

## Preparing for the Goal

*Dr.-Ing. - The Engineering Doctorate is the classical training and career path for technocrat leaders. It is a hidden champion in the German Education System for the development of high potential individuals for industry. This kind of doctorate is valid especially for research facilities close to the industry. The conventional Doctoral degree Ph.D. has no significant stand alone value, when it comes to industrial problem solving. 50% of personnel belonging to the top management cadre in industry are “Dr.-Ing.’s”. The decisive factor is the development of well trained individuals with ample experience vital for effective project and human management and withstanding and handling complex situations. All these can be achieved by the Engineering Doctorate [1]. The Dr.-Ing. integrates simultaneously in just one program three different aspects viz. the Ph.D., the Post Doc and industrial relevant project experience in a single 5 year program*

As a rule, graduates are lured by the Industry offering them high entry-level salaries as compared to industrial focused research facilities. This is crucial especially for times with huge deficiencies of engineers. Independent studies, however, show that doctorates pay off in the long run. So, in a short time, the postdoctoral candidates catch up with their colleagues due to direct entrance and eventually overtake their colleagues. A study by economists proves this phenomenon [2]. The study shows that a positive cash flow occurs due to the doctorate degree.

### The Money

This idea is reflected in similar studies on salary structures, like the VDI [3]. The extreme salaries offered by the industries in the past, if looked carefully reveal themselves as a deceptive packing. Here, the salaries are raised only in the first and second year, and then follow the typical salary curves, which are valid in companies and also need to be maintained for long term salary struc-



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tures. The economic career path of engineering doctorate is given and should thereby not influence the decision for or against it.

### The Content

In industry focused research facilities like RWTH Large Institutes like ITA, Fraunhofer Institute etc., the scientific employees are associated with a particular specific area of study. The doctorate

evolves from this specific area of research. The doctorate involves the independent identification of open industry relevant problems and queries and working out a industry relevant solution for the same. This in depth study is covered within the framework of the doctorate study.

Further on, the doctorate provides the scientific employees the possibility to carry out different tasks on industry focused projects and gain immense experience along the breadth of the area of research (Fig. 1). This provides with a much greater research spectrum as against direct entrance into the industry. The industry in turn is currently showing very strong tendencies in “lesser product strategies” along with strong product focused.

The decisive result of an engineering doctorate is what the Institute provides the scientific employee on benefits. The central point of discussion is the development of well trained individuals with ample experience vital for effective project and human man-

agement and withstanding and handling complex situations [1,4].

### **The Challenge**

Most of the engineering graduates consider the high technical challenge as a challenge of their doctorate thesis. On having a closer view, the scientific employee has three basic challenges: going into the depths of a specific area of research but at the same time managing multiple projects. Secondly, certain distinctive Management attributes are questioned (Self management, project management and personal management). Normally a scientific employee has to lead groups including people like technical men or service employees, one to three students, and scientific work carried out by the students. Thirdly, the scientific employees of industry focused institutes are expected to deliver HR work and acquiring projects. This include aspects like presenting results to industrial customers and at certain research conferences, acquisition of direct industry contractual projects and publicly funded industrial projects, documentation of quotations, writing of proposals and reports. It is necessary to accept and to overcome these challenges! (Fig. 2).

### **The Motivation**

The three dimensions of the mentioned challenges demands a lot from a scientific employee (Fig. 3). Additionally this demand leads to the fact that the scientific employees selected for the engineering doctorate lay the requirement

of a higher standard on the results of the work they deliver. This requirement of achieving higher standards results in the following phenomenon: The employee performs a lot in the first and second year, and expects a lot of positive results directly after the first year. The employee himself has higher expectations on oneself as against the expectations of the superior or the supervising professor. This attribute further results in a phenomenal drop in motivation after the first year. Although no individual success has been registered, the individual claims and complexity plays on the minds of the employees. Approx. 10% to 20% of the engineering doctorates give up in this phase and mostly for unnecessary reasons.

The lesson to learn from this motivation drop is a part of the valuable experience which one uses immensely later in life! The institute is not supposed to excessively utilize the employees but instead actively assist the employee.

In order to encounter the mentioned three dimensional challenges, ITA (Institut für Textiltechnik und Lehrstuhl für Textilmaschinenbau der RWTH Aachen Universität) has strengthened three important matters. Among them are, the doctorate is well structured, an entire package for personal development is offered and a specific mentoring of the doctorate engineers is also on offer.

### **Personal Development**

Although the doctorate is often the issue of discussion and is the main focus, yet the candidate needs to be developed to encounter the three challenge dimensions. This is important because when the candidate later joins the industry, the cumulative capabilities and experience is taken into account. The doctorate serves the purpose of an elaborate technical personal development.

In order to ease out the entry, as well as the phase of the doctoral studies, ITA offers its employees a number of opportunities for intensive technical up gradation with help from industrial partners or from independent seminar providers.

In order to strengthen the Soft Skills in the area of management capabilities and acquisition operations, a catalogue with about ten different seminars are offered at ITA (Oratory, Technology and innovation development, Marketing, Proposal writing, personal and project management etc.). An individual can cash on the seminars for self development or also independently offered seminars.

The RWTH Aachen University also offers a wide variety of extensive courses for its doctoral students in its Center for doctoral studies (CDS). The development of the strengths of an individual always is placed in the foreground.

An essential element of the personal development is the realization of one's own responsibility. This is done by placing the scien-

tific employee at the center of affairs by providing him opportunities to present his results, defend his results and also be responsible for the project management. This provides the employee the opportunity to establish oneself in an area of research well before he/she finishes his doctorate. Doctorate is also achieving a doctoral degree in self betterment.

### **The Mentor**

A beginner employee always is provided with an experienced employee to guide him. This assists the new employee to comprehend the new procedures and understand the arguments of colleagues, superiors and customers. The mentor also is available for advice and supports the new employee initially [5]. The Mentor also accompanies the new employee during certain employee discussions and discussions with new customers. The motive is to enable the young aspirant to quickly become independent and to extract the best out of him. The Mentor along with the Doctor Father advises the candidate on issue of technical and scientific/innovative relevance – which is a part of the core of the personal development of a “Engineering Doctorate”.

### **The Doctorate**

Many industry focused universities and technical universities have tried to structure the engineering doctorate in the past years. This has been carried out without diluting the basic concept

of independent work culture. (Fig. 4).

On observing the regular five year period for completion of a doctorate, it is evident that the entire period of time is not only completely dedicated to the doctoral thesis.

The first year is the orientations year. The scientific employee is expected to establish oneself technical in a particular area of research and reveal for himself where lacunas in the research fields exist and then decide on an area which he plans to look at closely (either production research, simulation, experimental..). During his search for an area of research, he would be guided by colleagues and also superiors. Moreover, the research topics are always a part of the group strategy which in turn represents the institute strategy.

After about one year, a working title of the thesis along with a mission statement and a concept diagram, explaining the project, along with a thesis structure would be decided. These aspects could vary within a particular boundary during the progress of the thesis. In reality, the ideas in the thesis converge and focus on a particular research topic over the span of the thesis.

After the third year another meeting regarding the doctoral thesis is conducted and the final title, mission statement and structure of the thesis is discussed and frozen upon.

In the fourth year of the doctorate, the thesis work is carried out in-

tensively and the thesis written together. The first version of the thesis is presented at the end of the fourth year. This version is a thesis version ripe enough for submission.

The fifth year of the thesis incorporates issues such as correction of the thesis, preparation for the oral examination and printing of the thesis.

After carrying out the entire exercise, the scientific employee knows in detail about the deficits in a particular area of research and can prepare scientific proposals for public funding for his successor. The fifth year is also utilized to train the successor and to ensure a friction free exchange of knowledge and information to the next generation. This model (Fig. 4) shows that there is an active job search period. This secures the doctorate which comes to an end before the scientific employee leaves the institute and facilitates the sustainable transfer of knowledge and results.

### **The Career Path after the Doctorate**

Once having received the doctorate, the employees are extensively equipped with capabilities and take charge of project as well as responsibility of personal in big

projects in the industry. A typical doctorate from an industry focused university takes charge of activities and leads a group or a division after an initial training period. Employees who continue at the institute as a chief executive officer or a head of division

later join the industry as people responsible for entire company and belong to the board of directors.

A doctorate at a industry focused university is hence an ideal preparation for technocrats to lead industries and to flourish in

technical surroundings by successfully taking charge and mastering it!

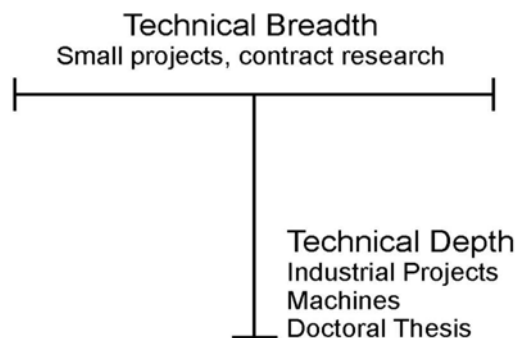


Figure 1: T-Profile of the technical expertise

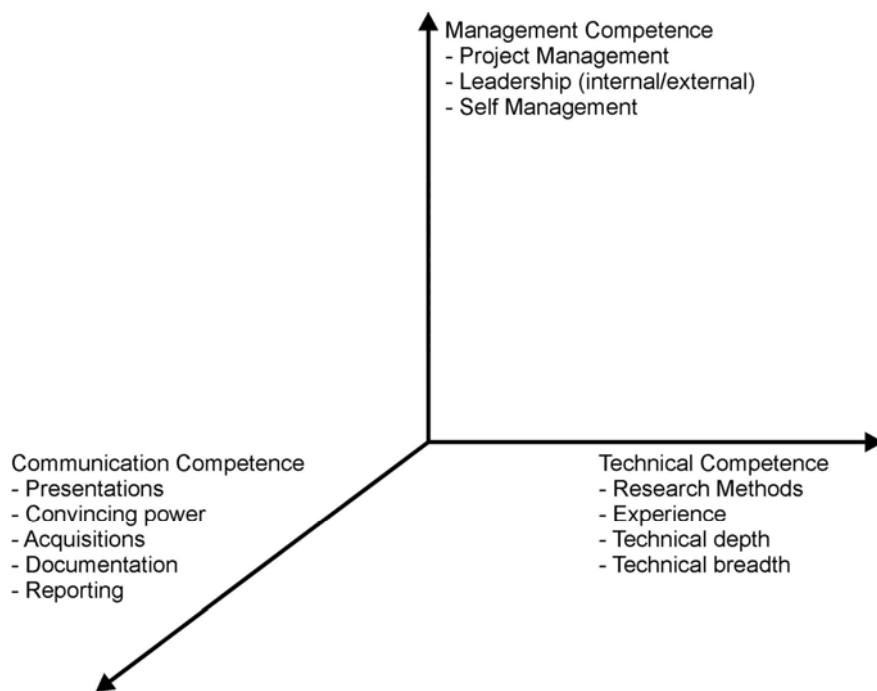


Figure 2: The three challenges of a "Dr.-Ing"

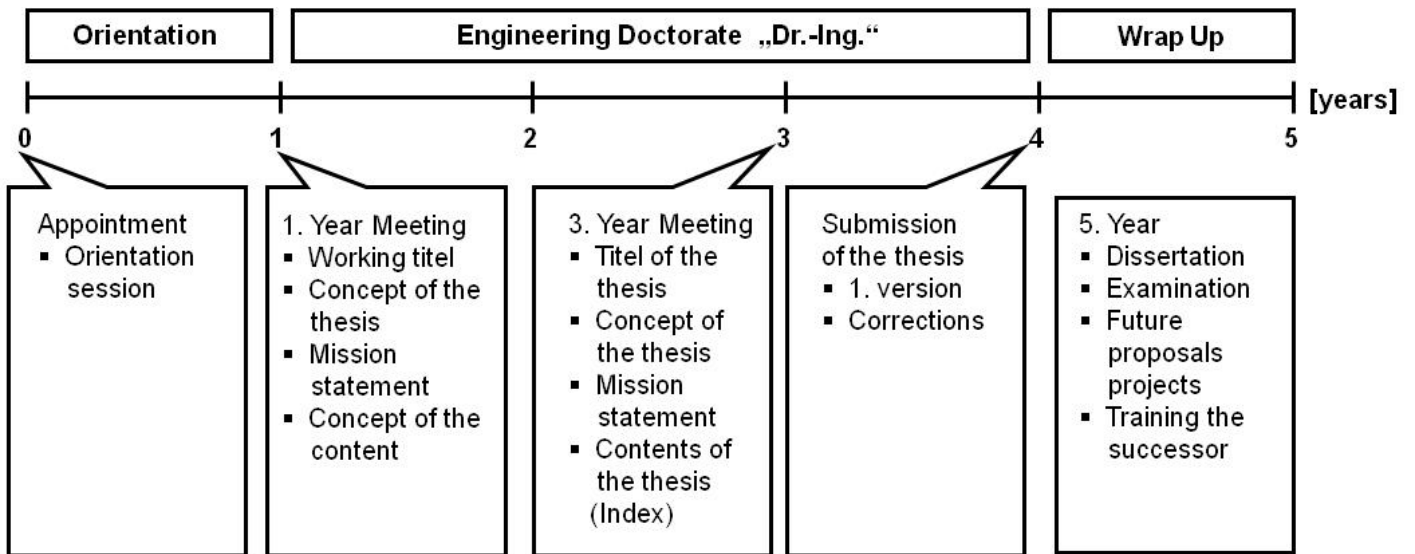


Figure 3: The time plan of an engineering doctorate “Dr.-Ing.”

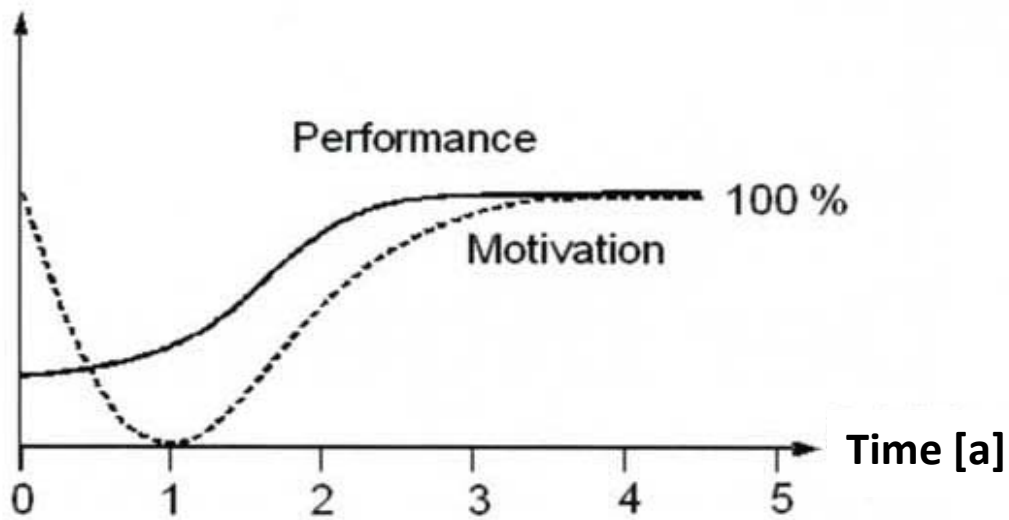


Figure 4: Performance and Motivation