Acta Mechanica Slovaca 14 (1): 42-53, 2010
DOI: 10.2478/v10147-011-0006-z

Integration of Product Innovation Techniques in Automotive Component Design

Milan KOVÁČ [*] ***(SK)*** *milan.kovac@tuke.sk*

Štefan BABJAK (SK) stefan.babjak@tuke.sk

BIOGRAPHICAL NOTES

prof. Ing. Milan Kováč, DrSc. Director of the Institute of Technology and Management and head of the Innovation centre of automotive production, works at the Faculty of Mechanical engineering, Technical university of Košice since 1969. He was the head manager of number of state grants and commercial innovation projects, and also four international research projects. Milan Kováč is author and co-author of monographs, books and publications focused on planning and projection of production processes and systems, automation, roboting, reengineering and innovations, Kaizen and lean production, and development trends in the field of automotive industry. He is also winner of several domestic science awards. Nowadays, his primarily field of interest in research includes the questions of innovation strategies, systems of innovation creation and preparation, and building the support infrastructure for innovations.

Ing. Štefan Babjak, PhD. Graduated at the Technical university of Košice in 2003 and also obtained the PhD. degree in 2008 there, both in the field of Mechanical engineering technologies and materials with specialization on the innovations of products and production systems. Nowadays, he is a researcher at the Innovation centre of automotive production and his field of interest is focused on methods and techniques leading to various improvements of innovation preparation process primarily oriented on the automotive industry, including Rapid prototyping, reverse and simultaneous engineering, wikinomics, crowdsourcing, open and user innovations, innovation process support via creative e-communities, and Kaizen and lean approaches in product design. Štefan Babjak is co-author of three books and author of number of publications.

KEY WORDS

Automotive industry, product design, innovation techniques integration, lean approach, new product development

ABSTRACT

The automotive sector has been under the uncommon depression since 2008 due the global economic crisis. The companies will need in forthcoming time to reevaluate their strategies and adapt to oncoming changes. Experts correspond in opinion that the way out of crisis leads through innovation. The best way to eliminate the losses that don't add value within the process of product design and development is to apply the "lean thinking" philosophy. For innovation process in the field of automotive components is integrated portfolio of innovation methods and techniques an excellent way to gain the benefits of lean approach.

INTRODUCTION

The automotive sector has been under the uncommon depression since 2008 due the global economic crisis, which hit the automotive industry as a first between the industry branches. The main influence of crisis became evident through the reduction of demand and complication of the availability of financing. Additional negative side effects are:

- *Decrease in demand on new cars purchasing.*
- *Interruptions or reduction of automobile production.*
- *Intensive pressure on price reduction of materials, components and products.*
- *Reduction of new orders, especially for the automotive component suppliers.*
- *Canceling or dramatic reduction of investments into research and new projects.*

Synchronized breakdown on key automobile markets caused that the situation in the beginning of the year 2009 became serious. Since 60 to 80 percent of new cars in Europe are sold through credit, the financial crisis hit the automotive industry extremely serious with 20 percent reduction of production, what represents in the EU more than 60 billions € loss on revenues in the branch. Similar trend is also in the year 2009 and thereafter is expected a slow recovery. The main causes of the critical development are:

- *Rapid decrease in demand on passenger and utility vehicles, in EU and worldwide; adverse conditions for loan obtaining, decreasing stocks and assets prices, uncertainty resulting from worldwide economy environs and recession reflected in very low consumer credence and decreasing spending power - new cars sales radically declined.*
- *In particular segments of automotive industry, there were indicated problems with access to financing from loans with insufficient liquidity – the cash don't flow towards the manufacturers. The situation is particularly serious in the case of small suppliers with lower amount of capital and lower production diversification ratio.*

Various expertise examinations [1], [2], [3] correspond in opinion that the way out of crisis leads through innovation.

This is the right time not only to think about the innovation, but also to innovate. It is important to keep the costs low and assure the positive cash-flow. However, to focus only on these problems is not enough. Recession means opportunities, as well as threats. The organizations that will succeed are only those which are sufficiently agile and find new and better ways to satisfy the customers. The cost control is imperative, the innovation is obligatory.

AUTOMOTIVE INDUSTRY IN THE CRISIS PERIOD

Government support arrangements intended to overcome the crisis, such as the scrappage program, loans for company restructuring, stimuli for "green" automobiles, etc. particularly stabilize the business environment of automotive production. However, the problem of crisis must resolve the automotive industry on its own. Except of influence of the financial crisis other important factors there are acting that combine into synergy (Fig. 1), mainly:

- *Changes of the customer's preferences. Nowadays, the most preferred is low consumption and running costs, acceptable price and quality.*
- *Radical change of markets. The pivotal increasing moves to new markets referred to as BRIC (Brasilia, Russia, India, China).*
- *Presence of manufacturing overcapacities estimated to 20 - 30%. The industry in highly developed countries partially has partially overestimated the potential of market growth.*
- *Environmental factors that cumulate legal regulations etc.*
- *Innovations of products and production systems. This factor is permanent throughout whole production history. Presently, the innovation cycles are dramatically abridged.*

Even if the influence of the financial crisis will weaken, the other factors will remain on a long-term basis and the industry will change.

The reduction of production volumes and consequent cost reducing of automotive companies

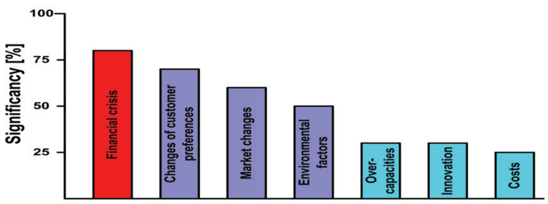

Fig. 1 *Synergic influence on automotive industry*

led to the employment decrease. According to the branch statistics, the worsening conditions on the market may threaten 15 to 20 % of manpower, whereby as much as every third supplier is vulnerable due to the crisis. The main recommendations can be assumed as:

- *Reducing of the variable costs in order to keep positive EBIT (net profit).*
- *Assuring of financial fitness until the optimization of financial flows.*
- *Further improvements and enhancement of technological level.*
- *Elimination of outdated modes of production and equipment.*
- *Progressive development of "clean" cars and fuels.*
- *Platform-based and module-based architecture of automobile construction.*

Other characteristics of innovation strategies in the crisis period:

- *Reevaluation of existing innovation projects and reduction of trivial projects.*
- *Utilization of innovation methods in order to reducing the product costs.*
- *Approval of new products preparation for forthcoming years.*
- *Emphasis on new opportunities.*
- *Focusing on creative partnership with other organizations.*
- *Reorganizing of entrepreneurship based on lean concepts.*
- *Risk management and problem solving of products and technologies.*
- *Investments to culture and sustainable relations.*
- *Changes in thinking of employees in order to get familiar with innovation approaches.*

INNOVATIONS, LEAN PRODUCTION AND DESIGN AS A WAY OUT OF CRISIS

Womac [1] emphasizes for elimination of crisis impacts on automotive industry intensification of use of Lean Product & Process Development methods. Automotive firms can respond to changing markets by rapidly, changing mix quickly, & introducing products with little/no down time.

- *Total product cost can be reduced through lower design cost, tooling cost, and plant investment methods.*
- *Strong, cross-functional chief engineer with obeys; steady cadence; concurrent concepts through prototype; rapid, cheap prototyping with knowledge capture & reuse; and simultaneity to compress lead time.*
- *No OEM can have competitive factories without competitive designs and process configurations.*
- *Lean design and supply in combination. To the extent that vehicle technologies change dramatically and new technologies (batteries, drive motors, etc.) come from outside the traditional supply base, the industry may need to de-integrate much further while finding better ways to tightly synchronize its development and production activities with new types of suppliers. To the extent that markets require more variety in lower volume per product, a rethink of product architecture may be required to permit more variety while varying mix quickly and minimizing cost.*
- *Quality may be "free" but no OEM can provide flexible variety without incurring incremental costs.*
- *Reality is that no known manufacturing system can deal with the dramatic swings in total volume and mix experienced in the past year.*

In the next ten years, the automotive industry will precede more changes than occurred in past 50 years. The companies are forced to [4]:

- *Innovate the production, technologies and production organization.*
- *Apply the next generation Kaizen, Lean Production, and Lean Design.*
- *Rapid and flexible react on changes.*
- *Refine the cooperation within the supplier networks.*
- *Intensive utilization of support resources.*

The present-day challenge for the innovation break-point is shown on Fig. 2. It is important to identify the opportunities for refinement of innovation initiatives in the period of economic crisis:

- *Elaboration of the scenarios and plans. Forecasts evaluate probable changes and effects of the financial crisis.*
- *Enforcing the status of products and services that utilize innovations.*
- *Reevaluation of the production portfolio. Get rid of hazardous or too wide programs and move the finances to shorter-time horizon initiatives support.*
- *Search the opportunities for rapid testing of new innovation ideas. Proceed in research and development, but with lower cost and lower risk.*
- *Search for the creative ways, how to extend existing products. Implementation of services with added value for products and provide the customers new experiences.*

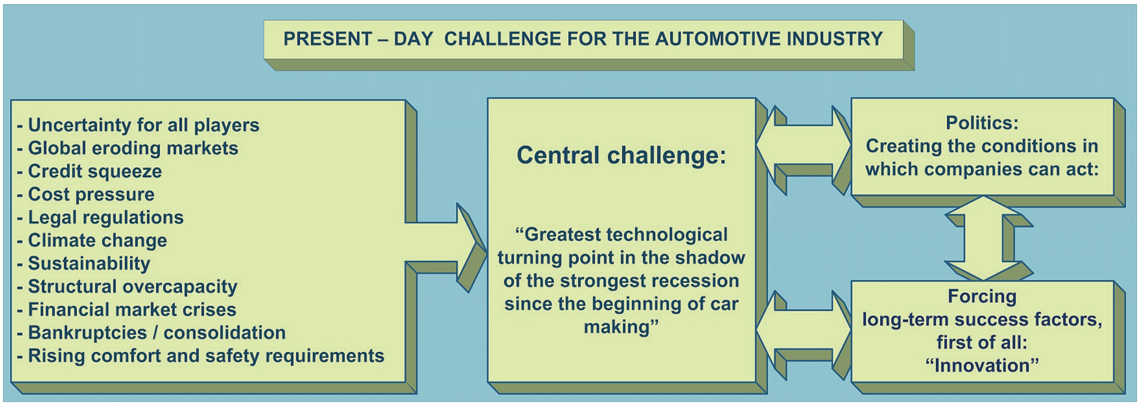

Fig. 2 *Present-day challenge for the automotive industry*

The companies will need in forthcoming time to re-evaluate their strategies and structures and adapt to oncoming changes. It deals with the update of the wide range of innovation techniques and tools:

- *Reengineering of manufacturing processes.*
- *Growing emphasis on ecological aspects.*
- *Enhancement of the innovation level of enterprises as the prerequisite for competitive ability.*
- *Advanced emphasis on innovation activities, innovation management creativity development.*
- *More effective resources use, elimination of redundancies and complicated manufacturing, material, logistic, and information flows.*
- *Implementation of management tools as: crisis management, risk management, lean structures, continuous improvement.*
- *Enhancement of communication and cooperation with scientific institutions, especially universities, on elimination of crisis impacts, improvement of processes, and effectiveness and manufacturing productivity enhancements.*
- *Enhancement of interest in cooperative networks and alliances creation (clusters, innovation centers, supplier networks, etc.).*
- *Measures for diversification of production programs and services, especially for product groups with high added value and knowledge intensive services.*

RAPID AND LEAN PRODUCT DEVELOPMENT

Within the automotive companies continuously grows the share of research and development cost. For illustration, between the years 1990 - 2000 the outcomes of worldwide car companies in research and development increased more than 200%, what represents 5 - 7 % of revenues. Except normal factors, acting in long-time periods, as inflation, and wage and inputs growth, the pressure on increase of research and development costs is caused by additional factors:

- *Advanced complexity of consequent innovations (sophistication of products) and acceleration of innovation cycles.*
- *Growing complexity of innovations (more variants).*
- *Additional social and legal factors (e.g. environmental, recycling, reliability requirements).*
- *Development of research itself.*
- *Global character of research and development activities, risks of competiveness.*

The best way to eliminate the losses that don't add value within the process of product design and development is to apply the "lean thinking" philosophy. Since "lean" business cannot produce "bold" products, the Lean Design and Lean Product Development methods get into concern. Chances to dramatic reductions of costs during the product design are:

- *Reduction of direct material costs: platform components and material, simplifying of design, reduction of useless waste, samples, prototypes, etc.*
- *Reduction of direct costs on experiments and testing: simplifying of design - design for lean manufacturing and assembly, reduction of part count, adaptation of product tolerances to operational possibilities, process standardizing, etc.*
- *Reduction of operational costs: minimum impact on reconfiguration of manufacturing processes and systems, modular design, standards for modifications according to customer's demands, better uti-*

lization of manufacturing capacities and human resources.

- *Minimizing development costs: platform of design strategies, lean QFD, Six Sigma, design of experiments, value engineering, and others.*

Acceleration of product development process affects three basic lean principles:

- *Preference of projects that have high value for company in terms of long-time direction of business.*
- *Concentration of development activities: perform the work tasks in the shortest time possible, and minimum moving of project documentation between individuals and departments. That can be achieved with simultaneous solving and strong IT support.*
- *Application of knowledge basis from the existing products and technical experiences portfolio in order to support design of new product. It means to make use of appropriate expertise, learn more than until now and update the knowledge base with development-relevant data from suppliers, competitors, customers, and partners.*

Checklist for Lean Design

Do the clearly formulated goals for Lean-type new product planning exist?

Do the process analyses of actual production, checklists, etc. for planning of new production exist?

Within the process of product design, are there used the tools as: Design for manufacturing/assembly (DFM/A), Design for quality (DFQ), Design for Six Sigma (DFSS), Design to cost (DTC), Quality function deployment (QFD), Design failure mode and effect analysis (DFMEA)?

Are the manufacturing representatives intensive included into the development process of the new product?

Is there the influence of new products on costs, functionality, assembly feasibility, logistics, and quality taken into account and evaluated?

What is the ratio of repeating parts (used in previous product) in new product? The more – the better.

The representative of use of Lean Design in automotive production is the New JIT System Toyota [5], which extends the original Toyota Production System (TPS) with:

- Toyota Marketing System (TMS).
- Toyota Development System (TDS).

The development process is defined here as process of knowledge creation and management in order to create the continuous flow of high profitable products. The ambitions of new system are:

- *Four times higher productivity of engineers in development compared to European and American companies.*
- *Despite of 50% faster development than competitors, the highest quality in branch.*
- *Only 25% of competitors' workers amount in development process.*
- *There are not applied complicated process procedures for development management and all the deadlines of the project are right on schedule.*
- *Self-learning company - all the knowledge gained during the development process is stored for possible use in future projects.*
- *Simultaneous development with number of parallel projects and prototypes.*
- *Teams built on knowledge and experience of the leaders.*

INTEGRATION OF PRODUCT INNOVATION TECHNIQUES APPLICATION CASE STUDY: MID MARKET SPORT SEAT DEVELOPMENT

Innovation centre of automotive production, Faculty of mechanical engineering, Technical university of Košice (ICAV SjF TU Košice) applied the principles of lean innovation approach in the project of sport seat development. The project goal was set as: sport version of simultaneously developed 1st row driver side standard version seat for left hand drive B-class vehicles intended for markets in Middle and East Europe. Crucial attributes of final solution were demand on development time compression (limited to 6 months since the project kick-off), inventiveness of design (differentiation from competitive products), and keeping the limitations as the platform, development and manufacturing costs, manufacturing feasibility and so on. Combination of these key attributes required application of integrated innovation tools mix to achieve the partial results within the specific project stages, as described on Fig. 3. The statement of work (SOW) that represents required proceedings and delimitations was set as follows:

- *Seat intended for Middle and Eastern Europe markets for the cars within the specified price range with specified target potential of annual sales.*
- *Attractive design according to market research re-*

sults and benchmarking.

- *Manufacturing feasibility - based on existing seat structure for basic seats, in which the system of sport seat was to be integrated. The metal structure changes were allowed in some areas, except those defined by customer as not changeable.*
- *Ergonomics, comfort and safety standards according to customer's standards (which are stricter than valid legal regulations).*
- *Technical meetings led by customer's experts on a regular basis, at least once a month in order to summarize suggestions and approve the actual progress.*

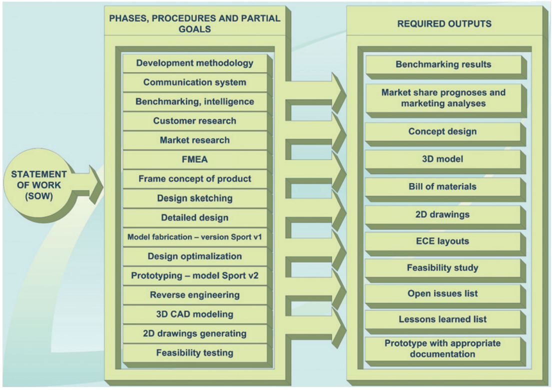

Fig. 3 *Structure of the Mid market sport seat project*

Proceedings in the project are represented by following milestones:

Month 1: Project kick-off:

- statement of work obtained, development and adaptation of the methodology, goals, scheduling and milestones setting.

Month 2: Product development kick-off:

- development methodology evaluation and approval,
- market research, benchmark and user demands survey launch,
- test run of the information system (CMS with web interface).

Month 3: Concept frame preparation:

- CMS system evaluated, adjusted and fully operational,
- user requirements and preferences survey and competitive sport seats benchmarking,
- innovation intelligence: inspiration suggestions,
- sport seat parameters specifications and preliminary version of the frame design,
- solution alternatives generating (morphological map Fig. 4), visualization (sketches - example Fig. 5) and evaluation,
- sales and market share prognoses for the target markets.

Month 4: Detailed design preparation and kick-off:

- concept frame evaluation and refinement,
- development of the features according to the research results and recommendations,
- complementary activities: FMEA, launch of the CAD modeling, prototyping technologies evaluation, further proceedings evaluation,
- first physical model fabrication - Sport 1 (Fig. 6).

Months 5 and 6: Detailed design elaboration, testing and optimization:

- presentation and evaluation of the first generation prototype,
- development finalization ,
- CAD modeling,
- relevant post-development analyses (safety, manufacturing feasibility, etc.) and required documentation elaboration,
- prototype fabrication - Sport 2 (Fig. 7).

End of month 6 - Deadline for the final delivery of all deliverables: approval of the project results and documentation performed on the final meeting at the customer's headquarters.

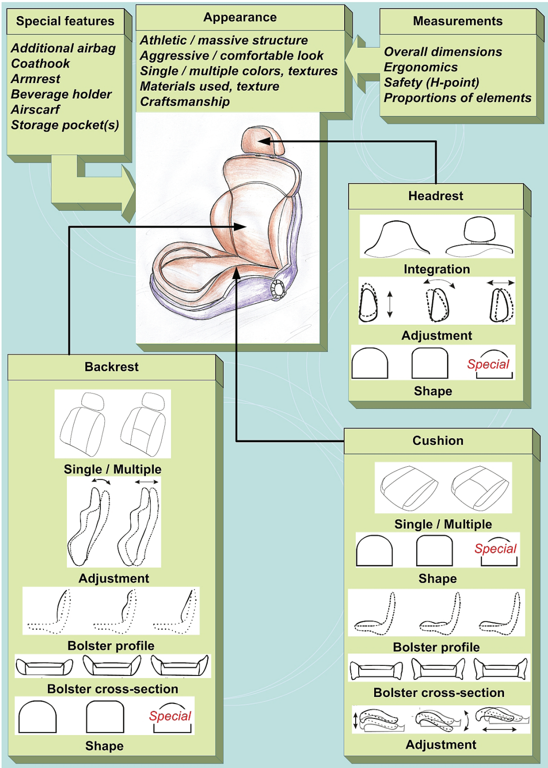

Fig. 4 *Morphologic map of sport seat*

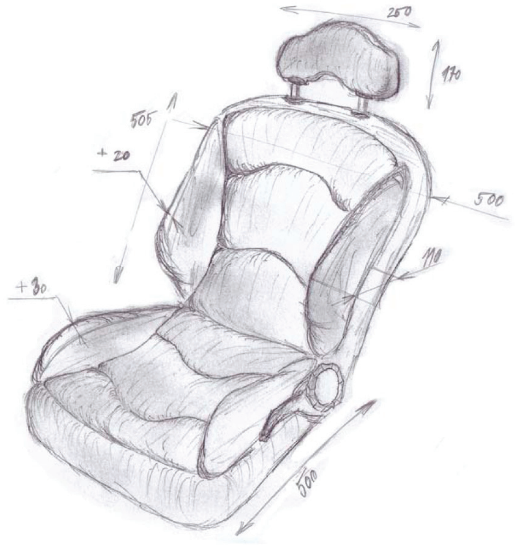

Fig. 5 *Concept frame sketch of the sport seat*


Fig. 6 *Sport seat mockup Sport 1*
Fig. 7 *Sport seat prototype Sport 2*

INNOVATION TECHNIQUES AND TOOLS INTEGRATION APPROACH FOR AN EFFECTIVE PRODUCT DESIGN

Experience from Mid market sport seat project and other similar projects proved that for innovation process in the field of automotive components is the integrated portfolio of innovation methods and techniques an excellent way to gain the benefits of lean approach. The recipe for successful portfolio mixture must consist of four essential ingredients:

1. Analytic innovation methods and techniques

They are intended for gathering and evaluation of source data for innovation process and its particular phases launch, including i.a.:

■ ***Surveys:*** *marketing surveys for future product users, surveys for branch experts, etc. As a tool of open and user innovation they are helping to refine the product innovation according to user needs and demands. In combination with taking the opinions or suggestions branch specialists into account provide the unique tool to adjust the product bespoke target user groups and assure the competitive success.*

■ ***Benchmarking*** *of competitive products. Helps development teams become familiar with the bill of materials, part count, features etc. of competitive products in the appropriate segments in order to understand how to improve the engineering and/or design of the product and trends in the area. The more complex, detailed and numerous (in terms of examined competitive products) the benchmarking is, the better. There is also recommended to perform the examination outside the product segment's boundaries, in order to explore and identify key differentiating features as the optional areas for improvements.*

■ ***Innovation intelligence*** *focused on inspiration suggestions (product architecture, new functions, materials, technologies, fields of application, etc.) partially utilizes benchmarking results, which, combined with new knowledge can be the source of new innovation ideas.*

2. Creative methods and techniques

In the beginning of the innovation process are used to generating innovation ideas, their evaluation and transformation to innovation opportunities, and also in concept creation. Some of them play in the next phases the role of stimulating pulses for subsequent appropriate outputs routine. Here belongs a number of methods and techniques, i.a.:

■ ***Brainstorming (brainwriting).*** *Spontaneous and quick random generating of number of ideas can be useful for almost each problem solving. For example, within the Mid market sport seat project were this way solved the questions of conceptual frame, original shape design of simple trim outfit, etc.*

■ ***TRIZ.*** *Uses algorithmic approach (unlike random in brainstorming) to solve the contradictions using the typical solutions where the ideal final result is predetermined (set within the SOW, according to customer standards, legal regulations etc.). Within the project was TRIZ used to solve the contradictions in interfaces between existing platform and new shapes, where particular elements were defined by customer as not changeable.*

■ ***Morphologic tables / morphologic map.*** *As illustrated on figure 4, this tool is intended to quick design alternatives creation. It has shown very useful by generating headrest, lumbar bolster shape, and additional* *features.*

3. Control and testing methods and techniques

Their role is to reveal risks and possible weaknesses of actual state before and during the phases of innovation process help to eliminate them, and provide the boundaries of the acceptable innovation. For example:

- ***Quality function deployment (QFD)*** *is an extremely powerful catalyst for driving in quality at all stages of the product life cycle. It integrates quality throughout the value chain by starting with the Voice of Customer (VOC) and working with quality until the positive impact on customer satisfaction is achieved. The VOC (customers' requirements as expressed in their own terms) is translated into final product characteristics expressed in technical terms with help of the series of matrices.*
- ***Failure mode and effect analysis (FMEA)*** *reveals the potential weaknesses of the analyzed system and suggest the recommended actions towards the critical and significant characteristics. The Design FMEA (DFMEA) in product design must primarily take into account following groups of product functions (ordered by descending importance): legal (legislation and standards), safety, operational (basic functionality), comfort of use, manufacturing and assembly feasibility, ergonomics, robustness (reliability and durability), and haptic and optic functions.*
- ***Cause - effect diagram*** *is the fishbone shape diagram heading to negative state and describing the groups of negative factors leading to the negative state. The more clearly and accurate reason is defined, the best chance is to eliminate it fast and cheap.*
- ***Design to cost (DTC), Design for manufacturing/assembly (DFM/A),*** *etc. are so called "design for X" methodologies, where X may correspond to one of dozens of quality criteria such as reliability, serviceability, environmental impact, manufacturability, etc., or particular costs within specified boundaries. Basic general principles for achieving any of the Xs in DFX are: detail design decisions can have substantial impact on product quality and cost; development teams face multiple, and often conflicting, goals; it is important to have metrics with which to compare alternative designs; dramatic improvements often require substantial creative efforts early in the process. A well defined method assists the decision-making process.*
- ***SWOT analysis*** *despite the lack of measurement accuracy, it can be very useful e.g. for technical meetings for brief description of actual results.*

4. Support techniques and tools

- *CA technologies accelerate, simplify, and enhance quality of outputs of routine procedures, and allow limited testing via simulations.*
- *Integrated cycle of shape design refinement: Optimization - Model fabrication, prototyping (Fig. 8) - Reverse engineering (3D scanning - Fig. 9 and digitizing - Fig. 10 a 11). As soon as the geometry is defined, the physical model can be built as a first visualization. There are a number of methods and techniques available to make a mockup, e.g. clay modeling, foam blocks hand tooling, epoxy resin laminating, silicone molding and urethane casting etc. For the further development of the car, the CAD model is needed. To get a CAD model, the reverse engineering phase has to be performed. This involves the preparation of the model (fixing the mockup and the definition of the reference points in order to stitching the surfaces correctly), digitizing (obtaining the point cloud) and final corrections and conversion (smoothing and stitching the surfaces and export to the interchangeable CAD file format).*
- *Rapid prototyping means not only use of computer-aided manufacturing (whether CNC machining or layered manufacturing), but the quickest and cheapest way of fabrication of prototypes (or mockups) with optimum quality, which means to sufficiently fulfill the needs in current state of product development. In addition to conventional technologies and materials, the use of easy formable materials (polyurethane or polystyrene foams and blocks) makes good.*
- *Network-based development represents one of the paradigms of innovative approaches to product development in cooperation with various partners within the network. Selected of involved partners are engaged in the individual phases and there are created virtual sub-teams ad hoc in order to create outputs needed (concept frame, QFD, benchmarking, FMEA, analyses, surveys, documentation, optimizing, etc.). General paradigm of such as network for product design is shown on figure 12. Advantage of this approach is lean and flexible team with clearly defined competences and responsibility of each team member. Result is the save of time since every member takes part only on assigned work tasks. Thanks to IT support is each involved partner informed about current progress of single tasks, which can comment, or consult the correspondence with own task results and further proceedings. Combined with parallel solving of several partial tasks is there applying the simultaneous engineering approach that brings saves of time and costs, and brings*

competitive advantage in terms of advanced design robustness.

■ E-community is a general term used to refer to computer-enhanced method of cooperation between geographically dislocated members making use of web tools and technologies to perform distance learning, team working on the specific project, knowledge sharing and so on. The communication between the members of the community can be both synchronous (chat, video conference, remote desktop sharing, whiteboard, etc.) and asynchronous (discussion boards, messaging, knowledge library, etc.). According to purpose of the community and structure of the team, the specific needs and requirements, as good as the levels of utilization of the specific tools often vary. The reasons are various: sometimes are the skills of the team members insufficient to use some of the tools, the nature of the project may not allow using them or it will only complicate the work, or the specific tool may be too simple to support the solution of advanced tasks or it doesn't provide the results as it is required and needed. That's why the crucial role of the community manager (learning tutor, community moderator or project team leader), in addition to planning, scheduling and coordinating the community activities and motivating the team members, is to adjust the environment and available tools to gain an optimum profitability. The software support of e-community can be also various according to the conditions mentioned above. The highest and most complex level of integration of these tools is within the frame of so called CMSs (Content management systems). Example of the most common tools available within the frame of standard CMS and their usage possibilities is in the table 1.

Fig. 8 *Mockup of the urban concept car*

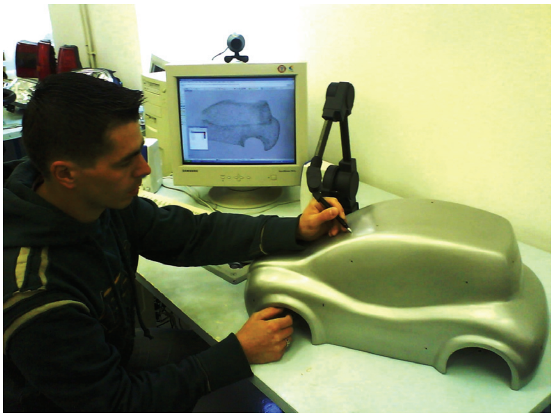

Fig. 9 *Mockup 3D scanning*

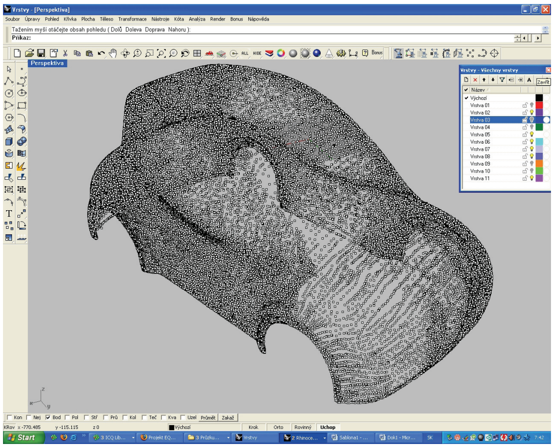

Fig. 10 *Scanned urban concept car - point cloud*

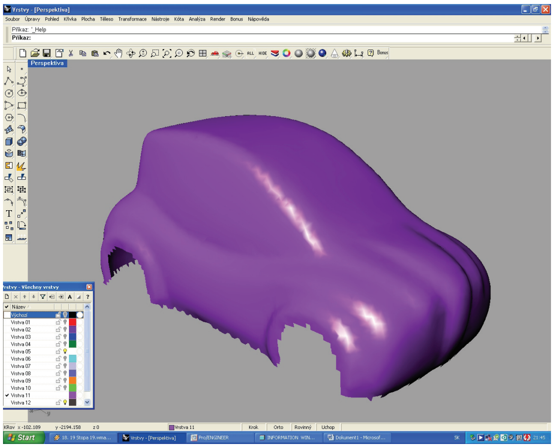

Fig. 11 *Processed point cloud - 3D surface model*

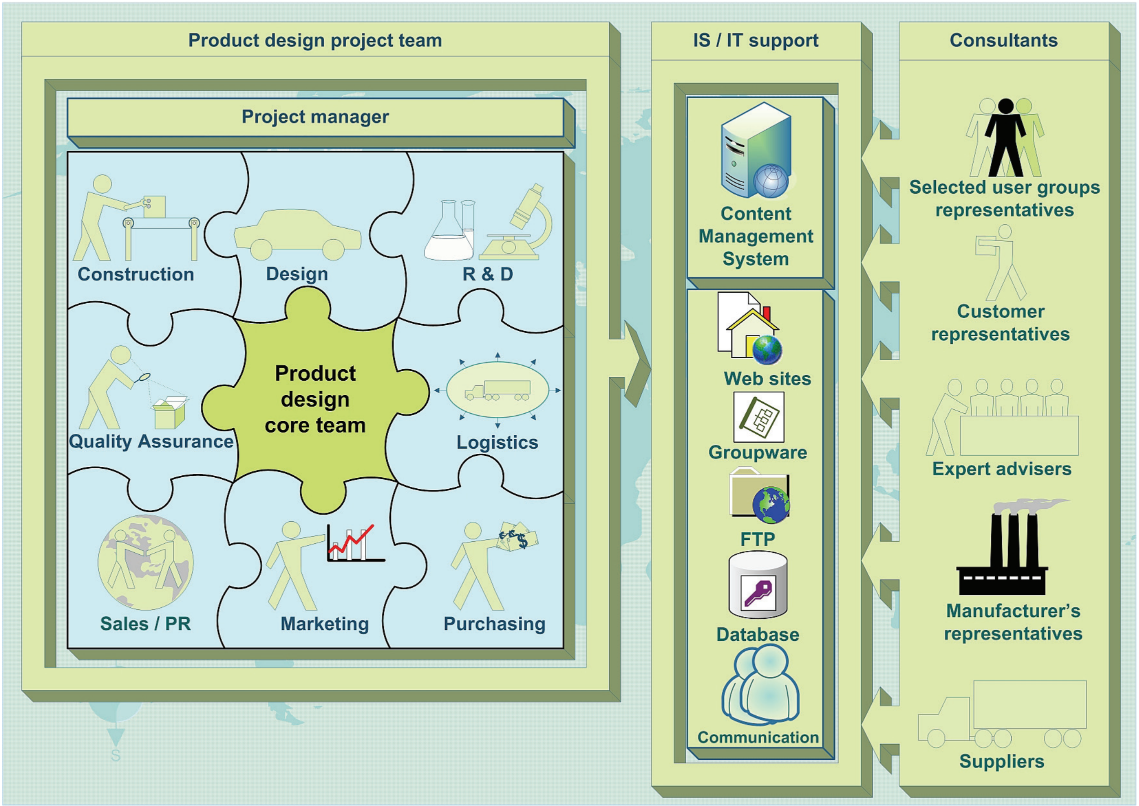

Fig. 12 *Network-based product development with IT support through CMS*

Tool	Most common usage and possibilities
Web page manager	User-friendly and digestedly-organized content creation and publishing (often combined with appropriate WYSIWYG editor)
WIKI	Collaborative document creation, glossaries, etc.
Chat / conferencing	Real time communication
Discussion board	Asynchronous communication, private and public messaging
Videoconference	Visual real time communication
Whiteboard	Visualization of ideas (schemes, diagrams, etc.)
Audio/video streaming	Visual learning / demonstrations (e.g. instructional video)
Calendar	Planning and scheduling of important events
Library	Data storage (documents, files, programs, etc.)
Web link library	Sorted web links, reference to published documents on another servers in order to save disk space and other resources
Blog	Chronological ordered entries, e.g. personal comments, notes to project progress etc.
Sandbox	Area used to getting familiar with the e-community tools and to practice; the changes made here are not saved and have no influence on the other content

Tab. 1 *Common CMS tools and fields of their usage*

CONCLUSION

The companies will need in forthcoming time to reevaluate their strategies and adapt to oncoming changes. The best way to eliminate the losses that don't add value within the process of product design and development is to apply the "lean thinking" philosophy. Lean approach means way, how to gain the best results in the most effective way. It does not mean always the easiest way, especially the change of thinking is very hard, but it's worth. The most important thing is to realize, that any effort makes sense only if it adds value to product, company, customer, employee, etc. Lean approach doesn't mean expensive investments, every deed that simplifies any process or system, whereby the quality does not descend, is the step towards the lean organization. The lean philosophy must become standard business policy and culture throughout each and every department, division, and employee. It necessarily needs leadership towards responsibility and motivation policy, which will clarify the benefits and meaning of measurements, and help to make the discipline in lean thinking sustainable. There are many innovative methods, techniques and tools available, the only problem is to make them useful.

The global financial crisis changed many things. However, it won't change the innovations and experience.

ACKNOWLEDGEMENTS

This article was supported by project VEGA 1/0248/09 – Innovative techniques for design and testing of automobile components.

REFERENCES

[1] Womac,J.P.: Manufacturing Beyond the Crisis. Lean Enterprise Institute. August 2009

[2] Impact of the Financial and Economic Crisis on European Industries. EU Report IP/ITRE/RT/2009-04

[3] Polczynski,M.: Five Principles of Lean Thinking. ENMVA 6040 Spring 2009.www.technologyforge.net

[4] [4] Annual Report 2009.Verband der Autoindustrie. /VDA/ Berlin June 2009.ISSN 0171 4317

[5] Amasaka, K.: Applying New JIT - Toyota's global production strategy: Epoch-making innovation of the work environment. Pergamon Press, Inc. Tarrytown, NY, USA, 2007, ISSN:0736-5845

[6] Engel, K.: Future Innovation Paradigms – Potential, Opportunities and Threats, AT KEARNEY, Frankfurt 2008

[7] Auto 2020: Passenger Cars - Expert Perspective. January 2009, AT KEARNEY

[8] Automotive 2020 Clarity beyond the chaos. IBM Institute for Business Value, August 2008

[9] Global Automotive Supplier Study 2009. How supplier can master the auto crisis , Roland Berger Strategy Consultants, October 2009

[10] Babjak, Š. et al.: Inovatívne metódy navrhovania automobilových komponentov interiéru - projekt Mid market sport seat. In: Transfer inovácií. č. 12 (2008), s. 55-57. ISSN 1337-7094

[11] Mid Market Sport Seat Project documentation, ICAV SjF TU v Košiciach , 2008