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Author(s)

Name: Dr. Karl Ledermüller | Dr. Oliver Vettori

Position: Head of the Evaluation and Quality Enhancement Unit| Director of Program Management & Quality Management

Organisation: WU Vienna University of Economics and Business

Country: Austria

Short bio:

Dr. Karl Ledermüller is the Head of the Evaluation and Quality Enhancement Unit at the WU Vienna University of Economics and Business. He worked as a research associate at the Institute for Operations Research and the Institute for Finance, Banking and Insurance, where he earned his doctoral degree focusing on the analysis of job announcements by means of text/data mining techniques. His major research interests are related to learning and assessment analytics, data structures and (parallel and automatized) reporting in the field of quality management. Karl Ledermüller has received two awards for innovative teaching (WU – 2008/2010), an award for e-Teaching (WU - 2010) and the Best Practice Award from the German Society for Online Research for his Open Source Facebook Analytics Project (2010). His areas of teaching include corporate finance as well as operations research on both undergraduate and graduate level.

Dr. Oliver Vettori is the Director of Programme Management and Quality Management at WU. He obtained his PhD in the field of Sociology and Organisation Theory from the University of Vienna. He teaches at both the University of Vienna and at WU, where he is also liaised as a research associate with the Institute of Governance and Public Management and the Institute of Organization Studies. Oliver Vettori is the initiator and coordinator of the Network for Quality Assurance and Quality Development of the Austrian Universities and regularly works as an evaluator and reviewer for the Institutional Evaluation Programme of the EUA, ENQA, evalag, AQ Austria and ASEAN-QA. Furthermore, he is currently a member of the Commission for System Accreditation at ZeVa as well as a member of the European Group of Organization Studies (EGOS), the Academy of Management (AoM) and the European Association for Institutional Research (EAIR).

Proposal

Title: The value of prognostics in quality assurance: Using student and graduate monitoring data for strategy development

Abstract

From a conceptual point of view, quality assurance tends to be oriented towards the presence or the past rather than the future (ex post approach). This paper strongly advocates the need to make use of quality assurance instruments and processes as a means of forecasting future developments and thus to contribute to strategic and proactive decision-making. Presenting the case of a complex Student and Graduate Panel Monitoring – a framework of integrated surveys for students and graduates at different stages in the student life-cycle that is also combined with other data sources – the authors show how quality assurance instruments can be used for predictive purposes, provided that they are constructed in a specific way.

Text of paper:

Introduction:

Conceptually, quality assurance tends to be oriented towards the presence or the past rather than the future. Numerous definitions (e.g. Brown, 2009; Blackmur, 2007) describe quality assurance as a process of identifying quality-related characteristics, fixing standards for these characteristics (to ensure at least a 'minimum' level of quality) and monitoring/protecting the standards through a combination of institutionalized and external actions – reflecting the "*hope that error can be eliminated*" (Barnett, 1992: 117). For Thomas (2007), quality assurance thereby is a retrospective activity based on conformity with externally imposed standards. Therefore he claims it to be inferior to quality enhancement as the latter is a future-oriented process aiming at enhancing quality by continually striving to improve teaching and learning at universities. It is not our intention to link this debate to the classic "accountability versus improvement" discourse though. We simply want to raise the argument that by their very design, many quality assurance instruments and processes generate data on past developments and experiences, which are then contrasted with current standards. This holds true for most course evaluations, program evaluations and learning outcome evaluations – in particular if they are not integrated into a long-term process: If such an integration cannot be found, the results of past measurements are not put into relation to subsequent measurements and thus do not allow for longitudinal analyses or trend assessment. This can even be noticed when taking a closer look at the much quoted PDCA cycle (Deming, 1982), in which the main purpose of the "check" phase is to evaluate the preceding planning and implementation phase and provides a basis for corrections of the status quo. In fact, the question of how this could lead to future plans and strategies that go beyond adaptations of what has been done before is hardly ever tackled.

In this paper, we want to strongly advocate the need to make use of quality assurance instruments and processes as a means of forecasting future developments and thus to contribute to strategic and proactive decision-making. Presenting the case of WU's Student and Graduate Panel Monitoring – a framework of integrated surveys for students and graduates at different stages in the student life-cycle – we will show how quality assurance instruments can be used for predictive purposes, provided that they are constructed in a specific way. In the first part of the paper, we will therefore describe how the framework has been developed and how it works in practice. The second part will highlight a few selected examples that illustrate past and future use cases based on the data provided.

The WU Student and Graduate Panel Monitoring

Questionnaires are a widely used instrument to gather information about both students and graduates (Hertwig 2014). Especially graduate/tracer studies are very popular since they can be used to answer employability-related questions (Schomburg 2003). Some Higher Education Institutions (HEI) have started to introduce student and graduate panels monitoring students and graduates over the entire lifecycle relevant for the institutions.

WU's Student and Graduate Panel Monitoring belongs to this kind of instruments. The panel provides various kinds of information about students throughout the entire student lifecycle from admission to graduation and beyond. Questionnaire-based panels – such as this initiative - are characterized by repeated measurements on the same individuals at different points in time. WU's Student and Graduate Panel Monitoring consists of five annual surveys and one biennial survey. Data from these sources can be linked at the level of the individual student. The panel consists of surveys conducted at the beginning, in the middle and at the end of the bachelor studies, as well as one questionnaire used to survey former students 3-5 years after their graduation. Analogously, master students are surveyed at the beginning, at the time of graduation as well as 3-5 years after their graduation. The comparably early introduction of this project in 2009 and its subsequent development allows WU to answer questions of strategic relevance, using forecasting methodology in the way of longitudinal analyses. This is further enabled by linking the survey-based data to other data sources from the university (Ledermüller/Vettori, 2012) – at least as far as Austrian public law allows to do so.

How the panel is organized and technically embedded

The surveys of the WU Student and Graduate Panel Monitoring are integrated into the dominant learning and communication environment of WU students – the so called Learn@WU platform (Alberer et. al, 2003).

Learn@WU not only hosts all e-learning and blended learning activities of WU, it is also a much used means of communication and organisation, with more than 23,000 users. WU students use Learn@WU quite intensively. Therefore, the distribution of the questionnaires via the MyLearn page, (a personalized learning, study organization and communication page within the Learn@WU environment), can easily be handled. Additionally, pop-ups regularly remind students to fill out the questionnaires when logging into the Learn@WU system.

Learn@WU is based on the OpenACS (Demetriou et. al., 2006) (Hernandez/Grumet, 2005) project and uses dotLRN Technology, which was developed at Sloan School of Business at MIT and has over half a million users worldwide[1]. Surveys are published and distributed among students within the tlf-survey package developed at WU that uses XoWiki Content Flow technology (Neumann, 2008) and generated by using Tcl[2] Syntax for questionnaire programming. Learn@WU contains more than 160,000 different learning materials used in approximately 5,000 supported courses. Up to 17,000 users daily log into the system for learning, communication or organization purposes. (Andergassen et. al, 2015; Mödritscher et. al., 2013)

Integrating the surveys in the learning environment of students generates relatively high response rates and as a result assures more relevant survey results. Furthermore evaluation fatigue is also reduced considerably. Therefore this removes the two most frequently perceived obstacles for setting up surveys with a long term perspective.

[1] http://dotlrn.org/
[2] http://tcl.tk/

Technical reporting implementation

Analysis and reporting of the surveys is performed by means of the open source statistical software R. (R Development Core Team, 2015) R is an open source statistical computing and graphics software which provides a wide variety of statistical and graphical techniques. The automated generation of the studies behind every survey is generated with the open-source typesetting software LaTeX.[3] LaTeX is a high-quality typesetting system including features designed for the production of technical and scientific documentation. It is widely seen as the de-facto publication standard in various scientific fields.

Due to the open source nature of R and LaTeX, the user community is able to continuously provide additional features called "packages". The R-package knitr (Yihui Xie, 2014), for instance, enables its users to produce report structures using LaTeX technology to generate automated dynamic PDF documents based on questionnaire data within the R environment. R Scripts not only exist on the survey level, but can additionally be modified so that special stakeholder-relevant reports can be produced for different parts of the populations within the data set, e.g. one report for each master program. This stakeholder oriented reporting approach is one of the key strengths of WU's current QA system. In addition, the R/LaTex technology also offers the potential for program specific forecasting of trends or evidences. Program specific forecasting is for example applied when calculating the optimal level of support related to working students (Figure 5). Figure 1 shows the WU student panel reporting process on the bachelor and master level. For every survey a report is produced. On the Bachelor level, there are two special reports as WU offers two bachelor programs.

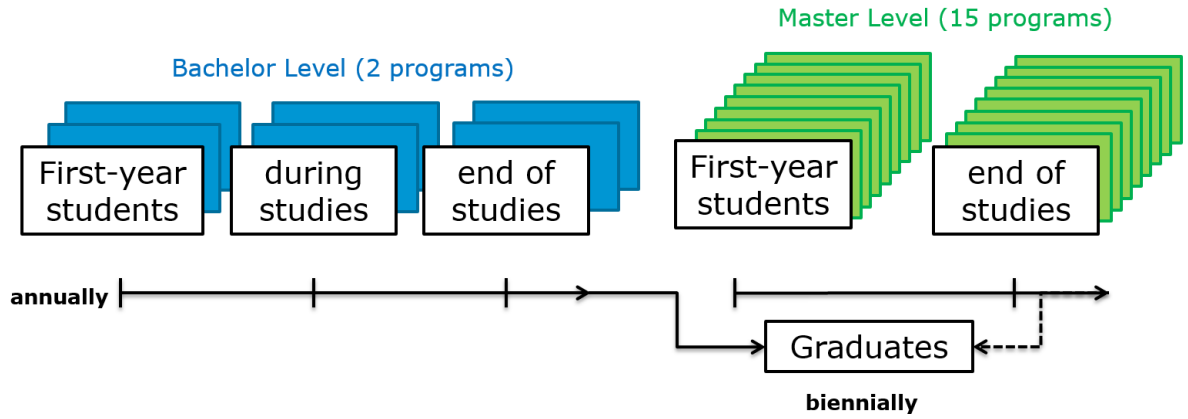

Figure 1: WU Student and Graduate panel: process description

What the surveys are about

Questionnaire for the first-year Bachelor students

Within the first semester, bachelor students are asked to fill out the first survey of the panel via Learn@WU. The total population covers over 3,000 students each year, around 45 percent of whom respond to the beginner questionnaire. Students are regularly asked about topics related to their previous activities, their decision to study at WU, their satisfaction with studying at WU and the service facilities, previously acquired and desired skills and competences, scheduled study duration and further plans after completion of the

[3] http://www.latex-project.org/

bachelor program, their current financial situation as well as their sociodemographic background.

Bachelor Mid-study Questionnaire

After having completed courses worth 70 ECTS in total (but not more than 120 ECTS in total) bachelor students are considered to be in the middle of their studies. The mid-study survey takes place in the summer term and about 2,900 students are asked to participate each year. The response rate is higher than 70 percent. Some topics of the questionnaire are linked to the first questionnaire (e.g. previously acquired and desired skills and competencies, satisfaction with studying at WU, sociodemographic background, financial situation and employment); other areas, such as the plans after graduation and questions on specific service facilities or study modules of the first half of the bachelor program are adequately adapted for this specific study phase.

Bachelor Graduation Questionnaire

Every bachelor student completing his/her program is asked to take the graduate survey. Due to the integration of the questionnaire into the student graduation process, the response rate of the last survey is usually higher than 96 percent. Besides the continuously monitored topics, such as previously acquired and desired skills and competencies, satisfaction with studying at WU and sociodemographic background, financial situation and employment, the survey modules are specifically designed for graduates: satisfaction with the bachelor thesis process, retrospective satisfaction with the program and questions on exchange programs.

Bachelor Graduate Tracer Questionnaire (3-5 years after graduation)

Three to five years after graduation, a survey is conducted in order to gain relevant retrospective information related to the program, career start (job market entry) and the present and past employment situation (field of activity, income, position within the company, number of employees of the company, factors influencing the career choice and current satisfaction with these aspects). In contrast to questionnaires during the study lifecycle this post-graduation survey is conducted as a paper/pencil survey or as an online survey outside of the Learn@WU environment since graduates no longer have access to the platform.

First-year Master students Questionnaire

The questionnaire for first-year master students is very similar to the questionnaire for undergraduate students. Students are asked about topics related to their previous activities, their decision to study in a master program at WU, their satisfaction with studying at WU and the service facilities, previously acquired and desired skills and competences, further plans after completion of the master study, their financial situation and employment status as well as their sociodemographic background. Response rates are usually around 45 percent of the total population consisting of more than 1,000 master students.

Master Graduation Questionnaire

Master graduates have to take the graduate survey as part of their graduation process (equivalent to the bachelor graduate survey), resulting in a very high response rate of more than 90 percent. Besides the modules similar to those in the bachelor graduates questionnaire, such as previously acquired and desired skills and competences, satisfaction with studying at WU, financial situation and employment, questions on the following topics

are asked: master thesis process, retrospective satisfaction with the program and questions on the participation in an exchange program.

Master Graduate Tracer Questionnaire (3-5 years after graduation)

Every two years, graduates who have completed their studies three to five years before receive the Master Graduate Questionnaire (*3-5 years after graduation*). Similar to the Bachelor Graduate Questionnaire, relevant information on the program, career start and the present employment situation as well as the employing industry is gained. This survey is conducted every two years by means of a paper and pencil as well as an online questionnaire. The response rate usually amounts to approximately 20 percent.

On the doctoral level, a similar system of surveys has been introduced. However, as the third level follows a different logic in purpose and quality assurance, it is not further discussed in the scope of this paper.

From single questionnaires to a study panel

By means of a personalized code based on time-independent personal characteristics serving as indicators (the first two letters of the first name of the mother/birthday of mother (dd|mm)/first letter of own first name), surveys can be linked to a panel by pooling data from all questionnaires on a personal level. Such an approach makes it possible to conduct *longitudinal studies, which* can help to track students over their lifecycle and might answer related questions, such as the job market integration process, increases in (perceived) competences or changes in study satisfaction during different critical studying periods. Figure 2, for example, shows the increase of perceived competences within different surveys (first year/mid/graduation survey). Figure 3 shows a Structure Equation Model (SEM) which is used to investigate a concept of latent competency that is in turn needed to assess increased overall competency over time and to link this competency benchmark to other variables (e.g.: student satisfaction, student orientiation and gender or social status).

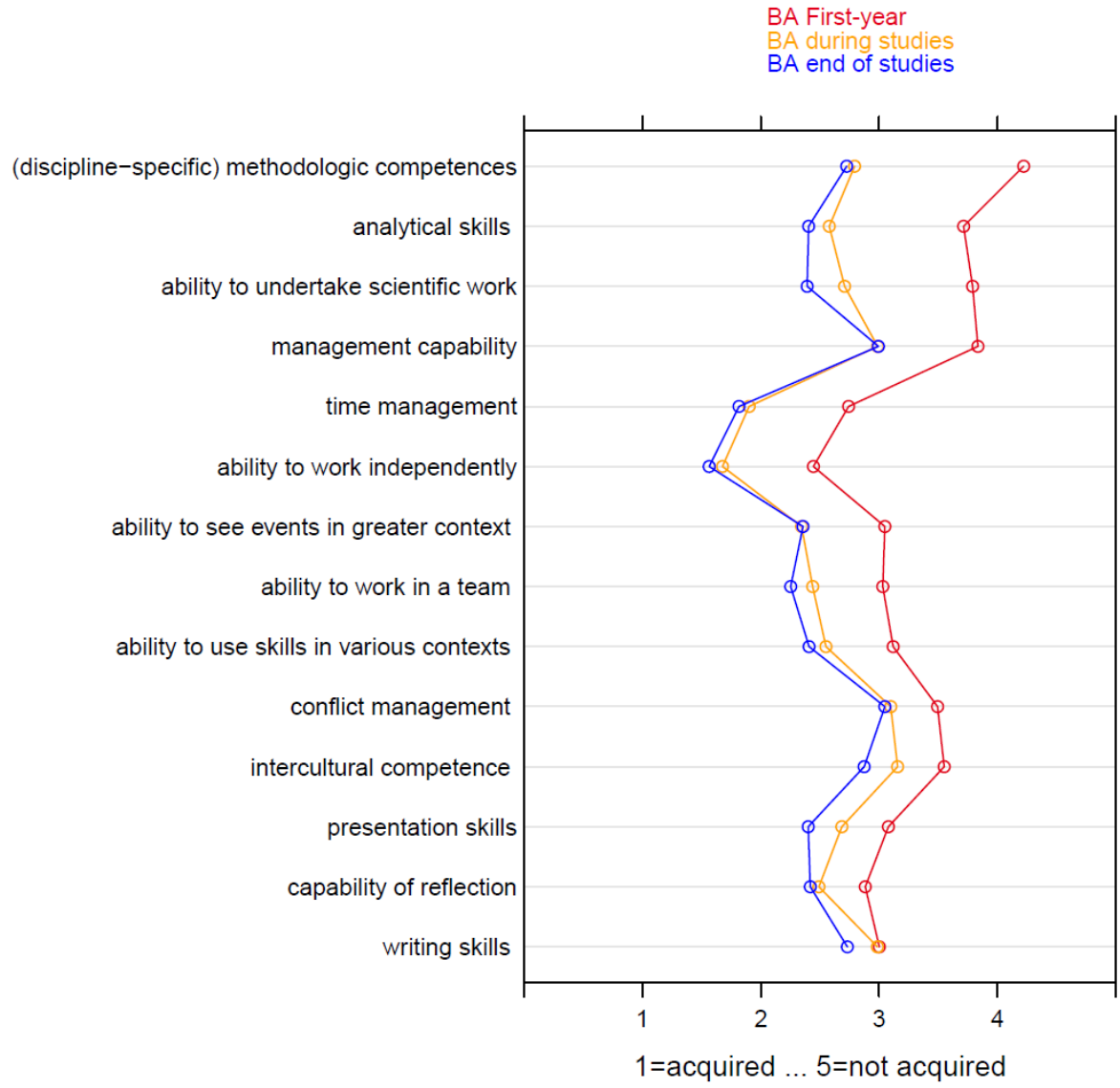

Figure 2: perceived competences

As mentioned above, the survey panel data are also regularly linked to other data sources. Measuring student progress, for example, in order to be able to predict student activity, means to dig deeper into the matter of the complex construct of student (in)activity. Therefore, register data (e.g. on student performance) and survey based information (e.g. values, student satisfaction, feeling informed about study processes or sociodemographic background) have to be combined. Figure 4 shows various student activity patterns, which are based on n-gram categorization of student activity. It becomes apparent that measures against inactivity have to start at a very early stage in the student lifecycle because active students tend to stay active and receive a degree (black line) and inactive students show a tendency towards staying inactive and don't receive a degree (red line). The survey data then offers valuable insights into the students' patterns of explanation for the respective level/phase of activity.

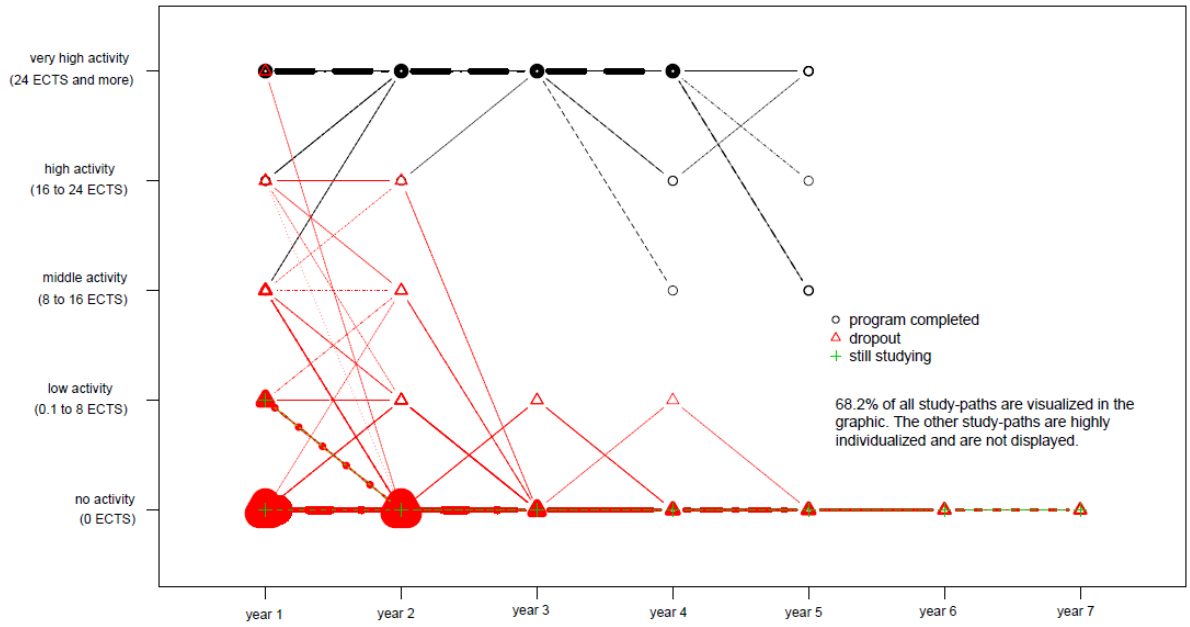

Figure 3: Student Activity Patterns

Prognostic and managerial value of the panel

The data from WU's Student and Graduate Panel Monitoring are used for several purposes (evaluation, service development, marketing…) but they also play an important role for assessing future developments (opportunities and threats) and form an important basis for the senior management's strategic decision-making. The analytical models include – among others - the prediction of relevant factors for student success, the most valid entrance and student selection mechanisms and also help to predict which students have a high risk of dropping out. Additionally, employability-related trends over the student lifecycle and beyond can be predicted with the help of interlinked panel data. Furthermore, by means of deep-data integration, one can include exogenous factors, such as sociodemographic variables, pre-university schooling and variables that potentially describe unintended consequences. An example of the latter would be the ECTS credits successfully obtained during a semester in combination with data on the employment situation, proving that a high job market integration (e.g.: a full-time job) leads to a lower number of credits.

Figure 4 shows a draft of an SEM-based forecasting and early-warning model to identify at-risk students in terms of inactivity, which was developed related to the idea of the government linking university funding to the student-activity-level. This model can help to identify (with high probability) students who are at-risk to become inactive in the near future or even to drop out at all and therefore not receive a university degree. The model also includes factors such as knowledge about the university or the perception of the courses/services. Different personalized support strategies can help students who are at risk at an early stage. Figure 3 shows that student activity patterns leading to drop-outs show very early student inactivity, which increases the demand for early stage forecasting models (Jayaprakash et. al., 2014).

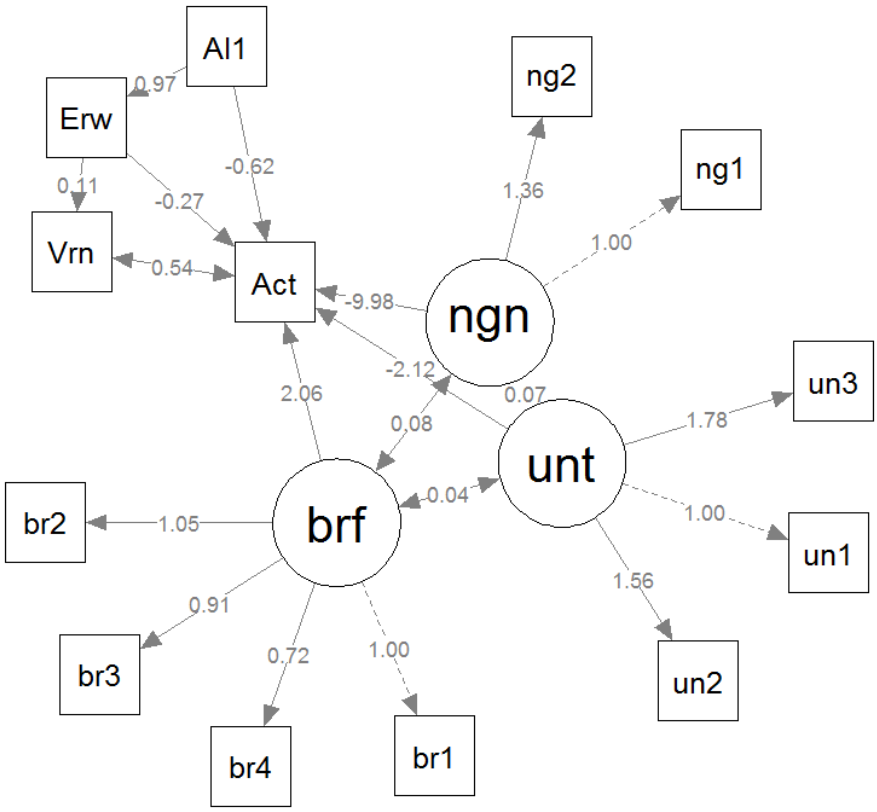

Figure 4: Early-Alert-Model for Student Inactivity

As mentioned above, even employability-related questions, such as which factors might improve employability or how the study progress is affected by an intensive early job market integration of students (i.e. students working too much during their studies) can be answered by the panel. Figure 5 shows the relation between working hours and perceived compatibility with the study progress on the bachelor level. Predicting the optimal relation between studying and working for the bachelor program leads to a rule of thumb which recommends to not work more than 10 hours per week on a regular basis. This finding is currently discussed at WU and might help the strategic alliance between university, companies and student union to promote a more suitable design of student internships for bachelor students. Different findings for each master program in the master special reports (Figure 1) can be used analogously to the bachelor findings.

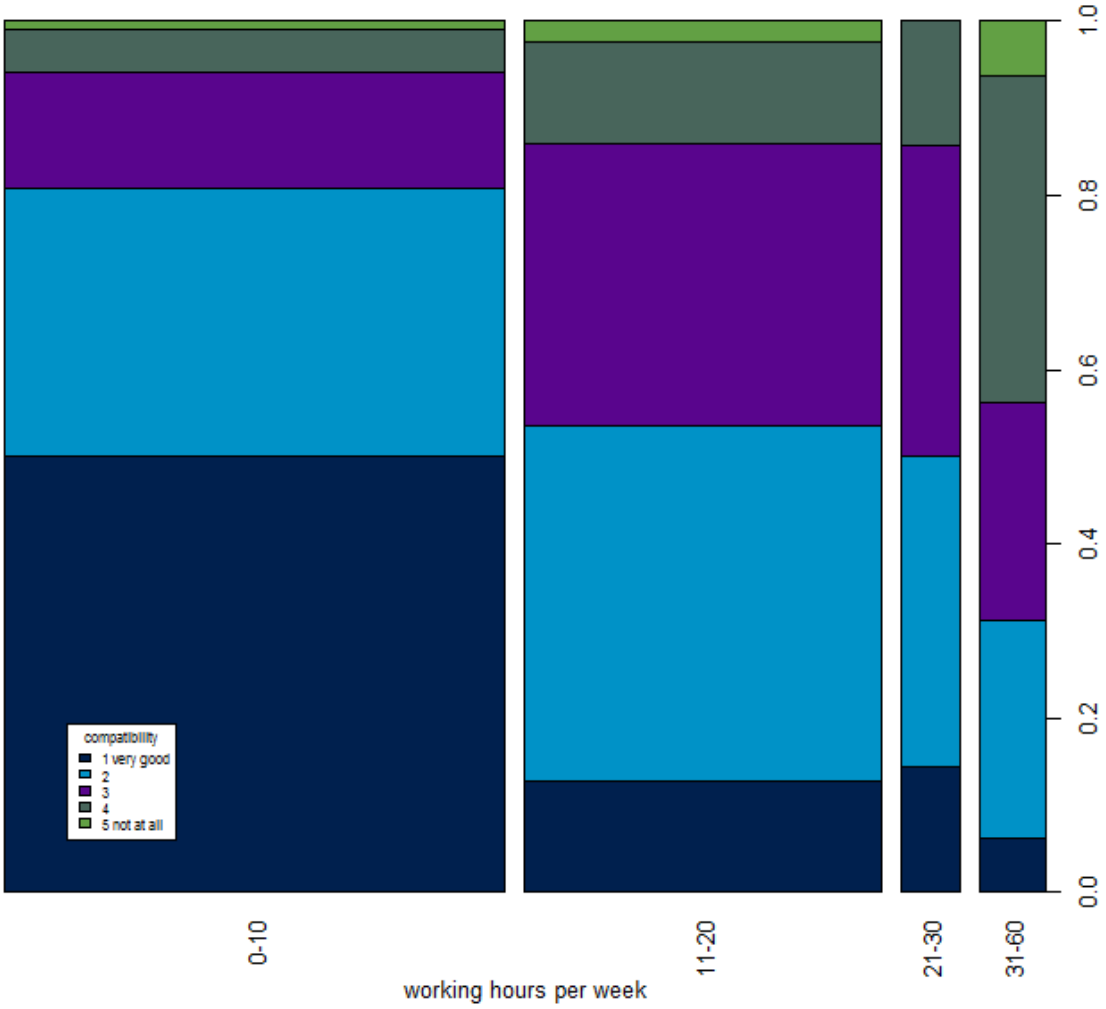

Figure 5: perceived compatibility of internships

Conclusions: Factors that enable prognostic QA

Within the limited scope of this paper we have tried to show how quality assurance instruments offer significant potential for assessing potential future and mid- to long term developments instead of merely helping to evaluate the status quo and describe past events. We have used the example of WU's Student and Graduate Panel Monitoring to explore the possibilities that lie in combining different surveys and other data sources over a longer period of time. However, in order to construct such a framework, several aspects have to be considered from the very beginning – most of which were already mentioned in the course of the paper. First of all, it is not enough to just link different surveys – unless they have been conceptually linked from the very beginning. Ideally, there would also be a theoretical model that is operationalised and researched through the framework. Longitudinal applications demand properly planned and stable item batteries.

Secondly, the framework needs to be supported technologically. As presented above, the embedding in WU's online learning environment ensures unusually high response rates – and the open source based automated reporting system allows for a rather differentiated dissemination of the results, allowing the quality assurance experts to take more time for tasks, such as interpretation and discussion of the results with the intended addressees. Last but not least, the information thus provided needs to be met with proper interest by the senior management, hinting at the importance of an organisation (leadership) culture that favours evidence-based decision-making and an understanding of interrelated phenomena. However, if those factors are largely given, there are some considerable benefits to be gained from investing into complex and long-term oriented data collection and data relation frameworks. This might be an important step towards fulfilling the high expectations for quality assurance in higher education, moving away from an approach that focuses mostly on documenting quality-related issues and dimensions (ex post quality assurance) to an approach that actively and dynamically irritates and shapes organisations and their environments (pre-formative and formative quality assurance).

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