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Organization of the Purchasing Function for Innovation

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***Abstract*—**Innovations not only contribute to competitiveness of the company but have also positive effects on revenues. On average, product innovations account to 14 percent of companies' sales. Innovation management has substantially changed during the last decade, because of growing reliance on external partners. As a consequence, a new task for purchasing arises, as firms need to understand which suppliers actually do have high potential contributing to the innovativeness of the firm and which do not.

Proper organization of the purchasing function is important since for the majority of manufacturing companies deal with substantial material costs which pass through the purchasing function. In the past the purchasing function was largely seen as a transaction-oriented, clerical function but today purchasing is the intermediate with supply chain partners contributing to innovations, be it product or process innovations. Therefore, purchasing function has to be organized differently to enable firm innovation potential.

However, innovations are inherently risky. There are behavioral risk (that some partner will take advantage of the other party), technological risk in terms of complexity of products and processes of manufacturing and incoming materials and finally market risks, which in fact judge the value of the innovation. These risks are investigated in this work. Specifically, technological risks which deal with complexity of the products, and processes will be investigated more thoroughly. Buying components or such high edge technologies necessities careful investigation of technical features and therefore is usually conducted by a team of experts. Therefore it is hypothesized that higher the technological risk, higher will be the centralization of the purchasing function as an interface with other supply chain members.

Main contribution of this research lies is in the fact that analysis was performed on a large data set of 1493 companies, from 25 countries collected in the GMRG 4 survey. Most analyses of purchasing function are done by case study analysis of innovative firms. Therefore this study contributes with empirical evaluations that can be generalized.

***Keywords*—**Purchasing function organization, innovation, technological risk, GMRG 4 survey.

I. Introduction

VARIOUS prominent scholars argue that innovation is the key distinguishing attribute for survival e.g., [1], [2]. Substantial practitioner-oriented literature suggests that in order to survive and thrive in increasingly hypercompetitive markets, innovation is the only solution e.g., [3]. Fostering an innovation orientation has more positive effects on firm performance than creating innovation process outcomes such as patents or innovative products or services [4]. Innovative performance is important for firm growth in particular the combination of product and process innovations [5]. Not all sectors of industries are equally innovative and that was proven by [6]. Reference [7] shows there is a myriad of factors that influence and enhance innovation. New product innovations accounted for an average of 14 percent of sales revenues for all firms [8]. Reference [9] in an interesting longitudinal research tried to evaluate direct benefits from innovation and found that effective innovation programs can increase firms' revenue, cost efficiency, and market valuation. Reference [10] shows a positive relationship between quality programs and innovation.

Given this massive evidence that innovation actually helps companies one of the first objective of companies should be innovation.

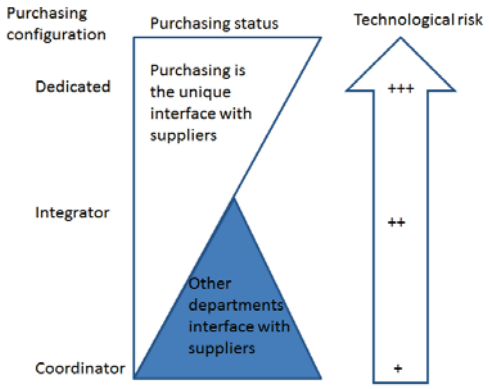


Fig. 1 Model [16] for organization of purchasing department for innovation

However, a great number of the skills and resources necessary for future prosperity and innovation lie outside a company's boundaries [11]. Focusing on innovation as a competitive priority, recent literature has emphasized the role that purchasing departments or purchasing professionals adopt with respect to the new product development (NPD) process [12]. The increasing number of outsourced R&D departments indicates the relevance of the subject [13]. Because the purchasing department (PD) is the common interface with the supply base, a natural response has been to investigate its role in the NPD process [14], [15]. Reference [16] analyzed in great detail literature on the role of purchasing department in innovation. They based the study on 7 highly innovative firms and came out with the framework for organizing the

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purchasing department shown in Fig. 1. According to their findings the higher the technological risk more centralized is the purchasing function, but involves employees with greater knowledge, spanning from commercial, technological and managerial skills.

Inspiration for this paper is enhancing the findings of [21] which are a case study method, by a large scale survey analysis based on Global Manufacturing Research (GMRG 4) data collected in 2009, involving 25 countries and covering all industries. The aim is to check the validity of [16] model.

The article is structured as follows. First the methodology is defined, then data on competitive priorities and competitive advantage are presented, followed by presentation of relationships to suppliers according to innovativeness, where innovativeness of the company is measured by a variable of % of sales generated by products introduced in last two years. Finally with the regression analysis the [16] model is tested.

II. Purchasing Function and Innovation

Purchasing function in an organization is extremely important as it deals on an average of 50% or more of a firm's expenditures [17], [18]. In the nineties the purchasing department is largely seen as a transaction-oriented, clerical function [19] but today purchasing integration provides a formal interface mechanism between purchasing and other firm functions that services other functions within the company [20]. Purchasing function if organized and managed correctly is important to the success of the firm [21]-[23]. Reference [24] shows the purchasing function has to follow manufacturing priorities in order to serve its purpose. Therefore it examined the linkages between purchasing, operations and other parts of the supply chain. Reference [25] is a book on the role of purchasing in innovation. Especially, [26] found that purchasing function is now also involved with supplier development in order to help them to manufacture to specifications of new products, so its role has grown to be more important. Reference [27] shows that innovation considers also the purchasing function but calls it "Collaborative purchasing". Reference [28] shows that managers should recognize the goal of buying, the strategic importance of the object of purchasing, and choose accordingly between the different types of supplier structures. Due to its relevance [28] propose three strategies of purchasing according to the goal of purchasing and divided them in three categories; transactional exchange, relational partnerships (mostly for R&D projects) and collaborative network (mostly for updating products).

Reference [29] added innovation as an additional priority in purchasing. They used supplier selection and retention as a surrogate for purchasing's competitive priority on innovation. Reference [30] shows that trust is very important in supply chain partnerships for enhancing innovativeness because innovations are inherently risky [31], [32].

Reference [33] analyzed behavioral risk in purchasing for innovation but concluded that purchasing managers assess overall risk in their decisions not just behavioral risks. Very similarly to [16], [34] also conclude that higher is the technological risk the company's personnel have to have greater knowledge. Reference [35] shows that purchasing managers often have contingency plans in high technology risk situations and suggests that not enough risk assessment is done on a company level.

In this work technological risk, organization of the purchasing department as well as other results will be presented. However the special emphasis is given on the relationship between the organization of the purchasing function and technological risk in order to prove or decline the [16] model.

III. Methodology

This survey research is based on Global Manufacturing Research Group (GMRG) data. The data is from the fourth round (GMRG 4.0) taking place in 2009. This research group dates back to 1986. The GMRG has gathered an extensive amount of data regarding manufacturing practices in countries all over the world. The data was collected through a questionnaire distributed simultaneously in different countries by local research groups. The responses are gathered in a unique database. The questionnaire is designed around different modules, each of which focuses on a specific research topic (e.g., outsourcing, manufacturing information systems, purchasing, forecasting). Detailed description of the project can be found in [36]. In this fourth round, 1493 filled questionnaires, from 25 countries are collected which is a respectable simple size for analysis of plant operational issues [37].

The sample was first divided according to the profit margin. This profit margin was obtained as 1 – all manufacturing costs as a percentage of sales. It was divided into three groups. If profit margin is over 0,7 then they are best performers. The low performers are with profit margins less than 0,3 and the middle range are middle performers. One may argue that there are major differences in profit margins between industries, but that has been checked for. The only industry that had above average profit margins is tobacco industry which was then excluded from the sample. The average profit margin is 0.47, while the standard deviation is 0,0603. The same procedure was performed with innovation variable. If percentage of revenues from new products is over 0,7 of sales then they are highly innovative. The low innovative are with percentage of sales from new products less than 0,3 of total sales and the middle range are middle range innovators. The mean of percentage of revenues generated by new products launched in two last years is 0,308 with standard deviation of 0,064. Again the tobacco industry had to be excluded because it had significantly higher profits from new products than the rest of the sample.

IV. The Sample and Results

In following figures the sample is represented in terms of countries that participated and according to size.

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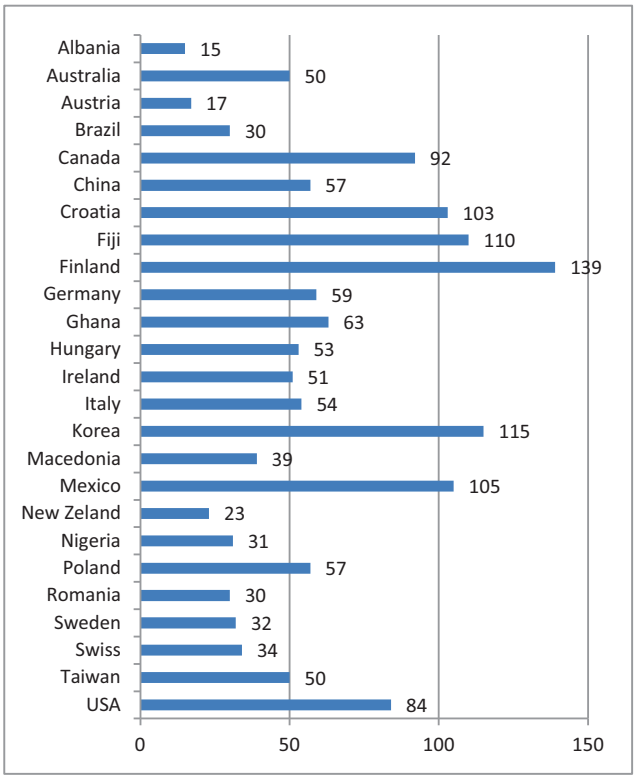


Fig. 2 Number of answers per country

As it can be seen from Fig. 2, the sample is quite rich as it covers developed and developing countries. There are countries with expensive workforce (Finland, Germany) as well as countries with cheap workforce like China for example.

The sample is also investigated according to size. It is important to see that the sample is well represented by size (measured in terms of number of employees) so that results can be generalized.

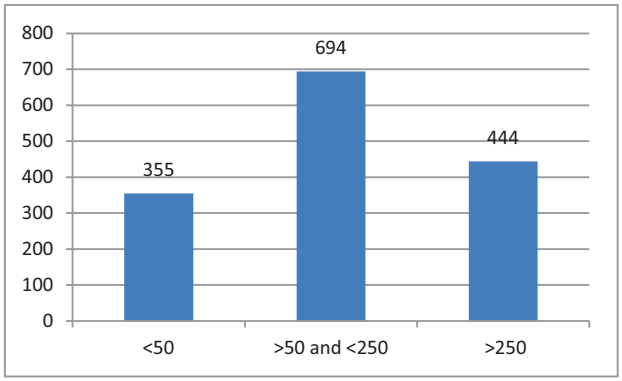


Fig. 3 Number of answering companies according to size

Fig. 3 represents the distribution of the sample according to size of the company. It has to be noted that the collecting cutoff was companies with more than 10 employees.

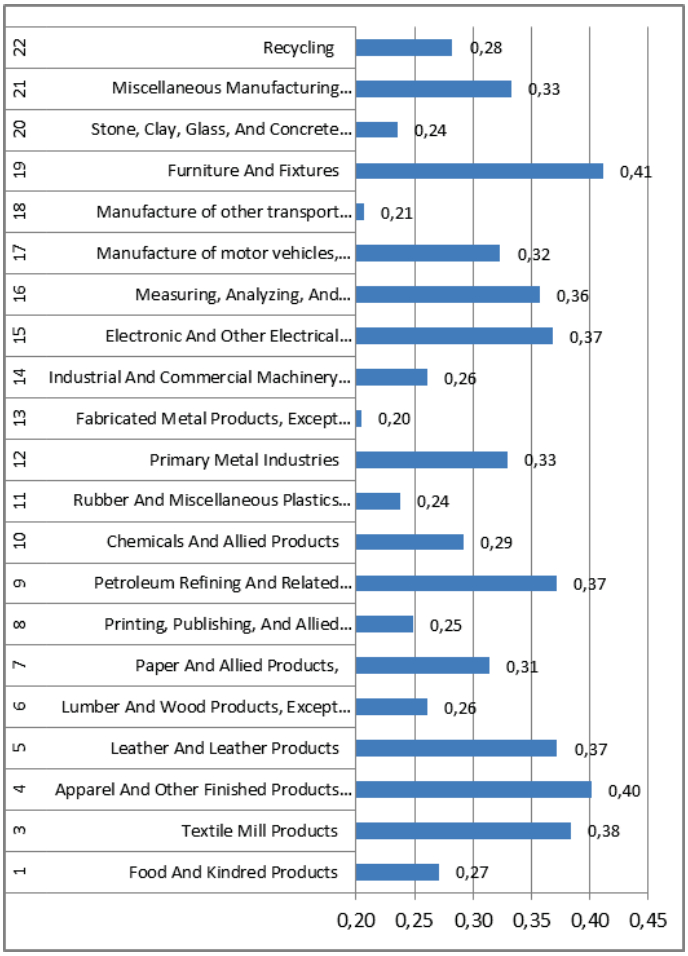


Fig. 4 Revenues from new products by industry

There are fewer high performers (22,64%) and very few high innovators (14,4%). A large data sample is of unique value to compare differences between various performers.

Priorities are mainly goals so the next step was to evaluate what priorities have high innovators and do they differ between innovators and non-innovators. The result is depicted in Table I.

TABLE I
PRIORITIES BY INNOVATORS

% sales from new products group	Cost	Quality	Delivery	Variety	New Product	Environment/ Safety
< 30% of sales (low innovators)	26,9	25,1	17,8	11,3	10,7	11,6
30%-70% of sales (medium innovators)	26,4	26,6	18,0	13,4	15,3	11,8
> 70% of sales (high innovators)	30,0	27,5	16,8	12,1	15,9	14,0
Mean	27,2	25,8	17,7	12,0	12,7	12,0
N=1312						

As can be seen from Table I, even high innovators don't have innovation as their top priority. The top priority for all groups is costs followed by quality. A T-test was performed and there are significant differences between the groups except for delivery priority.

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All the risks rise as we move from low innovators to high innovators (Table II) which are expected. There is a statistically significant difference on Technology and Behavioral risk between groups found in the ANOVA table, but no statistically significant difference in Market risk, meaning that although high innovators face greater Market risk this risk is not statistically different for other two groups leading to a conclusion that market risk is present to all companies.

TABLE II
RISK MEAN VALUES FOR CLASSES OF INNOVATORS (LIKERT SCALE 1-5)

% sales from new products group	Technology Risk	Behavioral Risk	Market Risk
< 30% of sales (low innovators)	2,03	2,24	2,43
30%-70% of sales (medium innovators)	2,27	2,32	2,4
> 70% of sales (high innovators)	2,31	2,49	2,53

Technological and behavioral risks are higher for higher innovators.

Low innovators have "Other" reasons as dominant reason why they chose this most important supplier, while to most innovative firms reasons as "Parent company ordered" and "Latest manufacturing technology" makes this supplier most important, as can be seen in Table III.

TABLE III
REASONS WHY THE CHOSEN SUPPLIER IS MOST IMPORTANT (PERCENTAGE OF ANSWERS)

Percentage of sales generated by new products launched in last two years	Largest Value	New Technology	Parent company ordered	Latest manufacturing technology	Longest contract	Other
< 30% of sales (low innovators)	56,6%	56,3%	47,7%	40,0%	44,8%	66,9%
30%-70% of sales (medium innovators)	27,5%	24,4%	29,2%	37,7%	37,5%	18,6%
> 70% of sales (high innovators)	15,9%	19,3%	23,1%	22,4%	17,7%	14,5%

Fourteen criteria for evaluation of suppliers were researched, but the ANOVA analysis revealed no statistically significant differences in evaluation criteria by the three groups, except significant differences on three following negotiation activities for the most innovative group. The results are displayed in Table IV.

"Haggling" and "Excessive negotiation" is lower for the high innovators, while "Mutual trust" is higher for the high innovators. There is no statistically significant difference how the suppliers are evaluated and the dominant method for all three groups of innovators are quality of purchased material, delivery timeliness and avoidance of stock outs. Methods for supplier selection between groups are presented in Fig. 5.

TABLE IV
THE ANOVA TABLE, SIGNIFICANT DIFFERENCES IN NEGOTIATING PRACTICES

	F	Sig.
This supplier and my firm are committed to relationship of mutual respect, that is, we do not to alter facts to own advantage	3,645	,013
Involve "excessive" haggling	4,005	,008
Involve an "excessive" (i.e. beyond what you would consider to be 'normal') amount of negotiation sessions	8,153	,000

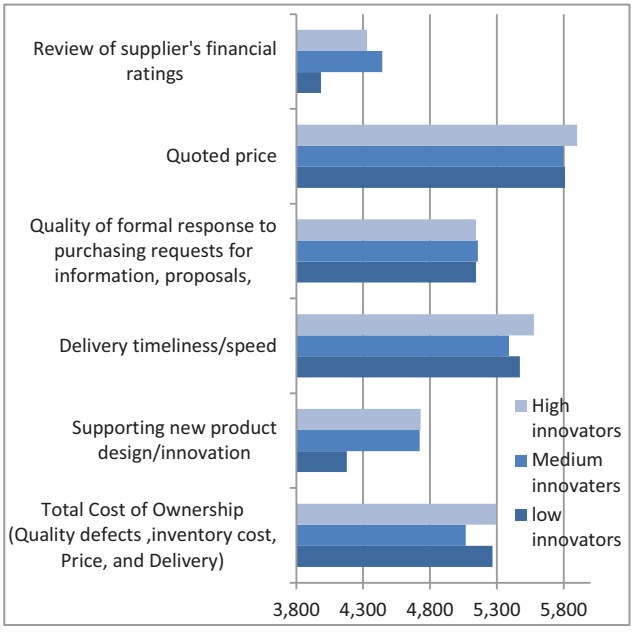


Fig. 5 Used methods for supplier selection (Likert scale 1-7)

There is a significant difference between groups on question of reviewing supplier's financial ratings, meaning that innovators use this criterion more often since risks of innovation are high. The second significant difference is on support of suppliers for new products. This is important because suppliers have to adapt to innovations as well as the innovators.

The final analysis is done on the question of centralization of the purchasing function as it would serve to verify the [16] model.

TABLE V
REASONS FOR CENTRALIZATION AND THE ORGANIZATION OF THE PURCHASING FUNCTION (LIKERT SCALE 1-5)

% sales from new products group	To establish long term relationships with suppliers (1)	Common items used across the corporation/company (2)	Volume leverage of price/cost (3)	Items are standardized commodities (4)	Purchasing information technology enables centralization (5)	Which of the following best describes the organizational structure of purchasing in your company? (6)
< 30% of sales (low innovators)	4,83	4,72	5,34	4,34	4,05	2,4
30%-70% of sales (medium innovators)	4,85	5,21	5,13	4,56	4,34	2,36
> 70% of sales (high innovators)	4,91	5,27	5,51	4,76	4,47	2,68

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Columns from 1 to 5 in Table V present reasons for centralization. Responders had to evaluate reasons for centralization on a Likert scale from 1 to 7. The ANOVA table showed no difference between groups of innovators. Reasons for centralizing are mostly for common items across the company and volume/leverage cost. The column (6) asked responders to describe their purchasing department. It was again measured on a Likert scale but from 1- Highly centralized, 3- Balanced mix of centralization and decentralization to 5- Highly decentralized. Again the ANOVA table showed no differences between groups and they all described their purchasing function as a balanced mix of centralization and decentralization.

Finally it was researched what influence the purchasing function has in the company. The importance was measured on a 7 point Likert scale. The ANOVA analysis revealed no differences between groups although it can be seen that high innovators have greater support by the top management. In Table VI one can observe the top-management support of the purchasing function by various groups of innovators.

TABLE VI
SUPPORT OF THE PURCHASING FUNCTION BY THE TOP MANAGEMENT (LIKERT SCALE 1-7)

% sales from new products group	To what degree does your procurement organization influence (have direct input)	To what degree does top management support the strategic importance of
< 30% of sales (low innovators)	4,39	4,84
30%-70% of sales (medium innovators)	4,53	4,93
> 70% of sales (high innovators)	4,99	5,18

The regression analysis confirms model [16], that is, the higher the technological risk the higher would be centralization. The relationship is significant so it enables us to conclude that the risk really influences the degree of centralization. Interestingly on the whole sample the technological risk was evaluated to 2,1 which would be low risk, and the degree of centralization is on the average 2,43 that tends more towards Balance between centralization and decentralization.

Before making general conclusions we looked at the distribution of risks and the organization of the purchasing function by the following two questions: "Which of the following best describes the organizational structure of purchasing in your company?" which was measured on 7 point Likert scale, and the lower the number the more centralized the purchasing function would be, and the second question "What percent of your active supplier base is managed by central purchasing?" measured in percentage of the overall purchasing.

Interestingly, as it can be seen in Table VII, the medium innovators face the highest risk and their centralization is highest. One would expect that from higher innovators, but it seems that high innovators are used to higher risks and perceive them maybe as less dangerous.

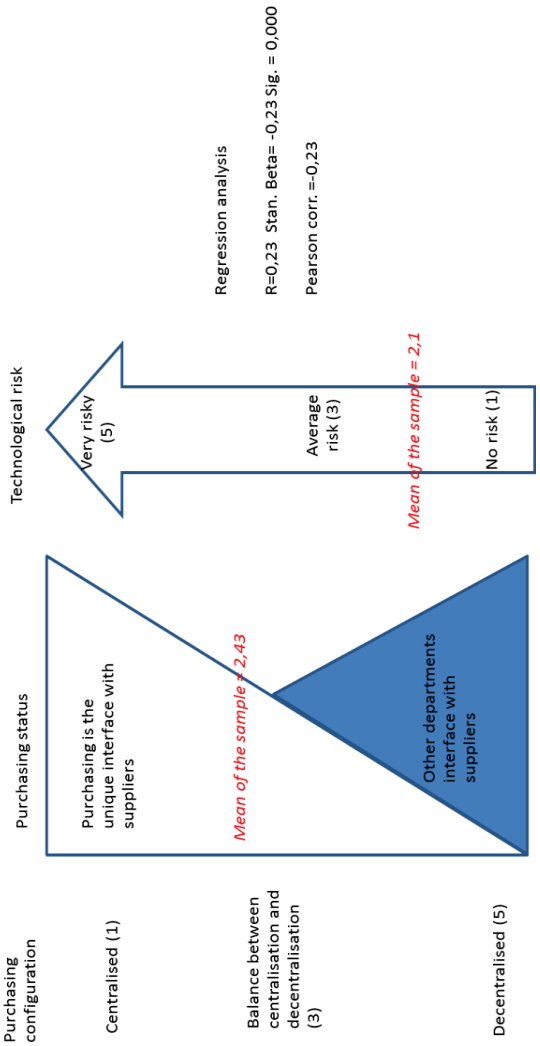


Fig. 6 The verification of the [16] model

TABLE VII
RISKS AND ORGANIZATION OF THE PURCHASING FUNCTION

% sales from new products group	Technology Risk	Which of the following best describes the organizational structure of purchasing in your company? (1- highly centralized, 7 highly decentralized	What percent of your active supplier base is managed by central purchasing?
< 30% of sales (low innovators)	1,98	2,27	,642
30%-70% of sales (medium innovators)	2,29	2,06	,713
> 70% of sales (high innovators)	2,27	2,18	,620
Total	2,10	2,24	,651

V. CONCLUSION

The role of purchasing in innovation has been studied by several authors among which also [16]. They believe that in all a purchasing function has an important role when technology risk is high in terms of greater knowledge of purchasing personnel and a more centralized organization. On a large GMRG 4 set which included 1493 filled questionnaires, from

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25 countries the [16] model was confirmed. An interestingly even to high innovator, innovation is not the top priority rather is quality and cost. There is a possible logic to it. Enhancing quality can lead to modification of products thus to incremental innovation and cost reductions, and that would explain the profits the companies make from new products as [10] suggested. However, one should bear in mind as [7] and [38] conclude that there is a myriad of factors that influence and enhance innovation.

To most innovative firms reasons as "Parent company ordered" and "Latest manufacturing technology" makes this supplier most important. As for selection of a supplier "Supporting new product design/innovation" and "Review of supplier's financial ratings" seem important.

The majority of the sample is innovating because 82% of the sample reported share of profits by new products introduced in last two years over 5% of total revenues. 5,2% of the sample reported less, while others didn't answer the question and are considered non innovators.

The purchasing function has a greater role in trying to lower the purchase cost while simultaneously keeping in mind quality and other factors in dependence what kind of purchase it is (e.g. Kralic division [39]). But even taking this into account, that the purchasing function is in fact responsible for a large part of company's expenses - the purchasing function still has not gained merits by upper management. The only higher support by top management to purchasing function is to higher innovators. Obviously for new products it is very important out of which material it is made.

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