Factors Affecting the Educational and Occupational Trajectories of Women in Engineering in Five Comparative National Settings

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***Abstract*— Issues surrounding women's participation in engineering have confounded policymakers around the globe for a number of years. While substantial progress has been documented for women in engineering and in computing and information technology in the Middle East, the recruitment and retention of women in these fields continue to face substantial challenges. The primary objective of our new multi-site case study is to identify the factors underlying and contributing to the educational and occupational trajectories of women in engineering and computing in Jordan, Malaysia, Saudi Arabia, Tunisia and the US. These countries vary substantially in their economic, educational, cultural, historical, legal, geographic, and political contexts AND in women's engineering and computing representation. Perhaps most importantly, they differ in their levels of prosperity, the democratization of their political and social institutions, and in the prevailing cultural understandings of engineering and computing, including its gender labeling.**

Our research questions are: (1) What motivates women's choice of engineering or computing as an educational/occupational path? (2) How do women perceive professionals in these fields and the work they do? (3) What societal, cultural, legal, and policy factors are perceived to support or constrain women's participation in engineering or computing fields of study and occupations? (4) What common themes emerge in different national sites and for women at different stages of study or professional practice? (5) What can we learn from one another?

In addition to these general research questions, our collaborating teams in each of the five case study contexts (Jordan, Malaysia, Saudi Arabia, Tunisia, and the USA) have created context-specific questions based on relevant literature and national metrics for each respective site. Our collaborators in Saudi Arabia have developed a set of context-specific research questions related to computing as well, which has enjoyed strong female participation in that nation. We will include Saudi's first female engineering program, opened in 2011, in the second phase of our study when its first cohort has graduated. In this paper, we describe general and country-specific research questions and solicit input from diverse stakeholders in the IFEES community on the relevance, validity, and scope of these questions. By eliciting varied and broad perspectives, the research questions and resulting interview protocol for this study will gather rich qualitative data and will encourage buy in from the IFEES community for scale up survey work during our next phase.

Keywords-women in engineering; USA; Jordan; Tunisia; Malaysia; Saudi Arabia

I. INTRODUCTION

Issues surrounding women's participation in engineering have confounded policymakers around the globe for a number of years [1,2,3]. While substantial progress has been documented for women in computing and information technology in some parts of the Middle East, the recruitment and retention of women in engineering in MENA countries and in the United States continues to face substantial challenges [4,5].

Further exploration into the multi-faceted core causes of successes and challenges for gender parity in the global workforce is needed for three primary reasons [6]:

1. Gender disparities limit the educational, career and life options of both men and women;
2. "Separate but equal" distribution principles that result from gender disparities frequently do not yield equal pay or power;
3. Such disparities prevent women from filling the growing global shortage of technical expertise.

The primary objective of our new multi-site case study is to identify the factors underlying and contributing to the educational and occupational trajectories of women in engineering in Jordan, Malaysia, Saudi Arabia, Tunisia and the US. These countries vary substantially in their economic, educational, cultural, historical, legal, geographic, and political contexts AND in women's engineering representation. Perhaps most importantly, they differ in their levels of prosperity, the democratization of their political and social institutions, and in the prevailing cultural understandings of engineering, including its gender labeling.

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Our research questions:

1. What motivates women's choice of engineering/computing as an educational/occupational path?

2. How do women perceive engineers/computing professionals and engineering or computing work?

3. What societal, cultural, legal, and policy factors are perceived to support or constrain women's participation in engineering and computing fields of study or occupations?

4. What common themes emerge in different national sites and for women at different stages of study or professional practice? What heterogeneity can be observed?

We will compare five diverse countries that have varying profiles of women in engineering and diverse political, social, economic, and cultural environments. Four of the countries chosen as case-studies are majority Muslim countries, while the US is not. The US, however, has struggled for half a century to increase the number of women in both engineering and computing and has invested billions in researching the reasons behind such low participation of women in these fields. We highlight this dimension of diversity in our case-study countries for two important reasons: (1) Opportunity: Members of our research team have collaborated with female faculty in each targeted country and little is conclusively known about why female representation in engineering is relatively strong in these contexts. (2) Good Test Case: Muslim countries are typically depicted in Western media as offering women fewer choices in the public sphere as compared to the US. Muslim women's strong representation in what is one of the most extremely male-dominated fields in Western democracies is surprising to many in the US. This is an opportunity to surface and wrest biases and assumptions to challenge stereotypes.

II. Background and Rationale

In 2012, three of our researchers crossed borders and looked outside STEM education literature to gain perspectives into the multi-faceted core causes of successes and continuing challenges for engineering gender parity in Jordan, Malaysia and the US [7]. The team looked to sociologists' Charles and Bradley and their 2009 study of gender segregation across fields in 44 countries, which documented counterintuitive patterns of cross-national variation. They suggested that cultural beliefs about gender and the meaning and purpose of educational and work activities contribute to greater sex segregation in STEM fields in countries characterized by broad-based material security. Specifically, they posited that widespread cultural expectations that people pursue individual passions through their educational and occupational choices (norms of "self-expression") together with deeply held beliefs about gender differences ("gender essentialism") intensify gender typing of curricular choice in highly affluent democracies. To the extent that engineering is stereotyped as masculine, Charles and Bradley argued, normative mandates for individual self-expression (e.g., following one's passion) would contribute to weaker female representation in these contexts.

Utilizing Charles and Bradley's Gender-Essentialist and Self-Expressive Value Systems Framework, quantitative and qualitative data from Jordan, Malaysia, and the US, three countries with different economic profiles, was analyzed (US ranks 8th out of 182 in GDP, Malaysia 59th, and Jordan 109th). Until the 2012 publication, this framework had not been used in engineering education literature, nor had the counter-intuitive findings of cross-national patterns been directly tested.

Our preliminary analysis both confirmed and contradicted Charles and Bradley's findings and interpretation in important and interesting ways. In Jordan in 2009-2010, women comprised 40% of undergraduate engineering students in the two largest public universities and represented 30.9% of all registered engineers. In Malaysia in 2009, women comprised 40% of entering engineering undergraduates of two of the largest universities, yet represented only 20% of the engineering workforce. This quantitative data are generally consistent with Charles and Bradley's findings [8].

In many economically developing countries, according to Charles and Bradley, women's educational and occupational choices are influenced by pressures to provide financial assistance to their families. While the 2012 analysis found this to be generally true in Jordan, it did not seem to hold in Malaysia. Women frequently cited their interest in engineering and its intellectual challenges as rationales for career choice. They also pointed to strong professional engineering role models and a desire to prove that women were as capable as men of excelling in engineering. We suspected that Malaysia's greater economic prosperity might account for the greater centrality of self-expressive motivations reported by Malaysian women than Jordanian women. Interestingly, self-expressive choices did not appear to promote gender segregation in Malaysia [9].

III. Research Design

When Charles and Bradley conducted their cross-national comparison, individual-level data were unavailable to test directly their arguments about the social, psychological and cognitive mechanisms underlying sex segregation. We propose testing the claims made by Charles and Bradley, co-investigators on this proposed project, by interviewing female engineers in five strategically-selected countries with varying economic, religious, and social contexts about their understandings of their motivations, constraints, and gender appropriateness of the engineering discipline.

Our study will also impact the globally competitive STEM workforce, an area which has seen a great deal of investment with little return. Additional specific broader impacts of this study will be an increased, in-depth understanding of the multiple, interrelated individual and structural factors related to women's participation in engineering. Identification of these factors is crucial for picking up relatively stalled efforts at bringing—and keeping—women in engineering across the globe.

Our qualitative research design will give us purchase on how context matters in shaping women's decisions to enter

engineering. Our approach also allows testing of some central claims made by Charles and Bradley – specifically, that career choices are driven more by self-expressive and less by instrumental considerations in affluent "postmaterialist" societies and in societies where engineering is stereotyped as "male."

A. Research Questions

To achieve our objective, we ask a set of cross-nationally harmonized research questions. In addition to the following questions, our country-specific research teams have identified areas of inquiry important to their unique country contexts. These country-specific topics will be raised for discussion at the conclusion of the cross-nationally standardized semi-structured interviews. (Draft country-specific questions are included prior to the Broader Impacts section of this paper.)

1. What motivates choice of an engineering educational/occupational path?
    b. To what extent is engineering as a curricular or work choice seen as self-expressive (i.e., as a means of self-realization)?
    c. To what extent is the choice of engineering motivated by instrumental/practical concerns (e.g., money, job security, work/family compatibility)?
    d. What other considerations are referenced in women's choice to pursue engineering (e.g., patriotic interest in promoting national development, prestige, gender-appropriateness, pressures from parents/family to do something practical)?
2. How do women perceive engineers and engineering work?
    a. To what extent is engineering seen as a gendered (i.e., by nature a male or female) field of study or work?
    b. To what extent is study or work in engineering perceived as self-expressive (e.g., individually rewarding, creative) by women at different stages of their study/occupational trajectories?
    c. Do women view engineering as difficult work?
    d. How are engineers stereotyped?
3. What societal, cultural, legal, and policy factors are perceived as affecting women's participation in engineering fields of study or occupations?
    a. How do concerns about future work/life balance shape motivations and choices?
    b. How are motivations and choices influenced by popular culture?
    c. Do respondents believe that policy or legal changes at the local or national level would promote greater gender equity? What policies do they perceive to be hindrances?
4. What common themes emerge in different national sites and for women at different stages of study or professional practice? What heterogeneity can be observed?

IV. LITERATURE REVIEW

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Considerable scholarly and policy attention has been directed toward the underrepresentation of girls and women within STEM fields, in particular in engineering [10,11,12,13,14,15,16,17,18]. Several factors have been identified as shaping the uneven distribution of women and men across fields of study including: women's overall lower status within societies, the structure of national educational systems, and cultural beliefs and norms regarding women globally and within specific countries. Factors yielding such gender-differentiated participation include processes such as stereotype threat that affect individual decision-making [19], gender-based differences in cultural and social capital [20], the notion of engineering as a masculine-gendered field [21,22], and macro-level forces such as societal and global cultural norms and the logic and structure of educational systems themselves [23].

Thanks to global norms stressing increased educational access, as well as gender-neutral equality, opportunity spread through the direct influence of international and national professional and funding organizations such as UNESCO and the World Bank [24], and some areas of women's participation (e.g., higher education enrollment) have seen progress towards gender parity [25]. National and international governmental organizations have mobilized considerable resources to identify the underlying factors that have prevented gender progress in all areas and have implemented strategies to increase female participation as students and professionals within scientific fields (see, for example, National Science Foundation programs within the United States and the Central European Centre for Women and Youth in Science).

Research has also shown that issues related to women's participation in engineering vary widely between national contexts. For example, Charles and Bradley found that economically developed countries were characterized by greater gender typing of curricular fields than less economically developed countries. Differences in opportunities for women engineers may also translate to patterns of international skilled migration in engineering fields. Patterns of foreign-born individuals with science and engineering degrees working in the US, for example, reveal high proportions of skilled workers in engineering disciplines and science/engineering overall [26]. The share of women in the

United States' immigration flow was over half (55%) in both 2000 and 2010 [27]. Interestingly, women make up an increased proportion of highly skilled migrants, although international migrants in recent years are less likely to settle abroad permanently [28].

Despite notable amounts of research and funding, policymakers have not identified clear and workable solutions to the problem of women's underrepresentation in engineering. What is more, research evidence about the mechanism driving this problem is incomplete. Specifically, we lack an understanding of the way broad, national context shapes women's representation in engineering. Despite some progress in studying specific local or national contexts, we remain in the dark about how broader national contexts matter. In our study, we focus on five settings where the challenges, history, and current environments are diverse, and where policymakers may gain insight into a wide range of alternative models for structuring educational systems and labor markets. What questions have yet to be addressed? What are the underlying mechanisms? What could specific contexts reveal/teach? What interventions might actually work and be sustainable? In the rest of the literature review, we provide important background information and describe the five national sites, extant research, and important contextual factors.

A. Saudi Arabia: High income, high female attainment, high female unemployment, gender-segregated education

Saudi Arabia, with its notably higher GDP per capita than Jordan and Tunisia, also experiences near parity in the youth literacy rate (97%/99% female/male from 15-24 years of age) and slightly higher female tertiary enrollment (46% vs. 41% [29]). However, the seeming gender-parity within the educational system does not translate into equality in the labor force; only 1.4% of STEM researchers are women [30], and female unemployment hovered around 36% in 2012 [31]. Women continue to be under-enrolled in technical and vocational education (TVET), where jobs are reportedly undersupplied [32]. Historically, fields such as engineering have also excluded women from studies as well [33]. Gender segregated school are viewed as a possible vehicle for the education of the nearly "… '80% of girls in Saudi Arabia…interested in engineering' [according to a recruitment expert in the Middle East]" [34]. In Jordan (discussed in the next section), gender segregation is already widely practiced in both public and private schools. Despite these developments, the spread of separate schools is seen by others as preservation traditional women's expectations and roles [35]. The education itself is seen as a mechanism of control and enforcer of the traditional and lower-status of women [36]. With this country, too, little is known about how the overall system impacts women's decisions to enter engineering.

B. Jordan: Recent growth in representation, less research focused on this issue

Jordan, with a GDP per capita very similar to Tunisia's [37], has seen a greater historical change in women's participation in engineering over its history, as the participation of women began at a much lower proportion but has increased in recent years. In Jordan, women's and men's literacy rate is close to equal (94%/95% for women and men overall and 99% for female/male ages 15-24) [38]. Additional, the country enjoys near parity in pre-primary education through secondary enrollment, and notable overrepresentation of women in tertiary enrollment (43%/37% female/male enrolment [39]). This gender parity in enrollment is a recent phenomenon, and it has raised the question of a possible change in the perception of young women's roles in society [40]. Still, fewer than a quarter (22.8%) of STEM researchers are women [41]. Although the percentage of female students in specific disciplines such as computer science is low (about 25%), it is rising [42]; further, the proportion of women in other STEM disciplines (e.g., chemistry, biology, physics, and math) may reach as high as 75%. Scholars have yet to know what factors drive this very different outlook for women in engineering in Jordan.

C. Malaysia: Near parity in academia, perceived need to reconcile gender roles

Malaysia's historically British education system has been combined with state efforts at modernization and support of global competitiveness. Malaysia has a high and relatively equal literacy rate (91%/95% female/male for the population, and 99%/98% for female/male ages 15-24), and over-representation of women in secondary and tertiary enrollment [43]. Indeed, nearly half (48.7%) of STEM researchers are women [44]. Despite this, executive-level female employees in a Malaysian multinational company indicated that family structure and women's commitment to family were the most significant barriers to women's career progression [45]. These findings corroborate other analyses of Malaysian women in managerial roles and of Malaysian computer scientists, wherein a specific construct of female identity had to be reconciled with academic career aspirations [46,47,48]. We have yet to fully understand the Malaysian context and its relationship to women's engineering decisions.

D. Tunisia: Historical female participation, secularism, and French education

Historically, Tunisian national policymakers have explicitly embraced equality for women [49]. However, studies done respectively by a PI on this proposal [50] and an advisory council member [51], found that engineers from multiple Tunisian sectors noted that traditional gender perceptions and expectations tied to familial roles did not fit with women's participation in engineering work. The traditionally French education system in Tunisia is seen as having a leveling effect on opportunity, and overall educational enrollment figures are approximately equal for women and men, tipping slightly towards women in the secondary (89%/93% for boys and girls, respectively) and tertiary (25%/21% for men and women) levels [52]. Researchers in STEM fields are nearly half women (47.4%) [53]. The literacy gap, which is notable in the overall population (71%/87% female/male), is reduced in youth (96%/98% female/male in 15-24 year olds) [54]. Tunisia's marked secularism and its well-known participation of groups like the National Tunisian Women's Union have improved women's to engineering participation, but more research is needed to illuminate exactly how the Tunisian system achieves this.

E. United States: Plethora of research, little progress

Studies on the underrepresentation of women in engineering in the United States are abundant. Since the 1970s, millions of dollars have been spent by the federal government (e.g., the 1981 Equal Opportunities for Women and Minorities in Science and Technology Act), individual universities, industry, and professional societies to increase women's presence in engineering. These efforts may have helped to increase the percentage women among undergraduate engineering graduates from 2% in the mid-seventies to 17% in the nineties. However, the same progress in fields traditionally dominated by men such as law and medicine has not been matched in engineering, where the proportion of women in the field has been around 11% for the last 20 years [55]. According to a 2010 study, women in the US were found to be less likely to perceive that STEM (especially engineering) careers would fulfill communal goals, a belief that was related to women's lower likelihood of choosing engineering as a field of study [56]. The 2011 report, Stemming the Tide: Why Women Leave Engineering, highlighted challenges for female engineering graduates in the US [57]. That report indicated that 20% of women left the field because of working conditions (lack of advancement opportunities and low salaries were among reasons cited), unwelcoming workplace climate and culture, and to spend more time with family. The study also revealed that one third of women never entered the engineering workplace because the perceived engineering as an inflexible career or because the engineering workplace culture did not support women. Far less research attention has been focused on the problem of women's under presentation in engineering in the remaining four countries in our proposed project.

V. METHODS

We will illuminate the social-psychological mechanisms underlying women's school and work choices and the structural constraints on these choices across diverse national contexts. A research design that relies primarily on cross-nationally harmonized semi-structured interviews is ideal for these purposes.

A collective case study will provide the methodological framework for the analysis. We define case study as an empirical inquiry that "investigates a contemporary phenomenon in depth within its real-life context, especially when the boundaries between the context and the phenomenon are not clearly evident" [58]. A collective case study investigates a number of cases to inquire into potential variations of seemingly similar phenomenon [59,60], . It is by "illuminating the experiences, implications, or effects of a phenomenon in more than one setting, wider understandings about a phenomenon can emerge" [61].

We initially hypothesize, based on past research, that "engineering capable" women are generally more likely to complete engineering degrees and work as engineers in either academic or professional settings in less advanced industrialized countries (represented in this study by Jordan, Malaysia, Saudi Arabia and Tunisia) than in more advanced industrialized countries (represented in this study by the US). This collective case study will allow us to examine the underlying reasons, specifically the country- and context-specific factors, for women's engineering educational and occupational trajectories. Our case study will also have the power to compare and contrast such factors across countries and contexts. Our theoretical approach is informed by the literature cited in the above literature review. Charles and Bradley's framework guides our data analysis.

A. Research Design

The project's multiple-case design uses replication logic to ensure robustness. To optimize what we can learn and to provide a sufficient number of cases, we will use purposeful sampling to guide replications at three levels: 1) country 2) institution, and 3) individual female undergraduate students, graduate students and faculty members. For this embedded multiple- case study, we have selected cases that are expected to yield, in aggregate, contrasting findings for anticipatable reasons (i.e., despite greater gender parity in engineering in the targeted less advanced industrialized countries than in the targeted advanced industrialized country, we anticipate finding different underlying mechanisms across countries and contexts).

B. Data Generation and Collection

The semi-structured interview will be the primary method for generating data. To ensure the reliability and validity of the data, we aim for interviewing techniques that are reproducible, systematic, credible, and transparent [62]. Specifically, we will use Patton's Qualitative Research and Evaluation Methods to develop (a) an interview protocol including interviewee selection criteria, (b) a topic guide, (c) specific questions, and (d) a study-specific interview skills training to be implemented via video-conference to increase the reliability and validity of the data generation and collection across sites [63].

C. Data Analysis and Interpretationn

Data will be analyzed using qualitative software such as Atlas.ti or NVIVO. This software is commonly used to systematically analyze large bodies of text and other unstructured data that do not lend themselves to quantitative statistical analysis. These software packages provide a suite of tools that help identify and explore patterns that might be hidden in textual data, such as interview transcripts. We will use grounded theory to determine common themes and illustrative exceptions. As Patton notes, grounded theory "is inductively generated from fieldwork...that emerges from the researcher's observations and interviews..." [64]. Using Atlas.ti or NVIVO we will upload all raw transcribed/translated interviews from each of the five country sites, noting the attributes of the interviewees (e.g., undergraduate, mechanical engineer). We will include as "headings" the question prompts from our semi-structure protocol, though we will have sociology faculty and graduate students code data with and without prompt categories. Coders will create nodes and node hierarchies by reading through the raw interview text and identifying the topics that emerge and can be organized into themes. Coding will be compared between individual coders.

We will use pattern-matching logic as an analytical technique specific to our case study design. Pattern-matching

logic is a type of theory testing analysis. Such logic is used to compare an empirically based pattern, such as that found in Charles and Bradley's study, and a predicted one [65]. We will use a slight variation of pattern-matching logic because our research design is intended to capture patterns as they emerge from the interviews; given this, we cannot establish a set of predictions a priori, as is typically done. A research hypothesis is confirmed if the cases match the pattern. If the pattern is not matched, then modification of the theory and/or further investigation is required [66]. The complexity of the pattern matching generally varies in relation to the number of independent and dependent variables included in the predicted pattern(s) [67].

Within-case (i.e., within country) pattern analysis will be conducted prior to cross-case pattern analysis. The purpose of within-case analysis is to identify unique patterns within the data for that single case. During the cross-case pattern analysis, investigators compare cases for similarities and differences, then they divide the data by type across all cases. This allows investigators to look at the data in different ways so that premature conclusions are not reached. When a pattern from one data type is corroborated by the evidence from another, the findings are stronger. Certain evidence may emerge as being in conflict with the predicted pattern(s). Should that occur, follow-up measures to confirm or correct the initial data should be conducted.

VI. Country Specific Research Questions

For Saudi Arabia, these questions are: (1) To what extent does 'workplace segregation' (as structured by Saudi law and societal expectations) affect women's employment opportunities for computing and IT graduates? (2) To what extent do familial obligations contribute to choosing computing or IT as educational pathways? (3) To what extent will the rapid development and advancement in Saudi Arabia in areas such as engineering, computing, medicine and law affect the occupations available to women and ensuing social implications?

For Malaysia, these questions are: (1) To what extent are family background, cultural background, and early school experiences perceived as influencing the choice of an engineering educational / occupational path? (2) To what extent does workplace discrimination affect the choice of an engineering educational / occupational path? (3) What is the perceived role of religion in individual decision-making and in perceived barriers or supports?

For Jordan, these questions are: (1) What is the relationship between the high school educational system and women's choice of engineering as a discipline? a. How does the national 12th grade exam influence women's choice of engineering as a discipline (Females aptitude to studying, hard work, and higher grades compared to male students) b. How does awareness (or lack thereof) of the field of engineering prior to admission affect women's choice of engineering as a discipline? (2) To what extent does the post-graduation work environment after graduation affect women's choice of engineering as a discipline? a. What is the role of Jordan's association of engineers in raising awareness of engineering and providing job opportunities with equal pay to women? b. What is the relationship between suitable engineering career choices post-graduation and engineering discipline choice? c. Do women think that engineering is a career they can successfully combine with family life?" d. What factors impact female undergraduate engineering majors to pursue graduate school (length of time to advanced engineering degree, etc.) e. Why do so few women earn a PhD in engineering? (3) What role do culture and economy play in shaping women's choice of engineering as a discipline? a. How different are secondary private schools and international schools from public schools in quality of engineering education? b. How do economic needs influence women's choices of engineering as a discipline? c. How do cultural beliefs such as prestige level of engineering and ability to obtain work-life balance shape women's perception and participation in engineering? d. How does cultural disapproval of women studying and living abroad alone, especially if not married, affect women's pursuit of engineering as a discipline? e. How do motivation to succeed and job/monetary attainment at work affect women's choice of engineering as a discipline?

For Tunisia, these questions are: (1) How do high-stakes examinations shape women's perceptions of and participation in engineering? (e.g., DeBoer, forthcoming [chapter in book on engineering education in the MENA region]; World Bank note on exams in former French colonies [will find this citation]) (2) How have perceptions of and participation in engineering been changed with recent political events? (e.g., University of Mandouba write-up [attached to email as well], 2012)

For the United States, these questions are: (1) How do perceptions of work/life balance shape perceptions of engineering self-expression, obstacles and supports to participation, and participation itself? (2) How does popular culture shape perceptions of engineering self-expression, obstacles and supports to participation, and participation?

VII. Broader Implications of Our Current and Future Work

Exploration of the multi-faceted causes of the successes and challenges facing women in engineering will broaden the educational, career and life options of both boys and girls and reduce the global unequal gender-based pay and power distributions. Our study will also impact broadened access and representation of globally competitive STEM workforce, an area which has seen a great deal of investment with little return. Additional specific broader impacts of this study will be an increased, in-depth understanding of the multiple, interrelated individual and structural factors related to women's participation in engineering. Identification of these factors is crucial for picking up relatively stalled efforts at bringing—and keeping—women in engineering across the globe.

As part of our efforts to identify globally-relevant and context-specific questions that reflect the particular issues of a given country, we are gathering feedback on appropriate research questions. We began this process in December of 2013 with the goal of broadening and focusing the applicability of our findings. We continue this process in this paper and the associated presentation, where we describe general and

country-specific research questions and solicit input from diverse stakeholders in the IFEES community on the relevance, validity, and scope of these questions. By eliciting varied and broad perspectives, the research questions and resulting interview protocol for this study will gather rich qualitative data and will encourage buy in from the IFEES community for scale up survey work during our next phase.

Targeted research questions will support relevant next steps for our scale-up quantitative investigation and will help scope policy recommendations to actually improve the access and retention of women in engineering internationally.

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