Sampling scheme

ok

The sampling scheme that we are going to use for this survey will be the Simple Random Sampling (SRS) without replacement scheme. We are not using any clustering or stratification scheme because we are not interested in the characteristics of the subgroups that exist within our population and sampling frame (e.g. students from different departments). Instead our goal is to generate inferences about innovation concepts for the population as a whole. The equal probability selection method that is utilized in the SRS without replacement scheme is the most appropriate tool to achieve this goal.

Moreover, it sounds like from our conversation that you were worried about sampling whole departments and getting very low response rates.

That is an issue worth thinking about (since low response rates in general suggest there may be something "different" about those who respond vs those who do not).

Individual's characteristics and academic elements that promote innovations skills: Survey

----- Pretest Questionnaire -----

Section I. Demographic questions (*Choose one of the options or write your answer*)

1. Are you female or male? ◯ **Female**   ◯ **Male**

2. What is your nationality? *[red: clarify: country of origin, ethnic nationality, etc.?]* _____

3. How old are you? ◯ **20-25**   ◯ **26-30**   ◯ **31-35**   ◯ **36-40**   ◯ **41 or more**

4. What was your major/academic program *[red: grammar]*
   in university/before your entered CMU? _____

5. Did you have any work experience before joining CMU? ◯ **Yes**   ◯ **No**

6. Are you a graduate student? ◯ **Yes**   ◯ **No**

7. What will your final degree be? ◯ **Master**   ◯ **PhD**   *[red: clarify: in life goals, here at CMU, or …?]* *[red: what other degrees do grad students go for here?]*

8. If it is PhD, have you passed the qualification exams? ◯ **Yes**   ◯ **No** *[red: your answer to question 7 was]*

9. Are you graduating within this year ◯ **Yes**   ◯ **No** *[red: with which degree? current? final? etc]*

10. If yes, how many years did you work? ◯ **1-5**   ◯ **5-10**   ◯ **11-15**   ◯ **16 or more**

11. Have you ever done an internship? ◯ **Yes**   ◯ **No**

12. If yes, for how long (months)? ◯ **1-2**   ◯ **3-14**   ◯ **4-6**   ◯ **7 or more**

Section II. Individual's characteristics and academic elements questions

13. Which of the characteristics listed below you think are the most important to be innovative?
    (*Please **select** 5 and add others if you think other elements are more important*)

	Creative approach
	Wide-ranging interests
	Problem solver
	Self-Driver and persistent
	Well-built job ethic
	Resourceful and shrewd
	Highly competitive
	Moderate risk-taker
	Thrive on change
	Able to live with uncertainty
	Highly future-oriented
	Social-person
	Initiators of change
	Others:

*[red: since #14 is ranking, how about having respondents *rank* their top 5 here? this also lets you extract narrower questions like "% of people that thought creative approach was most important"]*

14. Which kinds of knowledge listed below you think are important to be innovative?
    (*Please **rank** them all and add others if necessary*)

	Business knowledge (business plan, marketing, market needs, etc)
	Technical knowledge (Technology, methods, engineering, production, etc)
	Design Knowledge (conceptualization, creativity, form, ergonomic issues, etc)
	Law or legal Knowledge (intellectual property, contract, agreement, etc)
	Others:

[red: may need to provide several lines for "other" to allow for more than one suggested 'other']

15. Which of attitudes listed below you think are the most important to be innovative?

*(Please **select** 5 and add others if necessary)*

	Commitment
	Curiosity
	Fairness
	Judgment
	Optimism
	Persistence
	Respect
	Self-esteem
	Thoughtfulness
	Thoroughness
	Tolerance
	Challenge-seeking
	Aggressively ambitious
	Nothing is impossible
	Others:

same suggestion as #13 above.

16. Which values do you think are the most important to be innovative?

*(Please **select** 5 and add others if necessary)*

these are all fairly positive liberal values.

what about other less attractive values e.g. greed, survival of the fittest, competitiveness, etc etc

	Justice
	Peace
	Freedom
	Opening and fraternity
	Honesty
	Personal and social responsibility
	Respect for others
	Transcendence
	Service
	Integrity
	Others:

same suggestion as #13 above.

17. How do you evaluate the contribution of CMU culture to innovation ability?

(Choose one option that you think is most suitable and answer the following questions)

O Excellent   O Fair   O Good   O poor   O Very poor

Why?

a. Which part(s) do you think is good? _____

b. Which part(s) do you think is not good enough? _____

c. How to improve it? _____

18. How do you evaluate the impact of your department's culture on innovation promotion?

(Choose one option that you think is most suitable and answer the following questions)

O Excellent   O Fair   O Good   O poor   O Very poor

Why?

a. Which part(s) do you think is good? _____

b. Which part(s) do you think is not good enough? _____

c. How to improve it? _____

these will be interesting

19. How do you evaluate the influence of CMU facilities, like libraries, laboratories and classrooms, on improving students' innovation ability?
    (Choose one option that you think is most suitable and answer the following questions)

    O Excellent   O Fair   O Good   O poor   O Very poor

    Why?
    a. Which part(s) do you think is good? _____
    b. Which part(s) do you think is not good enough? _____
    c. How to improve it? _____

20. How do you evaluate the CMU faculty skills on improving students' innovation ability?
    (Choose one option that you think is most suitable and answer the following questions)

    O Excellent   O Fair   O Good   O poor   O Very poor

    Why?
    a. Which part(s) do you think is good? _____
    b. Which part(s) do you think is not good enough? _____
    c. How to improve it? _____

21. How do you evaluate the effect of academic activities (like seminars, meetings, etc.) in CMU on improving students' innovation ability?
    (Choose one option that you think is most suitable and answer the following questions)

    O Excellent   O Fair   O Good   O poor   O Very poor

    Why?
    a. Which part(s) do you think is good? _____
    b. Which part(s) do you think is not good enough? _____
    c. How to improve it? _____

22. How do you evaluate the impact of your classmates and/or colleagues in CMU on improving your innovation ability?
    (Choose one option that you think is most suitable and answer the following questions)

    O Excellent   O Fair   O Good   O poor   O Very poor

    Why?
    a. Which part(s) do you think is good? _____
    b. Which part(s) do you think is not good enough? _____
    c. How to improve it? _____

23. How do you evaluate the curriculum in your program based on its effect on fostering a student's innovation ability?
    (Choose one option that you think is most suitable and answer the following questions)

    O Excellent   O Fair   O Good   O poor   O Very poor

    Why?
    a. Which part(s) do you think is good? _____
    b. Which part(s) do you think is not good enough? _____
    c. How to improve it? _____

questions 17-23 very interesting, looking forward to answers. One thing to think about is that these questions presume that the features you list *are* relevant to innovation. Respondent may not agree, eg someone may think libraries, classrooms etc are irrelevant to promoting innovation. Think about whether it is possible/worth it to expand each question to consider this possibility as well (a possible reason not to is that it might make the survey take too long, and increase rate of incomplete survey forms).

Sample size needed

Based on the Carnegie Mellon University 2009-2010 Factbook[1] there are 2400 graduate students enrolled in Engineering, Business, and industrial Design departments.

We are using the 5 points scale for the answers. The worst case will be when the respondents answer 5 scales in an equal amount which will cause the probability of each scale to be 20%. Therefore, the standard deviation will be 0.4, as shown below.

$$SD = \sqrt{p(1-p)} = \sqrt{(0.2) \times (1 - 0.2)} = 0.4$$

The confidence interval we chose for our survey is 95% and the margin of error is ±0.10. The reason why we chose the ±0.10 margin of error is that this is a scientific experiment and there are a lot of unknown facts and assumptions that could affect the results.

Our sampling method is SRS without replacement, so we will need n=60 respondents so that we could fulfill this confidence interval and margin of error which is calculated as:

$N = 2400 \; persons$

$SD = 0.4$

$ME = 0.1$

$$n_0 = \frac{z_\alpha^2 \times SD^2}{ME^2} = \frac{1.96^2 \times 0.4^2}{0.1^2} = 61.46$$

$$n \geq \frac{Nn_0}{N + n_0} = \frac{2400 \times 61.46}{2400 + 61.46} = 59.93 \rightarrow n = 60$$

We know that if we would like to improve the margin of error to ±0.07 with the same confidence interval and standard deviation, we will need twice the amount we need now, which will be 120 respondents. And for a margin of error of ±0.05 we will need 223 respondents.

what response rate do you expect to get?

how many more than 60 respondents will you need to approach, to obtain a sample of size 60?

---

[1] http://www.cmu.edu/ira/factbook/pdf/facts2010/2_fact-book_webversion_2009_10_enrollment1.pdf