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Exploring Entrepreneurship in the Academic Environment

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Abstract—The entrepreneurial university has taken a prodigious influence globally and studies show the expedient value of entrepreneurship in education. Universities are performing various entrepreneurship activities alongside their main objectives of teaching and research. This study evaluates university faculty of different work experiences and positions of their perceptions toward the entrepreneurial university. Analysis of Variances (ANOVA) and Least Significant Difference (LSD) comparisons were performed on participants work experience by evaluating certain factors of the entrepreneurship university. Independent sample t-tests were conducted to reveal faculty's awareness of entrepreneurship in their universities. The results help in understanding the interpersonal dynamics within academic organizations. Universities worldwide are adopting entrepreneurship in education by introducing models, methods, and collaboration on all levels of industry and government to fulfill innovative systems in academia.

I. INTRODUCTION

Many studies have been prepared on the Entrepreneurial University. Higher education institutes offering the traditional education in Europe and the Americas are in support of entrepreneurship in academics and are evolving by introducing new models and projects to better understand this innovative field. Universities are flocking to the field of entrepreneurship education hosting programs to satisfy student's desire and faculty with private experience to integrate these new philosophies in higher education. University faculty is the most crucial entity of an academic entrepreneurship program.

Universities are shifting from custom teaching by leading new programs and models collaborating with government and industry. Cooperation of universities and industry gives new insight and produces new programs and jobs in the private sector. Government has played an enormous role with the association of education by sustaining research and grants to assist this emerging field that will benefit the academic future. University, Industry, and Government collaboration is all to improve growth and development of the economy.

II. LITERATURE REVIEW

Project Aspire is a four year long project that involved faculty and students in entrepreneurial teaching from 12 universities and 8 countries supported by the European Union. The results were cross institutional building, innovative curriculum design and the development of a footprint beyond the project for further collaboration and cooperation in research,

learning and teaching strategies [1]. A survey of 3,037 students and faculty perceptions of entrepreneurship motives and barriers across six countries (USA, China, India, Turkey, Belgium, and Spain) with widely varying cultures, economies, and entrepreneurial environments where students consistently see themselves as more entrepreneurial than the faculty perceives [2]. Goldstein compared US and EU universities and the results show the differences in attitudes of the faculty and both adjusting to the emerging entrepreneurship university missions and needs [3].

An innovative academic entrepreneurship model in China has stimulated the academic entrepreneurs and technology transfer with industry collaboration has shown productive [4]. A study in Taiwan Higher education have results that faculty ties in the industry have a greater impact based on age, gender, academic status, awards, social ties, and patents [5]. Spin-offs and patents are analyzed in Sweden and the United Kingdom of the commercialization of research and the different IP rights [6]. Russia is focusing on education, the field of science, and innovative technologies by learning from past experiences of the eastern countries such as Japan and India [7]. Higher education institutes in Lithuania are studying the development of entrepreneurship education by detecting gaps through teaching methods and student's attitudes [8]. These studies display the benefits and advantages of international collaboration between universities and their future development.

In 2012, the National Science Foundation (NSF) launched the NSF I-Corps (TM) program that offered universities funding and exposed them to innovative and entrepreneurial curriculum across the country [9], [10]. Academic entrepreneurship and economic growth are interconnected and universities are educating faculty for university and industry collaboration in technology projects [11]. Many factors come into play when discussing an entrepreneurial university. In 2011, Stanford University assessments of nearly 40,000 corporations their alumni formed one entity would be one of the world's largest economies as the alumni have created 5.4 million jobs and annual world revenues of \$2.7 trillion [12]. Illinois Tech lists entrepreneurship education as a core value in its mission. The structure provided uses key external community members to connect the University projects to the regional entrepreneurship ecosystem [13].

Faculty and Staff play a vital role in student's views of entrepreneurship. In Spain, a survey with 84 deans and directors established an innovative maturity model and applied it to their

universities [14]. Educational researchers are the key individuals in academic commercialization [15]. Project UNEK was developed by the Polytechnic College of Donostia - San Sebastian (UPV-EHU), the School of Engineering Tecnun (University of Navarra) and Mondragon University's Faculty of Engineering has presented the Academic Entrepreneurial Management Model [16], [17]. Entrepreneurship temperament and character in the higher education institutes of Turkey influence entrepreneur intentions of students [18].

The Institute of Higher Education (IPT) in Malaysia encourages entrepreneurial programs in higher academic institutions and the main objective is to promote and generate business interests and ideas among students [19]. European business schools develop most of the innovative skills by merging lectures and active entrepreneurial methods. They are combining the "about entrepreneurship" attitude with "for entrepreneurship" view [20], [21]. Faculty is significantly supportive of their universities assisting regional economic development [22].

The Entrepreneurial University has been researched and studied for years and there is a profusion of sources but there is still a lack of models of generalized entrepreneurship education process [23]. Literature or research was limited on the specific challenges and obstacles faced by administrators, faculty and departments in fulfilling this mission, and few studies recommended changes that needed to be implemented in HEIs to support this new mission [24]. Sixty-eight senior-level educationists of three universities in India identified a poor entrepreneurial ecosystem, the need of specialized entrepreneurship faculty, and ineffective teaching methodology [25]. The Quadruple Helix Model is an innovative cooperation of collaborators involved from industry to research and identifies challenges associated with the entrepreneurship university based on knowledge management [26].

III. METHODOLOGY

The methodology in this study is a questionnaire and survey that has been sent to participants anonymously for data collection. Analysis of Variance (ANOVA) is a collection of statistical models used to analyze differences between group means. The Least Significant Difference (LSD) test is used within the framework of analysis of variances to identify the group means that are statistically different. Independent sample t-tests were conducted to obtain the differences needed for the study.

Participants targeted are of an academic background of faculty and staff from diverse countries of different continents. The demographics of the participants work experience are entry (1-3), associate (4-8), senior (9-14) and executive (15+) years. The positions of the participants are assistant, docent, associate professor; full-time professor, other, and gender are used in this study. ANOVA and LSD are used to show the significance of data analyzed and the differences between the sets of data leading to hypotheses of this study.

IV. HYPOTHESES

- H₁ Participants' work experience has a significant impact to evaluate entrepreneurship courses of students" as a requirement to make universities more entrepreneurial.
- H_{2,3} Participants' work experience has a significant impact to evaluate "state funding/dependency on the state" and "inadequate cultural values" as barriers for universities being entrepreneurial.
- H_{4,5,6} Participants' work experience has a significant impact in agreement of the statements that "faculty members in our department emphasize applied research", "the performance review of our faculty members includes off-campus activities in addition to research, teaching, and service to the university", and "we give faculty members significant freedom to pursue their career goals".
- H_{7,8} Participants' work position has a significant impact to evaluate "entrepreneurship courses of students" and "traditional values" as a requirement to make universities more entrepreneurial.
- H_{9,10,11,12} Participants' work position has a significant impact to evaluate "state funding/dependency on the state", "lack of physical resources", "clash with research objectives", and "inadequate cultural values" as a barrier for universities being entrepreneurial.
- H_{13,14,15,16,17,18} Participants' work position has a significant impact in agreement of the statement that "our department is given significant latitude when evaluating faculty members performance", "the performance review of our faculty members includes off-campus activities in addition to research, teaching, and service to the university", "our university has a department (or group) dedicated to industry/university liaison activities", "we give faculty members significant freedom to pursue their career goals", "in our department we know the rules and know how to break the rules", and "when facing a decision that carries some risk, we tend to adopt a wait-and-see approach".
- H₁₉ Male participants support the entrepreneurial university concept more than female participants.
- H_{20,21,22,23,24,25} Female participants evaluate "entrepreneurship courses for students", "entrepreneurship courses for staff", "incubators", "appropriate reward system", "links with industry" and "entrepreneurship role models" as requirements to make universities more entrepreneurial compared to male participants.
- H_{26,27,28,29} Female participants evaluate "state funding/dependency on the state", "lack of funding", "inadequate cultural values" and "traditional ways of teaching" as barriers for universities to be entrepreneurial compared to male participants.
- H_{30,31,32,33} Male participants agree on the statements that they encourage our graduate students to engage in research with significant implications for industry or society; many of their faculty members conduct research in partnership with non-academic professionals; their faculty members feel they benefit financially from their research efforts (in addition to their university salary); and in their department

they know the rules and know how to break the rules compared to female participants.

H_{34, 35} Female participants agree on the statements that performance review of their faculty members includes off-campus activities in addition to research, teaching, and service to the university and in the last 3 years, they have made major changes to their course offerings and curriculum compared to male participants.

V. FINDINGS

To test the following findings, a series of one-way between participants Analysis of Variances (ANOVAs) was conducted. Besides, to investigate these differences further, Least Significant Difference (LSD) post hoc comparisons were made.

ANOVA Results for Participants Work Experience

The findings showed that there is a significant difference between the various groups of participants' work experiences on evaluating "entrepreneurship courses of students" item as a requirement to make universities more entrepreneurial ($F = 4.77$, $df = 3$, 108 , $p < 0.01$). The post hoc comparisons showed that associate, senior and executive participants significantly evaluated this item as a requirement more than entry-level participants (See Table 1 and Figure 1).

TABLE 1 LSD POST HOC ANALYSIS FOR PARTICIPANTS' WORK EXPERIENCE ON "ENTREPRENEURSHIP COURSES OF STUDENTS" REQUIREMENT (*: $p < 0.05$; **: $p < 0.01$)

	Entry	Associate	Senior	Executive
Entry	-	** $p = 0.008$	** $p = 0.005$	** $p = 0.001$
Associate	** $p = 0.008$	-		
Senior	** $p = 0.005$		-	
Executive	** $p = 0.001$			-

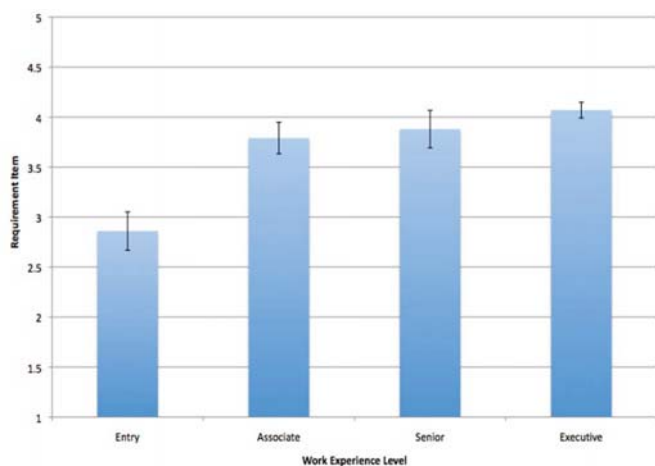


Figure 1 Mean of Participants' Work Experience Levels on the Requirement

The findings also illustrated that there is a significant difference between the various groups of participants' work experiences on evaluating "state funding/dependency on the state" item ($F = 3.26$, $df = 3$, 104 , $p < 0.05$) and "inadequate

cultural values" item ($F = 3.80$, $df = 3$, 104 , $p < 0.05$) as barriers for universities being entrepreneurial. The post hoc comparisons showed that senior and executive participants significantly evaluated these items as barriers more than entry-level participants.

The findings also demonstrated that there is a significant difference between the various groups of participants' work experiences on participants' agreement of the statement that "faculty members in our department emphasize applied research" ($F = 2.73$, $df = 3$, 105 , $p < 0.05$). The post hoc comparisons showed that executive participants significantly agreed on this statement more than associate and senior participants.

The findings also showed that there is a significant difference between the various groups of participants' work experiences on participants' agreement of the statement that "the performance review of our faculty members includes off-campus activities in addition to research, teaching, and service to the university" ($F = 4.17$, $df = 3$, 104 , $p < 0.01$). The post hoc comparisons showed that executive participants significantly agreed on this statement more than entry, associate and senior participants.

The findings also illustrated that there is a significant difference between the various groups of participants' work experiences on participants' agreement of the statement that "we give faculty members significant freedom to pursue their career goals" ($F = 5.53$, $df = 3$, 107 , $p < 0.01$). The post hoc comparisons showed that executive participants significantly agreed on this statement more than entry, associate and senior participants.

ANOVA Results for Participants Work Position

The findings showed that there is a significant difference between the various groups of participants' work positions on evaluating "entrepreneurship courses of students" item as a requirement to make universities more entrepreneurial ($F = 3.25$, $df = 4$, 106 , $p < 0.05$). The post hoc comparisons showed that associate and full-time participants significantly evaluated this item as requirement more than assistant participants. Moreover, there is a significant difference between the various groups of participants' work positions on evaluating "traditional values" item as a requirement to make universities more entrepreneurial ($F = 2.64$, $df = 4$, 105 , $p < 0.05$). The post hoc comparisons showed that participants in other group significantly evaluated this item as a requirement more than any other position groups.

The findings also illustrated that there is a significant difference between the various groups of participants' work positions on evaluating "state funding/dependency on the state" item ($F = 2.84$, $df = 4$, 105 , $p < 0.05$) as a barrier for universities being entrepreneurial. The post hoc comparisons showed that docent participants significantly evaluated these items as barriers more than assistant participants. In addition, there is a significant difference between the various groups of participants' work positions on evaluating "lack of physical

resources” item ($F = 3.42$, $df = 4$, 105 , $p < 0.05$) as a barrier for universities being entrepreneurial. The post hoc comparisons showed that docent, full time participants and participants in the other group significantly evaluated these items as barriers more than assistant participants. Besides, participants in the other group significantly evaluated these items as barriers more than associate participants. In addition, there is a significant difference between the various groups of participants’ work positions on evaluating “clash with research objectives” item ($F = 6.32$, $df = 4$, 105 , $p = 0.000$) as a barrier for universities being entrepreneurial. The post hoc comparisons showed that participants in the other group significantly evaluated these items as barriers more than any other position groups. Additionally, the docent and full-time participants significantly evaluated these items as barriers more than assistant participants. Furthermore, there is a significant difference between the various groups of participants’ work positions on evaluating “inadequate cultural values” item ($F = 6.45$, $df = 4$, 105 , $p = 0.000$) as a barrier for universities being entrepreneurial. The post hoc comparisons showed that participants in the all groups significantly evaluated these items as barriers more than assistant participants.

The findings also demonstrated that there is a significant difference between the various groups of participants’ work positions on participants’ agreement of the statement that “our department is given significant latitude when evaluating faculty members performance” ($F = 2.65$, $df = 4$, 106 , $p < 0.05$). The post hoc comparisons showed that participants in the other group significantly agreed on this statement more than assistant, docent and full-time professor participants. Furthermore, there is a significant difference between the various groups of participants’ work positions on participants’ agreement of the statement that “the performance review of our faculty members includes off-campus activities in addition to research, teaching, and service to the university” ($F = 2.57$, $df = 4$, 102 , $p < 0.05$). The post hoc comparisons showed that participants in the other group and associate professor participants significantly agreed on this statement more than assistant participant. Moreover, there is a significant difference between the various groups of participants’ work positions on participants’ agreement of the statement that “our university has a department (or group) dedicated to industry/university liaison activities” ($F = 2.56$, $df = 4$, 106 , $p < 0.05$). The post hoc comparisons showed that participants in the other group significantly agreed on this statement more than assistant and docent participants. In addition, there is a significant difference between the various groups of participants’ work positions on participants’ agreement of the statement that “we give faculty members significant freedom to pursue their career goals” ($F = 3.49$, $df = 4$, 105 , $p < 0.05$). The post hoc comparisons showed that participants in the other group and full-time professor participants significantly agreed on this statement more than assistant participant. Besides, there is a significant difference between the various groups of participants’ work positions on participants’ agreement of the statement that “in our department we know the rules and know how to break the rules” ($F = 3.69$, $df = 4$, 106 , $p < 0.05$). The post hoc comparisons showed that

participants in the other group significantly agreed on this statement more than any other position groups. Lastly, there is a significant difference between the various groups of participants’ work positions on participants’ agreement of the statement that “when facing a decision that carries some risk, we tend to adopt a wait-and-see approach” ($F = 4.26$, $df = 4$, 105 , $p < 0.01$). The post hoc comparisons showed that participants in the other group, docent and associate professor participants significantly agreed on this statement more than assistant participant. Besides, participants in the other group significantly agreed on this statement more than full time professor participants.

Gender T-Test Results

The study also tested whether participants’ answers on some questions differ based on their gender. To test this, independent sample t-tests were conducted. Significant t-test results for participants’ gender are given signifying that male participants support the entrepreneurial university concept more than female participants. However, female participants evaluated “entrepreneurship courses for students”, “entrepreneurship courses for staff”, “incubators”, “appropriate reward system”, “links with industry” and “entrepreneurship role models” as requirements to make universities more entrepreneurial with a higher mean compared to the male participants. In addition, female participants evaluated “state funding/dependency on the state”, “lack of funding”, “inadequate cultural values” and “traditional ways of teaching” as barriers for universities to be entrepreneurial with a higher mean compared to the male participants. The male participants agreed with a higher mean on the statements that they encourage our graduate students to engage in research with significant implications for industry or society, many of their faculty members conduct research in partnership with non-academic professionals, their faculty members feel they benefit financially from their research efforts (in addition to their university salary) and in their department they know the rules and know how to break the rules compared to the female participants. On the other hand, female participants agreed with a higher mean on the statements that the performance review of their faculty members includes off-campus activities in addition to research, teaching, and service to the university and in the last 3 years, they have made major changes to their course offerings and curriculum compared to the male participants.

VI. CONCLUSION

Faculty and staff of diverse work experiences, positions, and gender have been surveyed on entrepreneurship in the academic trade. Numerous methods have been utilized to evaluate the participants assessments and the significance with less than 0.05 has been accepted in this study. The analysis demonstrates that all values evidenced in the hypotheses are significant to the improvement of entrepreneurship in education. This demonstrates the insight of university staff and faculty and their attitudes toward this industry and the tremendous trend entrepreneurship is producing in global edification.

Entrepreneurship and education have been an innovative topic and when combined the results of the studies are institutional. Several models have been introduced and applied

to the knowledge of the entrepreneurial university. The models accessible are more tailored to the explicit university needs. Challenges face the entrepreneurship education with various factors from attitudes and support that limit the progression of these studies and attempts to make universities more entrepreneurial.

There are limited studies of international collaboration and several prepared display valuable and industrious outcomes. Alongside teaching and research, entrepreneurship awareness in the educational setting is emerging and developing for students and faculty worldwide. Collaboration of university, industry, and government of interactive subtleties are to improve the world economies on all levels by the development and growth of entrepreneurship in the academic environment for generations to come.

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