

# Career Preparation in Doctoral Education at the Departmental Level

Buon Kiong Lau and Daniel Sjöberg

**Abstract**—Traditionally, doctoral education is designed to train students to become skilled researchers in their respective disciplines. In many cases, however, doctoral graduates find themselves ill-prepared for their career choices. In this paper, we adopt a systematic approach to study the career preparation aspect of doctoral study in our home department. Our findings reveal several shortcomings in the current system and we formulate concrete recommendations to address these issues.

**Index Terms**—Doctoral education, career preparation, soft skills, electrical engineering

## I. INTRODUCTION

THERE is an ongoing paradigm shift in the nature of doctoral education. As opposed to the traditional view that it should only be concerned with equipping the student with research skills, it is now more commonly accepted that career preparation should also be an integral part of such education.

Most existing studies related to this topic are performed on the university [1]-[6] or national [7],[8] level. They indicate that on a university level, the postgraduate education needs to clarify and strengthen its relations to 1) professional skills, 2) introduction to working life, and 3) introduction to professional networks. However, these studies are not intended to give specific details and insights to situations close to the individuals on department level.

In this paper, the focus is two-fold. First, we determined through short interviews and a survey the extent to which doctoral education on a *departmental* level (i.e., the Department of Electrical and Information Technology or EIT, Lund Institute of Technology, Lund University) prepares each doctoral candidate for their preferred future career. Based on the findings, we identified several shortcomings in the current system and made recommendations to the department to address these issues.

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## II. METHODOLOGY

Short interviews were conducted with a small group of people (all with doctoral degrees) who are familiar with the process and practical implications of doctoral education. They included EIT's Director of Postgraduate Studies, three employers of doctoral students in the industry and academia and a recent doctoral student graduate. The interviews provided the first feedback on career aspect of doctoral education from the other side of the fence.

The feedback was partly used to form a survey designed to obtain specific opinions from doctoral students on how different aspects of doctoral education support, or do not support, their career aspirations. The survey was also intended to obtain useful information, especially from senior students.

The results of the interviews and the survey were then carefully analyzed in order to extract and analyze relevant information, so that relevant recommendations may be made.

## III. RESULTS AND DISCUSSIONS

### A. Short Interviews

The Director of Postgraduate Studies agreed that it is beneficial to increase the preparation of doctoral students for future career. One vision was to expose students via real life examples to the broad career possibilities after a doctoral education, which may be outside their trained discipline.

Two technical managers, a professor and a recent graduate spoke from experience that doctoral graduates are generally competent in performing technical duties. However, they tend to struggle with team work, managing and moving between multiple short tasks that are typical in industry, as well as having a broader (or "system") perspective of their tasks. On the other hand, the time pressure to complete doctoral study (i.e., 4 years full time) is seen to inhibit the development of genuine interest and innovation in research.

In general, the interviewees supported that adequate career preparation is both important and relevant for doctoral study.

### B. Doctoral Student Survey

More than 50% (26) of EIT's doctoral students volunteered to participate in the survey and some verbal feedback indicated that the survey forced them to start thinking about their career goals and how their current hard work may or may not be equipping them to achieve their dreams. The respondents were found to be representative of the demographic trend of EIT in gender, nationality, prior work experience, year of study, and nature of study (full-time

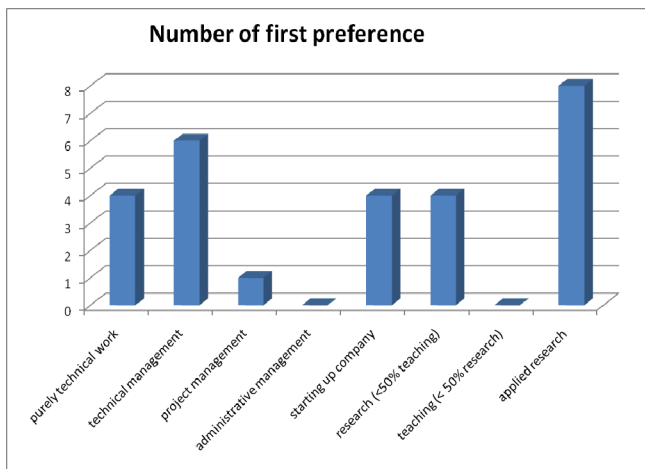


Fig. 1. Distribution of top career preference for the 26 respondents.

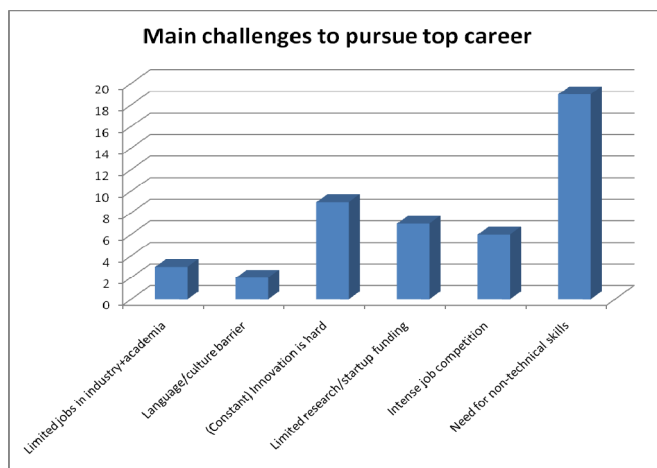


Fig. 2. Perceived main challenges for achieving top career choices.

“doktorandtjänst” vs. industry doctoral students). In particular, the average PhD student at the EIT can be characterized as male, Swedish or Middle-Eastern/Asian origin, no or little prior work experience, with 0-5 years of study and full-time employed. Several key results are summarized here.

In Fig. 1, the top career preferences of the respondents are shown. Not surprisingly, most would opt for technical related jobs. However, pure technical work and academic career were only preferred by 30% (8) of the students, while others chose careers that involve significant non-technical skills, notably management and entrepreneurship. In this context, it is not surprising that the overwhelming majority perceived non-technical skills as the most important challenge in their future career pursuit (see Fig. 2).

Another notable survey result is that none of the six first year students has yet had a change of mind in top career choice, whereas more senior students have a 50% likelihood of picking another top career. Among those who changed their mind, 90% chose careers that require non-technical skills, which further supports the importance of non-technical training in doctoral education.

Although many respondents recognized some available tools and resources for non-technical training, such as courses, industry attachment and mentorship program, most do not see the urgency and importance of taking full advantage of them.

#### IV. RECOMMENDATIONS

Based on our findings, we recommend the following measures to improve career preparation of doctoral education.

##### A. Improve packaging of available resources

Despite significant amount of internal LU/LTH non-technical resources, it took dedicated searches and shared experience from colleagues and senior doctoral students to find them. Therefore, it would be highly beneficial to better package them so that they are both easily accessible and categorized (e.g., under different career tracks). In addition, there is an urgent need for more resources to be available in English, since over half of EIT’s doctoral students are from non-Swedish origins.

##### B. Promote holistic approach to doctoral education

The tyranny of deadlines in externally funded research projects that finance most doctoral student positions can result in non-technical training being perceived as a time-waster and a threat to the success of the projects. The staff should be encouraged to balance project requirements with providing holistic doctoral education, so that the education may be relevant to career interest/plan. As a student pointed out “A lot of opportunities are available at the university but it is not common to consider these in EIT’s PhD study, so a change of practice is needed.”

##### C. Formulate comprehensive career program

LTH should consider a more comprehensive program for doctoral students, in addition to the PLUME initiative that was started this year (see <http://www.tlth.lth.se/~dunkt/plume>). Such a program should ensure that students increase their awareness that their study should be relevant to their top career choice, and offer them available resources (including mentorship). It can also include seminars and workshops to prepare them for what is ahead (job interview skills, etc.), not unlike those available for undergraduate students in their final year. In fact, such a career program (called “Lund University Postdoctoral Program (LuPOD)”, <http://www.lu.se/lupod>) has already been initiated for postdoctoral researchers and junior faculty.

#### V. CONCLUSION

In summary, the main purpose of the paper is to capture the primary issues relevant to career preparation in doctoral study, and to make several recommendations to address these issues. Although this study, which was initially performed as part of a pedagogical course, is based on one department/discipline within LTH, the findings and recommendations are believed by EIT’s leadership to be applicable to other departments. As a result, these have since been forwarded to the leadership of LTH for further attention.

Due to the complexity of the topic, more in-depth analysis may be conducted in order to gain further insights. For example, data from the survey can be processed using more advanced statistical analysis methods to extract more obscured information and to increase the level of confidence in the obtained results.

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REFERENCES

- [1] O. Holmström, "Forskarhandledningen vid Lunds universitet (Research supervision at Lund University)," Office of Evaluation, Lund University (Utvärderingsenheten, Lunds universitet), report 2008:248, 2008.
- [2] O. Holmström and M. Nilsson Lindström, "Efter doktorsexamen – en alumnstudie (After a doctor's degree – An alumni study)," Office of Evaluation, Lund University (Utvärderingsenheten, Lunds universitet), report 2008:250, 2008.
- [3] O. Holmström and M. Nilsson Lindström, "Postgraduate education and professional careers – conclusions from the evaluation of Ph.D. programmes at Lund University," Office of Evaluation, Lund University (Utvärderingsenheten, Lunds universitet), report 2009:254, 2009
- [4] M. Nilsson Lindström, "Doktorandbarometern 2007 (The Postgraduate Student Barometer 2007)," Office of Evaluation, Lund University (Utvärderingsenheten, Lunds universitet), report 2008:247, 2008.
- [5] P. Näsman and M. Westerman, "Doktorandrapport 2009," Royal Institute of Technology (KTH), 2009. Available: <http://www.kth.se/alumni/karriarstod/doktorandenkat-1.25736>
- [6] S. Rosén, "KTH-doktorer attraktiva i näringslivet," Campi KTH, 2009-12-03, 2009

- [7] H. Dryler, K. Holmvall, and M. Kahlroth, "Utländska doktorander i svensk forskarutbildning," Swedish National Agency for Higher Education (Högskoleverket), report 2009:14 R, 2009.
- [8] D. A. Kemp, "Knowledge and innovation: a policy statement on research and research training," Canberra, Australia: Dept. of Education, Training and Youth Affairs, v. 1999, 29 pages. Available: <http://catalogue.nla.gov.au/Record/1715438>.

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