

# Evaluation of innovation attributes in order to meet the challenges of global knowledge economy

**Presented by:**

BARADARAN SHORAKA, MOHAMMAD

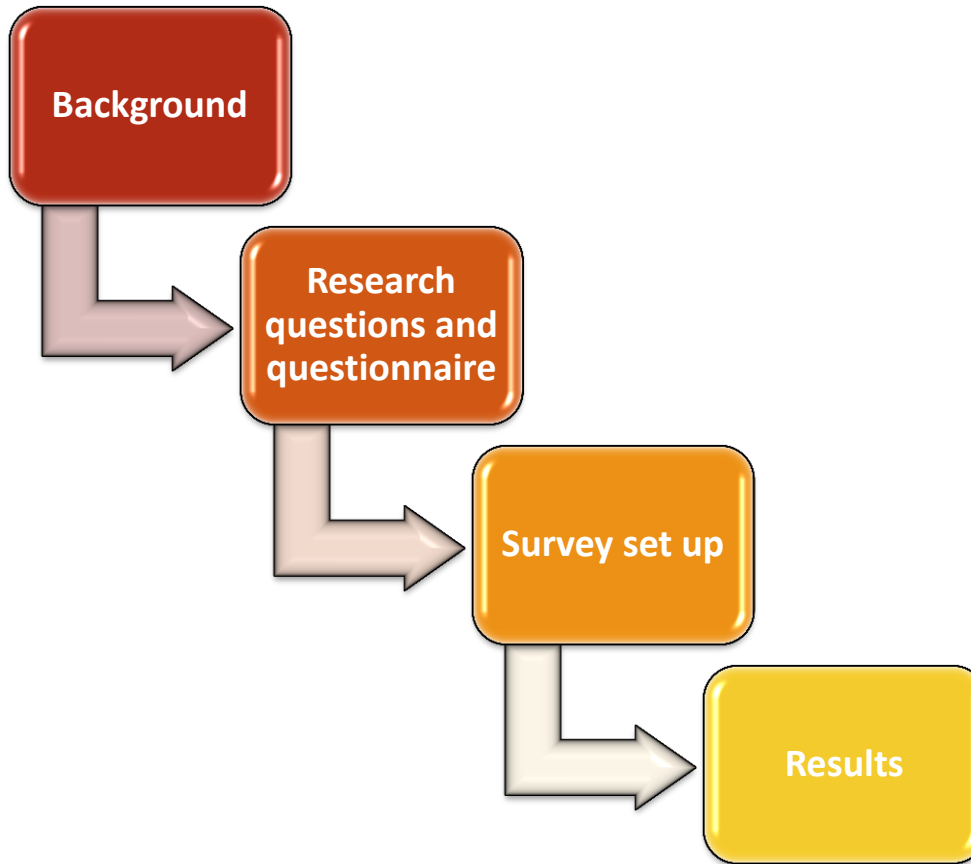
GALVAN, JOSE ALFREDO

LEONTIADIS, NEKTARIOS

YANG, CHIA-HSUAN

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# Agenda



## Background

- At the end of the 20th century, the world experienced more intensely the effects of innovation. (Klaus 2009).
- In the 21st century, nations, businesses and individuals face challenges of the global knowledge economy to create value. (McCraw 2007).
- Radcliffe (2005) states that the innovative competence is a meta-attribute.
- Rao et al (2002) conducted a study concluding that the experienced workforce and new university graduates are determinants of innovation.
- For instance, the 3M Company is looking for "inventorpreneurs". (Gundling 2000).

**Klaus, S** (2009), "Global Competitiveness Report 2009–2010, World Economic Forum, 2009

**McCraw, T.** (2007), "Prophet of Innovation: Joseph Schumpeter and Creative Destruction", Kindle Edition,.

**Radcliffe, D. F.** (2005), "Innovation as a meta graduate attribute for engineers", International Journal of Engineering Education, Vol. 21, No. 2,

**Rao, S, Jianmin T, and Weimin W.** (2002), "The Importance of Skills for Innovation and Productivity", International Productivity Monitor,

**Gundling, E** (2000)., "The 3M Way to Innovation", Kodansha International

## Research questions

Which are the most important innovation characteristics and skills that university students need to develop?

and

Which are the most powerful educational elements that promote the innovation skills?

# Questionnaire overview

It has three sections:

## **Section I:** Consent form

Introduction and three questions

## **Section II:** Demographic questions

13 questions: gender, nationality, previous major, current program, previous experiences, internships, so on.

## **Section III:** Research questions

22 questions: characteristics, attributes, values, university facilities, university and department culture, extra academic activities, classmates, curriculum program, professor skills, so on.

# Questionnaire overview

\*17. Do you think the following characteristics are important to be innovative?

Strongly disagree

Strongly agree

Creative approach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self-driven and persistent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resourceful and shrewd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Initiator of change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Highly future oriented	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Survey setup

### Mode of administration

- Web-based, self-administered (Survey Monkey)

### Target population

- Master and PhD students of CMU whose area of research or curriculum is relative to engineering, industrial design or business administration

### Sampling frame

- Students in the target population that either have past job experience or they have been in CMU long enough to be able to have an opinion.

### Sample design

- SRS on people with specific characteristics that fit to the target population based on the CMU directory.

## Sample size needed

- Based on the Carnegie Mellon University 2009-2010 Factbook there are 3715 graduate students enrolled in Engineering, Business, and industrial Design departments.
- We are using the 5 points scale for the answers. Therefore, the standard deviation will be 0.4.
- The confidence interval we chose for our survey is 95% and the margin of error is  $\pm 0.10$ .
- Our sampling method is SRS without replacement, so we will need  $n=61$  respondents so that we could fulfill this confidence interval and margin of error.
- With assuming a 20% response rate, we will need to contact 305 respondents to fulfill the confidence interval and margin of error. The actual number of respondents we used in our survey is 320 persons.



## Sample generation

Use of CMU's  
online directory –  
LDAP

- Students
- Faculty
- Stuff

Allows queries  
based on a  
person's  
attributes

- eduPersonAffiliation
- eduPersonSchoolCollegeName
- cmuStudentLevel

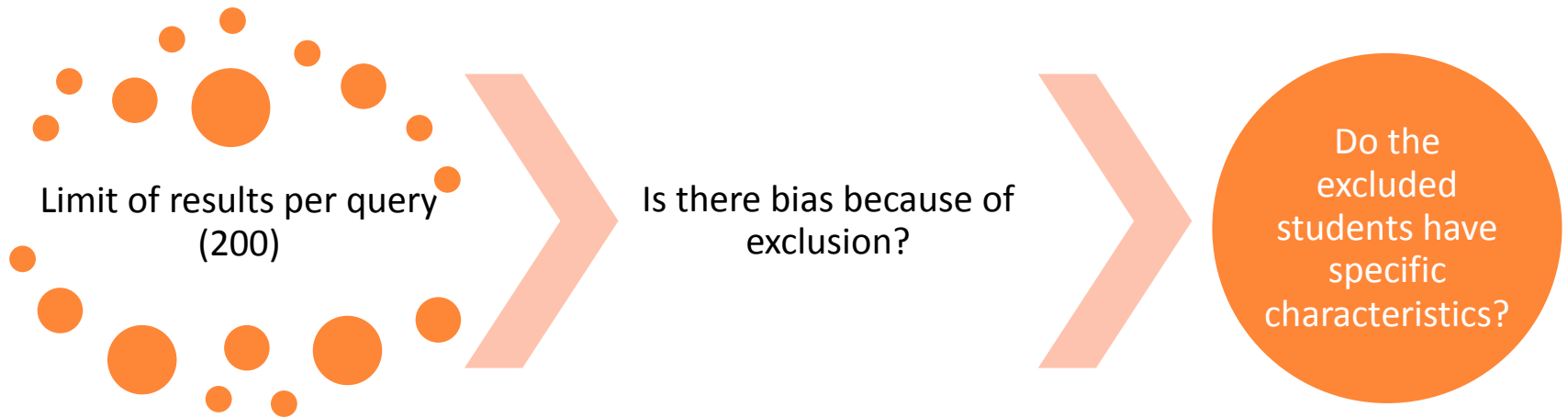
Allows retrieval of  
specified  
attributes

- lastName
- andrewId

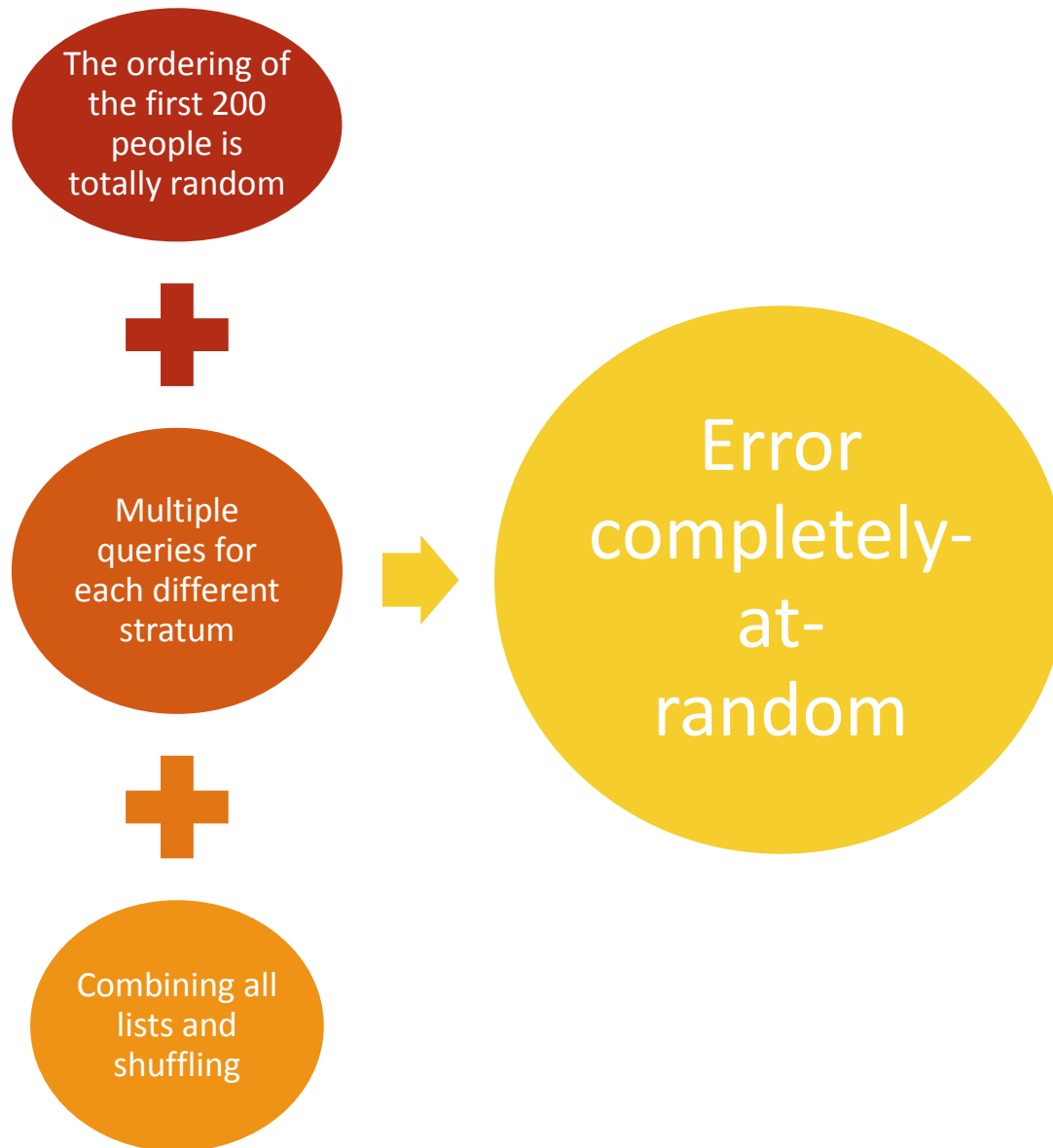
## Query example

```
(& (eduPersonAffiliation=Student)
(! (eduPersonAffiliation=Stuff)) (|(cmuStudentLevel=Graduate)
(cmuStudentClass=Masters))
(eduPersonSchoolCollegeName=David A. Tepper School of Business))
```

## Sample generation: problems...



## Sample generation: ...and solutions



# Data collection

The first batch  
of invitation  
emails were  
sent on  
Monday  
03/21/2010,  
12:10am

Reminder  
email was  
sent on  
Thursday,  
3/25/2010,  
12:15am

We had

- 77 responses
- 57 complete
- 22 partial
- 17 denials to participate

By 4<sup>th</sup> day we  
had 40  
responses and  
they stalled

The survey  
was closed on  
Friday  
03/26/2010m,  
5pm

## Post processing

### Data cleaning

- Consent form errors (3),
- Target population errors(1)
- Item non-responses in the main part of the survey (5)

### Hot-deck imputation for missing data based on

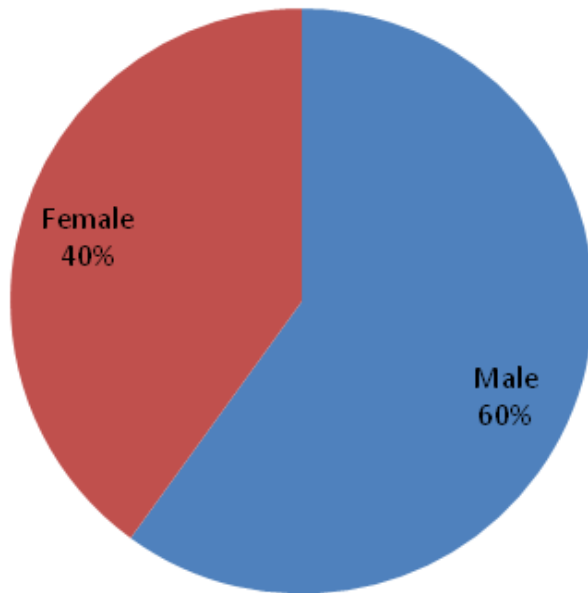
- Current major
- Nationality

### Post survey stratification

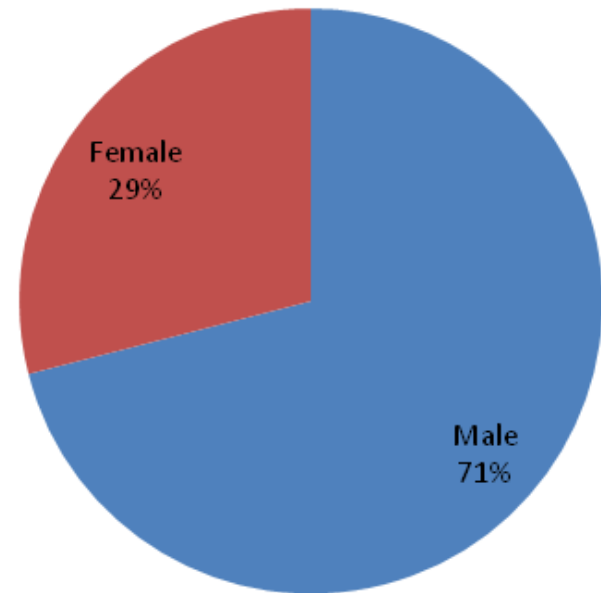
## Results

- Looking at the answers of the 68 respondents for the demographic questions, we have this information:
- 60% are male and 40% are female;

**Gender - Survey Results**

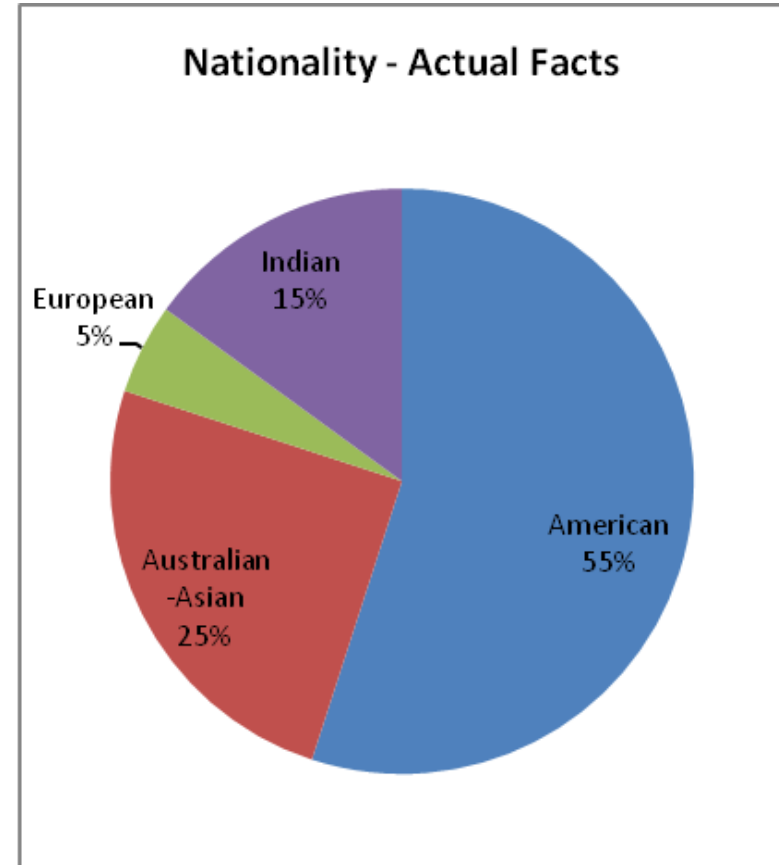
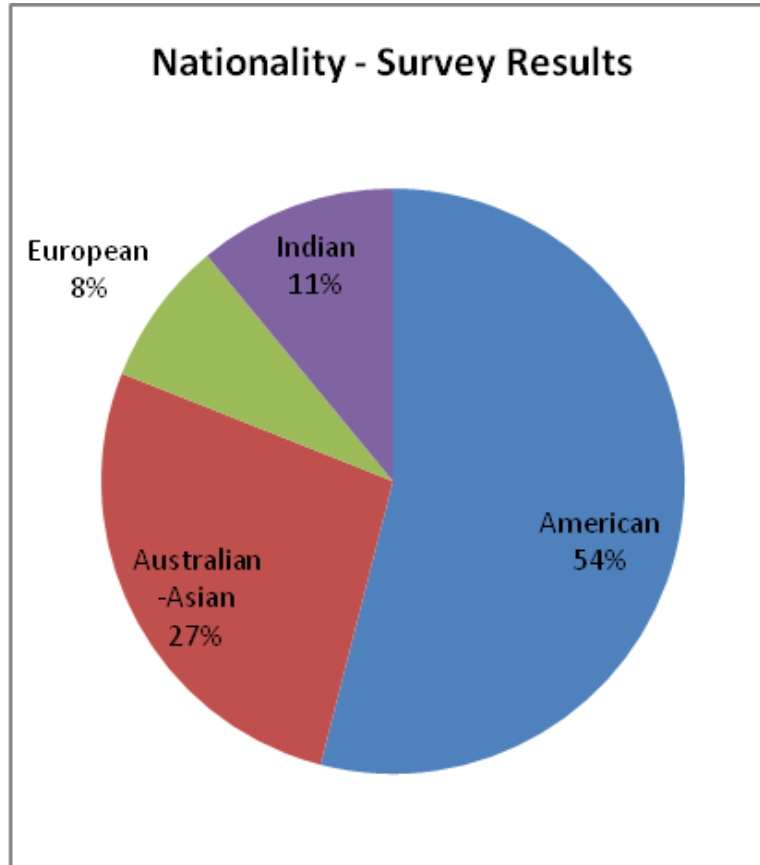


**Gender - Actual Facts**



## Results (continued)

2. The nationalities are divided into four regions, 54% American, 27% Australian-Asian, 8% European and 11% Indian;



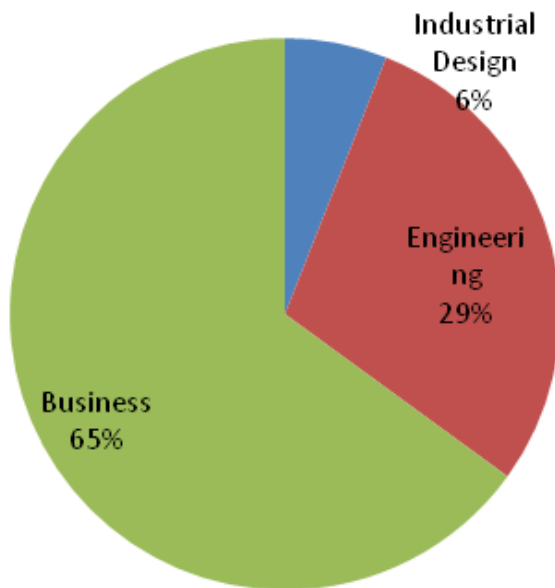
3. 27% have an age of 20-25, 36% have an age of 25-30, 12% have an age of 30-35, 10% have an age of 35-40, and 15% have an age of 41 and more;



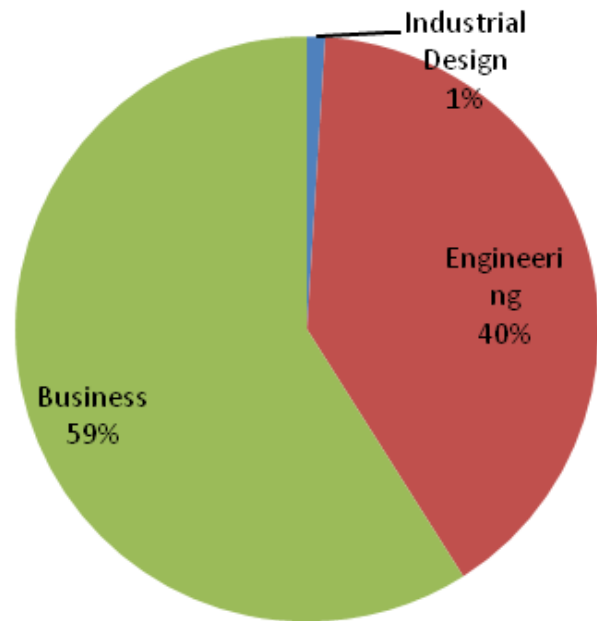
## Results (continued)

4. 6% are in the Industrial Design program, 29% are in Engineering and 65% are in the Business program;
5. 8% have an previous degree in Design, 43% were in Engineering, 33% were in Business and 24% were in other programs;

**Academic Program - Survey Results**



**Academic Program - Actual Facts**



## Results (continued)

6. 59% are Master students and 41% are PhD students;
  7. Out of the 41% that are PhD students, 79% have taken their qualification exam;
  8. 51% are graduating within this year;
  9. Out of the 69% that have work experience, 47% have 1-5 years of work experience, 30% have 5-10 years, 13% have 11-15 years, and 10% have 16 years or more of work experience;
  10. Out of the 71% that have attended an internship, 15% have done 1-2 month, 60% have done 3-4 months, 10% have done 5-6 months, and 15% have done 7 months or more.
- The information about the rest of the questions need post stratification which we are working on.

**THANK YOU!**

**QUESTIONS?**