

## Engineering graduates at work: Reality check for information literacy

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# ENGINEERING GRADUATES AT WORK: REALITY CHECK FOR INFORMATION LITERACY

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## Abstract

Information Literacy (IL) in the Workplace is a relatively new and increasingly important area of research in library science. Many libraries offer IL programmes in order to help students find, access and use literature for their studies and final papers. But to what extent does instruction in IL help students in their future employment?

In international library science, a number of publications already investigate concepts of employability and their relation to information literacy. In Germany, the discussion is just beginning. There is little evidence that German libraries include information literacy for the workplace in their strategic programme development.

The University Library of the Technical University of Munich (TUM) offers a comprehensive IL programme for all stages of study, research, and teaching. To develop a better understanding of the differences between IL as part of a university study programme, and information literacy in the workplace, the University Library decided to conduct a survey among engineering graduates who have finished their master's degree at the TUM and are at an early stage of their professional career. In semi-structured interviews, participants describe their experience with IL in workplace environments and give feedback regarding their academic IL training. Results support a process of reconsideration and adaptation of the IL programme with a focus on student employability, as well as on course formats and content to reflect workplace requirements.

*Keywords: Information Literacy in the Workplace; Employability; Information Literacy for Engineers*

*Sub-theme: Information Literacy in a Digital Age; User Centered Library and Service Design*

## 1. Introduction

The University Library of the TUM implemented a quality management system and undergoes regular certification audits by external inspectors (DIN ISO 9001:2015). To identify potential for improvement is part of the certification process, with recommendations of where to modify existing workflows or create new services.

In 2017, the certification auditors in charge examined the University Library's IL training programme including structure, organization and evaluation of the courses. They pointed out that there was a missing link in the University Library's end-customer orientation. They suggested to take requirements of relevant third parties – like for example future employers of TUM students – into account for the development of the IL programme and training topics.

This seemed to be a valuable indication, and the University Library decided to take up the idea of considering the interests of a broader target group. As “relevant third parties”, the Quality Officers of the University Library identified future employers of the TUM students, as well as TUM students themselves in their future roles as employees.

In order to find out more about IL requirements in the workplace, the University Library decided to conduct a survey among TUM alumni on their information needs and experiences at work. The project started with a literature review (chapter 3), followed by the design of a three-phase

project (chapter 4). The project team conducted interviews with TUM alumni and analyzed the information (chapter 5). The results allowed a look into the information needs of the corporate world of business and industry (chapter 6 and 7), and will support a process of reconsideration and adaptation of the IL programme with a focus on student employability, as well as on course formats and content to reflect workplace requirements.

## **2. Information Literacy Programme of the University Library of the TUM**

The University Library of the TUM offers a comprehensive IL programme for students and scientists on information retrieval, reference management, correct citation and good scientific practice, research data management, academic publishing and research impact. (University Library of the Technical University of Munich)

In 2017, the library offered about 650 sessions including courses, guided tours, webinars and e-learning courses, with more than 9.000 participants (high school students, undergraduates, PhD students, academic staff and professors). The library cooperates with other units at the TUM in order to provide support for all stages of learning, teaching and research, in particular with the student service center and student bodies of the faculties, as well as the graduate schools, tenure track academy and departments.

Regular evaluations and feedback from the participants serve as guidelines in order to align the programme with changing needs of students and scientists, along with international developments in IL teaching, and best practice examples.

## **3. Literature**

We started the project with a literature research on the topic of information literacy in the workplace (ILW). ILW is a relatively new and increasingly important area of research in library science, with an increasing number of publications on IL requirements from both employers' and employees' perspectives, including surveys and theoretical approaches to concepts of ILW and their implementations into library teaching programmes. The following three titles are examples of the diverse field of approaches to ILW in recent years:

- The anthology "Information Literacy in the Workplace", edited by Marc Forster, gives a diverse insight into ILW from different perspectives (Forster, 2017)
- The Sconul Seven Pillars ILW Lens offers a structured overview of ILW and includes also a literature review (Goldstein, 2015)
- Alison Head reports on a series of qualitative interviews with US companies and employees on their information needs and experiences (Head, van Hoeck, Eschler, & Fullerton, 2013)

However, in German library journals and library reports ILW has not been discussed so far. The term does not appear in position papers and standards on IL in the German-speaking context. Position papers on IL sometimes look at the connection between IL as a key competence and lifelong learning skills. We did not find any German literature which is dedicated to ILW or describes projects in the context of ILW. We also looked for German literature on neighboring topics like critical thinking, graduate attributes or employability where we hoped to find some information about ILW concepts or projects. This was, however, not the case.

## **4. Project design**

Against this background, we ultimately decided on this higher-level project assignment:

**To determine the IL requirements in the workplace of TUM alumni, and use these findings for the further development of the training programme at the University Library of the TUM.**

#### **4.1. Phases**

To facilitate a realistic time and resource planning, the project was subdivided into three phases, with milestones at the end of each phase. The phase model is not definitive, further phases can be added if necessary.

##### **Phase 1**

Objective: We know more about the requirements at the future workplace of graduates of the TUM. In this phase, the project team develops an interview guideline and runs interviews with TUM alumni about their experiences in everyday working life. Based on an analysis of the interviews, the project team identifies main characteristics of ILW requirements and experiences.

##### **Phase 2**

Objective: On the background of the interview findings, the IL training programme of the University Library is reviewed, potentials for further developments are identified.

##### **Phase 3**

Objective: Potentials for further developments of the IL training programme are implemented.

This paper reports on phase 1 of the project, which was finished in June 2018.

#### **4.2. Project team and time setting**

The project team for phase 1 consisted of four staff members of the department of information services, with variable time resources.

The overall project started in March 2017 with taking up the suggestions from the quality management audit, followed by the literature search, a definition of the different project phases and milestones, the specification of methods and time setting, clarification of data protection issues, and the development of an interview guideline.

In January 2018, we started to contact interview partners. From February to April 2018, we conducted the interviews. In May and June 2018 we analyzed the recordings.

A first presentation of the results of project phase 1 took place at the 39<sup>th</sup> IATUL Annual Conference 2018 in Oslo, Norway.

#### **5. Phase 1 – Information Literacy requirements in the workplace**

In the beginning of phase 1 the project team discussed some basic questions about the project setting and agreed on several specifications:

##### **Interview partners**

Who should be addressed for the interviews in the first project phase? One option was to talk to employers, e.g. to management representatives of companies with a large number of TUM alumni in their workforce, and ask them about their expectations with regard to the IL competence of their staff. Another option was to contact employees with a TUM degree. For several reasons the project team decided, to interview employees. The employees' perspective allows a look into real working life, with everyday information needs and behavior. At the management level, reports would presumably be made from a more overarching, conceptual perspective. The employees' perspective seemed more productive and relevant to the project team, with insights into the day-to-day work of engineers.

##### **Professional background and study degree**

The project team decided to limit the interviews to TUM alumni of the engineering study programmes. Regarding the limited number of planned interviews, it seemed necessary to focus on one field of study. Graduates from the engineering sciences are currently the largest group of graduates of the TUM. (Technische Universität München, 2017b; 2017a, pp. 7–41) The limitation to graduates from the engineering sciences would, it was assumed, make it easier to compare the findings of the interviews and help to understand main issues with ILW in this field.

**Minimum time of work experience:**

A minimum of one year of professional experience was defined for all interview partners. We were looking for employees who were beyond their first experiences at work, and had become familiar with routines and regular work processes.

Phase 1 comprised three steps (see figure 1, by the authors):

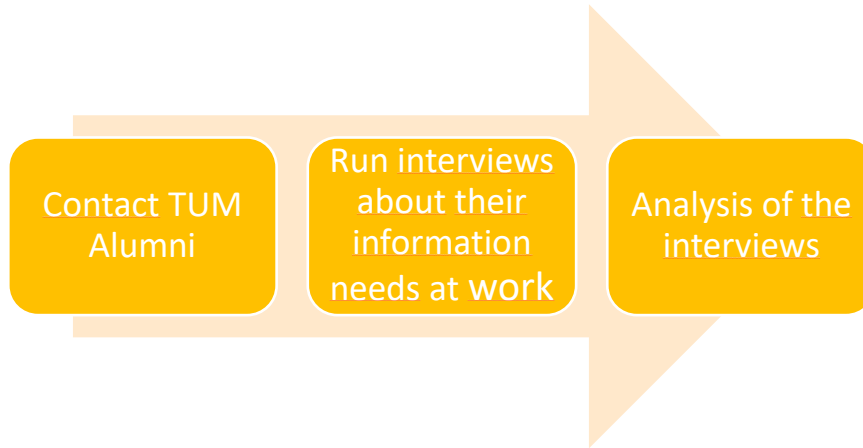


Figure 1: Steps in Phase 1

**5.1. Contact TUM Alumni**

The interview partners were contacted via the TUM Network, an online network site for current students and alumni of the TUM. The platform contains a search engine, which allows to search for individuals with various criteria and to contact members directly via e-mail. (Technische Universität München).

We sent out e-mails to 150 alumni, based on the criteria "final year", "study programme" and "sector of the labour market in current position". 17 alumni answered and agreed to be interviewed (response rate of 11%).

**5.2. Interviews****Interview method**

Inspired from other ILW projects using interviews (Crawford & Irving, 2009; Head, 2012; Head et al., 2013; Hepworth & Smith, 2008), the project team decided to conduct semi-structured interviews, also called guided interviews. This method offers an ideal combination of flexibility and standardization. Standardization of course facilitates evaluation and comparability. On the other hand, the order of the questions can easily be adjusted to the course of the conversation. (Döring & Bortz, 2016, p. 372; Hussy, Schreier, & Echterhoff, 2013, p. 225)

The interview guideline included a set of open questions. For the wording of the guideline, we avoided terminology from library science or infrastructure but used everyday vocabulary instead. The guideline was designed in accordance with the recommendations of Döring und Bortz (2016, pp. 403–404) and Hussy et al. (2013, 225-226, 229). It was tested in two interviews and then slightly modified.

The scope of questions comprised the following aspects:

- Introduction and formalities
  - introduction of the interviewer
  - data privacy declaration
  - explanation of the background of the project
  - explanation of the interview procedure

- request of permission to record the interview, and assurance of anonymity
- Questions
  - Professional background of the interviewee
  - Information needs (frequency, type of information)
  - Sources of information
  - Information acquisition
  - Competences needed for information search and acquisition
  - Assessment of own competence: What skills did the interviewee bring from the university? Which competences should be taught at the university?
  - Main differences between study and work, regarding information needs
- Conclusion of the interview
  - Thanks to the interviewee
  - Question if he/she wants to be informed about project results

### **Technical Aspects**

The interviews were conducted and recorded online, with the conference software Adobe Connect, which is similar to Skype or Zoom. Online interviews seemed to be a good means to reduce time and costs, in particular travel time and expenses for the interviewer or interviewee. Adobe Connect is funded by the German Research Foundation and is also used for webinars by the University Library of the TUM. It allows an uncomplicated recording in the MP4 format.

### **Data protection**

Throughout the project, the topic of data protection was of great importance. Participants should be able to report freely during the interviews, and confidentiality had to be guaranteed.

A data protection declaration was signed by all interview partners involved, which determined clear rules on how to handle content and recordings of the interviews.

During the design of the interview settings and guideline, the project team carefully considered which personal information from the interviewees was necessary for the project, and decided on how to handle these data and make sure it was anonymized during the analysis. It should not be possible to draw conclusions about individuals, their opinions, and affiliation. Information such as e-mail correspondence, audio files or appointment details, was only kept for as long as absolutely necessary. At regular intervals, data that were no longer needed were deleted.

## **6. Analysis**

As a basis for the analysis, all interviews were literally transcribed. Considering the various possible methods for transcriptions, the focus of our transcripts was on the spoken content, and limited time and staff resources were considered. (Döring & Bortz, 2016, pp. 367–368; Fuß & Karbach, 2014, p. 57; Hussy et al., 2013, p. 246) We decided on a “simple scientific transcript” which only includes few nonverbal aspects. (Fuß & Karbach, 2014, pp. 61–64) A set of rules and a transcript form helped to ensure consistency and readability of the transcripts. (Döring & Bortz, 2016, p. 368; Fuß & Karbach, 2014, pp. 71–83)

The privacy of interview partners was ensured by anonymizing sensitive data like, for example, company names. (Fuß & Karbach, 2014, pp. 95–96)

The technical approach was to save the recordings of the interviews as mp4-audio files, and to open them with the VCL player. The VCL player offers shortcuts for breaks and skipping back in the recording which helped a lot with transcribing the interview content.

For the analysis, we entered the answers of the interviews into a category scheme. (Döring & Bortz, 2016, pp. 599–606; Hussy et al., 2013, pp. 255–259) The categories followed the structure of the interview guideline, with each question or topic representing one main category. Some subcategories could already be defined at the beginning of the analysis, by listening to the complete interviews or reading their transcripts. In a second step, we identified the main statements in the answers, determined further subcategories, and categorized the answers again. The categorizing of answers was accompanied by reducing text passages as far as possible, without losing the meaning.

Due to the number of interviews, it is not possible to make statistically relevant statements, but it is possible to get an impression of the role IL plays in the workplace of TUM alumni in their current position.

## 7. Results

The interviews took from 20 to 50 minutes, with an average duration of about 30 minutes. Interviewees came from very different fields of study, but there was an accumulation in electrical and computer engineering as well as in mechanical engineering.

The interviewees had between one and ten years of working experience and were employed at companies with a size between 28 and more than 300.000 staff members. The areas of work reported on have been very different, too.

To illustrate the results, we decided to add some exemplary statements. The statements were translated analogously by the project team. The German transcripts are not published in order to protect the privacy of the interviewees.

### 7.1. What kind of information do you need?

In this category, interviewees mentioned a great variety of information types, with several different information types within each interview. Assigning a type of information to only one category was rather difficult in some cases, consequently some statements were assigned to two categories.

The most important type of information seems to be “specialized knowledge for engineers” and information on “innovation and trends”. Under “specialized knowledge”, we summarized diverse statements on engineering knowledge, such as process engineering knowledge. Statements on the importance of current research findings or developments on the market were categorized as “innovation and trends”.

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*What is needed is a lot of technical know-how, i.e. what is going on in the mobile app development market and which new trends are coming up at this point. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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"Product information / requirements" are also often needed. Of course, this can vary greatly depending on the type of work. Some examples: Project plans or cost plans for a project, construction plans for the technical support of buildings or CAD models.

"Internal company regulations" are obviously also a type of information that is frequently used in the workplace. Examples include compliance rules, but also company-specific information on a product.

Furthermore, legal information, information about competitors, norms and standards and scientific publications were mentioned.

### 7.2. Which sources of information do you use?

In general, internal company information sources were mentioned more frequently than external sources. The information source which was named most often was “colleagues and other employees of the company”.

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*Yes, of course it always helps to ask your colleagues if they have been involved with a certain topic before. Maybe this even replaces one or two searches on the Internet. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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The intranet and databases also play an important role. "Databases" can mean both literature databases and databases containing internal company information. Interviewees also reported that they often search for information in folders or file storages.

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*Perhaps always first internally and then externally. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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Only in three interviews, professional information service providers, such as company-wide experts for specific materials, were mentioned.

Among the freely available sources "the Internet" and "Google" were mentioned in particular, as well as pages of public institutions, such as the EU. Occasionally, interviewees reported they use blogs, forums and websites for their information retrieval on the respective topic or product.

Only once YouTube and Wikipedia were mentioned.

### **7.3. How do you get the information you need?**

All interview partners were able to report on a kind of strategy or course of action.

As a strategy we rated statements which included a description of the way or manner of information procurement. However, it is striking that when asked about a strategy, interviewees sometimes mentioned rather different sources of information than an actual search strategy, like for example the use of synonyms or keywords, or the awareness of using search terms in different languages.

The "experience" factor was mentioned particularly frequently when interviewees talked about how they obtain information. This means, for example, using your own experience, previous knowledge from your studies or the experience of others to obtain the information you need.

To ask someone who already has the relevant knowledge, also seems to be a very relevant strategy for gathering information. Online search, in comparison, was mentioned less often.

Another important part of the interviewees' strategies seems to be sorting and filtering information by its content.

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*Yes, I have good to very good access to the information I need and want, because I usually do not rely on a source. Or a search facility. If I am looking for anything, then there is company information and free information on the Internet, maybe we also have a book in the department. Then it's lunch and I'll meet my colleagues, and then I'll ask them if they know anything. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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### **7.4. Which competences do you need?**

#### **Which competences do you need yourself?**

When we asked directly for necessary competences in the workplace, the answers emphasized that the ability to evaluate the reliability of sources is considered very important.

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*Yes, one should rather assume that not everything that is written somewhere by someone is correct. Because that is definitely a very important ability when it comes to Internet research. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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*It is important to know relatively quickly whether a source can be found at all and whether the information makes sense. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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Basic research skills, most notably the ability to choose the best search terms, seem to be very relevant, too.

Speed – with regard to the reliability check and effective search terms – also turned out to be very helpful.

Furthermore, communication skills, for example the ability to communicate with different target groups, cultures or hierarchy levels play an important role.

A number of other competences were named, but there was, however, no obvious accumulation.

#### **What should students bring along?**

The ability to evaluate and filter information with regard to the respective professional needs, was considered to be important when, in a second step, we asked for the competences students should bring along for employment.

In addition, the ability to pass on information and to make it reusable for oneself or others was often mentioned. Also in this section of the interview, the ability to communicate was mentioned again as important.

Students should further bring along the ability to work independently and well structured.

Overall, many answers could be assigned to several categories. We suppose that important abilities cannot be viewed in isolation, but are strongly interrelated and in part interdependent.

#### **7.5. Do you think you have the competences you need?**

The interviewees assessed their own level of IL competences positively, referring either to single, isolated competences or groups of competences.

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*So personally I feel quite well equipped for my current tasks. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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Nevertheless, some interview partners found it difficult to judge.

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*Many information requirements are very complex, of course one tries with existing knowledge, experience, test series and whatever to close these knowledge gaps, but actually it is very very difficult. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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The answers in the interviews also revealed that universities seem to impart necessary competences, such as research skills, professional knowledge and the ability to evaluate sources and to solve problems.

#### **7.6. Differences between the university and the workplace**

All respondents were able to see differences between university studies and the workplace straight away.

The differences were particularly often related to the factor “time”. It is necessary to work faster in the workplace than during studies. Time constraints do not allow in-depth research of literature, the search for background information or a deeper examination of the problems.

In the workplace, the complexity of tasks seems to be higher than at university. The statements on this topic were manifold. It was mentioned several times that the questions and tasks are less clearly formulated than during studies. There are no more sample solutions, you have to find a solution yourself and you have to be able to judge it yourself. Tasks in the workplace are further embedded in complex contexts such as projects.

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*It's not like at school anymore that you have a problem, type it in Google and the first hit gives you the right answer, but you have to search a long time and put together partial answers to understand your problem in the first place, or solve it. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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Several interviewees explained that there is a greater dependency on others and that you have to be able to work in a team. For example, individuals must consider the relevance of their work and related information for the entire company or other dependent parties.

Working without guidance is particularly required in the workplace, too.

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*The further you go, there is nobody left to take you by the hand and say, here, watch out, you have to do it this way. (Statement from an interview transcript, analogous translation, University Library of the TUM, project team, 2018)*

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## **8. Conclusion and next steps**

The interviews offered exciting insights into the professional world of graduates: The diversity of perceptions on the subject of information literacy in the workplace was as diverse as the diversity of workplace activities. As a rule, information needs are part of the working experience. To identify information needs, find adequate sources and obtain the information needed appears to be a relevant part of the working experience of our interview partners.

There was great interest and openness among the discussion partners. All interviewees reported very openly and willingly, and many expressed interest in the topic and wanted to be informed about the results of our project.

As an interviewer, it was often difficult to adhere to the interview guidelines. It was tempting to ask unscheduled follow-up questions and to deepen topics beyond the interview guideline.

The interviews were a good way to get an idea of the role IL plays in the workplace, even if statistically reliable statements are not possible.

There is much more information in the transcribed material than could be extracted in the first analysis. It would be interesting to look at the results more closely in relation to specific aspects.

We will proceed to steps 2 and 3 of our project which is the evaluation of the IL courses and consulting services of the University Library, and – if applicable – the implementation of changes or amendments to the IL programme.

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