Expert Opinion

for the Doctoral Thesis entitled

Qualification Profile of Nondestructive Testing Personnel

Submitted to the
Faculty of Metallurgy and Materials Engineering
VSB – TU Ostrava

by

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Introduction: General Context and Value

The dissertation “Qualification Profile of Non-destructive Testing Personnel” submitted by Dipl.-Ing. Ralf Holstein introduces an innovative concept in analyzing the influences on the reliability of NDT (Non-Destructive Testing) beyond the existing “Modular Model” developed by an international NDT expert group, where the influencing factors are assigned to intrinsic capability, application factor, human factors and organizational context in proposing a living structure for the internal and external organizational context and its relation to the qualification profile of NDT personnel. While the intrinsic capability and application factors are already well explored the human factors and especially the organizational influences are only poorly recognized in the NDT community. This thesis presents the theoretical elaboration and specific experimental results for this important extension of the “Modular Model” combined with a huge expert knowledge of the candidate and practical competence in the field of NDT-education and application in industry. In this way it provides not only a valuable gain in scientific knowledge in the field of “Management of Industrial Systems” but also a practically applicable guidance how to improve the reliability of NDT by optimization of the internal and external organizational processes and the qualification profile of the personnel especially for NDT service companies filling a gap of high topical importance.

In order to meet increasing demands for safety & reliability in industry, in our daily life and the infrastructure around us, the development of appropriate maintenance strategies based on risk reduction and life prediction tools is essential. Well evaluated Non-Destructive Testing techniques are key enablers, providing substantive information about the integrity of materials, components, and systems. The design & life management as well as simple maintenance functions of an organization achieve confidence in reported NDT process reliability through robust validation and resilient management and organizational procedures and appropriate NDT personnel qualification. The work presented in this thesis contributes to the process of developing these procedures, understanding and communicating their effect.

Presentation and Communication

The thesis contains 109 pages of text including 39 figures, 65 references and 1 annex consisting of 10 pages. The thesis is well structured and the tangibility of the argumentation is supported by well designed figures. The work is guiding the reader from the (1) introduction to the field via a first formulation of the aim(2) and a deep analysis of the current stage of research and the status in practice(3) to the formulation of the problem and the research questions(4), the description of the methodology(5) for the general extension of the modular model for the external and internal organisational factors(Expert Estimation) and its specific, implementation in service companies in Germany(Survey), the presentation of results(6), their interpretation with respect to the state of the art(7) and the most important chapter 8 with restatement of the aim, summary and conclusions where the general and specific findings are brought back to the general context of NDT reliability. The work is closed by an outlook to further work of importance for the very practical work of NDT companies and also further
gain in scientific knowledge. As mentioned before there is a good balance of theoretical parts and practical parts while I would have expected a stronger emphasis on the general extension of the internal and external organizational influences – which represents a valuable outcome of the work – also in the hypotheses. Although English is not his native language, the candidate expressed himself very clearly, correctly and understandably.

Knowledge in Relevant Disciplines (State of the Art)

In his work, the candidate studied all the relevant literature sources in the field of NDT - reliability and quality management and education practices as well as relevant sources in working psychology, marketing – and management research. While the subject of research is very interdisciplinary he is completely familiar with previous work in his field, his thesis revealing deep understanding and thorough knowledge which resulted in a proper indication of the “gap” in the current knowledge and formulation of the research questions.

Methodology

The candidate made use of the method of “Expert Estimation” for the extension of the general modular model for reliability of NDT and the descriptive research methodology and survey technique by e-questionnaires to collect specific data for the corresponding situation of NDT service companies in Germany followed by a statistical analysis. The methods are appropriate for the problem and were properly applied. The general extension of the model is important to bridge the gap between research and industry also in a broader sense and the high response rate of the specific survey showed the need for this work for the service companies.

Analysis and Discussion of Results, Conclusions and Recommendations

The data of the specific survey were analyzed by professional means showing the consistency of the questionnaire results allowing interesting insights about the internal and organizational structures of service companies. Together with the general extension of the modular model for the internal organization (Business Processes, Information Processes, Delivery Processes) and the external organization where these processes are put in the environment in the society it turned out – among other conclusions – to be important to improve the information between the business and delivery departments on the one hand and between service providers and customers on the other hand to make NDT more reliable. For NDT services between customers and providers this requirement is pioneer work. It is clear that this improvement cannot be solved by technical improvement of the NDT- devices and methods but by restructuring the processes and personnel training and policy. The discussions and
conclusions presented in Chapter 8 are well suited to become a subject of education and
training of NDT-personnel and managers. Generally, the results in the candidate’s thesis are
presented clearly and systematically, with a good feeling for their relevance in the context of
the thesis and also the practical meaning.

Summary & Recommendation

The objectives of the thesis are fulfilled and the scientific level of the work is adequate for a scientific
dissertation. I evaluate the doctoral thesis of Dipl.-Ing. Ralf Holstein as a very good one (magna cum
laude) and recommend that Mr. Holstein is allowed to defend his thesis “Qualification Profile of
Non-destructive Testing Personnel” and after a successful defence to award Dipl.-Ing. Ralf
Holstein to the scientific degree Ph.D..

Within the defence of the submitted doctoral thesis I would like the candidate to explain the
following questions:

i) When the useful concepts of risk informed inspection and damage tolerance principles
would be applied beyond the aero-space sector what processes of the internal/external
organizational factors needs to be taken care of to make it possible?

ii) What tests/investigations are necessary to determine the intrinsic capability and the whole
system of intrinsic capability + application factors + human factors for the isolated NDT-
systems and how could the reliability of the NDT-system be expressed when considered in
the full internal and external organizational context?

Berlin, September 3rd, 2014

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