Using a Risk Management Approach in Analytics for Curriculum and Program Quality Improvement

Wai Yee Wong
The University of Queensland
Institute for Teaching and Learning Innovation
St Lucia, QLD Australia
+617 3365 6731
amywong@uq.edu.au

Marcel Lavrencic
The University of Queensland
Institute for Teaching and Learning Innovation
St Lucia, QLD Australia
+617 3365 3169
m.lavrencic@uq.edu.au

ABSTRACT
Learning analytics, with a risk management approach, provides relevant and actionable information to teaching and administrative staff to make evidence-based decisions in curriculum and program quality improvement. This paper outlines the development and pilot implementation of a risk management model with an online feedback system in a research-intensive Australian university. Providing teachers and executives with the opportunity, facilitated by the essential IT infrastructure, to contextualise data and to document their response to the identified risks is a proactive approach to empower staff to make enhancements to their teaching practices, and to influence academic management. In addition, the opportunity for individual teaching staff to examine the progress of their own courses is a fundamental step in curriculum and program quality improvement. Positive feedback has been received in terms of the ease of access and opportunity provided to contextualise the risk. Future development will incorporate dynamic data from different sources, such as student participation in the learning management system, to build a holistic risk management framework in teaching and learning.

CCS Concepts
• **Social and professional topics→Professional topics→ Management of computing and information systems→Project and people management→Systems analysis and design**

Keywords
Risk management; analytics; teaching; curriculum; quality assurance.

1. INTRODUCTION
In the current highly competitive environment, new modes of governance that emphasise performance, quality and accountability of student learning and experience have become common practice in higher education institutions (HEIs) [1, 2, 3]. HEIs are under pressure to demonstrate their teaching quality with increasing degrees of accountability and quality assurance expectations [4]. In the Australian higher education system, the Australian Qualifications Framework (AQF) provides criteria for different types of qualifications, as well as the expected learning outcomes, skills and knowledge required for each qualification level [5]. Together with the Tertiary Education Quality and Standards Agency's (TEQSA) risk assessment framework [6], these national frameworks evaluate and monitor the teaching, learning and assessment quality of HEIs [7]. Linking these national requirements to the field of learning analytics, the emergent question is how to best use the "measurement, collection, analysis and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and environments in which it occurs", a definition of learning analytics by the Society for Learning Analytics Research [8], in the context of curriculum and program quality enhancement. Curriculum based analytics is defined as the actions of collecting, analysing and interpreting key stakeholder data, such as student admission, retention, satisfaction, course and program structure, and assessment, across multiple offerings to enhance the development, implementation and evaluation of curriculum and program quality [9]. Active engagement from university executives, academics and students in using evidence-based practices to evaluate curriculum design and make decisions about curriculum and program reforms is pivotal to the success and sustainability of efforts to curriculum and program quality improvement [9].

This paper outlines the development of a risk management framework in the revised Curriculum and Teaching Quality Appraisal (CTQA) process at a research-intensive Australian university, which will be fully implemented for the academic year 2016. The pilot phase of implementation concluded in January 2016. The paper also discusses how a risk management model better facilitates data-driven decision making, and curriculum and program quality improvement, compared with the traditional performance management framework. Alongside with the risk management framework, a series of interactive reports and dashboards for University Executives, Program Convenors, Course Coordinators and teaching staff are also developed. This is an attempt to provide comprehensive, relevant, and actionable information to key stakeholders to encourage the use of evidence-based practices, as well as to assist individual teaching staff to examine the success of a course which is fundamental to curriculum and program quality improvement. Last, but not least, an online feedback system also acts as an effective means to close the loop of the risk management process. Staff are provided with the opportunity to document their response to the data provided via the online feedback system. Risk management with active participation from staff empowers the University community to make data-driven decisions in considering student learning and experience.

2. BACKGROUND
The CTQA is a key component of this University's overall quality assurance process in teaching and learning. It is undertaken on an annual basis, and involves an evidence-based consideration of the overall quality of its teaching programs. The previous CTQA process was established in 2008 and was based on a performance management model, which identified programs that did not meet the specified performance indicators. Since 2008, there have been changes in both the external and internal higher education environment. In order to align the University's teaching and learning quality assurance process to the national agenda, and to

maximise the internal benefits of this quality assurance process, a decision was made to revise the CTQA process.

3. THE REVISED CTQA PROCESS

The principle of the revised CTQA process is to collect relevant data, and undertake critical and diagnostic data analyses which focus on trends, issues, actions taken and outcomes to support ongoing curriculum and program quality improvement. The rationale of selecting a risk management framework, instead of using a performance management framework, is based on the concept that through identification and management of risk, it can impact performance. A performance management framework focuses on the measurement of the actual results and their deviation from the targets [10]. Academic staff reactively respond to the identified areas for improvements and implement strategies in an attempt to reach the university's targets. A number of academic staff previously expressed their resentment to a performance management framework, as they felt that they should not be penalised for the poor performance of the indicators that they have limited control on, such as the student load. In contrast, a risk management framework emphasises the importance of proactive actions for risk mitigation [10]. The premise of this framework lies in the fact that when an indicator is identified as at risk, it may not necessarily signal poor performance of a specified course/program. Instead, the identification of risk provides an opportunity for the staff to mitigate and contextualise the risk, and make a conclusion of whether current actions are adequate to address the identified risk or further actions are required. Academic staff who participated in the pilot welcomed the change from a performance to a risk management framework, as it lessens the punitive perception of the process and encourages conversations between staff and senior executives to investigate the identified risks.

The first step in developing the revised process is key stakeholder consultation to ensure that relevant and actionable information is provided to teaching staff and University executives. A broad consultation was conducted with the Associate Deans (Academic) in each Faculty, Chairs of Teaching and Learning Committees of each School, Heads of Schools, Program Convenors and Course Coordinators. Through committee meetings, presentations and individual discussions, a community of teaching and administrative staff was encouraged to engage in making evidence-based decisions to improve student learning. Based on the outcomes of the consultation, in alignment to the TEQSA risk assessment framework [6] and the University's strategic plan and policies, separate sets of risk indicators were defined for courses and programs. The future plan is to include dynamic data from other sources, such as the student learning management system, as the model evolves in time.

3.1 Risk Indicators for Programs

The set of risk indicators for programs and the rationale, based on the TEQSA risk assessment framework [6] and the University's strategic plan and policies, are outlined as follows:

1. Year 12 Student First Preferences to a Program with an Overall Position (OP) 1-5 (OP ranges from 1 – the highest to 25 – the lowest): This indicator shows the ability of a program at this University to attract students with high academic achievements in comparison to its competitors. A significant decrease may signal a decline in the quality or value of the program offered. However, recruitment strategies and employment in a profession need to be considered when interpreting this indicator.
2. Student Load: An unplanned significant increase in student load could potentially impact on the quality of student experience. Conversely, an unplanned significant and continuing decrease may signal a decline in the quality of the programs offered as perceived by prospective students.
3. Domestic Retention: A low retention rate may suggest that there are potential quality issues in the process of student admission, teaching and learning, and the overall student experience. Prompt actions to address early attrition are critical to minimise the compound effect on attrition in the later years of the program.
4. International Retention: Rationale same as Indicator 3.
5. Full-Time Employment after Graduation: A very low employment rate could indicate that students may not be well-equipped with the necessary graduate attributes for successful transition to the next stage of their chosen profession. However, volatility in the labour market needs to be factored in when interpreting this indicator.
6. Overall Satisfaction: A core quality indicator in higher education and provides an overall guide as to whether the program met student expectations. Poor satisfaction is a risk to the institution's future market demand.
7. Pass Rate: A core indicator of student success and quality of the academic environment. When the pass rate is at very high/low levels, it may suggest that there are potential quality issues in student teaching and learning, and/or the overall student experience.
8. Completion Times: This indicator represents one dimension of the effectiveness of the delivery of educational services. Number of students in different study mode (full-time or part-time) need to be factored in when interpreting the results. Prompt actions to identify at-risk students, at an early stage, who are not being able to complete a program and to provide them with appropriate support are essential to minimise the possibility of reaching the stage of non-completion.

3.2 Risk Indicators for Courses

The set of risk indicators for courses and the rationale, based on the TEQSA risk assessment framework [6] and the University's strategic plan and policies, are outlined as follows:

1. Enrolments: An unplanned significant increase in student enrolments could potentially impact on the quality of student experience. Conversely, an unplanned significant and continuing decrease may signal a decline in quality in courses offered as perceived by prospective students.
2. Pass Rate: A core indicator of student success and quality of the academic environment. When the pass rate is at very high/low levels, it may suggest that there are potential quality issues in student teaching and learning, and/or the overall student experience.
3. Student Evaluation of Course and Teacher (SECaT) Response Rate: This is one of the indicators to reflect student engagement with the course in providing feedback. However, strategies implemented and timing at which the SECaT was administered need to be considered when interpreting this indicator.

4. Average SECaT Score for Q1: I had a clear understanding of the aims and goals of the course.
5. Average SECaT Score for Q2: The course was intellectually stimulating.
6. Average SECaT Score for Q3: The course was well structured.
7. Average SECaT Score for Q4: The learning materials assisted me in this course.
8. Average SECaT Score for Q5: Assessment requirements were made clear to me.
9. Average SECaT Score for Q6: I received helpful feedback on how I was going in the course.
10. Average SECaT Score for Q7: I learned a lot in this course.
11. Average SECaT Score for Q8: Overall, how would you rate this course?

For indicators 4 to 11, these are core quality indicators to provide a guide as to whether a course met student expectations. Prompt actions to address low student satisfaction scores in specific areas will assist in identifying the issues and implementing appropriate strategies to minimise student attrition and increase overall student satisfaction over time.

Using separate sets of risk indicators for courses and programs enable individual Course Coordinators and teaching staff to examine the success of the courses that they have taught in a semester. This is an obvious progression from the former CTQA, as previously only faculty- and school-level data were available with limited individual course/program information. Nevertheless, individual courses are the building blocks of the curriculum and program. The provision of course-level data will further engage teaching staff in the curriculum and program quality improvement.

Most importantly, the key feature of this risk management model is the opportunity provided for teaching and administrative staff to contextualise and mitigate the identified risk, to make a decision on whether the identified risk should be closely managed, or the risk is expected and actions have been in place to minimise its impact. Staff can also document their feedback to the data provided via an online feedback system which will be further discussed in Section 5. This active engagement from teaching and administrative staff in the revised CTQA process encourages them to reflect on the relevant student learning data and adopt a continuous improvement approach to teaching and learning. Staff are able to review individual program data on an annual basis, and individual course data on a semester basis. By using trend data of each program and course, teaching and administrative staff are proactively managing risks rather than reactively managing performance. The revised process not only identifies the at-risk courses and programs, but also the minimal-, neutral-, increasing-risk courses and programs. The opportunity to explore the risk indicators, which contribute to a heightened risk for increasing-risk courses and programs, as well as those result in a lesser risk for neutral- and minimal-risk courses and programs, allows staff to adopt a proactive approach in managing risks. For example, course staff are able to modify their teaching practices, such as the use of a flipped classroom model to allow more interactive sessions with students, in anticipation of an increasing trend of student enrolments. Unlike the reactive management approach, staff only formulate a solution after an increase in student enrolments is evident. The revised CTQA is an annual process that focuses on data-driven decision making through contextualising and mitigating risks, evidence-based action planning, and revisiting and evaluating proposed actions in subsequent annual reviews.

This section outlined the development of the revised CTQA process. The next section will focus on how to create visualisations that encourage a community of teaching and administrative staff to engage in making evidence-based decisions to improve student learning at both course- and program-levels.

4. DATA VISUALISATION

The ultimate goal of data visualisation is to provide clear and useful information to the targeted audience. However, it is an iterative process to find the best way to visually present data to meet the needs of the stakeholders [11]. Being able to easily access the required data is the key starting point to make data-driven decisions in teaching practices, curriculum design and academic program delivery. Therefore, the aim of the first iteration of data visualisation for the revised CTQA process is to provide University executives, academic and administrative staff with quick and easy access to both high-level overview and detailed-level information about the courses and programs offered, with the incorporation of simple visual cues, such as differential colour coding to provide greater ease in interpretation of risks. Three levels of data visualisation are created. The first level is the new executive dashboards and reports (see Figure 1), which provide University executives with an overview of the minimal-, neutral-, increasing- and at-risk courses and programs.

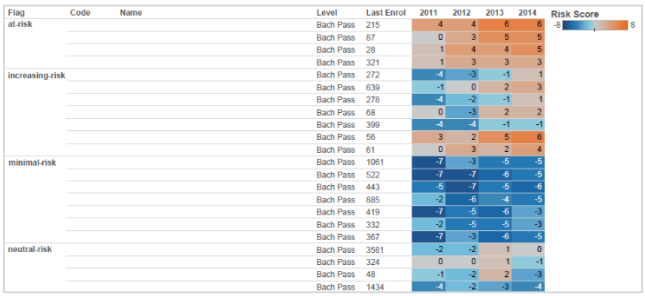

Figure 1. A snapshot of a program executive dashboard.

The second level is the new Faculty and School dashboards and reports (see Figure 2), which provide the Associate Dean (Academic) of each Faculty, Heads of Schools, Chairs of Teaching and Learning Committees, Program Convenors and Course Coordinators with an overview of the minimal-, neutral-, increasing- and at-risk courses and programs offered within their Faculty and School.

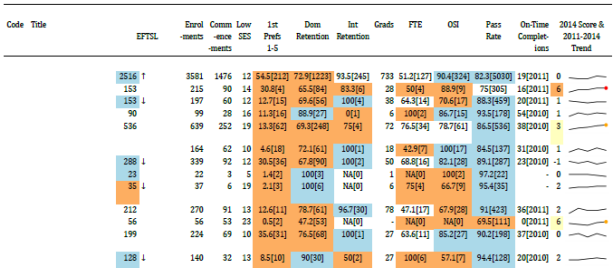

Figure 2: A snapshot of a Faculty dashboard.

The third level is the detailed course/program report for an individual course/program (see Figure 3). Previously, Course Coordinators or individual teaching staff were required to collate and compile their own reports from the available and relevant teaching and learning data about a course/program. The new reports consolidate all the required data and provide the stakeholders with an integrated report for each course/program.

2015 Program Report:

	2010	2011	2012	2013	2014	2015
Enrolments - Headcount (Commencing)	447	469	441	543	503	527
Domestic	267 (60%)	276 (59%)	294 (67%)	353 (65%)	329 (65%)	350 (66%)
International	180 (40%)	193 (41%)	147 (33%)	190 (35%)	174 (35%)	177 (34%)
Enrolments - EFTSL (Commencing)	358.50	386.63	371.88	444.88	409.38	416.88
Domestic	210.88 (59%)	225.5 (58%)	249.63 (67%)	290.38 (65%)	273.75 (67%)	281.13 (67%)
International	147.63 (41%)	161.13 (42%)	122.25 (33%)	154.5 (35%)	135.63 (33%)	135.75 (33%)
Enrolments - Headcount (both commencing and continuing)	1,083	1,175	1,223	1,410	1,447	1,510
Domestic	702 (65%)	743 (63%)	798 (65%)	955 (68%)	989 (68%)	1,037 (69%)
International	381 (35%)	432 (37%)	425 (35%)	455 (32%)	458 (32%)	473 (31%)
Enrolments - EFTSL (both commencing and continuing)	841.5	926.75	979.75	1,110.13	1,118.25	1,154.75
Domestic	520.38 (62%)	556.13 (60%)	626.75 (64%)	733.25 (66%)	748 (67%)	766 (66%)
International	321.13 (38%)	370.63 (40%)	353 (36%)	376.88 (34%)	370.25 (33%)	388.75 (34%)

Figure 3: A snapshot of a detailed program report.

Staff, who have access to these modified detailed course/program level reports, are already actively using them to explore the strengths and limitations of their courses/programs. They have also provided positive feedback about the reports and process. This unified approach reduces a considerable amount of administrative time in collating data. As a result, they can use the time to engage in data-rich conversations focused on improving curriculum and pedagogical practices, reflection and decision-making as to how to improve student learning in their course/program.

In addition, these three levels of reports and dashboards are interrelated, which provide the opportunity for key stakeholders to either drill down to the details of the strengths and limitations of a course/program, or zoom out to look at the relationship of a particular course/program to the relevant group of courses/programs. These three levels of data visualisation aim to generate conversations, initially, between individual teaching staff, and gradually expand the conversations with the Course Coordinators and Program Convenors, and collaborate to make evidence-based decisions to improve teaching practices, curriculum and program quality.

Apart from the three levels of data visualisation, it is essential that reasonable requests of teaching and learning data from individual teaching staff are adequately addressed. Nevertheless, courses are the building blocks in a curriculum and program. Providing individual teaching staff with customised reports could, in fact, extend their engagement in the curriculum and program quality improvement process. The additional data that an individual teacher requests may also be beneficial to other courses/programs. Hence, consideration should be made to incorporate those in the new iteration of the reports and dashboards. An example is the request of analysing the distribution of assessment types (that is, examinations, presentations, essay writing) in the compulsory courses of a program. These relevant and actionable data about assessment allows teaching staff and Program Convenors to have a holistic view of student learning and assessment experience in a program. When data revealed that a large percentage of assessment was examinations, one would expect that investigation into the rationale of the existing assessment regime is conducted and changes will be made to provide students with the opportunity to demonstrate their knowledge and skills via different modes of assessment. This process is the start of a continuous improvement approach to teaching and learning, in which assessment is a core component, and should be encouraged in other Faculties/Schools.

The first iteration of data visualisation for the revised CTQA process only includes static and historical data about student learning. In the second iteration of data, the aim is to create interactive reports and dashboards with automatic drill-down functions to reveal dynamic data, such as student access patterns to online resources and assessment, and student and teacher engagement patterns with the Learning Management System (LMS). As part of the curriculum and program quality improvement, these additional data about student interactions with online resources and technologies would provide insight into the optimal structure of a course/program that will engage and motivate students to learn.

5. ONLINE FEEDBACK SYSTEM

The continuous process of reviewing, reflecting and proposing new solutions is a core part of the quality improvement process. One of the strategies to engage a community of teaching staff in curriculum and program quality improvement is to empower them to complete the revised CTQA process loop via an online feedback system (see Figure 4). The purpose of this online feedback system is to provide an opportunity for staff, firstly, to provide contextualised information around selected courses/programs, such as those identified as increasing- or at-risk. Secondly, to confirm or disconfirm the identified risk and determine the residual risk for relevant courses/programs as minimal-, neutral-, increasing- or at-risk. Finally, to document proposed actions that will be undertaken to address the confirmed risks.

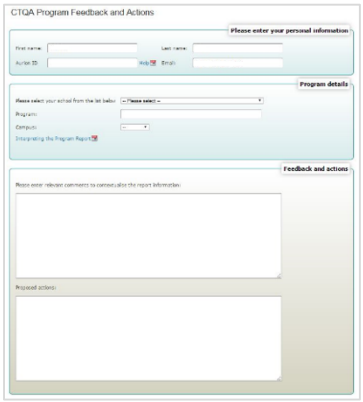

Figure 4: A snapshot of the online feedback system.

The documentation of feedback is pivotal in the continual cycle of curriculum and program quality improvement, as the feedback collected from academic staff, Course Coordinators/Program Convenors, and Faculty Executives establish the basis for the required actions to address the risks. All key stakeholders can review their feedback and document progress in comparison to the previous release of data. The program reports and dashboards are updated on an annual basis, whereas the course reports and dashboards are released after the conclusion of a semester. Once these reports are available, each Faculty and School will have the autonomy to decide which group/s of courses or programs to focus on in order to enhance their delivery, and the approach they use in response to the data provided. This autonomy provides opportunities to generate conversations among staff to develop a Faculty/School-wide response to the issues identified and raised

during the review process and the ability to apply the learnings of best practice to other courses or programs requiring intervention and/or reward. In summary, this online feedback system is developed to enable collection and consolidation of feedback and proposed actions to address risk.

6. FEEDBACK FROM PILOT PROCESS

The purpose of this pilot was to ascertain the effectiveness of the new process and associated communication strategy. The information gathered provided an opportunity for the Learning Analytics and Evaluations teams to mitigate risks associated with a University-wide implementation, and facilitate resolutions to any identified issues prior to the formal rollout of the new process across the University.

Feedback from the participants was positive. They appreciated the integrated course/program reports which provide all the relevant data for a particular course/program. This unified approach reduces a considerable amount of administrative time in collating the data from different sources. In addition, the Faculty/School reports provided an overview of the minimal-, neutral-, increasing-, and at-risk courses/programs in a Faculty/School, which assists in directing attention, resources or recognition to particular groups of courses/programs. The identified courses/programs risk dashboard appeared to have face validity based on the participants' knowledge and experience. Participants also acknowledged that the revised process provides them with the opportunity to contextualise and mitigate the identified risk, to make a decision of whether the risk should be closely managed, or the risk was expected and actions have been in place to minimise its impact via the online feedback system.

7. CHALLENGES

This paper presents how learning analytics methodologies play a pivotal role in developing understanding, optimising and transforming courses/programs, using a risk management framework with an online feedback system. The two major challenges encountered in the development of the revised CTQA process are the institutional culture change from a performance management to a risk management framework, and collaboration with the business intelligence and IT departments. The lessons learnt in developing and implementing the pilot revised CTQA process revealed that effective communication, with the support from the University senior executives, is the best strategy in dealing with these challenges. Although a cultural shift in an institutional-wide system can take up to a few years, consistent communication and clear expectations from all key stakeholders involved are the important incremental steps in shifting the culture from a performance to a risk management model. In terms of collaboration with business intelligence and IT departments, the message needs to be focused on the value-adding role of learning analytics to the current business intelligence and IT functions, instead of being perceived as a threat to their operation.

The development of the risk management framework, and its associated reports and dashboards and online feedback system, is still evolving. Continual support to the teaching and administrative staff in terms of understanding the data, as well as possible pedagogical enhancement that they could implement in their courses/programs, is required to sustain their engagement with the data to make evidence-based decisions in the curriculum and program improvement process. Future development will incorporate dynamic data from additional sources, such as student participation in the LMS, to build a holistic risk management framework in teaching and learning in higher education.

8. REFERENCES

[1] Cohen, P. 2004. The crisis of the university. *Campus Review,* 14, 15 (Apr. 2004), 9-12.

[2] Knight, P. T. and Trowler, P. R. 2000. *Departmental leadership in higher education*. Society for Research into Higher Education, Philadelphia, Pa.

[3] Tremblay, K., Lalancette, D. and Roseveare, D. 2012. Assessment of Higher Education Learning Outcomes: Feasibility Study Report OECD. (2012). Retrieved February 10, 2015 from http://www.oecd.org/edu/skills-beyond-school/AHELOFSReportVolume1.pdf.

[4] Lockyer L, and Dawson S. 2011. Learning designs and learning analytics. In *Proceedings of the 1st International Conference on learning analytics and knowledge* (Banff, AB, Canada, February 27 - March 01, 2011). ACM, 153-156. DOI= http://dx.doi.org/10.1145/2090116.2090140

[5] Australian Qualifications Framework Council. 2013. Australian Qualifications Framework (January 2013). Retrieved February 10, 2015 from http://www.aqf.edu.au/wp-content/uploads/2013/05/AQF-2nd-Edition-January-2013.pdf

[6] Tertiary Education Quality and Standards Agency. 2016. TEQSA's Risk Assessment Framework Version 2.1. (February 2016). Retrieved February 20, 2016 from http://www.teqsa.gov.au/sites/default/files/publication-documents/TEQSARiskAssessFramework_v2.1_0.pdf

[7] Marshall, S. J., Orrell, J., Cameron, A., Bosanquet, A. and Thomas, S. (2011). Leading and managing learning and teaching in higher education. *Higher Education Research & Development.* 30, 2 (Apr. 2011), 87-103. DOI= 10.1080/07294360.2010.512631

[8] Siemens, G. and Baker, R. (2012). Learning analytics and educational data mining: Towards communication and collaboration. In *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge* (Vancouver, British Columbia, Canada, April 29 - May 02, 2012). DOI=10.1145/2330601.2330661

[9] Dawson, S. and Hubball, H. 2014. Curriculum Analytics: Application of Social Network Analysis for Improving Strategic Curriculum Decision-Making in a Research-Intensive University. *Teaching and Learning Inquiry: The ISSOTL Journal.* 2, 2 (2014), 59-74.

[10] Arena, M. and Arnaboldi, M. (2014). Risk and performance management: Are they easy partner? *Management Research Review.* 72, 2 (2014), 152-166. DOI= 10.1108/MRR-08-2012-0180.

[11] Olmos, M. M. and Corrin, L. 2012. Learning analytics: A case study of the process of design of visualizations. *Journal of Asynchronous Learning Networks.*16, 3 (2012), 39-49.