

## BUSINESS PROCESS MANAGEMENT: ITS RELATION TO REVERSE LOGISTICS PRACTICES IN CZECH COMPANIES

ŠKAPA Radoslav

Masaryk University, Brno, Czech Republic, EU, [skapa@econ.muni.cz](mailto:skapa@econ.muni.cz)

### Abstract

Current body of research presents many factors, which influence the performance of reverse logistic; however the attention payed to the different factors, as demonstrated by number of existing research papers, varies very much. Process management, its tools and its maturity level belong to the group that is under-researched. The analysis presented in the paper is based on cluster analysis, which integrates several variables reflecting process management practices. Three groups of companies built upon the empirical data from Czech firms are then compared in terms of managerial approach to (and views on) reverse flows. The contribution of the text lies in the exploration of the differences in companies that utilize process management more and less intensively. In this respect the paper demonstrate that (1) business process management is related to perceived effectiveness of reverse logistics and (2) it provides an insight into the causal mechanism of this relationship.

**Keywords:** Process management, reverse logistic, reverse flows, empirical research, cluster analysis

### 1. INTRODUCTION

Similarly to other management research domains, the role of efficiency (and effectiveness especially) in reverse logistics is crucial, which contradicts the low number of published papers on this topic: Despite of more than two decades of research into management of reverse flows, the academic attention paid to effectiveness of reverse logistics is limited [1]. One potential cause of this situation relates to specificities of reverse flows, which limits the effectiveness - the companies sometimes need to design and apply solutions, which are tailor-made and which require specific knowledge, innovativeness and commitments from logistics specialists as well as from executive management [2]. No surprise that there remarkable differences between the best-in-class and the average firms: the best companies retrieve 64 percent of original value of reverse flows, while keeping the reverse logistics cost lower at the same time, whereas it is 12.5 percent of value in average companies [3].

Process management proved to be a successful managerial approach to performance improvement initiatives more than three decades ago. Surprisingly, this approach is not discussed intensively in the current literature related to reverse logistics [4]. This contradict the fact that in many definitions of reverse logistics, processes and their management is mentioned explicitly - see works of [5], [6] and others. There are a few papers only that recently deal with application of process management in reverse logistics context: e.g. [4], [5] or [7].

For this reason, the paper tries to shed more light on process management and its impact on and relations to reverse logistics; thus providing further empirical evidence. The research aim is set formally as follows:

Research aim: *What is the relationship between the level of process management practices and selected aspects of reverse logistics in companies?*

Due to exploratory nature of the aim no formalized hypothesis are introduced.

## 2. METHODOLOGY

### 2.1. Data collection and the research sample

The data was collected by means of personal interviews, which contained 28 main questions adopted from works of [8] and [9]. The survey was conducted as a part of an exploratory research project (see the acknowledgement in the end); just a small part of data (of variables) is utilized in the paper. Besides companies' characteristics, selected aspects of management and reverse logistics practices were employed in the text.

The collection of data was realized 2014 and in two rounds. Due to research funding restrictions the convenience sampling was chosen - as the data come not from random sampling, the external validity was out of control resulting in hardly generalizable results. The sample amounted for 221 cases, which diminished to 181 do the missing values (explained further in the text). The representation of industries is uneven: 60 % belongs to services (according to respective core business activity) and the remaining 40 % to the manufacturing companies. Medium-size and large companies are over-represented in the sample (27 and 11 per cent respectively) compared to their share in the population (i.e. all businesses in the Czech Republic).

### 2.2. Measurement of variables used

Business process management includes miscellaneous practices and therefore its development in a company (level of application, in other words) cannot be measured by a single item/variable. More maturity models are suggested and tested empirically in the current body of research literature. Despite certain criticism towards maturity models, they would be an effective tool for the purpose of this article. Due to technical limitations, such precise measurement couldn't be applied, and more "rough" approach was chosen. Out of the variables collected, ten of them were selected to enter the factor analysis. The dummy and scale variables measured intensity of application of various tools, which relate to process management. More specifically, the factor procedure entered the variables reflecting the following aspects:

Presence/absence of reverse flow planning on strategic/tactical/operational company's plans (4 items were merged into one index variable): planning is a part of formalization activities, which directly support processes management activities.

- Presence/absence of cost associated to reverse logistics: performance measurement systems is part of process management approach.
- Cross-functional integration of activities within a company (2 items).
- Knowledge management system (3 items).
- Existence and usage of internal corporate directions (formalization of management).
- IS/ITC support for business processes.
- Existence of quality management system - certification of ISO 9001 (9004).

The factor analysis was used in confirmatory mode: First, the Cronbach alpha indicated very good reliability of the proposed latent variable ( $\alpha = .79$ ). The data were examined by checking both the correlation and the inverse correlation matrix. Next, the Bartlett's test of sphericity supported the idea of sufficient size of correlations (chi-square = 634.4,  $p < .00$ ) and Kaiser-Meyer-Olkin Measure = 0.782 (passing the recommended threshold of 0.5). After conducting these basic tests, the calculated factor scores were used in the further analysis as the main independent variable. Due to listwise deletion in factor calculation, which was a conservative option in terms of statistics, the number of final sample shrank from 221 to 181. The extracted factor explained 38.1 % of variability in the original data.

### 3. RESULTS AND DISCUSSION

#### 3.1. Relationships to general aspects of company's management

Before the links to reverse logistics were examined, the calculated latent variable of process management was related to general descriptive characteristics of companies and their management. For items measured on scales, the Pearson coefficient of correlation was calculated (see the Table 1), in the case of dummy variables, the results for t-tests are presented. As apparent, relationship can be observed in all general aspects that were enquired in the questionnaire. To summarize it, the higher level of the applied principles and tools of process management is associated with higher company's size (as measured by number of employees), and profitability (including the relative profitability compared to the industry average). Manufacturers showed more extensive usage of process management, compared to the group of services.

**Table 1** Process management and its relation to various general aspects of companies

Variable related to process management	Pearson r/t-test	N
Number of employees	0.152*	181
Profitability in the last 3 years	0.278**	178
Profitability compared to industry average	0.209**	180
Product innovativeness (unimportant vs. necessity for company's existence)	0.35**	179
Industry: services / manufacturing	t = 2.44*	181

Note: \*  $p < .05$ , \*\*  $p < .01$

#### 3.2. Relations to reverse logistics

The four views on reverse logistics were covered in the questionnaire: its innovativeness, intensity of its modifications, usefulness, and effectiveness (as measured by its benefits to company's competitiveness) - see **Table 2**.

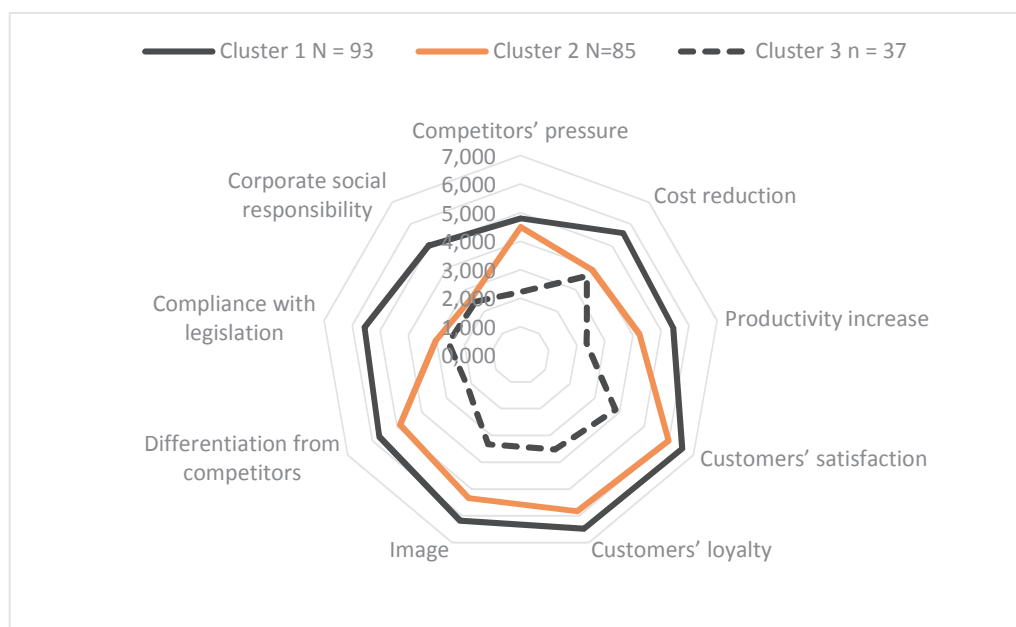
All these aspects are positively related to process management; the coefficient of correlations are statistically significant and are weak to medium. On one hand, it means that process management in this field is not a barrier to development and to innovations; at the same time, process management is related to higher competitiveness (effectiveness). Probably, the reason behind it is that companies of higher level of process management perceive the reverse logistics as important (as very necessary) issue. Surprisingly, there is no evidence about link to profitability of reverse logistics, which somehow contradict the existence of the link to effectiveness. The (hypothetical) explanation is as follows: The "Impact of RL on corporate profitability" was measured as a percent of increase/decrease the whole company's profit due to reverse logistics activates. In majority of companies, such information is not available, as companies do monitor the reverse logistics cost (if at all) and don't the benefits (this piece of information resulted from our survey). Thus, the impact of reverse logistics is the qualified guess only. In the same time, the companies of higher process management practices measure the cost more precisely (this item entered the factor analysis to form process management as explained above, i.e. it is based on our definition), so they might be more realistic about the cost and thus more conservative in estimation of the revenues (and the profit consequently).

The logistics system should reflect specific requirements of companies on logistics output, i.e. on customer services and logistic aims. In the next part, the exploratory question of relationship between process management and different types of motivation is investigated. Eight motivates for reverse logistics were enquired using scale questions (no impact to high impact of particular motivation).

**Table 2** Process management and general perception of reverse logistics

Variable related to process management	Pearson r/t-test	N
Management approach to reverse logistics (conservative vs. innovative)	0.452**	180
Change in approach to RL in the last 5 years (no vs. substantial change)	0.416**	180
Role of reverse logistics (useless vs. very necessary)	0.526**	180
Effectiveness of RL (causing high losses vs. important competitive advantage)	0.328**	180
Impact of RL on corporate profitability	-0.1	150

The clustering was conducted in two steps: according to the Agglomeration coefficient (calculated in Hierarchical Cluster Analysis procedure - Wards method), the companies were then grouped into three clusters (K-Means cluster procedure). As apparent from **Fig. 1**, there are no big distinctions in terms of motives, but the difference is in intensity of general motivation: Cluster 1 is obviously more motivated to gain the whole variety of (reverse logistics-) benefits, compared to the remaining two clusters.


**Fig. 1** Motivation to reverse logistics - three clusters

The clusters differ in terms of process management, which was expected ( $F = 18.848$ ,  $df = 2$ ,  $p = .0$ ). The more "motivated" companies (i.e. Cluster 1 and 2) employ process management in higher intensity of process management. Specifically, the difference is statistically significant between Clusters 1 vs. 2 and Clusters 1 vs. 3, not between Cluster 2 vs. 3 (see **Table 3**).

**Table 3** Difference in PM + Bonferroni post-tests

Cluster	N	Mean for Proc. man.	Cluster No.	Compared to Cluster No.	Mean Diff.	Std. E.	Sig.
1	78	0.433	1	2	-0.652	0.149	.000
2	69	-0.218	1	3	-1.060	0.188	.000
3	33	-0.626	2	3	0.408	0.191	.104

Note: Sample size is limited to 181 cases due to the missing values in Process management.

Different analytical approach was employed to check the conclusion: the correlations between each motive and process management were calculated. As apparent from **Table 4**, all the motives are positively related to process management, which supports the previous outcomes based on cluster analysis.

**Table 4** Pearson correlations for Process management and particular motives

Motives for reverse logistics	r	Motives for reverse logistics	r
Competitors' pressure	0.218**	Image	0.346**
Cost reduction	0.270**	Differentiation from competitors	0.341**
Productivity increase	0.384**	Compliance with legislation	0.301**
Customers' satisfaction	0.310**	Corporate social responsibility	0.394**
Customers' loyalty	0.279**		

#### 4. CONCLUSION

Process management is an immanent approach in reverse logistics; however its effects, its mechanism and its suitable areas of application are neglected by academic research, as documented by only a few papers that question its implicitly accepted benefits on the business. Our findings don't deny it: statistical tests have proven the link between process management and effectiveness of reverse logistics. However, we failed in confirming the link to the overall corporate profitability. Probably, this result illustrates more the fact that companies are de facto unaware of real contribution of reverse logistic to their profitability, than the inefficiency of process management practices.

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