Development of a Survey for Understanding the Careers of Engineering Professionals

by

Erin Bailie

Submitted to the Department of Mechanical Engineering
in Partial Fulfillment of the Requirements for the Degree

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ABSTRACT

The purpose of this project is to devise a way to learn about the careers of professionals in positions that undergraduates at the Massachusetts Institute of Technology are likely to aspire to enter. A survey was developed to be conducted over the summer of 2015 by MIT sophomores who are on summer internships to collect data in four categories: career path goals, underlying motivations, time use and management, and qualitative advice or suggestions from professionals. The survey has been tested with engineering students and engineering professionals. The results of the survey will inform curriculum development and career advising at MIT for engineering students.

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This thesis would not be possible without input, advice and expertise from several mentors and staff members at MIT and beyond.

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1. Introduction

1.1 Project Mission and Goals

The purpose of this project is to better understand key aspects of career roles which undergraduate engineering students at The Massachusetts Institute of Technology aspire to enter in their careers. Engineering students aspire to a wide variety of career paths and industries [1]. By developing an understanding of engineering professionals, as well as the motivations behind students' ambitions towards certain professional roles, MIT can better provide educational curricula and career resources for its students.

The survey developed as part of this work aims to explore the following qualities of the careers of those being surveyed, through an interview conducted with a subject of the students' choosing, with the requirement that the subject is in a career role that the student aspires to enter someday:

1) The career paths taken by the interview subject, including educational background, number of companies and roles held, and the average time spent in each company or role
2) The underlying motivations for an employee to remain involved in or leave a certain role, industry or company
3) Qualitative experiences and advice from the interview subject pertaining specifically to the students' educational and career path
4) Quantitative data regarding the expectations of time management and variety of tasks within the role

This project will be executed through UPOP – the Undergraduate Practice Opportunities Program. UPOP is a professional development program for MIT sophomores which provides mentorship and training in professional practices. As part of the program requirements, students participate in a summer experience in a field they are interested in pursuing a career in, most often research, industry, or public service. Students then apply the lessons from the yearlong program to their summer experiences [4]. UPOP students will be given an assignment to conduct an informational interview with a mentor in a role they aspire to be in at some point in their careers, and the interview will inform answers to an interview report in the form of an online survey which will be used to collect data about the interview subject in the four categories listed above.

1.2 UPOP Overview

UPOP is a year-long program for MIT sophomores. Though the program is funded through the School of Engineering and is aimed towards engineering-based industries, it is open to students of all majors. The program focuses on "firm skills" [4] and progresses through five developmental modules.

1) **Self** – UPOP students come to understand work and career preferences through site visits and information sessions. They also learn to create a strong personal brand through a resume and practice interviewing skills.

2) **Team** – UPOP students participate in a one-week course with a small team of fellow students and an alumnae mentor to practice team dynamics and professional networking through a variety of tasks.
3) **Opportunity** – UPOP students explore opportunities for summer experiences available to them through a variety of networking events and internship postings.
4) **Enterprise** – Through the summer break, UPOP students understand an organization or enterprise and get a chance to practice team skills they learned in the Team session through a summer project in an internship or similar opportunity.
5) **Career** – Students are given the chance to reflect upon their summer experiences and apply them to their career objectives.

This survey will be a component of the Enterprise portion of the UPOP curriculum. In years past, UPOP students have completed progress reports twice each summer, or "check-ins", to facilitate reflection on summer experiences and personal growth. The interview will be incorporated into the earlier of the two summer progress reports, due in early July.

1.3 Literature Review

In order to understand current trends in career choices of engineering students, we looked to current research in STEM education and persistence in the engineering field. Our goal was to understand if there were any current breakdowns or ethnographies of engineering students pursuing non-engineering careers.

This project is to be executed as part of a follow-up to a project done by MIT undergraduate Kristen Wolfe in 2004 for her thesis [1]. Wolfe's research surveyed MIT alumni from Mechanical Engineering to understand four topics: technical knowledge and reasoning, personal and professional skills and attributes, interpersonal skills, and engineering skills. In her survey, Wolfe also found that about a third of engineering students remained engineers or engineering students; a third were engineering managers; and a third did not identify as engineers, though could have been in engineering roles. This third group could be found in a variety of fields, including consulting, military, or managerial roles. While Wolfe gathered data from MIT Mechanical Engineering graduates approximately a decade out of college, we sought to better understand non-MIT graduates as well and the kinds of roles sought by current undergraduate students.

Wolfe's survey design was the basis for the creation of this survey. Question structures were mimicked from Wolfe and then, through iterative design, were tailored to meet the context of UPOP students conducting an interview over their summer internship. Much credit is due to Wolfe's foundational work.

1.3.1 Engineering Careers and Persistence

Through literature review, we learned several key patterns in engineering students and engineering professionals. Engineering students tend to leave the field of engineering less during their undergraduate careers and more immediately after graduation. [5]

Additionally, many students find that their studies do not resemble an engineering career. Because the process of technically preparing an engineering student does not leave much time or many experiences to allow the student to practice being an engineer in the real-world setting, many engineering students disperse after graduation due to disappointment in limited engineering experiences or engineering course work. [3] An engineering program hoping to serve its students and best prepare them for success should not only prepare them for the engineering field but should also give them skills or knowledge that can be applied should they choose to leave engineering. US Census Data shows that engineering students exiting STEM fields most likely migrate to management, business, education, and sales [9]. The importance of understanding the career goals of students becomes clear. We hope to demonstrate these patterns and the importance of this survey throughout this work.

In order to understand the career paths taken by engineers, we began with a paper from July 2009 by G. Lichtenstein and others [3] which examines answers to the question "To what extent do students who complete undergraduate programs in engineering intend to pursue engineering careers?" The paper summarized data from surveys and interviews which examined the post-graduation plans of 80 engineering students at 2 universities. Most notably, the conclusion was drawn that "students who complete a major in engineering are not necessarily committed to careers in engineering or even STEM". Students who pursued engineering sometimes found themselves in early career not by intention but by circumstance; meanwhile, students who left the field often intended to do so, whether to attend medical school or to work in finance or other industries. One might conclude that engineering students sometimes enter their academic careers never intending to become engineers after graduation.

While Lichtenstein examines the diverse career options available to and pursued by engineering students, much more research centers around persistence. This research aims to target the perceived problem of loss of engineering interest in order to retain engineers in the field.

One view on engineering matriculation suggests that an engineering degree is a personal commitment made early in a college career and that students see a degree worth finishing even if there is intention to leave the engineering field after graduation. M. W. Ohland and others [5] examine the number of students who join, leave, and stay engaged in engineering programs. The authors found that students who matriculate in engineering have a high likelihood of staying in engineering, and that engineering has little inward migration to the field. Combined with the high rate of outward migration reported by Lichtenstein [3], this early commitment seems plausible, especially when one considers the large number of requirements for engineering degrees and many prerequisites for most engineering courses.

Within MIT, a survey from 2010 conducted as part of an undergraduate thesis [2] found that amongst students who migrated from another major to mechanical engineering, the majority enrolled themselves in the flexible 2A degree (see section 2.2). This indicates

that a more flexible engineering curriculum may increase rate of migration into the field, as students may see strict requirements as a barrier to entry.

The survey developed for this work requires students to interview someone in a role that is anywhere along their desired career path. This allows us to explore where the split from engineering may occur in careers, specifically in the Career Path section of the survey. S. Brunhaver and others highlight a valid point: "Not all engineers wait until later in their careers before pursuing non-practitioner paths [6]." Thus, considering only post-graduation plans when examining persistence is not sufficient; one must also consider career choices further from graduation to understand the breadth of career paths of engineers.

Dissonance between degree and career becomes clear. A paper from 2011 by R. Adams and others [7] highlights this phenomenon. "Engineering education is holding onto approaches to problem solving and knowledge that are out of alignment with professional practice. The education undergraduates experience emphasizes a focus on acquiring technical knowledge over preparing for professional practice, coverage of technical concepts over deep learning, narrow and discipline-focused programs, heavy workloads, and a meritocracy of difficulty, and the use of laboratory and design experience as 'adjuncts' to deductive teaching strategies and structured problem sets." This schism between engineering education and engineering practice may be cause for migration out of the field after graduation – students who do not enjoy their studies may assume that their careers will be similar as engineers and choose to leave, and students who understand that their careers will be different from their studies may decide to enter another field rather then feeling unprepared.

Several professionals offer their recommendations for addressing this problem in the Adams paper. Denise Wilson offers the suggestion to connect educational material to engineering experience: "Educators should strive to emphasize… the connection between the mind and the heart through affect." Affective outcomes represent the roadway by which present and future engineers can cross the bridge between science and society."

When examining the migration of engineering students away from the engineering field, some try to examine the experiences of early career engineers to determine why the field is unattractive to those who are qualified for it. "In general, little is known" which makes such research challenging [8].

Winters and her colleagues echo the gap between education and preparedness that Adams also highlighted [8]. Additionally, Winters finds that "early career engineers may still be figuring out their identities and goals for their careers." Most engineering graduates are in their early 20's. It is true that perhaps part of the persistence problem is that career decisions have not been made.

Additionally, Winters finds that engineering students may prepare for a particular role or sub-field and find that their early career does not resemble what they had expected or prepared for, further highlighting the problem that comes from the education gap between

science and society. "[Students] have been unable to find work in their desired field, experienced job losses, or discovered that they do not enjoy working in a particular environment or field." Winters' study compares early career engineers' experiences to the goals they had set as undergraduates and shows that these goals may be irrelevant, as the first years of an engineering career strongly clarify the reality of engineering, affecting perspective.

Both Ohland and Carrico [10] emphasize that engineering students gain the opportunity to clarify details of the profession through internship and co-op experiences much more than in classes. Combined with the views offered by others on the lack of professional preparation in a technical engineering curriculum, it is clear to see that professional experiences best prepare students for their early careers, whether they choose to persist in engineering or explore a new field.

1.3.2 Methods for Understanding Engineering Careers

Once we gained a better understanding of the motivations of engineering students for entering an engineering education and trends for graduates exiting engineering roles or fields, we began examining how we might conduct research to better understand careers pursued by engineering students.

A valuable side effect of the student interview and survey process is the insight that the student gains from conducting this project. By interviewing an engineer in a career role, the student can better understand potential career options for him or herself. For example, one insight that students gain is an understanding of how their interview subject uses time throughout the work week, and on which tasks. (See section 3.3 for a further explanation of the learning values for students through this process.) Mark Robinson of Leeds University conduced a work study to examine the use of time of design engineers throughout the work day [12]. Two key insights were gained from this study. First, Robinson relied on timed alarms to remind engineers to mark their tasks at the time the alarm went off to prevent memory bias. Though that approach is not possible given the means of this project, I took efforts to prevent memory bias by asking the interview subject to use a calendar or personal planner to report time usage rather than calling from memory.

The other key insight from the Robinson study is that engineers do not spend all of their time doing technical work, though "around half of design engineers' time is devoted to such technical issues". Design engineers also spend considerable time clarifying their tasks, searching for solutions and combining solutions, evaluating variants on a solution, planning, reporting, and reviewing. Because we know that engineering professionals encounter a variety of tasks daily and, we hoped to capture a weekly overview through sampling of a week from each interview subject.

2. Stakeholder Review

2.1 Office of Institutional Research – Mission and Goals

MIT's Office of Institutional Research (OIR) was instrumental in the creation of this survey and adaptation for an interview-based information-gathering phase. Their role was that of an interested third-party, providing feedback to shape the survey without inducing bias for their own benefit.

The OIR is experienced with the survey software Qualtrics, which was used as the platform for collecting input data from UPOP students. Additionally, the OIR is interested in the results of the survey: their role within MIT is to understand the student experience so that they can inform relevant decision-makers, and this survey helps them to do so.

2.2 MIT Mechanical Engineering – Mission and Goals

This project was conducted through the Department of Mechanical Engineering for several reasons. First, the Department of Mechanical Engineering has one of the first and the largest "flexible" option within its offered undergraduate degrees - nearly 300 students are enrolled in the flexible 2A degree each year from MIT, choosing concentrations in areas such as product design, nanoengineering, robotics, or management [13]. 2A has grown to be about the same size as the traditional Mechanical Engineering track within the department.

Since the 2A program can differ from a traditional engineering education, MIT must take extra steps to ensure that 2A students are prepared for careers through their coursework. There are no statistics from MIT regarding persistence of mechanical engineering students as compared to other engineering students, but the sheer (and growing) size of the program requires knowledge of student goals and needs to better develop appropriate curricula. This survey will aim to deliver information in three key areas for the department: the career goals of students, the career paths taken by others in roles students aspire to, and the perceived skills that students need to succeed in those roles. Together, this information will provide valuable feedback for decisions within several engineering departments as post-graduate student success becomes more of a priority in curriculum development.

2.3 UPOP – Mission and Goals

UPOP's curriculum currently includes an informational interview during the summer. This informational interview provides experience for students in professional practices, including reaching out to a colleague, establishing a professional relationship with a non-supervisor, and exploring career options through networking.

By conducting this survey through UPOP, students are still provided these opportunities and experiences, as the informational interview is still a component of the process.

However, through the structure of the survey, students are given more structured knowledge and more guidance on topics to explore during the informational interview. Not only will the survey process be a vital practice opportunity for UPOP students, but it will also provide them insight into the career path and daily tasks of their career ambitions, helping them shape their vision of their future.

As a stakeholder, UPOP benefits from the results of this survey in several ways, a few of which are explained above. Perhaps most importantly, UPOP can utilize the data from the interview and survey to better understand their students and their students' employers, so that they can better tailor student programming to student needs. Additionally, UPOP will gain data regarding key aspects of some careers or roles which they can use to better advise students in the future.

3. Survey Design

3.1 Question Formats

The process that students will follow to conduct the survey, and the context and environment of their internships, affected development of survey format and questions. We wanted to ensure that students were focusing on their interactions with their interview subject as much as they focused on gathering data for the survey reports; we didn't want the interview subject to feel disregarded. Thus, it was required to keep interview guidance as minimal as possible and to eliminate as many distractions from the interview process.

In order to satisfy this requirement, we did two things: we broke the survey report into two sections, and we created a worksheet for the interview. Students are to complete the pre-interview "biography" report, then conduct the interview, then complete the post-interview report. This way, pre-interview and post-interview information was kept separate, and computer interactions were removed from the interview process. See Appendices A and B for the two survey reports and the interview worksheet, respectively. Both of these strategies were taken after feedback from one of many rounds of user testing, demonstrating the benefit of iterative design. See section 3.4.1 for more explanation on the use of an iterative design process.

The survey report is in two sections: pre-interview and post-interview. The pre-interview report collects data on the career path of the interview subject and enables the student to understand the background of their interview subject more clearly. In this section, the student connects with their interview subject on LinkedIn and uses the LinkedIn profile to enter data about the subject's career, including companies or organizations worked for and roles taken at each company or organization.

The post-interview report allows the student to enter data collected during the interview and is broken into four subsections: Understanding the Role, Understanding the Title, Gaining Perspective, and Understanding Time Use. In each of these sections of the report, the student enters data – some qualitative, and some quantitative – about the interview subject. Lastly, the survey report collects feedback on its own structure, as well as the interview process, so that the process can be improved for future years.

In order to ensure that the topics discussed in the informational interview are relevant to the post-interview report and to ensure that the student is informed enough to complete the survey, a worksheet for use during the interview is also given. This worksheet parallels the post-interview report, so that students are collecting data in a format that mirrors how they will enter it into the online software. It also provides helpful tips for conducting the informational interview, including suggested questions and guidance for asking advice. Lastly, the worksheet provides writing space for students to take notes and later recall information.

Each question was developed through an iterative writing and testing process. For example, one question in the "Understanding the Role" section of the survey seeks to gain insight into the primary motivation or drive for the interview subject in their career. Are they most motivated by scientific discovery, or are they fueled by the users they design for? This question took on many formats: first, a primary motivation was asked with a text entry allowed. However, this was too broad and test subjects were very overwhelmed in the existential nature of the question. Thus, the multiple-choice format with the prompt "Which of these is your interview subject most engaged in?" was selected.

3.2 Student Preparation

Since the data from these interviews and surveys is to be used for MIT's institutional research and by several departments and programs, the validity and quality of the data is of key importance. Several steps were included in the survey process to ensure quality.

First, students were briefed by the researcher or research advisor before embarking on their summer internships regarding the importance of honesty in survey responses. Additionally, the UPOP website was re-formatted to ensure as little confusion as possible about the survey intentions and process. In previous years, the UPOP website included in-line text boxes for data entry regarding the informational interview; now it contains step-by-step instructions with several resources, including a sample email to a coworker to find a time for an informational interview. Please see Appendix C for a mockup of the UPOP website where students can read about the interview process.

UPOP students were also reminded several times – in person, on the UPOP website, and on the interview worksheet – that omitting a question if it was confusing or if they did not know the answer was an acceptable question response. They were encouraged to omit a question rather than trying to answer it.

Lastly, the UPOP curriculum prepared students for the networking process of creating and conducting an informational interview. Part of the UPOP year-long program is a week-long workshop in January of students' sophomore year called "Team Training Camp". The workshop provide experience in teamwork, communication, negotiation, and other workplace skills; it also provides ample practice and coaching in networking with mentors of various ages and backgrounds. From this training camp, UPOP students are prepared to enter a conversation and conduct the interview.

3.3 Anticipated Value

Two key parties are expected to benefit from the survey process: the students conducting the interviews, and MIT employees and offices who view the results of the surveys. It is important to note that the students also benefit indirectly from the survey data but benefit more personally and directly from the survey process.

3.3.1 Anticipated Value for UPOP Students

UPOP students are expected to gain much from the survey process. UPOP students in previous years were required to conduct an informational interview with a colleague who was not their direct supervisor as part of their professional development. UPOP students will still have the developmental experience of conducting such an interview; they will also have the added benefit of having a more structured format to the interview – made possible by the guiding questions in the worksheet – to allow them to cover key topics in a breadth of subjects.

The structured process will allow students the experience of creating a plan for a meeting and executing on that plan, by requiring them to set up and complete the informational interview. It will also provide them the experience of conducting an informational interview, in which neither party is evaluating the other and the only goal is shared knowledge and information. Lastly, it will provide them with knowledge of the career and education path that one might take to be in a role that the student aspires to be in.

3.3.2 Anticipated Value for MIT

Various groups at MIT – the OIR, UPOP, and the Department of Mechanical Engineering – will gain vital information from the results of this survey. From the survey report data, three key takeaways can be made.

First, data can inform what kind of roles engineering students aspire to take on one day, and what kinds of backgrounds individuals in those roles might have. Data from the "Understanding the Title" section can link titles and role characteristics, highlighting differences between confusing similarities, such as managers and executives. Additionally, patterns in companies or colleges related to roles or industries may be explored to better understand the demographics.

Second, qualitative and anecdotal data about the interview subjects, their backgrounds and experiences, and the advice they gave students will be collected. This can be used to understand not only the demographics of students' ambitions but also perspective from those in those positions to better allow MIT staff to provide guidance and advice to students considering those roles.

Lastly, the data will provide insight into the breakdown of time use in roles and industries to better inform the relevance of certain tasks or skills. This will both allow MIT staff to prioritize the needs or individuals in those roles and will also allow the students to get a sense of what that role may "feel like".

3.4 Engineering the Experience

This survey report and worksheet format was not born in a single design phase; it was shaped and crafted through an iterative design and testing process which utilized information-gathering processes similar to those used in product design processes.

3.4.1 Iterative Design

An iterative design process has been proven by many to be a successful way to develop designs while understanding the needs of users and thus creating the best solution given the information available [14]. Throughout the process of survey creation, user tests with MIT undergraduates, MIT faculty, and MIT alumni were conducted on various levels to gain insight in question design and survey structure. In fact, the design process is still not complete: Summer 2015 can be considered a pilot test of the survey report structure. Incoming results will inform the final design of the survey report for Summer 2016.

To understand the path that the survey structure took from first design to now, consider the example of professional education. A question to collect information about continuing education was initially included. It asked interview subjects about their preferences of continuing engineering education and the services offered by their company or organization. However, many user testers did not know what they wanted and did not know the specific benefits available to them, and often opted to skip the question, so it was removed. The question is now included in Appendix F for consideration for future inclusion.

Additionally, "Understanding the Title" asks the UPOP student to mark and categorize the title of their interview subject in the survey report. Initially, titles were grouped similar to the grouping on the US Census Bureau resource sites; however, many complaints about role groups (such as computer scientists and information technologists; and chemical engineers and petroleum engineers) led to the elimination of these groupings and refinement of groupings of roles and titles. From this question, we learned that the U.S. Census groups engineering roles by economic factors, while engineers group themselves by social factors.

3.4.2 Question Phrasing

A key design feature of surveys and questionnaires is the clarity and phrasing of questions or prompts. If prompts are misleading or confusing, data may be muddled or unusable. In design terms, the clarity of the questions can be considered the most critical module: without its success, the rest of the project cannot run successfully. Much work was put into ensuring question phrasing would yield intended outcomes.

For example, the "Understanding Time Use" question initially presented over 40 categories for time use and asked the UPOP student to mark those which the interview subject spent more than 5 hours a week completing. This list was initially overwhelming, and so fine-grained that almost no categories were selected. Time-use categories were combined or eliminated, and grouped into two main groupings: "Structured Time" and "Unstructured Time".

One design constraint in design of the survey report was the trade-off between granularity of data and survey experience. While extremely quantitative answer structures yield

faster and more thorough analysis, the report process becomes confusing and burdensome, as some categories are best left quantitative. If students become too confused or overwhelmed, they are likely not to complete or submit the report. Since some data is better than no data, the decision was made to reduce the quantitative nature of some questions in favor of formats that are easier to answer.

3.4.3 Getting Feedback

Though significant effort was put into the clarity and efficacy of the questions and prompts within the survey, other safeguards against confusion were also put into place to ensure both the validity of data and the possibility for survey report improvement. At the end of each question section in the report, a question was included to allow students to explain confusions they had about the question or any reasons why they may not have answered the question.

If report questions are consistently left blank by students, the answers in this feedback box may shed some light on points of confusion or lack of clarity that could be improved in the survey process.

3.4.4 Worksheet Design

The purpose of the worksheet influenced its design to maximize the students' ease of use. The worksheet is intended to supplement and guide the interview conversation, and to give the student insight into what questions they will have to answer in the report afterwards. However, the students are not expected to read word-for-word from the worksheet nor are they to only ask and answer questions from the worksheet. Thus, empty "white space" for note-taking was left on the worksheet to allow students to write thoughts that they could later reference when they answered survey questions. Additionally, the worksheet is structured similarly to the survey so that students can mark items from a list on paper that will be marked on a multiple choice question in the survey. Lastly, long sets of instructions were removed from the worksheet since user testers tended to skip over them rather than reading them, indicating that students might do the same.

Graphic design principles were applied to the worksheet, which was created from scratch. Varying typefaces, including type size and italics, were used to categorize information on the page into segments such as question headers, suggested phrasing, and possible responses. Information was aligned to be paired with other, similar information and to be out-of-line with dissimilar information. Lastly, a clean black-and-white interface was applied to account for various printing resources of students.

4. User Testing and Results

Two types of user testing were used in the creation of this thesis, alongside informational interviews.

4.1 Informational Interviews

Informational interviews were conducted with key stakeholders to better understand needs so that the survey could best meet them. Informational interviews with UPOP staff led to insight into student habits and program curriculum design. Interviews with networking experts gave insight into the habits and uses of LinkedIn amongst engineering professionals. Interviews with practicing engineers led to insight into organizational dynamics and titles for various roles.

4.2 Informal User Testing

Throughout each design iteration, informal user tests were conducted with undergraduates and engineering professionals to better understand the interpretation of survey materials. In these tests, individuals were given information about the survey and its goals in a format similar to how UPOP students would be given such information (see Appendix C for UPOP Website Mock-Up, used for user testing) and were observed as they completed the survey.

These tests were invaluable, as they provided insight into how a first-time user would interpret the report. Many report improvements came from them. Male and female pronouns were changed to non-gendered pronouns to be respectful of all identities. Additionally, the two-report structure and idea for a worksheet to accompany the survey came from a suggestion from a tester. Lastly, almost all questions were tested and re-phrased to prevent misinterpretation or confusion.

4.3 Formal User Testing

The final round of user testing was conducted with two individuals: an entrepreneur based in Boston, MA and an engineering leadership instructor at MIT. Both individuals were instructed to complete the pre-interview report for a colleague or for their supervisor. Then, an interview was conducted using the interview worksheet. Lastly, they completed the post-interview report based on their answers given in the interview. During the entire process, the testers were instructed to speak aloud about their thoughts and interpretations.

These user tests provided valuable insight into several aspects of the survey process, and yielded changes in report format and structure. Many prompts and instruction blocks were changed. Specifically, wording which was considered too formal or unfriendly was changed to be more colloquial. Additionally, instruction blocks often created a certain expectation for the user tester, and the subsequent questions did not meet that expectation, causing confusion. Instructions were re-ordered and clarified. Mechanics of

the online report form were also changed to meet user needs. A "back button" was installed to allow students to re-enter information if they were confused by a question prompt.

User tests also highlight some issues that were not able to be resolved. These changes are recommended for consideration in future iterations of the survey and are included in Section 6.2, "Possible Expansions". First, the survey was created on a free account of Qualtrics, and the title block of the report shows a Qualtrics logo that reads "free account". One user thought that he had been misdirected, since the logo was not what he expected on a final version survey. Additionally, one user tester mentioned that time use is highly seasonal – some times of year require extensive rework, and other times of the year require extensive hiring initiatives. Future iterations might include some ability to distinguish these two types of time use.

Overall, the process of entering LinkedIn information did not feel fluid and both user testers became irate with the entries, since they did not know how many questions remained. We changed the report to be more precise about the title for which the student should be entering information to prevent confusion, and we allowed questions to collect additional data to "pop up" in line with existing questions, rather the appearing on the next page, to reduce the number of pages that a student had to click through to enter information.

The interview process was awkward, even though both the interview subject and the student tester were friends. Each question offers a suggested phrasing of the question, but the nature of the questions requires significant cognitive effort to comprehend and answer, and we worry that a natural conversation may never happen if the interview subject never feels comfortable in the interview. We hope that students will learn from the challenge of planning a conversation, and hope that the next iteration of this survey can incorporate student feedback on the interview process to improve the data collection.

We believe that this interview process is far from perfect, and trade-offs between data collection and conversation style must be explored further. For this iteration, we hope that we have struck a balance between these two experiences and we hope that in future iterations, a more innovative approach could resolve some of the tension between these two components.

5. Deployment Plan

5.1 UPOP Check-In Format

In order to best access engineering professionals, we decided to utilize MIT's vast network; specifically, we wanted to use the hundreds of sophomores in the UPOP program to aid in administering this survey to professionals in career roles they aspire to enter. We partnered with UPOP and an agreement was made to have the survey supplement the existing informational interview progress report for UPOP students.

UPOP students will be required to complete the interview and associated surveys as part of their UPOP assignments for the summer. Since they receive academic credit for the program, there are incentives for students to complete the reports. Students will receive reminder emails and their personal website portal will have all of the information that they need to complete the reports. The goal of the survey design was to make the process as streamlined as possible for students, so that the maximum number possible would complete the assignment.

5.1.1 Previous UPOP Check-In Format

Previously, UPOP's second summer check-in was an online form in which students shared reflections on an informational interview conducted with a coworker. The survey still allows for this insight and reflection but also gathers data about the interview subject for MIT's use. See Appendix E for the previous UPOP check-in.

UPOP's previous format came with a handful of known issues. First, students sometimes simply do not do the check-in. Most of these students elect not to finish the UPOP program; they find that the value of the UPOP program lies in the internship experience, not the informational interview. Secondly, some students falsify the information in the check-in. In order to prevent this, we continually reminded students that the option to skip a question was present and preferable to falsified data.

Additionally, the check-in is well-integrated into the UPOP website, so it is easy for UPOP staff to check who has completed the assignment. We had to ensure this ease of tracking was maintained, and chose to add the survey report links to the UPOP website so that tracking was done through the existing site, rather than through survey results.

5.1.2 Advantages of Integrating into UPOP platform

Several key advantages lie in building the survey into the UPOP website, rather than creating a new UPOP assignment or a separate platform for hosting the surveys. First, as mentioned, is the ease of completion tracking. Second is the student familiarity with the UPOP website and check-in process. Lastly is the platform for hosting multiple report links and sample documents for student reference, rather than including in an email or hosting elsewhere on the web.

5.2 End-of-Question Feedback

Though care was taken to ensure that survey report questions were clear and the survey process was well-explained, students are still offered the option to skip a section or question, and are prompted to give feedback as to why they made this choice. This feedback, at the end of each section of questions on the online survey report, asks students "Did you understand the questions on this page? If you skipped any, tell us why here." and allows a text response. Though this question will collect qualitative data, which a human must interpret after the survey has been administered, it will provide insight into response patterns and allows users to provide feedback on their survey experience.

6. Future Considerations

At the time of completion of this document, the UPOP survey has not been yet been completed by any students. Thus, the following section elaborates on suggested evaluations of the results by another party, as well as considerations to make for the future given feedback from the survey report. This section can be considered a framing document for future revision and implementation of the survey process guided by results from 2015.

6.1 Considerations of Results

When evaluating results of the UPOP survey reports, three key patterns should be examined closely and results should be reported to the stakeholders listed in Section 2.

The first of these patterns are career trajectories: the paths taken by an individual to arrive in the role they are currently in. The pre-interview section is intended to collect this data through each role and organization the individual has worked for, as well as the degrees they have earned. Metrics for analysis of career paths include:

- average length of time in each role,
- average length of time in early roles as compared to later roles
- length of time before switching industries
- length of time before leaving engineering
- degrees held (especially for certain roles such as executive or consulting roles)

The second metric which is of use to stakeholders is the use of time, as indicated by the "Understanding Time Use" section of the report. Analysis of most commonly marked tasks and frequency of positive response for those tasks, especially as compared to role, industry, or years since graduation, could give a strong indication of what roles "feel" like on a day-to-day basis. For example, UPOP would benefit from gaining an understanding of the relative time spent on emails and testing in an engineering role so that they can advise students on the tasks within those roles.

The third metric to consider is the correlation between students' majors and the backgrounds or titles of the individuals they chose to interview. Finding patterns for a specific degree or a specific industry could help curriculum planners understand the career goals and career opportunities for students in those courses.

6.2 Possible Expansions

One of the discarded report segments was a series of questions to better understand continuing education. The full series of questions can be found in Appendix F. These questions were intended to evaluate current continuing education resources and needs of the interview subjects, with the hope that the results could aid MIT in developing continuing education for engineering professionals. However, the question felt out of place because it did not aid in student career development and was purely for data-collection purposes.

A second possible expansion to the survey could be made within the pre-interview section of the report using data available on LinkedIn profiles. One potential barrier to this section is the proportion of individuals who do not maintain a LinekdIn profile; the response rates of students regarding whether or not their subject had a LinkedIn profile should be taken into consideration before implementing this question.

LinkedIn profiles allow an individual to list completely unique and personalized "skills" which their colleagues can "endorse" publicly. This allows an individuals' network to advocate for their skill set, and a profile with a well-developed portfolio of endorsed skills can be a strong indication of an individuals' expertise and background. A future expansion could collect and/or categorize the skills individuals list and compare the results to the careers or industries of those individuals.

In the LinkedIn section of the report, users are not informed as to how many companies they will be entering data for, or how much of the survey is left to complete. A future iteration might ask students upfront to enter the number of companies, and tailor the number of questions to that response. Another innovative solution would be to export the LinkedIn page as a whole and use a script to extract all API data on companies, titles, years worked, and degrees earned from a single profile. However, this approach requires more programming than resources allowed.

The time use question contains some possible selections that are highly seasonal, such as hiring or team planning. In the future, a dual-answer mechanism may be useful, allowing a subject to indicate if they spend 5 hours a week on a task all of the time, or only during certain times of the year. Additionally, the time use question could benefit from being a more holistic consideration – one user tester suggested having a "pie chart" or other graph and allowing interview subjects to indicate the proportion of time they spend doing certain tasks. This adaptation would require computer use for the student, and thus was not included in this year's survey. However, it should be considered in the future.

6.3 Questions to Consider

As the survey became more developed, some key questions for refinement and revision came up throughout the process. They are listed and explained below.

- *Were some roles or titles extremely common?*
  If so, elaborating those roles to contain more granular titles within the role may help create a more complete picture of that particular role or industry. Additionally, the popularity of the role may give insight into common ambitions of engineering students and guide curriculum development or course options.
- *Were some roles or industries never marked?*
  These titles may be worth removing from the report to reduce unnecessary options. This logic could also apply to options in the Time Use section of the survey. Just as an answer can provide insight, a lack of an answer can provide valuable insight.

- *Did the same write-in option for an "other" category appear often?*
  If so, it may be worth adding it as a regular selection for the survey report.
- *How many roles and companies were often listed on LinkedIn profiles?*
  Did students often indicate that there were more roles or companies that they did not have space to enter in the survey report? Were there more questions about roles than roles for students to list? Consider the balance between survey density and information available, and expand or remove questions about roles as necessary.
- *Is LinkedIn an appropriate tool for finding career trajectory?*
  This can be found by evaluating the completeness of pre-interview report entries and the proportion of students who could not complete the pre-interview report because their interview subject did not have a LinkedIn profile. If a lack of a LinkedIn profile prevented many students from learning about their interview subject, an alternative collection practice may be to have students verbally ask about career trajectories and enter information later.
- *Was one question answered differently from all of the others?*
  Did students consistently skip the question, answer it incorrectly, or provide the feedback that it was confusing or misleading? The question should probably be re-written and tested.
- *Is there a single firm that dominates MIT hiring in this field?*
  If a single company or firm is representative of almost all interview subjects within a certain field or role, their answers may not be representative of that entire field.
- *Was one individual interviewed more than once?*
  Comparison of survey responses for the same individual may give insight into student interpretation of the survey; additionally, this may be an indicator that this individual is in a highly sought-after role. Additionally, care should be taken to ensure that their survey response is not counted twice.

7. Conclusions

The problem of engineering persistence is very real: surveys conducted in 2004 indicate that about a third of engineering undergraduates continue to be engineers immediately after college in their careers. [1] In an effort to better understand the goals and ambitions of MIT engineering undergraduates, a survey was crafted to collect data and yield insight. The results of this survey will aid many parties in development of curriculum and career development options for engineering students.

The survey was crafted for implementation over summer 2015 through UPOP students on their summer internships. The survey was crafted with an iterative design process, with stakeholder interviews and user testing to collect feedback to inform further designs. This survey contains two online reports: the first informed by a LinkedIn profile and the second informed by an informational interview. Much work was put into the ease of use of the survey reports and the format in which they are presented to students.

Though care was taken to test the survey, and it is complete as it can be at this time, some survey considerations cannot be made without information from a full summer of survey-takers. Suggestions for survey revision and improvement, informed by responses, have been given.

Appendix A: Interview Worksheet and Reports

Intro and LinkedIn

Q1.1 First, we want to collect some information about you! In each section, the final question is an opportunity for you to provide feedback to the survey creators about your experience with this survey. If you do not understand a question and do not feel like you can answer it honestly, feel free to skip it and tell us what you found problematic in this feedback section. There is no penalty for skipping questions or sections.

Q1.2 A. What is your name?
- First
- Last

Q1.3 B. What is your primary major?

- ❍ 1C
- ❍ 1E
- ❍ 2
- ❍ 2A
- ❍ 2-OE
- ❍ 3
- ❍ 3A
- ❍ 3C
- ❍ 4
- ❍ 5
- ❍ 6-1
- ❍ 6-2
- ❍ 6-3
- ❍ 6-7
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10
- ❍ 10B
- ❍ 11
- ❍ 12
- ❍ 14
- ❍ 15
- ❍ 16-1
- ❍ 16-2
- ❍ 17
- ❍ 18
- ❍ 18C
- ❍ 20
- ❍ 21
- ❍ 22
- ❍ 24

Q1.4 C. Which of these are you pursuing this summer?

- ❑ Research or UROP
- ❑ MISTI
- ❑ An internship in engineering
- ❑ An internship in management or operations
- ❑ An internship in banking or financial services
- ❑ An internship in consulting
- ❑ Shadowing a medical doctor
- ❑ Founding my own company
- ❑ Other _____

Q1.5 D. What is your interview subject's name?

Q2.1 Please use your interview subject's LinkedIn profile to fill out this pre-interview report as best as you can. This is also a great opportunity to understand their background and can give you some questions to ask during the interview. If your subject does not have a LinkedIn profile: please fill out as many fields as you can, and let us know in the comments.

Q2.2 A. What is your interview subject's current title?

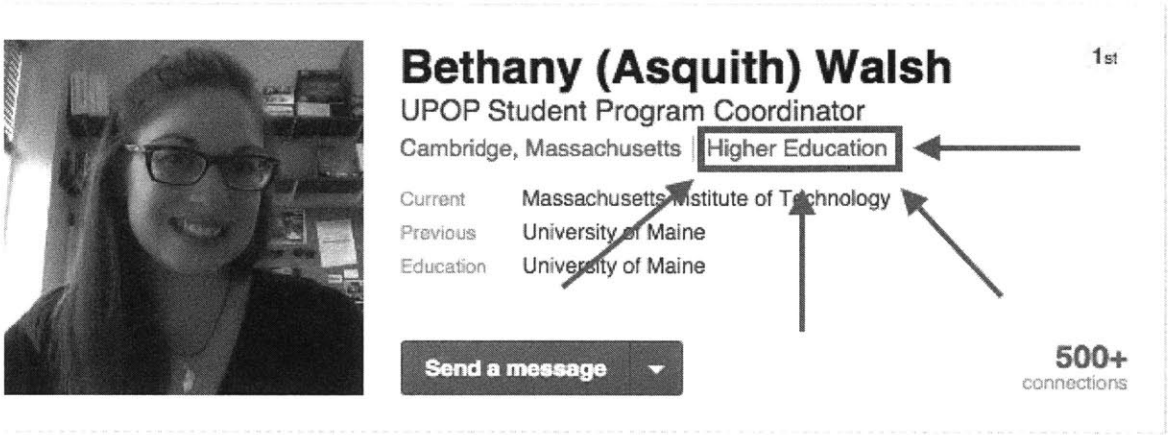
Q2.3 B. What company or organization do they work for?

Q2.4 C. What is their relationship to you?

- ❍ We work on the same team or project and they are my manager or supervisor.
- ❍ We work on the same team or project but they are NOT my manager or supervisor.
- ❍ We work in the same area but on different projects.
- ❍ We work for the same company or organization, but not in the same department.
- ❍ We do not work for the same company or organization.

Other _____

Q2.5 D. Their profile should list an industry that they work in. Please mark theirs below. This picture shows where on their profile this information is shown.



- Accounting
- Airlines / Aviation
- Alternative Dispute Resolution
- Alternative Medicine
- Animation
- Apparel and Fashion
- Architecture and Planning
- Arts and Crafts
- Automotive
- Aviation and Aerospace
- Banking
- Biotechnology
- Broadcast Media
- Building Materials
- Business Supplies and Equipment
- Capital Markets
- Chemicals
- Civic and Social Organization
- Civil Engineering
- Commercial Real Estate
- Computer and Network Security
- Computer Games
- Computer Hardware
- Computer Networking
- Computer Software
- Construction
- Consumer Electronics
- Consumer Goods
- Consumer Services
- Cosmetics
- Dairy
- Defense and Space
- Design
- Education Management
- E-Learning
- Electrical/Electronic Manufacturing
- Entertainment
- Environmental Services
- Events Services
- Executive Office
- Facilities Services
- Fine Art
- Fishery
- Food and Beverages
- Government Administration
- Government Relations
- Graphic Design
- Health, Wellness, and Fitness
- Higher Education
- Hospital and Health Care
- Hospitality
- Human Resources
- Import and Export
- Individual and Family Services
- Industrial Automation
- Information Services
- Information Technology and Services
- Insurance
- International Affairs
- International Trade and Development
- Internet
- Investment Banking
- Investment Management
- Judiciary
- Law Enforcement
- Law Practice
- Legal Services
- Legislative Office
- Leisure, Travel, and Tourism
- Libraries
- Logistics and Supply Chain
- Luxury Goods and Jewelry
- Machinery
- Management Consulting
- Maritime
- Market Research
- Marketing and Advertising
- Mechanical or Industrial Engineering
- Media Production
- Medical Devices
- Medical Practice
- Mental Health Care
- Military
- Mining and Metals
- Motion Pictures and Film
- Museums and Institutions
- Music
- Nanotechnology

- ❍ Newspapers
- ❍ Non-Profit Organization Management
- ❍ Oil and Energy
- ❍ Online Media
- ❍ Outsourcing / Offshoring
- ❍ Package / Freight Delivery
- ❍ Packaging and Containers
- ❍ Paper and Forest Products
- ❍ Performing Arts
- ❍ Pharmaceuticals
- ❍ Philanthropy
- ❍ Photography
- ❍ Plastics
- ❍ Political Organization
- ❍ Primary / Secondary Education
- ❍ Printing Professional Training and Coaching
- ❍ Program Development
- ❍ Public Policy
- ❍ Public Relations and Communications
- ❍ Public Safety
- ❍ Publishing
- ❍ Railroad Manufacture
- ❍ Ranching
- ❍ Real Estate
- ❍ Recreational Facilities and Services
- ❍ Religious Institutions
- ❍ Renewables and Environment
- ❍ Research
- ❍ Restaurants
- ❍ Retail
- ❍ Security and Investigations
- ❍ Semiconductors
- ❍ Shipbuilding
- ❍ Sporting Goods
- ❍ Sports
- ❍ Staffing and Recruiting
- ❍ Supermarkets
- ❍ Telecommunications
- ❍ Textiles
- ❍ Think Tanks
- ❍ Tobacco
- ❍ Translation and Localization
- ❍ Transportation / Trucking / Railroad
- ❍ Utilities
- ❍ Venture Capital and Equity
- ❍ Veterinary
- ❍ Warehousing
- ❍ Wholesale
- ❍ Wine and Spirits
- ❍ Wireless
- ❍ Writing and Editing
- ❍ Other: _____

Q2.6 E. Please list your interview subject's educational background. List all degrees they have earned, and where and when they earned them. Example: BS in Mechanical Engineering, 2002MBA, 2009

Degree (MS, BS, MBA, PhD, etc.) and Field
Year
Degree (MS, BS, MBA, PhD, etc.) and Field
Year
Degree (MS, BS, MBA, PhD, etc.) and Field
Year

Q2.7 If they have any other degrees, list them here.

Q2.8 In this section, we'd like to collect information about positions and companies that your interview subject has listed on their profile. Please answer the questions based on information on your interview subject's LinkedIn profile. How many years have they worked at their current company or organization? Round to the nearest whole number.

Q2.9 Do they have multiple positions, titles or roles listed during their time in that company or organization?

- ❍ Yes
- ❍ No

Q2.10 Let's begin with the most recent title.
Number of years held (round to the nearest number)

Q2.11 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.12 Tell us about the second title.
Title
Number of years held (round to the nearest number)

Q2.13 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.14 Tell us about the third title.
Title
Number of years held (round to the nearest number)

Q2.15 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.16 Tell us about the fourth title.
Title
Number of years held (round to the nearest number)

Q2.17 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.18 Tell us about the fifth title.
Title
Number of years held (round to the nearest number)

Q2.19 How many titles do they have listed for the same company or organization that you have not listed?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5+

Q2.20 Is there another company or organization listed on their profile, other than the one they currently work for? Note: if they have worked for a company more than once, but worked at another company in between (i.e. worked for Google from 1999-2004 and 2009 - 2012, but worked at Apple from 2004-2009) just consider each time at the company as a separate company.

- ❍ Yes
- ❍ No

Q2.21 What is the name of the second company or organization?

Q2.22 Tell us about the most recent title.

Title

Number of years held (round to the nearest number)

Q2.23 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.24 Tell us about the second title.

Title

Number of years held (round to the nearest number)

Q2.25 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.26 Tell us about the third title.

Title

Number of years held (round to the nearest number)

Q2.27 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.28 Tell us about the fourth title.
Title
Number of years held (round to the nearest number)

Q2.29 How many titles do they have listed for the same company or organization that you have not listed?
- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5+

Q2.30 Is there a third company or organization listed on their profile that you have not entered data for? Note: if they have worked for a company more than once, but worked at another company in between (i.e. worked for Google from 1999-2004 and 2009 - 2012, but worked at Apple from 2004-2009) just consider each time at the company as a separate company.
- ○ Yes
- ○ No

Q2.31 What is the name of the third company or organization?

Q2.32 Tell us about the most recent title.
Title
Number of years held (round to the nearest number)

Q2.33 Do they have more titles within this company or organization?
- ○ Yes
- ○ No

Q2.34 Tell us about the second title.
Title
Number of years held (round to the nearest number)

Q2.35 Do they have more titles within this company or organization?
- ○ Yes
- ○ No

Q2.36 Tell us about the third title.
Title
Number of years held (round to the nearest number)

Q2.37 Do they have more titles within this company or organization?

- ❍ Yes
- ❍ No

Q2.38 Tell us about the fourth title.

Title

Number of years held (round to the nearest number)

Q2.39 How many titles do they have listed for the same company or organization that you have not listed?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5+

Q2.40 How many companies have they worked for that you have not had a chance to enter information about?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4+

Q2.41 UPOP Students: Did you understand the questions in this section? If you skipped any, tell us why here.

Post-Interview

Q1.1 Answer the following questions with information from your interview. If you feel like you cannot answer a question in any section, please tell us why at the end of the section - it will help us improve the survey in the future.

Q1.2 What is your name? This is so that we can link your previous survey with this survey.

First

Last

Q1.3 Which of these is your interview subject most engaged in?

- ❍ Team or personnel development
- ❍ Prototype development
- ❍ Product development
- ❍ Research or analysis
- ❍ Process or infrastructure development
- ❍ Other _____

Q1.4 Please help us better understand their position by marking which title fits best.

- ❑ Mechanical Engineer
- ❑ Manufacturing or Industrial Engineer
- ❑ Software Engineer, Computer Scientist, or Programmer
- ❑ Electrical Engineer
- ❑ Systems Engineer or System Architect
- ❑ Chemical Engineer
- ❑ Petroleum Engineer
- ❑ Civil, Structural, or Infrastructural Engineer
- ❑ Safety or Facilities Engineer
- ❑ Product Design / Development
- ❑ User Experience or Human-Computer Interaction Designer
- ❑ Human Factors Engineer
- ❑ Other Engineer _____
- ❑ Technical Manager
- ❑ Project Manager
- ❑ Product Manager
- ❑ Business Development
- ❑ Chief Executive
- ❑ Medical Doctor
- ❑ Lawyer
- ❑ College / University Faculty
- ❑ Other educator (K-12, pre-school, adult education, other)
- ❑ Non-University Researcher
- ❑ Student
- ❑ Financial Investor / Banker / Trader
- ❑ Venture Capitalist
- ❑ Accountant
- ❑ Management Consultant
- ❑ Engineering Consultant
- ❑ Other Consultant _____
- ❑ Other _____

Q1.5 What sort of advice or insight did your interview subject provide regarding their position?

Q1.6 Did you learn something surprising or new?

Q1.7 What was "old news"?

Q1.6 UPOP Students: Did you understand the questions on this page? If you skipped any, tell us why here.

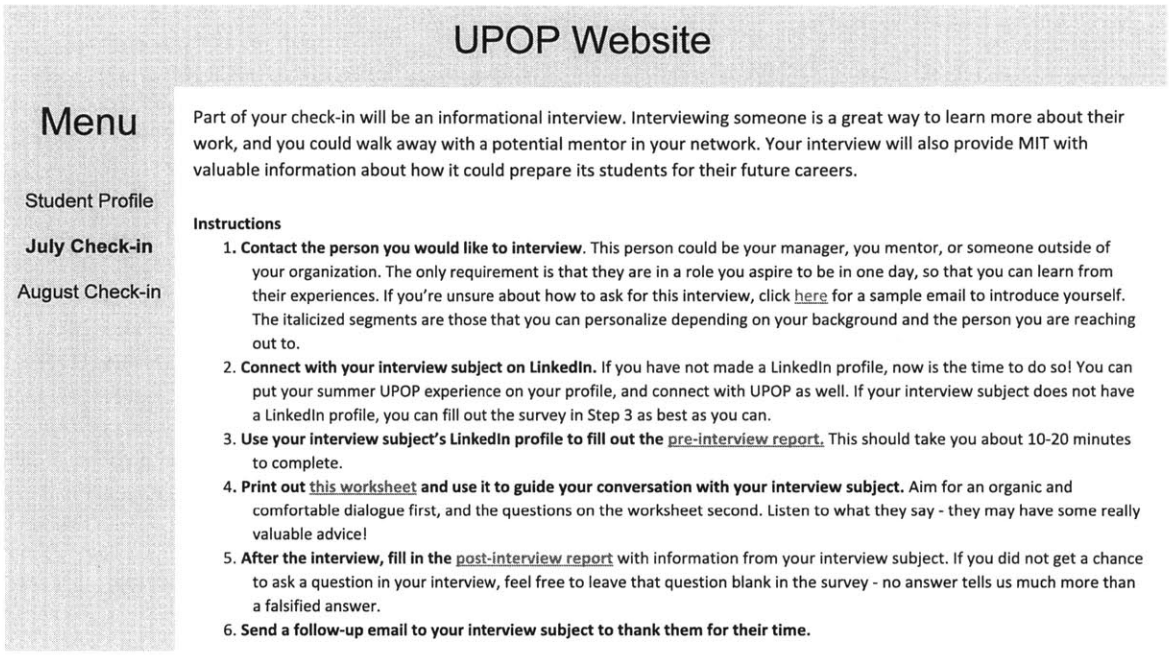
Q2.1 Answer the following questions with information from your interview about how your interview subject uses their time. If you feel like you cannot answer a question in any section, please tell us why at the end of the section - it will help us improve the survey in the future. Did they spend 5 or more hours last week doing the following:

- ❑ Meeting with one or more members of your project team
- ❑ Meeting with other company employees or organization members
- ❑ Interacting with customers or users
- ❑ Meeting with individuals outside your organization, such as contractors
- ❑ Designing or conducting performance tests (including testing fixtures or protocol)
- ❑ Conducting analyses
- ❑ Documenting project strategy or direction
- ❑ Evaluating competitors' products or similar products, design, or research
- ❑ Creating or modifying a model or representation
- ❑ Writing code
- ❑ Modifying the design of an existing feature
- ❑ Interviewing candidates
- ❑ Travel
- ❑ Reading or sending email
- ❑ Responding to requests or questions from others
- ❑ Planning the schedule for teams or groups of people
- ❑ Other _____

Q2.2 UPOP Students: Did you understand the questions on this page? If you skipped any, tell us why here.

Q2.3 Did you find the interview experience useful or valuable? Tell us why, or why not.

Appendix B: UPOP Website Mockup



Appendix C: Student Interview Worksheet

UPOP Summer Check-In – Interview Worksheet

Introduction

This worksheet will help you gather the information you need for the second survey, but it also gives you some suggested questions for getting to know your interview subject and their career – they can be a great resource! Your conversation doesn't have to directly follow these questions or this order.

Print out this worksheet before your interview, and use it however you want to take notes for yourself. Be sure to ask your interview subject if it's OK to take notes while you talk.

If you find any questions confusing or misleading, please let us know in the survey.

1. Understanding their role.

Of all the things that their organization does, which part are they most engaged with?
Hint: You could ask "Which of these is your primary responsibility?"

a. Team or personal development
b. Prototype development
c. Product development
d. Research or analysis
e. Process or infrastructure development
f. Other: _____

1

UPOP Summer Check-In – Interview Worksheet

2. Ask which of these titles, then subtitles, best fits their role.

Hint: You could ask "What would you call your role?" or "Which of these categories best describes your role?" while suggesting categories and subcategories.

a. Engineer
   i. Mechanical Engineer
   ii. Manufacturing or Industrial Engineer
   iii. Software Engineer, Computer Scientist, or Computer Programmer
   iv. Electrical Engineer
   v. Systems Engineer or System Architect
   vi. Chemical Engineer
   vii. Petroleum Engineer
   viii. Civil, Structural, or Infrastructural Engineer
   ix. Safety or Facilities Engineer
   x. Product Designer or Developer
   xi. User Experience / Human – Computer Interaction Designer
   xii. Human Factors Engineer
   xiii. Other Engineer: _____

b. Executive or Manager
   i. Technical Manager
   ii. Project Manager
   iii. Product Manager
   iv. Business Development
   v. Chief Executive
   vi. Other: _____

c. Medical Doctor

d. Lawyer

e. Educator or Researcher
   i. College or University Faculty
   ii. Other educator
   iii. Non-university researcher
   iv. Student
   v. Other: _____

f. Banker
   i. Financial Investor Banker, or Trader
   ii. Venture Capitalist
   iii. Accountant
   iv. Other: _____

g. Consultant
   i. Management Consultant
   ii. Engineering Consultant
   iii. Other Consultant: _____

h. Other: _____

2

UPOP Summer Check-In – Interview Worksheet

3. Learn more about their position and experiences.

You could ask the following:

- What do you enjoy most about your position, organization, or career?
- What made you enter this field? Is it meeting your expectations?
- *[If the field they are currently in is not related to their field of study]* Why did you change industries or fields?
- If you could share a downside about your career path thus far, what would it be?
- If you had advice for a person entering your job or profession, what would it be?
- Does this organization support your personal and professional goals? How?

You can ask other questions as well. If you find the answers valuable, take note of it and let us know later – we want to know!

3

UPOP Summer Check-In – Interview Worksheet

4. Understand how they use their time.

We'd like to know what they spent 5 or more hours on last week. Even if it was an atypical week, for whatever reason, ask them to be honest for last week specifically.
Hint: You could ask "If you pulled up your calendar or planner, could you circle which of these you spent 5 or more hours on last week?"

Structured Time

- Meeting with one or more members of your project team
- Meeting with other company employees or organization members
- Interacting with customers or users
- Communicating with individuals outside your organization, such as contractors
- Designing or conducting performance tests (including testing fixtures or protocol)
- Conducting analyses
- Documenting project strategy or direction
- Evaluating competitors' products or similar products, design, or research
- Creating or modifying a model or representation
- Writing code
- Modifying the design of an existing feature
- Interviewing candidates
- Travel
- Other: _____

Unstructured Time

- Reading or sending email
- Responding to requests or questions from others
- Planning the schedule for teams or groups of people
- Other: _____

You could also ask:

- What are your hours? How are they structured?
- Do you like thinking through problems at home, or keeping all reflection to the work day?
- How do you manage your email and tasks?

4

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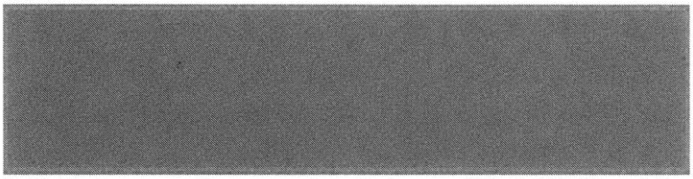
Appendix E: Previous UPOP Check-In

1. TEAMS

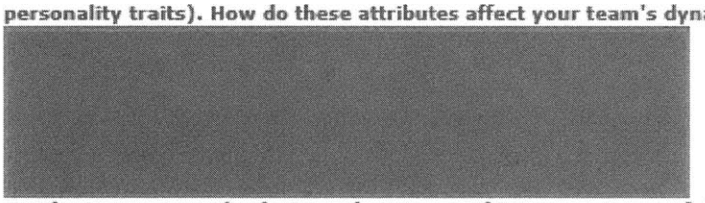
Please reflect on your experiences working with your team this summer.

***If you are not working in a team, you can choose to write about your co-workers or observations you've made about other teams. You may also reflect on how your work is affected by working alone.**

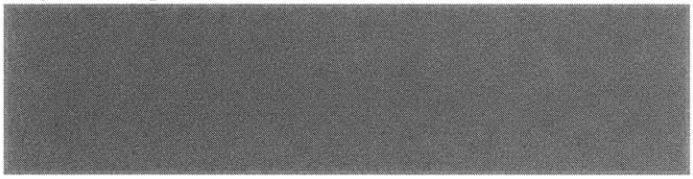
A. How does your team work together? What works well? What doesn't work well?



B. Reflect on your team members in terms of their thinking styles and styles of communication (think about the 6 Hats, HBDI, and other personality traits). How do these attributes affect your team's dynamics?



C. Who is your team leader? In what ways is this person successful (or not) at leading the team?



2. INFORMATIONAL INTERVIEW

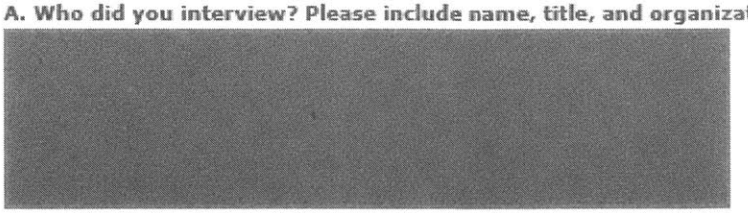
Interview someone who you would like to learn more about. Ideally this is someone you don't normally get to interact with, but who is doing something that interests you. Your interview can be formal or informal, either a meeting in their office or a meeting over coffee/lunch, or even over the phone.

When you contact a prospective interviewee, give your elevator talk about who you are and why you are contacting them. Give your contact information and availability, and try to be as flexible as possible. This person is doing you a favor!

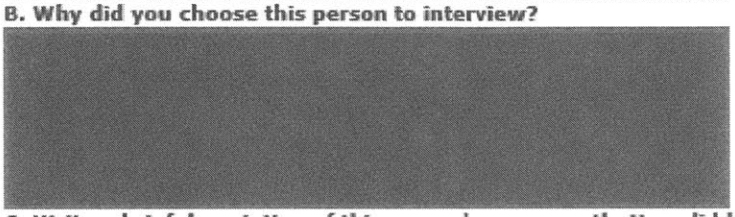
Prepare for the meeting by doing a little research on the person you are meeting with, and by writing down 10-15 questions you have for them. Depending on time, you may not get to all of them, but you should be prepared. There are sample questions under the "Resources" tab on the UPOP website.

After your meeting, remember to send a thank-you note. This person is in your network now!

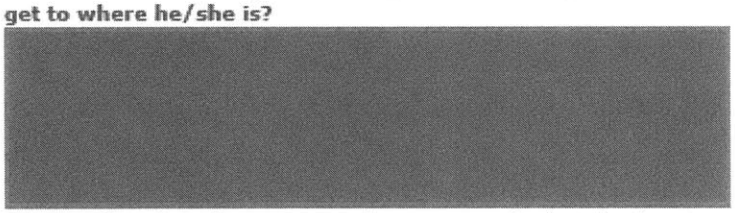
A. Who did you interview? Please include name, title, and organization.



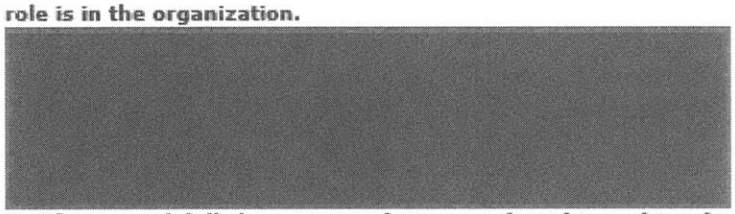
B. Why did you choose this person to interview?



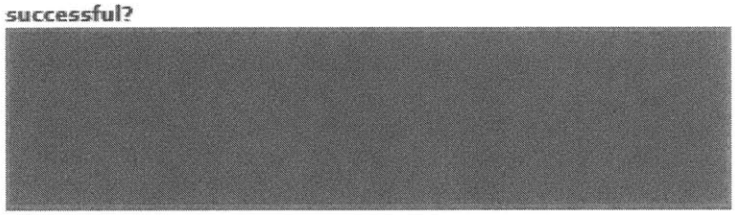
C. Write a brief description of this person's career path. How did he/she get to where he/she is?



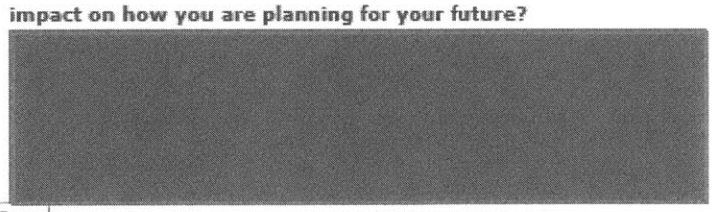
D. Describe what this person is doing now and what the function of their role is in the organization.



E. What traits/skills/experiences have contributed to making this person successful?



F. What advice did you get from this person? Did the interview have an impact on how you are planning for your future?



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Appendix F: Discarded Questions

Q1.1 We are trying to understand the continuing education needs of professionals in industry. Which of these areas would you be most willing to participate in ongoing education courses for?

- ❑ New software or tools
- ❑ New languages or applications
- ❑ Management or project tools
- ❑ Leadership and team development
- ❑ Manufacturing processes or controls
- ❑ Design
- ❑ Mechanics, dynamics or other "textbook" material
- ❑ Other _____

Q1.2 What areas does your company offer continuing education in?

- ❑ New software or tools
- ❑ New languages or applications
- ❑ Management or project tools
- ❑ Leadership and team development
- ❑ Manufacturing processes or controls
- ❑ Design
- ❑ Mechanics, dynamics, or other "textbook" material
- ❑ Other _____

Q1.3 Do you use these services?

- ○ Yes
- ○ No

Q1.4 What is most important to you in an ongoing education experience?

_____ Cost
_____ Scheduling flexibility with my annual schedule
_____ Scheduling flexibility during the day or week
_____ Personal interaction
_____ Opportunity for courses open only to my company or team
_____ Other

Note: This question included a "sliding scale" with a bar for each category to allow the survey taker to indicate the relative importance of each category.

Q1.5 How do you prefer to encounter content and interaction?

- ❑ In a classroom
- ❑ In a live video conference
- ❑ In a recorded lecture video
- ❑ In a textbook
- ❑ In a screen-share video

Q1.6 UPOP Students: Did you understand the questions on this page? Were they easy to complete?