellectual foundation for industry to collaborate with faculty and students on resolving generic, long-range challenges, producing the knowledge base needed for steady advances in technology and their speedy transition to the marketplace. ERCs have produced a new generation of engineering graduates who are highly innovative, diverse, globally engaged, and effective as technology leaders in industry[13].

The business model for the ERCs rests on a 3-way partnership involving academe, industry, and the NSF (along with any participating state, local, and/or other Federal government agencies). In FY 2012, total annual funding from all sources provided directly to each Center ranged from $3.5 to $10.0 million, with NSF's share ranging from $2.7 million to $4.2 million[14]. This program has been very effective at initiating and maturing ecosystems that are stable enough for the ERCs to continue operating after NSF funding sunsets at the end of 10 years. The current success rate for graduated ERCs is 82 percent[15].

ERCs act as an innovation ecosystem that uses systems engineering to create new engineering disciplines, products, and jobs. The NSF's share of the funding typically supports the administration of the ERC. Industry and academic contributions fund research of interest to all parties. Academics and industry alike shares this research. Should a given industry member wish to pursue the initial results further, they broker additional research agreements with the ERC regarding the resulting intellectual property and its distribution.

## ASTD Forum

The ASTD Forum[16] helps senior learning and development professionals and their organizations to connect, collaborate, and share their training, learning, and performance improvement processes, practices—including cooperative benchmarking and strategic networking. To promote the open and equal exchange of information and practices, members

agree to abide by ethical principles regarding confidentiality and exchange of information. While the names of member organizations are public, individual member's contact information is confidential. Members also agree to attribute generic information that appears in professional formats to the ASTD Forum.

Forum members accrue the following benefits:

- Networking opportunities with the Forum membership online and off-line throughout the year, including ASTD Forum-exclusive conferences and events. Events take place in the U.S. and India.
- Unlimited access to peers within the Forum membership.
- Monthly opportunities to gather information and data from other Forum member organizations and colleagues.
- Exclusive monthly interactive web discussions with thought leaders.
- Two complimentary registrations to ASTD conferences.
- Two complimentary registrations to ASTD Education offerings.
- Two complimentary national ASTD memberships.
- Complementary Annual Comparative Data Report and State of the Industry Report.
- 10% discount on top of the published member rate for ASTD products.
- National ASTD group membership discount, entitling groups to additional resources.

## Nonprofit Research Organization

501c-3 nonprofit organizations offer an organizational structure that universities and industry could use to pursue their shared goal of decreasing rampup time to competent engineering performance in the workplace.

A nonprofit organization for the proposed coalition could:

- Partner with universities in obtaining grants.
- Charge a markup on consultative services that vendors provide, creating an additional revenue stream supporting the consortium.
- Provide a venue for shared research that academics and industry would share without Intellectual Property (IP) restrictions.
- Provide a mechanism to hire researchers and vendors to complete contracted proprietary research on a pay-for-services basis.
- Streamline human subjects protection across multiple university and business partners.
- Streamline IP agreements across members.

## A New Coalition

Where the ERCs employ a systemic approach to engineering new products and industries, the proposed coalition would employ a systemic approach to engineering the transition freshout engineers themselves from school to work. The coalition would employ systems engineering to

manage the interfaces between academic, industry, and government stakeholders. Like the ERCs, the coalition would receive startup funding and resources from academics, industry, and government agencies. Likewise, the coalition would pursue and disseminate shared research as well as proprietary research based on shared research findings.

Like the ASTD Forum, the proposed coalition would provide opportunities to network and share research and best practices within a confidential venue. The coalition could also provide opportunities to meet with other members of the coalition at conference events.

The business plan that follows is a roadmap to achievement of this mission and vision.

# External Environment

## Stakeholder Segments

The proposed coalition of academics, industry, and government to decrease rampup time to competent performance in the engineering workplace cuts across a wide range stakeholder environments in the universities, government agencies, and employer communities.

There are 526 universities and colleges in the US that offer ABET-accredited engineering programs at the undergraduate level, and 36 that offer such accredited programs at the graduate level[17]. They face pressure from employers and government to produce more engineers faster to meet a growing unmet demand in the workforce. They face financial pressure as state and federal funding is being cut while new alternatives such as massive open online courses MOOCs appear, gain popularity, and offer learning alternatives to the university environment. These factors reduce tuition-provided funding at the lower academic levels. Universities are also coming under increasing competitive pressure from prospective students to demonstrate that graduates are highly likely to get well-paying positions enabling timely student loan repayment and early career success. In addition, because of the decreased funding, universities will be approaching businesses for gifts resulting in pressure from the business donors to demonstrate that the graduates are job-ready.

There is a huge variability in the extent to which universities are moving toward these goals. There are some university programs, especially among the newer ones, who have developed programs that are further advanced. There are some where individual faculty members have taken initiatives. There are very few where there is department-level or program-level systemic effort.

Government agencies have a variety of workforce development policies and programs and funding streams at federal and state levels. For example, some of the relevant federal sources include the NSF, Veterans Affairs, Commerce Department, and Department of Education. At this time, none of them has a focus on ramp-up time to competent performance. At the state levels, increasing budget pressures have reduced the money flowing to university engineering programs. While there is a general agreement on the need to increase the number of graduates and jobs in the STEM categories, there is little agreement on how to do it. Engaging this diverse set of government players in this consortium will present a significant challenge. There are no successful models to emulate.

Thousands of organizations hire engineers. In the business community, approaches and success rates in onboarding are highly variable. Large corporations with large engineering hiring programs can afford expensive and efficient onboarding programs—should they choose to do so. Smaller businesses that hire small numbers of engineers do not have this opportunity.

There is also a high degree of variability in the relationships between the business and academic communities. In some cases, there is a high degree of interplay with business leaders on

academic advisory boards, a history of corporate giving, and robust coop and internship programs. In other cases businesses and academics are operating largely independent of one another. They approach funding sources independently and do not systematically manage the school-to-work transition.

# Competition

There have always been a small number of academics who have been interested in the transition from engineering school to the workplace. However, aside from meeting at conferences, there is no lager, permanent venue for sharing approaches and results. There are many independent research efforts collecting and analyzing data, but no way to share and leverage their value.

On the government side, there is a myriad of independent agencies and legislative committees working on related issues but there is no overall collaborative center. Current efforts to fund joint academic and industry research to decrease ramp-up time are based on single grants, rather than a sustainable business model[18].

The business community, likewise, has no focal point to address this issue. While businesses may sit on academic advisory boards, there is no single venue for businesses and universities to enjoy ongoing access to each other.

The bottom line is that there is no venue that lets universities, industry, and government agencies focus on this issue.

# Important Trends

Some of the important trends that bear on the creation of a coalition to decrease rampup time include

- Universities can’t produce enough engineers to meet the growing demand.
- State funding for all forms of university education is decreasing.
- Government agencies and the public are developing a growing dissatisfaction with increasing university tuition.
- There is a growing recognition among all stakeholders in workforce development that subsystem solutions don’t solve system-wide problems.
- Increased hiring plans in the business community are causing them to look for more effective approaches and tools for on-boarding.

# Business Model

The business model for the proposed coalition includes

- Services to be offered.
- Customers for these services.
- The value proposition for these services to these customers.
- The financial model to make it all feasible.
- Barriers to competitive entry by other organization.
- Organization and staffing.

## Services to be Offered

The coalition will offer the following services.

- Research and subsequent shared reports related to decreasing ramp-up time in the workplace.
- Targeted sponsored research to apply basic shared research findings in ways that develop proprietary intellectual property.
- Opportunities to partner with the researchers to develop proprietary intellectual property based on the results of the shared research.
- Consultative services to universities including
    - Assessment of the effectiveness of the university program with respect to producing job-ready engineering graduates.
    - Recommended changes in program and approach.
    - Change agent support for Deans and other internal change agents in the university.
- Consultative services to industry to help them improve the effectiveness and efficiency of their on-boarding processes, including
    - Assessment of the effectiveness of existing on-boarding systems.
    - Recommended changes in coop and internship opportunities in ways that help business inexpensively recruit and groom new engineers.
    - Recommended changes in onboarding processes and tools.
    - Change agent support for engineering leaders and learning and development leaders.
- A best practices database.
    - University practices.
    - Business practices.
    - University/business interface practices.
- A clearinghouse for funding sources and requirements.
- A venue for collaborative problem identification, root cause analysis, and corrective action.
    - Conferences.

- Networking.
- Study groups.
- Awards and recognition.

## Customers

The primary customers for the services listed above are the university engineering schools and the businesses that hire their graduates. The government and private foundation funding sources are secondary customers. Secondary customers could also include community college programs in math, science, and engineering. These primary and secondary customers could use the data collected by the coalition and its best practices clearinghouse to formulate new grant programs and to establish criteria for evaluating applications.

## Positioning and Value Proposition

The positioning to the university customers is to the deans and change agents in engineering programs. The value proposition to them is that the coalition will help them remove barriers to the adoption and use of more effective instructional practices, and will help them forge new alliances with businesses and funding agencies.

The positioning to business customers is to the engineering executives and secondarily to the learning and development groups that serve them. The value proposition to them lies in

- Decreasing ramp-up time
- Reaping the innovation and other benefits that freshouts will produce as they gain competence.
- Better retention of new-hire engineers.

The coalition would also target its services to government agency and foundation customers and specifically seek out agency leadership and grant funders. The value proposition to these customers is to offer them a grant planning venue and to create funding criteria that increase the likelihood that funds provided will actually decrease ramp-up time.

## Channels to Customers

One channel to these customers is professional organizations such as ASEE (American Society for Engineering Education), the National Academic of Engineering (NAE), engineering societies (IEEE, ASME, etc.), Learning and Development Societies (ASTD, Chief Learning Officer /Human Capital Media, ISPI), and Professional Research Groups (Bersin Group, Elliot Masie Group, E-learning Guild, CorpU).

Another channel would be networking and direct marketing to specific organizations and specific leaders (VP Engineering, CTO, COO, CLO, Engineering Training Director, Deans and Department Heads of Engineering Colleges).

A final channel lies in direct marketing to faculty and business practitioners, who might be members of the coalition.

# Financial Model

The coalition will generate revenue using a mix of initial and follow-on streams. Initial revenue streams are those with low entry costs. These initial streams can generate funds for secondary streams, which have higher entry costs.

Initial revenue streams include

- Organizational membership fees (based on the number of practicing engineers, member businesses, and member academic organizations).
- Shared research in areas of mutual interest in decreasing rampup time.
- Proprietary research.
- Consulting services for universities providing information about the job readiness of their engineering graduates.
- Consulting services for industry providing assistance in improving their onboarding practices.
- Grant monies investigating new areas of interest.

Secondary streams will be funded from initial revenues and will require additional tools and resources to create additional products and services.

- Tools for sale or subscription use on line. For example, the coalition could create software to automate data collection, analysis, and reporting related to decreasing rampup time.
- Database subscriptions to a growing set of academic and industry best practices.
- Licensing of intellectual property, e.g., courseware and tools for non-technical workplace skills development.

Once the organization structure and business processes are designed and a cost structure is established, a pricing structure can be developed.

# Organization and Staffing Model

The organization model that appears to have the best chance of succeeding is a not-for-profit corporation with institutional memberships for academic and business organizations. There is no viable umbrella organization in ether academic or business circles that could overcome their own existing constraints to achieve the mission and vision of this coalition.

The governance of this coalition/corporation includes a Board of Directors made up of university and industry leaders, Councils that deal with special areas of interest and related projects, e.g., aerospace industry on-boarding, computer science recruitment and retention, engineers in manufacturing, small firms employing engineers, etc.

The organization structure will most likely include the following roles

- CEO.
- Financial management.
- Consulting services management.
- Marketing and membership/account management.
- Research.
- Governance support.
- Information technology management.

Research and consulting work will be done by a combination of subcontract consultants and university faculty members. Some university faculties may opt to conduct their research as part of their salaried faculty activities and forego consulting fees.

# Goals and Strategies

## Biggest Challenges and Opportunities

| **Challenges** | **Opportunities** |
|---|---|
| This is a "big, messy wicked problem" and no organization has tackled it systematically and systemically before. | • There is a readiness emerging among both university and business stakeholders as well as the granting agencies.<br>• Creating an experimental approach to developing system solutions to the on-boarding problem by using systems engineering. |
| Getting leading academic institutions and corporations in at the beginning in order to generate a critical mass. | There are both academic and business organizations that have made substantial progress who may be persuaded to become leaders of the coalition. |
| Industry partners may first want to see a proof-of-concept demonstration from their academic partners. | If industry partners want a visible demonstration of academic "skin in the game" before making any funding commitments, academics could pursue a grant that would fund part of the proposed activities for the coalition. |
| The multi-organizational, multi-discipline nature of the coalition will make it hard to manage. | Creating a collaborative, evidence-based, data driven approach that is independent of individual and organizational biases. |
| Forming a potent board of directors who will be able to exercise the necessary leadership and entice institutional memberships. | |
| Recruiting a CEO who will have the necessary entrepreneurial and operational skills and have credibility with both academic and business leaders. | |
| Producing enough early "wins" to demonstrate the value of the coalition to institutional members. | |
| Transitioning from start-up to sustaining leadership. | |
| University and business leaders are not experienced and skilled at collaborating with one another. | |

| Challenges | Opportunities |
|---|---|
| Getting start-up funding without an existing organization that can demonstrate proven results. | Getting a small set of influential business and academic leaders behind the initiative whose backing will generate credibility with funding sources or actually provide initial capital. |
| Define a set of compelling benefits for university members and business members. | Once these benefits have been defined and validated they become recruiting tools to approach potential institutional members (a draft list appears below). |

# Potential Benefits for Institutional Members

The university members can expect the following benefits:

- A venue for multi-university, multi-disciplinary collaboration, which is where the major granting agencies are going.
- More grants for larger amounts with a streamlined efficiency for administering them.
- The ability to leverage best practices across universities.
- A formal mechanism for aligning engineering curriculum with industry needs.
- Valid data on what work the graduated engineers are actually doing.
- An advantage in student recruiting, teaching, and retention—especially with underrepresented and non-traditional engineering populations.
- Improved placement of graduates.
- Satisfied alumni who give more and provide more opportunities for coops and internships.
- Research opportunities for faculty, graduate students, and post-doctoral fellows.
- Strengthened corporate relationships resulting in increased corporate giving and sponsored research.
- University change agents with valid data to help remove barriers to changing the engineering curriculum.

The business members can expect the following benefits:

- Shortened ramp-up time to competent performance for new hire engineers.
- Improved retention of new hire engineers.
- Improved recruiting results emanating from exposure to candidates through coop and internships, and other company/student exposure.
- Real impact on the university curricula.
- Relatively inexpensive access to best ramp-up practices.
- A venue for accessing qualified consulting expertise.

Government members can expect the following benefits:

- Creation of a self-sustaining success story.
- Source of new grant proposals to decrease rampup time.
- Training of new researchers in engineering education.

# Goals and Strategies[2]

| Goals | Strategies |
|---|---|
| 1. Enroll several academic leaders and several business leaders in the start-up. | • Form an initial start-up group including:<br>o Boise State and 2 or 3 other colleges of engineering who express an interest in participating in this type of initiative).<br>o Some of their industry partners.<br>• Use this initial group to demonstrate proof of concept before attempting to enroll a larger group of institutional members. |
| 2. Recruit a CEO. | • Look for a recently retired executive or engineering dean with industry street cred to take on the CEO role during the proof of concept phase and who is willing to do this without compensation until start-up funding can be obtained.<br>• Once the proof of concept phase has been successfully completed, launch a search for a full-time CEO. |
| 3. Obtain start-up funding. | • The initial proof of concept team of universities, their industrial partners, and the temporary CEO will obtain start-up funding from existing sources of their own.<br>• Once proof of concept has been established, the income streams described in the Financial Model above will come into play. |
| 4. Recruit a Board of Directors. | • Select an interim Board of Directors from among the start-up academic and business partners.<br>• Grow the Board of Directors as the institutional membership grows. |
| 5. Select and implement governance councils. | • Start up with no more than 3 governance councils that represent the needs of the proof of concept group of business and academic partners.<br>• Add additional councils as the institutional membership grows and the need for additional councils becomes apparent. |

[2] Academics may be more comfortable with finding a grant mechanism to demonstrate the viability of the coalition concept to potential business partners. If this is the case, then the starting academic members could pursue a collaborative grant before enrolling academic and business leaders in the coalition start-up.

| Goals | Strategies |
|---|---|
| 6. Identify and execute a portfolio of quick-win projects. | • The initial governance councils and Board of Directors will pick and fund the quick win projects.<br>• Additional projects will arise with the growth of the institutional membership and governance councils. |
| 7. Recruit additional academic and business members. | • Use the results of the proof of concept phase and quick win projects to recruit additional institutional members.<br>• Create a long-term sustainable recruitment and membership process that build on ongoing successes and demonstrated results. |
| 8. Staff the organization. | • The CEO and the proof of concept phase institutions will create a bare bones staff sufficient to complete the quick win projects; probably by supplying temporary resources from their own staffs.<br>• Once proof of concept is established; the CEO will forecast the workload and staff appropriately. |

If this coalition never grows beyond the initial proof of concept institutional members, it could still be considered a success if it takes on an ongoing portfolio of work in line with the mission and vision.

# Business Processes

The core business processes that will be required include:

- Project planning, contracting, and project management for research and consulting projects with institutional members.
- Marketing and recruiting to obtain additional institutional members.
- Institutional account management/Marketing services to existing institutional members.
- Strategic planning and governance.
- Financial management.
- Information management.
- Results measurement and reporting.

Each of these processes will be designed, documented, and maintained as a part of implementation.

# Organization

## Form of Business

The initial thinking is that a not-for-profit corporation with corporate and university institutional members who sit on the board of directors is the best business structure. The reasons for this include

- Public universities by law cannot add a markup to consulting fees.[3]
- An organizational structure is needed that is separate from its institutional members but controlled by them.
- A structure is needed that can apply for and accept government grants and corporate gifts.
- A structure is needed that can contract with university and corporate clients for research and consulting project and subcontract the work to others.
- A structure is needed that can maintain databases and other information resources and sell subscriptions and products for a price.

## Organization Structure and Roles and Responsibilities

The organization structure, roles, and responsibilities and consulting staffing plan set forth in the Business Model section will be detailed later once this basic concept has been accepted.

## Compensation and Financial Model

After the proof of concept phase there will be a small number of employees who will be salaried. During the proof of concept phase the only employee will be the CEO, who could be a contractor, and who would receive a modest fee. Consultants performing research and consulting projects will be paid out of grants and/or institutional membership funds.

The coalition will receive income from the revenue sources listed in the Business Model. The finances must be managed to cover the direct cost of doing work for the institutional members plus the overhead associated with the not-for-profit corporate structure.

[3] This is true at Boise State University. The coalition will need to determine if it is true at other public and private universities.

# Action Plan for Implementation

## Start-up Risks and Risk Mitigation

| Very Early Start-Up Risks | Mitigation Strategies |
|---|---|
| 1. Getting University buy-in and approvals.<br>• Engineering departments.<br>• Legal.<br>• Accounting.<br>• Human subjects.<br>• Intellectual property.<br>• University governance. | The Engineering Dean of each institutional member will need to mitigate these risks and steer approvals through the decision making structure. |
| 2. Getting start-up funding: the grant cycle is too long and too uncertain to count on for startup. | Obtain start-up funds from the initial business institutional members. |
| 3. The coalition will have an initial learning curve to figure out how its members will work together to produce valued work. | • The quick wins approach during the proof of concept phase.<br>• Facilitation and graphic techniques that support development of a shared mental model.<br>• Start with a small group of institutional members.<br>• Quick win project must involve all or most of the initial institutional members. |
| 4. The initial and permanent CEOs will be hard to find. | • Create a CEO job description and selection criteria.<br>• Ask the initial institutional members to go through the list of their own contacts for candidates.<br>• Limit the initial CEO to a 12 month contract to bring the coalition through the proof of concept phase.<br>• Institutional members provide start-up staff resources and office space to help accomplish the proof of concept activities. |
| 5. Rapid growth may outstrip organizational capability to deliver quality results. | The CEO and Board must manage the growth of organizational capability in balance with the work that is accepted. |

| Very Early Start-Up Risks | Mitigation Strategies |
|---|---|
| 6. The selected quick win projects may not be compelling. | Create criteria for the quick win project that demonstrate the viability of the portfolio of services to be offered and provide compelling marketing data to attract additional institutional members. |

# Milestones, Objectives, Activities and Timelines

## Phase 1: initial organization

End result: Initial institutional Membership established, CEO recruited, start-up money obtained, and Not-for-Profit Corporation established

| Objectives | Actions | Accountability |
|---|---|---|
| 1. Establish University Members. | • Get commitment from the Engineering Deans. | • Steve V. and Don Plumlee. |
| | • Flesh out the Business Plan including start-up cost estimate. | • Steve, Don, and Ray with the Deans in a face-to-face meeting. |
| | • Deans get the institutional commitment. | • Engineering Deans. |
| 2. Establish Corporate Members. | • Deans recruit corporate partners who can also provide start-up funding. | • Engineering Deans. |
| | • Review and edit the business plan including the start-up cost estimate. | • Steve, Don, and Ray with Deans and Corporate Partners in a face-to-face meeting. |
| | • Corporate partner executive contact gets the corporation committed. | • Corporate partner executive. |
| 3. Establish the Board of Directors. | • Institutional members select board representatives. | • Institutional representatives. |
| | • Conduct initial Board Meeting (s) to approve.<br>o Board charter.<br>o Not-for-profit business model and business plan.<br>o Start-up budget.<br>o Not-for-profit corporate application.<br>o CEO job description and selection criteria.<br>o Quick win projects for the next phase. | • Steve and Ray facilitate Board Meeting by webinar. |

| Objectives | Actions | Accountability |
|---|---|---|
| 3. Obtain start-up funding. | • Get corporate funding approved. | • Corporate Board members. |
| 4. Recruit CEO. | • Board members identify candidates and obtain willingness to serve. | • Board Members. |
| | • Screen and select. | • Steve and Ray screen candidates and Board selects the CEO. |
| 5. Establish a not-for-profit corporation. | • Establish bank account and receive start-up funding. | • CEO. |

## Phase 2: Complete Selected Quick Win Projects

End Result: Proof of Concept, with data that can be used for recruiting additional institutional members.

| Objectives | Actions | Accountability |
|---|---|---|
| 1. Select consultants to complete the quick win projects. | • Review projects and known available consultants and recruit the consultants for the projects. | • Steve. |
| 2. Complete a project plan and budget for each project. | • Create a standard project process template. | • Ray/Steve. |
| | • Work with the client organization to complete the project plan and budget. | • Selected consultants. |
| | • CEO review and approval of project plans and budgets. | • CEO with support. |
| 3. Get approval of the project plan and funding from the clients for the projects. | • Present to internal client approvers. | • Client project owner. |
| 4. Complete the projects. | • Perform tasks per project plan. | • Consultant and project team. |
| | • Bill against the contract. | • Consultants bill the consortium, which will bill the client organization. |
| 5. Document and report the results. | • Conduct post-mortem reviews. | • Steve, the consultant, and the client. |

| Objectives | Actions | Accountability |
|---|---|---|
| | • Report what worked and what didn't work and important benefits resulting from the work. | • Steve and CEO distill the results across projects. |
| 6. Market the results. | • Create a marketing plan.<br>• Implement the plan. | • CEO and Board Members |

### Phase 3: Form Councils and complete a second round of projects

(must be started before the end of Phase 2 in order to maintain steady work flow)

End Result: Several new councils formed, new institutional members, new round of projects (learning from 1st round of projects)

### Phase 4: On-going operation

End Result: Continual project work, Best Practices Data Base, more institutional clients, rotating Board and Council memberships, Permanent CEO and staff

## Financial Forecast[4]

It is too early to develop a multi-year financial forecast, but it is not unreasonable to expect a multi-million dollar annual budget by the time phase 4 kicks off. The start-up cost to be funded up front will be in the order of $200,000 to $500,000.

[4] If initial academic and business partners feel a more detailed financial forecast would be helpful, then it could be created later.

# Appendices

## Biographies

### Steven W. Villachica

#### Education

- BA English, *summa cum laude*, University of Northern Colorado, 1980.
- MA Computer Technology in Education, University of Northern Colorado, 1986.
- Ph.D. Educational Technology, University of Northern Colorado, 1999.

#### Learning and Development Consulting

Prior to joining the faculty of Boise State in 2007, I worked as DLS Group, Inc.'s chief learning officer. My responsibilities included project management and lead design of training and other organizational performance improvement projects. I worked with clients in the following industries:

- Securities.
- Telecommunications.
- Biomedical.
- Manufacturing.
- National Security.
- Law Enforcement.
- Railroad.

As an Associate Professor of Organizational Performance and Workplace Learning, I teach courses in the instructional design of performance-based training. My research interests focus on leveraging expertise in the workplace. I am currently co-PI of the NSF-sponsored Engineering Education Research to Practice ($E^2$R2P) project.

### Don Plumlee

**Don Plumlee** received his Ph.D. degree in mechanical engineering from the University of Idaho, Boise, in 2007. He is currently an Associate Professor/Associate Chair in the Mechanical and Biomedical Engineering Department, Boise State University (BSU). Prior to joining BSU, he was with Lockheed Martin Astronautics, where he worked in the structural airframe development of the Atlas/Centaur commercial space launch vehicle. His research interests include professionalism in engineering education and preparing students for the workplace.

### Ray Svenson

#### Education

- BSEE Michigan Technological University 1961

- MSEE California Institute of Technology 1962

### Entry into the Engineering Workforce

I was hired into Bell Labs as an entry engineer in 1962. Bell Labs had, at that time, a world class on-boarding system for new engineers. I was operating relatively independently after one year and very independently after two years as a telecommunications systems architect and planner.

### The Bell System Center for Technical Education

I moved to AT&T headquarters in New York City in 1966 to do technology planning, and moved into middle management in 1970. The Bell System had 50,000 engineers in its operating companies and was not doing an effective job of training them to do their basic job and to prepare them for the new technology we were pushing into the field. We established the Bell System Center for Technical education in Lisle, IL to fill this need, and I went there to be the systems architect for the training system. During the time I was there we grew the program to have performance-based curricula with hundreds of programs in fifteen different technical disciplines and we operating a multi-million dollar program.

We were so successful that we were being benchmarked by engineering departments in other large companies. I saw the opportunity to help other companies set up their own training systems and left the Bell System to start my own consulting business in 1978.

### Learning and Development Consulting

For the last 35 years, I have been a consultant to many large companies helping to create learning and development strategies and the organizational systems to support them. Some of the companies where I have served the Engineering Departments and their training units include:

- Exxon
- Motorola
- Alcoa
- Westinghouse
- Shell
- Boeing
- GM
- Baxter Healthcare

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