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Identification and assessment the barriers of growth and development of nanotechnology research's in the Islamic Azad University: A case study of south Tehran branch

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A B S T R A C T

This paper presents an empirical investigation to detect major barriers on developing nano technology in Islamic Azad University. The proposed study selects south Tehran branch as a pilot study, designs a questionnaire and distributes it among all 80 employees who work for this university. Cronbach alpha is calculated as 0.93, which is well above the minimum acceptable level. The study has executed the study in five different areas including financial resources, physical equipment, training and empowering human resources, organizational culture and outside organizational factors. The study has determined that physical equipment is number one priority followed by financial resources and training as well as empowering employees.

1. Introduction

In 2020, areas of specific importance for technology trends will include biotechnology, nanotechnology, materials technology, chemistry and information technology (Silberglitt et al., 2002; Zhao et al., 2003; Kim & Song, 2007). Nanotechnology covers many areas of engineering, science and its convergence with modern biology and medicine has been under tremendous changes (Roco, 2003; Ferrari, 2005). Today, nano-technology has been widely accepted as a primary success for business development (Macoubrie, 2004; Lee & Song, 2007; Van den Hoven & Vermaas, 2007). Meyer (2006) investigated whether patenting scientists the better scholars by performing an exploratory comparison of inventor-authors with their non-inventing peers in nano-science and technology. The study was based on an analysis of the nano-science publications and nano-technology patents of a small set of European countries. Today, there are only a very few nano-scientists hold patents in nano-technology and many nano-inventors are actively publishing nano-science research. In other words, the patenting scientists seem to outperform their solely publishing

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(non-inventing) peers in terms of publication counts and citation frequency. Nevertheless, a closer examination of the highly active and highly cited nano-authors points to a slightly various situation. Scheufele and Lewenstein (2005) performed a survey about nano-technology on levels of knowledge about and attitudes toward nanotechnology that stated how people make decisions about emerging technologies. Their findings suggested that people form some sort of opinions even in the absence of relevant scientific or policy-related information. They also reported that cognitive shortcuts or heuristics, often provided by mass media, were presently a key factor in impacting how the public thinks about nanotechnology and about its risks and advantages, and in determining the level of support among the public for further funding for research in this area.

2. The proposed study

This paper presents an empirical investigation to detect major barriers on developing nano-technology in Islamic Azad University. The proposed study selects south Tehran branch as a pilot study, designs a questionnaire and distributes it among selected 80 university professors and graduate students at this university. Cronbach alpha is calculated as 0.93, which is well above the minimum acceptable level. The study has executed the study in five different areas including financial resources, physical equipment, training and empowering human resources, organizational culture and outside organizational factors.

2.1. Personal characteristics of the participants

We first present details of our survey on personal characteristics of the participants through Fig. 1.

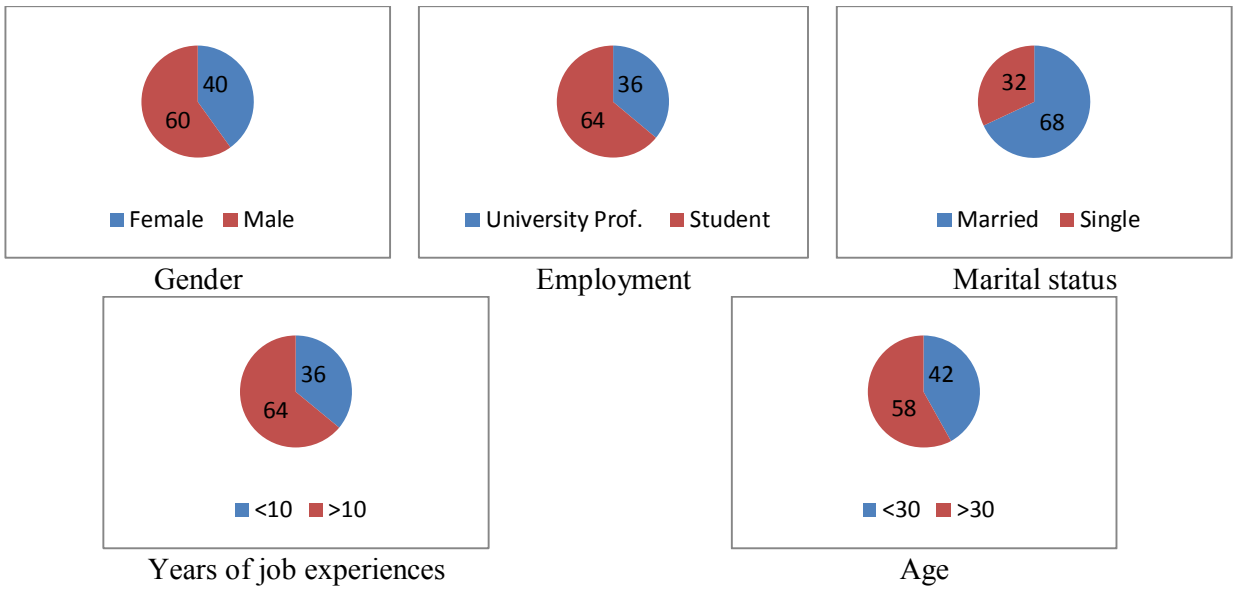

Fig. 1. Personal characteristics of the participants

As we can observe from Fig. 1, 60% of the participants were male and only 40% of them were male. In terms of employment status, nearly 36% of the participants were university professor while 64% of them were university student. In our survey, 64% of the people who took part in our survey were married and only 36% of them were single. In our survey, 64% of the participants had at least 10 years of job experiences and 58% of them were over 30 years of age.

2.2. The questionnaire

The questionnaire of the survey consists of five main items including financial resources, physical equipment, training and empowering human resources, organizational culture and outside organizational factors.

2.2.1. Human resources

This item includes objectives, cooperation among top management, team-work within organization, trust, learning and growth, top management guidance and general involvement.

2.2.2. Financial resources

The second item, financial resources, consists of five items including sustainable benchmark for budgeting planning, financial support on behalf of other organizations, guideline for execution, resource planning and financial support for research projects.

2.2.3. Training and empowering employees

Training and empowering employees is the third item in this survey, which includes seven items including training tools, scientific infrastructures, short term training programs, research projects inside and outside university for university professors, specialized team works, empowering university professors and using training equipment.

2.2.4. Equipment

This item includes four sub-item including friendly implementation of equipment, management system of infrastructures, possibility of executing knowledge based projects with existing equipment and existence of necessary equipment.

2.2.5. Outside organization relationships

The last item is associated with outside organization relationships with four items including best practices, giving priority to organizational interests, real improvement on outside organization relationships and benchmarking from other organizations.

3. The results

In this section, we present details of our survey on investigating the effects of five important factors on having successful implementation of nano technology in Islamic Azad University. Table 1 summarizes the results of Freedman test.

Table 1
The summary of Freedman test

Title	Number	Mean	Standard dev.	Priority
Physical equipment	59	3.29	0.77	First
Financial resources	59	3.06	0.76	Second
Training and empowering people	59	3.014	0.75	Third
Outside organization relationship	59	3.012	0.81	Fourth
Organizational culture	59	2.8	0.81	Fifth

According to the results of Table 1, physical equipment is number one priority followed by financial resources, training and empowering people, outside organization relationship and organizational culture. In order to find out whether or not there is any difference between two groups, we have performed a t-student test between two groups. Table 2 summarizes the results of our survey. The results of Table 3 clearly indicate that there was no meaningful difference between two groups when the level of significance is five percent. Therefore, we can conclude that both groups, university professors and graduate students, had the same concerns towards barriers on nano technology development in Islamic Azad University.

Table 2
The summary of t-student test

Factor	Group	#	Mean	Std. dev.	Standard error	Sig.
Physical equipment	Graduate students	38	20.1842	6.09765	0.98917	0.349
	University professors	21	18.7143	4.95119	1.08044	
Financial resources	Graduate students	38	15.7895	3.87757	0.62903	0.224
	University professors	21	14.5238	3.61413	0.78867	
Training and empowering people	Graduate students	38	22	5.48709	0.89012	0.079
	University professors	21	19.4762	4.56748	0.99671	
Outside organization relationships	Graduate students	38	13.9737	2.93614	0.4763	0.095
	University professors	21	11.7619	2.89663	0.6321	
Organizational culture	Graduate students	38	12.5789	3.55369	0.57649	0.349
	University professors	21	11.0952	2.44754	0.5341	
Barriers	Graduate students	38	84.5263	18.48847	2.99923	0.061
	University professors	21	75.5714	14.5725	3.17998	

4. Conclusion

During the past two decades, there have been tremendous changes on development of high tech. industries. Many well-known industries have tried to use advances on nano-technology to offer new products. There is no doubt that universities must be the basis for development of newly introduced knowledge based technologies and there is a need to remove any barriers for development of this industry. The proposed study of this paper has performed an empirical survey and detected five important factors including physical equipment, financial resources, training and empowering people, outside organization issues and organizational culture.

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