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**Management of innovation projects in SMEs
in the Czech Republic**

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Abstract

There is prevailing understanding that large companies are mostly inclined to using sophisticated innovation management processes as well as other management tools like project portfolio management while SMEs are believed to take advantage of more simple and often intuitive approaches to innovation processes management. Therefore methodologies of Monte Carlo simulation (MC), Stage Gate Control Process (SGCP) and Post-implementation review (PIR) were reprocessed into more simplistic implementation models so as to prove that these methods can be operated even by routine staffs in Czech SMEs. All the test performed proved that the applications of aforementioned methods increased the effectiveness of innovation projects management and generated added value for shareholders.

Keywords: innovation, Stage Gate Control Process, Monte Carlo simulation, post-implementation review.

JEL Classification: M11, L23, L25.

Introduction

There is a pending question whether SMEs can use routinely some of sophisticated approaches like Monte Carlo analysis (MC), Stage Gate Control Process (SGCP), or Post implementation review (PIR) which might seem to be demanding for staff skills, training, managing or funding. It has become apparent that in SMEs these activities are not prevalently used on daily basis [Frank & Roessl

2015]. Hardly can the company set up a dedicated team which would be in charge of permanent observation and control of these activities. The point is that these approaches should be in some extent simplified so as to be easily adopted by SME's company staff. Till now, there has been only a partial adaptation (e.g. in small food business [Howieson, Lawley & Selen 2014]) for the decision support concerning innovation project contribution for firm's value creating in the SME's segment. To fill this gap it was necessary to develop implementation models for the application of aforementioned methods which would be instructive enough and easily implemented and operated in SMEs. Research question to be raised in this respect is whether SMEs can easily master any of these methods under strictly confined conditions which are typical for SMEs and make them efficient company value drivers.

Such implementation models have been developed in University of Economics in Prague over several past years. Moreover all implementation models had to be tested and validated on innovation projects taken from industrial practice. These real case studies illustrating the topics are described in this paper.

1. Innovations and its impact on company value creation

According to Drucker any company has just two sources for growth – marketing and innovations [Drucker 2008]. Moreover Pitman [2003] proved that long-lasting company value growth was still by far the best indicator of quality of company performance. Exploration of the impact of innovation on company growth is still in spotlight for many researches. Mañez et al. [2013] as well as Rochina-Barrachina et al. [2010] examined the effect of process innovation on productivity growth with the emphasis on differences in company size. They concluded that innovation boosted company productivity no matter what company size was. For small firms the productivity growth was only temporary while for large firms the growth was long-lasting. The reason is that the innovation processes in small firms are rather incremental and easy to imitate while innovation processes in large firms are preferably of radical character and therefore unique. Similarly large companies introduce more complex processes dedicated to innovations that have become common knowledge with a longer delay. Rosenbusch, Brinckmann & Bausch [2011] examined relationships between innovation and company performance and found out that this relationship was ambiguous and depended on the context. Factors such as the age of the firm, the type of innovation and the cultural context affected the impact of innovation on firm performance to significantly larger extent [Ates, Garengo, Cocca & Bititci 2013].

Winning competitive advantage is usually considered one of basic strategic goals which enables company to outplay competitors and generate value for shareholders. Any company has to possess dynamic capabilities which include difficult-to-replicate enterprise capabilities. These capabilities are required to adapt the company to changing customer and technological opportunities [Teece 2007]. One of the most significant capability is company ability to innovate. Strategic innovation consists of four different processes that are already challenging on their own: (1) strategising, (2) entrepreneuring, (3) changing, (4) investing. Managers must think of the entire process, from idea generation and managing the renewal process up to the successful implementation of the innovation [de Witt & Meyer 2014, pp. 437-440]. For the innovation to be a customer value generator is essential to be properly designed and timely launched. In order to meet these demands a company has to establish functional and effective management of innovation activities. Despite possible variability of innovations there is an idea that a sort of formalized process can be conducive to effective management of innovation activities [Špaček 2012]. Once such a process is put into effect then the company may proceed in consonance with prescribed and properly defined steps and bring innovation project to the end in expected time and within predefined budget. Research question to be raised in this context may react to necessity of having powerful analysis tools like MC simulation to be used for analysis of risk impact on innovations projects. Furthermore there is the need to have managerial vehicle for effective innovation process management like SGCP as well as the ability of SMEs to use techniques for innovation project analysis like PIR approach.

2. Research methodology

Since the examination of problematics was preferably based on qualitative research, the method of case study was given a priority. It is not far from true that the case study is one of the most frequently used qualitative research methodologies [Yazan 2015; Yin 2014]. The topic of a case study definition was also tackled by Merriam [1998] who views the case as a thing, a single entity, and a unit around boundaries exist. Designing of case study must follow the basic logical sequence that connects the empirical data to a study's initial research questions and ultimately to its conclusions [Yazan 2015]. The first step of the research was therefore oriented on the qualitative level, concerning interviews with top and middle management of SMEs. The aim of this interviews was to describe the decision problems, match them with firm's performance and find out all limitation which could influence the decision making process. After that value analysis could be completed by modelling data and their evaluation. The

outputs of data simulation formed the scenarios which were submitted to management for decision making.

Projects chosen as case studies are to demonstrate the use of basic methodologies convenient for innovation management and value process management creating. The MC simulation is suitable for doing innovation project risk analysis, according to which it is possible to design quantitative scenarios and make decisions towards innovation project contribution for value creating. The SGCP is a methodology used for innovation project management which take place in actual time and environmental framework. The PIR is a final phase, where the ongoing projects could be analysed and outputs of it may contribute to growing firm's knowledge. Case studies presented are based on following theoretical background.

2.1. Risk analysis of the investment project by support of MC analysis

MC simulation represents certain type of computing algorithms which simulate behaviour of various physical and mathematical systems. MC simulation can be defined as stochastic, static simulation which uses continuous distribution of input variables [Wright 2002]. MC simulation can be used as a tool for the solution probabilistic models which cannot be solved at all or can be solved by means of analytical methods with difficulties [Koller 2005]. Primary output of MC simulation is the probabilistic distribution of output value of a simulation model and its statistic characteristics. In addition MC simulation is considered quite demanding approach which requires properly skilled and qualified staff which has moreover good command of mathematics and statistics. Despite this demandingness which may deter potential users from the application of MC method it is possible to make this method much more simplistic and open it up to non-professionals. This was exactly what SMEs want: to use demanding and complex method which would help facilitate risk analysis on one hand and not simultaneously invest excessive money or effort to education of company staff to acquire skills which are not applied on a daily basis. The goal of this part of this paper was to elaborate methodology of the application of MC method in SMEs. MC simulation is a technique currently used in power engineering for instance for power system composite reliability assessment due to its flexibility and the possibility of obtaining the probability distribution of variables of interest [Madhusudahan & Sankar 2007]. Further field of use the MC modelling can be traced in SME's financial performance prediction influenced by adding middle-manager innovators to low-innovation SMEs [Mellor 2015]). The use of the MC simulation can be often seen in valuation of innovation investment through real options method [Liu & Liu 2006).

2.2. Product portfolio management innovation by SGCP

In general SGCP is a conceptual and operational road map which enables passing a new product project from the very idea to a final launch [Cooper 2008]. The term SGCP was coined for the first time in late 80. by Cooper [1986; 1990]. Over next two decades he gathered findings and best practices from companies which had a proven track record on innovation and arrived at formalised process which included: building in an idea capture and handling system; doing voice of customer research work, including “camping out” with customers and working with innovative users; generating scenarios; and holding major revenue-generating events [Cooper et al. 2002; Cooper 2008]. The idea behind the process is to systematically and carefully evaluate the merits of a product or service idea before, rather than after, it is launched [Cooper 1990]. He postulated SGCP to help firms minimise the risk of new product failure and to help managers develop differentiated products or services with superior value [Barringer & Gresock 2008]. SGCP typically consolidates tasks and decisions into a bundle of activities so called stage. Passing on the innovation from one stage to another is contingent upon meeting criteria and the approval of management gates (so called gate keeping) [Barringer & Gresock 2008]. It is worth to stress that SGCP is not a rigid but flexible concept. It may be creatively and purposefully adapted to serve special purposes like product and process quality improvement [Wuest et al. 2014]. Especially SMEs can't afford to use SGCP in the full scope [Donath 2001]. As pointed out in this paper it can be also adjusted to special type of business or company size. The SGCP methodology is not routinely used in the project management of SMEs in the Czech Republic. On the contrary the literary sources describe the use of this approach in Germany [Leithold et al. 2015].

2.3. Innovation projects PIR implementation

PIR means retrospective evaluation of actual project performance as compared to initial assumption. PIR is usually performed 1-2 years after the implementation of the project. The objective of PIR is not only a plain comparison of originally set performance indicators like profit, investments, production capacity utilisation, technology failure rate, etc., but also obtaining lessons learned to be applied to the next projects. PIR topic was subjected to more than 15 years systematic literature search nevertheless PIR approach hasn't been largely tackled by SMEs so far. Over this time various approaches to PIRs were experienced [Fotr et al. 2009]. These findings enabled to arrive to some generalisation concerning formalised methodology of PIR, which would be applicable with slight modifications to any industrial subject. This methodology is addressed in this paper.

Inclusion of feedback into investment decision making process represents a powerful tool for the improvement of quality of investment process management. This feedback which is designed as *post implementation review* (PIR) or *postaudit of project* offers a tool by which it is possible not only to learn from past mistakes but also implement corrective measures to pending projects to prevent from undesired proceeding the project and thus to minimize deepening possible losses [Downs & Kondolf 2002].

Projects to be selected for PIR should observe several rules which are dependent on the size of the company, the scope of investment activities and general entrepreneurial context. Evaluation of PIR can be made according to various standards. In this paper the methodology of Špaček [2009] was applied.

3. Case studies

As case studies the authors chose three typical examples demonstrating the stepwise use of mentioned methodologies in real firms. Photovoltaic PowerStation as a highly risky project accompanied by high investment costs was tested by MC in this paper. Pharmaceutical firm operating under strictly regulated rules so as to avoid the risk of damage of human health was chosen as an appropriate example for SGCP. An example from machinery firm was taken for the demonstration of Post Implementation Review. All these case studies were completed during 2010-2013.

3.1. Risk analysis of the investment project by support of MC analysis

Photovoltaic PowerStation project was selected to exemplify the effectiveness of using MC simulation in SMEs.

Consortium of Czech entrepreneurs decided to invest financial resources into construction of Photovoltaic PowerStation. Designed installed input was either 1.0 or 1.5 MW. Advantageous purchase energy prices up to CZK 14.0/1 kWh over this period were incentives for this investment. Even if the Czech Regulatory Office has temporarily announced gradual decrease of electricity purchase prices this investment remained still a lucrative opportunity [Bobůrková 2009]. Further investment stimulus is income tax exemption for 5 + 1 years. A typical feature of such an investment was a relatively high cost up to CZK 90-120 million for each installed MW in output. On the other hand operational costs of these investments have been low for the tested period. Supposed life time of installation was 20 years. In course of this period the efficiency of solar panels has decreased. Concerning announced decrease in purchase prices of electricity from renewal energy re-

sources, there was no time for protraction. Exploitable area for Photovoltaic PowerStation construction was limited to 50 km².

For evaluation of value creation of this innovative project key performance indicators such as Net Present Value (NPV), Internal Rate of Return (IRR) and Index of Return (IR) were chosen. As an auxiliary criterion Payback period from discounted and/or non-discounted cash-flows was used. Financial model of investment project was processed in current prices for 20 years term. Discount rate was derived from WACC and increased by unsystematic risk premium. Values of key performance indicators are presented in Table 1.

Table 1. Key performance indicators of Photovoltaic PowerStation investment project

NPV (thous. CZK)	IRR (%)	IR	Payback period in years (non-DCF)	Payback period in years (DCF)
5,253	11.1	1.03	9.3	18.8

Source: Own calculation.

To proceed with this method it was necessary to observe a couple of recommendable steps: First of all it was essential to choose simulation software like Crystal Ball (CB) [www 1]. Then it was necessary to set up a financial model which represents backbone of Monte Carlo. This model clearly stated which output criteria (like NPV) would be observed. Next step was risk factors determination (sensitivity analysis or an expert opinion). The most critical step is key risk factors determination and assigning probability distribution to any of key input variables. For the latter due to shortage of historic data experts' opinion played crucial role. Probability distribution were selected so that the opinion "to be on the safe side" principle was observed (the probability distribution shapes of the costs item would incline to overcoming mean value and vice versa for profit values). It is worth mentioning that risk factors usually gained different values during project life time (20 years). Total number of risk factors therefore accounted for 90 (6 x 15 = 90). All the variables which were used in the simulation were derived either from expert knowledge or actual market values. The key parameter values were then set as follows:

1. Quantity sold was derived from demand for the product and possibilities of its further processing.
2. Production capacity utilisation reflected possible variability of production capacity in dependence of technological constraints.
3. Unit price of the product.

4. Operation production costs reflected prices of key raw materials as well as accompanying overhead provoked by the implementation and operating production unit.
5. Investment expenditure were expressed in terms of inevitable investments to be executed during project lifetime.
6. Discount Rate variability mirrored different risk exposure during project lifetime including the change in company capital structure (depending on the way of project financing).

The number of simulation steps was 50,000.

3.2. Product portfolio management innovation by SGCP

PharmaComm s.r.o. is the mid-size Czech pharmaceutical company which is focused on the development, production and sales of active pharmaceutical ingredients. Development of a new product thus requires exploration of multi-step technology, its optimisation and validation. In order to minimise failures, the company established formalised innovations management process, which bears resemblance to SGCP.

Stage 0 – discovery: Activities were oriented on revelation of opportunities and generation of new ideas about the product. Process of innovation was initiated by collecting ideas, which may originated from both inside and outside the company. Ideas generators were usually R&D or marketing people. The output of this stage was critical assessment of ideas from various points of view like environmental impact of technology, accessibility of key sources, preliminary technical feasibility etc. If the results substantiated further proceeding with the idea, then the topic would move to the next stage where it was subjected to preliminary laboratory examination. The gatekeeper in this stage was an expert panel which was composed of R&D Managers and specialists, Quality Assurance Managers and Technical Managers.

Stage 1 – scoping and laboratory exploration: A comprehensive assessment of technical and financial benefits of the project and its market prospects was performed. This stage usually worked with variant and scenario approaches. This critical stage had to prove that the technology projected was feasible from technical point of view. To avoid potential intellectual property conflicts, preliminary laboratory development should take into consideration only those technologies which were apparently patent conflict free. The output of this stage was the Opportunity Study which should be approved by the gatekeepers top Management Team and Managing Director.

Stage 2 – development: Development plans were transformed into concrete deliverables. Plans were broken down into several phases, each of them was substantiated by comparison with predefined milestones. Technological development and engineering was performed in its full complexity including scale-up, technology placement, ancillary operation ensurance and pilot production tests. In addition to technological development, marketing, logistic, quality assurance, operating and especially financial plans were elaborated. Finally the test plans for the next stage were defined. The output of this stage was the Feasibility Study which should be approved by the gatekeeper Board of Directors.

Stage 3 – testing and validation: Testing and validation of processes were activities which were ranked among the most important ones. The purpose of this stage was to perform validation of the entire project including process and testing methodology validations. Both aforementioned types of validations were prerequisites for getting final approval from regulatory authorities. On top of that customer acceptance of the product and the economics of the project were subject to final verification. R&D and Quality assurance Directors had to put their fingers on consonance of project parameters with publically posted regulatory standards. These standards were addressed in Regulatory Bodies' guidelines (typically State Institute for Drug Control in Czech Republic – SUKL, and Food and Drug Administration in USA – FDA, and various Pharmacopoeias – European, US, Japanese Pharmacopoeia). The output of this stage was the validation report. Gatekeepers were R&D and Quality Assurance Directors.

Stage 4 – final audits of the process: Final audits of the process were critical milestones which qualify the process for commercialisation. Successful passing these audits was a precondition for product commercialisation; otherwise the company was not allowed to put the product on the market. The audits were focused on several key topics like:

Health and safety where the audit was performed by Regional Hygienic Station which had to confirm that new technology was safe.

Environmental compliance meant that technology from environmental point of view should comply with 2008/01/ES or its Czech equivalent 76/2002 Sb. When implementing new technology, companies had to submit updated version of so called Integrated Prevention and Pollution Control (IPPC). Approval was granted by a Regional Office which judged whether Best Available Technology (BAT) was actually used and environmental pollution was within prescribed limits.

Compliance with Quality Assurance Standards – this was the most challenging part of the approval process. Auditors examined whether there was a compliance of company Quality Assurance System with codified standards as well as principles of Good Manufacturing Practice (GMP) were actually applied on new technolo-

gy at full scope. If the company failed to meet GMP standards, then the company would be prevented from the production of pharmaceuticals. Gatekeepers were both internal and external auditing bodies like internal company audit, State Institute for Drug Control (SUKL), Food and Drug Administration (FDA), Regional Hygienic Station or Regional Office. Internal managers were responsible for company preparedness for final “sharp” audit while external regulatory body auditors had an integral authority to grant a final approval which enabled the company to market the product.

Stage 5 – Launch of innovative product: Any pharmaceutical product had to be registered by customers who eventually took charge of the registration of the product with respective national health authorities. Therefore it was necessary to provide customers with full support. To speed up registration process, it was necessary to provide customers with maximum available data so that the customer might avoid redundant work. Unless registration process was completed commercial production couldn't be started. Therefore it was an intention of the producer to be conducive to the customer and it was of advantage if both made joint effort to commercialise the product in shortest possible time. From the legal point of view it was necessary to execute all the sales contracts, arrange for logistics, etc. Gatekeepers were internal company managers who were responsible for smooth cooperation with the customer as well as for putting all the technicalities into effect.

3.3. Innovation projects PIR

Even if there was no established methodology for PIR implementation in SMEs, many companies preferred having a PIR methodology in place. Effectiveness of PIR was exemplified by the case taken from machinery industry.

The owners of mid-size Czech Machinery Company decided to upgrade technological processes and thus boost company effectiveness by means of construction of integrated production unit for the production of components for cranes. Inherent part of the project was the installation of a welding robot. Robot was designed to weld simple machinery parts like rolled steel joists, square tubes, etc. Such a robot was usually one-purpose apparatus with low flexibility. The objectives tied with the implementation of the robot consisted in rapid increase in quality of welds and their checking by RTG rays. The purchase of the robot was subsidized by the donation at 5.7 M CZK. As key variables, which might have decisive impact on the effectiveness of this project were set:

- Product prices – namely increase in revenues after putting robot in operation.
- Utilisation of working capacity of the robot.

- Prices of key inputs – especially iron and steel joists.
- Investment costs to be estimated at 19 M CZK.
- Discount rate 8%.
- Life time of the project – 5 year.

Net present value (NPV) and Internal rate of return (IRR) were chosen as criteria for project evaluation. Similarly payback period from discounted and non-discounted cash flow were chosen as supportive criteria. Another relevant parameters as sales, material costs, efficiency of facility and investment costs were subjected to post audit analysis. Table 2 shows key criteria which were assumed in pre-investment phase.

Table 2. Financial criteria of the project “welding robot”

	NPV (thous. CZK)	IRR (%)	Payback (non-DCF)	Payback (DCF)
Assumed values	37,310	75	2,7	2,9

As far as the outcomes of PIR are concerned Table 3 shows comparison of assumed and actual parameters of the project “welding robot”.

Table 3. Assumed and actual values of key parameters of the project “welding robot”

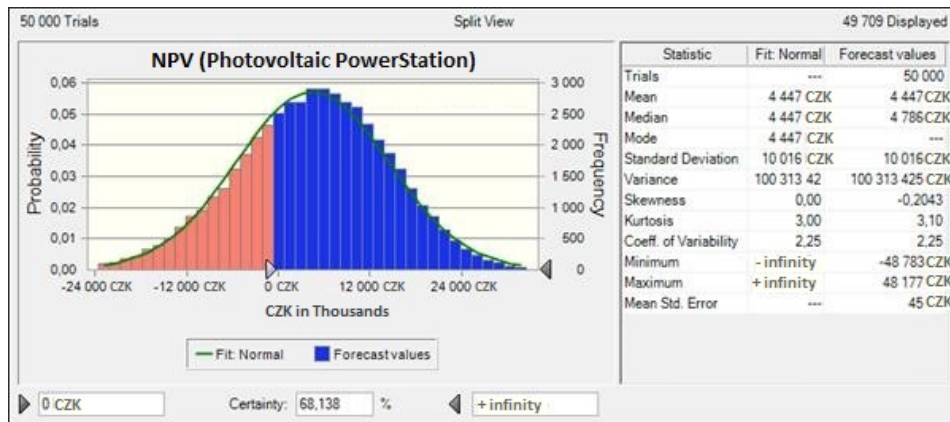
	Sales (thous. CZK)	Material costs (thous. CZK)	Efficiency of facilities (number of defect free welds)	Investment costs (thous. CZK)
Actual values	22,800	14,750	68%	21,300
Assumed values	39,900	25,835	98%	19,000

4. Results, discussion and limitation of the research

4.1. Risk analysis of the investment project by support of MC analysis

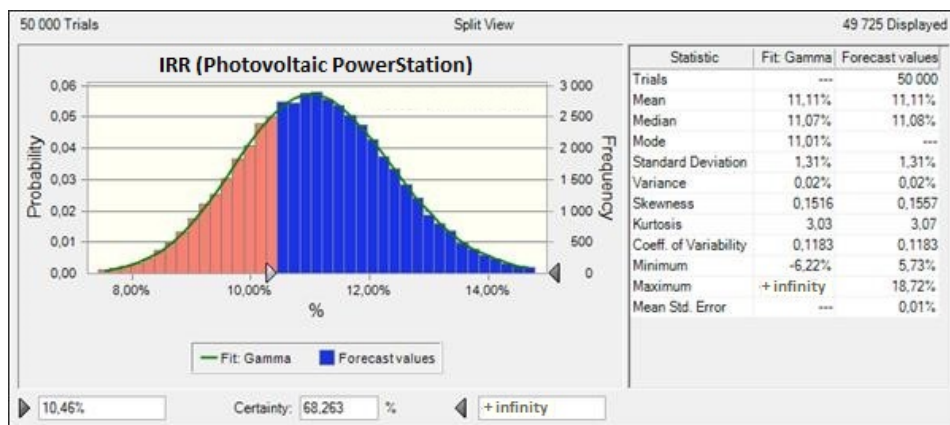
Despite to risk exposition it was recommended to execute the Photovoltaic PowerStation project. The stress-test showed that the NPV was significantly sensitive to investment costs. The second risk factor to be treated was the solar panels efficiency. It was proven that probability of minimal levels of criterion risk parameters was above 68%. Figure 1 shows probability distribution of NPV of Photovoltaic PowerStation.

Figure 1. Probability distribution of NPV of photovoltaic PowerStation



As it is evident from Figure 1, the distribution is quite symmetric and fits normal distribution. As far as the economic effectiveness of the project is concerned, there is slightly more than 68 % probability that the project will be effective (NPV > 0). Figure 2 shows probability distribution of IRR of Photovoltaic PowerStation.

Figure 2. Probability distribution of IRR of photovoltaic PowerStation



As contrasted to Figure 1 NPV probability distribution the IRR distribution fits gamma distribution (see Figure 2). In accordance with previous findings economic effectiveness also exceeds 68 % (IRR > DR, that is company discount rate including unsystematic risk premium).

4.2. Product portfolio management innovation by SGCP

In view of the fact that over past decade the company didn't have strategic plan which would support innovations, the company didn't have any new product in the pipeline. At these circumstances external investors were unwilling to bid more than 1 M Euro for PharmaComm. It was necessary to look for appropriate tools which would help over next three years increase company value to be close to the level expected by current owners (4.8 M Euro). In this context company assessed innovations as the most efficient leverage to company value generation. Due to consistent fulfilment of research strategic goals, the company PharmaComm completed reengineering of its product portfolio. Thanks to this approach entire product's life-cycle could be observed and managed. The highest value drivers had become four products which were still under development. From aforementioned dependence between the number of new products in the pipeline and company market price could be deduced, that the very innovative potential was highly evaluated by the investors.

4.3. Innovation projects PIR

Standard evaluation criteria used in PIR analysis were (1) Comparison of assumed and actual values, (2) Contingency plans, (3) Analysis of successes and failures, (4) Set of recommendation for modification of the project, (5) Set of recommendation for upcoming projects, (6) Contribution to PIR methodology. This PIR evaluation process was described by Špaček (2009).

Comparison of assumed and actual values indicated several fundamental deviations which in practice resulted in manual adjustment of technical parameters of the robot.

Contingency plans consisted in the proposal of six version of controlling software, which, with the support of operator, coped with the welding of non-standard input material.

Analysis of successes and failures came to conclusion that the project didn't fulfil objectives which were set down prior to putting project into effect. Maximum efficiency achieved was 68% only. Moreover part of the welds had to be welded manually. Non-standard production required almost permanent manual intervention in technology and breaking down the production into four product classes which were distinguished by the amount of reprocessing work.

Set of recommendation for modification of the project consisted in redefinition of supply chains and contracts closing process. The aim was to contract for such an input material which met very demanding criteria for low dimension tolerance.

Set of recommendation for upcoming projects said that for projects to be under preparation it was inevitable to place emphasis on risks connected with quality of supplies. Thorough evaluation of supplier quality systems should be also mandatory. The facility had to have such parameters which ensure problem-free processing of input materials. In this respect it was recommendable to evaluate flexibility of facilities and make decision on the purchase of more costly but more flexible facilities to be able to process material within wider tolerance.

4.4. Limitation of the research

The limitation of done research emerged from the nature of SMEs. At the beginning of the research it is necessary to take into account the resource limitation, limited possibilities to create reserves, time shortage by decision making procedures, limited staff for analytical processes, and keeping necessary flexibility of strategy and risk mitigation. As a certain limitation the character of chosen projects could be taken. Transferability of the outputs of the research is always limited by management's attitude, risk appetite and high vulnerability to the changes in company's environment.

Conclusions

Companies can boost their competitive position through capturing larger market share for innovative products, grabbing quite new businesses with innovative products and diversification of company's product portfolio. Efficient innovation management shall be thus generally considered underlying factor of sustainable company value creation. To outplay competitors managements are looking for tools which help them both speed up innovation process and find such attributes of innovation which generate higher value for customers.

The decision puzzle for the management of the Photovoltaic PowerStation project was, if it should be accepted or rejected. From the available information there was not clear, how the risk could influence the expected value of the project. Base on done MC simulation it was finally decided despite to risk exposition to execute the Photovoltaic PowerStation project.

On the example of mid-size Czech pharmaceutical company it was shown how implementation of formal strategic management of product portfolio enabled to trigger market value growth of the company and hereby the rise of investors' interest to invest in the firm stake. As a methodology for innovation management in the company, SGCP approach was used after it had been adapted to specific company environment. The paradigm of Roberts' model of SGCP was

proven to fit in well with the innovation process in middle-size pharmaceutical business. One of the most significant reason for opting for Roberts' model rather than for Cooper's one was that the former reinforces idea generation phase [Roberts 2007]. Basic requirement for the elaboration of this case study was knowledge of internal sensitive data, according to which it became possible to compare calculated market value of the company with real proposals from investors.

Done PIR proved that there was a difference between assumed values and actual values. Efficiency of the welding robot was approx. 50% shortly after the robot installation. Lower efficiency of the robot could be ascribed to both steel joist parameters fluctuation and strict demand of the robot for the accuracy of dimensions of the material to be welded. Contribution to PIR methodology implied that using one scenario approach was insufficient and it was inevitable to extend risk analysis by taking alternative scenarios of business environment development into consideration. The main conclusion which was deduced by the company experts from the PIR, was that the company should significantly improve its investment project management especially in terms of more sorrow screening of technical parameters of prospective investments.

The aim of this paper is to demonstrate that even SMEs can effectively apply sophisticated innovation management processes like SGCP as well as more advanced approaches to the evaluation of innovation project effectiveness like, MC simulation or PIR. As a matter of principle all the methods in question were simplified so as to be suitable to SMEs condition. Feasibility of using these approaches in SMEs was validated on the pattern of mid-size Czech chemical, pharmaceutical, energy and machinery companies. The chosen pattern has proven that the developed implementation models can be applied on large scale in the SMEs. Particularly not in one branch only, but according to the type of solved problems. The methodology is implementable in managerial practice, grasped by top and middle management of SMEs.

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