

Turning Points in Business Process Orientation Maturity Model: An East European Survey

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Abstract

Companies worldwide are embracing Business Process Orientation (BPO) in order to improve their overall performance. Over the past few years methodologies for analyzing maturity state of BPO have been developed. Maturity model consists of a number of stages through which companies evolve as they increase the adoption of process oriented practices. Understanding the transition between different stages of BPO is of utmost importance for enabling governance and superior execution of these processes. In this paper we present the investigation of turning points between different stages of BPO in the business setting in transitional economies of East European countries, specifically Croatia and Slovenia. Using an acknowledged data mining technique of classification and regression trees (C&RT) turning points are detected based on survey results obtained in 2008. These findings present invaluable guidelines for any business that strives to achieve more efficient business processes.

1. Introduction

Business process orientation (BPO) is a business organization concept that is being adopted by companies worldwide. Companies wanting to improve their performance and stay competitive are introducing and adopting a process view of business in order to enhance their

overall performance [4]. BPO can slim down operational costs, promote customer relations through satisfying customer needs better and increase employee satisfaction through harnessing the benefits available in organizational knowledge. As this is a complex process done over a long period of time, companies can attain various degrees of BPO acceptance through adjustments of their business processes. Over the past few years methodologies for analyzing the maturity state of BPO have been developed. Maturity model consists of a number of stages through which companies evolve as they increase the adoption of process oriented practices. This paper closes some of the gaps in understanding BPO adoption by identifying key turning points for transitioning from one level to another. Here we will present the investigation of turning points between different stages of BPO in the business setting in transitional economies of East European countries. Using an acknowledged data mining technique of classification and regression trees (C&RT) turning points are detected based on data set that was obtained as a part of a survey conducted in Croatian and Slovenian companies in 2008. These results support earlier conclusions about turning points as well as they reveal some new turning points. Discovered knowledge about turning points can be used as a set of practical guidelines for any company that strives to achieve more efficient business processes.

The structure of the rest of the paper is as follows. In Section 2 we explain the purpose of

maturity models for determining status of business process orientation within a company. Characteristic of a turning point as one of the most important terms in any maturity progress will be explained. In Section 3 possibilities of applying data mining approaches in discovering properties of turning points will be presented. Decision tree learning will be discussed in more detail as it will be used for investigation of turning points in Slovenian and Croatian firms. In Section 4 we present the survey conducted in 2008 in Slovenian and Croatian companies. Preliminary results and demographics are given. These data was used to generate a decision tree model that will be presented in Section 5. In the following Section, discussion of revealed turning points is given. The results are used to suggest guidelines for companies that are trying to adopt BPO. Finally, in Section 7 we give conclusion and define directions for future work.

2. Business Process Orientation Maturity Model

Extensive literature on business process orientation (e.g. [3, 6, 15, 2, 7]) suggests that organizations can enhance their overall performance by adopting a process view of business. Theoretically, the benefits that BPO brings to an organization are numerous. It affects the soft side of organizations as well as the bottom line figures. Some of the benefits reported in the literature are: cost savings through a more efficient execution of work, reduced cycle times, improved customer focus, better integration across the organization, increased flexibility of the firm along with improved customer satisfaction, elimination of redundant and duplicated activities [10, 22, 16, 5]. Implementing BPO as a way of organizing and operating in an organization will improve internal coordination and break down the functional silos that exist in most companies [15].

Promising theoretical propositions about the impact of process orientation on organizational performance have also been empirically tested and validated. McCormack and Johnson [15] tested BPO's impact on financial performance

and found strong positive relationship. Similarly, Skrinjar et al [23] examined this relationship but extended it to include the nonfinancial performance (employee satisfaction, customer satisfaction and supplier relationships) and found a direct impact of BPO on nonfinancial performance and indirect impact on financial performance that is mediated by nonfinancial performance. Willaert et al [25] also showed positive relationship between BPO and specific performance indicators. In a nutshell, process oriented companies perform better than those that are not process oriented. Theoretical presuppositions and empirical evidence thus convey an appealing concept for organizations striving for performance enhancements.

Although definitions of the business process orientation (BPO) vary, we adopt the McCormack's and Johnson's [15] definition of process orientation: An organization that, in all its thinking, emphasizes process as opposed to hierarchies with a special emphasis on outcomes and customer satisfaction.

It is evident that all organizations are composed of business processes, even though they have not entirely adopted the process view. Therefore, a process approach can be applied to any organization. While definition of BPO does explain crucial insight into what BPO stands for it does not reveal the complexity of the concept. There are many interpretations of what BPO entails (Davenport [3], Hammer and Champy [6], McCormack and Johnson [15], Burlton [2], Harmon [7] to name a few dominant authors) and the conceptualizations are on one hand partially overlapping and on the other hand interpret the intricacies of BPO quite differently based on the tradition the author(s) belong to [8]. While each interpretation stresses several important points it also neglects other ones. Based on our extensive literature review we synthesize different viewpoints of BPO into a comprehensive BPO model that takes into account majority of dimensions, frequently mentioned in literature. In order to analyze and improve BPO companies need to take the following dimensions into account:

1. Strategic view
2. Process identification and documentation
3. Process measurement and management
4. Process oriented organizational structure
5. Human resources management
6. Process oriented organizational culture
7. Market orientation
8. Supplier perspective
9. Process oriented information technology /information systems development

It should be noted that the concept of process orientation is not bipolar. Rather, companies can employ different levels of process orientation, based on how many and which practices that are aligned with process paradigm they have implemented. The levels of process orientation are often presented by a process maturity concept. In the current business environment, there is no scarcity of process maturity models [23]. They serve as reference models of the stages that organisations go through as they move from being immature to mature in their process orientation. The business process maturity models are based on concepts developed by researchers over the past two decades and imply that a process has a lifecycle that is assessed by the extent to which the processes are explicitly defined, managed, measured and controlled.

For the purpose of this research, the BPO maturity model was readjusted from [15]. The original model was developed based on the concepts of process maturity, BPO, and the Capability Maturity Model developed by the Software Engineering Institute at Carnegie Mellon University [12]. The BPO construct describes a four-step pathway for systematically advancing business processes along the maturity continuum (Ad Hoc, Defined, Linked, and Integrated level). Each step builds on the work of the previous steps to apply improvement strategies that are appropriate for the current maturity level. The following definitions are provided for the stages that an organization goes through when becoming business process oriented:

Ad Hoc: The processes are unstructured and ill-defined. Process measures are not in place and the jobs and organizational structures are based upon traditional functions, not horizontal processes.

Defined: The basic processes are defined and documented and are available in flow diagrams. Changes to these processes must now undergo a formal procedure. Jobs and organizational structures include a process aspect, and yet remain basically functional. Representatives from functional areas (sales, manufacturing, etc.) have regular meetings to coordinate with each other, but only as representatives of their traditional functions.

Linked: The breakthrough level. Managers employ process management with strategic intent and results. Broad process jobs and structures are put in place outside the traditional functions.

Integrated: The company, its vendors and suppliers, take cooperation to the process level. Organizational structures and jobs are based on processes, and traditional functions begin to be equal or sometimes subordinate to the process ones. Process measures and management systems are deeply imbedded in the organization [15, 13].

While theoretically sound, presented maturity model lacks practical usability as it is descriptive in nature and does not give companies a clear direction on what specifically needs to be done in order to achieve higher level of maturity. To overcome this deficiency the concept of turning points is used [14]. Turning points define the key elements that need to be addressed in order to advance to higher level of maturity. The nature of a turning points is that they are heterogeneous and can embody a wide variety of practices such as implementing certain IS/IT solution, defining business measures or training and empowering employees to name a few candidates.

The aim of this paper is to identify the most important turning points that will enable companies to advance to higher levels of BPO maturity.

3. Data mining techniques and turning points investigation

Data mining is an approach to data analysis that is based on the nontrivial extraction of implicit, previously unknown and potentially useful information from large data sets through identification of patterns within underlying data [11, 24]. There is a number of techniques that are used for pattern recognition that are adopted from statistics, mathematics and artificial intelligence. Methods such as clustering, association rules and decision trees can be used to investigate turning points in maturity models.

Cluster analysis, also called segmentation analysis or taxonomy analysis, is used to identify homogeneous subgroups of cases in data set. These groups, also known as clusters, are formed so that they both minimize within-group variation and maximize between-group variation. For each cluster a typical value across predictor variables is identified called centroid. Centroid is the value that has the minimal average distance for all members of each cluster, but that has maximum distance to centroids of other clusters. By analyzing cluster members of each cluster conclusions can be made about properties that determine turning point for changing maturity level.

Association rules are undirected data mining method which goal is to discover associations between specific values of categorical variables in large data sets [17]. It is an a priori algorithm that generates implicative rules that contain conditions that must be met before conclusive part of the rule becomes evident. Each generated rule can have different levels of support within the data set and different level of confidence. For detection of turning points, the most important rules are those with highest confidence, because the discovered relation between conditions and resulting maturity level is stronger.

Decision tree is a versatile predictive model used for classification problems and regression. Depending on the data type of the dependant variable there are classification trees and regression trees. Classification trees are used to predict membership of cases or objects in classes

of categorical dependant variable based on the measurements of one or more predictor variables [18]. Regression trees are used to predict the value of the continuous dependant variable based on one or more continuous or categorical predictor variables.

For the purpose of this research we will use data mining technique based on decision tree learning. Since the dependant variable that describes current level of maturity of a company is categorical, we will use a classification tree as it is more appropriate [14]. In the rest of this Section we will give more detail overview of this data mining technique and software used.

3.1. Decision tree learning

Decision tree learning is a common machine learning method used in data mining. A tree can learn how to classify a given set of data (training set) by determining split criteria for each branch. Various decision tree algorithms such as CHAID, ID3, C4.5, C&RT, and other [9] produce trees that differ from one another in the number of splits allowed at each level, how these splits are chosen when the tree is built, and how the tree growth is limited to prevent overfitting. However the most important characteristic of the algorithms is the criteria for determining the split. General C&RT algorithm (see [1, 21]) uses statistical measurements of homogeneity of cases in a node (such as Gini index, Chi-square or G-square). ID3 algorithm and C4.5 algorithm (see [19, 20]) uses an information driven evaluation function based on entropy and information gain. All of the algorithms try to determine the predictor variable and split criterion that can generate the greatest improvement of the predictive accuracy.

STATISTICA provides General C&RT algorithm for building binary decision trees that can use any of the abovementioned criteria for evaluating appropriate predictor variable for split.

4. Survey of Croatian and Slovenian firms

In 2008 a joint empirical research was carried out by Faculty of Economics in Croatia and Slovenia. The main goal was to assess the current

state of BPO maturity of companies in both countries.

A questionnaire had 51 questions regarding BPO characteristics that were divided in 9 domains as follows: Strategic view (5 questions), Process identification and documentation (6 questions), Process measurement and management (7 questions), Process oriented organizational structure (5 questions), Human resources management (5 questions), Process oriented organizational culture (6 questions), Market orientation (7 questions), Supplier perspective (3 questions), Process oriented information technology (7 questions). Each question describes a particular BPO characteristic within each domain. Degree of presence of these characteristics in the organization of the firm is measured on a 7 point Likert scale (1=Strongly disagree, 2=Disagree, 3=More disagree than agree, 4=Neither agree or disagree, 5=More agree than disagree, 6=Agree, 7 =Strongly Agree).

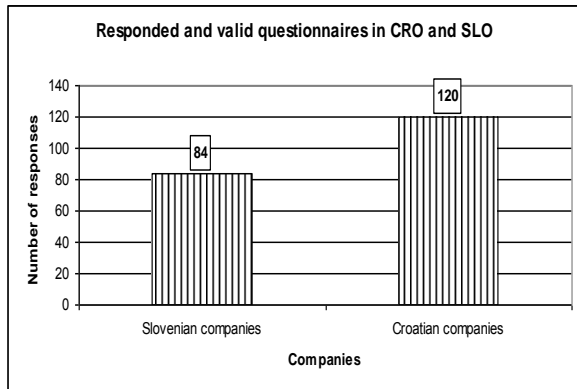


Figure 1. Number of responses to the survey per country

Questionnaires were sent to CEOs or senior managers in 3089 firms (1750 Croatian and 1339 Slovenian). A total of 195 Croatian and 129 Slovenian managers responded, so the final response rate was 10,5 %. Responses contained 121 records with missing or invalid data so the final data set contains 204 records (Fig. 1).

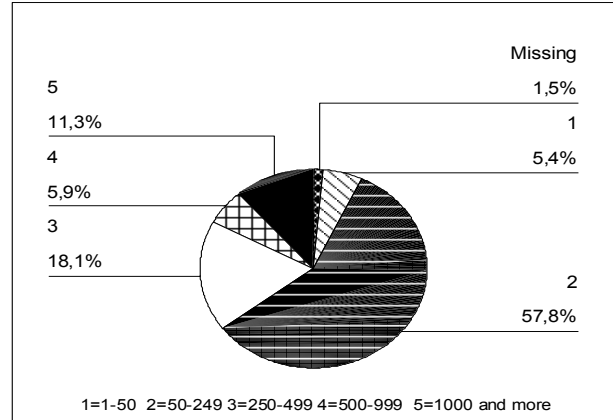


Figure 2. Companies by number of employees.

Company size is determined by the number of employees. In the resulting data set 5.4% of the companies have between 1 and 50 employees, 57.8% of the companies have between 50 and 249 employees followed by 18.1% of companies with 250–499 employees, 5.9% companies with 500 to 999 employees and 11.3% of the companies with 1000 or more employees (Fig. 2).

Also 55 companies estimated their profit in 2008. at less than 50 million Croatian kunas (HRK) or 8,5 million USD, 85 companies estimated between 50 and 200 million HRK (or 8,5 and 34 million USD) and 56 of them estimated more than 200 million HRK (34 million USD).

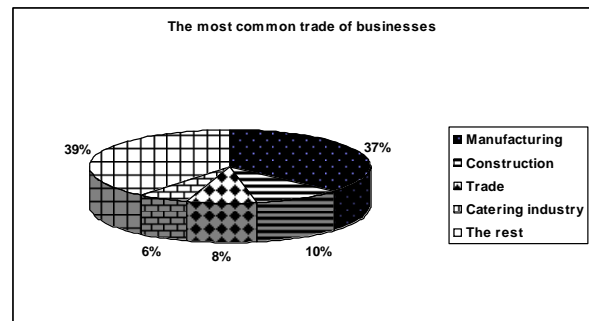


Figure 3. Companies by most common trades of business.

The most common trade of business in data set is Manufacturing (36,8%). It is followed by Construction (10,3%), Trade (7,8%) and Catering industry (5,9%). 39.2% of the companies developed other sorts of business (Fig.3).

5. Decision tree model for turning point detection

5.1. Data set preparation

First step in data mining effort is data preparation. Based on the responses of companies, maturity levels for each company had to be assessed. A total of 51 questions are included in the questionnaire regarding the BPO characteristics, divided in 9 relevant domains as described in Section 2.

Since split criteria cannot be evaluated if records with missing or invalid data are used, these cases are removed from the dataset as mentioned earlier.

Each question was measured on a 7 point Likert scale. For each domain an average grade was calculated. BPO Maturity level was assessed using the average value of all 9 dimensions. Due to the difference in Likert scale of the questionnaire and number of maturity levels, values were mapped using Table 1 in order to assess the maturity level for each data set record.

Table 1. BPO Maturity level mapping

<i>Likert scale values</i>	<i>BPO Maturity Level</i>
1,2,3	Ad Hoc
4	Defined
5	Linked
6, 7	Integrated

5.2. Model description

Model was developed using General C&RT algorithm where the split criteria was Chi-square. Maturity level assessment was used as dependent variable, and the other 50 variables obtained through the questionnaire were used as predictor variables. In order to validate the optimal tree model V-fold cross-validation was used that samples the data set and calculates error of classification for each generated tree, so called CV score. Finally, tree no. 5 was selected as optimal model because of the lowest classification error (as shown in Fig. 4.)

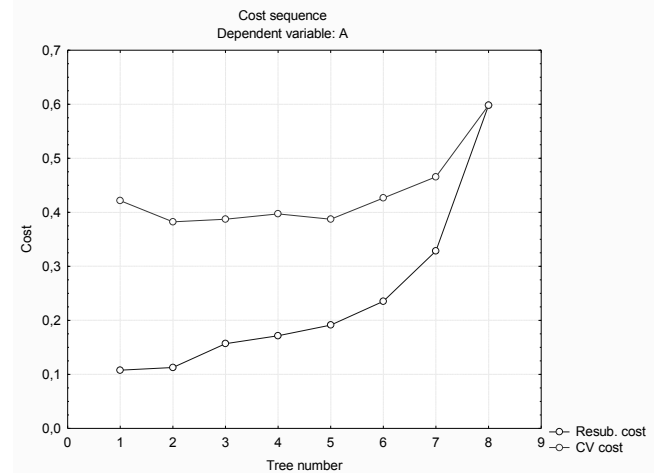


Figure 4. Decision tree model comparison using CV score sequence

The selected model successfully classifies 80,9% of presented data. It contains 11 terminal nodes and 10 intermediate nodes as shown in Fig. 5.

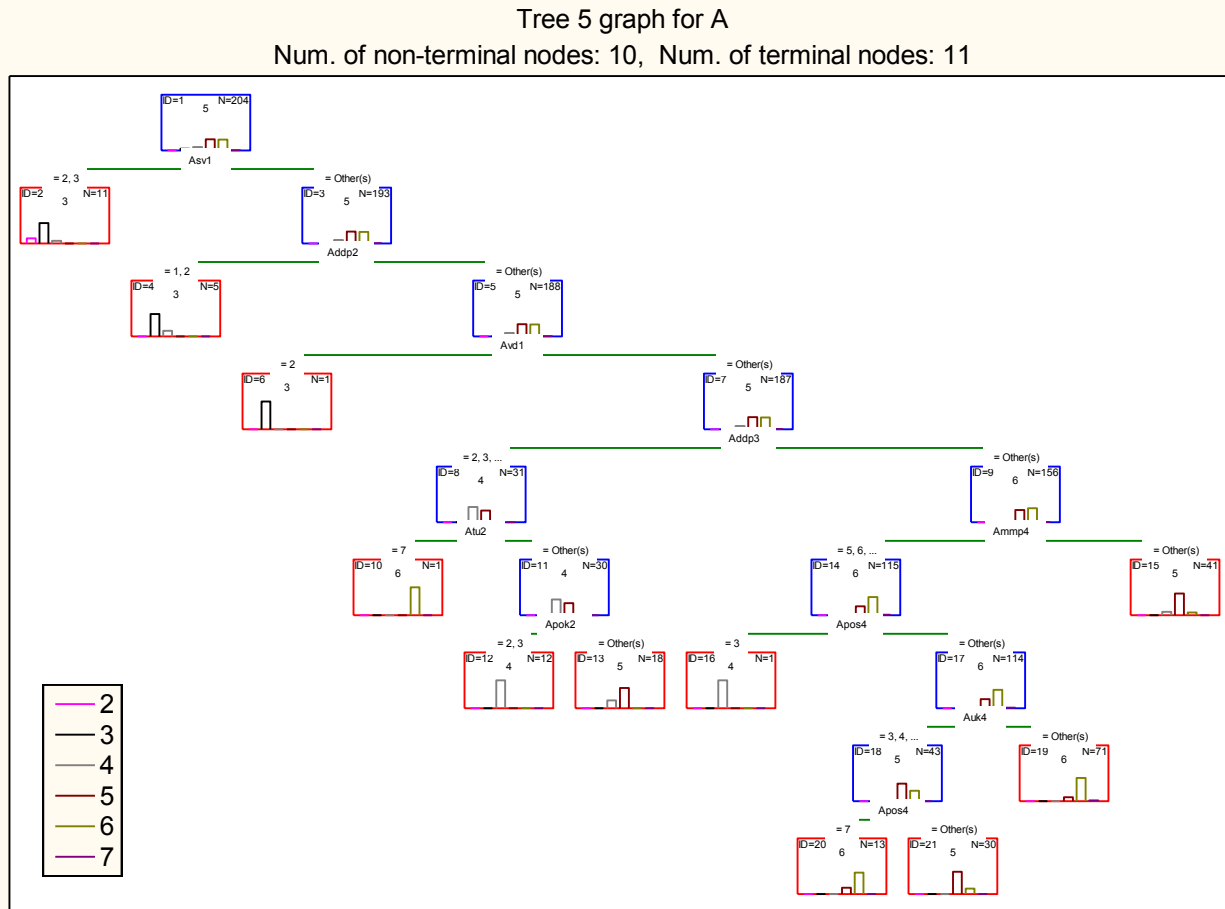


Figure 5. Classification of maturity levels using General C&RT Tree model.

For each terminal node a classification rule can be derived from the tree by combining split criteria from the root of the tree to each terminal node into a classification precondition. If a data case coincides with the precondition it is classified according to the rule to a given maturity level.

For each rule a support indicator and misclassification error are calculated in order to differentiate between significant rules and insignificant ones. Support of a rule is a ratio of total number of cases that are classified using that rule and number of cases in data set. Misclassification error is a ratio of number of misclassified cases by a given rule and total number of cases (both misclassified and correctly classified) that are classified by this rule. If a rule has low support it can be a significant only if

number of misclassified cases is very low (preferably with no classification error at all). According to this, most important rules, with highest support and lowest misclassification error, are given in Table 2.

Table 2. Most important rules generated by the decision tree model

Id	Rule	Supp.	Class. err.
19	IF Asv1>3, Addp2>2, Avd1>2, Addp3>4, Ammp4<5, Apos4>3, Auk4>5 THEN A=6	35%	16,9%
15	IF Asv1>3, Addp2>2, Avd1>2 Addp3>4, Ammp4<5 THEN A=5	20,2%	22%
21	IF Asv1>3, Addp2>2, Avd1>2, Addp3>4, Ammp4<5, Apos4=4, 5 or 6, Auk4<6 THEN A=5	14,8%	20%
12	IF Asv1>3 and Addp2>2 and Avd1>2 and Addp3<5 Atu2<7 and Apok2<4 THEN A=4	5,91%	0,00%

If we transform resulting values of rules using key in Table 1, we can conclude that (1) rule 12 can be used to determine turning point conditions for lowest BPO maturity level, (2) rules derived from nodes 15 and 21 can be used to determine the turning point conditions for linked processes and (3) rules derived from node 19 can be used to determine turning points for integrated business processes.

6. Discussion

While in previous section formalized rules that were detected using decision tree are shown in this section we explain the practical implications of some of the rules. Detected rules are explained in order of importance and not in sequence of steps that a company must take. Another important notion that needs to be pointed out prior to discussion is the mapping of 7-point Likert scale (used in questionnaire) to 4 levels of BPO maturity. As seen in Table 1 company's average BPO scores (rounded to integer value) represent the following maturity levels: **1 - 3: AdHoc; 4: Defined; 5: Linked; 6-7: Integrated.**

First turning point for advancing BPO maturity is the top management involvement in process renovation initiatives (rule ID=1). With no management support, company cannot exit AdHoc level and stays very much in traditional functional paradigm of operations. At least some degree of management involvement is required to start the journey to higher levels of BPO. Of course, even management is not omnipotent, and solely supportive managers are not sufficient for the highest level (see rule ID=3).

The second important turning point is defining and documenting processes. Company that hasn't, to at least some degree, defined and documented is processes inevitably stays at AdHoc level. The reasoning behind this turning point is very straightforward; companies cannot improve their processes if they don't know which processes they have and how they operate. Hence, after ensuring that management is behind the BPO implementation, the first step is to thoroughly examine and document processes. Base on our experience, it is best to model processes using

some standard modeling technique (such as BPMN) as process descriptions in text format are rarely very informative and do not reveal the true functioning of the process. As was the case in manager's support, so is this turning point limited in its power to reach the highest level of BPO maturity (rule ID=5).

When establishing BPO it is very important to clearly define the roles and responsibilities of employees executing processes. In fact this turning point is one of the things that company must do, in order to reach the highest level of BPO. Usually when adopting process principles, companies expand the responsibilities of their employees thereby enabling them to perform more multidimensional tasks and take more decisions which can result in fewer handoffs and shorter process cycle. Clear definition of roles is key in this process and successful completion of this task is one (not the only one) of the conditions for reaching the Integrated level of maturity.

Another turning point acting as a prerequisite for advancing from Linked level to Integrated level lies in process measurement and management dimension. After company has defined its performance measures, defined target values and started measuring them it is very important to give feedback to its employees and keep them informed on the process efficiency and effectiveness. Only by having this information loop can employees readjust their work in accordance with target performance.

With regard to employees it is also very important for them to truly understand their customers' (either internal or external) needs and wants. By neglecting or not knowing what customers want, company can only reach the Defined level of BPO maturity. This turning point actually stresses the general importance of understanding customers. By definition process oriented companies focus on customers; on fulfilling their needs and wants. Clearly, in order to fulfill the needs, company must first know and understand them. This turning point is therefore, in its core, about having adequate market research processes in place. Only companies that truly

understand customer's needs can reach Integrated level of BPO maturity.

Next turning point is widely recognized in literature yet has never been empirically evidenced. We are talking about process owners, an organizational role that must be introduced into organization in order to strengthen process oriented principles and way of functioning. Simply put company must appoint process owners, who will be responsible for the success of their processes and ensure that processes as a whole operate optimally (as opposed to local optimization in functional organization whereby secluded functions optimize their parts of the process which creates problems for other functions and brings process as a whole in sub-optimized state) and in accordance with the goals of other processes and organization as a whole. Not appointing process owners will keep companies at the Defined stage. Naming process owners is therefore another important turning point for advancing to Linked level of BPO maturity.

Final turning point that will be pointed out has been somewhat neglected in literature. However based on our field work experience in process renovation projects we find it, and this is confirmed by this analysis, of paramount importance. Appropriate organizational culture is also important in adopting process paradigm. Employees must understand and see the functioning of a company as a set of processes. Traditional functional mindset, where people see functional departments, organizational units and strong hierarchy and where turf wars are frequent and ubiquitous will hinder the development of process orientation and trap company at Defined level at best. Companies must therefore educate employees on benefits of BPO and get them to understand how new way of working will also be beneficial to them.

7. Conclusion and Future work

Business process orientation (BPO) is an appealing concept for companies wanting to improve their performance and stay competitive. Previous research has shown that there is a

positive impact of BPO on organizational performance as it can slim down operational costs, promote customer relations and consequently increase employee satisfaction. There is, however, lack of research on what precisely companies need to do to advance its BPO maturity level. In this paper we addressed this issue by identifying key turning points for transitioning from one level to another. In order to discover this knowledge from practice of a pool of Croatian and Slovenian companies an acknowledged data mining technique was employed. Decision tree learning algorithm for classification was used in order to reveal most important characteristics that determine accomplished BPO maturity level. As it was shown, there are some factors and practices that need to be implemented before company can advance to certain level. While many of our findings have been identified before, now they are tied to specific levels of BPO maturity and in this regard enrich current body of knowledge on BPO. To sum up, clear management determination and congruency of employees with this determination through organizational culture is most evident. Introduction of the "process owners" concept was verified and documented as key turning point for higher BPO maturity levels.

Needless to say the list of turning points is not conclusive neither the relationships among them. Discovering the precedence and sequence of the steps needed to be taken in addition to identification of more turning points is left for future research.

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