

Standardization of Project Management Practices of Automotive Industry Suppliers - Systematic Literature Review

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Abstract: This paper deals with the issue of standardization of project management (PM) practices of development activities of automotive industry suppliers. Development activities are critically important for ensuring the final quality of the developed products and related production systems while keeping the target costs. The key to their successful management is considered the use of modern PM practices. In order to represent the current best practices and to be apparent and transparent, the PM practices must be properly standardized. A comprehensive branch standard of PM in automotive industry is however missing. In order to fill the gap in the current state of knowledge, consecutive steps of standardization were defined. This article describes one of the initial steps, a systematic literature review of existing resources that could serve as a valuable basis for standardization. The results show that general PM standards are suitable for treating the quality of project processes and branch PM standards of automotive industry for treating the quality of project product – manufacturing processes of automotive suppliers. The paper discusses the individual methods within both groups in more detail and recommends what purpose they are suitable for.

Keywords: automotive industry suppliers; product creation process; project management; standardization

1 INTRODUCTION

In recent decades, the automotive industry has undergone intensive development. The growing market pressure on car prices and on shortening the duration of development on the one hand, and the ever-increasing complexity and technical demandingness of products in the face of increasing competition and increasing demands of end-users on quality and guarantees on the other hand, are forcing car manufacturers (OEMs) to move ever greater depth of development and production towards suppliers. Suppliers have taken over much of the research and development (R&D) and production from car manufacturers, achieving an overall increase of 70-80% in the process. Richly branched dependent supplier-customer production networks have become an integral part of this industry and car production today is heavily dependent on suppliers. This trend defined a completely new qualification profile for suppliers. Suppliers take full responsibility for the results of development of product and related production systems, product launch and delivery, and absolute fulfilment of the list of requirements and target costs defined by the car makers [1-3]. They thus find themselves in a completely new role, which they are forced to adapt to.

In the past, the Serial production stage was considered to be the decisive stage in terms of ensuring the required quality of the developed products and production systems and achieving the target costs. Currently, it is already widely recognized that up to 80% of the resulting quality and costs are decided already in the pre-production stages of the car's life cycle, collectively called the Product Creation Process (PCP). In the pre-production stages, suppliers plan, create and fine-tune the concepts of future products and production systems and make critical decisions that determine whether the final product will meet the customer's requirements, be competitive and ensure a reasonable profit for the manufacturer. The high influence of pre-production stages on

the final quality is directly related to the fact that in these stages there are many more non-conformities than in the implementation phase. In addition, practical experience shows that the expenses associated with the elimination of non-conformities in the pre-production stages require only a fraction of the costs necessary for the elimination of non-conformities during the realization and use of the product (The Rule of Ten) [4]. The earlier thus the suppliers discover and treat the non-conformities, the less effort and resources they have to spend on their elimination and the better results they achieve. In such an environment, project management (PM) takes on a decisive importance.

PM is designed to effectively manage complex, unrepeatable, time- and resource-constrained activities with long durations and high levels of uncertainty. It is exactly such attributes that the development activities of the PCP phase show. PM practices have proven to be an effective tool for their management and mastering the practices turned out as a strategic competence of enterprises in this highly competitive environment [8, 21]. However, in order for PM practices to be truly effective, to represent the best current solutions and to be apparent and transparent, PM practices must be properly standardized. Although there are thousands of suppliers per one OEM today (e.g. the global supplier network of the VW concern includes more than 40,000 suppliers [5]), a comprehensive branch standard of PM in automotive industry is missing.

The main motivation of this research was the will to fill this gap in the current state of knowledge and to contribute to the standardization of the PM industry standard. The subject of the research was defined as a systematic literature review (SLR) of information sources dealing with the issue being addressed. The expected output is recommendations which sources, why and for what purpose suppliers can use in the standardization process.

2 EXPLANATION OF THE CONTEXT OF STANDARDIZATION

To understand the role of SLR in the standardization process, it is useful to first explain its context.

Step 1: Mapping the processes on OEM side

The initial key step in the standardization process was mapping of the processes on side of car manufacturers. Car manufacturers stand at the top of supplier-customer networks and their activities influence the entire dependent chain below them. Understanding processes and events running on the side of the OEMs is thus an integral part of the standardization of activities on the side of their suppliers.

As it emerged from the SLR, the basic framework of cooperation between car manufacturers and their suppliers is defined by the model of Product Creation Process (PCP). PCP is the initial part of the car's life cycle, in which its research and development takes place. The activities of this stage are very complex, diverse and are implemented by development teams requiring mutual coordination. For these reasons, OEMs elaborate the PCP stage in detail into a clear graphic model containing key activities and events running on the side of OEMs for the purposes of determining the continuity of individual processes. The analysis and synthesis (reconstruction) of the PCP model of OEMs took place in the previous step of the research and its closer understanding became the inspiration for the creation of a process model on the suppliers' side.

Step 2: Defining the architecture of the PCP model of Tier 1 automotive suppliers

The construction and hierarchy of the proposed PCP model of Tier 1 automotive suppliers is shown in Fig. 1. From the point of view of complexity and scope of detail, the model consists of 4 vertical levels.

- **Level N** composes of basic PCP phases bordered by gate-type milestones.
- **Level N-1** composes of process steps in the form of project milestones horizontally located in so-called swim lanes depending on the responsibility for their fulfillment. Milestones represent critical process steps that must be completed to be able to move from one gateway to another.

Form: Level N and N-1 are interpreted in the form of a process map.

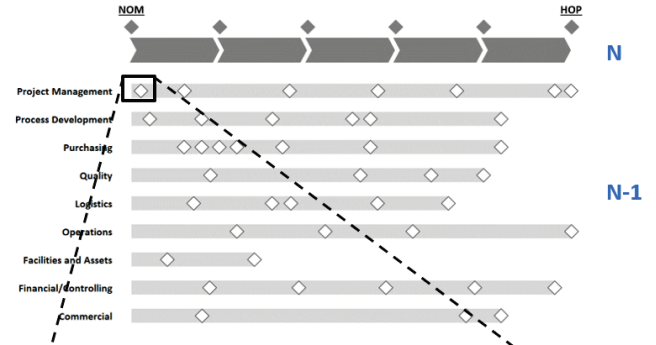
- **Level N-2** is defined by sub-activities (also called work packages) that must be fulfilled to be able to close the process steps.

Form: Process cards containing inputs, activities/ work packages, responsibilities, outputs and supporting PM tools and techniques.

- **Level N-3** is defined by auxiliary tools and techniques of PM.

Form: Methods, instructions, manuals, rating tables, diagrams, etc.

Process map



Process steps with sub-activities

Inputs	ID	Process step Completion criteria	R	Outputs	Tools & Techniques of PM
Customer RFQ package ready - Technical Specification - 2D, 3D - CRA ratio - Quality Requirements - Logistics Specification - Financial Agreement - Time Plan - Tender package defined - BOM - Value Stream Design - Logistic Concept - PI Quotation - PI Budget and FIN targets - Business Case - PI Time Plan - Nomination letter signed - Sourcing plan defined	1	Project handover to development (HOD)	COM		
	1.1	Define project team	PJM	Project team defined	Project team nomination list
	1.2	Create project in PLM software	PJM	Project created in PLM SW	PLM SW
	1.3	Issue list of requirements for handover	PJM	List of requirements issued	LOR template
	1.4	Prepare handover package	COM	Handover package prepared	
	1.5	Issue handover presentation	COM	Handover presentation issued	H-O presentation template
	1.6	Organize handover meeting	COM	Handover meeting organized	H-O meeting agenda standard
	1.7	Issue list of open points	PJM	List of open points issued	LOP template

Tools & Techniques of PM

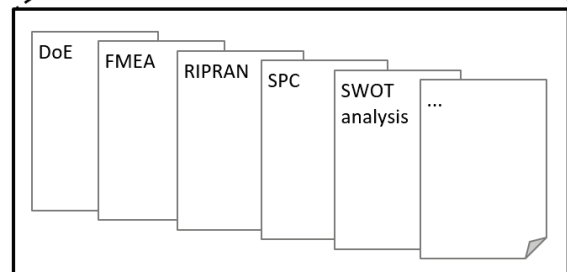


Figure 1 PCP model of Tier 1 suppliers of the automotive industry [1]

The definition of the form of the standard was followed by the proposal of its content.

Step 3: Defining the content of the PCP model of Tier 1 automotive suppliers

In order for the model to reliably fulfill its function, it is necessary not only to choose a suitable form, but above all to ensure its eligible content. The proposed procedure for ensuring an eligible content is presented in Tab. 1.

Table 1 Matrix of definition of eligible content of the PCP model

#	Activity / Method	Vertical level of PCP			
		N	N-1	N-2	N-3
1	A: Mining existing literary sources M: Systematic Literature Review	×	×	×	×
2	A: Defining Key Success Factors of PM in automotive industry M: Delphi method	×	×		
3	A: Defining/treating process steps M: Structured interview w. experts	×	×	×	×

After explaining the context of standardization this paper further focuses on description of activity #1 - SLR of sources

that have already dealt with the problematics and that can potentially serve as an input in all 4 levels of the PCP model.

3 SYSTEMATIC LITERATURE REVIEW OF SOURCES TREATING PROJECT MANAGEMENT OF AUTOMOTIVE INDUSTRY SUPPLIERS

Considering the limited scope of this paper, the research focuses exclusively on the investigation of PM standards applicable to Serial suppliers (Build to Print), who do not deal with product development and specialize in the development of production systems and the provision of serial deliveries (see research limitations below).

For successful project management, it is necessary to properly treat simultaneously the quality of the project processes and the quality of the project product [6]. Since the main business activity of Serial suppliers of the automotive industry is the development of production systems and the provision of serial deliveries, the basic prerequisite for the success of the PM of these companies is the mastery of procedures and tools that treat both the quality of the project management itself and the quality of the production systems that are developed and implemented within the project. Despite an extensive search in global databases, it was not possible to find a branch standard that dealt with the issue of project management of Serial suppliers of the automotive industry, treated simultaneously the quality of project processes and the quality of project product, and had the character of a comprehensive methodology. Due to the absence of a comprehensive solution, a new strategy was defined. Its essence was not to continue on the search for information sources that fully correspond to the assignment, but to look specifically for sources that treat the quality of the project's processes and, in particular, for sources that treat the quality of the project's product.

3.1 Sources Treating the Quality of Project Processes - General Project Management Standards

To treat the quality of the project's processes, the research focused on general PM standards.

3.1.1 Review of General Project Management Standards

Current best practices used in project management are summarized in internationally recognized general standards. They are based on decades of experience of thousands of PM professionals (project sponsors, project managers, project teams, academics, trainers, consultants) working in a wide range of industries and geographies, and are based on their established and proven project management best practices. General standards are designed to be applicable to any project regardless of its scope, type, organization, geography, or socio-technical environment. This is achieved by separating project management activities from the specific needs and requirements of individual fields, companies, or specific users. However, specialized aspects of any type of project are integrated with these standards and together they provide a secure overall framework for project work. Due to

their properties, general standards are understood and recognized by the general public and form the proven basis of any project [7].

During the research, it turned out that in terms of the number of certifications granted, the most popular general standards of PM worldwide are:

- PMBOK Guide by Project Management Institute,
- IPMA ICB4 by International Project Management Association, and
- PRINCE2 by Axelos PRINCE.

PMBOK Guide

As it emerged from the research of the publication PMBOK Guide [8], the PMBOK standard is based on a total of five main process families, ten knowledge areas, forty-seven processes and their interrelationships. All processes and process steps have defined inputs, outputs and transformation tools (actions, methods, techniques). In its entirety, this PM standard contains a set of 132 process tools and techniques, including their description and functionality. The PMBOK Guide is a de facto set of project tools and methods designed for all project phases. The advantage of the standard is the complexity, detail and clarity given by the clear structure. The PMBOK Guide standard is process-oriented and based on managerial practice, focusing on best practices that are applicable to most projects. In project management, the standard does not provide the user step-by-step guidance on how to manage a project throughout its life cycle, but serves as a rich reference guide for those who want to have the widest possible range of analytical techniques and recommendations at hand. It is intended for experienced project managers who do not need step-by-step guidance through all phases of the project life cycle [7, 8, 12].

IPMA ICB4

As shown by the review of the publication ICB4 [9] and as its name Individual Competence Baseline implies, ICB4 is by nature a standard that defines the competencies (abilities, knowledge, skills) required for successful project management. The ICB4 project management competence standard distinguishes and describes in detail three competence areas that make up the so-called Eye of Competence. The competence areas mentioned are contextual, behavioural and technical (29 in total). Behavioural competencies define the personal and interpersonal skills required for successful project management, technical competencies define the technical aspects of project management, and contextual competencies refer to those competencies that form the context of project management. Within each of these domains, the standard defines the appropriate knowledge and skills that are required for successful management in that area. The focus is then on the ability of appropriate application by specific personalities. So there is a lot of room for creativity and one's own opinion. The ICB standard therefore does not dictate processes, but recommends certain process steps that need to be appropriately applied to a specific project situation.

Unlike the previous process concept of the PMBOK standard, the concept of the IBC standard is competence. The standard is therefore not focused on the exact form of the defined processes and their specific application, but focuses on the person of the project manager and members of the project team and on what knowledge, skills and abilities - competences - they should have in order to successfully manage projects [9, 10, 12].

PRINCE2

The review of the standard Managing Successful Projects with PRINCE2 [11] showed that it is based on seven principles, consists of seven processes and describes seven topics. It is possible to adapt the standard within a specific project, but it is necessary to take into account the principles that are the backbone of the entire standard. Individual processes can be greatly simplified and each of them has many possibilities of use according to the specifics of the project. However, the principles remain and ensure that the project is a project in a controlled environment. The review also revealed that PRINCE2 is not a project management standard in the sense of the previous two PMI or IPMA standards. It is more of a guide or project management methodology. Unlike the previous two analysed standards, the PRINCE2 methodology focuses on WHAT, WHEN, WHO and WHY need to be done. What, on the other hand, cannot be found in this methodology is the answer to the question of HOW to do it. Thus, detailed coverage of project management tools and techniques is lacking. The PRINCE2 methodology has approximately 40+ techniques in its entirety, which it refers to, however, only 2 techniques are described in more detail - Quality control and Product planning. For comparison, the PMBOK standard contains a total of 132 tools, which it elaborates in detail. The methodology explains the absence of tools and techniques by the fact that there is a whole range of techniques for planning and controlling projects, which are described in detail in separate books, so it is not necessary to repeat it again in the PRINCE2 manual. PRINCE2 also does not address management skills as one of the key factors in competent project management. The concept of the PRINCE2 methodology is thus different from other PM standards not only in terms of the insight into PM issues, but also in the way it is processed and the use of different terminology, which is chosen with regard to the environment (state administration) in which it was developed [11-14].

3.1.2 Common Attributes of General Project Management Standards

As it emerged from the evaluation of General project management standards, everyone views project management from a different angle. Nevertheless, they exhibit common attributes that characterize the standards and distinguish them from PM standards with a different scope of common agreement. These attributes can be summarized in the following two categories defined based on the contribution of the assessed resources to the needs of this research:

Advantages (+):

- They treat the quality of project processes,
- They are universal, applicable to any project,
- Specific aspects of any project are integrated with these standards,
- They represent best practices of the field.

Disadvantages (-):

- They do not treat the quality of the project product,
- They do not treat specific aspects of particular fields,
- They do not offer a comprehensive guide to pm - they represent either methodology or tools,
- They have a considerable scope,
- Adaptation to a specific project requires a high administrative burden.

3.1.3 Evaluation of General Project Management Standards and their Validity for this Research

There is no clear answer to the question of whether the PRINCE2 Manual, PMBOK Guide, or ICB4 is better for PM of automotive suppliers. None of the standards offers a balanced, universal guide to project management, each treats a different aspect of project management, and each has its strengths and weaknesses. Based on the research and evaluation of the attributes of individual standards, the following recommendations can be made:

- 1) The PRINCE2 methodology can be recommended as the main information source suitable for creating a robust foundation (skeleton) of the planned methodology for the area of treatment of the quality of project processes. PRINCE2 is the only one of the analysed PM standards that has the nature of a methodology, it guides the user step by step through all phases of the project life cycle, it is strictly formal, it contains a detailed description of roles and competences, it can be adapted to the nature and scope of a specific project and its use is possible even without prior knowledge of the user. It is a guide in the entire life cycle of the project and gives very detailed instructions on WHAT to do, WHEN to do it, WHO should do it and WHY.
- 2) What, on the other hand, cannot be found in this methodology is the answer to the question of HOW to do it. For that reason, it is advisable to combine the methodology with another standard that describes these tools and methods in detail and thus appropriately complements the main shortcoming of the PRINCE2 methodology.
- 3) The PMBOK standard can be recommended as a supplementary information source that will serve as a reference manual containing a wide range of proven PM tools and techniques (132) for all phases of the project, including their detailed description and description of functionalities.
- 4) The IPMA standard, which defines the competencies of the project manager required for successful project management, is of no fundamental importance for the creation of an industry-specific PM methodology of automotive industry suppliers.

See Tab. 2 for a summary.

Table 2 Summary table presenting the resulting recommendations for sources treating the quality of project processes

Recommended literary sources	PCP level treated			
	N	N-1	N-2	N-3
PRINCE2 (Methodology)	×	×	×	
PMBOK (Tools & Techniques of PM)				×

The selected general project management standards PRINCE2 and PMBOK have been selected as globally recognized and proven best practices by PM professionals from around the world. Although the standards approach project management from two different perspectives, these are two of the most recognized methods of global project management, which fit together well and their combination appropriately covers the needs of this research.

However, since by their very nature general PM standards do not treat the quality of the project's product and do not take into account the specific needs of different fields (a tax for their universality), in the following part the review will focus on identifying, analysing and evaluating relevant information sources that meet these attributes. The review will be performed in the branch databases of the automotive industry [15-19].

3.2 Sources Treating the Quality of the Product of the Project - Branch Standards of Project Management of the Automotive Industry

During the research, branch standards created and issued by trade groups of the automotive industry were identified as a suitable source for treating the quality of the production systems of suppliers of the automotive industry. Automotive industry business groups bring together car manufacturers and major suppliers of the industry, and their purpose is to develop topics of common interest, share practical experience and define rules facilitating cooperation between all levels of the supply chains of the industry. A search of information sources revealed that the following groups are among the world's most important trade associations of the automotive industry: AIAG (USA), ANFIA (IT), FIEV (FR), JAMA (JP), SMMT (UK), or VDA (DE). Considering the number of business groups, it was decided to limit the search at this point to an analysis of branch standards issued by the AIAG group. AIAG is the most popular of the listed business groups worldwide, has a wide field coverage, and its publications are used with confidence by car makers and their suppliers all over the world.

AIAG Group

The Automotive Industry Action Group (AIAG) is a global non-profit organization of car manufacturers and their suppliers founded in 1982 in North America. The company was founded by the progressive managers of Chrysler, Ford Motor Company and General Motors (the Big Three). Currently, AIAG has over 4,000 members, which include OEM, such as GM, Honda, Nissan, Stellantis, Toyota, or

Volkswagen, and important suppliers of this industry, such as Adient, Bosch, Continental, Lear Magna, or ZF [20].

The goal of AIAG is to increase prosperity in the automotive industry by improving business processes and activities that are part of the supply chain. Under the auspices of the AIAG, the gathering of ideas on the basis of specific problems of the supply chain of the automotive industry takes place in the form of an open forum, and a suitable solution is sought together. People at all levels of management participate in it. The result of the mutual cooperation are the branch standards of the automotive industry that help to align the procedures of suppliers of different subject matter (products, services) and scope of supply and different supplier levels. By standardizing the definitions of terms and their content, the standards support the consistency of work in the supply chain, create transparency and mutual understanding between its individual participants, they can be adapted to the needs of the respective project and, through proven methods and tools, they help to ensure the agreed quality of the start-up, deliveries in the pre-production stages and even deliveries during series production [20].

In the databases of the AIAG group, 80+ publications divided into the following categories were discovered:

- Quality publications,
- Supply chain publication, and
- Publication of social responsibility.

The following selection criteria were defined to select suitable information sources. The publication had to:

- 1) Be universal, applicable regardless of the subject of supplies and the nature of production systems,
- 2) Treat the quality of production systems,
- 3) Be applicable in the PCP phase.

The following publications met the defined criteria:

- Advanced Product Quality Planning (APQP),
- Production Part Approval Process (PPAP),
- AIAG & VDA FMEA Handbook,
- Measurement System Analysis (MSA),
- Statistical Process Control (SPC),
- The Costs of Poor Quality Guide (COPQ),
- Layered Process Audit (LPA) Guideline, and
- Effective Problem Solving Guide.

3.2.1 Review of Branch Standards of Project Management of the Automotive Industry

From the review of selected publications of the AIAG group, it emerged that APQP has the unique nature of a comprehensive methodology tailored to the needs of automotive industry. The remaining publications can be characterized as well-known, proven tools and techniques of project management of industrial enterprises, which can also be well applied in the automotive industry. Since these tools and techniques are covered in detail in separate books, there is no need to repeat them again in this paper. For that reason, only the APQP methodology will be described in the following part.

Advanced Product Quality Planning

As declared by AIAG, APQP is part of the five Core Tools for effective quality management with PPAP, FMEA, MSA, and SPC being the other core tools. Advanced Product Quality Planning [22] is a manual providing guidelines designed to produce a product quality plan, which will support the development of a product or service that will satisfy the customer. The primary goal of product quality planning is to facilitate communication and collaboration between engineering activities. As such, it requires the engagement of a cross-functional team (CFT) that includes marketing, product design, procurement, manufacturing, and distribution. The objective is to ensure a clear understanding of the voice of the customer (VOC), and to translate it into requirements, technical specifications, and special characteristics. APQP consists of five phases. Within the individual phases, the methodology recommends the use of previously mentioned supporting tools, such as FMEA, Control Plan, SPC, or MSA, which increase the probability of success of development activities. For practical reasons, the five phases are translated into five main activities that correspond to the stages of the Product Creation Process (PCP). The contents of the individual phases are presented in the methodology through recommended decisive inputs and outputs. The outputs of the previous phase automatically become the inputs of the upcoming phase. Each input/output is then briefly characterized. The verification of the correctness of the procedure is enabled by predefined checklists of questions located in the appendix. As the book explains, the use of the APQP methodology leads to simplification of product quality planning, efficiency and improvement of development activities, significant cost savings and facilitation of communication with subcontractors [22, 23].

3.2.2 Common Attributes of Branch Standards of Project Management of the Automotive Industry

Similarly to the general PM standards mentioned in the previous text, the AIAG branch standards share common attributes that characterize the standards and distinguish them from PM standards with a different scope of common agreement. They are again structured into two categories based on their contribution to the needs of this research:

Advantages (+):

- They solve the needs of automotive industry and thus fulfil the essence of branch standards,
- They treat the quality of project products of the automotive industry,
- They represent the Voice of the Customer (VOC),
- They have a universal character and can be tailored,
- They represent best practices of the field.

Disadvantages (-):

- They treat the quality of project processes only to a very limited extent,
- They do not offer a comprehensive and balanced guide - they represent either methodology or tools,

- They are tools of PM of suppliers and complement this, but in no case replace it,
- They have only a recommendatory character.

3.2.3 Evaluation of Branch Standards of Project Management of the Automotive Industry and their Validity for this Research

After analysing all selected publications of the AIAG group and subsequent evaluation of their properties, the following conclusion were made:

- 1) The APQP publication can be recommended as the main source of information that will support the creation of the skeleton of the planned methodology for the area of treatment of the quality of project product. Similarly to PRINCE2 in the field of general PM standards, APQP is the only one of the analysed publications of the AIAG group to be of the nature of a complex methodology. It was tailored from the very beginning by the AIAG group to the needs of the automotive industry, it is a guide in the entire PCP phase, it defines the scope of planning participants, it can be adapted to the nature and scope of a specific project, and its use is possible even without prior expert knowledge of the user. The publication gives rough instructions on WHAT to do, WHEN to do it, WHO should do it and WHY.

What, on the other hand, cannot be found in this publication is the answer to the question of HOW to do it. Although APQP recommends 11 analytical techniques that can be used in product and process quality planning and thus increase the probability of project success, it describes the analytical techniques very briefly. Similarly to PRINCE2, it refers to techniques as well-known tools detailed in separate books that do not need to be described again. As for the number of techniques, APQP mentions only 11 techniques, unlike, for example, the PMBOK standard, which lists 132. In addition, the methodology exhibits a low level of detail, overgeneralization of content, and a disproportionately small range compared to general PM standards. For comparison, while the PRINCE2 methodology describes PM procedures on 480 pages, the APQP methodology on 108 pages only. From the above reasons, it is advisable to combine the APQP methodology with another information sources that will appropriately complements its shortcomings.

- 2) The remaining publications of the AIAG group, such as PPAP, FMEA, MSA, SPC, COPQ, LPA and Effective Problem Solving Guide, can be characterized as widely known and proven tools and techniques of project management of industrial enterprises, which can also be well applied in the automotive industry. Their analysis confirmed that all of them can be confidently recommended as a supplementary information source that will suitably complement the deficiencies of the APQP methodology.

See Tab. 3 for a summary.

Table 3 Summary table presenting the resulting recommendations for sources treating the quality of the project product

Recommended literary sources	PCP level treated			
	N	N-1	N-2	N-3
APQP (Methodology)	×	×	×	
PPAP, FMEA, MSA, SPC, COPQ, LPA, EPSG (Tools & Techniques)				×

From the findings of this part of the review, it can be conducted that the selected publications of the AIAG group represent appropriate information sources very well usable for the standardization of PM procedures of automotive industry suppliers. The resources address topics that support product and process quality assurance in the supply chain at the PCP stage, intertwining and complementing each other as appropriate. However, since the branch standards of the automotive industry do not sufficiently treat the quality of the project processes, it is recommended to combine them with the previously recommended general PM standards and thus create a suitable combination, which would appropriately cover both key areas of project management and provide a safe overall framework for processing the branch methodology of PM in the automotive industry.

4 THESES OF THE SYSTEMATIC LITERATURE REVIEW

The key findings resulting from this research can be summarized in the following theses:

- Product Creation Process (PCP) phase activities have a major impact on the quality and costs of future products and related production systems.
- In the PCP phase, most non-conformities arise from the entire product life cycle.
- Eliminating non-conformities in the PCP phase requires only a fraction of the costs necessary to eliminate non-conformities during the implementation and use of the product.
- The occurrence of non-conformities in the Development phase can effectively be prevented by the use of modern project management practices.
- For successful project management, it is necessary to properly treat both the quality of the project processes and the quality of the project product.
- The quality of project processes is treated by general project management standards.
- General PM Standards are comprehensive, universal and adaptable to any PJ, but they do not treat the quality of the project product and branch specifics.
- The quality of production systems of Serial suppliers of the automotive industry is treated by branch PM standards of the automotive industry.
- Branch standards of PM treat the needs of automotive industry and represent the Voice of the Customer, but they treat the quality of PJ processes to a very limited extent and do not offer a comprehensive guide.

5 CONCLUSION

This paper deals with the issue of standardization of project management of development activities of automotive

industry suppliers. The subject of the research was defined as a systematic literature review of relevant information sources and the output recommendations which of the existing sources, why and for what purpose suppliers can use in the standardization process.

As described in the previous text, standardization of PM practices requires inclusion of procedures and tools that treat both the quality of project processes and the quality of the project product. In this research, the production systems of the suppliers of the automotive industry are considered to be the product of the project.

To treat the quality of project processes, general PM standards were identified as a suitable information source. General PM Standards are designed to be applicable to any project regardless of its scope, type, organization, geography, or socio-technical environment and they provide a secure overall framework for project work. As the main source of information for creating a skeleton of PM standard of suppliers of the automotive industry (PCP model level N to N-2) is recommended the methodology Managing Successful Projects with PRINCE2. As a supplementary information source with a wide range of proven project management tools and techniques is recommended the PMBOK Guide (level N-3). However, since by their very nature general PM standards do not treat the quality of the project product and do not take into account the specific needs of specific fields, it is recommended to combine them with the branch standards of the automotive industry. These will suitably complement their deficiencies.

To treat the quality of the project product and the specific needs of the automotive industry, the branch PM standards of the business group AIAG were identified as a suitable information source. As the main information source for creating a skeleton of PM standard of suppliers of the automotive industry (PCP model level N to N-2), the APQP methodology is recommended. As supplementary auxiliary tools and methods of project management for treating the quality of production systems of automotive industry suppliers (level N-3) the publications PPAP, FMEA, MSA, SPC, COPQ, LPA and Effective Problem Solving Guide are recommended.

The previous analysis showed that the recommended sources fit together very well and their proper combination will provide a secure overall framework for creating a competent methodology of project management of development activities of automotive industry suppliers that is so desperately lacking.

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6 RESEARCH LIMITATIONS

- Application sector
- Automotive industry

- Serial suppliers without own product development
- Process orientation
- Project management (not program or portfolio)
- Scope of common agreement
- Branch methodology of the automotive industry
- Part of the Product Life Cycle to be treated
- Product Creation Process (PCP).

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