TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

ACTA TECHNICA NAPOCENSIS

Series: Applied Mathematics, Mechanics, and Engineering
Vol. 68, Issue Special I, May, 2025

UNLOCKING POTENTIAL: HOLISTIC AUTOMOTIVE RISK BREAKDOWN STRUCTURE MODEL IN CHALLENGING TIMES

Roxana SANTA, Sorin POPESCU

Abstract: *The present study aims to establish a systematic conceptual framework based on Risk Breakdown Structure (RBS) to be used by the product development Team and Management for the dimension of risk sources identification in new holistic automotive product development, in challenging times. The study contributes a pragmatic direction for the business environment, whose risk sources and conceptualization were reviewed in a work group with remarkable experience and validated through an empirical analysis.*
Keywords: *risk sources, new product development, success factors, risk identification, RBS, methods*

1. INTRODUCTION

In modern times, the main influential sources:

- globalization, embedding diversity and culture
- evolution of technology and innovation (robotics and automation).
- digitalization (3D printing, generative artificial intelligence, data analytics, IoT, augmented intelligence etc.) [1] .
- pervasive sustainability ("Triple Bottom Line of sustainability" in terms of economic, social and environmental dimensions) [2], show a strong influence on the following five dimensions:

1. Customer and consumer behavior.

2. Integration of technologies into the product (AI control of the car).

3. Design and development of new products (integration and analysis at a global dimension)

4. Product customization (fast configuration) and tailoring according to customer requirements [3].

5. Servitization, which refers to a more complex offer of both products and services, can be a successful differentiator for the future.

The general premise behind the NPD (New Product Development) context is outlined by complexity (incorporating systemic thinking and sub-systemic acting with a steadily lifelong learning approach) and dynamism (rapid speed of innovation) underlining a high level of uncertainty that forces companies to think and act holistically, changing the mindset from stability thinking to adaptable and higher risk-taking.

Furthermore, new and complex risk sources, patterns and interconnections, as well as complex new systems, are constantly emerging and a long-term business strategy plan is no longer plausible.

It becomes evident that the better the uncertainty is managed and the extremely rapid pace is kept up, the better the organization is positioning itself in the market and achieving its objectives. But how can senior leaders and new product development teams deal with these challenges, understand and identify the risks, ensure business continuity, profitability and relevance for the future? The importance of risk-based thinking, risk awareness and especially risk vigilance (to quickly identify new and changing risks) is essential to be embedded in the strategic core competency [4] to act quickly, adapt, decide, lead, direct and respond accordingly to uncertainty. Initiating action and challenging the status quo becomes a necessity and risk management is known to handle uncertainty (unknown risks) and becomes a critical strategic factor for preserving value

(building resilience) and enhancing strategic innovation and growth (calculated risks - entrepreneurship), bringing multiple benefits for value creation to achieve objectives and ensure an inclusive and profitable new product development.

Although the scientific world proposes frameworks and methods for risk identification, in the current times of polycrisis there is a clear research gap for a systematic and pragmatic framework in the automotive context with all holistic influencing elements.

The goal of this paper is to adopt the definition of a multi-level risk identification conceptual framework based on RBS to identify the main sources of risks for an NPD in automotive sector, considering the past (deep root causes analysis), the present and the future perspective (generator of new sources of risks), to serve as a baseline for further developing clear strategic steps to overcome the current challenging situation and ensure a competitive advantage.

The product development team becomes aware of the type and amount of risks they would be willing to take (risk appetite) or tolerate (risk aversion), which ultimately contributes to future progress and economic performance [5], [6].

2. RISK MANAGEMENT

The concept of risk refers to an event of uncertainty which may have a positive or negative impact on the achievement of specified goals in product development organizations [7], [8]. The current context emphasizes a connection between value management and risk management in the so called “value-based risk management” with the main purpose of creating value [9], agile and lean risk management with a focus on customer value and innovation risk management, which highlights the opportunities and limitations of innovations that cover value creation for both companies and stakeholders. Also noteworthy is the intelligent risk management which covers all newly digitized methods (cognitive analysis, predictive data and scenario analysis, behavioral science methods, etc.).

Therefore, the new risk approach focuses on risk-based thinking to create value-added risk management within the strategic engine and competitive advantage as the main objective, at the expense of merely limiting it to mitigation and avoidance and strict risk management as a function. In contrast, the vast organizations fail to integrate risk-based behavior and mindset and focus on developing overly complex and unusable technical methods [10]. The winning organizations start by defining a culture of risk awareness and responsibility, promote risk escalation and transparency, and guide risk management through the application of risk management principles: Integrated, structured and comprehensive, tailored, inclusive, dynamic, best available information, human and cultural factors and last but not least continuous improvement, according to ISO 31000.

Risk-based thinking is also influenced by risk perception. Subjectivity (including cognitive, heuristic, organization and confirmation biases) determines the behavior and attitudes of management in decision making, and the objectivity of risk facts develops a harmonious risk approach.

The holistic view is also mandatory in risk management standards (FERMA, COSO II, AS/NZS 4360, ISO 31000, PMI) and refers to a correlation of all relevant elements (identification, prevention, risk reduction, crisis contingency plans and recovery plan) with the strategic objectives to ensure continuity and resilience [11].

In addition, risk-based thinking is not only fundamental for companies, but also appropriate documentation: risk structure, reports, SWOT Analysis, brainstorming, stakeholder analysis and management documentation is crucial for risk identification, one of the most demanding steps of risk management and part of the actual research.

3. HOLISTIC NEW PRODUCT DEVELOPMENT

Today’s times underline the strong need in modern product development to continuously develop technology, knowledge and skills, as well as innovations and to drive the change in product and market strategy, as well as implicit business scenarios in the new global market with a new mindset, new competitive behavior and

holistic methods. The new 21st century product development strategy focuses on customer centricity, customization, agility, flexibility and collaboration and aims to improve the new product development models and processes towards efficiency and strategic partnerships.

New product development (NPD) and R&D are impacted by various influencing factors such as market, industry, regulatory, technology and sustainability trends. Technological advancement outlines changes in customer expectations and requirements such as continuously innovated (remote access and control, virtual and digital/AI service), updated and integrated products, services with "shorter product lifecycle" [3] and higher quality requirements [12].

Holistic product development is made up of the following dimensions: ecosystem context, diverse learning and knowledge exchange, product developed in volatility, inclusion of creative and the state-of-the-art NPD approaches (Virtual Product Development - VPD, Design thinking, Digitalized Product Development - NPD, Sustainable Product Development - SPD) and entrepreneurial approach, independent team management and, not least flexible development application [3], [13].

In [14] product development is defined as follows: "Product development is a series of activities that begins with the perception of a market opportunity and ends with the production, sale and delivery of the product."

In the scientific literature and web science, there are various NPD models such as the Scorecard Markov model, the latest IDEO Model focusing on user needs, and the most cited and one of the oldest BAH models, which serves as the basis for other designed models [15]. New Product Development encompasses the following steps: product strategy and planning, product and process concept, concept testing, product and process development, product verification, product realization, approval, start of production and commercialization. And aims at the following main objectives: performance, efficiency & effectiveness and speed, as well as quality, customer orientation and profitability.

Enhance performance: Quality and customer satisfaction could lead to higher volumes and new collaboration projects

Enforce profitability: Plan and track component, tooling, labor, development and manufacturing costs accordingly to achieve profitability.

Focus on efficiency, effectiveness and speed: The team demonstrates competence, knowledge and experience and acts quickly on time and uses its resources in the most efficient way. The time required for development is also directly related to the competitiveness of a company and the project it receives.

Meet quality expectations and customer orientation: Meet and exceed the customer needs by fulfilling the requirements, being flexible and adaptable and delivering a reliable product.

The next generation products, including servitization, must focus on creating value through continuous innovation and adaptation of product and business processes, methodologies, digital tools (AI), sustainable approaches, skills and ways of working.

4. METHODOLOGY

The present study aims to create a structured knowledge framework that can be used by the team on the dimension of risk sources identification in new holistic product development.

In the first place, a broad type of structures that utilize enterprise-level risk management identification were analyzed. The RBS option was chosen for its utility, simplicity and clarity.

The RBS is defined as "a source-oriented grouping of project risks that organizes and defines the total risk exposure of the project. Each descending level represents an increasingly detailed definition of sources of risk to the project" [16]. The RBS provides invaluable support in understanding, structuring and improving risk identification and it was decided to expand it to three levels (refer to Fig. 3 Holistic automotive RBS). Subsequently, the

stages have been turned into clear and simple objectives (as shown in Fig. 2).

Fig. 1. Word Cloud extract from MAXQDA literature analysis.

I. The first stage aims to design the RBS using the following techniques:

1. Individual study of extensive research and literature (level 1, 2 and 3) of 200 reference sources (considered as reference, approx. 100), to name a few: [16], [17], [18], [19], [20] covering risk categories, success factors, trends, work breakdown structure (WBS) and the best methods and tools for identification using the best-rated academic research sources (Elsevier Science Direct, Taylor & Francis, Emerald Management, Springer), Web of Science and Google Scholar.

2. Objectively evaluate risk reports using MAXQDA Analytics PRO 24 Software tool for objective results analysis of literature research. Refer to Figure 1 for a word cloud extract from MAXQDA, resulting from the risk reports analysis.

II. The second stage refers to incremental information filtering through: 1. Practical experience in the field for over 10 years in both R&D and production facilities, built on a big picture, in-depth expertise and systemic thinking in corporate risk management carried out with the top management and department heads for all processes of the quality management system and risk in project management by leading about 10 state of the art projects.

In addition, competence is underpinned by scientific and current academic knowledge, various Audits in IATF 16949 and PMI Risk Management as well as experience in the holistic design and development of new products.

2. Interviewing specialists in own area of activity using communication techniques specific to the focus group, consolidating objectivity through confirmation without changing the sources of risk, but including insight-based explanatory descriptions.

III. The third stage aims:

1. To complete and validate the holistic automotive RBS framework using a survey with closed and semi-open questions.

2. To perform a qualitative analysis using MAXQDA Analytics PRO 24.

3. Using generative artificial intelligence at the end of conceptualization for comparison purposes (level 3).

5. RESULTS – EMPIRICAL ANALYSIS

The research is based on practical relevance and scientific argumentation conducted with a rigorous approach to fulfill the direction and needs in the current challenging times.

5.1 Holistic risk breakdown structure

The research focused on the context of new product development and proposes a structured and systematic RBS Model developed on a multi-level approach that aims to provide a clear direction with the understanding of the key critical risks source areas for companies in new product development to increase value creation and value preservation in current challenging times. In order to follow a logical sequence, the RBS constructs were designed based on the below considerations under Table 1.

Table 1

RBS pre-defined requirements.

Topic	**Desired outcome**
Objective:	Design a systematic and holistic risk identification model based on RBS (Risk Breakdown Structure) in the product development automotive context, to pragmatically guide **product development teams** to better comprehension, identification and later managing of the risks and opportunities in challenging times.
Requirement: Utility	RBS aims to be easy to use for users
Clarity	Each category is clear and unique defined
Consistency	Effective description to avoid redundancies and overlaps
Holistically	The categories must address the respective fields unequivocally
Competence	Categories defined based on the area of competence of those who are interviewed

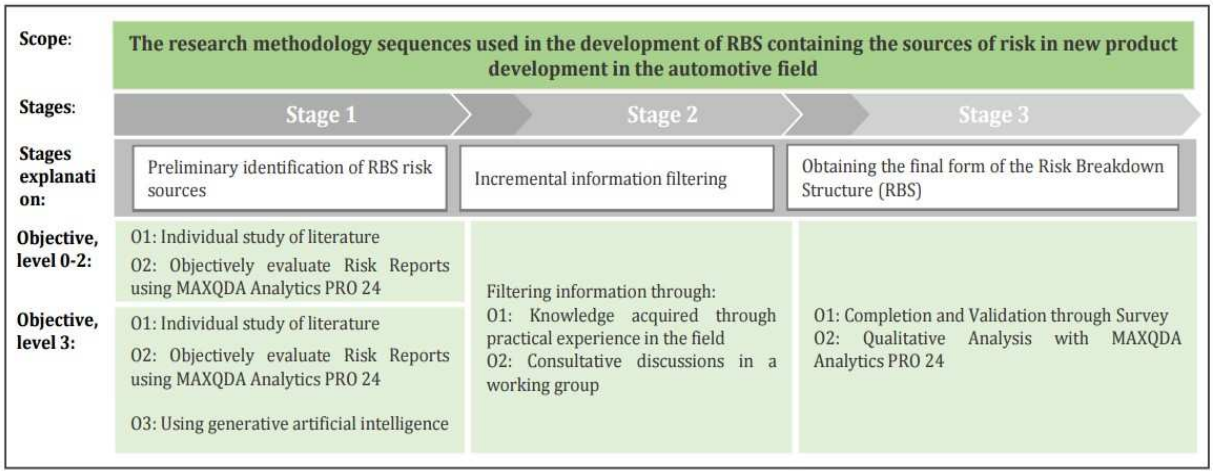

Fig. 2. RBS Methodology

All levels are summarized in a framework and show the big picture towards a future-oriented approach.

5.2 Risk sources

The risk sources aim to identify the six key dimensional categorizations to achieve the top NPD objectives: performance, efficiency & Effectiveness and speed, as well as quality customer focus and profitability.

The first three categories are synthesized under external conditions.

Every business needs customers to survive and achieve profitability. The way customers choose their supplier is based on the perceived value given, which is undoubtedly related to loyalty and satisfaction, and translates into profitability.

Therefore, the customer journey experience along the product development cycle, including need understanding, co-creation, feedback, satisfaction and strong collaboration is fundamental while introducing new sources of risk, which are explained in Chapter 5 “Results”. Steve Jobs also mentioned that it is essential to think about human behavior, what experiences the customer would have, what products they would expect, but asking the customer directly for requirements sometimes degrades innovation. Therefore, it is extremely important that the strategy and visions focuses on customer experience first [21].

Following this way of thinking, the definition of value nowadays is a holistic approach based on efficiency and effectiveness, considering both short- and long-term aspects, and is therefore essential for considering all complementary macro and micro dimensions [22].

The second category, external risks are risks or opportunities arising from external environments, crises, political, economic, social, regulatory, market and customer requirements, natural disasters and climate change which are critical to continuously pursue in the current uncertain product development ecosystem. The potential impact that external risks could bring could be fatal to the survival of the organization

if not adequately addressed with scenario, war-gaming detection processes or predictive artificial intelligence tools.

The unpredictability of the market with the uncertainty of industry developments and the emerging cost-effective competition forces companies to adapt and bring new sources of risks.

Furthermore, as part of an unstable and unpredictable market and ecosystem (third relevant category), supplier sustainability represents a key strategic source that can potentially jeopardize NPD company if not carefully secured (back-up) to ensure on-time delivery with appropriate quality standards and correct and stable prices.

By following the internal conditions under company influential sphere, governance refers to the catalyst and success factor of NPD companies due to their high level of responsibility to design proactive strategic directions with incorporating ecosystem

synergies, innovation and operational efficiency culture enforcement, rethinking processes, business models and financial & performance monitoring, all sources of risk generators.

The fifth categorization, product development processes, integrates sources of risks and benefits related to meeting requirements, technology and design, testing and sampling, post-launch, accompanied by the urgent need to shorten the product cycle by the introduction of new digitized methods.

Digital technology refers to changes in technologies such as generative artificial intelligence, automation, machine learning in NPD with both positive impact and value creation and negative like technology disruptions, skills deficiencies, unproven, complex technology, problematic use, data protection and security issues and undefined or changing regulations. The framework is summarized up to level 2 (see Fig. 3 for more details). The complete framework, including level 3 has been applied for validation through empirical analysis, described in Chapter 5.3.

5.3. Empirical analysis - survey

The aim of this survey is, if applicable, to further complete the construct of the proposed RBS framework. The assessment resulted in the revision of 113 closed risk sources, with multi-choice typology and the selection of 21 out of 64 new proposed risk sources (further described in Table 2) for integration in RBS.

The risk sources were assessed and filtered by 62 participants based on their own opinion (impact and occurrence) using a professional online tool. 87% of respondents in different roles like project manager, software, hardware developer and manager, quality manager, security manager, purchasing, manufacturing and senior management have notable experience ranging from 10 to more than 21 years. The vast majority (52%) of respondents come from Germany, remaining ones from regions such as Malaysia, Portugal, North America, China and Japan.

Holistic Automotive Risk Breakdown Structure in Product Development

L0	External conditions			Internal conditions		
	Non-Influencial	Influencial		Influencial		
L1	1.1 External	1.2 Supplier sustainability	1.3 Customer centricity	1.4 Governance	1.5 Product Development Process	1.6 Digital Technology
L2	Uncertainty arisen from: **1.1.1 Geopolitics, economic, social & demographic, political and climatic sources** **1.1.2 Market intelligence** Uncertainties brought by market volatility with challenges in understanding and predict: competition, trends, industry changes, pricing pressures and limited growth **1.1.3 Regulatory changes** embedding industry standards, safety, environmental, and intellectual property aspects (co-creation)	**1.2.1 Supply chain resilience** External and internal uncertainties including disruptions and financial and capacities issues **1.2.2 Supplier long term collaboration** Working history & style, structure and relations customer- supplier **1.2.3 Procurement performance and limitations** Performance, quality, reliability including requirements compliance	Issues and benefits in experience along the customer journey related to: **1.3.1 Empathic customer understanding and requirements compliance** Incompleteness, misunderstanding, poor prediction and non-compliance **1.3.2 Trust and reputation** Relationship building, communication and feedback, customer oriented leadership **1.3.3 Negotiation and collaboration** Contract constraints, right training and collaboration	**1.4.1 Organizational project wide** Corporate strategy and objectives compliance Product development scope Corporate resilience and agility Commercial profitability People and Product Management Process efficiency and quality **1.4.2 Operational processes and activities** Systematic planning Financial integrity	**1.5.1 Architecture and design** Technical complexity, flexibility and integration performance **1.5.2 Software** Components and compatibility issues Performance, testing and quality & security sources **1.5.3 Hardware** Components and compatibility issues Quality and technical sources **1.5.4 Post-launch** Capacity and timing production Issues Manufacturing and logistic feasibility	Detrimental influences brought by: automation, AI, machine learning **1.6.1 Digital culture, competence and partnerships** Digital strategic risks, technology disruption, skill gaps and third parties **1.6.2 SWs usage performance** Technology, maintenance and support **1.6.3 Information security, confidentiality and ethicality** Cyber, data protection

Preliminary Identification
Extensive Identification
Non-influencial by company

Fig. 3. Holistic Automotive RBS

Target: Understanding the value losses and sources for value creation in new product development

Table 2

Survey - Respondents explanatory risk sources.

Risk source level 2	Risk sources level 3 supplementary contribution
Market intelligence	"Technological trends and direction not clear - Decisions on investments from external stakeholders on hold"
Regulatory changes	"Delay in the regulations enabling new technologies (for instance automatic driving)", "New or changing regulations that start to be applicable for already existing products"
Procurement performance and limitations	"Suppliers with monopolistic position, low flexibility (google)"; "Fast change of technology limits parts availability (10-15 years in automotive)"
Empathic customer requirements compliance	"Missing Competence on customer side to develop requirements"
Trust and reputation	"Lack of knowledge of the customer culture (language, way of communicating, implicit customer expectations)"
Negotiation and collaboration	"Virtual communication", "Insufficient escalation management"
Organizational project wide	"Unclear long-time strategy", "Wrong prediction of future trends"
People and product management	"Long chain of hierarchy, long decision paths"
Post-launch	"Material shortage, Test tools in production", "Lack of preparation, capacity and investment for field data analysis. Lack of transparency in the customer process", "Delay in OEM approval..", "Poor field monitoring and missing error triage strategy"
SW usage performance	"Data Storage Limitations and Costs for Data Solutions are often overlooked during project kick-off"

The survey was initially sent to four colleagues to obtain initial feedback on the survey. Notes on the structure and corrections were immediately applied.

The survey begins with Section 1, general background questions, followed by Section 2-7. Section 2-7 contains the key Level 3 risk sources for RBS Level 2. The results show excellent 100% validation of the defined risk sources.

A total of 54 respondents rated economic uncertainty: demand forecast uncertainty, inflation, exchange rates, job security and crisis as the most likely source of risk impacting new product development under 1.1 External L1 RBS. Surprisingly, changes in generational preferences received the least significance, despite being a predictive criterion for future needs and strategic insight. Market risks are actively discussed by executives due to their high uncertainty, volatility, new industry changes and emerging new competition (e.g. smartphone company Xiaomi's entry into the automotive industry). Over 40 respondents rated the above sources of risk as significant and not least 40% of participants rated regulations as a risk for higher costs for product modifications, additional effort and testing due to continuous modifications. This shows that traditional car manufacturers and suppliers have major concerns as they constantly challenge the status quo in the market.

Supplier sustainability received the most feedback in the open section and 20% of 8 risk sources were scored for over-reliance on a single supplier/ country location due to climate, political, economical disruptions. Management almost unanimously emphasized inefficient stakeholder collaboration and service orientation as the main source of risks. Sales, Quality, Project Management, Senior Management and other roles rated unstable and incomplete requirements: continuous change with empathetic customer understanding as the most relevant to pay attention to. Trust and reputation are one of the most critical criteria that directly influence project losses (even the organization's probability of survival with major customers) or successful business continuity. 42 of the respondents rated inconsistent communication, transparency, data sharing and escalation of minor subjects as the main risk criteria for damage. In addition, besides good trust and good communication, the handling of negotiations and the documentation of agreements is a source of risk with an impact on profitability.

Governance, product portfolio prioritization and investment practices were found to be the least relevant, highlighting the management control over these aspects in the company. However it was found that the "strategic continuity between customer, portfolio – program – product development", has a higher relevance and need for alignment, with closer tracking of commercial profitability such as "economical pressure and lack of awareness of hidden costs" and rethinking business models to identify current risks and promote innovation and processes to adapt them to the dynamic markets (short development time and agile work) and customer needs: "organizational complexity" is classified as a current source of risk, also visible in collaboration with subcontractors. Despite the trend towards shorter product lifecycles, current reality shows that schedule risk source "unrealistic forecast and monitoring" is the biggest challenge. This could be explained by improper frontloading along with the continuous expansion of the project scope without alignment and recalculation, as well as the complexity of organization and processes.

Subsequently, 10 out of 15 Quality Managers and half of Project Managers consider improper identification and underestimation of unknown risks a problematic source of risk, which could be seen as a connection with post-launch risks, where risks are already becoming a problem with higher costs and losses.

Based on the synthesis of HR sources of risks "unclear roles and responsibilities" was ranked by 43 respondents as the most relevant risk source, which may be linked to other risk sources, such as organizational complexity, product manager inexperience, frontloading planning with direct impact on timeline and cost. Technical risk sources in modern NPD were mainly correlated with "third party" that cause integration challenges, "software quality and performance risks" and "testing" aiming to agile collaboration to share and implement changes.

Digital technology and successful partnerships enable competitive advantages, but at the same time also create new sources of risk. 50% of respondents see the greatest challenges in the areas of competence, integration, tool compatibility and cybersecurity risks. In addition, a qualitative analysis, implicitly a sentiment analysis with Code Matrix using MAXQDA Analytics PRO 24, was used for further data analysis (as shown in Fig. 4). Further complex analysis of the survey results is planned for further development.

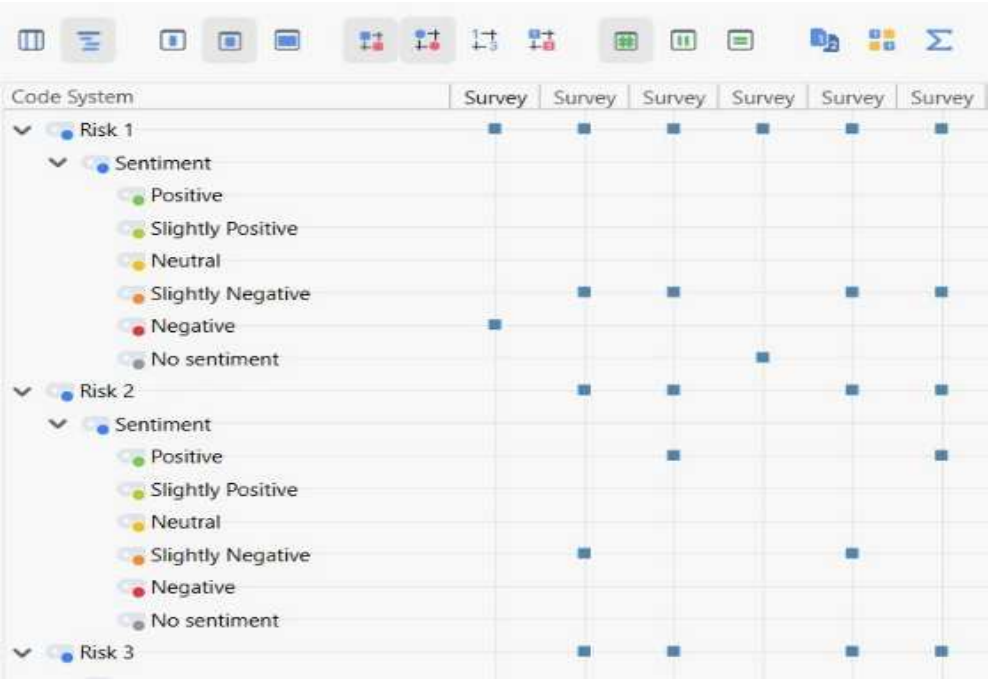

Fig. 4. Sentiment analysis with Code Matrix

Apart from the survey results, the majority of participants had very good knowledge in one or more areas and general knowledge in the remaining sections, in some cases some fields were left blank due to unfamiliarity of the topic. Further debates and discussions via online means of communication took place in parallel with the survey with a small number of respondents, to improve the comprehensive understanding, suggested solutions for text, structure (immediately integrated) and content or insights on a particular risk source that could potentially fit into further risk source areas, i.e. "overheating" source which is considered suitable as a mechanical topic, instead of hardware positioning "HW+SW produce the dissipated energy; mechanics must solve the issue". This illustrates the risk connection with potentially further areas. In addition, important insights into the risk sources from laboratory testing (e.g. DfR Design for Reliability) were brought up for discussion but finally were left out due to the extensive DfR risk detailing.

Typical questions were also asked about external risks and clarified immediately, where there was a lack of specialist knowledge. And general comments such as "survey is too detailed", "takes a lot of time" in connection with the considerable length of the survey (approx. 60 minutes) should be viewed as potential for improvement for future empirical analysis.

6. CONCLUSION

The study took a proactive approach to holistically identify and systematically structure through an RBS all the main critical sources of risks (level 1) from an external and internal perspective that influence the NPD competitive advantage, and segment them into a greater level of detail (level 2 and 3).

The Holistic Automotive Risk Breakdown Structure Model (RBS) is the fructified result of the following steps:

Identification, processing and filtering by:

- Extensive literature review (research papers and reports) filtered by own competence and utilization of MAXQDA Analytics PRO 24, a state-of-the-art software tool, for information discovery and objective analysis.
- Use of the artificial generative tool for a forward-looking approach and comparison purposes.
- Focus group.

And pragmatic validation done through a business environment based on:

- Empirical analysis under a survey form.
- Exchange with peers.

For the processing of the open responses of the survey, the already mentioned MAXQDA tool was used.

The validation results confirm 100% of the risk sources and provide important insights from a multidisciplinary, multinational team with experience in high probability and impact sources in NPD. The RBS obtained 134 risk sources and is considered very useful for NPD teams in the automotive industry that could constitute a solid basis for further actionable strategic definition.

For further research, additional validation could be obtained with Delphi analysis.

7. REFERENCES

[1] Nancy, A., Andrew, B., Yang, C., *Deloitte. The future of risks*, https://www2.deloitte.com/us/en/pages/risk/articles/future-of-risk-ten-trends.html.

[2] Hendrik, S.B. et al., *Development of a Risk Framework for Industry 4.0 in the Context of Sustainability for Established Manufacturers*, Sustainability, ISSN 2071-1050, 2019.

[3] Reinhard, G. et al. *Digital Product Development 2025*, . https://www.pwc.de/de/digitale-transformation/pwc-studie-digital-product-development-2025.pdf.

[4] Robert, S. K., Anette, M., *Managing Risks: A New Framework. Smart companies match their approach to the nature of the threats they face*, Harvard Business Review, June 2012.

[5] Linda. T.. Craig, S., *What is risk management and why is it important?*, https://www.techtarget.com/searchsecuri

ty/definition/What-is-risk-management-and-why-is-it-important.

[6] Kate, G., W*hat is risk management & why is it important?*, https://online.hbs.edu/blog/post/risk-management.

[7] Quality, *CQI*, https://www.quality.org/knowledge/risk-based-thinking.

[8] PECB, *Whitepaper ISO 31000: 2018 Risk management guidelines*, 2018.

[9] Christian, F., Rolf,, M., V*alue-Based Risk Management: Costs and Benefits*, Advances in Management Accounting, pp. 239-257, September 2014.

[10] Ulrich, P., et al., *The Art of Risk Management*, BCG, April 2017.

[11] Joseph, A., *Evaluating risks in new product development and the satisfaction of customers through technology*, Production Planning & Control, pp. 35-47, 1999.

[12] Prashant, T., Ravi, S., *Collaborative and lean new product development approach: a case study in the automotive product design*, International Journal of Production Research, Taylor and Francis, pp. 2457-2471, April 2015.

[13] Anna, H., et al., *Smartphones on wheels: New rules for automotive-product development*, McKinsey & Company, October 2022.

[14] Karl, T.U., Steven, D.E., *Product design and development Sixth Edition,* New York: McGraw-Hill Education, 2016.

[15] Booz, A., Hamilton, J., *New products management for the 1980s,* 1982.

[16] David H., *The Risk Breakdown Structure (RBS) as an aid to effective risk management*, Fifth European Project Management Conference, PMI Europe 2002, June 2002.

[17] Robert, G.C., Elko J.K., *Winning Businesses in Product Development: The Critical Success Factors*, Research-Technology Management, pp. 52–66, 2007.

[18] Preston, G.S., Guy, M.M., *Proactive Risk Management. Controlling Uncertainty in Product Development*, Taylor & Francis Group, 2002.

[19] Hendrik, S.B., et al., *Development of a Risk Framework for Industry 4.0 in the Context of Sustainability for Established Manufacturers*, Sustainability, ISSN 2071-1050, 2019.

[20] Mark, E., Grace, A., Saadia, Z., *Global Risks Report 2025*, January 2025. https://www.weforum.org/publications/global-risks-report-2025/.

[21] Web D School, *Steve Jobs – 9 Product Development Tactics*, https://www.webdschool.com/blog/steve-jobs-9-product-development-tactics/.

[22] Moshe, D., *Value Creation and Efficiency: Incompatible or Inseparable?*, Journal of Creating value, May 2018.

Deblocarea potențialului: model holistic structurat de identificare a riscurilor în domeniul auto în timpuri dificile

Prezentul studiu își propune definirea unui cadru conceptual sistematic bazat pe Structura detaliata a riscurilor (RBS) pentru a fi utilizat de către echipa de dezvoltare a produsului și management asupra dimensiunii identificării surselor de risc în dezvoltarea de produse noi auto, în vremuri dificile. Studiul contribuie cu o direcție pragmatică pentru mediul de afaceri al cărui surse de risc și conceptualizare au fost revizuite într-un grup de lucru cu experiență remarcabilă și validate printr-o analiză empirică – sondaj.

Cuvinte cheie: *surse de risc, dezvoltarea de noi produse, factori de succes, identificarea riscului, RBS, metode*

Roxana SANTA, PhD Student, Technical University of Cluj-Napoca, roxana.santa@muri.utcluj.ro, +49 157 35229659

Sorin POPESCU, PhD, Professor, Technical University of Cluj-Napoca, sorin.popescu@muri.utcluj.ro, +40 744 565 369